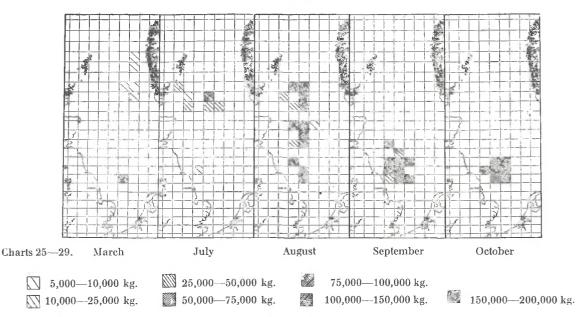
#### Dutch Catches of Trawled Herring.



## Trawl Fisheries.

The catch of herring per 100 hours fishing of the Dutch steam trawlers fishing with the herring trawl is shown in the Charts 25–29.

The distribution of the fleet shows some differences with 1950. In March rather large catches (of spent herring) have been made in the area near Silver Pit.

The mean catches in the months July, August and September have been about the same as in 1950. The mean catches in October were considerably higher than the year before. This depends partly on the differences in the areas where the fleet has been fishing.

The Table 13 B gives the quantity of herring landed by the trawlers and by the whole fleet fishing with trawl-nets. The total quantity landed was much higher in 1951 than in 1950.

L. K. BOEREMA.

## Full-Herring Concentrations exploited by the Belgian Herring Trawlers in 1951.

## 

The first full-herring catch was landed on the 23. July 1951, it came from the Fladen Ground. The herring fishery went on there until September, but from mid-September most trawlers were already active in the central area, viz., the Gut and west of this fishing ground. From October until the beginning of November, the fishery took place still more southerly, especially in the Bruceys Garden and on the western and south-western part of the Dogger Bank. From mid-November until 12. December, the fishery was carried out in the southernmost area of the North Sea, particularly around the lightships "Ruytingen", "Sandettié" and "Dyck".

The numbers of trawlers, voyages etc., catch and value for the years 1946—50 have been summarized in Ann. Biol., Vol. VII, Table 12, p. 139.

Comparing the activity of the herring trawlers with the season 1950, we must admit a slight decrease in 1951. The number of trawlers which have taken part in the campaign fell from 40 to 38; the number of voyages however increased from 213 to 215, whereas the number of H.P. developed-fishing hour decreased from 6,493,488 to 6,277,371, being a decrease of 216,117 H.P. developed-fishing hour, or 3.3%.

The total landings were 5,794 tons against 7,555 in 1950, this means a decrease of 23%.

The average catch per voyage also shows a marked diminution from 35 tons to 27 tons, or 24%.

The average catch per hour's fishing for 100 H.P. developed is also lower, 92 Kg. against 116 Kg. in 1950, being 21% less. This decrease

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# Table 14. Number of Belgian Herring Trawlers (T), of Voyages (V), of Sea-Days (S.D.) and of Effective Fishing Hours (F.H.)

