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Second Report of The Bluefin Tuna Working Group

by

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1. Introduction

At the invitation of the Norwegian Institute of Marine Research, the 2nd meeting of the Bluefin Tuna Working Group was held in Bergen from the 2nd to the 5th of April, 1963. Prior to the meeting the member countries of the Scombriform Fish Committee were requested to submit all available bluefin tuna catch statistics. Data have been submitted by Denmark, France, Germany, Norway and Portugal.

Apart from the member countries of ICES, Dr. H. Aloncle of the Institut des Pêches Maritimes du Maroc was contacted and has been so kind to submit data on the Moroccan bluefin tuna catches for the season 1962. In addition to the compilation of the 1962-materials, the Working Group has also compiled statistics of the German and Norwegian tuna catches made during the years 1956-59, so that now a complete picture of the catch composition of the German and Norwegian tuna catches is available as from 1956.

2. Methodology

In the 1st report of the Working Group it has been proposed to compile the catch composition data of the various countries uniformly on a weekly basis, since the single runs of tuna are usually so short that any larger time interval can hardly reveal the expected interdependence existing between the different distribution areas. Further to this the following definitions were adopted during our 2nd meeting:-

Time interval: all weeks, extending from Sunday to Saturday, should be continuously numbered throughout any one year, whereby the week, in which the 1st of January falls, should be counted as week No.1.

In order to avoid misunderstandings, it is desirable when tabulating materials, to add to the week number also the respective dates. The opportunity is taken here to give the following corrections for misprints made in our 1st report as to the dating of weeks:

Page 2, under 4, 1st paragr., line 10 - instead of the "34th week (20th to 26th August)" read "34th week (14th to 20th August)" and in the same paragr., last line - instead of "42nd week (17th to 23rd October 1960)" read "42nd week (9th to 15th October 1960)".

Size measurement and its grouping: in the 1st report of the Working Group it has been said that the size composition of the catches should be given either in length or in weight. However, if only one kind of data (either length or weight) can be collected, a key for the transformation from one type of data into the other should be given. Weight data should refer always to ungutted fish.

In the case of the Norwegian and German tuna catches, it has been found to be practical to group the data in weight units, which are between 5 and 10 kgs. The grouping of data does not completely correspond, since in both countries the original data refer to gutted fish, which have been gutted in different ways ($w_N = 1,285 \cdot w_N^i$; $w_G = 1,026 w_G^i$). As a general rule the weight units should not be greater than 5% of the average weight of the fish under study.

The length measurements should be compiled in groups not exceeding a range of 5 cm. When length measurements are taken, fork length should be measured. It has been found practical to make such measurements by means of a calliber.

3. Data Representation

3.1 1962 catches

3.1.1 Morocco

The Moroccan data refer to catches from madragues located in the vicinity of Larache during the period from the 5th of May to the 6th of June, 1962. The data give the total number and weight of fish caught for every week and permit consequently to calculate the weekly average weight of tuna (Table 1, page 5). Unfortunately, data on the more detailed catch composition are lacking. However, Dr. Aloncle, who was so kind to submit the data, is going to organize respective work for the coming tuna catch season, as he has informed the Working Group.

3.1.2 Portugal

The bluefin tuna catches made in the madragues located at the south coast of Portugal are given in Table 2 (page 5).

Dr. Vilela reports that the tuna fishing along the west coast was very scarce and irregular in 1962. The only catches known to him were 150-200 small tuna of a mean weight of around 5 kg.

3.1.3 France

The French landings of bluefin tuna made in Saint-Jean-de-Luz are given in Table 3 (page 6). The materials could be grouped in two size categories only, i.e., tuna below 30 kg and tuna between 30 and 70 kg. It is hoped, however, as Dr. Letaconoux reported to the Working Group, to improve the data with regard to the recognition of the size composition of the catches in the coming catch season. It must be mentioned that the French materials refer to weeks extending from Friday to Thursday.

3.1.4 Norway and Germany

Following the example of the previous compilations for 1960 and 1961, the compositions of the Norwegian and German tuna catches are given according to the three major fishing areas, i.e.,

1. North Norwegian coast (N of 63°N)
2. South Norwegian coast (S of 62°N)
3. North Sea.

In the area between the areas 1 and 2, which is being considered as a transition area (comp. Hamre, 1961), the 1962 catch was only 17 fish. Table 4 (page 6) gives the weekly length composition of the German tuna catches and Tables 5-7 (pages 7,8,9) the weekly size compositions by weight frequencies for the German and Norwegian tuna catches.

3.1.5 Denmark

The Danish report gives weekly catches of bluefin tuna, which were for the first time made exclusively in the Kattegat, Skagerak, Sound and Belt Sea by the Danish fishermen. In former years catches were also made in the North Sea, and in most of the years even the larger part of the Danish tuna catch was made there, i.e., on more or less the same fishing grounds as those being used by the German fishermen. Mr. Bagge, who submitted the information, was able to give the weight of weekly landings, referring to the weight of gutted fish with head but without gills (Table 9 - page 10). No regression formula for calculating the total weight was given. Although the number of fish caught is not available, the data permit to conclude from 29 fish the individual weight (Table 8 - page 10). Nearly 90% of the Danish catches were landed at Skagen, and the largest part of these were made east of Laesø Island in the Kattegat.

3.2 1956-59 catches

Apart from the 1962 materials discussed under 3.1, it was also possible to obtain data on the composition of Norwegian and German tuna catches for the years back from 1956-59, and these have been compiled in Tables 10-21 (pages 11-23).

4. Comparison of Catch Composition and Discussion

4.1 1962-season

As has been concluded already for 1960 and 1961 in the 1st Report of the Working Group, there were also in 1962 two major runs of tuna to the Norwegian coast, from which one, consisting of larger fish, was found from the 30th to the 37th week at the north coast of Norway, and the other from the 29th to the 41st week, i.e., during the entire fishing season, on the west coast south of 62°N. On the north Norwegian coast the largest weekly catch (3,814 tuna) was made during the 32nd week. South of 62°N, catches were best even earlier, i.e., during the 31st week, when 6,591 tuna were taken (Figure 1, page 24). If compared with the two former years under observation, the main fishing season on the southern run of tuna was earlier in 1962. This had to be expected, since they were fish of the same year-classes as in the two previous years and since it is a general experience that the older the fish, the earlier its arrival.

The fish, which was caught by the German fishermen in 1962 in the middle part of the North Sea, corresponded in its size composition again with that caught by the Norwegian fishermen on the north Norwegian coast. It had its peak of weight frequency distribution at about 260-270 kg, while the north Norwegian fish had its peak at about 250-260 kg. The small weight difference, which has been found, is very likely because the German fish was taken later in the year. This fish, which completely left the north Norwegian waters during the 37th week, was landed for the first time during the 36th week by the German fishermen. They had their main fishing season during the 39th week, i.e., 7 weeks later than the north Norwegian fishermen. In the case of the German catches, the catch composition data refer to landings, while the actual fishing time was on an average about 5-7 days earlier, as the German fishing cruises do normally extend over periods from 10-14 days.

As can be concluded from the Danish data, there was an unusual good tuna fishing in the Kattegat area, east of Laesø Island, where the tuna, according to Mr. Bagge, was found near strong herring concentrations. The peak of the catch was reached during the 41st and 42nd week, practically after the Norwegian and German fishing seasons had terminated. The fishing season there extended even until the beginning of November (4th-11th November = 45th week), and the last tuna was caught during the 51st week extending from the 16th to the 22nd of December. Neither the Norwegian nor the German fishermen have ever caught tuna at such a late date.

Although the size composition of catches were not studied by the Danish colleague, the few data available at present permit to conclude that the fish, caught in the Kattegat, was of a similar size composition as that of the Norwegian and German catches. In this connection it may be recalled that, in 1959 a tuna tagged on the west Norwegian coast was recaptured in the Kattegat near Anholt Island three weeks after tagging (Hamre, 1961).

The data available on the average weight of the tuna caught in the Moroccan madragues do unfortunately not reflect the catch composition which could be compared with the Norwegian and German data, as the madrague catches do consist of a great variety of age-groups. Therefore, it can be stated here only that the peak of the Moroccan catches was in the 22nd week and consequently 9-10 weeks earlier than in the Norwegian tuna fishery. The mean weight of the ungutted fish, which amounted to 181.5 kg, was much lower than that calculated for the Norwegian and German tuna catches.

Also the Portuguese data cannot easily be compared with the Norwegian and German data. In this case the peak of catches was reached during the 21st week, i.e., at about the same time as in Morocco. A second peak occurred during the 31st week, which corresponds with the peak of the Norwegian catches.

The French data refer to age-groups, which were not contained in the catches made in the North Sea area and its approaches. Dr. Letaconnoux reports it to be worthwhile to mention that the French catches of older fish, i.e., between 30 and 70 kg, were considerably larger than during the years 1960 and 1961. This may indicate that a stronger recruit year-class might occur in the near future on the Norwegian coast. This is in so far of special importance for the future development of northern tuna fisheries, as since 1958 recruit year-classes are lacking.

4.2 1956-59 catches

The comparison of the Norwegian and German 1956-59 tuna catches principally confirms the conclusions drawn from the 1960-62 materials (Figure 2-5, pages 25-28). The summarizing Figure 6 (page 29) shows that during the years 1956, 1957, 1959, 1960, 1961, and 1962 the north Norwegian tuna catch widely corresponds in its size composition with the German tuna catch, but does much less with the west Norwegian catch. If the average weight of tuna of the German catch is a little greater, this is due to the fact that the fish was taken several weeks later and that the fish consequently has had a respectively longer stay on the feeding grounds.

A different picture, which cannot easily be explained, was obtained in 1958, when the average size of fish of the north Norwegian catch was a little higher than that of the German catch. It is possible that the tuna, which were met in the middle parts of the North Sea, was a mixture of both the north and west Norwegian tuna runs.

5. Conclusions and Recommendations

The comparison of the weekly composition of tuna catches made in different areas permits to recognize the interdependence existing between the tuna occurrences in these areas. It could be shown again by means of the newly compiled materials that the tuna occurring on the north Norwegian coast are closely related to those being caught few weeks later in the middle part of the North Sea. Due to lack of suitable materials it was not possible to investigate the relationship which is expected to exist between the tuna on the northern and on the southern European fishing grounds. The close co-operation of all countries participating in this fishery is indispensable for such an analysis. In view of the recent tagging results, which indicate a trans-atlantic relationship of the bluefin tuna stocks of both sides of the Atlantic Ocean, the co-operation with the U.S.A. bluefin tuna research seems to be highly desirable.

In the previous report it was strongly recommended to immediately initiate in the ICES area collection of weekly catch composition data, and the desirability for a close co-operation with the member countries of the General Fisheries Council for the Mediterranean (GFCM) was stressed.

Further to this it is recommended that the reports of the ICES Tuna Working Group should be made available also to all institutions which deal with bluefin tuna research in the U.S.A., in order to seek also their close co-operation in this work.

