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REPORT FROM THE BLUEFIN TUNA WORKING GROUP

Observations on the Size Composition of Bluefin Tuna
Catches from 1971

by

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I. INTRODUCTION

Reference is made to previous reports of the Bluefin Tuna Working Group (Statistical News Letters, Nos. 20,26 and 38, and to Cooperative Research Report, Ser. A, No.23). The members continued their work by correspondance and with other tuna research workers in the region. In the following, the data obtained for the fishing season 1971 are presented.

II. MATERIAL

Reports on the catches and the catch composition of bluefin tuna were submitted by the following countries: Canada (Tables 1-5), Denmark (Table 6), France (Table 7), Italy (Table 8), Norway (Tables 9-11), Spain (Tables 12-13) and USA (Tables 14-18).

Dr. S.N. Tibbo and Dr. J.S. Beckett of the Biological Station at St. Andrews', Canada, reported, that the Canadian landings of bluefin tuna in 1971 were about 30% less than they were in the previous year. The total commercial catch amounted to 1,003 metric tons (Table 1); 935 tons from the purse-seine fishery and 68 tons from the trap and harpoon fishery. Sport fishermen caught an estimated 128 metric tons of large bluefin of which 81 tons were landed and the remainder released - usually after having been tagged. There were no incidental landings of tunas by swordfish fishermen as this fishery ceased in January following the discovery

of unacceptable levels of mercury in swordfish. The mercury problem also caused a curtailment of the inshore (trap and harpoon) fisheries for large bluefin (> 200 kg). The purse seine fishery for small bluefin off the mid-Atlantic coast of the United States was less successful despite an increase in fishing effort.

Statistics for all Canadian tuna fisheries were revised in 1971 in order to meet requirements of the International Commission for the Conservation of Atlantic Tunas (ICCAT) for a historical record of tuna catches by species, areas, and types of gear. Earlier reports of bluefin tuna landings have included small quantities of other tuna species but, in so far as it is possible to do so, these have now been eliminated. Table 1 represents the best estimate of bluefin tuna catches by Canadian fishermen for the years 1962 to 1971 inclusive.

Tourist Development Offices in the relevant provinces provide reasonably accurate and complete records of sport fisheries for bluefin tuna including locations, dates and sizes of fish caught and landed. Table 2 summarizes the size composition data for bluefin landed in three of the Atlantic provinces during 1971. Bluefin taken off Prince Edward Island in the Gulf of St. Lawrence are considerably larger, on the average, than those taken off the east coast of Newfoundland. The few (8) fish caught in Nova Scotia waters appear to be similar in size of those taken off Prince Edward Island.

The size composition data from Prince Edward Island were examined in more detail (Table 3) by separating catches into approximately one month periods. There is some indication of an increase in weight of fish as the season progresses.

Landings of small bluefin from the purse seine fishery off the mid-Atlantic coast of the United States were sampled for size composition. The samples (Table 4) covered three catch periods;- the first part of the season, the second part, and the whole period. Fish are mixed in the holds of the vessels and no finer division of the capture dates is possible for fish measured on landing.

It is apparent, however, that the size composition changed considerably as the season progressed. Age groups 1 and 2 (1970 and 1969 year classes) dominated the early catches while, later in the season, older fish (ages 3-7) made up the bulk of the catch. These results are similar to those of the 1970 season including the fact that in both years (and also in 1969) the 1966 year-class was poorly represented. A total of 362 small bluefin were measured aboard the purse seiners as they were tagged (some by U.S. personnel) and these are grouped by week of sampling in Table 5.

Tagging efforts were increased in 1971. 95 bluefin over 200 kg, and 271 under 12 kg, were tagged and released. Anglers in the Newfoundland area accounted for 51 of the large fish and the remainder (44) were tagged from fish traps in St. Margaret's Bay, Nova Scotia. All of the small fish were tagged from purse seiners in a joint program with the Woods Hole Oceanographic Institution to test the relative merits of two types of tags - the W.H.O.I. metal anchor tag (type H) and the FT1A tag with a plastic barb. Most (268) of these fish were double tagged using the two tag types alternately.

The only tag recoveries during the year were from the purse seine releases and, to date, 25 recaptures have been reported.

The French data were submitted by Dr. M.H. Aloncle (Table 7), and the Italian data by Dr. M. Sara (Table 8). Dr. Aloncle stated that the French bluefin tuna catches from the Mediterranean Sea amounted to 1,850 tons in 1971.

The Norwegian weight composition data include the total landing of tuna in 1971. The catches were made in the southern area (south of 62°N) in the districts of Sogn og Fjordane and Hordaland (Table 9).

10 fishes of the first week's landings were measured to get corresponding length/weight data. These measurements gave a low condition factor ($K = 1.77$), as expected. Unfortunately, no more measurements were taken later in the season. Therefore it was decided to consider the mean length of the 10 measured fishes

(\bar{L} = 176.5 cm) as representative for the whole season, as no significant length growth is likely to occur in such old stock during the 7 weeks fishing season. The mean length is compared to the mean weight of the fish in each week's landings and the mean weight for the whole season (Table 10). The mean condition factor, $K = 2.15$, seems reasonable.

The length frequency distribution has been calculated from the weight data, by the mean condition factor for the season, as usual (Table 11).

Dr. J. Rodriguez-Roda furnished the Spanish materials (Tables 12-13).

Mr. F. Mather III points out that the data given in Table 14 represent purse seine catches as they were being unloaded from vessels on arriving at the cannery. The data given in Table 15 are for fish measured on board the vessels while they were being tagged. These data are from the catches of three small New England-based vessels only. Apart from the Woods Hole Oceanographic Institution the Miami, Florida, and Oxford, Maryland, laboratories of the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, should be credited for the collection of the data. In Table 16 the latest revisions of the US release-return data for small bluefin tuna and together with the estimated age composition, catch and effort data for the purse seine fishery on small bluefin tuna are given. In addition to the catches from 1971 shown there, the small local seiners caught 200 to 300 tons of giant bluefin tuna for Japanese interest.

