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Afdeling: Biological Research Marine Fishery

Rapport: A PRERECRUIT SURVEY IN THE IRISH SEA ON DEMERSAL SPECIES CARRIED OUT BY THE DUTCH BEAMER KW 34 "ROSE MARIE", 25 APRIL - 14 MAY 1977

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Project:

Projectleider:

Datum van verschijnen: This manuscript will be published in ANNALES BIOLOGIQUES 1977, a periodic of the International Council for the Exploration of the Sea.

Inhoud:

A PRERECRUIT SURVEY IN THE IRISH SEA ON DEMERSAL SPECIES CARRIED OUT BY THE DUTCH BEAMER KW 34 "ROSE MARIE", 25 APRIL - 14 MAY 1977.

Investigated area:

For the purpose of predicting future catches of sole and plaice and to get information on demersal species in general 34 stations in the eastern part of the Irish Sea (See figure 1) have been fished with standard gear and method.

Technical details:

The first two surveys in the Irish Sea in 1975 and 1976 were carried out by the Dutch R.V. "Willem Beukelsz" (see **Annales** Biologiques 1975 and 1976). However, at the end of 1976 the R.V. "Willem Beukelsz" after doing her job for twenty years was taken out of service. From biological side there is a great interest in getting further information of the Irish Sea in connection with future catch predicting of commercial important species such as sole and plaice. As there was no research vessel available, the commercial beamer KW 34 "Rose Marie" was chartered.

The KW 34 is built in 1972 and equiped with a Stork engine of 1200 h.-power. The details of the gear used - standard beams of 5.80 meter opening with 4 tickler chains in front of the bobbin rope and mesh size 45 mm as used during the Netherlands' flatfish recruitment surveys in the North Sea - are given in figure

The speed of fishing was about 4 knots and the duration of each haul 30 minutes. On most stations fishing could be carried out without damage to the gear.

Weather conditions:

The weather conditions during the cruise were as follows;

29th of April	-	W 3 - 4
2nd of May	-	SW to NW 2
3rd of May	-	N to NE 3 later on NE 6 with showers and decreasing to 3
4th of May	-	SW 3
5th of May	-	WNW 3 to W 2
6th of May	-	WNE 2 increasing till NW 5
9th of May	-	NE 3 to NE 2.

Results:

Details of the stations as temperature and salinity are given in table .. . As the table .. shows the stations have been fished twice for the purpose of determining the variation in the catches per haul and with time. For working up the results the area covered by the survey was again split into four sub-areas A, B, C and D (figure 1).

The number of each species caught per station including non-commercial species has been recorded. In addition otoliths of sole, plaice and dab have been collected at each station in order to construct length-age keys per area. These length-age keys combined with the total length distribution per area give the age distribution per area per species.

Tables .... give the catch in numbers per 100 hours' fishing per area of each species, including non-commercial species.

Tables .... and .... give the length and age distributions per sexe for Irish Sea Sole in the sub-areas.

Tables .... to .... give the same distributions for Irish Sea Plaice and Dab.

Tables .... and .... give the length distributions of Irish Sea Whiting, Gadus minutus, Gadus luscus, Gurnard and Callionymus lyra.

Table ... gives the numbers per 100 hours' fishing of the other species per sub-area.

Interpretation of the results of all species between the three surveys is difficult because of the fact that in 1975 and in 1976 the R.V. "Willem Beukelsz" fished with a bottomtrawl while the survey in 1977 is carried out with the beam trawl. It is clear that fishing with the beam trawl is more effective on fish species which remain on the bottom. That's why we could expect, when comparing the average catch per 100 hours' fishing, an increased abundance of Irish Sea sole per area. Especially area B shows a higher density. Year class 1975 seems to be rather strong in area D. Remarkable is, as regards Irish Sea Plaice, the average catch per 100 hours' fishing has decreased for area A, B and D, while the density in area C remained more or less constant. In case of Irish Sea Dab we see the same effect as with the plaice: a considerable decrease of the abundance from 1975 to 1977 in all areas continued by a further decrease in 1977.

P.I. van Leeuwen

IJmuiden, August 1977.

KW 34 "ROSE MARIE" - IRISH SEA EAST APRIL-MAY 1977.

Average catch in numbers per 100 hours' fishing.