References

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|--------------------------|------|---|
| Hamre, J.
& Tiews, K. | 1962 | "First Report of the Bluefin Tuna Working Group". ICES, Scombriform Fish Cttee., Paper no. 67, pp.1-13, C.M.1962. |
| Hamre, J. | 1961 | "The Norwegian tuna investigations in 1959". Ann.Biol., <u>XVI</u> (1959). |

Table 1. Bluefin tuna catch of 3 Moroccan madragues during the 1962 catch season

Week No.	Date	Total No. of fish	Total weight of ungutted fish in kg	Average weight of fish in kg
18	29.IV. - 5.V.	1	182	182.0
19	6. V. - 12.V.	584	112,404	192.5
20	13. V. - 19.V.	1,516	274,613	181.1
21	20. V. - 26.V.	2,591	463,492	178.9
22	27. V. - 2.VI.	3,238	585,558	180.8
23	3. VI. - 9.VI.	2,081	386,697	185.8
24	10. VI. - 16.VI.	145	27,218	188.0
25	17. VI. - 23.VI.	417	69,324	166.2
26	24. VI. - 30.VI.	16	2,722	170.1
27	1. VII. - 7.VII.	28	4,566	163.1
Total		10,617	1926,776	181.5

Table 2. Bluefin tuna catch made on the south coast of Portugal by madragues

Week No.	Date	Number of tuna of the following weight classes caught:				
		>90 kg	50-89	30-49	<30 kg	Total
18	29.IV. - 5. V.	6	0	0	0	6
19	6. V. - 12. V.	295	4	0	0	299
20	13. V. - 19. V.	613	60	7	0	680
21	20. V. - 26. V.	878	149	70	1	1,098
22	27. V. - 2. VI.	280	69	56	2	407
23	3. VI. - 9. VI.	222	31	4	0	257
24	10. VI. - 16. VI.	214	33	10	0	257
25	17. VI. - 23. VI.	278	20	4	0	302
26	24. VI. - 30. VI.	195	9	15	3	222
27	1. VII. - 7. VII.	145	5	0	7	157
28	8. VII. - 14. VII.	102	4	0	5	111
29	15. VII. - 21. VII.	110	4	3	0	117
30	22. VII. - 28. VII.	198	8	4	5	215
31	29. VII. - 4. VIII.	631	11	3	0	645
32	5. VIII. - 11. VIII.	181	18	0	0	199
33	12. VIII. - 18. VIII.	185	15	1	0	181
34	19. VIII. - 25. VIII.	9	3	0	0	12
35	26. VIII. - 1.IX.	0	0	0	0	0
Total		4,522	443	177	23	5,165

Table 3. Bluefin tuna catch landed at Saint-Jean-de-Luz in 1962

Date	Total Weight	
	Fish below 30 kg	Fish between 30 & 70kg
3. V. - 10. V.	1,445.0	-
11. V. - 17. V.	19,760.5	-
18. V. - 24. V.	59,119.5	-
25. V. - 31. V.	18,793.5	-
1. VI. - 7. VI.	6,024.0	-
8. VI. - 14. VI.	50,881.0	-
15. VI. - 21. VI.	86,341.0	-
22. VI. - 28. VI.	46,829.0	-
29. VI. - 5. VII.	72,324.5	-
6. VII. - 13. VII.	61,128.0	-
14. VII. - 21. VII.	23,614.0	-
22. VII. - 28. VII.	31,912.5	5,881.0
29. VII. - 2. VIII.	50,437.0	68,913.0
3. VIII. - 9. VIII.	43,903.5	113,606.0
10. VIII. - 16. VIII.	19,997.5	15,581.0
17. VIII. - 23. VIII.	33,061.5	32,319.0
24. VIII. - 30. VIII.	19,869.0	16,313.0
31. VIII. - 6. IX.	20,614.5	8,039.0
7. IX. - 13. IX.	6,455.0	2,837.0
14. IX. - 20. IX.	4,019.5	-
21. IX. - 27. IX.	14,138.5	-
29. IX. - 4. X.	1,325.0	-
5. X. - 11. X.	3,091.5	-
12. X. - 18. X.	2,022.0	-
19. X. - 25. X.	1,860.0	-
9. XI. - 15. XI.	58.0	-
Total	699,025.0	263,489.0

Table 4. Size composition of German tuna catch by smoothed length frequencies (%) in 1962.
Total catch in 1962 = 733 fish

Group cm	Week Numbers							Total
	34	36	37	38	39	40	41	
190								
195		5						1
200		14						3
205		26						6
210		58						13
215		97						23
220		117	5	7	24	16		37
225		113	40	30	46	42		56
230		101	110	76	89	64		90
235		102	182	144	161	104	31	142
240		122	213	182	203	168	94	182
245	1000	116	190	205	190	217	188	182
250		68	137	197	149	181	250	139
255		30	77	106	90	97	125	77
260		18	35	38	33	56	94	35
265		10	11	15	7	29	31	12
270		3				6		2
275					2	2		
$n_1 = 1$		142	137	33	279	121	8	721
$n_2 = 2$		144	139	34	281	125	8	733

In all tables:

n_1 = number of tuna measured

n_2 = number of tuna caught in total

Table 5. Size composition of German tuna catch by smoothed weight frequencies (%) in 1962

Total catch in 1962 = 733 fish

Group w_G	Means w'_G	Week Numbers							Total
		34	36	37	38	39	40	41	
161	157.5						2		
166	162.5						4		
171	167.5						2		
177	172.5								
182	177.5		2			1			1
187	182.5		4			2			2
192	187.5		2			3			2
197	192.5			2		2	2		1
202	197.5			7	8	3	8		4
207	202.5		5	11	15	5	17		9
212	207.5		19	11	8	10	23		14
217	212.5		33	16		17	27		21
223	217.5		40	27		21	29		26
228	222.5		38	36	15	21	31		29
233	227.5		33	40	53	31	35		35
238	232.5		37	38	61	48	39		43
243	237.5		45	42	46	53	47		48
248	242.5		52	50	46	51	54		50
253	247.5		69	53	45	55	43	31	55
259	252.5	1000	84	68	61	56	37	63	61
264	257.5		74	89	53	52	52	63	63
269	262.5		56	77	38	58	50	62	59
274	267.5		53	57	53	62	33	62	54
279	272.5		55	46	45	56	35	63	50
284	277.5		50	42	38	47	45	31	45
289	282.5		52	40	38	45	41		44
295	287.5		46	46	38	48	33		43
300	292.5		28	48	53	49	41		43
305	297.5		23	38	53	41	41		37
310	302.5		21	31	38	26	29		26
315	307.5		19	22	23	26	27	63	24
320	312.5		19	18	38	28	27	156	26
325	317.5		16	21	60	12	27	156	22
330	322.5		14	11	38	5	31	125	15
336	327.5		9		7	8	27	94	11
341	332.5		2			14	15	31	8
346	337.5			2		13	6		6
351	342.5			3	7	10	10		7
356	347.5			3	15	8	16		7
361	352.5			3	7	5	6		4
366	357.5			2					1
382	372.5					2			1
387	377.5					4			2
392	382.5					2			1
402	392.5						2		
407	397.5						4		
413	402.5						2		
	$n_1 =$	1	142	137	33	279	121	8	721
	$n_2 =$	2	144	139	34	281	125	8	733

Table 6. Size composition of Norwegian tuna catch north of 63°N in smoothed weight frequencies (%) in 1962.

Group wN	Means w'N	Week Numbers								Total
		30	31	32	33	34	35	36	37	
119	92	-	-	-	-	1	-	-	-	x
125	97	-	-	-	-	-	-	-	-	-
131	102	-	-	-	-	-	-	-	-	-
138	107	-	-	x	x	-	-	-	-	x
144	112	-	-	-	1	-	1	-	-	x
150	117	-	-	1	x	-	-	-	-	x
157	122	1	-	1	1	1	1	-	-	1
163	127	2	-	1	1	1	2	-	-	1
170	132	3	2	2	2	1	2	-	-	2
176	137	7	4	4	4	2	2	-	-	3
183	142	14	5	6	7	4	2	1	-	6
189	147	17	9	12	11	8	2	3	-	10
195	152	21	13	17	16	13	4	6	3	14
202	157	28	20	23	23	17	11	11	9	20
208	162	36	36	34	33	23	17	16	15	30
215	167	60	56	46	44	34	19	22	18	42
221	172	93	68	55	53	46	28	29	18	52
227	177	98	74	63	61	50	42	33	24	60
234	182	87	77	73	67	55	53	35	27	66
240	187	86	82	81	68	68	68	41	24	73
247	192	85	91	81	72	78	77	50	29	77
253	197	76	93	79	77	78	75	58	41	78
260	202	71	88	75	78	75	69	62	53	76
266	207	65	70	66	70	77	68	61	71	69
272	212	45	52	57	59	71	73	60	83	60
279	217	28	44	50	53	57	73	68	86	54
285	222	25	36	44	48	51	65	82	100	49
292	227	20	26	36	38	45	53	79	100	40
298	232	14	18	29	29	36	42	62	82	32
305	237	11	14	22	25	32	36	49	65	26
311	242	7	11	16	18	27	33	39	44	20
317	247	3	8	11	12	17	26	31	41	14
324	252	1	6	8	9	11	19	30	38	10
330	257	-	4	6	7	9	14	26	18	8
337	262	-	1	4	5	7	9	16	3	5
343	267	-	-	3	3	6	7	11	-	3
350	272	-	-	1	1	3	4	7	3	2
356	277	-	-	-	x	1	1	5	6	1
362	282	-	-	x	x	-	1	4	3	1
369	287	-	-	x	-	-	-	3	-	x
375	292	-	-	-	-	-	-	2	-	x
382	297	-	-	-	x	-	-	1	-	x
388	302	-	-	-	x	-	-	-	-	x
	n ₁ =	353	1034	3431	2356	1191	908	513	85	9871
	n ₂ =	353	1062	3814	2356	1198	1096	513	85	10477

Table 7. Size composition of Norwegian tuna catch south of 62°N by smoothed weight frequencies (%) in 1962.