A few hundred tons of small bluefin tuna are being held in freezers and it is expected to receive a few more tags as these are processed. In addition to the data given in Tables 16-17 tag returns from a bluefin tuna was received which was tagged and released by a sport fisherman in September 1968 in Notre Dame Bay, Newfoundland, and harpooned in July 1972 in Trinity Bay, Newfoundland, about 225 miles away.

In Table 18 length composition data of bluefin tuna measured at Puerto Rico by the Interamerican Tropical Tuna Commission were

submitted by Dr. W.H. Lenarz from the SW Fisheries Centre, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, US Department of Commerce. Contrary to the statement in the Working Group Report submitted for 1970, saying that bluefin tuna samples measured at Puerto Rico were submitted for the first time in 1970, Mr. Mather III points out that such measurements were included already in previous report by the experts to the working group, but separated for the first time in 1970 in an extra Table.

III. Comparison of the catch composition data collected in the different countries

1. Spanish with Norwegian catches

The Spanish length frequency curve (Fig. 1) show two distinct modes from which the larger one represents fish of the same size composition as the Norwegian tuna catches. It is likely that this fish belonged to the year class 1958 which predominated already in former years in the Spanish catches. It might well be that fish of this year class also dominate the catches now taken off the Norwegian coast. The other mode of the Spanish curve represents fish of the year class 1961, which predominated in 1970 even over the 1958 year class and could be already recognized as mode in the length frequency curve of 1969.

2. US, Canadian and Puertorican catches

The US length frequency curve (Fig. 1) shows two distinct modes, the first representing fish of year class 1969, and the second fish of the year class 1967. The Canadian catches were comprised mainly of fish of year class 1969, as was also the case with the US catches and with the Puertorican catches. Other important age groups found in the catches were year classes 1970, 1968 and 1967. The Puertorican catches consisted mainly of fish of year classes 1969 and 1967. In general it can be concluded that all these catches were made from more or less the same stock. Fish of age group I was, although present in the catches, less available than in 1970.

3. Canadian with Italian and Norwegian catches of giant bluefin tuna

In Fig. 2 data on the size composition of giant tuna caught by sport fishermen along the Canadian Atlantic coast are compared with Norwegian purse seine catches and Italian madrague catches. It is not possible to conclude from the weight composition data to which year classes the giant tuna caught belonged. However, in general it seems that the Canadian catches consist of tuna which are slightly younger than those caught off the Norwegian coast. The Italian catches contain many age groups and have no distinct size composition pattern.

IV. Summary

The size composition of bluefin tuna catches collected in 1971 show that the Spanish and Norwegian tuna catches tally again in large parts with each other. In comparison to these the Italian catches were composed of more year classes. The west Atlantic purse seine fisheries have fished again more or less the same age groups. West Atlantic catches of giant bluefin tuna showed for the first time also such old fish as known from the east Atlantic tuna fisheries.

V. REFERENCES

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Table 1. Canadian catches of bluefin tuna
from the Atlantic Ocean 1962-71.
(Nominal catch in metric tons, live weight)

| Year | LANDINGS | | | |
|------|---------------------|--------------|------------------|--------|
| | Traps and Longlines | Purse Seines | Total Commercial | Sport* |
| 1962 | 137 | - | 137 | 40 |
| 1963 | 229 | 323 | 552 | 90 |
| 1964 | 318 | 579 | 897 | 99 |
| 1965 | 175 | 461 | 636 | 90 |
| 1966 | 211 | - | 211 | 102 |
| 1967 | 298 | - | 298 | 58 |
| 1968 | 253 | - | 253 | 180 |
| 1969 | 407 | - | 407 | 170 |
| 1970 | 275 | 1161 | 1436 | 151 |
| 1971 | 68 | 935 | 1003 | 128 |

* Weights are partly estimated. Some fish were not landed - many of them were tagged before being released.

Table 2: Size composition (10 kg live weight per mille) (smoothed) of large bluefin tuna captured by sports fishermen in three localities along the Canadian Atlantic Coast

| Size class kg | Area | | | Total |
|------------------|-------------------------|------------------------|-------------|--------------|
| | Prince Edward Island | Edward Newfoundland | Nova Scotia | |
| 170 | | 3 | | 1 |
| 180 | | 13 | | 4 |
| 190 | | 26 | | 8 |
| 200 | | 46 | | 14 |
| 210 | | 66 | | 19 |
| 220 | 4 | 66 | | 22 |
| 230 | 14 | 86 | | 35 |
| 240 | 20 | 135 | 31 | 56 |
| 250 | 25 | 141 | 63 | 63 |
| 260 | 36 | 121 | 31 | 62 |
| 270 | 52 | 112 | 31 | 68 |
| 280 | 63 | 83 | 62 | 63 |
| 290 | 67 | 39 | 31 | 58 |
| 300 | 75 | 10 | 62 | 55 |
| 310 | 89 | 0 | 160 | 65 |
| 320 | 91 | 10 | 125 | 68 |
| 330 | 73 | 20 | 62 | 57 |
| 340 | 52 | 10 | 62 | 40 |
| 350 | 49 | 3 | 31 | 36 |
| 360 | 55 | 7 | 0 | 39 |
| 370 | 56 | 3 | 0 | 39 |
| 380 | 49 | | 0 | 33 |
| 390 | 42 | | 31 | 29 |
| 400 | 35 | | 62 | 25 |
| 410 | 25 | | 31 | 18 |
| 420 | 17 | | 0 | 12 |
| 430 | 9 | | 0 | 6 |
| 440 | 2 | | 31 | 2 |
| 450 | | | 63 | 2 |
| 460 | | | 31 | 1 |
| Number caught | 173 1 000 | 76 1 000 | 8 1 000 | 257 1 000 |