SPECIES	AREA A	AREA B	AREA C	AREA D
Arnoglossus laterna	200	1.516	520	1.317
Hippogloss. platessoides	33	66	-----	-----
Pleuronectes microcephalus	516	33	137	107
Scophthalmus laevis	103	-----	12	31
Pleuronectus flesus	90	83	97	1.011
Solea lutea	1.039	5.166	15.585	390.546
Agonus cataphractus	1.326	33	3.215	2.864
Ammodytes lanceolatus	16	-----	-----	18
Callionymus maculatus	-----	866	20	-----
Onos cimbrius	-----	3.049	-----	36
Onos mustelus	-----	-----	12	11
Trachinus vipera	480	133	145	1.738
Trigla lucerna	-----	-----	-----	11
Trigla cuculus	116	-----	-----	33
Alloteuthis	6.259	1.299	740	462
Eledone cirrosa	16	-----	-----	77
Scomber scombrus	-----	-----	-----	9
Raja naevus	186	-----	12	-----
Raja clavata	20	-----	25	-----
Raja brachyura	133	33	155	557
Raja montaqui	190	16	25	185
Lophius piscatorius	133	383	10	62
Gadus callarias	106	183	132	203
Gadus aeglefinus	-----	-----	12	18
Gadus virens	-----	-----	25	-----
Gadus pollachius	-----	-----	62	-----
Scylliorhinus caniculus	140	-----	22	47
Gadus esmarki	-----	-----	20	-----
Solea variata	766	-----	400	383
Liparis spec.	-----	-----	265	-----
Clupea sprattus	-----	-----	20	18
Clupea harengus	-----	-----	40	49
Syngnathus acus	20	66	37	-----

KW 34 "ROSE MARIE" - IRISH SEA EAST APRIL-MAY 1977. (continued).

SPECIES	AREA A	AREA B	AREA C	AREA D
Pecten maximus	860	-----	-----	680
Chlamys opercularis	324.187	933	4.635	16.228
Corystes cassivelanus	155.153	58.660	195.680	141.765
Aphrodite aculeata	63.696	17.864	163.420	135.941
Echinoidea	60.591	1.099	1.400	64.094
Buccinum undatum	31.185	3.533	17.520	82.894
Egg mash of common whelk	3.413	3.999	3.500	17.739
Eupagurus spec.	51.572	21.098	29.120	58.905
Hyas araneus	25.425	1.999	13.300	7.142
Macropodia rostrata	11.680	-----	80	6.754
Astropecten irregularis	9.733	37.596	12.940	11.279
Asteria rubens	27.139	151.851	326.860	1.142.548
Ophiura texturata	545.896	120.521	2.671.660	8.520.480
Ophiothrix fragilis	-----	799	-----	-----
Asteria gibbosa	16	-----	-----	-----
Anseropoda membranacea	33	-----	-----	-----
Solaster papposus	4.123	333	580	11
Henricia sanguinolenta	6.200	-----	100	-----
Arctica islandica	299	-----	20	-----
Echinocardium cordatum	20.458	266	86.960	27.609
Actina equina	-----	21.097	24.340	2.530
Gonoplax rhomboides	-----	5.066	1.840	6.069
Portunus holsatus	16.666	16.665	70.360	125.069
Ensis siliqua	37.224	11.265	8.860	25.629
Macropipus puber	-----	166	4.020	167
Cancer pagurus	80	183	207	46
Acanthocardia echinata	-----	-----	4.960	4.848
Turritellidea	28.797	132.786	2.560	205.419
Alcynonium digitatum	15.906	4.832	13.320	92.992
Nephrops norvegicus	-----	239.592	500	-----
Scaphander lignarius	-----	1.599	-----	-----
Palaemon squilla	4.160	-----	880	494
Crangon crangon	1.120	333	800	12.806

KW 34 "ROSE MARIE" - IRISH SEA EAST APRIL-MAY 1977 (continued).

SPECIES	AREA A	AREA B	AREA C	AREA D
Empty whelks	-----	1.833	6.760	10.487
Holothureoidea	-----	199	-----	-----
Gobiidae	-----	-----	-----	127
Lunatia catena	-----	533	420	177
Chamelea striatula	-----	8.799	9.600	12.216
Calliostoma zizyphinum conuloide	3.520	-----	200	533
Aeolidia papillosa	-----	-----	-----	181
Aporrhais pespelicani	-----	133	420	-----
Macoma balthica	-----	-----	69.120	698
Cavolinia spec.	-----	166	840	2.133

M.V. KW 34 "ROSE MARIE" - IRISH SEA EAST 25 APRIL- 14 MAY 1977.