Group	Means		Week numbers											Total	
	w _N	w _N ¹	29	30	31	32	33	34	35	36	37	38	39		41
67	52	-	-	-	-	-	-	-	-	-	-	-	-	-	x
73	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-
80	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	67	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	72	-	-	-	-	-	-	-	-	-	-	1	-	-	-
99	77	-	-	-	-	-	-	-	-	-	-	1	-	-	x
105	82	-	x	-	x	-	-	-	-	-	-	1	-	-	x
112	87	-	-	-	-	1	-	-	-	-	-	-	1	-	x
119	92	-	-	x	x	x	-	x	1	-	-	-	2	-	x
125	97	-	-	-	x	-	x	-	-	-	-	1	1	-	x
131	102	1	-	-	x	x	x	1	1	-	-	2	2	-	x
138	107	1	-	1	1	1	1	1	3	3	1	3	2	-	1
144	112	1	-	1	2	2	1	5	4	3	3	9	3	7	2
150	117	2	1	3	4	2	3	9	6	4	16	8	14	7	4
157	122	5	2	5	7	5	6	12	11	4	15	14	7	6	6
163	127	9	6	8	12	10	10	15	18	5	11	20	7	11	11
170	132	13	12	15	17	17	14	23	26	9	12	24	27	16	16
176	137	23	20	25	26	28	20	30	32	14	18	29	37	25	25
183	142	38	30	40	41	41	27	37	39	22	26	36	24	36	36
189	147	50	45	57	56	50	38	49	47	24	32	43	21	49	49
195	152	65	60	72	70	57	53	63	55	23	38	50	31	61	61
202	157	73	76	83	83	66	64	71	61	31	55	60	34	72	72
208	162	81	90	93	92	75	72	71	63	44	65	72	48	81	81
215	167	88	94	97	94	82	79	73	68	53	62	71	64	85	85
221	172	90	93	93	89	84	80	78	71	57	69	62	61	84	84
227	177	86	90	85	81	80	78	76	68	64	71	58	58	79	79
234	182	80	83	75	72	71	73	65	66	64	66	60	51	72	72
240	187	69	71	63	61	65	67	57	68	59	63	64	38	64	64
247	192	55	57	50	50	57	59	53	61	62	58	61	51	54	54
253	197	45	46	39	37	46	50	47	49	62	60	54	68	45	45
260	202	40	39	29	28	38	44	38	40	59	54	49	71	37	37
266	207	30	29	21	23	29	37	30	30	60	39	40	71	30	30
272	212	18	19	16	18	23	29	22	25	56	32	32	61	23	23
279	217	12	13	11	12	21	22	18	24	50	30	26	55	17	17
285	222	11	10	8	8	16	17	19	18	44	28	19	41	13	13
292	227	9	7	5	6	11	14	12	11	35	23	15	21	10	10
298	232	5	4	3	4	7	11	8	10	26	14	8	11	7	7
305	237	3	2	2	3	5	9	6	10	18	9	3	7	5	5
311	242	1	1	1	2	4	7	5	6	12	7	3	7	3	3
317	247	-	-	1	1	3	5	4	4	11	4	3	4	2	2
324	252	-	x	1	1	1	3	3	3	10	2	2	4	2	2
330	257	-	x	x	1	1	2	2	1	7	1	2	7	1	1
337	262	-	-	x	-	1	1	1	-	4	1	1	4	1	1
343	267	-	-	-	-	1	1	-	-	2	1	1	-	x	x
350	272	-	-	-	x	1	1	-	1	2	-	-	-	x	x
356	277	-	1	x	-	-	x	x	1	1	-	1	-	x	x
362	282	-	-	-	x	-	-	-	-	-	1	1	-	x	x
369	287	-	-	-	-	-	1	-	-	-	3	1	-	x	x
375	292	-	x	-	-	-	-	-	-	-	1	-	-	x	x
382	297	-	-	-	-	x	-	-	-	-	-	-	-	x	x
	n ₁ =	1297	2195	6420	4157	3038	4273	2122	1346	681	412	1029	74	27044	
	n ₂ =	1297	2209	6591	4157	3407	4283	2122	1348	681	412	1035	74	27616	

Table 8. Weight distribution in % (smoothed) of 29 bluefin tuna landed in Denmark in 1962. The weight groups refer to gutted fish.

Group kg	n	%
120	-	17
130	2	35
140	-	17
150	-	9
160	1	17
170	-	17
180	1	26
190	1	34
200	1	43
210	2	69
220	3	86
230	2	69
240	1	86
250	6	147
260	4	129
270	1	69
280	2	43
290	-	17
300	-	9
310	1	17
320	-	9
330	1	17
340	-	9
Total n = 29		

Table 9. Weekly catches of bluefin tuna made in the Kattegat, Skagerrak, Sound and Belt Sea by Danish fishermen in 1962.
Total catch = 155,648 kg

Week No.	Dates	Weight of gutted fish
30	22. VII. - 28. VII.	195 kg
31	29. VII. - 4. VIII.	1,943
32	5. VIII. - 11. VIII.	0
33	12. VIII. - 18. VIII.	138
34	19. VIII. - 25. VIII.	265
35	26. VIII. - 1. IX.	443
36	2. IX. - 8. IX.	1,301
37	9. IX. - 15. IX.	464
38	16. IX. - 22. IX.	7,662
39	23. IX. - 29. IX.	20,369
40	30. IX. - 6. X.	23,022
41	7. X. - 13. X.)	
42	14. X. - 20. X.)	62,092
43	21. X. - 27. X.	27,662
44	28. X. - 3. XI.	5,884
45	4. XI. - 10. XI.	2,144
51	16. XII. - 22. XII.	212
Total		153,796

Table 10. Size composition of Norwegian tuna catch north of 63°N by smoothed weight frequencies (%) in 1956.

Group	Means		Week numbers						Total	
	w _N	w _N ⁱ	28	29	30	31	32	33		34
99	77	1	-	-	-	-	-	-	-	-
105	82	2	-	-	1	-	-	-	-	x
112	87	2	-	-	1	-	-	-	-	x
119	92	1	x	-	-	-	-	-	-	x
125	97	-	-	-	-	-	-	-	-	-
131	102	-	1	-	-	-	1	-	-	-
138	107	-	2	-	-	-	2	-	-	1
144	112	1	3	-	1	1	1	-	-	1
150	117	2	3	-	2	2	-	-	-	1
157	122	2	5	-	5	2	1	-	-	2
163	127	2	9	-	10	4	2	-	-	4
170	132	2	17	-	19	9	5	-	-	7
176	137	6	29	-	36	19	10	-	-	14
183	142	22	42	-	53	26	14	-	-	25
189	147	41	58	-	65	34	18	-	7	39
195	152	53	77	-	75	52	23	26	15	51
202	157	67	91	-	89	77	34	53	7	65
208	162	84	92	-	94	84	51	40	7	79
215	167	102	89	-	85	83	59	40	29	85
221	172	109	91	-	78	81	65	93	43	84
227	177	106	88	-	78	74	80	145	43	84
234	182	95	73	-	71	71	91	132	47	84
240	187	65	60	-	57	65	88	79	75	75
247	192	47	51	-	40	56	78	53	97	63
253	197	52	40	-	36	52	68	66	82	54
260	202	45	27	-	30	45	60	66	75	45
266	207	27	18	-	23	36	53	53	79	36
272	212	17	14	-	16	29	49	53	89	27
279	217	15	11	-	10	24	45	53	82	21
285	222	15	6	-	6	20	35	40	61	17
292	227	13	3	-	4	16	25	13	57	12
298	232	6	3	-	3	12	18	-	39	9
305	237	2	2	-	3	9	11	-	22	6
311	242	-	1	-	3	7	6	-	22	4
317	247	-	-	-	1	5	3	-	11	3
324	252	-	-	-	-	3	2	-	-	1
330	257	-	-	-	-	2	2	-	-	x
337	262	-	-	-	-	2	3	-	-	x
343	267	-	1	-	-	1	3	-	-	1
350	272	-	-	-	-	1	1	-	-	1
356	277	-	-	-	-	1	-	-	-	x
362	282	-	-	-	-	1	-	-	-	-
369	287	-	-	-	-	1	-	-	4	-
375	292	-	-	-	-	1	-	-	7	x
382	297	-	-	-	1	-	-	-	4	-
	n ₁ =	339	2417	1357	524	629	19	70	5355	
	n ₂ =	611	2878	1357	843	672	421	114	6931	

Table 11. size composition of Norwegian tuna catch south of 62°N by smoothed weight frequencies (%) in 1956.

Group	Means	Week numbers												Total
		28	29	30	31	32	33	34	35	36	37	38	39	
29	22	-	-	-	-	-	-	-	-	-	-	-	1	x
35	27	-	-	-	-	-	-	-	-	-	-	-	1	x
41	32	-	-	-	-	-	-	-	-	4	7	4	2	1
48	37	-	-	-	-	-	-	-	1	15	33	18	11	4
54	42	-	-	-	-	-	1	1	2	47	84	67	36	16
60	47	-	-	-	-	-	2	2	3	99	129	154	63	33
67	52	-	-	-	-	-	3	2	2	111	111	193	78	40
73	57	-	-	-	-	-	2	2	2	67	52	143	80	29
80	62	-	-	-	-	-	1	2	3	27	18	82	78	18
86	67	-	-	-	-	3	1	4	5	13	22	62	82	17
93	72	-	1	-	-	6	5	7	9	10	35	58	91	19
99	77	-	3	-	-	3	11	7	11	10	35	49	91	19
105	82	-	4	-	-	-	12	7	11	8	19	37	76	17
112	87	-	2	-	1	-	9	9	9	5	11	28	60	13
119	92	9	-	4	3	6	9	8	8	2	10	21	52	12
125	97	19	2	8	5	14	14	9	9	1	7	16	47	12
131	102	9	4	4	6	17	19	12	11	2	7	14	34	13
138	107	-	5	8	9	19	22	16	16	7	6	11	22	15
144	112	9	6	28	10	25	23	22	21	12	3	9	22	18
150	117	19	12	36	12	33	26	28	25	10	5	8	19	22
157	122	9	21	44	17	38	38	31	29	5	9	8	11	25
163	127	9	38	71	30	52	43	35	34	5	7	6	11	28
170	132	37	67	95	53	76	49	43	38	7	6	3	12	33
176	137	60	88	99	63	82	60	49	42	9	10	2	8	37
183	142	74	96	87	63	76	63	53	49	14	12	2	5	42
189	147	84	98	75	83	82	70	65	57	24	10	2	4	48
195	152	70	92	68	98	74	81	74	63	36	15	1	2	53
202	157	70	94	71	91	52	75	74	68	40	20	1	1	55
208	162	84	93	63	86	57	60	67	68	40	18	1	1	54
215	167	65	77	52	78	60	54	59	63	38	23	-	1	49
221	172	56	58	56	62	55	50	53	57	36	26	1	1	44
227	177	70	40	36	50	65	40	48	54	44	26	1	-	41
234	182	84	27	16	34	54	32	38	48	51	30	1	-	36
240	187	84	19	12	27	27	24	31	40	44	27	1	-	29
247	192	42	15	12	30	8	18	26	32	34	23	1	-	23
253	197	10	15	16	25	3	19	22	27	25	23	1	-	20
260	202	14	13	8	20	6	19	20	23	13	19	1	-	17
266	207	14	10	4	20	3	16	19	18	8	17	-	-	14
272	212	5	5	8	9	3	11	12	14	13	16	-	-	10
279	217	-	1	4	8	6	4	12	11	17	12	-	-	8
285	222	-	-	-	8	3	2	10	8	13	12	-	-	7
292	227	-	-	4	6	-	3	9	6	7	15	-	-	5
298	232	-	-	8	3	-	3	8	4	7	11	-	-	3
305	237	-	-	4	-	-	2	4	3	6	7	-	-	2
311	242	-	-	-	-	-	1	2	2	5	6	-	-	1
317	247	-	-	-	-	-	1	2	1	4	4	-	-	1
324	252	-	-	-	-	-	1	1	1	2	2	-	-	1
330	257	-	-	-	-	-	1	1	1	2	2	-	-	1
337	262	-	-	-	-	-	-	1	-	2	2	-	-	x
343	267	-	-	-	-	-	-	1	-	2	2	-	-	x
350	272	-	-	-	-	-	-	-	-	2	1	-	-	x
356	277	-	-	-	-	-	-	-	-	2	-	-	-	x
362	282	-	-	-	-	-	-	-	-	2	-	-	-	x
369	287	-	-	-	-	-	-	-	-	1	-	-	-	-
	n ₁ =	54	315	63	206	92	571	1791	5740	306	274	1758	493	11663
	n ₂ =	113	533	94	353	111	871	2829	8630	2955	742	2842	721	20794

Table 12. Size composition of German tuna catch by smoothed weight frequencies (%) in 1956.
Total catch in 1956 = 2,306 fish