Table 3: Size composition of large bluefin caught by rod and reel off Prince Edward Island during three consecutive periods of the 1971 season in 5 kg groups ‰ (smoothed), live weight

| Size class kg | Sampling Period | | |
|------------------|-----------------|--------------------|-----------------|
| | July 27-Aug.15 | Aug. 16 - Sept. 15 | Sept.16--Oct 15 |
| 230 | 4 | 6 | |
| 235 | 16 | 12 | |
| 240 | 29 | 6 | |
| 245 | 29 | 3 | |
| 250 | 20 | 6 | |
| 255 | 17 | 6 | |
| 260 | 12 | 21 | |
| 265 | 4 | 43 | 8 |
| 270 | 4 | 43 | 16 |
| 275 | 12 | 40 | 8 |
| 280 | 33 | 43 | 0 |
| 285 | 57 | 34 | 0 |
| 290 | 53 | 25 | 8 |
| 295 | 49 | 28 | 16 |
| 300 | 61 | 27 | 16 |
| 305 | 57 | 30 | 25 |
| 310 | 45 | 46 | 33 |
| 315 | 53 | 58 | 25 |
| 320 | 70 | 52 | 16 |
| 325 | 57 | 33 | 25 |
| 330 | 37 | 33 | 33 |
| 335 | 33 | 49 | 25 |
| 340 | 29 | 40 | 8 |
| 345 | 17 | 25 | 0 |
| 350 | 13 | 28 | 16 |
| 355 | 26 | 26 | 42 |
| 360 | 26 | 25 | 50 |
| 365 | 12 | 18 | 59 |
| 370 | 8 | 18 | 89 |
| 375 | 8 | 30 | 92 |
| 380 | 16 | 28 | 58 |
| 385 | 25 | 9 | 25 |
| 390 | 20 | 12 | 16 |
| 395 | 16 | 25 | 42 |
| 400 | 16 | 18 | 58 |
| 405 | 12 | 15 | 42 |
| 410 | 4 | 12 | 34 |
| 415 | 0 | 6 | 25 |
| 420 | | 9 | 25 |
| 425 | | 9 | 25 |
| 430 | | 3 | 16 |
| 435 | | 0 | 16 |
| 440 | | | 8 |
| Number caught | 61 1 000 | 82 1 000 | 30 1 000 |

Size class 230 = 230.0 - 234.9 kg

Table 4: Size composition in ‰ (smoothed) of small bluefin taken off the U.S. east coast by Canadian vessels in 1971

| Size class kg | <u>Sampling Period</u> | | |
|------------------|------------------------|---------------|------------------|
| | July 4-Aug 6 | Aug 13-Sept 4 | July 25 - Sept 1 |
| 40 | 1 | | |
| 45 | 53 | 3 | 13 |
| 50 | 118 | 26 | 38 |
| 55 | 81 | 41 | 38 |
| 60 | 44 | 19 | 16 |
| 65 | 186 | 42 | 108 |
| 70 | 313 | 193 | 296 |
| 75 | 178 | 269 | 286 |
| 80 | 24 | 140 | 104 |
| 85 | 1 | 20 | 8 |
| 90 | 1 | 17 | 3 |
| 95 | 0 | 31 | 12 |
| 100 | | 40 | 22 |
| 105 | | 36 | 21 |
| 110 | | 17 | 13 |
| 115 | | 12 | 9 |
| 120 | | 21 | 8 |
| 125 | | 21 | 4 |
| 130 | | 12 | 1 |
| 135 | | 3 | 0 |
| 140 | | 2 | |
| 145 | | 2 | |
| 150 | | 5 | |
| 155 | | 10 | |
| 160 | | 10 | |
| 165 | | 6 | |
| 170 | | 2 | |
| ----- | | | |
| Number caught | 810 | 315 | 1 015 |
| | 1 000 | 1 000 | 1 000 |

Size category 45 = 45.0 - 44.9 cm (fork length caliper)

Table 5: Size composition (caliper fork length cm ⁰/100)(smoothed) of bluefin tagged from Canadian tuna purse seiners off the United States mid-Atlantic coast in 1971, by week of release

| Size class cm | <u>Sampling Period</u> | | |
|------------------|------------------------|----------------------|----------------------|
| | Week 30 18/7-24/7 | Week 31 25/7-31/7 | Week 32 1/8 - 7/8 |
| 48 | | 4 | |
| 49 | 3 | 14 | |
| 50 | 7 | 32 | 4 |
| 51 | 17 | 75 | 28 |
| 52 | 31 | 107 | 91 |
| 53 | 46 | 83 | 161 |
| 54 | 51 | 46 | 204 |
| 55 | 51 | 32 | 208 |
| 56 | 36 | 20 | 136 |
| 57 | 15 | 6 | 65 |
| 58 | 3 | 0 | 24 |
| 59 | 0 | 0 | 6 |
| 60 | 0 | 0 | 4 |
| 61 | 0 | 0 | 2 |
| 62 | 0 | 0 | 0 |
| 63 | 0 | 0 | 0 |
| 64 | 0 | 0 | 0 |
| 65 | 0 | 0 | 0 |
| 66 | 0 | 0 | 0 |
| 67 | 3 | 0 | 2 |
| 68 | 7 | 4 | 4 |
| 69 | 12 | 8 | 2 |
| 70 | 19 | 4 | 0 |
| 71 | 27 | 18 | 2 |
| 72 | 63 | 73 | 7 |
| 73 | 115 | 123 | 17 |
| 74 | 123 | 133 | 13 |
| 75 | 121 | 115 | 13 |
| 76 | 99 | 71 | 5 |
| 77 | 65 | 24 | 2 |
| 78 | 41 | 6 | 0 |
| 79 | 15 | 2 | |
| 80 | 5 | 0 | |
| 81 | 12 | | |
| 110 | 10 | | |
| 111 | 3 | | |
| ----- | | | |
| Number caught | 104 | 124 | 134 |
| | 1 000 | 1 000 | 1 000 |

Table 6

Weight distribution in ‰ (smoothed) of Bluefin Tuna caught in Kattegat by Danish fishermen in 1971. The weight group refers to gutted fish, with gills (kg)

| Weight group (kg) | ‰ |
|----------------------|-------|
| 275 | 28 |
| 280 | 56 |
| 285 | 84 |
| 290 | 111 |
| 295 | 84 |
| 300 | 56 |
| 305 | 56 |
| 310 | 56 |
| 315 | 28 |
| 320 | 28 |
| 325 | 111 |
| 330 | 134 |
| 335 | 84 |
| 340 | 56 |
| 345 | 28 |
| Numbers caught | 9 |
| | 1,000 |

