International Commission for the Northwest Atlantic Fisheries

Serial No. 3372
(D.c.2)

ICNAF Res.Doc. 74/119

ANNUAL MEETING - JUNE 1974

The Fecundity of Georges Bank Herring in 1971

by H. Schultz

Institut for High Sea Fisheries and Fish Processing

Rostock, G.D.R.

Introduction

Fecundity of fishes can vary in remarkable way year by year as is generally stated by NIKOLSKI (1965). DRAGANIK and RAST (1970) pointed out that differences exist in the relationship between the number of eggs and the length of Georges Bank herring obtained in their own studies in 1968 and those made by JUDANOV in 1961/62 and PERKINS and ANTHONY in 1963/64. With regard to assessments of spawning potential the need for further investigations on the fecundity of Georges Bank herring is apparent.

Material and method

The material was collected from frozen landed fish which was catched one to three month before. In the w-hole 170 specimens were sampled, 97 in the northern and southern area of Georges Bank in August and September and 73 in the area off Cape Cod in September and October 1971. Each fish was subjected to the complete laboratory sampling procedure.

The length of fishes were measured from the nose to the longest rays of the caudal fin brought in the longitudinal axis of the fish and by an exactness of 0,5 cm (below).

Ovaries in stages IV, V and VI were taken and placed in Gilson's fluid. Ovaries in stage VI were only collected, when it was possible to decide whether eggs had been shed.

Nine month ago the counting was done. Before counting the glases containing the ovaries in Gilson's fluid were shaked, the eggs were seperated from rests of ovarian tissue and washed several times. Aocording to the method of descended volume the bulk of eggs were

determined. With an adjusted cup of 0,1 ml three samples for every fish were taken at random and counted. The standard deviation did not exceed 4,5 % in 96 % of all cases.

Results and discussion

In the range from 25,0 to 34,5 cm the individual fecundity varied between 27.000 and 167.000 eggs. The fecundity of individuals for length-groups on Georges Bank and off Cape Cod is given in figure 1. The mean fecundity for length-groups is shown in table 1.

The dividing of the material to age- and length-groups indicates the known distinct dependence of increase in fecundity upon length. Within a length-group it appears that the fecundity is somewhat dependent on age, but the material is too small for getting a clear statement on this possible relationship (table 2).

Studies on the fecundity of Georges Bank herring in former years were made by JUDANOV in 1961/1962, PERKINS and ANTHONY in 1963/1964, MOSKOV and ZINKEVICH in 1964, 1965 and 1966 and DRAGANIK and RAST in 1968. An exact comparison of the fecundity according to length-groups in 1971 to the results in other years is not always possible because of different not exactly known sampling method.

Taken in consideration a shrinkage of 0,75 cm of our frozen material in 1971 and a factor of 1.09 for a conversion from fork-length to total length for the material 1962 published by JUDANOV, figure 2 shows that in the years 1962, 1968 and 1971 fecundity to length-groups is highest in 1962 followed by 1971. Figure 3 demonstrates the percentual difference in the number of eggs per length-group in the years 1971 and 1968 in regard of 1962. With increasing length the relative difference decrease. Per 26 cm the fecundity in 1971 was by one third lower than 1962 and by nearly two thirds higher than 1968. Per 33 cm the fecundity in 1971 was as the same as in 1962, but by more than one third higher than 1968.

Although the ascertained fecundity in age-groups is not confirmed by combination with the length-age distribution of routine sampling, the data in table 3 may give an impression of the changing of fecundity to the same age-group.