Group	Means w _G	Week numbers												Total
		32	33	34	35	36	37	38	39	40	41	42	43	
141	137.5	-	5	-	-	-	-	-	-	-	-	-	-	-
146	142.5	-	9	-	-	-	-	-	-	-	-	5	3	1
151	147.5	-	4	-	-	-	-	-	-	-	-	10	6	1
156	152.5	-	4	-	-	-	-	-	1	-	-	6	6	1
161	157.5	-	9	3	-	-	-	-	2	-	-	3	6	1
166	162.5	-	9	9	-	-	-	1	-	-	5	8	3	2
171	167.5	-	18	9	-	3	2	-	3	4	13	15	3	5
177	172.5	23	31	4	1	6	2	1	5	8	13	15	9	6
182	177.5	46	45	11	3	5	3	4	4	4	15	22	15	9
187	182.5	45	45	21	8	8	5	6	8	4	21	35	18	12
192	187.5	91	27	25	15	14	5	11	16	14	26	53	18	17
197	192.5	114	31	27	17	16	5	19	20	22	34	69	27	23
202	197.5	46	53	36	19	24	8	27	21	32	34	61	58	27
207	202.5	23	62	39	19	35	21	29	28	43	36	57	86	34
212	207.5	68	49	46	22	33	40	35	39	43	41	61	86	42
217	212.5	68	36	54	35	33	45	49	42	45	54	61	79	47
223	217.5	45	49	44	44	35	42	52	41	63	73	67	79	49
228	222.5	91	67	31	42	31	42	45	45	69	62	64	67	47
233	227.5	114	58	39	46	35	50	45	59	47	52	45	55	48
238	232.5	45	31	55	55	52	50	50	75	49	67	41	58	56
243	237.5	-	23	64	58	60	58	50	78	71	75	52	52	60
248	242.5	-	27	62	57	48	56	46	72	57	64	49	37	55
253	247.5	-	22	48	55	43	53	47	58	29	44	28	27	46
259	252.5	23	13	50	63	42	42	50	46	23	26	19	31	41
264	257.5	45	22	60	74	43	33	40	41	37	26	24	34	42
269	262.5	23	49	48	63	52	37	31	37	45	28	24	33	41
274	267.5	23	53	36	38	48	39	41	32	37	23	19	30	36
279	272.5	45	40	33	38	35	39	50	22	26	21	13	12	32
284	277.5	22	31	27	47	31	43	38	17	28	16	6	3	29
289	282.5	-	18	24	34	36	40	25	20	33	21	3	6	27
295	287.5	-	5	20	20	42	35	21	24	28	26	8	3	24
300	292.5	-	-	9	17	42	32	26	22	22	21	13	3	22
305	297.5	-	5	3	16	40	27	35	14	18	13	9	12	20
310	302.5	-	18	12	15	34	25	22	10	15	10	5	15	18
315	307.5	-	23	21	12	19	22	15	12	14	10	2	8	14
320	312.5	-	9	12	12	10	18	11	10	12	10	-	-	11
325	317.5	-	-	1	15	8	17	13	8	10	3	-	-	9
330	322.5	-	-	-	16	7	15	7	13	8	3	2	-	9
336	327.5	-	-	2	11	-	10	5	12	8	5	3	3	7
341	332.5	-	-	3	5	1	7	10	6	6	3	2	6	6
346	337.5	-	-	1	3	4	9	12	5	4	-	-	3	5
351	342.5	-	-	-	1	2	10	9	7	4	-	-	-	5
356	347.5	-	-	2	-	3	5	5	8	2	-	2	-	3
361	352.5	-	-	3	-	3	2	3	7	2	-	5	-	3
366	357.5	-	-	1	-	4	1	1	5	4	-	5	-	2
371	362.5	-	-	1	1	4	1	1	2	4	-	2	-	2
377	367.5	-	-	3	2	6	2	3	-	4	-	-	-	2
382	372.5	-	-	1	1	3	1	3	-	2	-	-	-	1
387	377.5	-	-	-	-	-	-	2	-	-	-	-	-	-
392	382.5	-	-	-	-	-	-	1	-	-	-	-	-	-
397	387.5	-	-	-	-	-	-	-	-	-	-	2	-	-
402	392.5	-	-	-	-	-	-	1	-	-	-	3	-	-
407	397.5	-	-	-	-	-	-	2	1	-	3	2	-	-
412	402.5	-	-	-	-	-	-	1	1	-	3	-	-	-
$n_1 =$		11	56	166	228	187	395	213	292	127	97	155	82	2009

Table 13. Size composition of Norwegian tuna catch north of 63°N by smoothed weight frequencies (%) in 1957.

Group	Means		Week numbers				Total
	w'_N	w''_N	30	31	32	33/34	
67	52	-	-	1	-	-	1
73	57	-	-	1	-	-	1
80	62	-	-	-	-	-	-
86	67	-	-	-	-	-	-
93	72	-	-	-	1	-	-
99	77	-	-	-	2	-	1
105	82	-	-	1	1	-	1
112	87	-	-	1	1	-	1
119	92	-	-	1	2	-	1
125	97	-	-	1	2	-	1
131	102	1	1	2	4	-	2
138	107	2	2	4	6	-	4
144	112	3	3	6	3	-	4
150	117	4	4	6	-	-	4
157	122	5	5	6	3	-	5
163	127	7	7	8	5	-	7
170	132	14	14	14	7	-	12
176	137	18	18	30	19	4	24
183	142	27	27	50	38	14	40
189	147	50	50	64	56	17	57
195	152	66	66	70	70	10	67
202	157	79	79	81	71	11	75
208	162	103	103	102	75	24	92
215	167	114	114	110	93	44	105
221	172	104	104	105	102	54	103
227	177	94	94	90	89	58	89
234	182	74	74	72	82	85	75
240	187	52	52	53	78	109	60
247	192	43	43	39	60	105	47
253	197	33	33	33	40	105	37
260	202	23	23	24	30	81	27
266	207	23	23	12	19	37	17
272	212	22	22	6	11	31	12
279	217	15	15	4	12	44	10
285	222	9	9	3	9	44	7
292	227	6	6	3	4	41	6
298	232	4	4	2	5	31	5
305	237	2	2	1	3	17	3
311	242	1	1	-	-	11	1
317	247	1	1	-	-	7	1
324	252	2	2	-	-	7	1
330	257	2	2	-	-	4	1
337	262	1	1	-	-	4	1
343	267	-	-	-	-	7	1
350	272	-	-	-	-	4	-
356	277	-	-	-	-	-	-
362	282	-	-	-	-	-	-
369	287	-	-	-	-	-	-
375	292	-	-	-	-	-	-
382	297	-	-	-	-	-	-
388	302	1	1	-	-	-	-
395	307	2	2	-	-	-	1
401	312	1	1	-	-	-	-
$n_1 =$		389	838	292	74	1593	
$n_2 =$		722	1090	1228	1627	5340	

Table 14. Size composition of Norwegian tuna catch south of 62°N by smoothed weight frequencies (%) in 1957.

Group w _N	Means w _N	Week Numbers														Total
		29	30	31	32	33	34	35	36	37	38	39	40	41	42	
29	22	-	-	-	-	-	-	-	-	-	-	1	-	-	-	x
35	27	-	-	-	-	2	-	x	-	-	-	-	-	-	-	x
41	32	-	1	-	-	3	1	1	-	1	1	1	1	-	-	1
48	37	-	-	-	-	5	1	2	-	1	2	2	2	1	-	1
54	42	-	-	-	1	19	3	5	1	2	3	2	4	2	-	3
60	47	-	-	1	3	71	10	20	5	9	7	2	7	2	-	8
67	52	1	1	2	10	136	24	50	22	28	22	7	20	5	2	23
73	57	1	3	2	17	152	39	92	51	68	57	23	51	22	11	49
80	62	1	4	2	17	111	48	108	78	114	102	46	100	49	18	74
86	67	2	4	2	11	55	44	87	85	132	124	65	150	80	15	82
93	72	2	3	2	8	25	34	60	65	108	108	71	157	103	36	70
99	77	1	4	3	8	21	31	48	47	75	80	61	117	91	66	53
105	82	1	7	9	10	17	33	46	46	61	65	45	76	68	62	45
112	87	3	12	17	14	11	38	47	48	56	57	39	57	56	56	42
119	92	4	16	24	19	9	45	48	53	52	48	41	48	48	56	41
125	97	7	20	28	28	9	52	49	57	48	44	48	39	46	54	41
131	102	12	22	30	36	9	54	45	49	41	41	53	31	47	49	39
138	107	13	20	33	44	9	53	37	39	32	36	52	24	44	30	34
144	112	12	21	35	44	17	54	32	36	27	32	45	18	36	28	31
150	117	17	28	39	44	31	54	31	37	25	27	43	14	28	45	31
157	122	26	39	49	59	37	57	30	41	22	24	46	14	26	45	33
163	127	37	54	66	74	28	58	29	40	20	22	48	14	30	39	35
170	132	56	73	82	76	18	53	27	34	18	20	47	11	34	41	37
176	137	81	87	89	73	14	46	24	31	14	18	44	9	33	43	37
183	142	97	94	87	72	14	41	22	29	12	15	38	9	28	47	36
189	147	103	95	81	72	18	37	18	25	9	12	34	8	25	49	34
195	152	103	87	77	65	31	29	14	20	8	10	30	5	21	43	30
202	157	93	75	67	48	39	19	12	16	7	7	21	4	16	37	25
208	162	77	62	50	33	25	12	8	13	6	5	13	4	12	32	19
215	167	65	48	36	29	17	7	5	9	3	4	10	3	11	30	15
221	172	56	37	26	25	17	5	3	7	2	3	7	2	8	30	11
227	177	41	28	18	20	11	6	2	6	2	3	4	1	4	24	8
234	182	28	19	13	16	3	6	1	5	1	2	4	1	4	11	6
240	187	21	13	10	10	2	4	1	4	1	1	3	-	5	5	4
247	192	16	9	7	6	5	1	1	3	1	x	3	-	3	2	3

Table 14
continues
on next
page

continued..... Table 14.

Group w _N	Means w _N	Week Numbers														Total
		29	30	31	32	33	34	35	36	37	38	39	40	41	42	
253	197	11	7	5	4	5	1	1	1	-	x	2	1	1	-	2
260	202	3	5	4	2	2	1	x	1	-	x	1	-	1	-	1
266	207	4	2	3	2	-	1	x	-	x	x	-	-	1	-	1
272	212	2	1	2	1	2	1	-	1	x	x	-	-	-	-	x
279	217	1	1	1	1	3	-	-	1	-	x	-	-	-	-	x
285	222	1	1	-	1	3	-	-	1	-	x	-	-	-	-	x
292	227	1	1	-	1	5	-	-	1	-	-	-	-	-	-	x
298	232	1	-	-	-	5	-	-	-	-	-	-	-	-	-	x
305	237	-	x	1	-	2	-	-	-	-	x	-	-	-	-	x
311	242	-	x	-	1	-	-	-	-	-	x	-	-	-	-	x
317	247	-	x	-	-	-	-	-	-	-	-	-	-	-	-	x
324	252	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
330	257	-	-	-	-	-	1	-	-	-	-	-	-	-	-	x
n ₁ =		891	3337	1490	850	170	1416	5086	1146	3976	6568	1780	1422	688	117	28967
n ₂ =		1084	4214	1904	974	196	1820	5866	2501	4702	6993	1780	1540	946	118	34638

Table 15. Size composition of German tuna catch by smoothed weight frequencies (%) in 1957.

