



SCIENTIFIC COUNCIL MEETING – JUNE 1999

Assessment of Thorny Skate (*Raja radiata*) in NAFO Subarea 1 and
ICES Div. XIVb Based on Survey Indices, 1982-98

by

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Abstract

Since 1982 the abundance indices varied without a clear trend between 1 million and 20 million. In contrast, the stock biomass displayed a pronounced negative trend from 6 000 tons in 1982 to less than 1 000 tons in 1998. This decrease was caused by the stock reduction off West Greenland while the low biomass off East Greenland remained fairly stable. The continuous and drastic decrease of the spawning stock by 95 % indicates that the stock is outside safe biological limits although no appropriate management reference points can be proposed.

The length composition of the stock shrunk towards small and juvenile fish. During the most recent years, the stock was almost exclusively composed of juvenile skates. However, the recruitment (juveniles <21 cm) varied over a wide range without a trend. Concern must be expressed since the juveniles observed seem to be unable to rebuild the spawning stock and thus seem to be subject to high mortality rates.

Introduction

The exploitation of thorny skate in Greenland waters has never been of any commercial importance but is considered to reflect the bottom trawl fishing effects as a dominant species in the demersal fish assemblage and by-catch. This paper presents estimates of thorny skate stock abundance and biomass indices disaggregated by length groups as derived from annual groundfish surveys commenced in 1982, the only regular source of quantitative information from the traditional fishing grounds off West and East Greenland south of 67° northern latitude. The weight and maturity at length data were adopted from Templeman (1987 a and b) and used for estimation of spawning stock size in numbers and biomass.

Materials and Methods

Abundance, biomass estimates and length structures were derived from annual groundfish surveys covering shelf areas and the continental slope off West and East Greenland. Surveys commenced in 1982 and were primarily designed for the assessment of cod. Because of favourable weather and ice conditions and to avoid spawning concentrations, autumn was chosen for the time of the surveys. These were carried out by the research vessel (R/V)

WALTHER HERWIG (II) throughout most of the time period. In 1984 R/V ANTON DOHRN was used and she was replaced by the new R/V WALTHER HERWIG III since 1994, respectively.

The fishing gear used was a standardized 140-foot bottom trawl, its net frame rigged with heavy ground gear because of the rough nature of the fishing grounds. A small mesh liner (10mm) was used inside the cod end. The horizontal distance between wing-ends was 25 m at 300 m depth, the vertical net opening being 4 m. In 1994, smaller Polyvalent doors (4.5 m², 1,500 kg) were used for the first time to reduce net damages due to overspread caused by bigger doors (6 m², 1,700 kg), which have been used earlier. All calculations of abundance and biomass indices were based on the 'swept area' method using 22 m horizontal net opening as trawl parameter, i. e. the constructional width specified by the manufacturer. The towing time was normally 30 min. at a speed of 4.5 knots. Trawl parameters are listed in Table 1. Hauls which received net damage or became hangup after less than 15 minutes were rejected. Some hauls of the 1987 and 1988 surveys were also included although their towing time had been intentionally reduced to 10 minutes because of the expected large cod catches as observed from echo sounder traces.

The surveys were primarily designed for the assessment of cod. In order to reduce the error of abundance estimates, the subdivision of shelf areas and the continental slope into different geographic and depth strata was required due to a pronounced heterogeneity of cod distribution. The survey area was thus split into seven geographic strata. Each stratum was itself subdivided into two depth strata covering the 0-200 m and 201-400 m zones. Figure 1 and Table 2 indicate the names of the 14 strata, their geographic boundaries, depth ranges and areas in nautical square miles (nm²). All strata were limited at the 3 mile offshore line.

The applied strategy was to distribute the sampling effort according both to the stratum areas and to cod abundance. Consequently, fifty percent of the hauls were allocated proportionally to strata by stratum area while the other fifty percent were apportioned on the basis of a review of the historical mean cod abundance/nm², all hauls being randomly distributed within trawlable areas of the various strata. Non-trawlable areas were mainly located inshore. During 1982-98, 2 521 successful sets were carried out, the numbers of valid sets by year and stratum being listed in Table 3. Apart from stratum 7.2 (Dohrn Bank), East Greenland strata were not covered adequately in 1984, 1992 and 1994 due to technical problems. In 1995, the survey area off West Greenland was incompletely covered for the first time again due to technical problems. Only 50 % of the strata of West Greenland were covered, namely the southern strata 3.1, 3.2, 4.1, and 4.2. Stratum 7.1 has a very low area and therefore never been covered. Since 1996, the entire survey area was covered. Figure 1 shows the positions of hauls conducted during the most recent survey.

Stratified abundance estimates were calculated from catch-per-tow data using the stratum areas as weighting factor (Cochran, 1953; Saville, 1977). Strata with less than five valid sets were rejected from the calculation. The coefficient of catchability was set arbitrarily at 1.0, implying that estimates are merely indices of abundance and biomass. Respective confidence intervals (CI) were set at the 95% level of significance of the stratified mean.

Fish were identified to species or lowest taxonomic level and the catch in number and weight was recorded. Total fish length are measured to cm below. Weight (g) at length calculations were based on the regression $f(x)=0.00646081x^{3.0099}$, x =length (cm), which was determined for immature fish by Templeman (1987 a) for the NAFO Sub-areas 2-3. However, the SOP-check resulted in a constant underestimation of the weight by 30 %. The thorny skate off Greenland seems to be therefore better conditioned.

100% maturation at length was set at 45 cm as a knife edge according to Templeman (1987 b), who did report on a L₅₀-value around 44-47 cm of West Greenland for both sexes.

Results and Discussion

Figure 1 illustrates the survey area and splitting into strata and shows the trawl position and catch rates observed during the most recent survey in 1998. The catch rates peaked at 5 kg/0.5h in the north-western survey area.

Tables 4 and 5 list abundance and biomass indices by stratum, West and East Greenland and total in 1982-98. Indices varied significantly between strata and years and the stock was found to be mainly distributed off West Greenland. Trends of the abundance and biomass estimates for West and East Greenland are shown in Figures 2 and 3, respectively. While the abundance indices varied without a clear trend between 1 million and 20 million, Figure 3 illustrates the negative trend in stock biomass from 6 000 tons in 1982 to less than 1 000 tons in 1998. This decrease was caused by the stock reduction off West Greenland while the low biomass off East Greenland remained fairly stable.

The length disaggregated abundance and biomass for West, East Greenland and total 1982-98 is given in Tables 6-11. Length compositions are displayed in Figures 5a and 5 b. As indicated by the significant decrease in biomass but lack of trend in abundance, the length compositions shrunk towards small and juvenile fish. During the most recent years, the stock was almost exclusively composed of juvenile skates.

Tables 6-11 list the trend in the spawning stock in numbers and weight which is also illustrated in Figures 2 and 3. The continuous and drastic decrease of the spawning stock by 95 % indicates that the stock is outside safe biological limits although no appropriate management reference points can be proposed.

Figure 4 displays the variation in recruitment as estimated from the abundance of fish smaller than 21 cm. The recruitment varied over a wide range without a trend. Concern must be also expressed since the juveniles observed seem to be unable to rebuild the spawning stock and thus seem to be subject to high mortality rates.