Table 3. Mean number in thousands of eggs in age groups of Georges Bank herring

age		3	4	5	6	7	8	9	10	11	Author
year	1962	62.4	66.8	85.4	98.8	109.6	115.3	187.2	166.7		Yudanov
n		(5)	(12)	(49)	(101)	(41)	(6)	(2)	(3)	(-)	
year	1968	26.3	42.2	58.5	69.7	96.7	90.4	97.7	98.5	109.3	Draga-nik&Rast
n		(2)	(10)	(27)	(14)	(27)	(58)	(14)	(5)	(2)	
year	1971	46.1	70.7	89.6	102.9/118.7/123.0/161.3				132.9		Schultz
n		(39)	(35)	(42)	(31)	(8)	(9)	(2)	(2)	(-)	

To NIKOLSKI's generalized statement (1965) "fecundity is a specific adaption directed to the preservation of the species, by compensating for mortality, and by adjusting the numbers to the food supply". With regard to this view it may be of interest that in the above compared three years fecundity in relation to length ist lowest in 1968, when stock size (according to ANTHONY, 1972) is highest, and vice versa, fecundity is highest in 1962, when stock size is lowest (table 4).

Table 4. Fecundity and stock size of Georges Bank herring

year	thousands of eggs 28 cm	thousands of eggs 30 cm	millions of fish
1962	73	95	1.5
1971	53	80	2.1
1968	37	56	4.9

Annual investigations of fecundity appear necessary concerning the assessment of spawning potential and the recruitment problem.

References

1. ANTHONY, V.C., 1972. Georges Bank (ICNAF Division 5 Z and Subarea 6) Herring Assessment Doc., Midterm Meeting, ICNAF, Rome.

2. DRAGANIK, B. and RAST, B., 1970. The Fecundity of Georges Bank Herring. ICNAF, Redbook, Part III:117-120.

3. YUDANOV, I.G., 1966. Fecundity and Efficiency of Spawning of Atlantic Herring in the Gulf of Maine. Trudy PINRO, 17:249-262.

4. NIKOLSKI, G.V., 1965. Theory of Fish Population Dynamics as the Biological Background for Rational Exploitation and Management of Fishery Resources. Oliver and Boid, Edinburgh (1969):65-67.

5. NOSKOV, A.S. and ZINKEVICH, V.N., 1967. Abundance and Mortality of Herring (Clupea harengus L.) on Georges Bank according to the Results of Eggs Calculation in Spawning Areas in 1964-1966. ICNAF Ann.Meeting, Res.Doc. 67/98.

6. PERKINS, F.E. and ANTHONY, V.C., 1969. A note on the fecundity of Herring (Clupea harengus harengus L.) from Georges Bank, the Gulf of Maine and Nova Scotia. ICNAF, Redbook 1969, Part III:33-38.

Table 1 Mean number of eggs of Georges Bank herring for length-groups in 1971

Total length of herring (cm below)	Mean number (1000 eggs)	n pairs of ovaries
25,0	39,9	4
25,5	39,6	3
26,0	45,5	13
26,5	52,1	14
27,0	50,0	11
27,5	52,6	10
28,0	68,8	7
28,5	74,4	8
29,0	81,2	10
29,5	86,1	16
30,0	92,2	16
30,5	94,1	20
31,0	109,4	10
31,5	105,5	3
32,0	130,7	11
32,5	143,2	5
33,0	131,9	3
33,5	161,3	2
34,0	124,4	2
34,5	122,2	2

Table 2 The fecundity of Georges Bank herring in the age-length-groups in 1971

age	3	4	5	6	7	8	9	10	$\bar{x}$
years-class	1968	1967	1966	1965	1964	1963	1962	1961	
cm (below)									
25	40,8 (6)	37,9 (1)							40,4 (7)
26	46,3 (22)	59,4 (3)	74,1 (1)						48,9 (26)
27	48,3 (11)	58,2 (8)	39,3 (1)						51,8 (20)
28		71,0 (10)	76,8 (4)	58,7 (1)					71,7 (15)
29		73,4 (9)	80,2 (10)	79,5 (4)	94,3 (3)				79,0 (26)
30		105,8 (4)	89,3 (18)	95,1 (11)	90,0 (1)	94,7 (2)			93,2 (36)
31			83,0 (2)	110,5 (10)	139,2 (1)	-			108,5 (13)
32			127,1 (6)	143,6 (3)	148,0 (2)	141,2 (4)	-	99,1 (1)	134,0 (16)
33				114,5 (2)	-	-	161,3 (2)	166,7 (1)	143,7 (5)
34					141,0 (1)	117,3 (3)	-	-	123,2 (4)
$\bar{x}$	46,1	70,7	89,6	102,9	118,7	123,0	161,3	132,9	82,6
n	(39)	(35)	(42)	(31)	(8)	(9)	(2)	(2)	(168)