Total catch in 1957 = 5,599 fish

Group	Means	Week numbers												Total	
		w _G	w _{iG}	32	33	34	35	36	37	38	39	40	41		42
126	122.5	-	2	-	-	-	-	-	-	1	-	-	-	-	-
131	127.5	-	-	2	-	-	-	-	-	2	-	-	1	-	-
136	132.5	-	-	-	-	-	-	-	-	3	1	-	2	-	1
141	137.5	-	-	-	-	1	-	-	-	2	1	-	2	2	1
146	142.5	-	-	-	1	-	1	-	2	2	3	-	2	4	2
151	147.5	-	-	-	1	1	2	2	3	4	-	4	2	3	
156	152.5	-	2	2	3	3	5	4	4	6	4	6	1	4	
161	157.5	-	5	3	5	6	8	4	8	9	13	7	4	6	
166	162.5	-	5	5	5	7	11	7	13	16	17	7	5	9	
171	167.5	-	2	6	8	9	13	13	12	22	9	13	6	12	
177	172.5	8	9	8	13	13	13	17	13	28	13	23	10	16	
182	177.5	15	20	15	12	20	15	20	19	33	30	41	11	20	
187	182.5	15	15	28	19	26	20	25	30	32	43	32	19	25	
192	187.5	16	14	43	33	38	29	32	32	33	38	29	34	33	
197	192.5	16	30	46	44	48	40	34	34	40	42	37	47	41	
202	197.5	39	47	49	56	58	53	41	49	49	46	53	53	51	
207	202.5	78	45	57	63	64	62	55	65	60	30	60	47	60	
212	207.5	78	44	66	65	68	68	61	68	68	13	61	45	64	
217	212.5	47	59	64	68	73	71	67	59	68	13	61	57	66	
223	217.5	39	61	54	69	69	72	76	57	61	30	55	64	65	
228	222.5	55	55	57	65	60	72	71	60	55	34	51	60	62	
233	227.5	55	58	65	53	55	63	66	55	52	30	50	58	57	
238	232.5	47	60	54	42	52	50	59	48	52	42	47	55	51	
243	237.5	55	63	48	45	49	43	53	49	46	47	50	48	48	
248	242.5	63	67	45	51	46	41	52	46	39	34	50	46	46	
253	247.5	63	52	38	46	42	39	45	38	37	34	38	47	41	
259	252.5	55	30	32	39	37	36	33	35	33	55	31	50	36	
264	257.5	31	31	32	29	30	31	30	29	26	55	32	50	31	
269	262.5	8	37	33	20	23	24	22	23	22	47	29	40	26	
274	267.5	-	24	26	18	21	20	20	22	19	46	23	25	21	
279	272.5	8	16	22	19	20	17	14	19	14	29	17	14	17	
284	277.5	31	22	20	19	14	13	13	16	9	13	13	7	14	
289	282.5	47	26	16	18	9	11	11	18	8	9	10	5	12	
295	287.5	31	24	16	19	7	10	10	12	8	17	10	9	11	
300	292.5	8	21	14	17	5	11	8	6	8	21	12	14	10	
305	297.5	8	13	8	11	2	10	6	8	9	13	10	14	8	
310	302.5	15	7	7	6	2	7	5	9	7	13	7	12	6	
315	307.5	15	6	5	2	4	4	4	5	5	17	5	11	5	
320	312.5	15	4	3	1	4	3	5	3	5	17	4	6	4	
325	317.5	15	4	3	1	3	2	5	3	4	21	3	2	3	
330	322.5	16	2	2	2	3	2	2	4	2	27	3	2	3	
336	327.5	8	-	2	1	3	2	1	1	1	17	1	1	2	
341	332.5	-	2	3	1	2	1	2	2	1	4	-	-	2	
346	337.5	-	4	1	2	1	1	2	4	1	-	1	2	2	
351	342.5	-	2	-	2	1	2	1	3	2	-	1	5	2	
356	347.5	-	-	-	2	1	2	-	3	1	-	-	4	1	
361	352.5	-	2	-	1	-	-	1	2	-	-	1	2	-	
366	357.5	-	4	-	1	-	-	1	1	-	-	2	-	-	
371	362.5	-	4	-	1	-	-	-	-	-	-	2	-	-	
377	367.5	-	-	-	1	-	-	-	-	-	-	1	-	-	
382	372.5	-	-	-	-	-	-	-	-	-	-	-	-	-	
387	377.5	-	-	-	-	-	-	-	-	-	-	-	-	-	
392	382.5	-	-	-	-	-	-	-	-	-	4	-	-	-	
397	387.5	-	-	-	-	-	-	-	-	-	9	-	-	-	
402	392.5	-	-	-	-	-	-	-	-	-	4	-	-	-	
	n ₁ =	32	135	370	410	797	871	622	367	710	59	366	254	4993	

Table 16. Size composition of Norwegian tuna catch north of 63°N by smoothed weight frequencies (%) in 1958.

Group w _N	Means w _N	Week numbers							Total
		31	32	33	34	35	36	37	
157	122	-	-	2	1	-	-	-	x
163	127	1	-	5	1	-	-	-	1
170	132	3	1	6	1	1	-	-	2
176	137	5	3	2	2	3	-	-	2
183	142	6	4	1	3	5	1	-	3
189	147	12	8	5	6	5	2	-	6
195	152	22	23	11	8	8	2	-	10
202	157	27	45	17	11	13	2	-	15
208	162	42	59	21	18	18	6	12	22
215	167	66	74	23	28	25	11	35	32
221	172	83	88	30	41	37	17	35	44
227	177	102	89	59	59	55	32	18	61
234	182	113	91	89	80	68	40	17	77
240	187	104	98	98	90	69	46	29	81
247	192	85	102	101	88	76	65	53	84
253	197	67	90	96	93	93	76	70	87
260	202	53	56	89	103	99	81	59	87
266	207	46	34	81	93	91	87	64	80
272	212	39	38	66	69	73	87	76	66
279	217	31	37	54	57	61	81	64	57
285	222	28	19	45	50	53	77	70	49
292	227	21	9	32	34	38	71	64	37
298	232	12	9	23	22	30	57	41	26
305	237	7	7	18	16	22	43	41	20
311	242	7	6	15	12	19	32	70	16
317	247	9	4	11	9	15	28	94	14
324	252	7	3	5	5	9	22	59	9
330	257	3	1	2	2	6	12	12	4
337	262	-	-	2	1	4	10	6	3
343	267	-	-	1	-	4	8	12	2
350	272	-	-	-	-	2	5	6	1
356	277	-	-	-	-	-	4	-	1
362	282	-	-	-	-	-	2	-	-
369	287	-	-	-	-	1	-	-	x
n ₁ =		389	183	338	964	680	387	43	2984
n ₂ =		393	228	338	964	700	387	43	3099

Table 17. Size composition of Norwegian tuna catch south of 62°N by smoothed weight frequencies (%) in 1958.

Group w _N	Means w' _N	Week numbers												Total
		29	30	32	33	34	35	36	37	38	39	40	41	
41	32	-	-	-	-	-	1	x	-	-	-	-	-	x
48	37	-	-	-	-	-	3	3	3	1	1	1	-	2
54	42	-	-	-	-	-	4	13	18	5	5	2	-	7
60	47	-	-	-	-	1	4	27	41	15	14	5	1	15
67	52	-	-	-	-	-	6	32	47	25	25	8	2	21
73	57	-	-	-	-	-	6	25	38	27	29	11	1	21
80	62	-	-	-	-	1	6	20	34	23	25	12	-	18
86	67	-	-	-	1	1	14	27	43	28	23	13	-	21
93	72	-	-	-	2	3	28	47	63	48	34	21	4	35
99	77	-	-	-	3	5	47	75	91	76	56	36	13	54
105	82	-	-	-	3	7	60	94	110	98	76	61	15	70
112	87	-	-	-	4	9	58	89	104	79	92	89	15	76
119	92	-	-	-	4	12	55	69	81	92	97	102	24	70
125	97	-	-	-	5	17	50	50	59	72	85	95	34	58
131	102	-	-	8	8	22	42	38	44	55	69	77	43	47
138	107	-	-	16	12	28	40	31	33	41	56	63	43	39
144	112	-	-	8	17	39	44	27	27	32	44	50	45	34
150	117	-	-	16	27	51	49	26	26	30	37	40	52	34
157	122	-	-	47	42	60	54	26	22	30	36	38	56	35
163	127	-	-	47	53	66	60	27	18	29	32	37	56	36
170	132	-	9	32	54	68	60	29	18	27	27	35	52	34
176	137	13	26	39	46	68	53	29	16	26	24	33	50	32
183	142	38	34	47	45	68	44	27	14	22	21	31	53	30
189	147	69	34	78	49	66	37	27	12	17	18	27	60	28
195	152	88	43	71	51	59	33	26	10	15	17	23	67	27
202	157	75	86	63	57	49	29	22	9	14	14	21	61	24
208	162	88	129	88	63	42	22	18	7	11	11	18	50	22
215	167	125	112	55	64	41	17	13	6	8	8	15	48	20
221	172	131	69	24	62	41	15	10	5	7	7	11	46	18
227	177	106	69	47	64	37	14	10	3	4	6	8	41	16
234	182	63	78	63	63	32	11	9	2	3	4	6	26	14
240	187	25	43	55	51	28	7	7	1	4	3	4	13	11
247	192	6	26	47	38	23	6	6	1	3	2	3	7	8
253	197	13	34	47	31	15	7	6	1	2	2	3	5	7
260	202	44	26	39	25	11	5	5	-	1	2	2	6	6
266	207	56	26	31	18	10	3	5	-	2	1	1	6	4
272	212	31	52	23	12	8	3	3	-	1	x	1	6	3
279	217	13	60	8	10	5	2	1	-	1	x	1	5	2
285	222	13	34	-	7	4	2	-	-	1	x	1	2	2
292	227	6	9	-	4	4	3	-	-	1	x	1	1	1
298	232	-	-	-	2	3	2	x	1	x	-	1	2	1
305	237	-	-	-	2	2	1	1	-	x	-	-	1	1
311	242	-	-	-	1	1	1	1	-	x	-	-	-	x
317	247	-	-	-	1	1	1	1	-	-	x	-	-	x
324	252	-	-	-	1	1	1	-	-	x	-	-	-	x
330	257	-	-	-	-	-	-	-	-	-	-	-	-	-
337	262	-	-	-	-	-	-	-	-	-	x	-	-	x
343	267	-	-	-	-	-	-	-	-	-	-	-	-	-
350	272	-	-	-	-	-	-	-	-	-	-	-	-	-
356	277	-	-	-	-	-	-	-	-	-	-	-	-	-
362	282	-	-	-	-	-	-	-	-	-	-	-	-	-
369	287	-	-	-	-	-	-	-	-	-	-	-	-	-
375	292	-	-	-	-	-	-	-	-	x	-	-	-	x
	n ₁ =	40	29	32	1885	1308	524	2613	1989	3447	3306	1579	363	17115
	n ₂ =	55	29	32	1885	1355	530	2751	2073	3474	3309	1657	363	17513

Table 18. Size composition of German tuna catch by smoothed weight frequencies (%) in 1958.

