International Commission for the Northwest Atlantic Fisheries

Serial No. 5312

ICNAF Res. Doc. 78/XI/96

SPECIAL MEETING OF STACRES - NOVEMBER 1978

On the Distribution of the Shrimp Grounds off West Greenland in Relation to the Local Fisheries Zone

by

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INTRODUCTION

Throughout the period when ICNAF has been discussing shrimp in Subarea 1, i.e. since 1976, the term "offshore" has been used for that part of the stock complex for which a TAC has been recommended by STACRES and set by the Commission or by the coastal states concerned.

The term "offshore" is not a very precise term to include in the text of a law regulating the fisheries. For management purposes it would, therefore, be better to establish a juridically well defined borderline between the inshore and the offshore components of the stock.

In Greenland waters fishing inside a distance of 12 nautical miles from the established base line is not allowed except for Greenland citizens and vessels.

Assessment of any stock would, of course, still have to take into account the natural distribution and the total exploitation of the stock. However, if for practical management purposes some borderlines are established, then it is desirable, if possible, to estimate what proportion of a given stock is found on either side of such lines.

The present estimates of the offshore shrimp biomass at West Greenland are to some extent based on the area of the various shrimp grounds. This paper describes these grounds in relation to the 12 nautical miles limit.

DESCRIPTION OF THE OFFSHORE SHRIMP GROUNDS IN SUBAREA 1

The shrimp grounds in Greenland waters have been mapped gradually through many years as more and more information on the distribution of the shrimp became available. The most up-to-date description of the offshore grounds is given by Carlsson and Smidt (1978). They numbered 11 fishing grounds with a total area of about 42745 km^2 between latitudes 60°N and 71°N east of 59°W longitude. Although some of their individual grounds are, in fact, more or less arbitrarily chosen fractions of the larger continuous ground between latitudes 66°N and 69°30'N their numbering is followed also in this paper.

The 12 n.miles line has been drawn on the maps (Fig. 1-6) according to base lines as established in the Danish Regulation of 22 December, 1976,

effective from 1 January, 1977. The maps here given are not official maps of the line but for the purpose of the paper the lines drawn seem accurate enough.

As will be seen on the figures some of the grounds are located entirely or nearly entirely outside the 12 n.miles line, amongst these the major grounds around Store Hellefiske Bank, whereas the small grounds in the Julianehåb Bay have their (present) area entirely inside the line. Table 1 lists the grounds as described by Carlsson and Smidt (l.c.) with an estimate of their inside-the-line fraction based on Fig. 1-6. It will be seen that of the total offshore area considered about 6% of the area fall within the 12 n.miles line.

This figure can, however, serve only as a first rough estimate for that proportion of the offshore shrimp biomass in question which is distributed inside the 12 n.miles line. A better estimate would be one based on biomass estimates for each individual ground.

DISTRIBUTION OF SHRIMP BIOMASS ON GROUNDS

One factor complicating a break down by areas of the total shrimp biomass is the likelihood that some of the grounds shown in Fig. 1-6 may be surrounded by greater potential shrimp areas than other grounds. Carlsson and Smidt (l.c.) made a distinction between such grounds which are likely not to have any significant potential supply areas in their neighbourhood (grounds II, III, IV, V, and VI), and such grounds for which the total area of shrimp distribution may be about four times the mapped fishing area (grounds No. I and VII-XI). Converting the latter areas by a factor of 4 might, therefore, be proper.

Another complicating factor is the variation in shrimp density between grounds. Several authors, e.g. Carlsson, Horsted and Kanneworff (1978), Hoydal (1978) and Ulltang and Øynes (1978) have shown that catch per unit effort varies considerably between the various shrimp grounds and even between periods inside individual grounds. The distribution of biomass is, therefore, not likely to be constant by time. Nevertheless, throughout the period when extensive offshore fishing has taken place some grounds seem to have had higher density of shrimp than other grounds.

Ulltang and Øynes (1977 and 1978) gave weighted annual catch-per-unit-effort figures by ICNAF disvisions for the Norwegian vessels for 1975-77 and Hoydal (1978) for the Faroese vessels in 1975. These figures have been averaged (straight mean) in Table 2. The mean figures are then taken as a rough density index for the various grounds as shown in Table 3. The figure for Div. 1E is based upon a very scarce material and is probably an over-estimate, and no Norwegian or Faroese fishing seem to have taken place in Div. 1F. The Greenland trawler NUK made 19 hauls on the grounds in Div. 1F in 1976 but the catch per hour was only 29 kg, varying from nil to 133 kg between hauls (Anon., 1977). Lacking further data the figure of 29kg/hour is applied to the Div. 1F grounds.