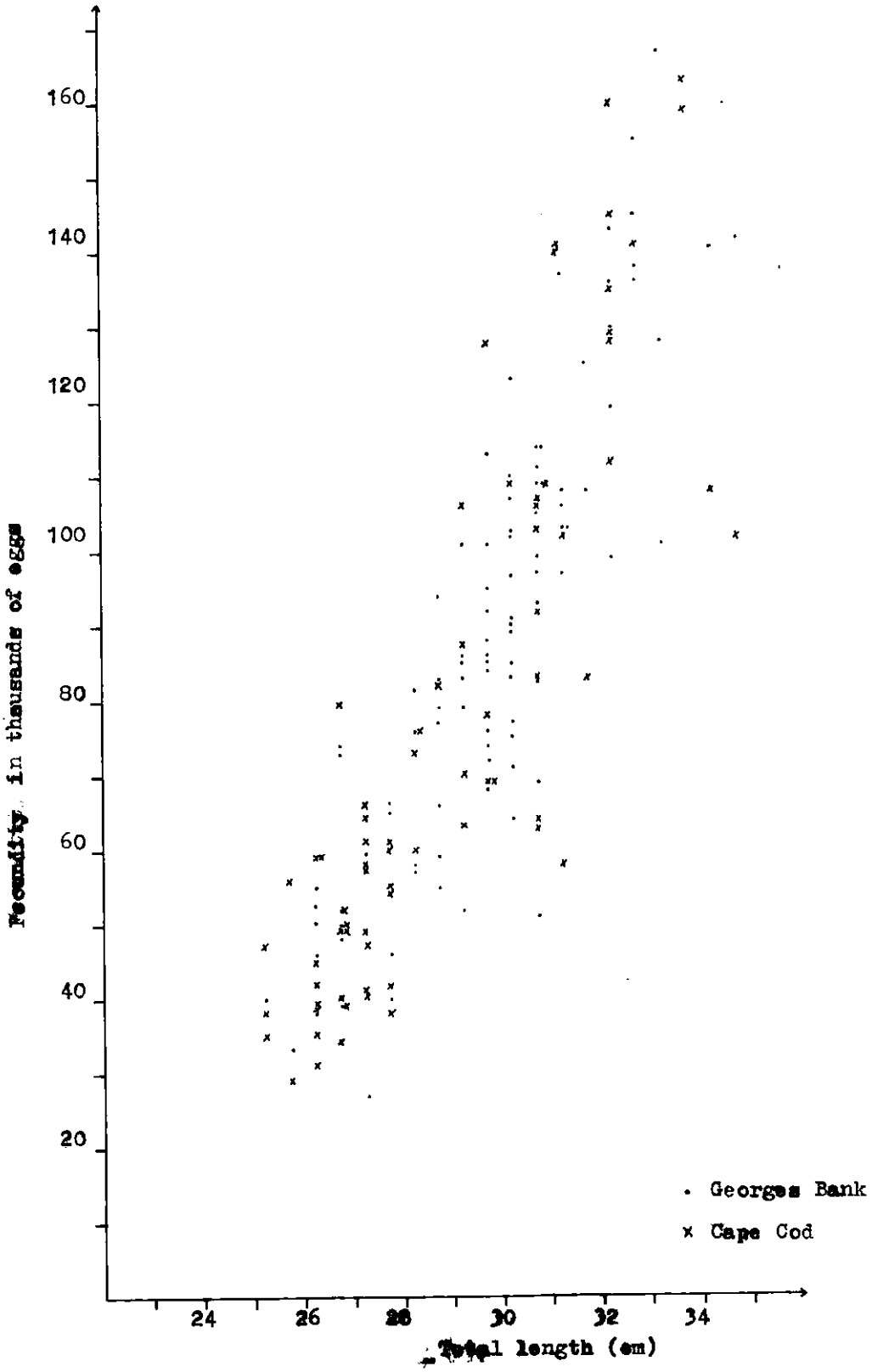

Fig. 1 Fecundity of individuals of Georges Bank herring in relation to total length of fishes in 1971

