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REPORT OF THE BLUEFIN TUNA WORKING GROUP

Observations on the Size Composition of Bluefin Tuna Catches from 1978

by

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CONTENTS Page

INTRODUCTION

Reference is made to previous reports of the Bluefin Tuna Working Group (Statistical News Letters, Nos. 20, 36 and 38, and Cooperative Research Reports, Nos. 23, 40 and 71) as well as ICES documents C.M.1977/J:3 and C.M.1978/H:34.

In 1978, Dr H. Aloncle from the Institut Scientifique et Technique des Pêches maritimes in Nantes, a member of the Working Group since 1972, decided to withdraw because of another research assignment and was replaced by Dr F.X. Bard from the Centre Océanologique de Bretagne and Dr H. Farrugio from the Institut des Pêches Maritimes, Centre de Recherches de Sète. Other Working Group members are at present: Mr E. Bakken (Norway), Mr R.C. Hennemuth (USA), Dr T.D. Iles (Canada), Ms O. Moura (Portugal), Dr J. Rodriguez-Roda (Spain), Dr J.C. Tyler (USA).

The members continued their work by correspondence and with other tuna research workers in the region. The data obtained for the fishing season 1978 are presented in the following.

MATERIAL

Data on the size and age composition of Bluefin Tuna catches and other information were received from the following countries: Canada (Tables 1-4), Denmark (Table 5), France (Tables 6-12), Norway (Table 13), Spain (Tables 14-18), Turkey (Tables 19-20), and USA (Tables 21-25).

Ms C.D. Burnett, Mr P.C.F. Hurley and Dr T.D Iles reported that the Canadian landings of Bluefin Tuna from the west Atlantic in 1978 amounted to 671 tonnes round weight (Table 1), a substantial decrease from the previous year (301 tonnes or 31%).

a) The purse seine fishery for juveniles off the eastern coast of the United States accounted for 241 tonnes, a decrease of 57 tonnes or 19% from 1977, and a decrease of 27% from 1976.

b) The incidental capture of Giant Bluefin in mackerel traps in St Margaret's Bay, Nova Scotia, also decreased from 368 tonnes in 1977 to 221 tonnes in 1978.

c) The sport (rod and reel) fishery for Giant Bluefin declined from 302 tonnes in 1977 to 209 tonnes this year, a decrease of 93 tonnes. The most significant change occurred in the Bay of Chaleur area of New Brunswick where the 1978 landings decreased 83%.

The size composition of Bluefin taken in five areas along the Canadian Atlantic coast is presented in Table 2. Seasonal mean weights increased from 1977 in all areas but Newfoundland. Mean weights range from 293.7 to 459.0 kg.

The size composition of the Prince Edward Island rod and reel fishery is presented in Table 3. The mean weight of fish increased as the season progressed, from 315.5 to 468.2, ranging in size from 174.6 to 560.1 kg. Although the seasonal mean weight for this area showed no increase in 1977, a significant increase from 394.4 kg in 1977 to 406.4 kg in 1978 was observed.

Catches of small Bluefin from the purse seine fishery in July and August off the mid-Atlantic coast of the United States were sampled for size (length) composition. Fork lengths ranged from 55.3 to 186.8 cm with an average length of 111.9 cm. Size composition is presented in Table 4. No Canadian vessels operated in the Gulf of Guinea in 1978.

The commercial impoundment programme was continued in St Margaret's Bay, Nova Scotia, and maintained at 18 impoundments in 1978. Of 553 Bluefin impounded, 460 were successfully held for one to four months for fattening. The remainder escaped or died during the season. Another 70 tuna were landed immediately upon capture in traps and were not impounded. Mean weight of the latter was 327.9 kg compared to 431.2 kg mean weight of the impounded tuna, demonstrating the rationale behind this programme.

One impoundment containing 10 Bluefin was allocated for experimental purposes. Canadian and American scientists conducted co-operative investigations of: monitoring behavioural and physiological parameters by means of ultrasonic telemetry, aging validation, tag retention, tissue contamination, nutrition, parasitology, and electrophoretic studies.

Six Bluefin were tagged and released in Canadian waters in 1978. Five were released from traps in St Margaret's Bay, and one from a rod and reel capture east of Halifax, Nova Scotia.

Four tagged Bluefin were recovered in 1978. Three had been tagged and released from traps in St Margaret's Bay, Nova Scotia, in 1975 and 1976; two of these were recaptured by rod and reel in the Prince Edward Island area and the other was taken by a Japanese longline in the Gulf of Mexico. The fourth recapture had been released in the Bay of Chaleur area and was recaptured in the same general area in 1978.

Sampling was continued at the major Bluefin landing ports in Canada in 1978. In addition to morphometric data, 300 otoliths were collected from Giant Bluefin and 50 from juveniles for age determination studies.

The following papers were presented to the ICCAT Standing Committee on Research and Statistics meeting in November 1978:

1. HURLEY, P.C.F., BURNETT, C.D. and DICKSON, C.A., 1978. An update of Canadian large pelagic fish tagging. SCRS/78/81, 9 pp.

2. HURLEY, P.C.F., DICKSON, C.A. and ILES, T.D., 1978. A report on the progress of research on impounded Bluefin Tuna in St Margaret's Bay, Nova Scotia. SCRS/78/83, 6 pp.

3. SANGALANG, G.B. and HURLEY, P.C.F., 1978. The application of radio-immunoassay to sex identification in Bluefin Tuna. SCRS/78/85, 3 pp.

Dr O. Bagge submitted the Danish data (Table 5) which were from catches taken in the Skagerrak mainly by Swedish boats in connection with herring trawling. One fish was caught in the Kattegat by a Danish boat.

The French data on Bluefin Tuna purse seine catches in the Mediterranean were submitted by Dr Farrugio (Table 6). The total catch amounted to 1 566 tonnes. Reference was made to Science et Pêche, Bull. Inst. Pêches marit., Nos. 268, 273 and 279, in which the fishery is described in full.

The French Bluefin Tuna catches made by live bait fishing in the Bay of Biscay were reported by Dr F.X. Bard (Table 7). He and Dr Cort from Spain also submitted Tables 8-12 evaluating the Bluefin Tuna fishery in the Bay of Biscay carried out by France and Spain over the past years. The 1978 statistic on the age composition of catch represents an estimate and is based on counts and sortings of 14 300 Bluefin Tuna according to commercial weight classes and carried out by the captains of fishing boats and fish dealers.

Drs Bard and Cort state that the Bluefin Tuna fishery in the Bay of Biscay has been continuously monitored since 1972. Catches, fishing effort and estimates of age composition of catches were recorded. The following conclusions can be drawn:

> There is a decrease of fishing effort by one half since 1975; there is a continuous increase of the mean occurrence of the younger age groups (Figure 2); since 1976 also fish of medium age (4-7 years) returned in the catches; there is evidence of the existence of a strong year class 1974. The experts conclude further that if one considers that the Bluefin Tuna stock of the Eastern Atlantic recruits to a large degree in the Bay of Biscay at an age of 2 years after it has escaped the fishery of Morocco, the stock situation of Bluefin Tuna in the Eastern Atlantic can be considered as rather good, as reflected by the recent development of the fishery in the Bay of Biscay.

Mr Iversen furnished the Norwegian data (Table 13) and stated that in 1978, except for two Tunas caught in Week 28, the fishery started two weeks later. This is more or less the usual time for starting the tuna season there.