SOLE - Age composition in numbers per 100 hours' fishing.

Year class	A		B		C		D	
	♂	♀	♂	♀	♂	♀	♂	♀
1976								
1975	33.4	16.7	148.5	25.8	227.0	203.8	1,895.6	178.2
1974	321.7		233.0	101.6	425.8	203.5	1,396.4	
1973	1,664.6	74.6	1,298.8	390.8	527.6	340.1	2,446.9	487.0
1972	572.7	57.0	194.2	62.9	177.8	67.4	629.0	302.8
1971	190.1	175.3	344.6	66.7	134.3	186.3	1,291.8	574.7
1970	478.1	53.7	50.0	16.7	29.0		35.5	55.9
1969	807.1	80.8	219.9	294.5	73.3	27.5	246.1	88.0
1968	113.3	48.6	46.6		13.3	10.0	39.2	
1967	233.7	17.3	142.7	11.1	68.4			37.6
1966	150.1	29.6	85.5	11.1	13.3			10.7
1965		30.2	50.0		13.3			23.0
1964	159.8	40.1						11.7
1963	13.7	12.9	30.9				80.6	71.6
1962	11.7	16.7						
1961		11.7		11.1				30.4
1960	13.7			89.0		12.5		
1959	36.7							
1958	69.2	29.6	91.7		17.0			40.2
1957								
1956								
1955	12.4							
1954								
1953			23.3					
1952								
1951								
1950	36.7							
1949		12.9						
1948								
1947	12.4			16.7				
1941		16.7						

M.V. KW 34 "ROSE MARIE" - IRISH SEA EAST 25 APRIL- 14 MAY 1977.

PLAICE - Age composition in numbers per 100 hours' fishing.

Year class	A		B		C		D	
	♂	♀	♂	♀	♂	♀	♂	♀
1976	38.4		100.1	16.7	70.0		111.1	52.2
1975	203.1	115.1	155.5	125.1	427.7	432.0	3,021.4	2,348.7
1974	324.5	563.2	216.5	33.4	250.8	400.4	1,067.9	1,290.2
1973	325.4	218.7	33.4	69.4	157.0	251.6	71.2	363.2
1972	154.5	205.4	16.7	33.4	85.2	101.3	72.0	139.9
1971		25.0		16.7	42.0	91.3	72.0	154.0
1970	57.4	36.7		16.7	26.7	62.8	42.5	159.1
1969		56.7			16.8	42.3		103.3
1968		16.7		16.7	14.3	53.3		17.4
1967		40.0					21.0	20.2
1966				16.7		30.5		15.7
1965		90.1				12.5		10.2
1964		16.7		16.7				
1963								
1962		16.7						

M.V. KW 34 "ROSE MARIE" - IRISH SEA EAST APRIL-MAY 1977.

DAB - Age composition in numbers per 100 hours' fishing.

Year class	A		B		C		D	
	♂	♀	♂	♀	♂	♀	♂	♀
1976	1,826.7	4,416.5	4,547.5	1,306.6	2,014.2	4,003.2	7,121.7	10,507.1
1975		2,214.4	3,344.6	2,109.9	1,035.7	1,252.2	4,943.3	4,317.2
1974		1,735.9	344.4	280.8	84.7	612.8	1,341.4	3,290.1
1973				166.7		150.3		606.1
1972				16.7	28.8			107.3
1971						33.8		91.3
1970							269.3	45.5

M.V. KW 34 "ROSE MARIE" - IRISH SEA EAST 25 APRIL - 14 MAY 1977.