Acknowledgement

Josep Lloret was financially supported by a fellowship of the D. G. Research of the Government of Catalonia.

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Table 1. Trawl parameters of the survey.

Gear	140-foot bottom trawl
Horizontal net opening	22 m
Standard trawling speed	4.5 kn
Towing time	30 minutes
Coefficient of catchability	1.0

Table 2. Specification of strata.

	Stratum geographic boundaries		depth		area (m)	(nm ²)
	south	north	east	west		
1.1	64°15'N	67°00'N	50°00'W	57°00'W	1-200	6805
1.2	64°15'N	67°00'N	50°00'W	57°00'W	201-400	1881
2.1	62°30'N	64°15'N	50°00'W	55°00'W	1-200	2350
2.2	62°30'N	64°15'N	50°00'W	55°00'W	201-400	1018
3.1	60°45'N	62°30'N	48°00'W	53°00'W	1-200	1938
3.2	60°45'N	62°30'N	48°00'W	53°00'W	201-400	742
4.1	59°00'N	60°45'N	44°00'W	50°00'W	1-200	2568
4.2	59°00'N	60°45'N	44°00'W	50°00'W	201-400	971
5.1	59°00'N	63°00'N	40°00'W	44°00'W	1-200	2468
5.2	59°00'N	63°00'N	40°00'W	44°00'W	201-400	3126
6.1	63°00'N	66°00'N	35°00'W	41°00'W	1-200	1120
6.2	63°00'N	66°00'N	35°00'W	41°00'W	201-400	7795
7.1	64°45'N	67°00'N	29°00'W	35°00'W	1-200	92
7.2	64°45'N	67°00'N	29°00'W	35°00'W	201-400	4589
Sum						37463

Table 3. Numbers of valid hauls by stratum and total and weighted (by stratum area) mean near bottom temperature, 1982-98.

Year	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2	Sum
1982	20	11	16	7	9	6	13	2	1	10	3	12	1	25	136
1983	26	11	25	11	17	5	18	4	3	19	10	36	0	18	203
1984	25	13	26	8	18	6	21	4	5	4	2	8	0	5	145
1985	10	8	26	10	17	5	21	4	5	21	14	50	0	28	219
1986	27	9	21	9	16	7	18	3	3	15	14	37	1	34	214
1987	25	11	21	4	18	3	21	3	19	16	13	40	0	18	212
1988	34	21	28	5	18	5	18	2	21	8	13	39	0	26	238
1989	26	14	30	9	8	3	25	3	17	18	12	29	0	11	205
1990	19	7	23	8	16	3	21	6	18	19	6	15	0	13	174
1991	19	11	23	7	12	6	14	5	8	11	10	28	0	16	170
1992	6	6	6	5	6	6	7	5	0	0	0	0	0	6	53
1993	9	6	9	6	10	8	7	0	9	6	6	18	0	14	108
1994	16	13	13	8	10	6	7	5	0	0	0	0	0	6	84
1995	0	0	3	0	10	7	10	5	8	6	6	17	0	12	84
1996	5	5	8	5	12	5	10	5	7	9	5	13	0	9	98
1997	5	6	5	5	6	5	8	5	5	5	4	8	0	8	75
1998	9	5	10	7	11	6	10	5	5	8	6	12	0	9	103

Table 4. *R. radiata*. Abundance indices (1000) for West, East Greenland and total by stratum, 1982-98. Confidence intervals (CI) are given in per cent of the stratified mean at 95% level of significance. () incorrect due to incomplete sampling.

YEAR	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2	WEST	EAST	TOTAL	CI
1982	5383	1625	1412	473	556	83	162			0		0		170	9695	170	9865	38
1983	4798	589	815	360	349	27	59			0	0	0		0	6997	0	6997	87
1984	2742	1672	653	505	149	482	116		37				148	307	6319	493	6812	42
1985	2239	2393	1847	689	397	56	257		0	0	0	16		165	7878	181	8058	44
1986	2178	2806	766	326	295	131	203			0	0	39		179	6704	218	6922	46
1987	1790	538	653		291		64		10	28	3	23		179	3336	244	3580	30
1988	3879	1046	996	770	335	39	85		5	44	0	39		73	7149	161	7310	39
1989	11963	2141	3859	694	607		149		10	0	0	31		188	19412	229	19641	38
1990	7145	1981	2489	548	271		550	345	10	50	7	0		486	13328	553	13881	51
1991	1967	480	1220	262	610	130	95	65	12	53	25	70		96	4828	257	5085	26
(1992)	4457	598	2844	1531	496	523	205	58						202	10713	202	10915	50
1993	2266	352	684	279	188	263	95		0	78	13	94		197	4127	382	4509	39
(1994)	2531	378	872	272	233	79	398	15						1060	4777	1060	5837	43
1995				182	301	116	15	0	0	7	31			317	614	355	968	59
1996	1273	126	428	76	114	111	56	29	52	25	25	179		326	2214	607	2820	29
1997	4886	493	879	46	120	122	180	0	17	141		218		707	6726	1083	7809	41
1998	1694	534	439	202	258	46	49	15	37	88	0	47		266	3237	437	3674	31

Table 5. *R. radiata*. Biomass indices (tons) for West, East Greenland and total by stratum, 1982-98. Confidence intervals (CI) are given in per cent of the stratified mean at 95% level of significance. () incorrect due to incomplete sampling.

YEAR	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2	WEST	EAST	TOTAL	CI
1982	2994	811	1328	340	409	59	154			0		0		184	6094	184	6278	36
1983	966	192	703	132	331	27	56			0	0	0		0	2408	0	2408	34
1984	728	333	404	96	136	126	95		17			156		307	1918	481	2398	31
1985	497	427	804	181	159	46	56		0	0	0	23		216	2170	239	2409	22
1986	517	527	421	83	122	65	39			0	0	55		243	1773	298	2071	28
1987	415	149	306		184		13		20	44	1	8		220	1066	293	1359	29
1988	653	122	503	238	174	19	33		0	66	0	16		87	1743	168	1911	28
1989	2076	429	980	107	314		90		0	0	0	8		257	3995	265	4260	31
1990	980	263	526	56	91		113	201	0	25	0	0		610	2231	635	2866	45
1991	279	81	181	36	246	42	10	33	0	3	1	86		92	908	182	1090	28
(1992)	327	94	139	134	221	89	23	27						289	1054	289	1343	49
1993	340	88	82	31	29	24	3		0	3	0	62		179	598	244	842	28
(1994)	231	71	143	30	91	14	54	11						1317	646	1317	1963	61
1995				70	37	41	0	0	0	0	0	23		271	148	294	442	75
1996	95	23	38	23	21	16	8	13	17	6	1	117		193	236	334	570	44
1997	354	96	181	6	16	29	33	0	0	13		55		197	715	264	979	35
1998	143	90	89	47	56	13	8	15	0	13	0	31		174	461	218	679	33

Table 6. *R. radiata*. Length composition (1 000) for West Greenland, 1982-98.