Table 7: Bluefin Tuna catches at St. Jean- de-Luz (France) in 1971
(data given by Cooperative Maritime Itsasokoa)

| Date | Total weight | |
|----------------------|------------------|------------------|
| | Fish below 30 kg | Fish above 30 kg |
| 3. June - 9. June | 1 202.5 | |
| 17. June - 23. June | 11 262 | |
| 24. June - 30. June | 35 922 | |
| 1. July - 7. July | 81 591.5 | |
| 8. July - 13. July | 48 044 | |
| 14. July - 20. July | 69 147 | |
| 22. July - 29. July | 83 720.5 | 41 904 |
| 30. July - 4. Aug. | 44 142.5 | 35 135 |
| 5. Aug. - 11. Aug. | 77 665 | |
| 12. Aug. - 18. Aug. | 40 448.5 | 18 212 |
| 19. Aug. - 25. Aug. | 16 643.5 | 8 370 |
| 26. Aug. - 1. Sept. | 12 796 | 2 729 |
| 2. Sept.- 8. Sept. | 9 220 | 8 223 |
| 9. Sept.- 15. Sept. | 6 229.5 | 3 212 |
| 16. Sept.- 22. Sept. | 1 180.5 | |
| 23. Sept.- 29. Sept. | 2 277.5 | |
| 30. Sept.- 6. Okt. | 764 | |
| 7. Okt. - 13. Okt. | 990 | |
| 14. Okt. - 20. Okt. | 4 115 | |
| 21. Okt. - 27. Okt. | 5 394.5 | |
| 28. Okt. - 3. Nov. | 4 242 | |
| 4. Nov. - 10. Nov. | 5 322.5 | |
| Total | 562 320.5 | 117 785 |

Table 8: Weight distribution in ‰ (smoothed) of Bluefin Tuna caught in a Sicilian madrague at S. Cusumano during May and June 1971. The weight groups refer to ungutted fish (kg)

| Weight group (kg) | ‰ | Weight group (kg) | ‰ |
|----------------------|----|----------------------|----|
| 35 | 2 | 265 | 10 |
| 40 | 2 | 270 | 10 |
| 45 | 0 | 275 | 12 |
| 50 | 0 | 280 | 22 |
| 55 | 2 | 285 | 31 |
| 60 | 7 | 290 | 25 |
| 65 | 7 | 295 | 19 |
| 70 | 3 | 300 | 21 |
| 75 | 3 | 305 | 26 |
| 80 | 8 | 310 | 28 |
| 85 | 11 | 315 | 32 |
| 90 | 18 | 320 | 34 |
| 95 | 30 | 325 | 32 |
| 100 | 32 | 330 | 24 |
| 105 | 19 | 335 | 20 |
| 110 | 11 | 340 | 18 |
| 115 | 10 | 345 | 17 |
| 120 | 13 | 350 | 19 |
| 125 | 13 | 355 | 23 |
| 130 | 11 | 360 | 20 |
| 135 | 14 | 365 | 15 |
| 140 | 21 | 370 | 10 |
| 145 | 23 | 375 | 8 |
| 150 | 18 | 380 | 8 |
| 155 | 6 | 385 | 5 |
| 160 | 2 | 390 | 4 |
| 165 | 7 | 395 | 6 |
| 170 | 11 | 400 | 10 |
| 175 | 14 | 405 | 10 |
| 180 | 9 | 410 | 7 |
| 185 | 2 | 415 | 6 |
| 190 | 1 | 420 | 2 |
| 195 | 7 | 425 | 2 |
| 200 | 12 | 430 | 4 |
| 205 | 9 | 435 | 5 |
| 210 | 6 | 440 | 3 |
| 215 | 9 | 445 | 1 |
| 220 | 11 | | |
| 225 | 11 | | |
| 230 | 13 | | |
| 235 | 13 | | |
| 240 | 7 | | |
| 245 | 3 | | |
| 250 | 3 | | |
| 255 | 7 | | |
| 260 | 10 | | |

| | | |
|----------------|-----|-------|
| Numbers caught | 229 | |
| | | 1,000 |

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Table 9. Size composition (kg) of Norwegian bluefin tuna catches south of 62°N by smoothed weight frequency (‰) in 1971.