Date	Station	Position NL	Depth in meters	Surf. temp. °C	Salinity ‰	Date	Surf. temp. °C
29/4	7	53°49' 3°37'	36.0	-		5/5	8.6
	8	53 45 3 37	37.0	-			8.9
	9	53 37 3 37	31.5	8.2	33.66		8.4
	10	53 33 3 41	35.5	8.2	33.63		8.4
	11	53 41 3 30	32.5	8.1	33.23		8.6
	34	53 44 3 31	32.5	7.9	33.51		9.0
	33A	53 50 3 33	28.5	7.7	33.55		8.5
2/5	37	53 55 3 16	15.0	8.9	31.63	6/5	9.0
	15	53 47 3 13	15.0	9.6	31.01		
	14	53 44 3 14	13.5	9.6	30.59		
	13	53 41 3 15	19.5	9.6	30.69		
	12	53 41 3 22	28.0	9.4	31.28	5/5	8.6
	16	53 45 3 21	26.0	9.2	31.36	6/5	9.0
	35	53 49 3 19	22.5	8.8	31.38		9.0
	36	53 54 3 23	20.5	9.0	31.77		8.9
3/5	33	54 00 3 33	32.0	8.0	33.02	4/5	8.5
	6	53 54 3 39	32.5	8.0	33.14	5/5	8.4
	5	54 01 3 41	35.0	7.9	33.34		
	32	54 07 3 36	35.5	8.0	33.16		
	1	54 11 3 41	31.5	8.0	33.23	4/5	8.5
	4	54 17 3 43	41.0	8.0	33.23		8.2
	28	54 21 3 48	41.0	8.2	33.35	6/5	8.8
	27	54 26 3 51	36.5	8.2	32.87		8.8
	23	54 31 3 56	45.0	8.2	32.91		8.8
	24	54 31 3 48	30.5	8.2	32.46	9/5	8.2
	18-19	54 40 4 06	43.5	7.6	33.22		8.2
	20	54 39 4 02	44.0	7.6	32.94		8.2
	21	54 35 3 56	36.0	7.6	33.21		8.2
4/5	22	54 32 4 05	50.0	8.1	33.20		8.2
	3	54 20 3 56	39.0	8.1	32.87		8.6
	2	54 16 3 50	31.0	8.2	33.03	6/5	9.1
	31	54 01 3 51	42.0	8.5	33.86	9/5	8.8
	30	54 05 3 51	35.0	8.4			8.7
	29	54 05 3 57	32.0	8.5	33.86		8.8

M.V. KW 34 "ROSE MARIE" - IRISH SEA EAST 25 APRIL - 14 MAY 1977.

SOLE - Average length distribution in numbers per 100 hours fishing.

	Cm	Area A	Area B	Area C	Area D
	14				9.1
	15	16.7			53.6
	16			12.5	192.9
	17	16.7	16.7	25.0	542.3
	18	16.7	50.0	82.5	687.9
	19		133.4	152.5	552.1
	20			160.0	530.9
	21	20.0	66.7	117.5	922.4
	22	90.0	100.0	197.5	928.8
	23	196.7	166.7	214.5	1,060.5
	24	420.0	433.3	277.5	931.0
	25	570.0	216.7	319.0	855.7
	26	593.3	300.0	214.5	677.9
	27	656.7	466.6	275.0	355.3
	28	736.7	566.6	130.0	391.9
	29	596.7	416.6	105.0	170.7
	30	513.3	216.7	89.5	190.1
	31	293.3	116.7	87.5	223.8
	32	216.7	250.0	120.0	167.2
	33	123.4	100.0	55.0	107.2
	34	86.7	66.7	32.5	98.5
	35	70.0	33.4	42.5	104.9
	36	136.7	33.4	12.5	106.6
	37	86.7	100.0		60.6
	38	53.3		12.5	20.2
	39	90.0	16.7	10.0	
	40	16.7	33.4		11.1
	41		133.4		18.2
	42				
	43	16.7	16.7		
	44	16.7			
	45				
	46				
	47				
	48	16.7			
	49				
	50				
1977 total		5,667.1	4.050.4	2,745.0	9,971.4
1976 total		1,471.-	433.-	1,364.-	3,132.-
1975 total		1,625.-	250.-	2,889.-	6,860.-

M.V. KW 54 "ROSE MARIE" - IRISH SEA EAST 25 APRIL - 14 MAY 1977.

PLAICE - Average length distribution in numbers per 100 hours fishing.