651 fish, totalling 168 092 kg, were landed during Weeks 28-33. The main catch was landed in the two Weeks 31 and 32. 38 catches ranging between 1 and 117 fish were landed by 25 vessels. The bulk was caught on Vikingbank and the coast of Hordaland and Sogn and Fjordane.

The complete Norwegian catch is included in the Table. Only Giant Bluefin were caught. Individual weights are lacking for 117 fish in Week 32. Individual weights (gutted and without heads) varied between 130 and 380, averaging 258.2 kg, corresponding approximately to 330 kg live weight.

The poor catch this year was mainly due to bad weather during the season and that the Tunas seemed to be further from the coast than usual. Catches and observations from the Vikingbank confirm this.

No length measurements were recorded.

Dr Rodriguez-Roda informed the Working Group that the 1978 Spanish madrague fishery on Bluefin Tuna was better than in 1977. A total of 2 976 Bluefin Tuna were caught in 1978 against 1 626 in 1977.

Dr Cort who supplied Table 16 reports that the Bluefin Tuna fishing season in 1978 in the Bay of Biscay began in the second half of June and lasted until the end of October. In contrast to previous years, the weather was very good, resulting in good catches of 1 400 tonnes. He points to the great abundance of 1-year-old Bluefin Tuna which was uncommon in previous years. The Spanish Institute of Oceanography organised a tagging cruise in August 1978 aboard a trolling boat. 308 fish were tagged from which 170 were Bluefin Tuna and 138 Albacores.

The size composition data of Spanish Bluefin Tuna catches in the waters of the Canary Islands were supplied by Dr Santos Guerra. A total of 1 548 tonnes was caught (Table 17).

Dr J.C. Rey compiled the age composition data of Bluefin Tuna catches made off the Atlantic coast of Morocco (Table 18). The fish were caught between Cape Juby (28°N) and Cape Mazagán (34°N), from September to December 1978. They were landed at Algeciras port in Spain. The fishing fleet is composed of small and medium fishing boats (25-80 gross tons), fishing with hooks. Catches of Bluefin Tuna are occasional. Some 450 tonnes of Bluefin Tuna were caught.

The Turkish data were reported by Professor Demio. They refer to the Istanbul Fish Market and to a madrague stationed at Beykoz (Bosphorus) only (Tables 19 and 20).

The US data were compiled by Mr M.I. Farber (Tables 21-25). They are computer print outs for the actual size samples by month for each fishery as well as each total catch (actual or estimated) by weight and number. The fisheries included are: purse seine - small fish; purse seine - giant fish; sport fishing - small fish; and hand gear - giant fish. Length and weight frequencies are tabulated for each of these, except for hand gear where only a weight frequency is available.

RESULTS

1. The Bluefin Tuna catches of the Spanish madrague fishery which had declined to 339 tonnes in 1977 recovered again in 1978 to 634 tonnes and were the highest since 1970.

2. The catches of the Norwegian purse seine fishery decreased instead from 2 191 Giant Tuna (= 587 tonnes) to 651 fish (= 168 tonnes), mainly due to bad weather during the season and that the Tunas seemed to have been further from the coast than usual, as indicated from catches and observations from the Viking Bank.

3. The French Bluefin Tuna fishery in the Bay of Biscay continued to recover and increased to 723 tonnes and were as high as during the period from 1970-72. The same trend can be observed in the Spanish fishery in the Bay of Biscay which yielded 1 400 tonnes.

4. The Spanish Bluefin Tuna catches in the waters of the Canary Islands also continued to increase and amounted to 1 548 tonnes and were the largest since 1974 when the first catch figures were available.

5. The overall Canadian catches decreased by 31% to 671 tonnes and were the smallest since 1975, mainly because of reduced catches by traps and rod and reel, while the purse seine fishery was less affected. The US catches amounting to 1 853 tonnes were nearly as high as in 1977 (= 1 945 tonnes).

6. The Norwegian Bluefin Tuna catches were again of the known size composition which tallied very well with that of US Atlantic catches of giant fish caught by handline, harpoon or rod and reel, but did not tally with the Canadian catches of Giant Tuna, which as in the preceding year were considerably larger and neither did they correspond with the catches of Giant Tuna caught off the Canary Islands, which were smaller (Figure 1).

7. In the US and Canadian purse seine catches the same two year classes as in the preceding year dominated, now 3 and 5 years old. The year class 1973 had already dominated the catches since 1974. Small fish caught by US sport fishing off the Mid-Atlantic coast were mainly 1-year-old fish (Figure 2).

8. In the live bait Bluefin Tuna fishery in the Bay of Biscay the 1-year-old fish dominated in both the French and the Spanish fishery. Fish of year class 1974 were also found in 1978 to be stronger than year classes 1973 and 1975. This confirms again the conclusion of the previous Bluefin Tuna Working Group Report that the fluctuation pattern in the strength of recruit year classes does not tally in the eastern and western Atlantic during these years.

9. In the French purse seine catches of Bluefin Tuna in the Mediterranean, 1-year-old fish dominated, as in the catches made in the Bay of Biscay (Table 6).

10. Bluefin Tuna catches off the Atlantic coast of Morocco consisted mainly of old fish of year classes 12 and 13 (Table 18). They were thus of similar age composition as the Spanish madrague catches (Figure 2), which also seems to correspond largely with the catches made off the Canary Islands.

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Table 1. Canadian catches of Bluefin Tuna from the Atlantic Ocean, 1962-78. Landings (nominal catch in tonnes, round weight).

Year	Traps***)	Purse seine	Rod & reel*)	Total
1962	137	-	40	177
1963	229	323	90	642
1964	318	579	99	996
1965	175	461	90	726
1966	211	-	102	313
1967	298	-	58	356
1968	253	-	180	433
1969	407	-	170	577
1970	275	1 161	151	1 587
1971	68	935	128	1 131
1972	36	202	261	499
1973	160	639	215	1 014
1974	300	103	365	768
1975	141	295	193	629
1976	172	332	342	846
1977	372	298	302	972
1978	221	241	209	671

*) Prior to 1974, tagged and/or released fish are included in the rod and reel totals.

***) From 1962-74, the catch includes a small proportion of incidental longline catches.

Table 2. Size composition (round weight per mille by 10 kg unit) of large Bluefin Tuna captured in five localities along the Canadian Atlantic coast in 1978.

Class (kg)	P.E.I. rod & reel	Nfld. rod & reel	N.B. rod & reel	Quebec rod & reel	N.S. rod & reel	Trap	Total	‰ smoothed
60						1	1	2
70						4	4	2
80						0	0	1
..						..	..	..
120						1	1	1
130						2	2	1
140						0	0	1
150						0	0	0
160						1	1	1
170	1					0	1	1
180	0					1	1	1
190	1					1	2	1
200	0					1	1	1
210	0					0	0	0
220	0					0	0	0
230	0					1	1	0
240	0					0	0	1
250	2					2	4	2
260	0					0	0	3
270	2					4	6	5
280	3		1			3	7	7
290	3	2	0			4	9	8
300	3		0			4	7	8
310	6		0			4	10	10
320	8		0			6	14	14
330	9		0			7	16	21
340	24		1	1		10	36	32
350	24		0	1	1	16	42	43
360	26		0	0	0	31	57	50
370	26		4	0	2	17	49	54
380	38		4	1	0	27	70	62
390	32		2	1	0	35	70	69
400	32		2	2	0	43	79	68
410	24		5	1	0	24	54	64
420	29		1	2	1	42	75	66
430	28		3	0	2	35	68	62
440	21		2	1	0	20	44	48
450	16		2	0	1	22	41	44
460	20		2	0	1	31	54	49
470	12		1	1	1	37	52	46
480	6		1	0	5	18	30	36
490	13		2		0	23	38	29
500	5		2		0	9	16	24

(Cont'd.)