Total catch in 1958 = 1,625 fish

Group w _G	Means w _G ¹	Week numbers										Total	
		33	34	35	36	37	38	39	40	41	42		
146	142.5						4						
151	147.5						7	1		2	5	2	
156	152.5					1	3			4	10	3	
161	157.5			25	5	7	1			2	5	4	
166	162.5			50	14	14	6	3	3	3	2	7	
171	167.5			25	11	13	12	5	7	10	8	10	
177	172.5				5	13	16	10	14	16	10	12	
182	177.5				16	18	15	21	28	20	8	18	
187	182.5				35	19	9	28	27	23	13	21	
192	187.5				43	24	14	27	20	27	36	26	
197	192.5		36	25	32	27	23	30	30	35	52	31	
202	197.5		72	75	24	29	25	38	41	47	57	36	
207	202.5		36	75	30	38	29	44	41	61	62	43	
212	207.5		36	50	22	44	40	50	51	70	49	48	
217	212.5		72	50	19	52	47	56	61	63	41	52	
223	217.5		72	50	44	61	46	53	54	61	54	55	
228	222.5		72	50	60	54	58	47	47	73	64	56	
233	227.5		72	50	54	53	75	44	57	73	57	57	
238	232.5		142	50	54	58	74	50	64	56	34	56	
243	237.5		176	25	52	58	62	63	63	41	37	56	
248	242.5		70		36	57	53	65	64	37	60	54	
253	247.5				33	52	47	58	47	36	68	49	
259	252.5	1000			41	50	38	58	44	36	62	47	
264	257.5		36		49	45	34	53	54	30	49	44	
269	262.6		72		52	32	45	40	37	18	34	35	
274	267.5		36		41	29	53	32	10	13	15	29	
279	272.5				38	26	41	24		16	10	24	
284	277.5			50	41	21	23	16	3	17	8	19	
289	282.5			100	30	20	13	17	14	15	11	18	
295	287.5			50	22	20	14	17	17	20	11	18	
300	292.5				17	18	19	12	10	16	5	15	
305	297.5				8	15	14	9	14	13	3	13	
310	302.5			25	8	8	12	10	20	14	10	10	
315	307.5			50	8	3	12	6	17	10	13	8	
320	312.5			25	8	2		4	14	5	8	6	
325	317.5			25	14	3	1	4	10	4	8	4	
330	322.5			50	11	4	4	2	7	3	8	4	
336	327.5			25	8	3	4	1	7	1	5	3	
341	332.5				6	4	3	1	3	1	5	3	
346	337.5				6	3	3				3	2	
351	342.5				3		1						
356	347.5									1			
361	352.5					1		1		2		1	
366	357.5					1				1		1	
402	392.5									1			
407	397.5									2			
412	402.5									1			
	n ₁ =	1	7	10	92	429	214	424	74	247	97	1.595	

Table 19. Size composition of Norwegian tuna catch north of 63°N by smoothed weight frequencies (%) in 1959.

Group w_N	Means w'_N	Week numbers					Total
		30	31	32	33	34	
125	97	-	2	-	-	-	-
131	102	-	5	-	-	-	1
138	107	-	5	-	-	-	1
144	112	-	2	-	-	-	1
150	117	1	-	-	-	-	1
157	122	2	2	-	-	-	2
163	127	3	6	-	-	-	3
170	132	5	10	-	-	-	5
176	137	8	20	-	-	-	9
183	142	13	35	-	-	-	15
189	147	23	44	-	-	-	25
195	152	39	51	-	-	-	40
202	157	54	68	25	-	-	55
208	162	73	93	50	-	250	74
215	167	94	101	25	-	500	93
221	172	102	91	25	-	250	99
227	177	105	90	50	11	-	101
234	182	101	90	25	21	-	98
240	187	85	79	100	21	-	83
247	192	74	62	200	32	-	72
253	197	64	46	125	63	-	62
260	202	45	29	100	115	-	45
266	207	33	23	125	125	-	34
272	212	28	21	75	125	-	29
279	217	20	9	50	146	-	20
285	222	14	2	25	83	-	13
292	227	9	3	-	31	-	9
298	232	4	3	-	42	-	4
305	237	2	6	-	21	-	3
311	242	1	7	-	11	-	3
317	247	-	3	-	32	-	2
324	252	-	-	-	42	-	1
330	257	1	-	-	42	-	2
337	262	-	-	-	32	-	1
343	267	-	-	-	11	-	-
	$n_1 =$	1344	178	10	24	1	1557
	$n_2 =$	1619	178	19	26	1	1843

Table 20. Size composition of Norwegian tuna catch south of 62°N by smoothed weight frequencies (%) in 1959.

Group	Means w _N	Week numbers								Total
		30	31	32	33	34	35	36	37	
41	32	-	-	-	-	x	-	-	-	x
48	37	-	-	-	-	x	-	-	-	x
54	42	-	-	-	-	-	-	-	1	-
61	47	-	1	-	-	-	-	1	3	x
67	52	-	-	-	x	1	25	4	5	1
73	57	-	-	-	1	9	75	15	15	5
80	62	1	-	1	2	5	188	33	47	11
86	67	1	-	1	2	6	275	42	84	16
93	72	1	-	1	2	5	175	38	88	15
99	77	-	-	1	2	4	50	28	64	11
105	82	-	-	1	2	6	13	21	45	10
112	87	-	1	2	3	12	-	23	45	13
119	92	-	1	2	5	18	-	32	57	18
125	97	1	1	5	8	22	-	44	63	22
131	102	1	1	8	11	26	-	49	67	26
138	107	1	2	9	13	32	13	45	67	28
144	112	2	5	11	16	37	25	39	51	28
150	117	3	8	15	19	41	13	34	36	29
157	122	8	10	16	24	46	-	32	34	33
163	127	16	14	21	34	54	-	32	27	37
170	132	21	19	30	42	59	-	32	17	41
176	137	30	25	35	51	65	13	33	14	47
183	142	38	32	39	59	72	25	36	14	53
189	147	42	47	53	63	70	13	37	18	55
195	152	54	64	63	65	62	-	36	19	55
202	157	67	81	64	64	55	-	34	14	53
208	162	80	89	70	68	48	-	30	13	52
215	167	98	89	75	70	43	-	29	14	52
221	172	100	85	78	62	39	-	28	12	49
227	177	88	87	77	54	34	-	27	10	44
234	182	79	85	71	53	29	-	27	10	41
240	187	72	66	58	49	24	-	26	8	36
247	192	59	45	48	40	20	-	22	7	29
253	197	45	38	47	32	16	13	20	9	24
260	202	33	32	38	23	13	25	19	9	20
266	207	21	23	21	18	10	13	17	6	14
272	212	13	17	12	15	8	-	12	4	11
279	217	10	10	9	10	7	-	8	3	8
285	222	6	5	7	7	6	-	6	2	6
292	227	3	6	7	4	4	-	4	-	4
298	232	2	6	6	3	3	-	3	-	3
305	237	2	5	4	2	2	-	3	1	2
311	242	3	2	2	1	1	-	2	-	1
317	247	2	1	-	1	x	13	1	-	1
324	252	1	1	-	1	x	25	1	-	x
330	257	1	-	-	1	-	13	-	-	x
337	262	-	-	-	x	-	-	x	-	x
343	267	-	-	-	-	-	-	-	-	-
350	272	-	-	-	-	-	-	-	-	-
356	277	-	-	-	-	x	-	-	-	x
	n ₁ =	594	892	718	2868	4799	20	2643	738	13272
	n ₂ =	594	892	718	2868	4799	84	2908	752	13724

Table 21. Size composition of German tuna catch by smoothed weight frequencies (%) in 1969

Total catch in 1959 = 3,818 fish

Group w _G	Means w' _G	Week numbers											Total			
		33	34	35	36	37	38	39	40	41	42	43				
146	142.5					2										
151	147.5															
156	152.5								2							
161	157.5					2			3							
166	162.5							1	2							
171	167.5						6	4	5							1
177	172.5						6	5	8			2				4
182	177.5				2		9	6	6	11	1		3		4	5
187	182.5				12		8	11	14	2		2			9	8
192	187.5				7	12	10	13	20	4	4				9	10
197	192.5				5	3	10	12	23	4	10	4		7		10
202	197.5				9	9	18	17	24	7	10	12		9		14
207	202.5		9	16	19	20	28	31	12	8	17	11				20
212	207.5	63	17	30	22	28	38	40	15	15	17	12				27
217	212.5	125	17	40	25	38	44	43	22	20	21	27				33
223	217.5	63	26	35	42	34	45	51	31	24	26	44				40
228	222.5		35	28	50	58	43	59	36	27	26	44				43
233	227.5	31	44	52	31	40	42	62	43	29	25	42				46
238	232.5	63	43	82	75	50	44	61	47	36	26	46				50
243	237.5	31	43	73	53	56	46	54	41	46	39	49				51
248	242.5	31	69	56	59	68	54	57	40	51	54	57				53
253	247.5	63	69	49	62	42	58	64	46	49	57	51				55
259	252.5	31	43	44	72	50	55	58	51	47	52	39				55
264	257.5	31	34	42	56	46	54	47	50	46	47	39				50
269	262.5	63	52	47	59	47	50	36	48	44	56	51				47
274	267.5	62	78	52	28	44	45	26	43	39	64	60				45
279	272.5	94	78	42	47	66	48	22	44	32	56	53				43
284	277.5	94	60	32	53	24	42	24	48	29	36	42				38
289	282.5	31	43	35	50	36	30	23	44	24	24	39				35
295	287.5		43	37	53	40	26	23	42	24	32	51				34
300	292.5		43	35	37	24	26	24	41	32	41	61				32
305	297.5		35	30	22	20	23	17	36	41	38	44				27
310	302.5		34	21	16	21	17	9	28	37	36	26				21
315	307.5		26	16	12	24	14	8	21	27	32	14				17
320	312.5	31	17	14	6	14	13	9	21	32	25	7				15
325	317.5	62	9	12	3	10	10	6	20	37	23	9				12
330	322.5	31		7		6	8	2	18	24	27	12				10
336	327.5			7	6	4	7	4	15	19	20	9				9
341	332.5			5	9	4	6	8	10	32	7	7				8
346	337.5			5	3	4	4	8	7	32	3	2				6
351	342.5			2		2	3	4	7	20	2					4
356	347.5					2	3	1	10	10						4
361	352.5				3	2	2	1	13	7	7					4
366	357.5					4	1	1	9	5	14					3
371	362.5		8				1	1	6	2	7					3
377	367.5		17				1	1	6		2					2
382	372.5		8	2	3	2		1	4		3		2			2
387	377.5			3				1	3	2	3		5			2
392	382.5			2				1		4	3		5			1
397	387.5					2				1	4	2		2		
402	392.5								2	2	2					
407	397.5								1	12	3					1
428	417.5									5	2					
444	432.5			3												
	n ₁ =	8	29	143	322	501	668	461	534	148	141	142				3097