	Cm	Area A	Area B	Area C	Area D
	8		16.7		
	9				
	10				22.2
	11			37.5	
	12			12.5	38.3
	13		50.0		18.2
	14	76.7	16.7	10.0	51.6
	15		16.7	10.0	69.9
	16			105.0	106.3
	17	76.7	16.7	32.5	258.6
	18	36.7	33.4	90.0	265.8
	19	76.7		32.5	333.0
	20	150.0	33.4	75.0	566.8
	21	140.0	50.0	117.5	781.2
	22	146.7	16.7	117.5	742.2
	23	253.4	50.0	100.0	665.8
	24	133.4	100.0	112.5	822.9
	25	203.4	116.6	122.5	645.0
	26	76.7		132.5	660.4
	27	40.0		292.5	467.5
	28	183.4	83.3	110.0	531.8
	29	73.4	50.0	167.5	448.1
	30	160.0	66.7	70.0	210.1
	31	86.7	33.4	112.5	294.7
	32	153.4		172.5	131.9
	33	16.7		100.0	172.9
	34		16.7	30.0	149.6
	35	56.7	33.4	67.5	130.1
	36	50.0		32.5	126.9
	37	20.0	16.7	125.0	63.7
	38		16.7	55.0	119.5
	39				65.5
	40			35.0	33.4
	41	20.0		55.0	
	42	80.0		12.5	38.4
	43			12.5	11.1
	44				31.3
	45	16.7	16.7		18.2
	46	16.7			20.2
	47			10.0	9.1
	48	56.7			11.1
	49	50.0			
	50				9.1
	51	16.7			
	52	16.7			9.1
	53		16.7		
	54		16.7		
1977 total		2,484.-	884.-	2,568.-	9,152.-
1976 total		1,871.-	1,433.-	2,618.-	18,759.-
1975 total		6,425.-	1,475.-	1,175.-	25,620.-

M.V. KW 34 "ROSE MARIE" - IRISH SEA EAST 25 APRIL - 14 MAY 1977.

DAB - Average length distribution in numbers per 100 hours fishing.

	Cm	Area A	Area B	Area C	Area D
	5			25.0	
	6			25.0	181.8
	7			40.0	332.9
	8			135.0	109.1
	9		33.4	20.0	
	10	666.7	33.4	145.0	179.8
	11	1,160.0	1,066.6	195.0	1,369.2
	12	1,253.3	866.6	370.0	3,135.4
	13	1,100.0	1,799.8	995.0	3,251.8
	14	740.0	1,599.8	1,515.0	5,339.3
	15	820.0	1,699.8	1,435.0	2,239.4
	16	1,006.7	1,033.3	1,015.0	2,558.2
	17	960.0	1,199.9	815.0	1,907.3
	18	593.4	566.6	530.0	2,684.2
	19	533.4	933.2	470.0	2,388.1
	20	326.7	400.0	615.0	1,116.6
	21	433.4	466.6	330.0	1,753.3
	22	66.7	100.0	170.0	1,885.1
	23	66.7	100.0	115.0	818.1
	24	193.4	33.4	165.0	758.3
	25	33.4	33.4	25.0	226.3
	26	80.0	33.4	65.0	157.6
	27		66.7		76.8
	28			135.0	91.0
	29	160.0			58.6
	30				
	31		16.7		
	32				
	33				22.2
	34				
	35				
1977 total		10,194.-	12,083.-	9,350.-	32,640.-
1976 total		13,029.-	25,800.-	28,709.-	117,864.-
1975 total		47,050.-	25,200.-	28,825.-	80,600.-

M.V. KW 34 "ROSE MARIE" - IRISH SEA EAST 25 APRIL - 14 MAY 1977.

WHITING - Average length distribution in numbers per 100 hours fishing.

	Cm	Area A	Area B	Area C	Area D
	11				
	12		33.4	45.0	
	13		83.4	20.0	96.0
	14		33.4	25.0	145.5
	15		200.0	20.0	77.8
	16		216.7	100.0	96.0
	17	160.0	233.3	215.0	207.7
	18		133.4	220.0	135.4
	19	353.4	350.0	270.0	537.4
	20	280.0	783.3	315.0	667.8
	21	66.7	416.7	250.0	609.0
	22		533.3	65.0	879.3
	23	33.4	716.6	140.0	637.3
	24	33.4	466.7	190.0	548.5
	25	273.4	366.7	130.0	198.0
	26	40.0	200.0		120.8
	27	113.4	133.4	20.0	44.9
	28	173.3	83.4	55.0	26.7
	29	146.7	66.7	60.0	185.2
	30	110.0	133.4		84.4
	31	126.7	233.3		203.0
	32	73.4	116.7	20.0	84.9
	33	193.4	33.4	20.0	107.1
	34	40.0		50.0	44.5
	35	100.0	33.4		51.1
	36	50.0			
	37				
	38		16.7		

M.V. KW 34 "ROSE MARIE" - IRISH SEA EAST 25 APRIL - 14 MAY 1977.

CALLIONYMUS LYRA - Average length distribution in numbers per 100 hours fishing.