Length (cm)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
0,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,5	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0
2,5	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0
3,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4,5	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7,5	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8,5	0	0	0	25	0	0	0	0	0	0	0	29	16	0	51	0	0
9,5	0	10	11	12	5	0	11	5	87	18	0	41	31	0	62	162	82
10,5	64	127	100	177	487	94	158	271	630	143	350	121	300	12	136	660	435
11,5	89	394	422	416	70	188	279	602	741	216	881	376	418	4	187	684	225
12,5	128	526	317	492	117	204	450	704	860	357	1568	338	267	8	221	681	196
13,5	135	740	237	329	154	153	363	650	586	263	1180	272	179	34	192	343	121
14,5	164	373	271	502	269	195	404	855	583	252	1180	351	224	39	93	392	165
15,5	222	352	301	385	260	156	386	873	781	249	781	195	221	66	146	189	92
16,5	134	411	179	385	94	103	431	996	718	333	462	149	175	46	39	277	116
17,5	238	347	203	447	182	59	273	1221	779	257	479	146	123	26	104	201	162
18,5	247	244	302	323	166	104	232	1010	887	231	363	141	220	39	115	441	125
19,5	166	175	249	263	165	123	276	1025	989	211	406	81	139	23	22	213	93
20,5	213	127	255	269	159	117	419	1108	419	137	245	96	303	20	86	165	63
21,5	322	182	239	273	256	106	352	817	493	159	284	161	205	4	100	405	97
22,5	221	90	182	261	155	103	263	896	488	189	432	119	171	35	31	53	49
23,5	189	99	123	244	113	50	209	949	523	180	198	172	245	31	11	273	95
24,5	209	129	167	212	376	46	246	787	422	87	164	77	219	16	149	152	79
25,5	246	114	203	184	85	98	256	761	472	168	340	149	188	8	105	240	73
26,5	373	174	216	165	72	83	188	550	441	102	155	152	66	12	42	199	103
27,5	226	72	240	174	375	37	157	575	235	110	73	89	161	8	24	128	151
28,5	181	145	138	204	43	76	135	453	229	81	109	78	156	29	30	289	54
29,5	224	89	97	124	34	100	77	490	176	123	102	68	49	4	69	83	74
30,5	303	83	144	186	89	96	128	531	275	122	115	141	132	0	32	83	91
31,5	146	94	175	85	299	67	149	332	138	89	136	41	53	0	11	55	54
32,5	230	172	120	32	52	73	103	313	186	120	43	13	55	10	20	58	9
33,5	193	78	87	71	83	99	40	199	135	80	146	29	53	19	6	42	58
34,5	192	43	106	86	17	27	62	215	85	42	116	144	35	8	43	6	59
35,5	126	93	75	102	10	17	97	179	116	48	86	100	43	8	51	31	40
36,5	181	63	78	65	285	36	56	253	127	86	24	130	33	4	0	30	59
37,5	166	60	51	121	321	39	85	241	86	46	32	41	31	12	11	18	33
38,5	107	89	56	128	27	45	25	117	66	47	17	0	39	14	6	69	42
39,5	138	53	49	66	47	52	29	138	135	30	92	22	43	15	0	0	34
40,5	152	81	74	78	364	86	47	262	56	15	7	10	40	0	0	12	49
41,5	136	44	73	56	24	36	32	143	58	58	40	7	10	10	6	58	0
42,5	144	33	38	50	68	33	48	174	37	6	12	3	38	27	0	0	7
43,5	127	105	47	61	83	9	57	135	52	33	13	0	53	8	0	24	0
44,5	125	54	47	76	889	56	61	93	54	4	0	12	7	0	15	0	5
45,5	199	42	57	53	72	56	89	86	19	29	13	0	0	0	0	0	14
46,5	178	57	40	77	31	37	61	71	65	19	0	0	0	8	0	18	20
47,5	270	87	63	75	29	31	103	29	9	0	12	0	7	0	0	0	5
48,5	277	50	47	38	29	31	76	39	19	11	0	29	0	0	0	0	0
49,5	253	55	47	56	32	73	56	61	10	12	24	0	36	4	8	0	0
50,5	369	154	66	78	50	33	44	77	15	19	24	0	0	0	0	0	5
51,5	276	71	58	42	53	0	32	27	15	4	8	0	0	0	0	0	0
52,5	292	86	93	110	58	24	17	30	19	0	5	0	0	4	0	0	0
53,5	254	54	33	63	11	0	7	29	0	11	0	0	0	8	0	0	0
54,5	168	88	49	21	5	20	30	6	0	0	0	0	0	0	0	0	0
55,5	286	37	28	44	10	14	3	20	13	12	0	0	0	0	0	0	0
56,5	114	56	31	49	6	24	16	6	0	4	0	0	0	0	0	0	0
57,5	130	23	16	18	18	14	4	6	0	0	0	0	0	0	0	0	0
58,5	54	41	3	11	6	4	8	0	0	0	0	0	0	0	0	0	0
59,5	27	19	10	17	0	4	6	11	4	0	0	0	0	0	0	0	0
60,5	45	0	7	3	0	4	11	0	0	0	0	0	0	0	0	0	0
61,5	27	4	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0
62,5	5	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
63,5	5	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum	9686	6992	6341	7891	6705	3335	7147	19421	13333	4825	10717	4123	4784	623	2224	6734	3234
Sp.St.	3229	924	658	762	410	369	563	498	188	121	86	29	43	24	8	18	44

Table 7. *R. radiata*. Length composition (1 000) for East Greenland, 1982-98. () incorrect due to incomplete sampling.