1962

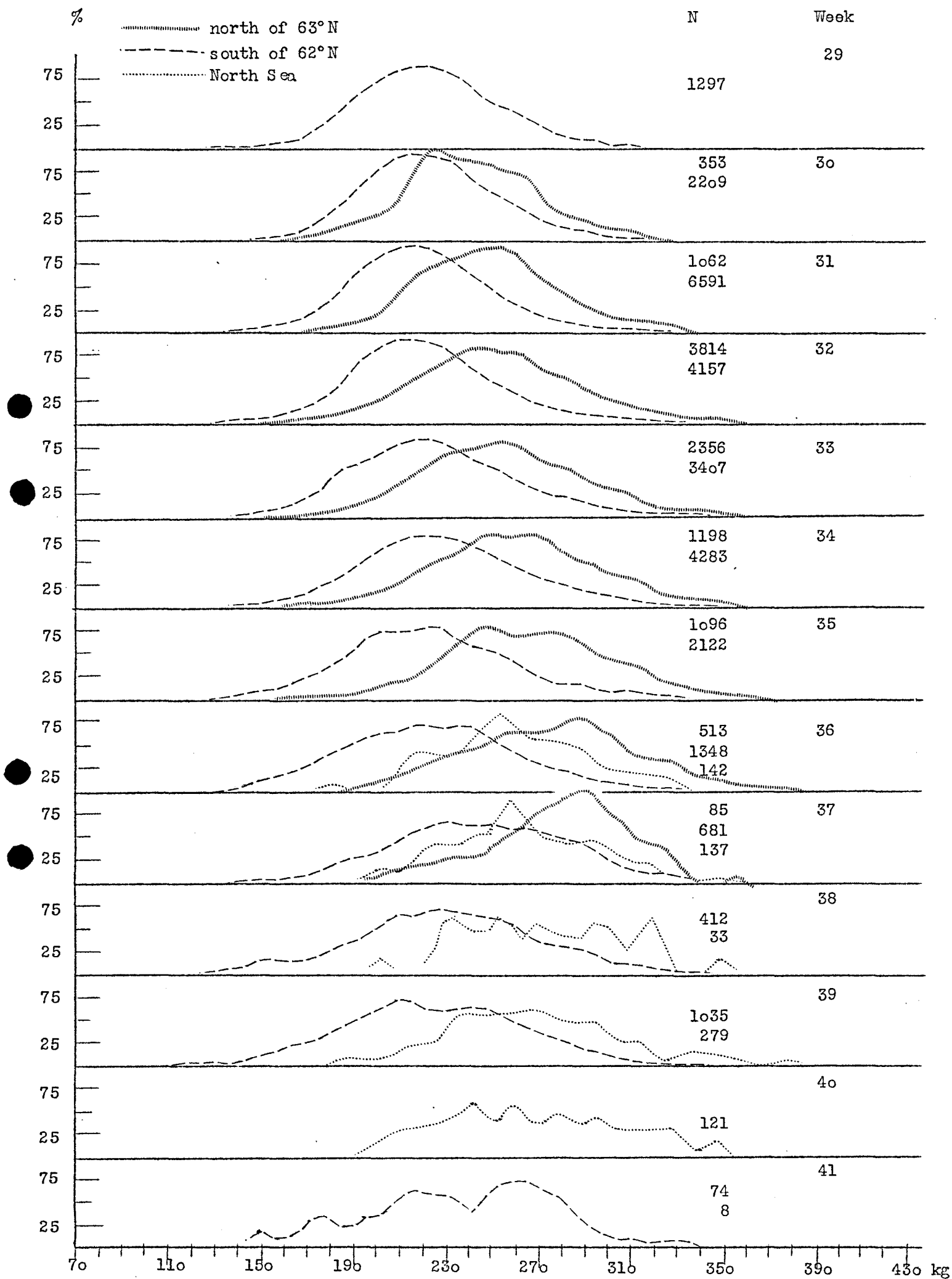


Figure 1. Size composition of Norwegian and German bluefin tuna catches by areas and weeks in 1962.

1956

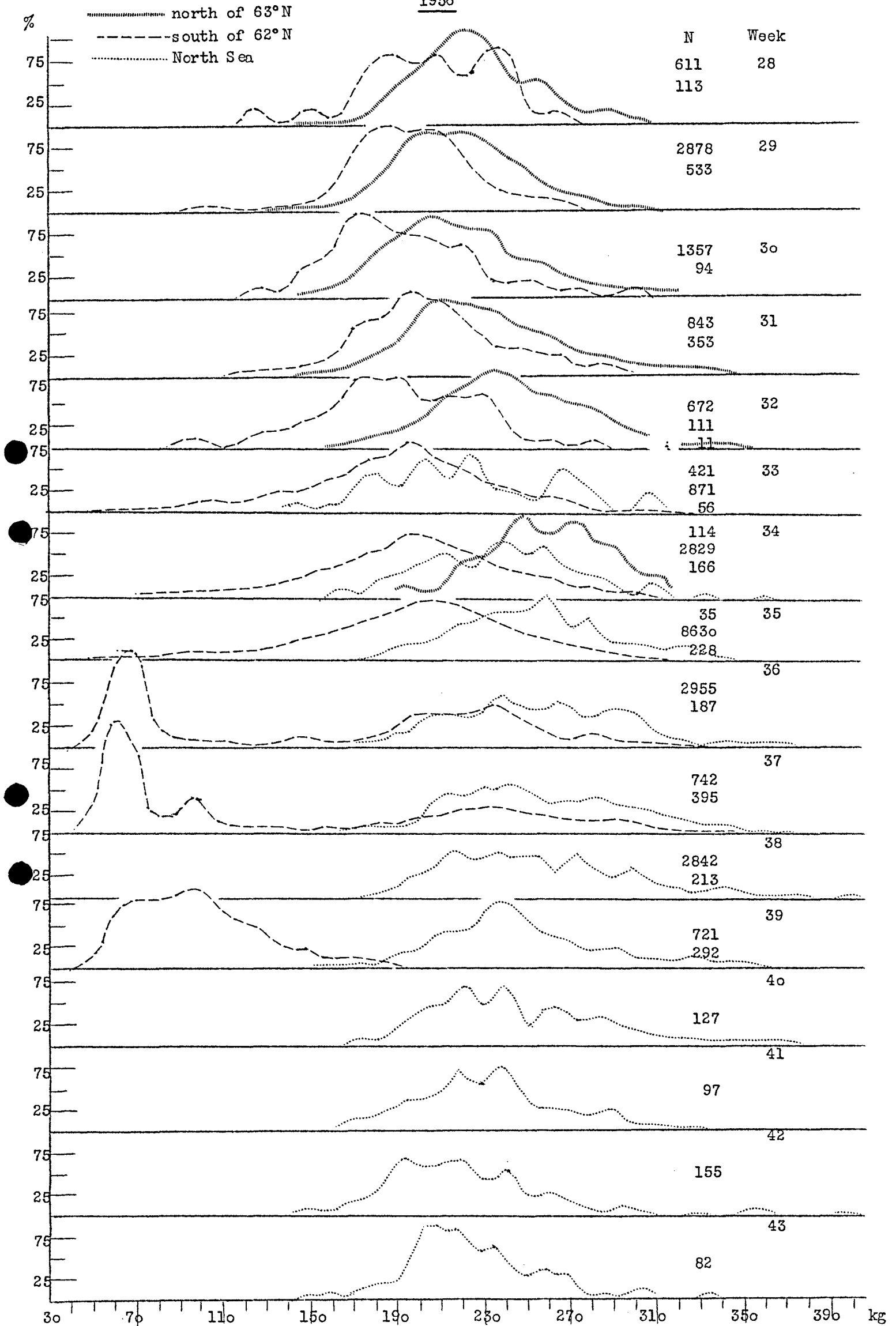


Figure 2. Size composition of Norwegian and German bluefin tuna catches by areas and weeks in 1956.

1957

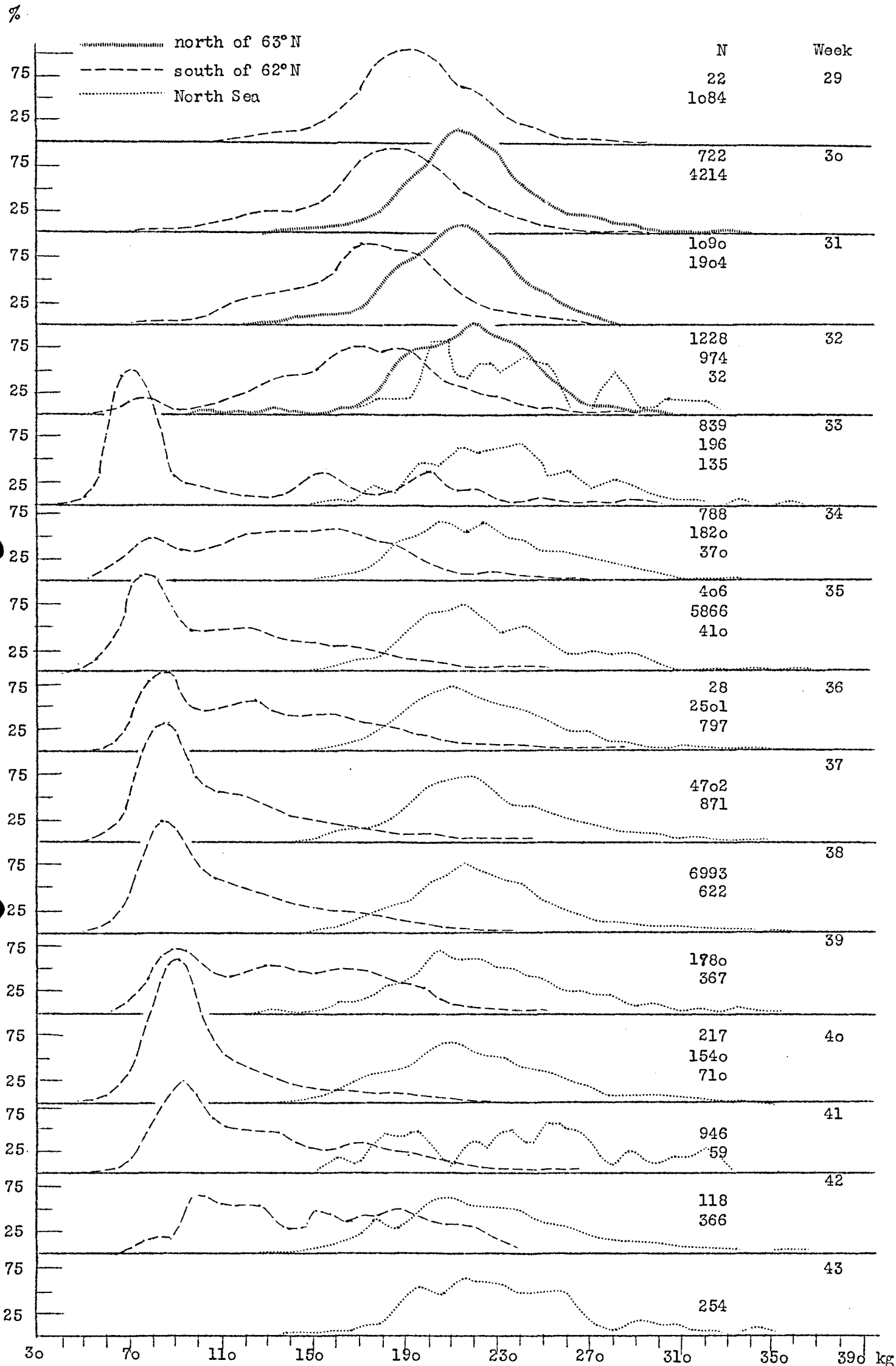


Figure 3. Size composition of Norwegian and German bluefin tuna catches by areas and weeks in 1957.