Table 2 (Continued)

Class (kg)	P.E.I. rod & reel	Nfld. rod & reel	N.B. rod & reel	Quebec rod & reel	N.S. rod & reel	Trap	Total	‰ smoothed
510	11				1	20	32	22
520	2				1	7	10	16
530	6				1	8	15	11
540	3					4	7	7
550						1	1	3
560	1					2	3	2
570						0	0	1
580						0	0	0
590						1	1	
n =	437	2	35	11	17	530	1 032	1 000
Mean weight kg	406.4	293.7	421.0	406.6	459.0	417.6		

Size class 60 kg = 60.0 - 69.9 kg

Table 3. Size composition of large Bluefin caught by rod and reel off Prince Edward Island during four consecutive months of the 1978 season (number of fish and round weights per mille by 10 kg unit).

Size class kg	July		August		September		October	
	No.	‰	No.	‰	No.	‰	No.	‰
170					1	5		
180					-	-		
190					1	5		
200					-	-		
210					-	-		
220					-	-		
230					-	-		
240					-	-		
250			2	13	-	-		
260			-	-	-	-		
270			2	13	-	-		
280			1	6	2	9		
290	1	500	3	20	-	-		
300			-	-	2	9	1	16
310			3	20	3	13	-	-
320			5	33	3	13	-	-
330	1	500	6	39	3	13	-	-
340			15	98	9	41	-	-
350			15	98	9	41	-	-
360			15	98	11	51	-	-
370			11	72	15	68	-	-
380			21	137	14	63	3	49
390			13	85	15	68	2	33
400			11	72	19	86	2	33
410			9	59	14	63	1	16
420			6	39	17	77	6	98
430			3	20	23	104	2	33
440			6	39	14	63	1	16
450			3	20	7	32	6	98
460			-	-	13	59	7	116
470			1	6	8	36	3	49
480			-	-	2	9	4	66
490			2	13	4	18	7	116
500					4	18	1	16
510					5	23	6	98
520					-	-	2	33
530					3	13	3	49
540							3	49
550							-	-
560							1	16
Total	2	1 000	153	1 000	221	1 000	61	1 000
Mean wt. (kg)	315.5		376.6		410.8		468.2	

Size class 170 kg = 170.0 - 179.9

Table 4. Size (fork length) composition of small Bluefin taken off the US coast by Canadian purse seine vessels in 1978.

Size class (cm)	No. of fish	‰ (smoothed)
55	7	14
60	62	32
65	39	27
70	2	11
75	13	16
80	58	37
85	64	44
90	42	33
95	25	46
100	151	123
105	319	191
110	210	147
115	27	51
120	2	8
125	9	8
130	15	13
135	27	19
140	30	25
145	43	37
150	79	49
155	54	40
160	21	19
165	4	6
170	1	1
175	1	1
180	1	1
185	1	1
Total	1 307	1 000
Size category 55 = 55.0 - 59.9 (fork length caliper)		

Table 5. Weight distribution of Bluefin Tuna landed in Denmark in 1978. The weight group refers to gutted fish with gills (kg).

Weight group kg	n
325 - 329	1
...	
340 - 344	1
345 - 349	2
...	
355 - 359	1
...	
365 - 369	1
...	
375 - 379	1
...	
400 - 405	1
...	
415 - 419	1
Total	9

Table 6. French Bluefin Tuna purse seine catches in 1978 from the Mediterranean by age groups.

Age group	April		May		October		November		Total	
	n	kg	n	kg	n	kg	n	kg	n	kg
1	2	17			14 931	113 932	2 410	20 426	17 343	134 375
2	2 559	41 827			1 430	21 189	6 982	113 519	10 971	176 535
3	68	1 327			80	1 512	9 717	231 124	9 865	233 963
4							300	11 302	300	11 302
5							175	9 174	175	9 174
6	10	820							10	820
7	222	20 470							222	20 470
8	61	7 513					1	118	62	7 631
9	26	4 179	19	3 163					45	7 342
10 and above	206	37 051	58	10 593					264	47 644
Total	3 154	113 204	77	13 756	16 441	136 633	19 585	385 663	39 257	649 256

Table 7. French Bluefin Tuna catches from the Bay of Biscay in 1978.

Catch: 723 159 kg

Fishing effort

Number days on sea: 814 x 1.2 = 977

Number of men days: 8 206 x 1.2 = 9 847

Age composition of catch

Age groups	1	2	3	4	5	6
n	35 000	32 300	3 170	4 100	770	62

Table 8. French and Spanish Bluefin Tuna catches in 1978 from the Bay of Biscay in tonnes*).

Year	Bermeo	Guetaria	Fontarrabia	St Jean de Luz	Total
1940	37			194	231
1941	7			144	151
1942	7			50	57
1943	32		263	-	295
1944	6		447	-	453
1945	12		539	298	849
1946	30		628	247	906
1947	10		515	76	601
1948	35		536	484	1 055
1949	81		1 107	1 990	3 178
1950	55		941	1 869	2 865
1951	318		768	2 893	3 979
1952	144		1 280	2 362	3 786
1953	11		1 181	2 364	3 556
1954	24		955	3 451	4 430
1955	411		1 006	3 031	4 448
1956	143		1 195	1 453	2 791
1957	97		1 507	1 550	3 154
1958	591		935	1 303	2 829
1959	67		954	2 031	3 052
1960	96	54	549	553	1 252
1961	32	61	514	907	1 514
1962	266	85	306	965	1 622
1963	115	124	520	543	1 302
1964	200	63	476	400	1 139
1965	270	185	581	621	1 657
1966	228	526	555	1 624	2 933
1967	91	209	360	860	1 069
1968	102	162	367	566	1 197
1969	274	137	810	534	1 755
1970	119	39	1 311	732	2 201
1971	151	30	1 421	680	2 282
1972	0	36	1 194	740	1 970
1973	0	156	1 469	540	2 165
1974	0	17	1 008	522	1 547
1975	0	38	891	692	1 621
1976	0	25	587	267	879
1977*)	0	34	720	593	1 347
1978*)	0	?	650	598	

*) Until 10 September 1978

Table 9. Fishing effort of the French and Spanish Bluefin Tuna fishing fleet in the Bay of Biscay 1972-78.

Year	Number of fishing boat days at sea*)	Number of fishermen days
1972	3 009	28 735
1973	3 389	32 556
1974	2 258	23 535
1975	3 034	30 931
1976	1 489	15 524
1977	1 778	18 034
1978*)	1 570	16 950

*) Until 10 September 1978

Table 10. Relationship of fishing efficiency of fishing boats equipped with sonar and without sonar.