| GROUP MEANS | | WEEK NO. | | | | | | TOTAL |
|-------------|-----|----------|-----|-----|-----|-----|-----|-------|
| w' | w | 31 | 32 | 33 | 34 | 35 | 37 | |
| 147 | 189 | - | - | - | 1 | - | - | - |
| 152 | 196 | 4 | - | - | 1 | - | - | 1 |
| 157 | 202 | 7 | - | 1 | 1 | - | - | 1 |
| 162 | 208 | 7 | - | 3 | - | - | - | 1 |
| 167 | 215 | 7 | 2 | 3 | 1 | - | - | 1 |
| 172 | 221 | 4 | 4 | 3 | 1 | - | - | 1 |
| 177 | 228 | 2 | 6 | 3 | 2 | - | - | 2 |
| 182 | 234 | 5 | 11 | 4 | 3 | 2 | - | 3 |
| 187 | 241 | 11 | 15 | 4 | 4 | 5 | 1 | 4 |
| 192 | 247 | 30 | 19 | 4 | 6 | 2 | 1 | 7 |
| 197 | 253 | 48 | 18 | 10 | 9 | - | 2 | 11 |
| 202 | 260 | 46 | 20 | 17 | 13 | 5 | 4 | 13 |
| 207 | 266 | 45 | 29 | 15 | 19 | 12 | 4 | 16 |
| 212 | 273 | 53 | 24 | 21 | 25 | 9 | 7 | 19 |
| 217 | 279 | 55 | 21 | 41 | 29 | 9 | 11 | 25 |
| 222 | 286 | 57 | 41 | 52 | 32 | 21 | 14 | 31 |
| 227 | 292 | 76 | 68 | 58 | 37 | 33 | 16 | 39 |
| 232 | 298 | 83 | 87 | 62 | 43 | 38 | 20 | 45 |
| 237 | 305 | 67 | 87 | 56 | 55 | 38 | 21 | 47 |
| 242 | 311 | 62 | 76 | 63 | 70 | 49 | 24 | 52 |
| 247 | 318 | 60 | 63 | 83 | 71 | 68 | 31 | 58 |
| 252 | 324 | 50 | 68 | 86 | 66 | 73 | 35 | 58 |
| 257 | 331 | 43 | 88 | 78 | 69 | 72 | 40 | 60 |
| 262 | 337 | 36 | 83 | 68 | 69 | 68 | 49 | 61 |
| 267 | 343 | 34 | 63 | 58 | 66 | 70 | 64 | 62 |
| 272 | 350 | 33 | 43 | 55 | 64 | 84 | 74 | 63 |
| 277 | 356 | 19 | 24 | 49 | 55 | 77 | 71 | 55 |
| 282 | 363 | 12 | 17 | 40 | 45 | 66 | 70 | 48 |
| 287 | 369 | 19 | 11 | 28 | 40 | 56 | 67 | 44 |
| 292 | 376 | 19 | 8 | 15 | 36 | 35 | 61 | 38 |
| 297 | 382 | 7 | 8 | 11 | 27 | 19 | 59 | 32 |
| 302 | 388 | - | 4 | 11 | 15 | 17 | 59 | 27 |
| 307 | 395 | - | - | 5 | 9 | 14 | 47 | 20 |
| 312 | 401 | - | - | - | 7 | 10 | 33 | 13 |
| 317 | 408 | - | - | - | 5 | 12 | 26 | 11 |
| 322 | 414 | - | - | - | 4 | 9 | 25 | 11 |
| 327 | 420 | - | - | - | 3 | 5 | 26 | 10 |
| 332 | 427 | - | - | - | 1 | 9 | 17 | 6 |
| 337 | 433 | - | - | - | 1 | 12 | 9 | 4 |
| 342 | 440 | - | - | - | 1 | 5 | 7 | 3 |
| 347 | 446 | - | - | - | 1 | - | 4 | 2 |
| 352 | 453 | - | - | - | - | - | 3 | 1 |
| 357 | 459 | - | - | - | 1 | - | 2 | 1 |
| 362 | 465 | - | - | - | 1 | - | 2 | 1 |
| 367 | 472 | - | - | - | 1 | - | 1 | 1 |
| n | | 145 | 136 | 215 | 492 | 107 | 542 | 1637 |

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Table 10. Mean condition factor (K) by weeks and total for Norwegian bluefin tuna catches 1971.

| WEEK NO. | \bar{w} | \bar{l} | K |
|----------|-----------|-----------|------|
| 31 | 232.5 | 176.5 | 1.92 |
| 32 | 241.7 | 176.5 | 2.00 |
| 33 | 248.2 | 176.5 | 2.06 |
| 34 | 254.9 | 176.5 | 2.11 |
| 35 | 264.3 | 176.5 | 2.19 |
| 36 | - | - | - |
| 37 | 280.0 | 176.5 | 2.32 |
| TOTAL | 259.9 | 176.5 | 2.15 |

Table 11. Length frequency distribution in per mille for Norwegian bluefin tuna catches 1971, calculated from weight data by $K = 2.15$.

| LENGTH GROUP CM | ‰ |
|--------------------|------|
| 205-209 | 1 |
| 210-214 | 2 |
| 215-219 | 3 |
| 220-224 | 9 |
| 225-229 | 25 |
| 230-234 | 50 |
| 235-239 | 94 |
| 240-244 | 147 |
| 245-249 | 176 |
| 250-254 | 196 |
| 255-259 | 155 |
| 260-264 | 90 |
| 265-269 | 42 |
| 270-274 | 14 |
| 275-279 | 5 |
| Number caught | 1637 |

Table 12: Spanish bluefin tuna madragues catches (by number of fish);
(the second figure * refers to fish smaller than 50 kg)
at Barbate, Sancti-Petri, Tarifa and La Linea by weeks in
1971 (RODRIGUEZ-RODA, 1971)

(D = pre-spawning fish; R = post-spawning fish)

| Week number | Time | Barbate | Sancti-Petri | Tarifa | La Linea | Total |
|-------------|-----------------------|-------------------|--------------|--------|----------|-------------------|
| 18 | 2. May - 8. May | 25 D | 2 D | - | - | 27 D |
| 19 | 9. May - 15. May | 55 D | - | 2 D | - | 57 D |
| 20 | 16. May - 22. May | 501*2 D | 666 D | 160 D | - | 1 327*2 D |
| 21 | 23. May - 29. May | 115 D | 339 D | 24 D | - | 478 D |
| 22 | 30. May - 5. June | 2 D | - | - | - | 2 D |
| 23 | 6. June - 12. June | 117 D | 49 D | 27 D | - | 193 D |
| 24 | 13. June - 19. June | 1 D | - | - | - | 1 D |
| 25 | 20. June - 26. June | 11*1 D | - | - | - | 11*1 D |
| 26 | 27. June - 3. July | - | - | - | - | - |
| 27 | 4. July - 10. July | - | - | - | - | - |
| 28. | 11. July - 17. July | 4*2 D | - | - | 4 R | 8*2 D*R |
| 29. | 18. July - 24. July | 4 R | - | - | - | 4 R |
| 30. | 25. July - 31. July | 12 R | - | - | 4 R | 16 R |
| 31. | 1. Aug. - 7. Aug. | 102 R | - | - | 6 R | 108 R |
| 32. | 8. Aug. - 14. Aug. | - | - | - | - | - |
| 33. | 15. Aug. - 21. Aug. | 412 R | - | - | 41 R | 453 R |
| 34. | 22. Aug. - 28. Aug. | 96 R | - | - | - | 96 R |
| 35. | 29. Aug. - 4. Sept. | 3 R | - | - | 6 R | 9 R |
| 36. | 5. Sept. - 11. Sept. | 1 R | - | - | - R | 1 R |
| 37. | 12. Sept. - 18. Sept. | - | - | - | - | - |
| | Number caught | 1 461*5= 1 466 | 1056 | 213 | 61 | 2 791*5= 2 796 |
| | Total kg | 327 390 | 232 860 | 46 690 | 9 190 | 616 130 |