Length (cm)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	(1992)	1993	(1994)	1995	1996	1997	1998
0,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
10,5	0	0	0	6	0	27	23	5	0	11	0	0	0	14	0	114	0
11,5	0	0	0	0	0	0	0	0	0	11	0	82	0	32	24	24	24
12,5	0	0	0	0	0	9	0	0	0	35	0	16	0	7	8	36	15
13,5	0	0	0	0	0	0	0	0	0	4	0	7	0	17	30	24	0
14,5	0	0	0	0	0	0	0	10	0	8	0	0	0	0	0	24	0
15,5	0	0	0	0	0	0	0	0	0	20	0	0	0	0	8	0	52
16,5	0	0	19	0	0	0	8	0	0	0	0	0	0	0	0	0	0
17,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0
18,5	0	0	0	0	0	0	7	0	0	11	0	20	0	0	0	0	0
19,5	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	15
20,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
21,5	0	0	0	0	0	0	5	0	0	0	0	0	0	0	13	0	0
22,5	0	0	0	0	12	0	0	0	0	11	0	0	0	0	0	24	15
23,5	0	0	0	0	0	3	0	0	0	11	0	0	0	0	19	21	0
24,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0
25,5	0	0	0	0	12	0	0	10	0	0	0	0	29	14	19	42	0
26,5	0	0	0	0	0	0	7	0	0	0	0	0	0	14	0	0	0
27,5	0	0	0	0	0	0	0	0	0	11	0	0	29	0	0	63	0
28,5	0	0	0	0	0	0	0	0	0	0	0	0	29	0	38	0	0
29,5	0	0	0	0	0	0	7	0	0	0	0	0	57	0	41	24	19
30,5	0	0	0	0	12	0	0	0	0	10	0	37	57	14	105	42	38
31,5	0	0	0	0	0	0	0	0	0	0	0	28	0	0	19	21	19
32,5	0	0	37	0	0	0	0	0	0	0	0	0	14	0	78	19	19
33,5	0	0	0	0	0	0	8	0	0	0	0	0	14	32	85	19	19
34,5	0	0	34	0	0	0	0	0	0	0	12	57	29	32	115	34	34
35,5	11	0	0	0	0	19	0	10	0	0	12	0	14	0	42	38	38
36,5	34	0	34	0	0	0	0	0	0	0	0	0	29	0	0	21	0
37,5	0	0	0	6	0	0	0	0	0	0	12	29	0	0	0	19	19
38,5	0	0	0	0	10	0	0	0	0	0	0	29	14	41	0	0	19
39,5	0	0	0	0	0	0	16	0	0	0	12	57	14	0	57	0	0
40,5	0	0	19	6	0	0	0	0	0	0	29	0	0	29	0	21	0
41,5	0	0	0	11	10	8	0	0	0	0	0	0	29	0	13	0	0
42,5	0	0	0	0	0	0	16	0	0	11	0	12	0	0	0	63	0
43,5	11	0	0	6	12	17	0	0	0	0	12	29	0	19	0	0	0
44,5	0	0	0	6	0	5	0	16	0	0	29	16	29	0	0	0	0
45,5	0	0	0	0	0	9	0	0	0	11	29	12	0	0	38	42	0
46,5	11	0	34	24	0	0	0	31	0	0	16	57	14	0	0	0	0
47,5	0	0	74	6	24	0	0	0	0	0	28	0	0	19	21	0	0
48,5	0	0	34	12	0	0	0	0	0	0	0	57	31	0	36	0	0
49,5	0	0	0	6	0	0	16	0	11	0	12	29	0	0	0	24	24
50,5	0	0	68	11	36	57	0	31	0	0	0	86	0	0	0	38	38
51,5	11	0	0	24	0	16	0	16	0	11	58	0	14	0	0	0	0
52,5	34	0	37	6	0	0	51	0	0	11	0	57	14	19	0	19	19
53,5	11	0	34	18	46	0	0	16	0	0	12	0	14	0	0	0	0
54,5	0	0	68	6	12	0	13	0	0	11	0	0	29	0	0	0	0
55,5	0	0	0	5	12	26	15	16	0	0	0	0	14	22	0	0	0
56,5	11	0	0	18	0	28	0	0	0	10	29	12	86	0	22	0	0
57,5	11	0	0	0	22	0	13	0	0	21	0	0	86	0	0	0	0
58,5	11	0	0	0	0	0	7	0	0	10	0	0	14	0	0	0	0
59,5	11	0	0	0	0	19	0	16	0	0	29	12	115	0	0	0	0
60,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61,5	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0
62,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum	167	0	492	177	220	243	164	230	0	260	203	382	1062	352	602	1082	441
Sp.St.	111	0	349	136	152	155	99	142	0	106	145	104	573	144	120	99	81

Table 8. *R. radiata*. Length composition (1 000) for Greenland combined, 1982-98. () incorrect due to incomplete sampling.

Length (cm)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	(1992)	1993	(1994)	1995	1996	1997	1998
0,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,5	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0
2,5	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0
3,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4,5	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7,5	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8,5	0	0	0	25	0	0	0	0	0	0	0	29	16	0	51	0	0
9,5	0	10	11	12	5	0	11	5	87	18	0	41	31	0	62	183	82
10,5	64	127	100	183	487	121	181	276	630	154	350	121	300	26	136	774	435
11,5	89	394	422	416	70	188	279	602	741	227	881	458	418	4	219	708	249
12,5	128	526	317	492	117	213	450	704	860	392	1568	354	267	15	229	717	211
13,5	135	740	237	329	154	153	363	650	586	267	1180	279	179	51	222	367	121
14,5	164	373	271	502	269	195	404	865	583	260	1180	351	224	39	93	416	165
15,5	222	352	301	385	260	156	386	873	781	269	781	195	221	66	154	189	144
16,5	134	411	198	385	94	103	439	996	718	333	462	149	175	46	39	277	116
17,5	238	347	203	447	182	59	273	1221	779	257	479	146	123	26	117	201	162
18,5	247	244	302	323	166	104	239	1010	887	242	363	161	220	39	115	441	125
19,5	166	175	249	263	165	123	276	1030	989	211	406	81	139	23	22	213	108
20,5	213	127	255	269	159	117	419	1108	419	137	245	96	303	20	86	165	78
21,5	322	182	239	273	256	106	357	817	493	159	284	161	205	4	113	405	97
22,5	221	90	182	261	167	103	263	896	488	200	432	119	171	35	31	77	64
23,5	189	99	123	244	113	53	209	949	523	191	198	172	245	31	30	294	95
24,5	209	129	167	212	376	46	246	787	422	87	164	77	219	16	149	173	79
25,5	246	114	203	184	97	98	256	771	472	168	340	149	217	22	124	282	73
26,5	373	174	216	165	72	83	195	550	441	102	155	152	66	26	42	199	103
27,5	226	72	240	174	375	37	157	575	235	121	73	89	190	8	24	191	151
28,5	181	145	138	204	43	76	135	453	229	81	109	78	185	29	68	289	54
29,5	224	89	97	124	34	100	84	490	176	123	102	68	106	4	110	107	93
30,5	303	83	144	186	101	96	128	531	275	132	115	178	189	14	137	125	129
31,5	146	94	175	85	299	67	149	332	138	89	136	69	53	0	30	76	73
32,5	230	172	157	32	52	73	103	313	186	120	43	13	55	24	20	136	28
33,5	193	78	87	71	83	99	48	199	135	80	146	29	53	33	38	127	77
34,5	192	43	140	86	17	27	62	215	85	42	116	156	92	37	75	121	93
35,5	137	93	75	102	10	36	97	189	116	48	86	112	43	22	51	73	78
36,5	215	63	112	65	285	36	56	253	127	86	24	130	62	4	0	51	59
37,5	166	60	51	127	321	39	85	241	86	46	32	53	60	12	11	18	52
38,5	107	89	56	128	37	45	25	117	66	47	17	0	68	28	47	69	61
39,5	138	53	49	66	47	52	29	154	135	30	92	34	100	29	0	57	34
40,5	152	81	93	84	364	86	47	262	56	15	36	10	40	29	0	33	49
41,5	136	44	73	67	34	44	32	143	58	58	40	7	39	10	19	58	0
42,5	144	33	38	50	68	33	48	190	37	17	12	15	38	27	0	63	7
43,5	138	105	47	67	95	26	57	135	52	33	13	12	82	8	19	24	0
44,5	125	54	47	82	889	61	61	109	54	4	29	28	36	0	15	0	5
45,5	199	42	57	53	72	65	89	86	19	40	42	12	0	0	38	42	14
46,5	189	57	74	101	31	37	61	102	65	19	0	16	57	22	0	18	20
47,5	270	87	137	81	53	31	103	29	9	0	12	28	7	0	19	21	5
48,5	277	50	81	50	29	31	76	39	19	11	0	29	57	31	0	36	0
49,5	253	55	47	62	32	73	56	77	10	23	24	12	65	4	8	0	24
50,5	369	154	134	89	86	90	44	108	15	19	24	0	86	0	0	0	43
51,5	287	71	58	66	53	16	32	43	15	15	66	0	0	14	0	0	0
52,5	326	86	130	116	58	24	68	30	19	11	5	0	57	18	19	0	19
53,5	265	54	67	81	57	0	7	45	0	11	0	12	0	22	0	0	0
54,5	168	88	117	27	17	20	43	6	0	11	0	0	0	29	0	0	0
55,5	286	37	28	49	22	40	18	36	13	12	0	0	0	14	22	0	0
56,5	125	56	31	67	6	52	16	6	0	14	29	12	86	0	22	0	0
57,5	141	23	16	18	40	14	17	6	0	21	0	0	86	0	0	0	0
58,5	65	41	3	11	6	4	15	0	0	10	0	0	0	14	0	0	0
59,5	38	19	10	17	0	23	6	27	4	0	29	12	115	0	0	0	0
60,5	45	0	7	3	0	4	11	0	0	0	0	0	0	0	0	0	0
61,5	27	4	3	4	0	0	0	0	0	10	0	0	0	0	0	0	0
62,5	5	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
63,5	5	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum	9853	6992	6833	8068	6925	3578	7311	19651	13333	5085	10920	4505	5846	975	2826	7816	3675
Sp.St.	3340	924	1007	898	562	524	662	640	188	227	231	133	616	168	128	117	125