1977	1.142	1.479	0.785	0.999	1.128	1.561	1.577	0.915
1978	1.298	0.537	0.868	1.813	0.985	1.51	1.37	

Mean : 1.196

Standard deviation : 0.357

N : 15

Table 11. Age composition of Bluefin Tuna catches in the Bay of Biscay 1972-78*).

Age group	1	2	3	4	5	6	7	8-10
1972	200	30 200	15 000	3 200	6 260	6 240	6 240	1 750
1973	1 100	91 900	11 000	2 200	2 400	5 000	3 000	2 000
1974	1 250	35 000	48 800	6 100	1 000	900	150	0
1975	13 000	85 700	9 410	5 900	950	480	0	0
1976	850	46 000	9 650	1 640	1 190	685	51	0
1977	7 790	76 100	16 780	5 740	350	222	94	0
1978*)	14 200	50 350	8 670	12 540	2 340	560	47	36

*) Until 10 September 1978

Table 12. Catch per unit effort of age group 2 Bluefin Tuna in the Bay of Biscay 1972-78.

Year class	Number of fish per days at sea
70	10.40
71	27.12
72	15.50
73	28.24
74	30.88
75	42.79
76	32.07

Table 13. Size composition (kg) of Norwegian Bluefin Tuna catches by weight frequency (‰) in 1978.

Group w'	Means w	Week No.					Total	Total smooth.
		28	30	31	32	33		
132	172					4	2	
137	178							
142	183							
147	190							
152	197				36		2	
157	204							
162	211							
167	217							
172	223							
177	228							
182	234			5			2	2
187	240							2
192	247					11	6	4
197	253			5			2	8
202	260			36	71	11	24	14
207	266			9		4	6	13
212	272			14	71	11	15	15
217	279		77	23	36	26	26	25
222	285			36		37	34	34
227	292	500	77	73	36	18	45	43
232	298		77	64		33	45	46
237	305	500	77	64		41	51	50
242	311		77	91	107	22	56	58
247	317		230	73	71	52	66	68
252	324		77	91	107	70	81	73
257	330			64	143	55	62	66
262	337			68	71	59	62	58
267	343			27	36	66	47	56
272	350		154	36	71	85	66	54
277	356			41		41	37	44
282	362			32	36	48	39	44
287	369		77	50	36	48	49	43
292	375		77	23	36	41	34	36
297	382			23		37	28	32
302	388			9	36	63	37	29
307	395			18		18	17	23
312	401			14		30	21	18
317	408			5		18	11	14
322	414					18	9	9
327	420					15	7	6
332	427			5		4	4	4
337	433							2
342	440			5		4	4	3
347	446					4	2	2
352	453							1
357	459							
362	465							
367	472							
372	478					4	2	
377	485							
382	491					4	2	
387	498							
n		2	13	220	28	271	534	1 000
Σ w'		464	3 275	55 569	6 931	72 627	138 866	
x w'		232	251.9	259.6	247.5	268.0	260.1	
N					145		651	
Σ w'					36 157		168 092	
x w'					249.4		258.2	

Table 14. Bluefin Tuna and other catches from three madragues in southern Spain in 1978.
Catches in number of specimen (n) and weight (kg) from the south Spain madragues in 1978.

Location in front of the city of	Madragues' name	Thunnus thynnus	Euthynnus alleteratus	Sarda sarda	Auxis thazard	Xiphias gladius
Barbate (Atlantic Sea)	"Ensenada de Barbate"	n = 1 963 kg = 417 440	n = 9 733 kg = 38 932	n = 30 198 kg = 45 297	n = 4 559 kg = 4 559	n = 37 kg = 1 850
Zahara de los atunes (Atlantic Sea)	"Cabo plata"	n = 1 010 kg = 216 140	n = 1 100 kg = 4 400	n = 13 700 kg = 20 550	n = 19 700 kg = 19 700	
La Línea (Mediterranean Sea)	"La Atunara"	n = 3 kg = 480			n = 300 000 kg = 300 000	
Total		n = 2 976 kg = 634 060	n = 10 833 kg = 43 332	n = 43 898 kg = 65 847	n = 324 259 kg = 324 259	n = 37 kg = 1 850

Table 15. Size composition of Spanish madrague catches of Bluefin Tuna (Thunnus thynnus L.) at Barbate in 1978.

Length group cm.	‰ smoothed
150 - 154.9	1.2
155 - 159.9	2.4
160 - 164.9	1.2
165 - 169.9	4.8
170 - 174.9	14.4
175 - 179.9	25.2
180 - 184.9	32.5
185 - 189.9	33.7
190 - 194.9	37.3
195 - 199.9	34.9
200 - 204.9	26.4
205 - 209.9	24.0
210 - 214.9	27.6
215 - 219.9	45.7
220 - 224.9	75.7
225 - 229.9	96.2
230 - 234.9	99.8
235 - 239.9	92.6
240 - 244.9	85.4
245 - 249.9	74.6
250 - 254.9	54.1
255 - 259.9	38.5
260 - 264.9	30.1
265 - 269.9	22.9
270 - 274.9	12.0
275 - 279.9	4.8
280 - 284.9	2.4
n = 208	1 000.4

Table 16. Age composition of Spanish Bluefin Tuna catches in the Bay of Biscay in 1978.

Year class	Number of fish	in %
1	66 650	55.7
2	33 464	28.0
3	5 713	4.8
4	10 123	8.5
5	2 532	2.1
6	931	0.8
7	73	0.06
8	18	0.01
9	34	0.03
n =	119 538	100.00

Table 17. Size composition (number of fish and round weight) of Bluefin Tuna caught by bait boats in the Canary Islands in 1978.

Size class (kg)	No. of fish	‰ smoothed
115 - 119.9	1	1
120 - 124.9	2	3
125 - 129.9	1	3
130 - 134.9	2	3
135 - 139.9	-	2
140 - 144.9	-	3
145 - 149.9	5	6
150 - 154.9	1	6
155 - 159.9	3	8
160 - 164.9	6	11
165 - 169.9	4	9
170 - 174.9	2	7
175 - 179.9	3	8
180 - 184.9	6	13
185 - 189.9	7	18
190 - 194.9	12	22
195 - 199.9	8	21
200 - 204.9	10	24
205 - 209.9	14	29
210 - 214.9	13	29
215 - 219.9	12	29
220 - 224.9	14	34
225 - 229.9	20	40
230 - 234.9	16	40
235 - 239.9	18	42
240 - 244.9	21	42
245 - 249.9	14	39
250 - 254.9	19	39
255 - 259.9	16	43
260 - 264.9	25	53
265 - 269.9	28	56
270 - 274.9	17	41
275 - 279.9	10	32
280 - 284.9	19	34
285 - 289.9	12	34
290 - 294.9	18	34
295 - 299.9	12	32
300 - 304.9	15	32
305 - 309.9	14	26
310 - 314.9	4	14
315 - 319.9	2	6
320 - 324.9	3	6
325 - 329.9	2	5
330 - 334.9	1	3
335 - 339.9	1	4
340 - 344.9	4	6
345 - 349.9	1	4
350 - 354.9	1	2
355 - 359.9	1	2
Total	440	1 000

Table 18. Age composition of Spanish Bluefin Tuna catches made off the Atlantic coast of Morocco in 1978.