	Cm	Area A	Area B	Area C	Area D
	6				
	7				
	8	33.4			
	9	33.4	266.7		145.5
	10	66.7			72.7
	11	66.7	66.7	20.0	155.5
	12	540.0	100.0	60.0	723.2
	13	853.4	316.7	140.0	1,844.0
	14	453.4	266.7	140.0	1,432.1
	15	333.4	350.0	285.0	1,545.9
	16	206.7	566.6	420.0	2,644.7
	17	513.3	416.6	355.0	2,627.6
	18	100.0	666.6	400.0	1,687.3
	19	33.4	733.3	360.0	1,412.6
	20	133.4	233.4	180.0	799.9
	21	886.7	450.0	200.0	1,370.1
	22	500.0	316.7	190.0	439.9
	23	646.7	500.0	265.0	1,308.6
	24	206.7	350.0	480.0	1,855.8
	25	66.8	216.7	545.0	1,011.5
	26		66.7	210.0	585.5
	27			185.0	439.9
	28				266.7
	29				
	30				

M.V. KW 34 "ROSE MARIE" - IRISH SEA EAST 25 APRIL - 14 MAY.

POUT (Gadus luscus) - Average length distribution in numbers per 100 hours fishing.

	Cm	Area A	Area B	Area C	Area D
	6				
	7				
	8			10.0	163.6
	9		116.7	30.0	
	10				
	11		283.3	70.0	320.0
	12		333.3	155.0	483.8
	13		349.9	175.0	202.0
	14		200.0	205.0	1,404.7
	15	33.4	350.0	320.0	910.2
	16	33.4	200.0	180.0	1,774.8
	17	100.0	350.0	335.0	1,954.6
	18	193.4	433.3	305.0	1,534.6
	19	40.0	416.7	565.0	886.8
	20	40.0		75.0	203.4
	21			50.0	222.2
	22			75.0	88.9
	23		66.7	175.0	
	24	33.4		150.0	
	25	73.4	33.4	150.0	18.2
	26	33.4	33.4	350.0	
	27		33.4	225.0	
	28	153.4		270.0	
	29			650.0	18.2
	30		100.0	150.0	
	31			225.0	
	32		33.4	250.0	
	33			300.0	
	34		100.0	100.0	
	35		33.4	100.0	
	36	33.4		250.0	
	37			150.0	
	38			50.0	
	39			50.0	
	40	33.4		50.0	

M.V. KW 34 "ROSE MARIE" - IRISH SEA EAST 25 APRIL - 14 MAY 1977.

GADUS MINUTUS - Average length distribution in numbers per 100 hours fishing.

	Cm	Area A	Area B	Area C	Area D
	6				
	7				
	8		416.7	150.0	307.9
	9	786.7	2,083.2	525.0	1,361.3
	10	2,153.3	3,033.0	815.0	2,620.1
	11	933.3	1,883.2	640.0	3,108.6
	12	706.7	1,216.6	575.0	2,102.3
	13	133.4	550.0	385.0	876.7
	14	706.7	233.3	140.0	149.3
	15	1,386.7	33.4	75.0	
	16	1,006.7	33.4	240.0	107.1
	17	1,106.6		125.0	186.7
	18	733.3	66.7	20.0	88.9
	19	380.0		35.0	151.5
	20	673.4	66.7		76.8
	21	333.4		60.0	
	22	66.7	33.4	50.0	88.9
	23				
	24				
	25	33.4			

M.V. KW 34 "ROSE MARIE" - IRISH SEA EAST 25 APRIL - 14 MAY 1977.

GURNARD (Trigla gurnardus) - Average length distribution in numbers per 100 hours fishing.

	Cm	Area A	Area B	Area C	Area D
	6				
	7				
	8				
	9			20.0	88.9
	10		50.0	60.0	53.4
	11	226.7	100.0	155.0	158.0
	12	153.4	333.3	260.0	76.8
	13	100.0	333.3	530.0	301.0
	14	280.0	216.7	435.0	345.4
	15	120.0	233.3	160.0	264.7
	16	20.0		87.5	127.3
	17		33.4	115.0	109.1
	18	60.0		120.0	
	19	173.4		135.0	22.2
	20	246.7	66.7	265.0	165.7
	21	180.0		100.0	54.6
	22	73.4		215.0	
	23	180.0		200.0	125.3
	24	93.4		175.0	18.2
	25	33.4		120.0	
	26	133.4		45.0	18.2
	27	73.4			
	28	20.0		75.0	
	29				
	30				18.2
	31				
	32	40.0			
	33				
	34				
	35				