| Fishing         |      |       |          |      | acco     | rdin     | g to   | Clas     | ses   | of Ve | essels | and F   | ishin | g Grou  | nds. |         |     |        |       |        |
|-----------------|------|-------|----------|------|----------|----------|--------|----------|-------|-------|--------|---------|-------|---------|------|---------|-----|--------|-------|--------|
|                 | Clas | s III | Clas     | s IV | Cla      | ss V     | Clas   | s VI     | T     | otal  | Cla    | ass III | Cla   | ass IV  | C    | lass V  | Cla | ass VI | г     | otal   |
| and Months      | T    | V     | T        | V    | T        | v        | T      | v        | Ť     | v     |        | ). F.H. |       | ). F.H. |      | ). F.H. |     |        |       | . F.H. |
| North Sea, Nor  | th   |       |          |      |          |          |        |          |       |       |        |         |       |         |      |         |     |        |       |        |
| July            | _    | -     | 3        | 3    | 3        | 3        | $^{2}$ | <b>2</b> | 8     | 8     |        |         | 36    | 553     | 27   | 329     | 21  | 242    | 84    | 1,124  |
| August          | -    |       | 6        | 7    | 4        | 5        | 4      | 8        | -14   | 20    |        |         | - 77  | 890     | 56   | 621     | 81  | 970    | 214   | 2,481  |
| September .     |      |       | 1        | 1    | 2        | <b>2</b> | 3      | 3        | 6     | 6     |        |         | 12    | 135     | 21   | 316     | 28  | 313    | 61    | 764    |
| Total           | _    |       | 6        | 11   | 7        | 10       | 4      | 13       | 17    | 34    | _      | _       | 125   | 1,578   | 104  | 1,266   | 130 | 1,525  | 359   | 4,369  |
| North Sea, Cen  | tral |       |          |      |          |          |        |          |       |       |        |         |       |         |      |         |     |        |       |        |
| August          |      |       | . 7      | 9    | 4        | 5        | 1      | 1        | 12    | 15    |        |         | 105   | 1,105   | 52   | 569     | 11  | 112    | 168   | 1,786  |
| September .     |      |       | 7        | 13   | 6        | 14       | 4      | 5        | 17    | 32    |        |         | 114   | 1,107   | 131  | 1,257   | 49  | 474    | 294   | 2,838  |
| October         |      |       | 4        | 12   | 8        | 16       | $^{2}$ | 4        | 14    | 32    |        |         | - 99  | 990     | 128  | 1,259   | 31  | 296    | 258   | 2,545  |
| November        |      |       | 3        | 3    | 6        | 6        | 1      | 1        | 10    | 10    |        |         | 31    | 297     | 61   | 677     | 10  | 80     | 102   | 1,054  |
| Total           |      | -     | 9        | 37   | 8        | 41       | 6      | 11       | 23    | 89    |        |         | 349   | 3,499   | 372  | 3,762   | 101 | 962    | 822   | 8,223  |
| North Sea, Sout | th   |       |          |      |          |          |        |          |       |       |        |         |       |         |      |         |     |        |       | 28     |
| November.       | 11   | 42    | 1        | 14   | <b>2</b> | 4        | 1      | <b>2</b> | 18    | 62    | 207    | 1,560   | 49    | 366     | 25   | 229     | 11  | 108    | 292   | 2,263  |
| December        | 9    | 25    | <b>2</b> | 5    |          | -        | -      | -        | 11    | 30    | 95     | 778     | 21    | 94      | _    | _       |     | _      | 116   | 872    |
| Total           | 11   | 67    | 4        | 19   | 2        | 4        | 1      | 2        | 18    | 92    | 302    | 2,338   | 70    | 460     | 25   | 229     | 11  | 108    | 408   | 3,135  |
| Seasonal Total  | 11   | 67    | 12       | 67   | 8        | 55       | 6      | 26       | 37    | 215   | 302    | 2,338   | 544   | 5,537   | 501  | 5,257   | 242 | 2,595  | 1,589 | 15,727 |
| The exercice    | dua  | otion | of a     |      | 0.00 3   |          | 1 90 / | hoo d    | 0.570 | on 79 | 15 6   | ahing h | 01170 |         |      |         |     |        |       |        |

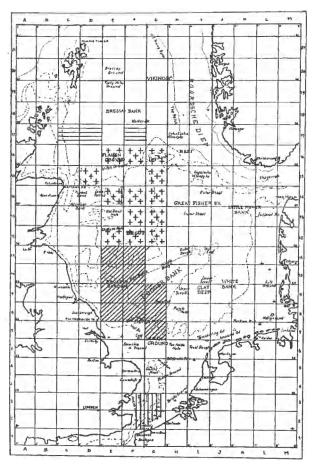
The average duration of a voyage was 7.38 sea-days or 73.15 fishing hours.

denotes that an equal effort produced by the trawlers gave a smaller catch than in 1950. From this we may infer that the herring concentrations exploited by the Belgian fishermen during 1951 were not so dense as during the previous year. However, this conclusion does not apply to the northern area, since the average catch for one hour's fishing for 100 H.P. developed reached a much higher level, 73 Kg. against 64 Kg. in 1950.

The value of the herring catch reached 21.6 mill. fr. being 12% less than in 1950.

## Table 15. Total Weight landed (in 1000 Kg.) and the Average Catch per Voyage (C/V) in 1000 Kg. and per Hour per 100 H.P. (C/H) (in Kg.).