Year class	Number of fish	%
5	6	0.3
6	6	0.3
7	26	1.3
8	56	2.8
9	126	6.4
10	150	7.6
11	226	11.4
12	420	21.2
13	480	24.3
14	340	17.2
15	108	5.5
16	22	1.1
17	8	0.4
18	2	0.1
Total	1 976	100.0

Table 19. Catch of Thunnus thynnus (L.) (Bluefin Tuna) in Istanbul area in 1977.

Month	Istanbul fish market	Beykoz trap (Bosphorus)
	total weight in kg	total weight in kg
Jan	565	-
Feb	427	-
Mar	1 794	-
Apr	9 850	-
May	-	-
Jun	-	-
Jul)		9 971
Aug)		
Sep	310	-
Oct	-	-
Nov	3 248	-
Dec	7 095	-
Total	23 289	9 971

Table 20. Turkish Bluefin Tuna catches made in the Istanbul area in 1978 and landed at Istanbul fish market.

Month	Istanbul fish market
	total weight in kg
Jan	7 250
Feb	5 429
Mar	9 808
Apr	5 886
May	10 472
Jun	6 123
Jul	-
Aug	1 295
Sep	200
Oct	556
Total	47 019

Table 21 US Atlantic Bluefin Tuna samples. Size frequencies - fish caught by purse seiners.

cm	Jun	Aug	Sep	Oct	Total	‰ smoothed
50 - 54	-	1			1	2
55 - 59	-	8			8	8
60 - 64	1	36			37	14
65 - 69	3	15			18	14
70 - 74	25	-			25	18
75 - 79	45	11			56	29
80 - 84	18	45			63	31
85 - 89	21	16			37	35
90 - 94	109	1			110	72
95 - 99	244				244	123
100 - 104	255				255	130
105 - 109	145				145	81
110 - 114	17				17	28
115 - 119	12				12	11
120 - 124	36				36	24
125 - 129	84				84	45
130 - 134	109				109	56
135 - 139	85		2		87	48
140 - 144	70		0		70	46
145 - 149	93		1		94	50
150 - 154	63		12		75	38
155 - 159	16		4		20	19
160 - 164	6		7	2	15	8
165 - 169	0		2	1	3	3
170 - 174	0		0	1	1	1
175 - 179	0		0	1	1	1
180 - 184	1		0	5	6	3
185 - 189			0	8	8	5
190 - 194			0	13	13	7
195 - 199			0	13	13	7
200 - 204			0	9	9	5
205 - 209			0	5	5	4
210 - 214			0	8	8	3
215 - 219			1	1	2	2
220 - 224			0	1	1	1
225 - 229			1	0	1	1
230 - 234			1	0	1	2
235 - 239			4	3	7	3
240 - 244			5	0	5	3
245 - 249			2	0	2	3
250 - 254			10	4	14	5
255 - 259			4	2	6	5
260 - 264			5	3	8	3
265 - 269			2	0	2	2
...						
285 - 289			1		1	
n =	1 458	133	64	80	1 735	1 000

June:

Small fish open season
Total catch = 852.3 t
Estimated = 24 560 fish
Sampled = 1 458 fish

August:

Small fish tagging season
Total catch = 60.2 t
Estimated = 7 130 fish
Sampled = 133 fish

September - October:

Fish open season
Total catch = 76.7 t
326 fish
Sampled = 144 fish

78 sample catch by gear 5 = purse seine

Average:

Jun = 113.52
Aug = 73.53
Sep = 208.83
Oct = 203.44

Total = 118.11

Table 22. US Atlantic Bluefin Tuna sample. Size frequencies - fish caught by purse seiners.

Weight (kg)	Jun	Aug	Sep	Oct	Total	‰ smoothed
0 - 4		5			5	21
5 - 9	16	60			76	64
10 - 14	34	68			102	82
15 - 19	50				50	104
20 - 24	221				221	124
25 - 29	9				9	60
30 - 34	5				5	11
35 - 39	25				25	24
40 - 44	40				40	37
45 - 49	47				47	40
50 - 54	27				27	32
55 - 59	24			4	28	29
60 - 64	29			3	32	33
65 - 69	39			2	41	32
70 - 74	15			2	17	23
75 - 79	10			7	17	13
81 - 84	0			2	2	6
85 - 89	0			2	2	3
90 - 94	0			7	7	4
...	..			..	..	..
100 - 104	1			3	4	2
...	..			..	..	..
115 - 119				1	1	2
120 - 124				5	5	3
125 - 129				0	0	0
130 - 134				1	1	2
135 - 139				7	7	4
140 - 144				1	1	8
145 - 149				13	13	10
150 - 154				4	4	10
155 - 159			1	17	18	10
160 - 164			0	1	1	6
165 - 169			0	3	3	4
170 - 174			1	6	7	5
175 - 179			1	0	1	5
180 - 184			2	8	10	6
185 - 189			1	1	2	4
190 - 194			0	3	3	3
195 - 199			1	2	3	3
200 - 204			2	3	5	3
205 - 209			1	-	1	3
210 - 214			2	1	3	2
215 - 219			1	1	2	2
220 - 224			0	0	0	0
225 - 229			1	1	2	2
...			..	..	..	..
240 - 244			1	1	2	2
245 - 249			2	-	2	2
250 - 254			1	0	1	2
255 - 259			1	1	2	2
260 - 264			3	0	3	2
265 - 269			0	1	1	2

June:

Small fish open season
Total catch = 852.3 t
Estimated = 24 560 fish
Sampled = 592 fish

August:

Small fish tagging season
Total catch = 60.2 t
Estimated = 7 130 fish
Sampled = 133 fish

September - October:

Giant fish open season
Total catch = 76.7 t
326 fish
Sampled = 288 fish

/Cont'd.

Table 22 (Continued)

Weight (kg)	Jun	Aug	Sep	Oct	Total	‰ smoothed
270 - 274			2	1	3	3
275 - 279			4	0	4	3
280 - 284			2	0	2	3
285 - 289			5	0	5	5
290 - 294			7	0	7	6
295 - 299			4	0	4	4
300 - 304			1	0	1	3
305 - 309			5	0	5	4
310 - 314			4	0	4	6
315 - 319			11	1	12	8
320 - 324			5	0	5	7
325 - 329			5	2	7	5
330 - 334			1	0	1	4
335 - 339			7	0	7	7
340 - 344			13	1	14	9
345 - 349			1	0	1	5
350 - 354			6	0	6	5
355 - 359			5	0	5	6
360 - 364			9	1	10	8
365 - 369			5	1	6	7
370 - 374			5	2	7	6
375 - 379			2	1	3	4
380 - 384			1	0	1	3
385 - 389			4	2	6	4
390 - 394			0	0	0	3
395 - 399			4	2	6	3
400 - 404			0	0	0	2
405 - 409			6	2	8	3
410 - 414			0	0	0	2
415 - 419			2	1	3	2
420 - 424			0	0	0	0
425 - 429			1	0	1	0
430 - 434			4	1	5	2
435 - 439			0	0	0	1
440 - 444			0	1	1	0
...			..	..	..	..
475 - 479			1	0	1	0
...			..	..	..	..
485 - 489			1	0	1	0
n =	592	133	155	133	1 013	1 000

78 sample catch by gear 5

Month	Weight	Average
Jun	20 540	34.70
Aug	1 123	8.44
Sep	50 453	325.50
Oct	23 104	173.71
Total	95 220	94.00

Table 23. US Atlantic Bluefin Tuna sample. Size frequencies - small fish caught by sport fishing off the Mid-Atlantic.