Table 9. *R. radiata*. Weight at length composition (tons) for West Greenland, 1982-98.

Length (cm)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
0,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
10,5	0	1	1	1	4	1	1	2	5	1	3	1	2	0	1	5	3
11,5	1	4	4	4	1	2	3	6	7	2	9	4	4	0	2	7	2
12,5	2	7	4	6	2	3	6	9	11	5	20	4	3	0	3	9	3
13,5	2	12	4	5	3	2	6	11	10	4	19	4	3	1	3	6	2
14,5	3	8	5	10	5	4	8	17	12	5	24	7	5	1	2	8	3
15,5	5	9	7	10	6	4	10	22	19	6	19	5	5	2	4	5	2
16,5	4	12	5	11	3	3	13	30	21	10	14	4	5	1	1	8	3
17,5	8	12	7	16	6	2	10	43	28	9	17	5	4	1	4	7	6
18,5	10	10	13	14	7	4	10	43	37	10	15	6	9	2	5	19	5
19,5	8	9	12	13	8	6	14	51	49	10	20	4	7	1	1	11	5
20,5	12	7	15	15	9	7	24	64	24	8	14	6	17	1	5	9	4
21,5	21	12	16	18	17	7	23	54	33	11	19	11	14	0	7	27	6
22,5	17	7	14	20	12	8	20	68	37	14	33	9	13	3	2	4	4
23,5	16	9	11	21	10	4	18	82	45	16	17	15	21	3	1	24	8
24,5	20	13	16	21	37	5	24	77	41	9	16	8	21	2	15	15	8
25,5	27	13	22	20	9	11	28	84	52	19	38	16	21	1	12	27	8
26,5	46	22	27	20	9	10	23	68	55	13	19	19	8	1	5	25	13
27,5	31	10	33	24	52	5	22	80	33	15	10	12	22	1	3	18	21
28,5	28	22	21	32	7	12	21	70	35	13	17	12	24	4	5	45	8
29,5	38	15	17	21	6	17	13	84	30	21	17	12	8	1	12	14	13
30,5	57	16	27	35	17	18	24	101	52	23	22	27	25	0	6	16	17
31,5	31	20	37	18	62	14	31	69	29	19	28	9	11	0	2	11	11
32,5	53	39	28	7	12	17	24	72	43	28	10	3	13	2	5	13	2
33,5	49	20	22	18	21	25	10	50	34	20	37	7	13	5	2	11	15
34,5	53	12	29	24	5	7	17	59	23	12	32	40	10	2	12	2	16
35,5	38	28	22	31	3	5	29	54	35	14	26	30	13	2	15	9	12
36,5	59	21	25	21	93	12	18	82	41	28	8	42	11	1	0	10	19
37,5	59	21	18	43	113	14	30	85	30	16	11	14	11	4	4	6	12
38,5	41	34	21	49	10	17	10	45	25	18	6	0	15	5	2	26	16
39,5	57	22	20	27	19	21	12	57	56	12	38	9	18	6	0	0	14
40,5	68	36	33	35	162	38	21	117	25	7	3	4	18	0	0	5	22
41,5	65	21	35	27	11	17	15	69	28	28	19	3	5	5	3	28	0
42,5	74	17	20	26	35	17	25	90	19	3	6	2	20	14	0	0	4
43,5	70	58	26	34	46	5	31	75	29	18	7	0	29	4	0	13	0
44,5	74	32	28	45	526	33	36	55	32	2	0	7	4	0	9	0	3
45,5	126	27	36	33	46	35	56	54	12	18	8	0	0	0	0	0	9
46,5	120	38	27	52	21	25	41	48	44	13	0	0	0	5	0	12	13
47,5	194	63	45	54	21	22	74	21	6	0	9	0	5	0	0	0	4
48,5	212	38	36	29	22	24	58	30	15	8	0	22	0	0	0	0	0
49,5	206	45	38	46	26	59	46	50	8	10	20	0	29	3	7	0	0
50,5	319	133	57	67	43	29	38	67	13	16	21	0	0	0	0	0	4
51,5	253	65	53	39	49	0	29	25	14	4	7	0	0	0	0	0	0
52,5	284	84	90	107	56	23	17	29	18	0	5	0	0	4	0	0	0
53,5	261	56	34	65	11	0	7	30	0	11	0	0	0	8	0	0	0
54,5	183	96	53	23	5	22	33	7	0	0	0	0	0	0	0	0	0
55,5	329	43	32	51	11	16	3	23	15	14	0	0	0	0	0	0	0
56,5	138	68	38	59	7	29	19	7	0	5	0	0	0	0	0	0	0
57,5	166	29	20	23	23	18	5	8	0	0	0	0	0	0	0	0	0
58,5	73	55	4	15	8	5	11	0	0	0	0	0	0	0	0	0	0
59,5	38	27	14	24	0	6	9	16	6	0	0	0	0	0	0	0	0
60,5	67	0	10	4	0	6	16	0	0	0	0	0	0	0	0	0	0
61,5	42	6	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0
62,5	8	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
63,5	9	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum	4179	1481	1253	1445	1698	697	1093	2456	1237	547	684	384	468	98	158	454	321
SSB	3029	872	606	702	350	320	463	413	151	99	69	22	34	21	7	12	30

Table 10. *R. radiata*. Weight at length composition (tons) for East Greenland, 1982-98. (.) incorrect due to incomplete sampling.