|                             |           | 0               |                   | 1                      |                      |     | · /          |                  | ·   | • /            |                |                |                |                |                |
|-----------------------------|-----------|-----------------|-------------------|------------------------|----------------------|-----|--------------|------------------|---|----------------|----------------|----------------|----------------|----------------|----------------|
| Northern section            | Class III | Class IV        | Class V           | Class VI               | Total                |     | s III<br>C/H |                  | ss IV<br>C/H                                  |                | ass V<br>V C/H |                | ss VI<br>7 C/H |                | otal<br>' C/H  |
| July<br>August<br>September |           | 35<br>180<br>19 | $70 \\ 241 \\ 55$ | $\frac{121}{669}\\271$ | $226 \\ 1090 \\ 345$ |     | 111          | $12 \\ 26 \\ 19$ | $\begin{array}{c} 22 \\ 70 \\ 47 \end{array}$ | 23<br>48<br>28 | 51<br>97<br>48 | 61<br>84<br>90 | 59<br>79<br>99 | 28<br>54<br>58 | 45<br>81<br>80 |
| Total                       | *******   | 234             | 366               | 1061                   | 1661                 |     | _            | 21               | 51  | 37             | 73             | 82             | 80             | 49             | 73             |
| Central section             |           |                 |                   |                        |                      |     |              |                  |   |                |                |                |                |                |                |
| August                      |           | 222             | 212               | 99                     | 533                  |     |              | 25               | 67  | 42             | 93             | 99             | 104            | 36             | 82             |
| September                   |           | 420             | 604               | 420                    | 1443                 |     | _            | 32               | 131   | 43             | 119            | 84             | 120            | 45             | 122            |
| October                     |           | 481             | 699               | 323                    | 1502                 |     |              | 40               | 181   | 44             | 135            | 81             | 176            | 47             | 156            |
| November                    |           | 64              | 114               | 50                     | 228                  |     |              | <b>21</b>        | 72  | 19             | 40             | 50             | 129            | 23             | 56             |
| Total                       |           | 1187            | 1629              | 891                    | 3707                 |     |              | 32               | 118   | 40             | 106            | 81             | 134            | 42             | 116            |
| Southern section            |           |                 |                   |                        |                      |     |              |                  |   |                |                |                |                |                |                |
| November                    | 175       | 63              | 57                | 45                     | 340                  | 4.2 | 51           | 4.5              | 66  | 14             | 57             | 23             | 56             | 5.5            | 55             |
| December                    | 69        | 17              | _                 |                        | 86                   | 3.8 | 49           | 3.3              | 72  |                | -              |                | -              | 2.9            | 52             |
| Total                       | 244       | 80              | 57                | 45                     | 426                  | 4.6 | 50           | 4.2              | 67  | 14             | 57             | 23             | 56             | 4.6            | 54             |
| Seasonal Total.             | 244       | 1501            | 2052              | 1997                   | 5794                 | 3.6 | 50           | 22               | 95  | 37             | 96             | 77             | 96             | <b>27</b>      | 92             |
| Percentage                  | 4.2       | 25.9            | 35.4              | 34.5                   | 100                  | _   | -            | _                | -   | _              |                |                | -              |                |                |
|                             |           |                 |                   |                        |                      |     |              |                  |   |                |                |                |                |                |                |



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July—August

August—September

September—October—November

November-December

Figure 9. Fishing grounds exploited by Belgian herring trawlers in 1951.

### II. Biology.

The material comprises 15 samples of which 7 were from the northern area, mainly the Fladen Ground and Long Forties, and 8 from the central area, Bruceys Garden as well as west and south-west of the Dogger Bank. The former area was fished mostly during August and the latter during September and October.

The average length of the herring was:-

|         | Northern area | Central area | Both areas |
|---------|---------------|--------------|------------|
| in 1951 |               | 261 mm.      | 267 mm.    |
| in 1950 |               | 257 —        | 261 –      |

|           | Total<br>1000 Kg | %    | Per voyage<br>in 1000 Kg. | Per eff. hour<br>per 100 H, P.<br>in Kg. |
|-----------|------------------|------|---------------------------|--|
| July      | 226              | 3.9  | 28                        | 45                                       |
| August    | 1623             | 28.0 | 46                        | 81                                       |
| September | 1788             | 30.9 | 47                        | 111                                      |
| October   | 1502             | 25.9 | 47                        | 155                                      |
| November  | 569              | 9.8  | 8                         | 55                                       |
| December  | 86               | 1.5  | 3                         | 52                                       |
| Total     | 5794             | 100  | 27                        | 92                                       |

The average length increased slightly in the two areas. The average weight is also somewhat higher, 162 gr. against 155 gr.

Comparing the numerical strength of the year-classes observed, we ascertained that the youngest generations (three to six-year-old herrings) although they were already very well represented in the 1950 concentrations were still better represented this year: 68.2% against 61.3%.

The average number of vertebrae for the northern area was 56.62 that for the central area 56.51 and for the two areas 56.55.

## Table 17. Average Numbers of Sea-Days and of Effective Fishing Hours per Voyage.

|          | Sea-days | Fishing hours |
|----------|----------|---------------|
| Northern | 10.6     | 128.5         |
| Central  | 9.2      | 92.4          |
| Southern | 4.4      | 34.1          |

The average number of vertebrae of the herrings, which during August belonged to the maturity stages I to III, and which we consider to be spring spawners, was 56.81 and for those with maturity stages IV to VIII—II + stages I to III from September, considered to be autumn spawners, 56.51.

The spring spawners represented 34.5% of the catch in the northern area; they are totally missing in the catches from the central area. This result corroborates once more the fact

## Table 18. Total Seasonal Weight in 1951.

|               | Weight<br>(1000 Kg.) | Percentage |
|---------------|----------------------|------------|
| Herring       | 5794                 | 89.5       |
| Mackerel      | 334                  | 5.2        |
| Demersal fish | 344                  | 5.3        |
| Shellfish     | 2                    | 0.04       |
| Total         | 6474                 | 100        |

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## Table 19. Full Herring. Length, Weight, Sex, Maturity, Fat Content, and Age (Percentages).