Total catch = 68.0 t estimated
6 350 fish estimated
Sampled = 1 478 fish
78 sample catch by gear 0 = all

cm	Jun	Jul	Aug	Sep	Total	‰ smoothed
20 - 24		4			4	2
25 - 29		1			1	2
30 - 34		0	1	4	5	3
35 - 39		3	2	2	7	3
40 - 44		0	0	0	0	2
45 - 49		1	0	0	1	5
50 - 54	10	15	0	0	25	21
55 - 59	13	56	2	0	71	58
60 - 64	4	124	63	1	192	98
65 - 69	19	28	65	12	124	118
70 - 74	164	78	12	2	256	169
75 - 79	197	157	7	1	362	211
80 - 84	98	134	30	2	264	164
85 - 89	6	55	14	2	77	74
90 - 94	4	10	4	0	18	23
95 - 99	12	9	0	0	21	14
100 - 104	9	14	0	0	23	15
105 - 109	8	13	1	0	22	12
110 - 114	1	2		0	3	5
115 - 119	0	1		1	2	1
n =	545	705	201	27	1 478	1 000

Month	Average
Jun	76.69
Jul	74.20
Aug	69.89
Sep	64.56
Total	74.36

Table 24. US Atlantic Bluefin Tuna sample. Size frequencies - small fish caught by sport fishing off the Mid-Atlantic coast.

Total catch = 68.0 t estimated
6 350 fish estimated
Sampled = 2 216 fish
78 sample catch by gear 0 = all

Weight (kg)	Jun	Jul	Aug	Sep	Total	‰ smoothed
0 - 3						28
1 - 4	18	160	56	2	236	162
5 - 9	253	370	302	40	965	332
10 - 14	248	330	158	45	781	294
15 - 19	21	20	26	12	79	115
20 - 24	28	32	14	5	79	28
25 - 29	3	5	2	2	12	12
30 - 34	1	1	0	0	2	3
35 - 39	6	1	0	0	7	2
40 - 44	1	2	0	1	4	3
45 - 49	3	1	1	3	8	3
50 - 54	0	2	0	1	3	3
55 - 59	2	3	2	2	9	3
60 - 64	0	1	1	2	4	3
65 - 69	1	5	1	1	8	3
70 - 74	0	2	0	1	3	2
75 - 79			2	1	3	1
80 - 84			0	0	0	1
85 - 89			1	1	2	1
90 - 94			2	1	3	1
95 - 99			0	0	0	0
100 - 104			0	1	1	0
...			..	..	..	..
115 - 119			2	0	2	
120 - 124			0	0	0	
125 - 129			2	1	3	
130 - 134			1	1	2	
n =	585	935	573	123	2 216	1 000

Month	Weight	Average
Jun	6 509	11.13
Jul	9 001	9.63
Aug	5 928	10.35
Sep	2 328	18.93
Total	23 766	10.72

Table 25. US Atlantic Bluefin Tuna sample. Size frequencies - giant fish caught by handline, harpoon, or rod and reel.

Total catch = 795.4 t estimated
2 321 fish
Sampled = 2 248 fish

Note: Sampled one fish (403 kg) found dead in January, not in table.

78 sample catch by gear 0 = all.

Weight (kg)	Apr	May	Jun	Jul	Aug	Sep	Oct	Total	‰ smoothed
135 - 139				1	2	4		7	3
140 - 144				0	1	0		1	3
145 - 149				0	4	8		12	3
150 - 154				0	0	2		2	2
155 - 159				0	1	5		6	2
160 - 164				1	1	2		4	2
165 - 169				0	1	0		1	1
170 - 174				0	1	3		4	2
175 - 179				0	1	0		1	1
180 - 184				0	2	1		4	1
185 - 189				0	1	1		2	1
190 - 194				0	1	1		2	1
195 - 199				0	0	3		3	1
200 - 204			1	1	0	0		2	1
205 - 209			0	0	0	0		0	1
210 - 214			0	0	1	0		1	1
215 - 219		1	1	0	1	0		3	1
220 - 224		0	0	0	0	1		1	2
225 - 229		0	0	1	6	1		8	3
230 - 234		1	1	1	1	1		5	2
235 - 239		0	0	2	1	0		3	2
240 - 244		1	1	2	3	1		8	3
245 - 249		0	1	3	6	0		10	4
250 - 254		0	0	2	7	0		9	4
255 - 259		0	0	1	3	1	1	6	5
260 - 264		0	1	7	10	1	1	20	8
265 - 269		0	1	11	8	4	0	24	11
270 - 274		0	1	10	18	5	0	34	14
275 - 279		0	1	9	14	5	0	29	16
280 - 284		0	3	15	29	2	0	49	19
285 - 289	1	0	2	14	17	4	1	39	22
290 - 294	0	1	6	22	40	5	0	74	26
295 - 299	1	0	0	12	27	1	1	42	22
300 - 304		0	1	10	23	7	0	41	21
305 - 309		0	1	18	33	8	1	61	26
310 - 314		0	2	20	34	11	1	68	32
315 - 319		0	2	25	52	15	2	96	37
320 - 324		0	0	20	46	10	0	76	38
325 - 329		0	1	14	67	10	0	92	37
330 - 334		0	0	15	42	17	0	74	34
335 - 339		0	1	15	42	6	0	64	39
340 - 344		1	0	35	90	24	0	150	48

C'td.

Table 25 (Continued)

Weight (kg)	Apr	May	Jun	Jul	Aug	Sep	Oct	Total	‰ smoothed
345 - 349			0	18	34	17	0	69	42
350 - 354			2	13	62	16	0	93	37
355 - 359			1	23	42	11	0	77	40
360 - 364			0	25	58	25	1	109	42
365 - 369			0	14	49	15	0	78	39
370 - 374			2	9	56	17	1	85	35
375 - 379			1	10	40	9	1	61	30
380 - 384			0	9	43	7	0	59	29
385 - 389			0	10	50	21	1	82	30
390 - 394			1	8	37	6	0	52	27
395 - 399			0	10	36	9	0	55	22
400 - 404			0	11	20	7	0	38	20
405 - 409			1	4	30	12	0	47	17
410 - 414				4	16	4	0	24	15
415 - 419				4	26	12	0	42	14
420 - 424				1	14	6	0	21	11
425 - 429				1	12	7	0	20	9
430 - 434				2	14	7	0	23	9
435 - 439				1	6	9	1	17	8
440 - 444				1	7	3		11	5
445 - 449				0	3	3		6	4
450 - 454				2	10	2		14	4
455 - 459				0	4	1		5	3
460 - 464				0	3	1		4	2
465 - 469				0	4	2		6	2
470 - 474				0	2	0		2	1
475 - 479				0	1	1		2	1
480 - 484				0	2	0		2	1
485 - 489				0	0	1		1	
490 - 494				0	0	0		0	
495 - 499				0	1	1		2	
500 - 504				1	0			1	
505 - 509					1			1	
n =	2	5	36	468	1 321	402	13	2 247	1 000

Month	Weight	Average
Apr	585	292.50
May	1 324	264.80
Jun	10 912	303.11
Jul	155 480	332.22
Aug	458 542	347.12
Sep	138 824	345.33
Oct	4 289	329.92
Total	769 956	342.66