Length (cm)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	(1992)	1993	(1994)	1995	1996	1997	1998
0,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11,5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
12,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
16,5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18,5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
19,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
20,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
21,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
22,5	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	2	1
23,5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	2	0
24,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
25,5	0	0	0	0	1	0	0	1	0	0	0	0	3	2	2	5	0
26,5	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0
27,5	0	0	0	0	0	0	0	0	0	2	0	0	4	0	0	9	0
28,5	0	0	0	0	0	0	0	0	0	0	0	0	4	0	6	0	0
29,5	0	0	0	0	0	0	1	0	0	0	0	0	10	0	7	4	3
30,5	0	0	0	0	2	0	0	0	0	2	0	7	11	3	20	8	7
31,5	0	0	0	0	0	0	0	0	0	0	0	6	0	0	4	4	4
32,5	0	0	8	0	0	0	0	0	0	0	0	0	3	0	18	4	4
33,5	0	0	0	0	0	0	2	0	0	0	0	0	4	8	21	5	5
34,5	0	0	9	0	0	0	0	0	0	0	0	3	16	8	9	32	9
35,5	3	0	0	0	0	6	0	3	0	0	0	4	0	4	0	13	11
36,5	11	0	11	0	0	0	0	0	0	0	0	0	9	0	0	7	0
37,5	0	0	0	2	0	0	0	0	0	0	0	4	10	0	0	0	7
38,5	0	0	0	0	4	0	0	0	0	0	0	0	11	5	16	0	7
39,5	0	0	0	0	0	0	0	7	0	0	0	5	24	6	0	24	0
40,5	0	0	8	3	0	0	0	0	0	0	13	0	0	13	0	9	0
41,5	0	0	0	5	5	4	0	0	0	0	0	0	14	0	6	0	0
42,5	0	0	0	0	0	0	0	8	0	0	6	0	0	0	0	32	0
43,5	6	0	0	3	7	9	0	0	0	0	0	7	16	0	10	0	0
44,5	0	0	0	4	0	3	0	9	0	0	17	9	17	0	0	0	0
45,5	0	0	0	0	0	6	0	0	0	7	18	8	0	0	24	27	0
46,5	7	0	23	16	0	0	0	21	0	0	0	11	38	9	0	0	0
47,5	0	0	53	4	17	0	0	0	0	0	0	20	0	0	14	15	0
48,5	0	0	26	9	0	0	0	0	0	0	0	0	44	24	0	28	0
49,5	0	0	0	5	0	0	0	13	0	9	0	10	24	0	0	0	20
50,5	0	0	59	10	31	49	0	27	0	0	0	0	74	0	0	0	33
51,5	10	0	0	22	0	15	0	15	0	10	53	0	0	13	0	0	0
52,5	33	0	36	6	0	0	50	0	0	11	0	0	55	14	18	0	18
53,5	11	0	35	19	47	0	0	16	0	0	0	12	0	14	0	0	0
54,5	0	0	74	7	13	0	14	0	0	12	0	0	0	0	32	0	0
55,5	0	0	0	6	14	30	17	18	0	0	0	0	0	16	25	0	0
56,5	13	0	0	22	0	34	0	0	0	12	35	15	104	0	27	0	0
57,5	14	0	0	0	28	0	17	0	0	27	0	0	110	0	0	0	0
58,5	15	0	0	0	0	9	0	0	13	0	0	0	19	0	0	0	0
59,5	16	0	0	0	0	27	0	23	0	0	41	17	163	0	0	0	0
60,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61,5	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0
62,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum	140	0	344	142	170	183	112	162	0	129	178	145	762	190	200	263	134
SSB	120	0	306	125	151	160	107	133	0	117	148	92	613	141	108	69	71

Table 11. *R. radiata*. Weight at length composition (tons) for Greenland, 1982-98. () incorrect due to incomplete sampling.

Length (cm)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	(1992)	1993	(1994)	1995	1996	1997	1998
0,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
10,5	0	1	1	1	4	1	1	2	5	1	3	1	2	0	1	6	3
11,5	1	4	4	4	1	2	3	6	7	2	9	5	4	0	2	7	3
12,5	2	7	4	6	2	3	6	9	11	5	20	5	3	0	3	9	3
13,5	2	12	4	5	3	2	6	11	10	4	19	5	3	1	4	6	2
14,5	3	8	5	10	5	4	8	17	12	5	24	7	5	1	2	8	3
15,5	5	9	7	10	6	4	10	22	19	7	19	5	5	2	4	5	4
16,5	4	12	6	11	3	3	13	30	21	10	14	4	5	1	1	8	3
17,5	8	12	7	16	6	2	10	43	28	9	17	5	4	1	4	7	6
18,5	10	10	13	14	7	4	10	43	37	10	15	7	9	2	5	19	5
19,5	8	9	12	13	8	6	14	51	49	10	20	4	7	1	1	11	5
20,5	12	7	15	15	9	7	24	64	24	8	14	6	17	1	5	9	4
21,5	21	12	16	18	17	7	24	54	33	11	19	11	14	0	7	27	6
22,5	17	7	14	20	13	8	20	68	37	15	33	9	13	3	2	6	5
23,5	16	9	11	21	10	5	18	82	45	17	17	15	21	3	3	25	8
24,5	20	13	16	21	37	5	24	77	41	9	16	8	21	2	15	17	8
25,5	27	13	22	20	11	11	28	85	52	19	38	16	24	2	14	31	8
26,5	46	22	27	20	9	10	24	68	55	13	19	19	8	3	5	25	13
27,5	31	10	33	24	52	5	22	80	33	17	10	12	26	1	3	27	21
28,5	28	22	21	32	7	12	21	70	35	13	17	12	29	4	11	45	8
29,5	38	15	17	21	6	17	14	84	30	21	17	12	18	1	19	18	16
30,5	57	16	27	35	19	18	24	101	52	25	22	34	36	3	26	24	24
31,5	31	20	37	18	62	14	31	69	29	19	28	14	11	0	6	16	15
32,5	53	39	36	7	12	17	24	72	43	28	10	3	13	6	5	31	6
33,5	49	20	22	18	21	25	12	50	34	20	37	7	13	8	10	32	19
34,5	53	12	38	24	5	7	17	59	23	12	32	43	25	10	21	33	26
35,5	41	28	22	31	3	11	29	57	35	14	26	34	13	7	15	22	23
36,5	70	21	36	21	93	12	18	82	41	28	8	42	20	1	0	17	19
37,5	59	21	18	45	113	14	30	85	30	16	11	19	21	4	4	6	18
38,5	41	34	21	49	14	17	10	45	25	18	6	0	26	11	18	26	23
39,5	57	22	20	27	19	21	12	64	56	12	38	14	41	12	0	24	14
40,5	68	36	41	37	162	38	21	117	25	7	16	4	18	13	0	15	22
41,5	65	21	35	32	16	21	15	69	28	28	19	3	19	5	9	28	0
42,5	74	17	20	26	35	17	25	98	19	9	6	8	20	14	0	32	4
43,5	76	58	26	37	52	14	31	75	29	18	7	7	45	4	10	13	0
44,5	74	32	28	48	526	36	36	64	32	2	17	17	21	0	9	0	3
45,5	126	27	36	33	46	41	56	54	12	25	27	8	0	0	24	27	9
46,5	128	38	50	68	21	25	41	69	44	13	0	11	38	15	0	12	13
47,5	194	63	99	58	38	22	74	21	6	0	9	20	5	0	14	15	4
48,5	212	38	62	38	22	24	58	30	15	8	0	22	44	24	0	28	0
49,5	206	45	38	50	26	59	46	63	8	19	20	10	53	3	7	0	20
50,5	319	133	116	77	74	78	38	93	13	16	21	0	74	0	0	0	37
51,5	263	65	53	61	49	15	29	39	14	14	61	0	0	13	0	0	0
52,5	317	84	126	113	56	23	66	29	18	11	5	0	55	18	18	0	18
53,5	273	56	69	83	59	0	7	46	0	11	0	12	0	23	0	0	0
54,5	183	96	127	29	18	22	47	7	0	12	0	0	0	32	0	0	0
55,5	329	43	32	56	25	46	21	41	15	14	0	0	0	16	25	0	0
56,5	152	68	38	81	7	63	19	7	0	17	35	15	104	0	27	0	0
57,5	180	29	20	23	51	18	22	8	0	27	0	0	110	0	0	0	0
58,5	88	55	4	15	8	5	20	0	0	13	0	0	0	19	0	0	0
59,5	54	27	14	24	0	33	9	38	6	0	41	17	163	0	0	0	0
60,5	67	0	10	4	0	6	16	0	0	0	0	0	0	0	0	0	0
61,5	42	6	5	6	0	0	0	0	0	16	0	0	0	0	0	0	0
62,5	8	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
63,5	9	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum	4319	1481	1597	1586	1869	880	1205	2617	1237	677	862	529	1230	288	358	717	454
SSB	3149	872	912	827	501	480	570	546	151	216	217	114	647	161	115	81	101