Table 13: Weekly size-composition in ‰ (smoothed) of Spanish madrague catches at Barbate in 1971 (D = pre-spawning fish, R = post-spawning fish) (RODRIGUEZ-RODA, 1971)

| Length group | <u>Week number</u> | | | | Total |
|---------------|--------------------|---------|---------|---------|-------|
| | D 23 | R 31 | R 33 | R 34 | |
| 140-144.9 | | | 1 | | 2 |
| 145-149.9 | | | 2 | | 2 |
| 150-154.9 | | | 1 | | 2 |
| 155-159.9 | | | 0 | | 0 |
| 160-164.9 | | | 0 | 8 | 4 |
| 165-169.9 | 5 | | 0 | 16 | 4 |
| 170-174.9 | 9 | | 0 | 16 | 4 |
| 175-179.9 | 9 | 3 | 0 | 16 | 5 |
| 180-184.9 | 11 | 6 | 1 | 16 | 6 |
| 185-189.9 | 37 | 9 | 4 | 28 | 15 |
| 190-194.9 | 73 | 11 | 6 | 49 | 28 |
| 195-199.9 | 99 | 6 | 13 | 65 | 37 |
| 200-204.9 | 122 | 3 | 21 | 80 | 48 |
| 205-209.9 | 126 | 17 | 31 | 88 | 57 |
| 210-214.9 | 119 | 31 | 43 | 84 | 63 |
| 215-219.9 | 103 | 37 | 46 | 81 | 62 |
| 220-224.9 | 73 | 54 | 52 | 77 | 61 |
| 225-229.9 | 46 | 62 | 56 | 93 | 60 |
| 230-234.9 | 44 | 74 | 63 | 113 | 65 |
| 235-239.9 | 53 | 105 | 85 | 81 | 78 |
| 240-244.9 | 32 | 105 | 103 | 41 | 77 |
| 245-249.9 | 18 | 99 | 124 | 28 | 83 |
| 250-254.9 | 16 | 113 | 131 | 16 | 86 |
| 255-259.9 | 5 | 105 | 107 | 4 | 69 |
| 260-264.9 | | 80 | 69 | | 46 |
| 265-269.9 | | 54 | 31 | | 24 |
| 270-274.9 | | 23 | 8 | | 8 |
| 275-279.9 | | 3 | 1 | | 4 |
| <hr/> | | | | | |
| Number caught | 109 | 88 | 210 | 62 | 469 |
| | 1 000 | 1 000 | 1 000 | 1 000 | 1 000 |

Table 16: Age composition, catch and effort, and tag return data for young bluefin tuna in coastal waters between Cape Hatteras, North Carolina, and Cape Ann, Massachusetts, by years, presented by Woods Hole Oceanographic Institution, Cooperative Game Fish Tagging Program

| Years | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971* |
|---------------------------|---|-------|-------|-------|-------|-------|------|-------|-------|-------|
| <u>Ages</u> | <u>Age composition, in percent of samples measured</u> | | | | | | | | | |
| I | 1 | 10 | 17 | 17 | 70 | 9 | 2 | 1 | 7 | 8 |
| II | 6 | 10 | 19 | 55 | 25 | 60 | 63 | 40 | 29 | 46 |
| III | 7 | 27 | 27 | 16 | 5 | 15 | 34 | 47 | 55 | 19 |
| IV | 61 | 21 | 13 | 1 | 0 | 11 | 1 | 8 | 3 | 27 |
| V | 20 | 20 | 15 | 8 | 0 | 5 | 0 | 4 | 5 | - |
| VI | 1 | 9 | 9 | 1 | 0 | 0 | 0 | 0 | 1 | - |
| VII | 1 | 1 | 1 | 2 | 0 | 0 | 0 | - | - | 0 |
| VIII | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | - | 0 |
| IX | - | - | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 |
| X | - | - | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 |
| > X | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N | 3 044 | 5 586 | 2 318 | 1 079 | 3 734 | 1 466 | 946 | 816 | 8 967 | 3 091 |
| Average age | 4.1 | 3.7 | 3.2 | 2.4 | 1.4 | 2.4 | 2.3 | 2.7 | 2.7 | 2.6 |
| <u>Fishery statistics</u> | | | | | | | | | | |
| Tons caught | 3 379 | 5 933 | 6 165 | 2 975 | 875 | 2 556 | 670 | 1 728 | 4 661 | 3 898 |
| Tons/boat day | 10.0 | 9.5 | 6.8 | 7.3 | 4.7 | 13.7 | 7.9 | 18.2 | 16.6 | 11.5 |
| No. of boats | 7 | 17 | 21 | 13 | 6 | 11 | 5 | 4 | 8 | 12 |
| <u>Months at large</u> | <u>Tag returns obtained in percent of releases, by times at large</u> | | | | | | | | | |
| 0 - 5.9 | 0 | 24.1 | 20.4 | 9.0 | 9.6 | 14.2 | 32.4 | 2.4 | 10.9 | 2.3 |
| 6.0-17.9 | 1.3 | 5.2 | 6.9 | 6.7 | 2.0 | 14.0 | 3.1 | 6.2 | 24.2 | 25.4 |
| 18.0-29.9 | 6.7 | 2.0 | 0 | 0 | 0 | 1.9 | 1.1 | 2.1 | 3.1 | 3.3 |
| 30.0-41.9 | 0 | 0 | 1.3 | 0 | 0 | 0 | 0 | 0.1 | 2.1 | 0 |
| <u>Months at large</u> | <u>Percent tag return/ 1,000 tons, by times at large</u> | | | | | | | | | |
| 0 - 5.9 | 0 | 4.0 | 3.3 | 3.0 | 11.0 | 5.5 | 48.4 | 1.5 | 2.3 | .6 |
| 6.0-17.9 | 0.4 | 0.9 | 1.1 | 2.2 | 2.3 | 5.4 | 12.1 | 3.6 | 5.2 | 6.5 |
| 18.0-29.9 | 2.2 | 0.3 | 0 | 0 | 0 | 0.7 | 1.7 | 1.3 | 0.7 | .8 |
| 30.0-41.9 | 0 | 0 | 0.2 | 0 | 0 | 0 | 0 | 0.1 | 0.5 | 0 |

* estimates based on incomplete data. Does not include about 300 tons of giant tuna seined north of Cape Cod.