Multiplying the density index by the area of the grounds as corrected when potential areas are taken into account gives a biomass index for each

ground as shown in Table 3. Applying the-inside-line percentage figures in Table 1 to these biomass indices leads to an index of biomass inside the 12 n.miles for the grounds in question. The indices indicate that 6-7% of the "offshore" biomass in Subarea 1 may be distributed inside the 12 n.miles line. It has, however, been assumed that each specific ground has the same density of shrimp on either side of the line, and also that (for grounds where correction of area has been made due to assumed supply area) the supply area has the same proportion inside the line as the mapped fishing area. If potential areas are likely to have a relatively greater proportion outside the line than the mapped areas then the above given figure is an overestimate.

Finally, Table 4 shows the inside-the-line proportion of biomass index for each of the four management areas established for 1977 and 1978, and the TACs in the 1978 regulation. The management areas apply to the Greenland fishing zone, which is not following the Subarea 1 border line hitherto used in this paper.

Approximately 1050 km^2 or 7.3% of ground No.III and 1500 km^2 or 8.8% of ground No.IV are estimated to be situated in the Canadian Fishing Zone.

Of ground No.II roughly about 950 km^2 or 15% are situated north of the 69°30'N latitude which form the northern limit of the management area west of Disko Bay. Of ground No.V about 880 km^2 or 38.3% of the area are situated south of 64°15'N and outside the 12 n.miles line.

Corrections for the above mentioned percentages are included in Table 4. With all the aforementioned assumptions made Table 4 may serve as a broad guideline in estimating that part of the biomass for the offshore grounds considered which is distributed inside the 12 n.miles line.

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TABLE 1. The area of offshore shrimp fishing grounds in ICNAF Subarea 1 (after Carlsson and Smidt, 1978) and their distribution in relation to the 12 nautical miles fisheries line.

Fishing grounds No.	Locality	Total area (km^2)	Area inside 12 n.miles km^2	% of total ground
I	Nordostbugten	1,500	600	40
II	West of Blåfjeld (east of 59°W)	6,300	350	6
III	North of Store Hellefiske Bank (east of 59°W)	14,300	0	0
IV	West of Store Hellefiske Bank and Holsteinsborg Dyb	17,000	400	2.4
V	Sukkertoppen Dyb	2,300	900	39
VI	Godthåb Dyb	900	400	44
VII	Fiskenæs Dyb	180	20	11
VIII	Danas Dyb	80	(5)	5-10
IX	Ravns Dyb	-	(10)	
X	FrederikshÅb Dyb	125	(5)	
XI	JulianehÅbsbugten	60	60	100
TOTAL		42,745	2750	6.4%

Table 2. Mean catch per unit effort (kg/hour) for Norwegian and Faroese vessels' shrimp fishing in Subarea 1 based upon figures by Ulltang and Øynes (1977 and 1978) and Hoydal (1978). Figures in brackets are not included in the straight overall mean as they are based upon catches of 1-4 tons only.

ICNAF Div.		1A	1B	1C	1D	1E
Norwegian vessels	1975	332	584	260	251	(184)
" "	1976	412	622	345	249	(1000)
" "	1977	-	553	256	282	-
Faroese vessels	1975	-	721	368	229	345
Straight mean		372	620	307	253	345

Table 3. Indices of shrimp biomass on the offshore shrimp grounds in ICNAF Subarea 1 as obtained by applying density indices from Table 2 and area of grounds from Table 1 but corrected to include possible potential areas (supply areas).

ICNAF Div.	Ground No.	Applied density index	Fishing area +potential area(km^2)	Biomass index (Density index x area x 10^{-3})	Biomass index inside 12 n.miles
1A	I	372	6000	2232	892
1A	II	372	6300	2344	141
mainly 1B	III	620	14300	8866	0
mainly 1B	IV	620	17000	10540	253
1C-1D	V	280	2300	644	251
1D	VI	253	900	228	100
1D	VII	253	720	182	20
Mainly 1D	VIII	253	320	81	4
1E	IX	thought to be included in potential area for grounds VIII and X			
1E	X	345	600	207	10
1F	XI	29	240	7	7
TOTAL				25331	1678 = 6.6% of total index

Table 4. Biomass indices for the offshore shrimp grounds in the management areas in the fishing zone at West Greenland in relation to the 12 nautical miles local fishing zone.