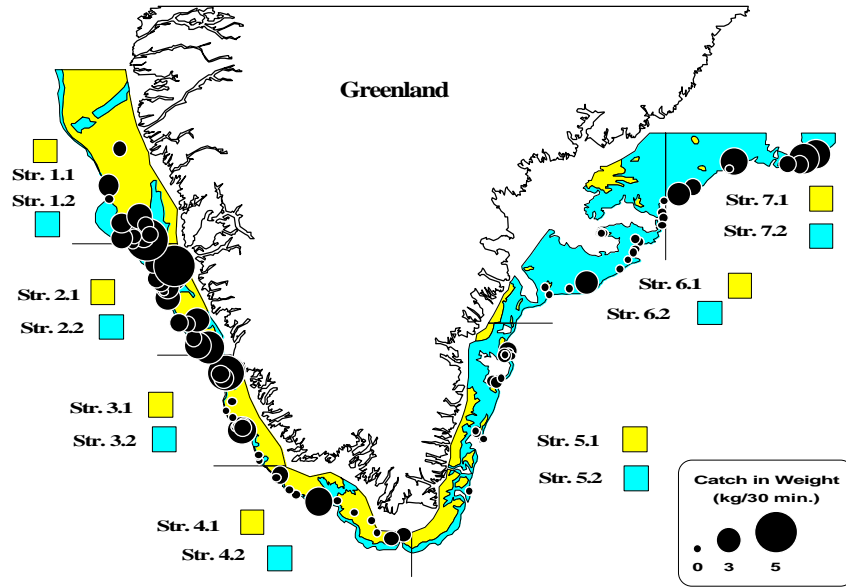


Fig. 1. Stratification of the survey area as specified in Table 2, positions of hauls carried out in 1998 and catches of thorny skate (*R. radiata*).

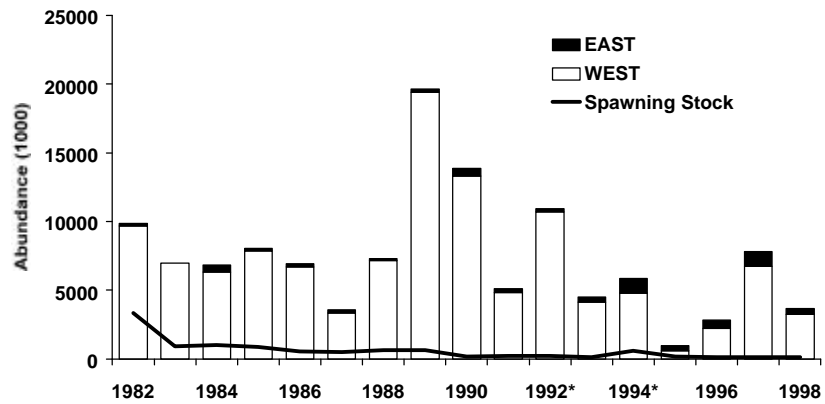


Fig. 2. *R. radiata*, Greenland. Aggregated survey abundance indices and spawning stock size as listed in Tables 4 and 8, 1982-98. *) incomplete survey coverage off East Greenland.

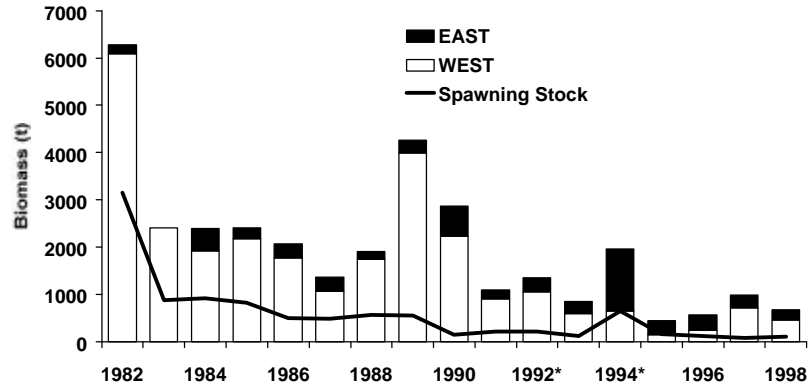


Fig. 3. *R. radiata*, Greenland. Aggregated survey biomass indices and spawning stock size (West Greenland only) as listed in Tables 5 and 11, 1982-98. *) incomplete survey coverage off East Greenland.

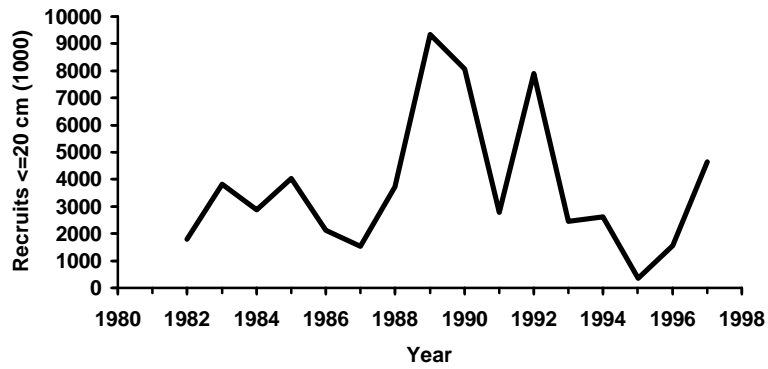


Fig. 4. *R. radiata*, Greenland. Recruitment indices (immature fish <=20cm) as listed in Table 8, 1982-98.