Table 17: Releases of young bluefin tuna in coastal waters between Cape Hatteras, North Carolina, and Cape Ann, Massachusetts, by years, and returns in percent of releases by region of recapture, and by time at large for local returns. Bay of Biscay returns were after from 11 to 60 months at large. Presented by Woods Hole Oceanographic Institution. Cooperative Game Fish Tagging Program.

| Releases Year | Number | Returns: local, by months at large | | | | | | | Total | Bay of Biscay |
|------------------|--------|------------------------------------|----------|-----------|-----------|-----------|---|------|-------|------------------|
| | | 0-5.9 | 6.0-17.9 | 18.0-29.9 | 30.0-41.9 | 42.0-53.9 | | | | |
| 1954 | 169 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0.6 | 1.2 | |
| 1955 | 215 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 1956 | 58 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 1957 | 34 | 0 | 2.9 | 0 | 0 | 0 | 0 | 2.9 | 0 | |
| 1958 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 1959 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 1960 | 15 | 0 | 0 | 6.7 | 0 | 0 | 0 | 6.7 | 0 | |
| 1961 | 150 | 0 | 1.3 | 2.0 | 1.3 | 0 | 0 | 4.7 | 0 | |
| 1962 | 77 | 0 | 5.2 | 0 | 0 | 0 | 0 | 5.2 | 0 | |
| 1963 | 29 | 24.1 | 6.9 | 0 | 0 | 0 | 0 | 31.0 | 0 | |
| 1964 | 465 | 21.3 | 6.9 | 0 | 0 | 0 | 0 | 28.2 | 0 | |
| 1965 | 672 | 9.8 | 2.9 | 1.9 | 0 | 0 | 0 | 14.5 | 1.1 | |
| 1966 | 959 | 13.4 | 14.4 | 1.3 | 0.2 | 0 | 0 | 29.3 | 0.4 | |
| 1967 | 628 | 15.4 | 9.4 | 2.4 | 2.1 | 0 | 0 | 29.3 | 0.3 | |
| 1968 | 260 | 33.8 | 7.3 | 3.1 | 0 | - | - | 44.2 | 0 | |
| 1969 | 336 | 3.6 | 24.4 | 3.3 | - | - | - | 31.3 | 0 | |
| 1970 | 457 | 10.9 | 25.6 | - | - | - | - | 36.5 | 0 | |
| 1971 | 342 | 3.2 | - | - | - | - | - | 3.2 | 0 | |

Table 18: Size composition of Bluefin Tuna landings at Puerto Rico in $\text{°}/\text{oo}$ (fork length by caliper), taken by the Inter-American Tropical Tuna Commission in 1971

| Length group cm | <u>Month of capture</u> | | Total |
|-----------------------|-------------------------|--------------|--------------|
| | July | August | |
| 50 | 7 | | 5 |
| 55 | 14 | | 10 |
| 60 | 8 | | 6 |
| 65 | 74 | | 56 |
| 70 | 304 | | 228 |
| 75 | 400 | | 299 |
| 80 | 180 | | 136 |
| 85 | 12 | | 12 |
| 90 | 1 | 3 | 4 |
| 95 | 0 | 32 | 11 |
| 100 | | 117 | 30 |
| 105 | | 179 | 45 |
| 110 | | 158 | 40 |
| 115 | | 150 | 37 |
| 120 | | 180 | 37 |
| 125 | | 138 | 34 |
| 130 | | 43 | 10 |
| Number caught | 300 1 000 | 100 1 000 | 400 1 000 |

USA = ITALY = ———
 TURKEY = - - - - - FRANCE = - - - - -
 NORWAY = - - - - - CANADA = ~~~~~
 SPAIN = ——— PUERTO RICO = + + + + +