Management area	Total biomass index in the Greenland Fishing Zone	Biomass index inside 12 n. miles	Index inside 12 n.miles in % of index for total management area	TAC for 1978 (tons)
1. North of 69°30'N	2584	913	35	2000
2. Between 69°30'N and 68°00'N	10211	120	1	3000
3. Between 68°00'N and 64°15'N	10009	504	5	27000
4. South of 64°15'N	952	141	15	3000
TOTAL	23756	1678	7	35000

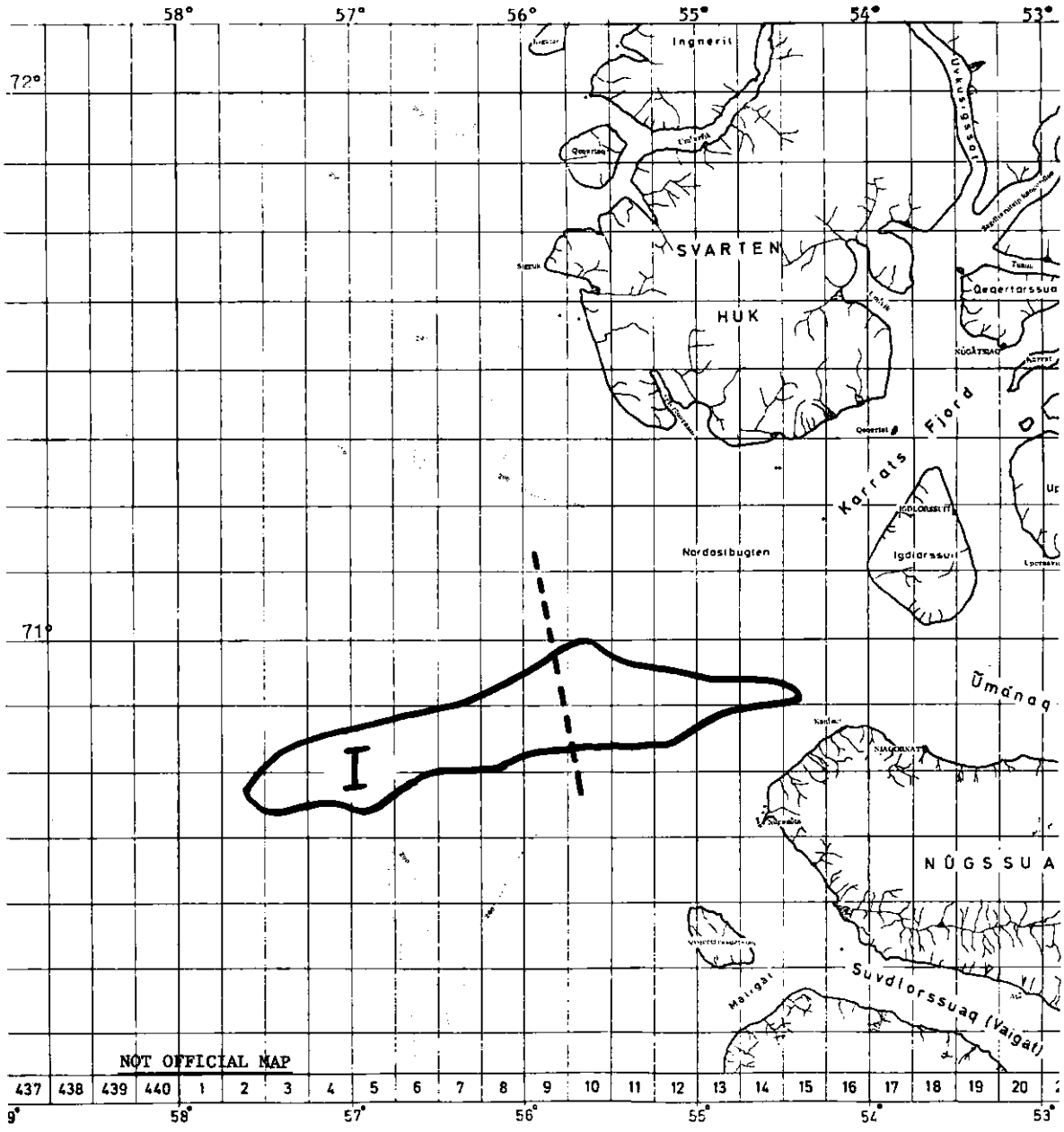