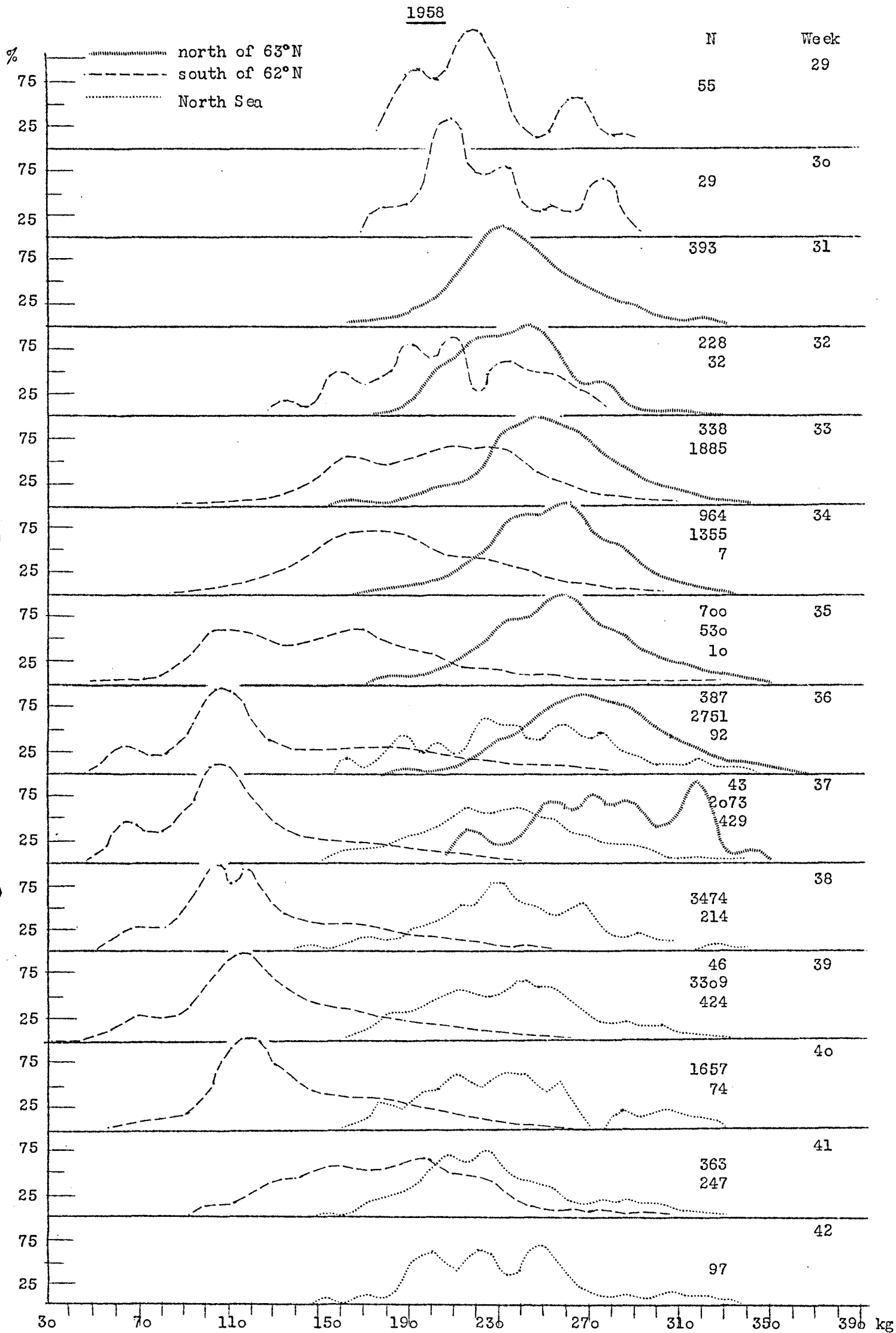


Figure 4. Size composition of Norwegian and German bluefin tuna catches by areas and weeks in 1958.

1959

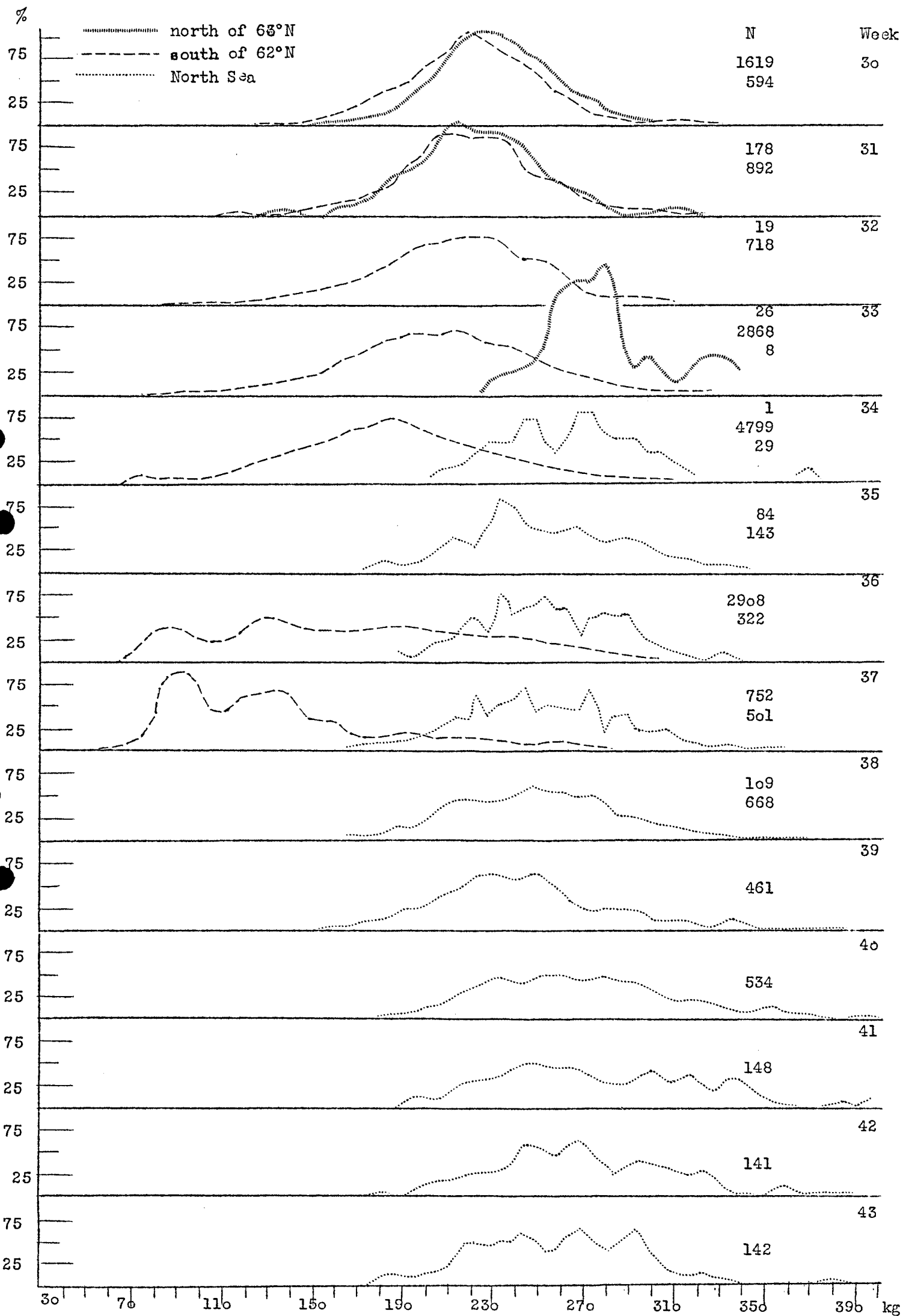


Figure 5. Size composition of Norwegian and German bluefin tuna catches by areas and weeks in 1959.

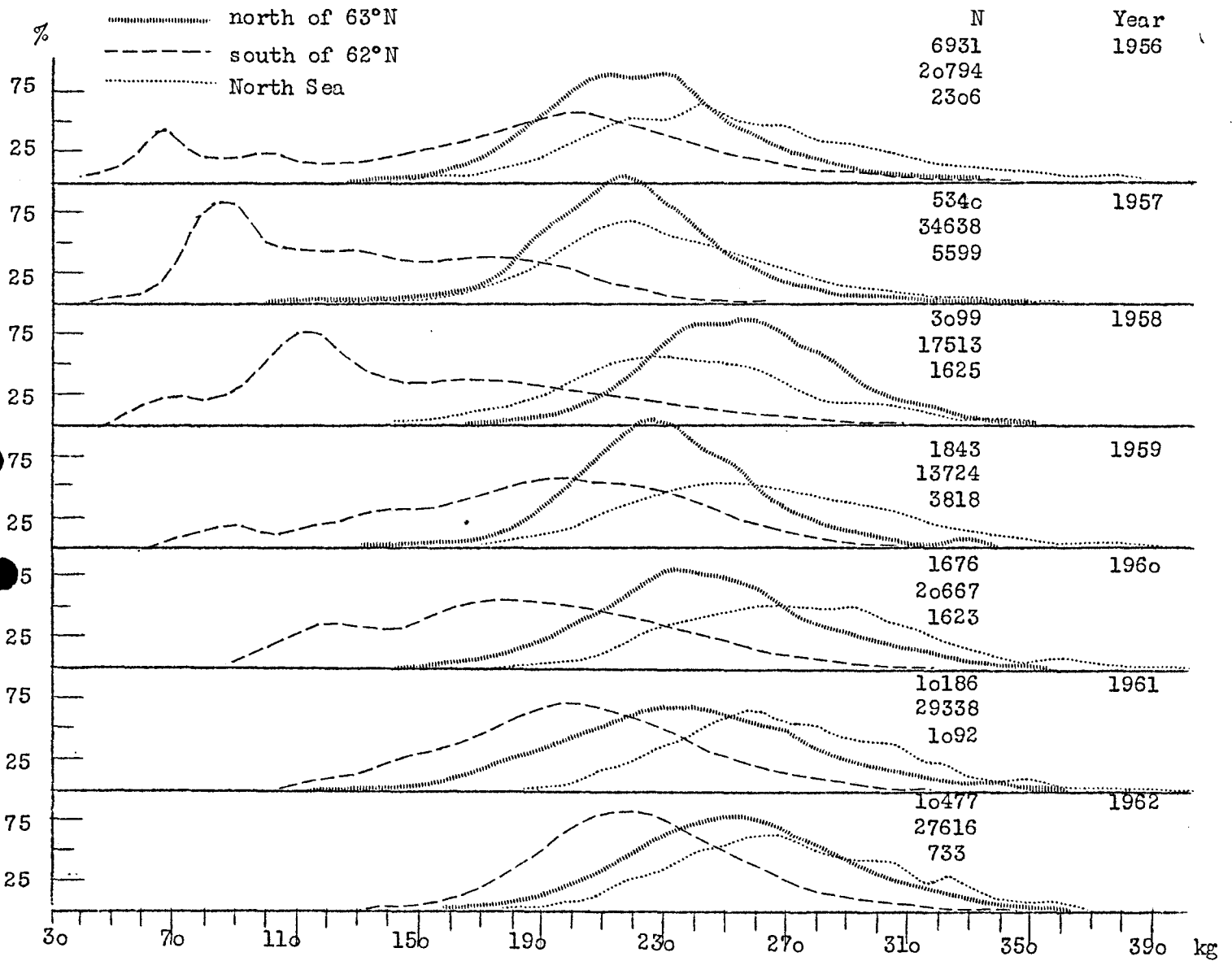


Figure 6. Size composition of Norwegian and German Bluefin tuna catches by areas in the years 1956-1962.