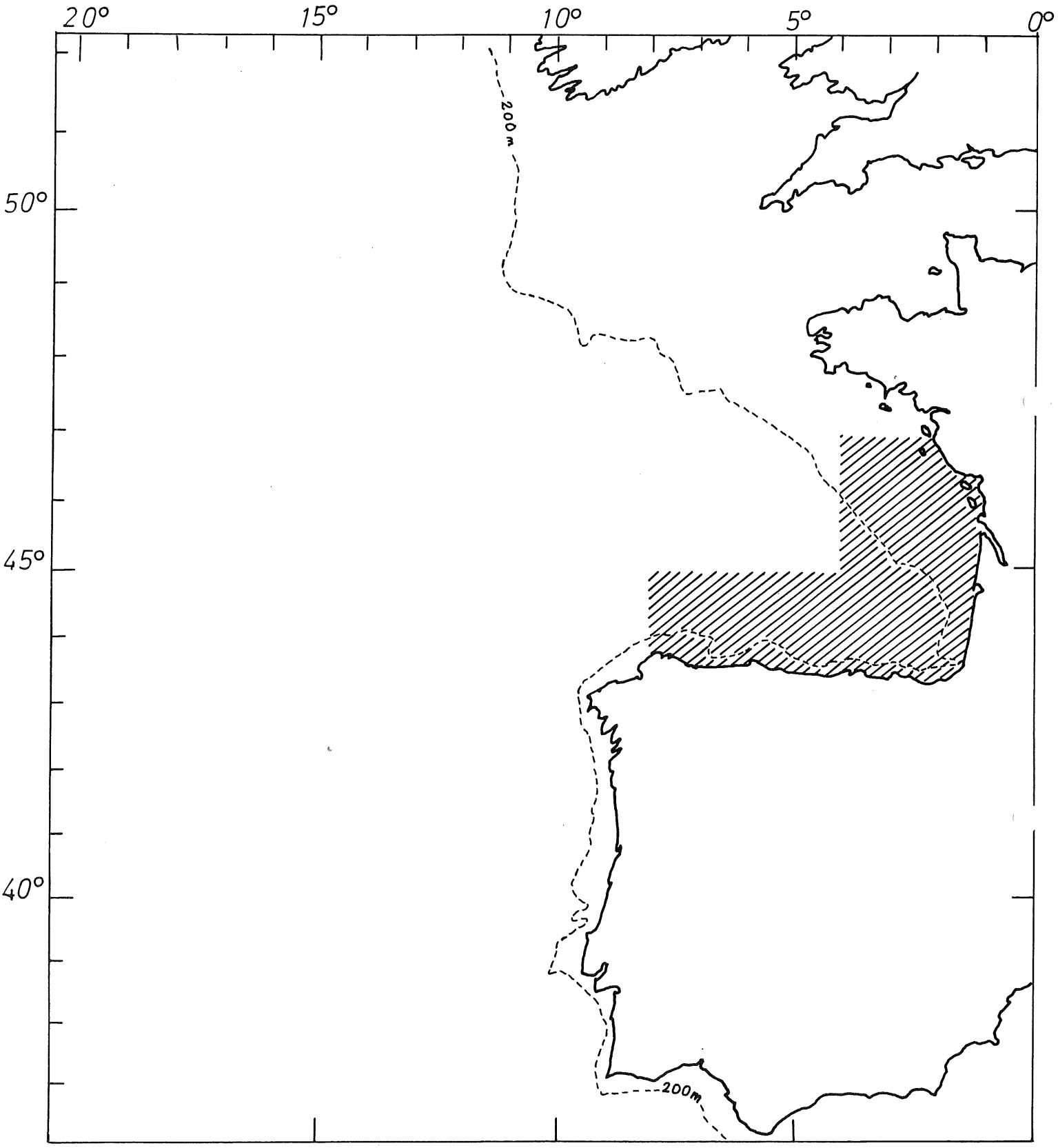

Fig. 1: Fishing area of Bluefin Tuna in the Bay of Biscay.

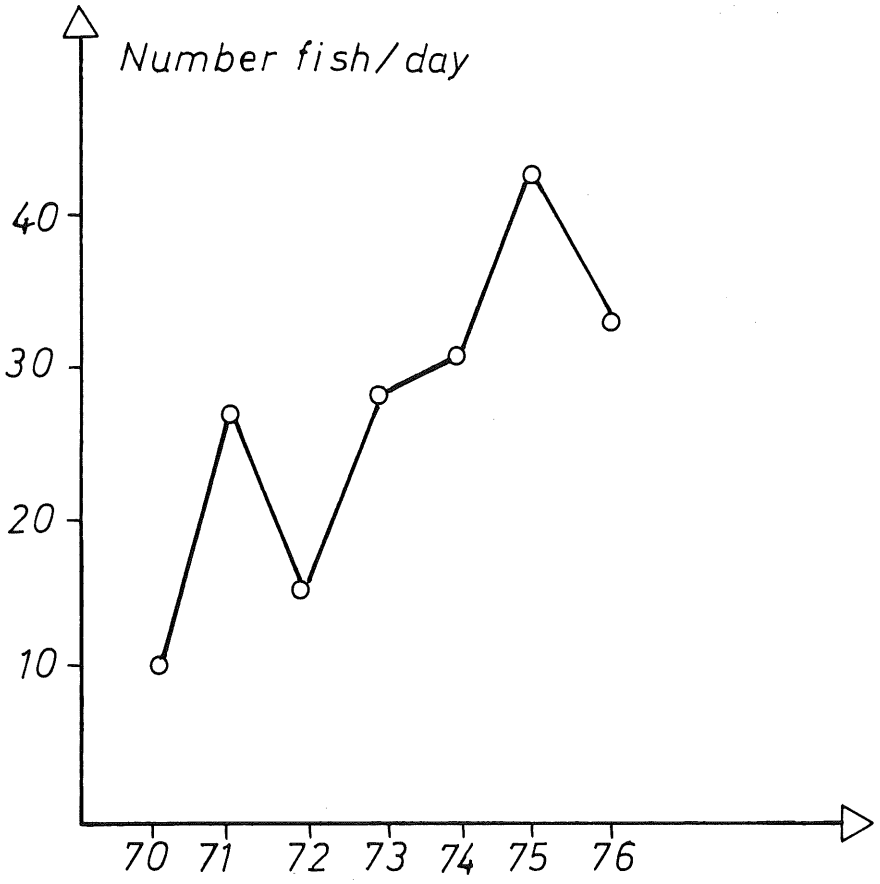

Fig. 2: Development of catch per unit effort of Bluefin Tuna (2 years old) in the Bay of Biscay.