Fig. 1. The shrimp ground at Nordostbugten, ICNAF Div. 1A (after Carlsson and Smidt, 1978). The broken line shows the approximate position of the 12 n. miles fisheries line.

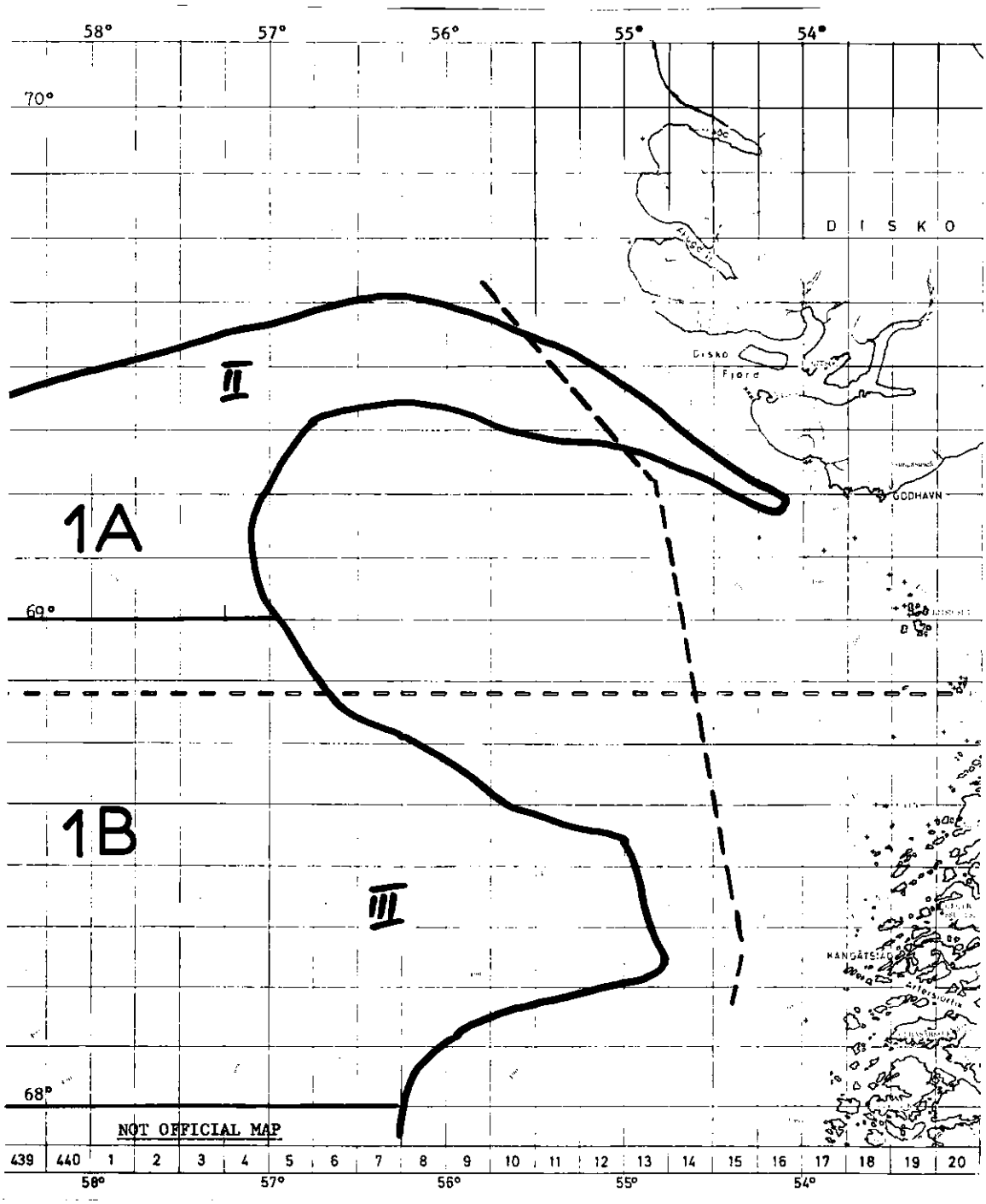

Fig. 2. The shrimp ground West of Blåfjeld (No. II) and North of Store Hellefiske Bank (No. III), ICNAF Div. 1A-1B (after Carlsson and Smidt, 1978). The broken line shows the approximate position of the 12 n. miles fisheries line.