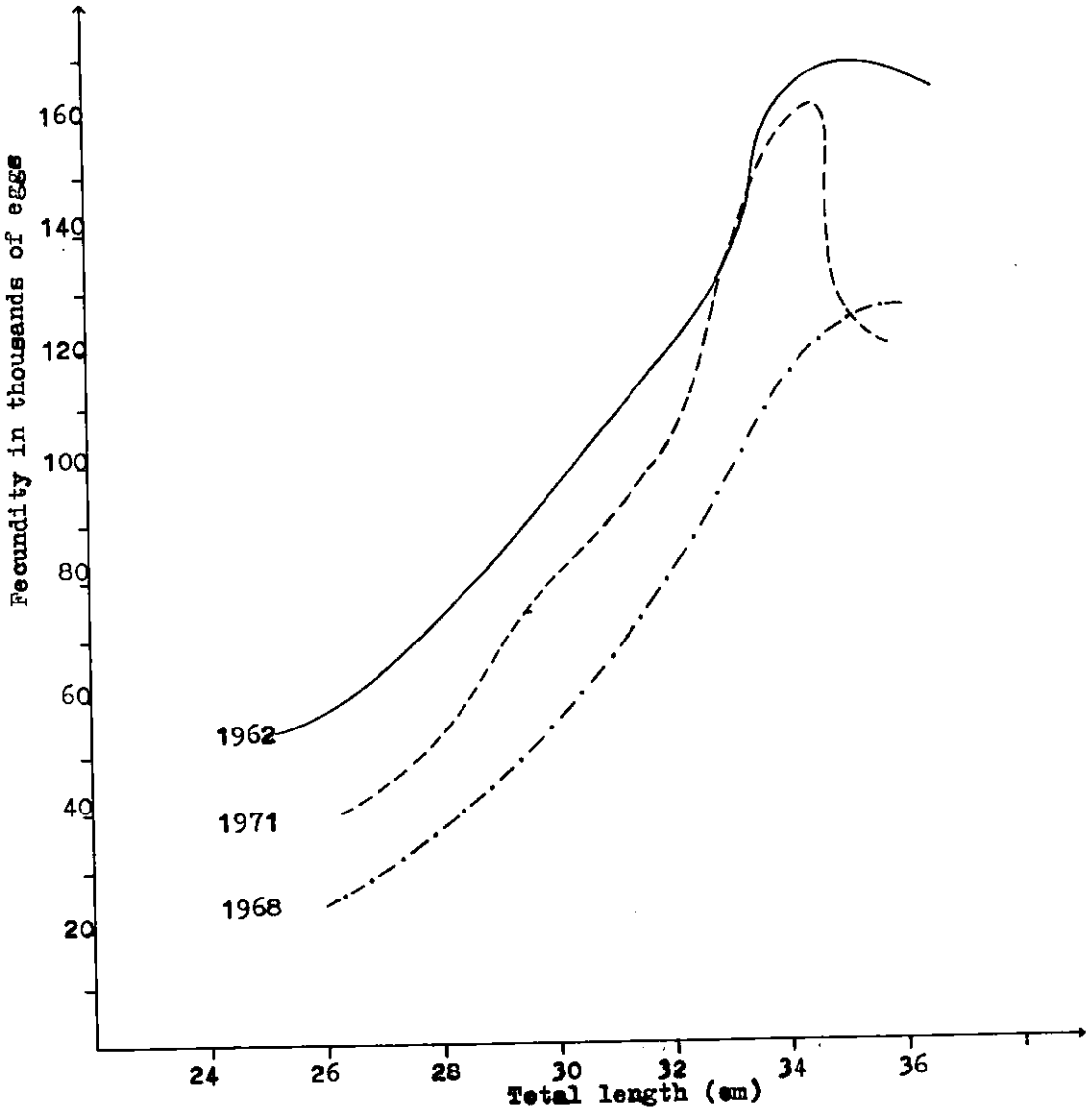

Fig. 2 Mean fecundity of Georges Bank herring in relation to total length of fishes in 1962, 1968 and 1971 (data of 1962 according to Judanov, data of 