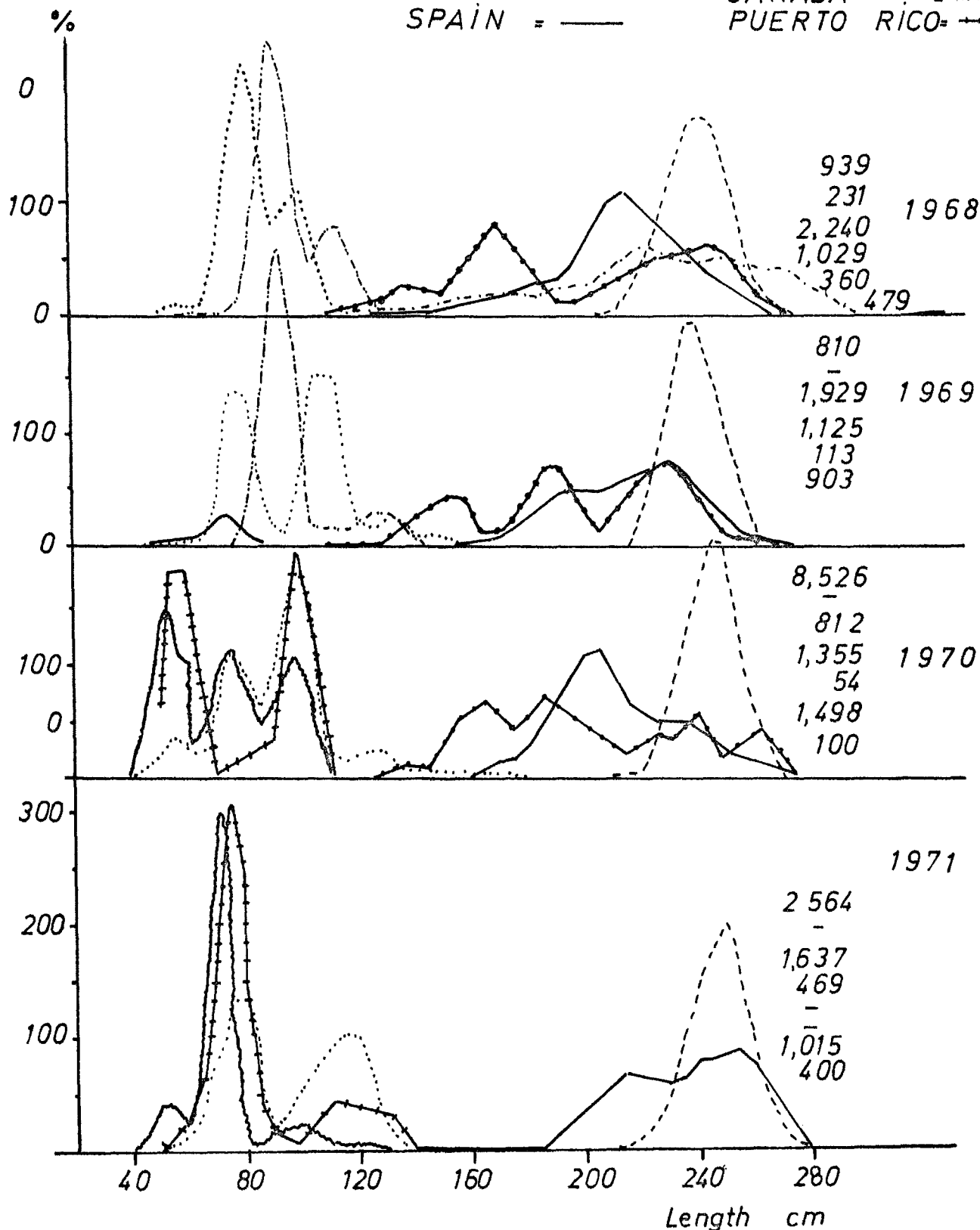


Figure 1. Size composition of bluefin tuna catches made in USA, Turkey, Norway, Spain, Italy, France, Canada and Puerto Rico.

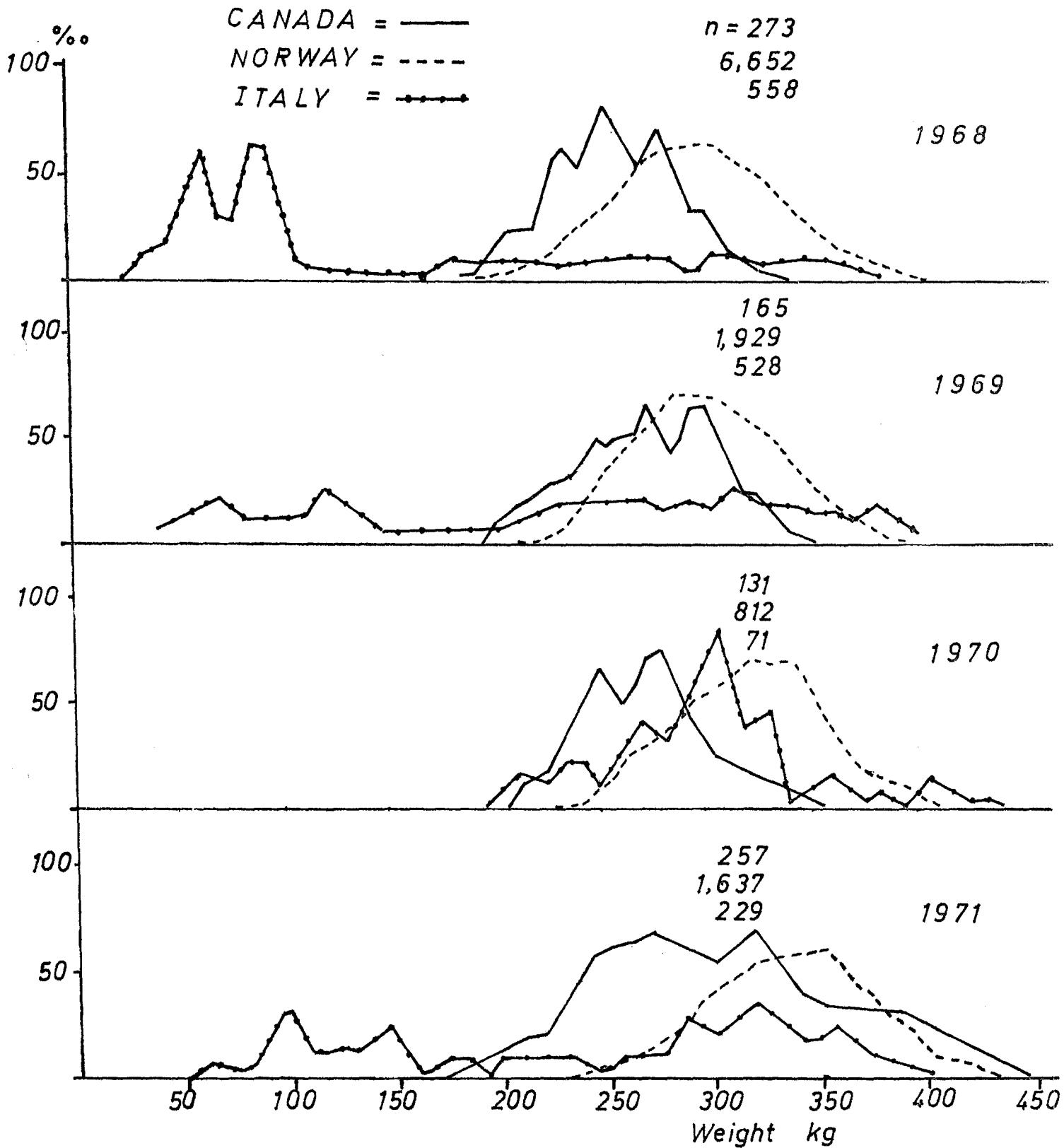


Figure 2. Weight composition of bluefin tuna catches made in Canada, Norway and Italy.