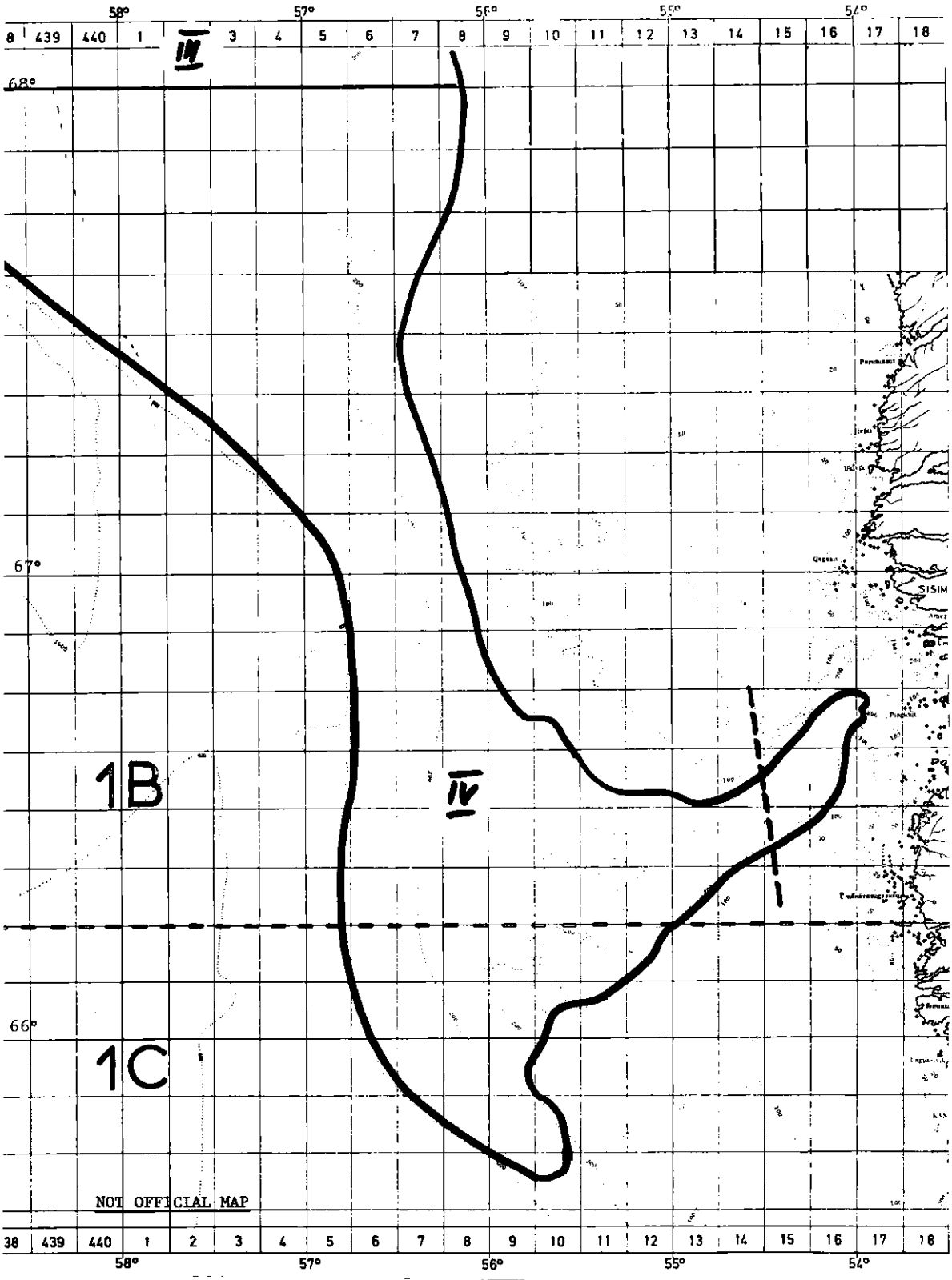

Fig. 3. The shrimp ground West of Store Hellefiske Bank and in Holsteinsborg Dyb (No. IV), ICNAF Div. 1B-1C (after Carlsson and Smidt, 1978). The broken line shows the approximate position of the 12 n. miles fisheries line.