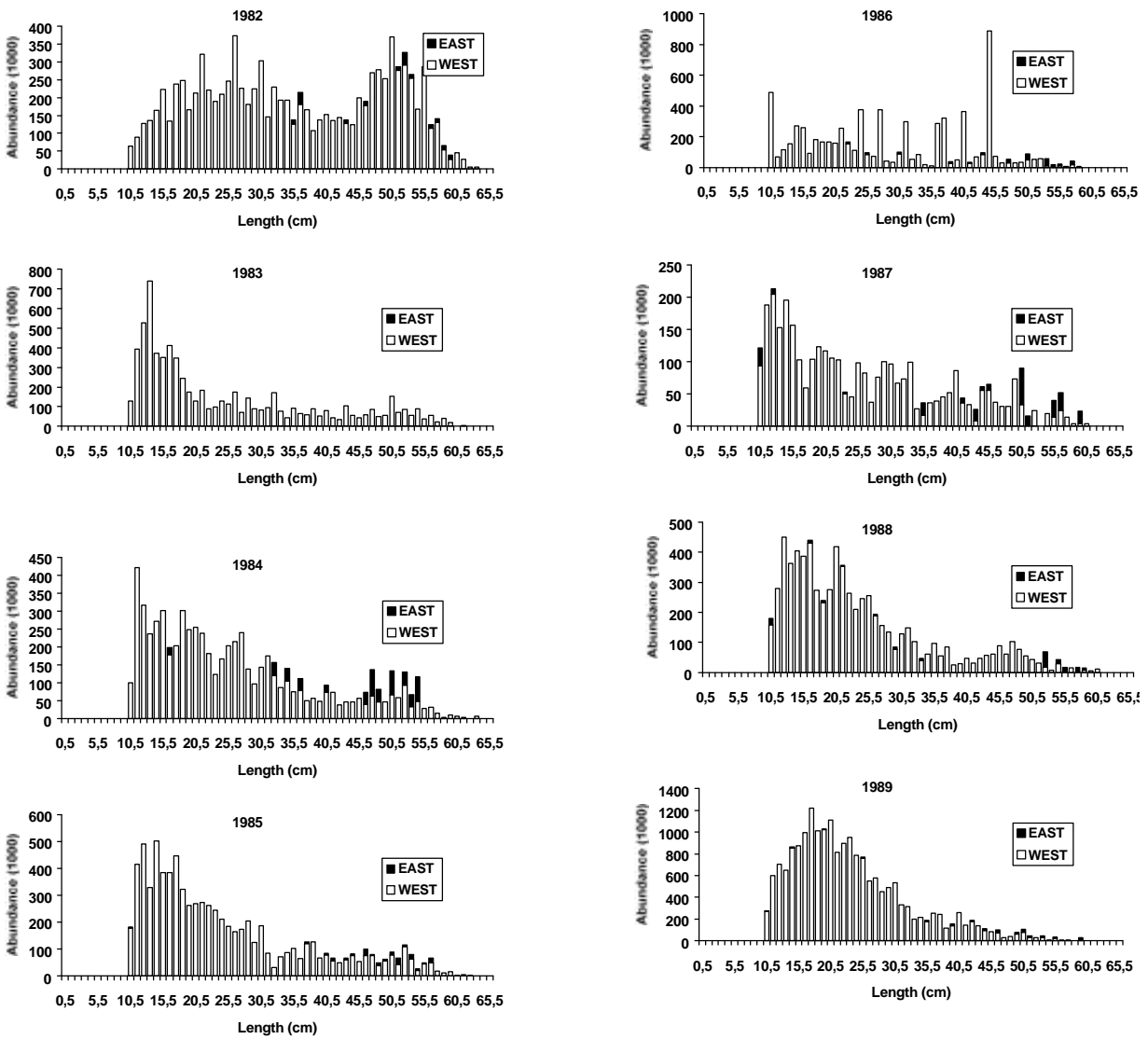


Fig. 5a. *R. radiata* (≥10 cm). Length frequencies for East and West Greenland, 1982-89.

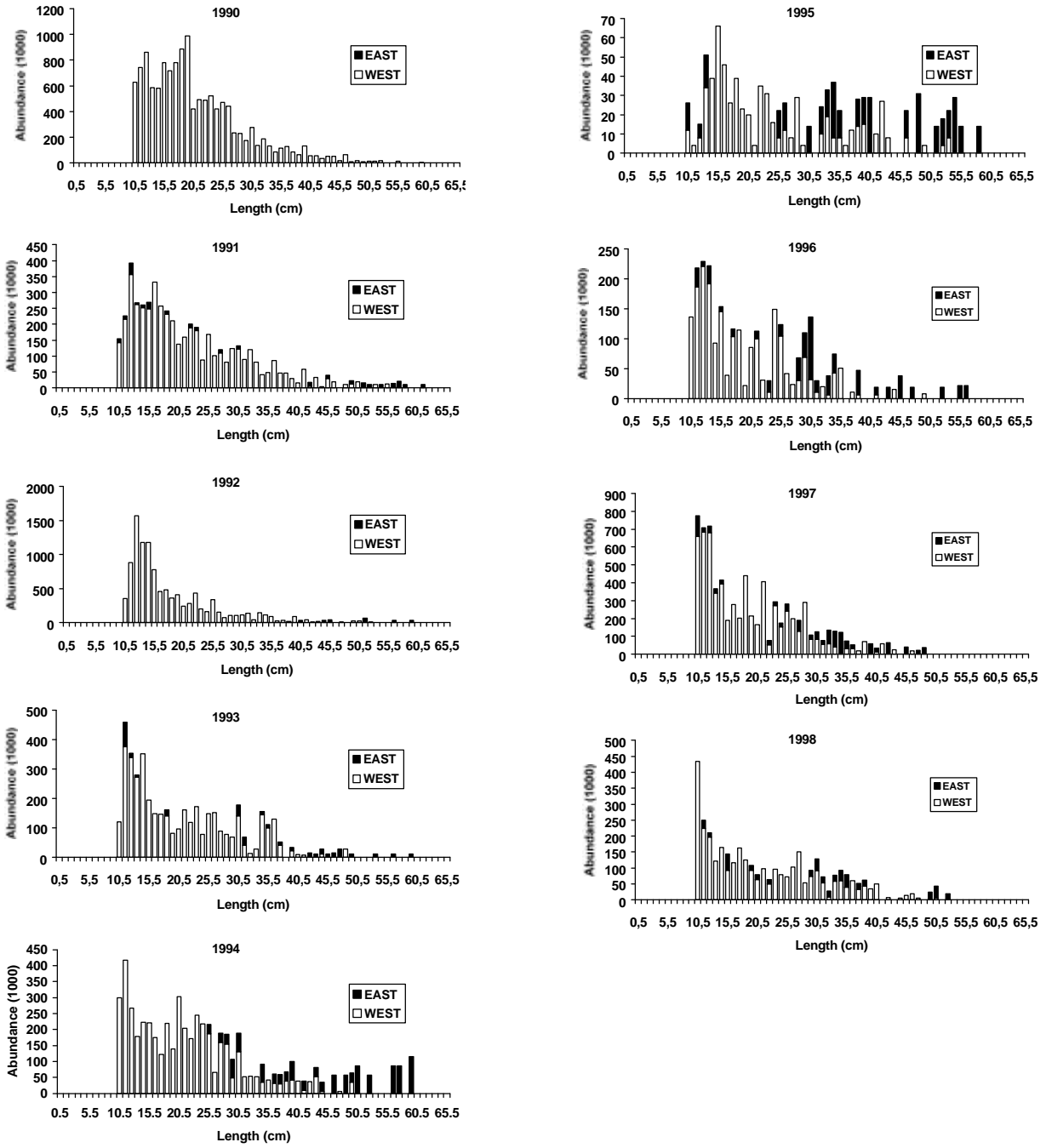


Fig. 5b. *R. radiata* (≥10 cm). Length frequencies for East and West Greenland, 1990-98.