1968 according to Draganik and Rast)

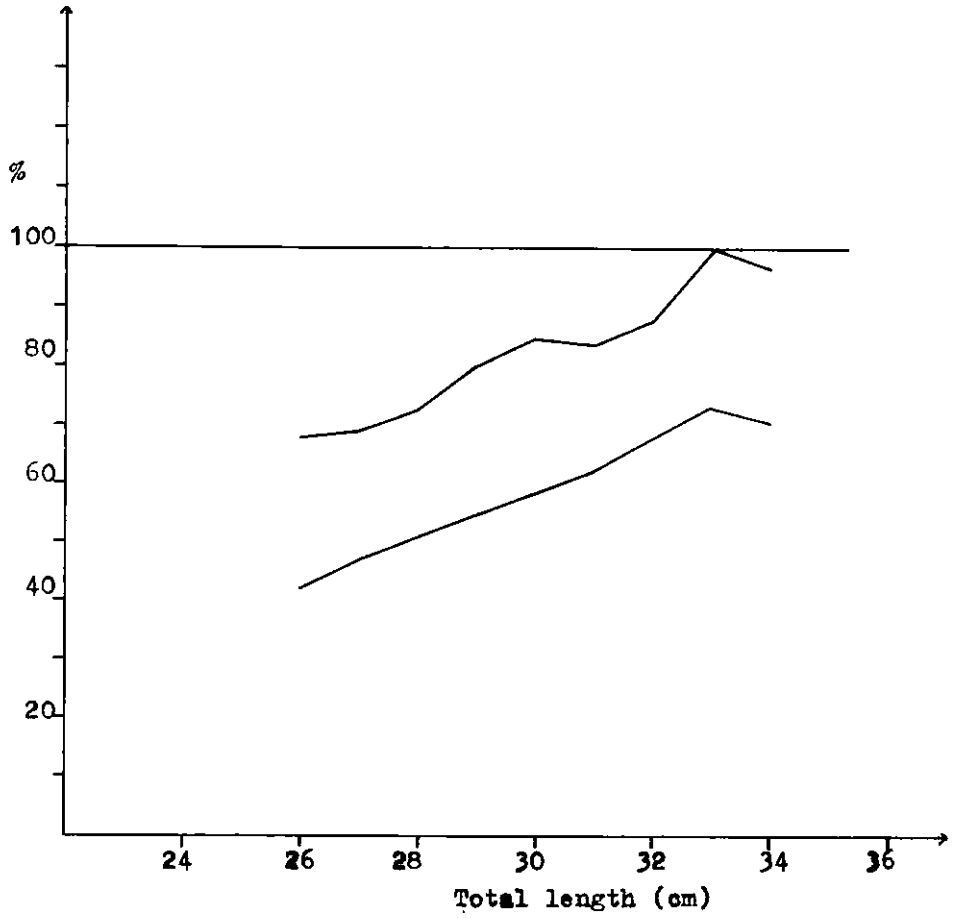

Fig. 3 The number of eggs per length-groups of Georges Bank herring in 1971 and 1968 in per cent in comparison to 1962