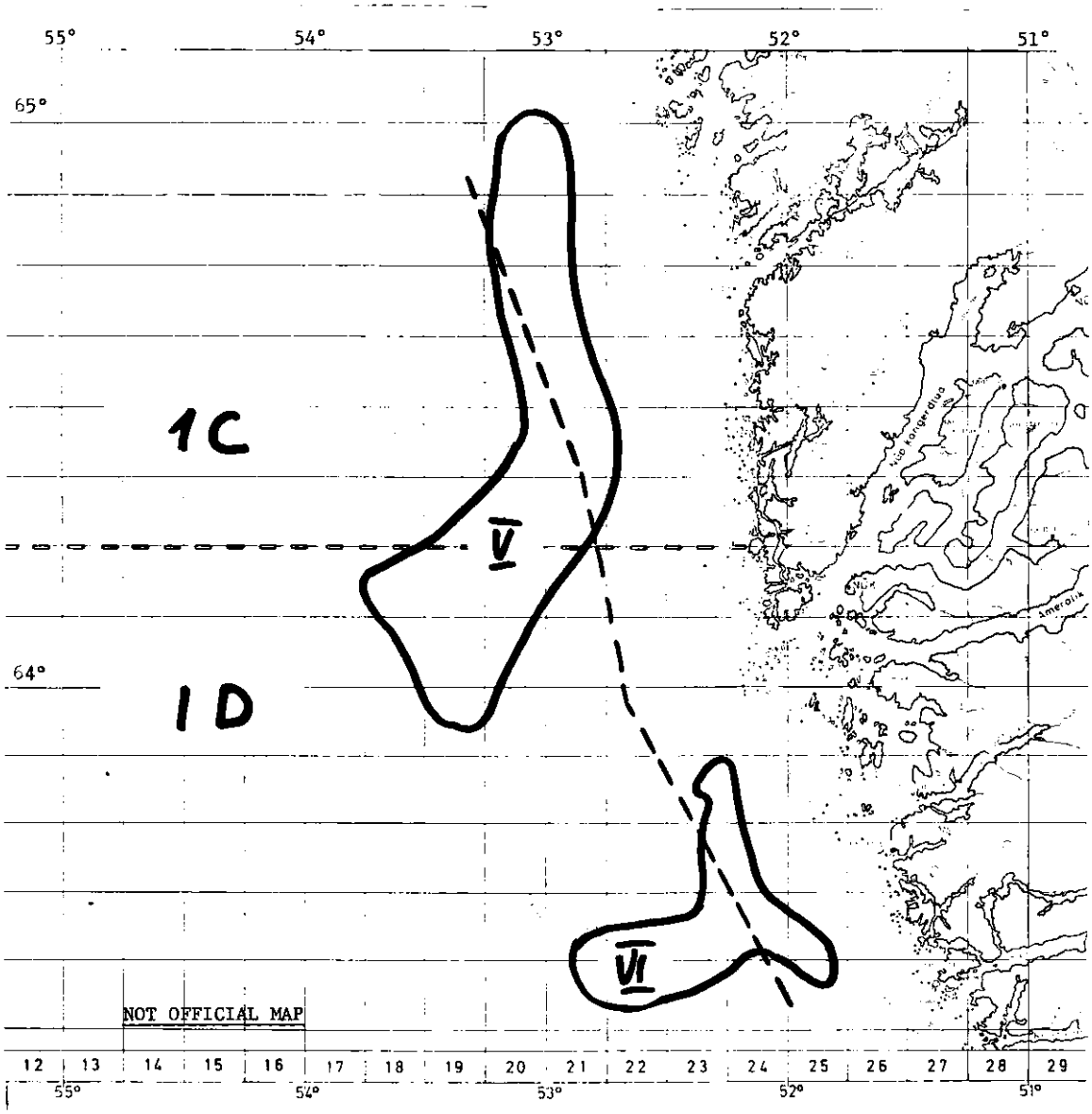

Fig. 4. The shrimp ground in Sukkertoppen Dyb (No. V) and in Godthåb Dyb (No. VI), ICNAF Div. 1C-1D (after Carlsson and Smidt, 1978). The broken line shows the approximate position of the 12 n. miles fisheries line.