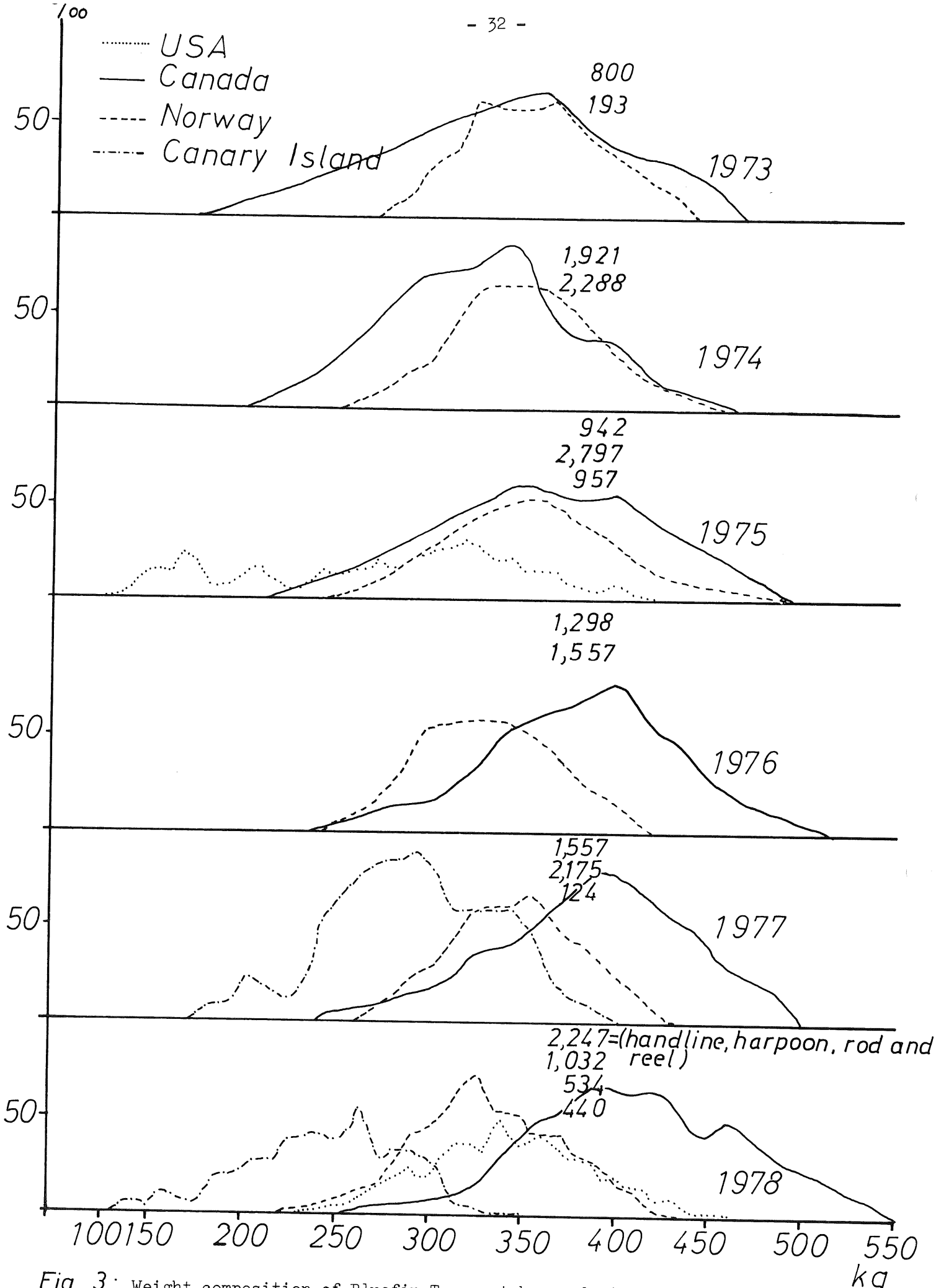

Fig. 3: Weight composition of Bluefin Tuna catches made in USA, Canada, Norway and Canary Islands (Spain).

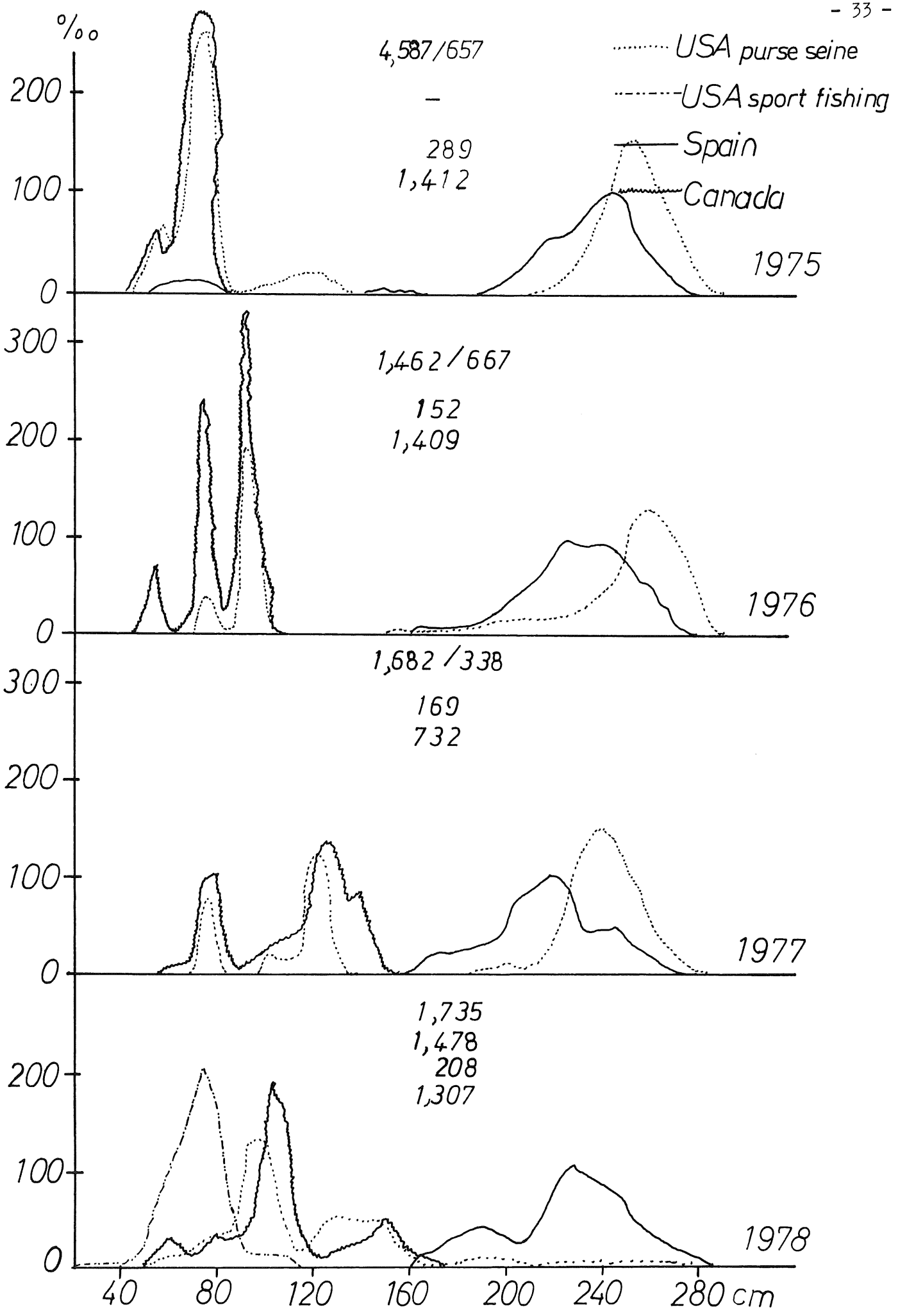

Fig. 4: Size composition of Bluefin Tuna catches made in USA, Spain and Canada.