Fig. 1

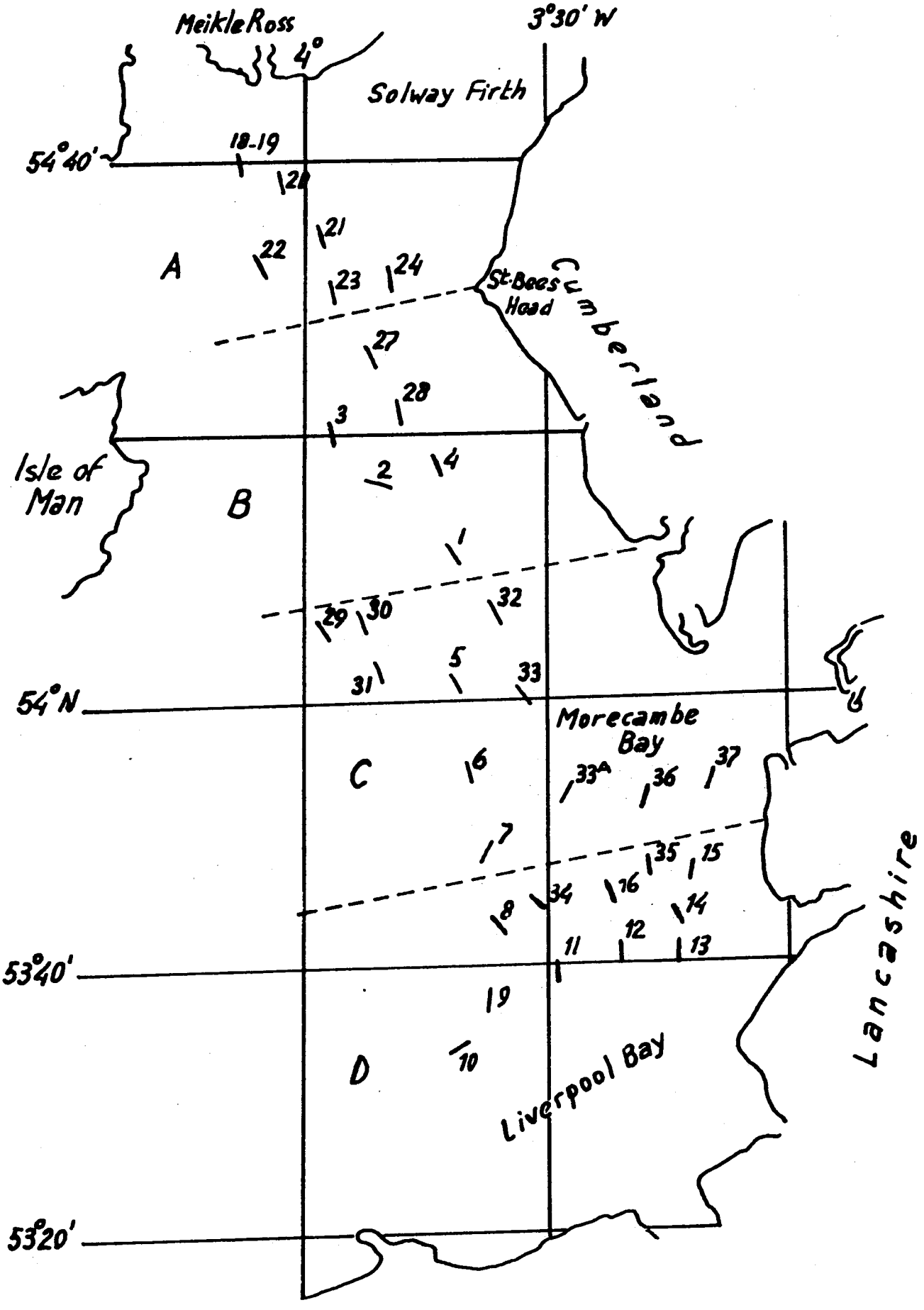
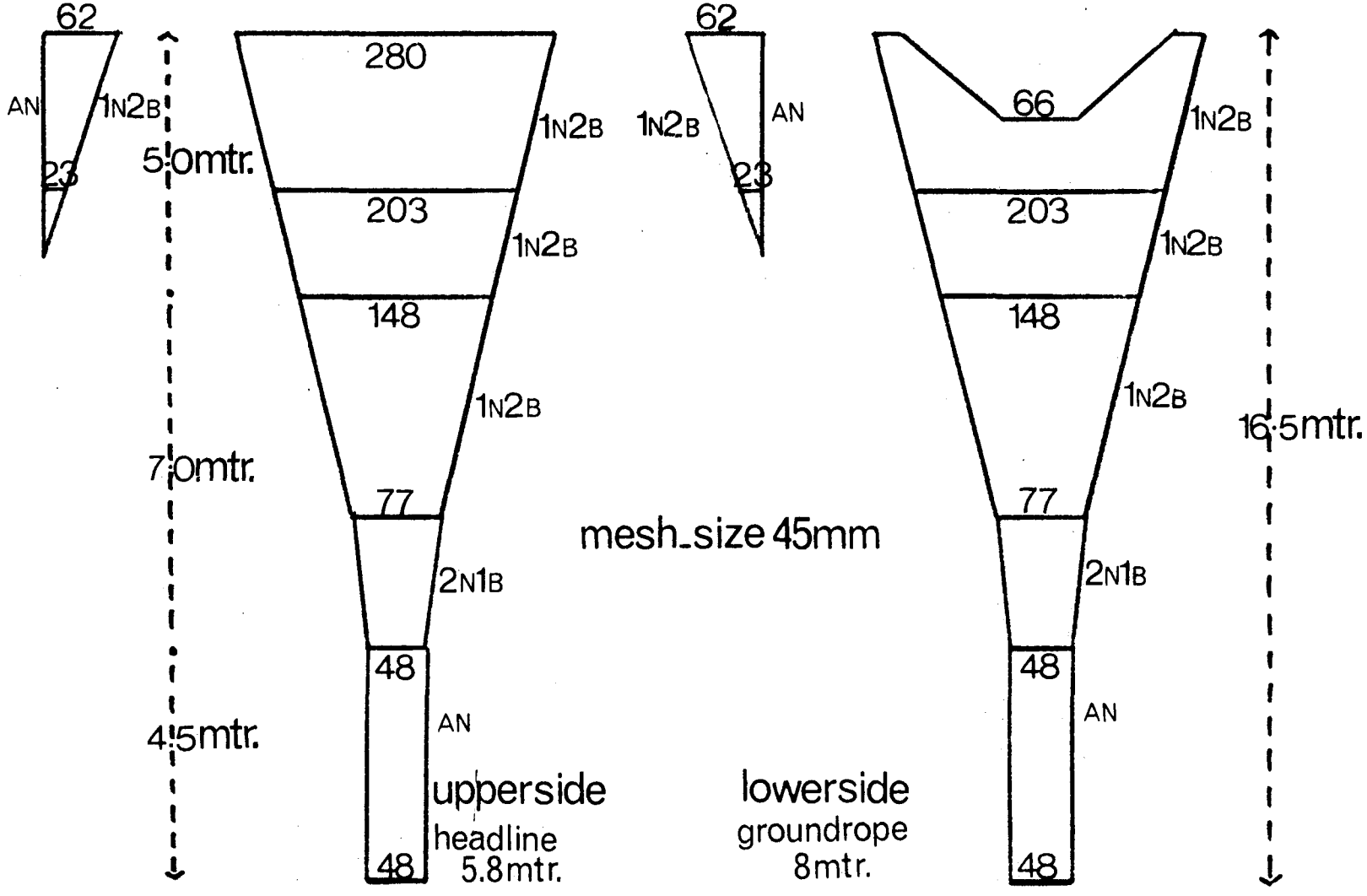

Meikle Ross
4°
3°30' W
Solway Firth
54°40'
18-19
20
21
22
A
23
24
St. Bees Head
Cumberland
27
28
3
Isle of Man
2
4
B
1
29
30
32
31
5
33
54°N
Morecambe Bay
C
6
33A
36
37
7
35
15
16
34
8
14
11
12
13
53°40'
19
D
10
Liverpool Bay
Lancashire
53°20'

Fig. 2


62
AN
1N2B
23
5.0mtr.
280
1N2B
203
1N2B
148
1N2B
7.0mtr.
77
2N1B
48
AN
4.5mtr.
upperside
headline
48
5.8mtr.
mesh_size 45mm
62
1N2B
AN
23
lowerside
groundrope
8mtr.
66
1N2B
203
1N2B
148
1N2B
16.5mtr.
77
2N1B
48
AN
48