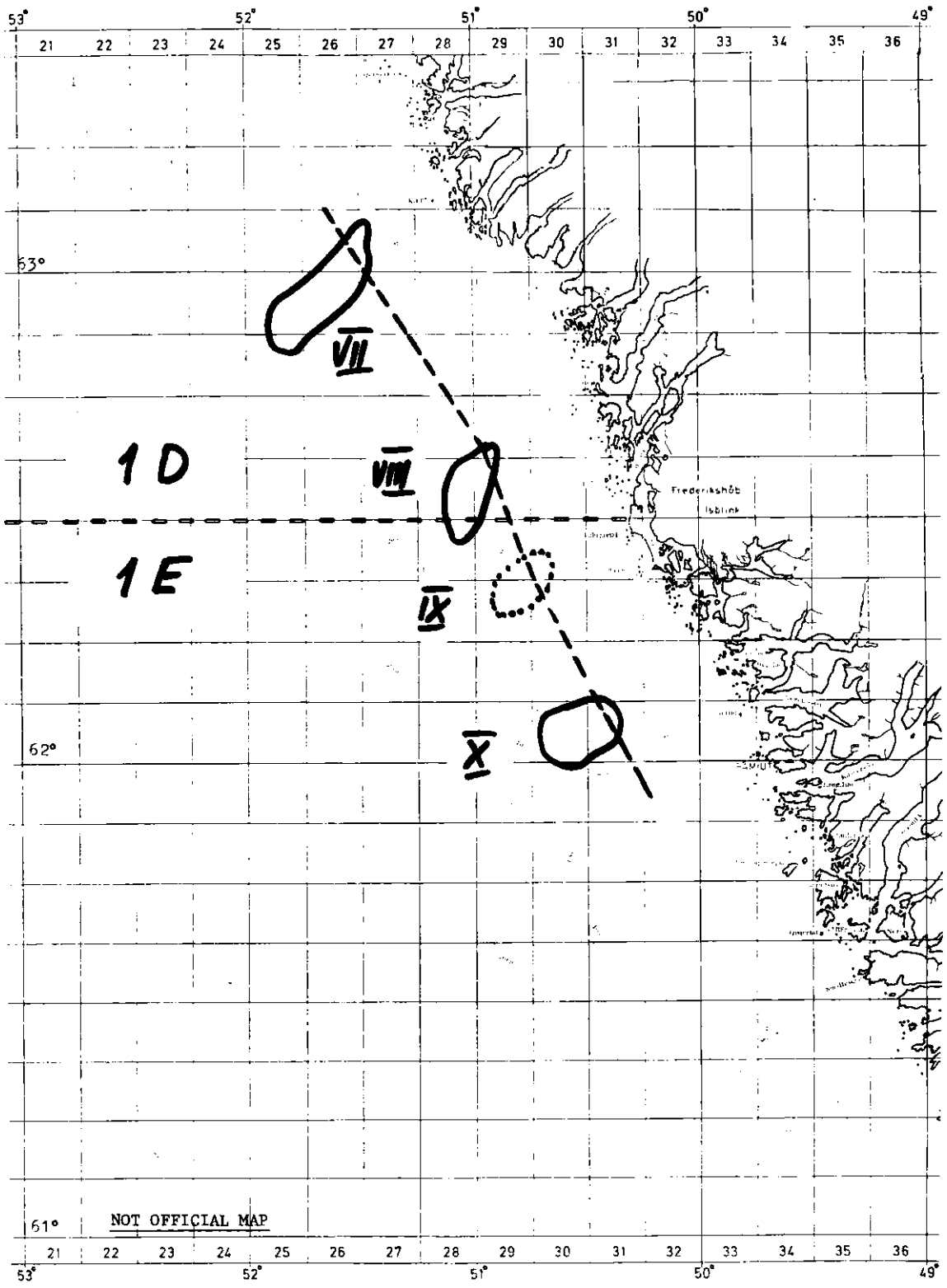

Fig. 5. The shrimp ground in Fiskenaes Dyb (No. VII), Danas Dyb (No. VIII), Ravns Dyb (No. IX) and Frederikshab Dyb (No. X). The broken line shows the approximate position of the 12 nautical mile fisheries line.

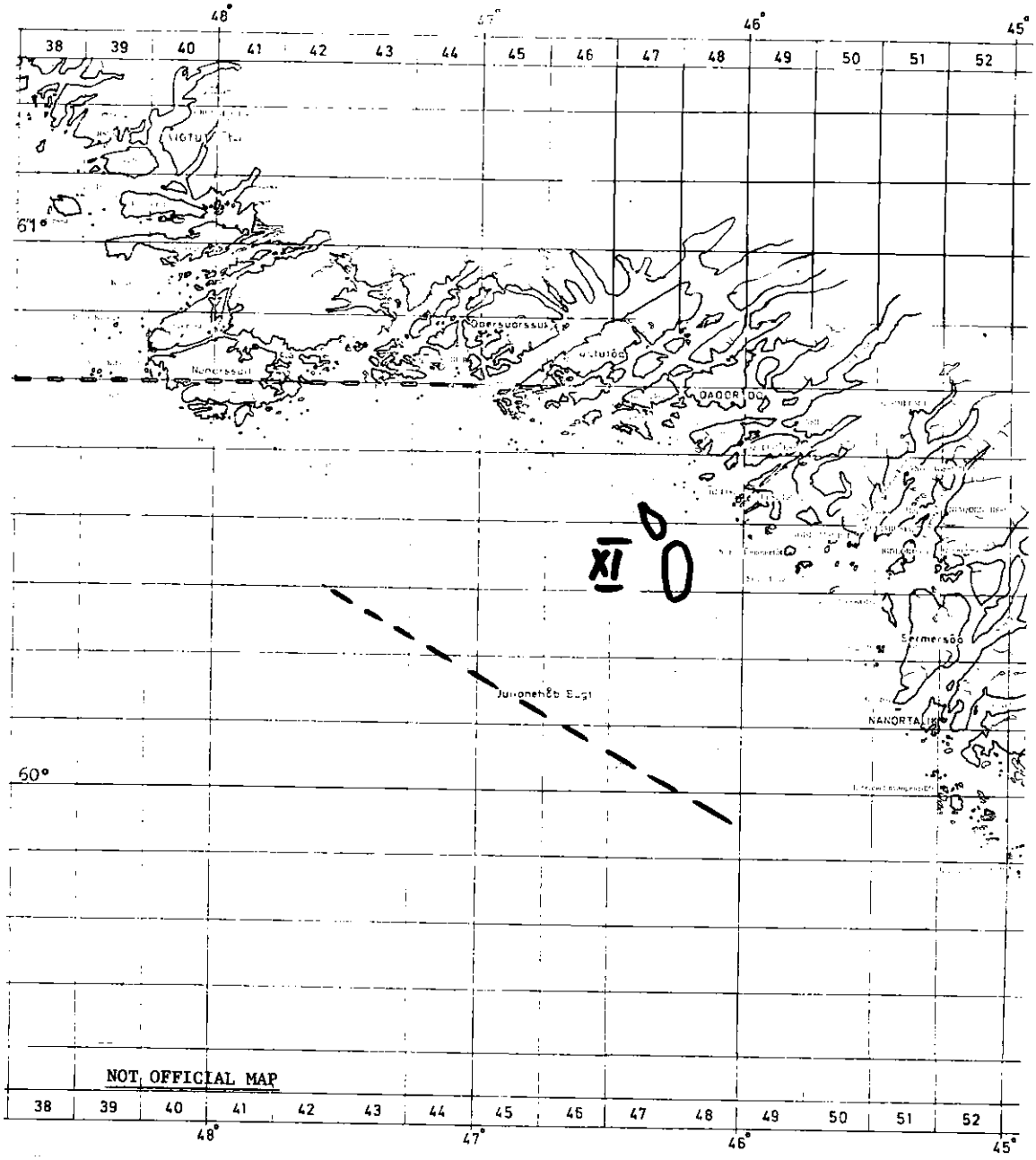

Fig. 6. The shrimp grounds in the Julianeshåb Bay (No. XI), ICNAF Division 1F (after Carlsson and Smidt, 1978). The broken line shows the approximate position of the 12 nautical mile fisheries line