A. Centimetre Class, Mean Length (cm.), Average Weight (gr.), and Sex (Percentages).

|          |     |     |     |     |     | Centir | netre C | lasses    |      |      |      |     |     |      | Aver.  | Males |
|----------|-----|-----|-----|-----|-----|--------|---------|-----------|------|------|------|-----|-----|------|--------|-------|
|          | 19  | 20  | 21  | 22  | 23  | 24     | 25      | <b>26</b> | 27   | 28   | 29   | 30  | 31  | Mean | Weight |       |
| Northern |     |     |     |     | 0.3 | 1.8    | 11.2    | 19.2      | 22.0 | 29.7 | 11.5 | 4.0 | 0.3 | 27.6 | 179    | 52    |
| Central  | 0.2 | 0.3 | 0.3 | 0.9 | 6.4 | 11.0   | 24.8    | 26.7      | 18.2 | 7.0  | 3.7  | 0.3 | 0.2 | 26.1 | 151    | 48    |
| Total    | 0.1 | 0.2 | 0.2 | 0.6 | 4.0 | 7.5    | 19.6    | 23.9      | 19.6 | 15.7 | 6.7  | 1.7 | 0.2 | 26.7 | 162    | 50    |

B. Stages of Maturity and Quantity of Mesenteric Fat.

|           |  | Quantity of Fat                           |  |      |      |      |         |  |             |  |              |
|-----------|--|---|--|------|------|------|---------|--|-------------|--|--------------|
|           | I  | II  | 111                                      | IV   | v    | VI   | VIII-II | 0  | 1           | +  | M            |
| Northern. | 4.0                                      | 2.8                                       | 27.7                                     | 38.7 | 26.8 |      | -       | 3.5  | 24.5        | 38.5                                     | 33.5         |
| Central   | 2.2                                      | 3.4                                       | 5.9                                      | 23.1 | 36.8 | 16.8 | 11.8    | 23.8                                       | 39.4        | 25.9                                     | 10.9         |
| Total     | 2.9                                      | 3.2                                       | 14.2                                     | 29.1 | 33.0 | 10.3 | 7.3     | 16.0                                       | 33.7        | 30.8                                     | 19.5         |
| 1. group  | $\begin{array}{c} 11.6\\ 1.6\end{array}$ | $\begin{array}{c} 8.0 \\ 2.4 \end{array}$ | $\begin{array}{c} 80.4\\ 4.2\end{array}$ |      |      | 11.9 | 8.4     | $\begin{array}{c} 0.7 \\ 18.3 \end{array}$ | 0.7<br>38.7 | $\begin{array}{c} 17.4\\32.8\end{array}$ | 81.2<br>10.2 |

C. Distribution of Year-Classes and Age-Groups.

| Number  | of Herrings  | with | readable | scales · 233 |  |
|---------|--------------|------|----------|--------------|--|
| NHHHOEF | or rierrings | WILL | reauane  | scales: Zoo. |  |

|              |      | 1    | vumber 0 | r nenng | 5 WILLIED | iuanie sta | ucs. 200. |      |             |           |       |
|--------------|------|------|----------|---------|-----------|------------|-----------|------|-------------|-----------|-------|
| Winter-Rings | 2    | 3    | 4        | 5       | 6         | 7          | 8         | 9    | +           |           |       |
| Age (Years)  |      | 4    | 5        | 6       | 7         | 8          | 9         | 10   | +           | Numb      | er of |
| Year-Classes | 1948 | 1947 | 1946     | 1945    | 1944      | 1943       | 1942      | 1941 | Before 1941 | l Samples | Fish  |
| Northern     | 2.4  | 10.6 | 20.0     | 20.0    | 15.3      | 9.4        | 7.0       | 8.2  | 7.1         | 7         | 400   |
| Central      | 4.0  | 19.6 | 36.5     | 16.9    | 5.4       | 3.4        | 6.8       | 4.0  | 3.4         | 8         | 644   |
| Total        | 3.4  | 16.3 | 30.5     | 18.0    | 9.0       | 5.6        | 6.9       | 5.6  | 4.7         | 15        | 1044  |

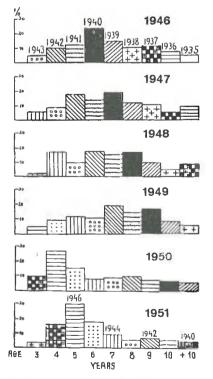


Figure 10. Biological Scale of the Full-Herring Concentrations exploited by the Belgian Herring Trawlers during the years 1946—1951.

that the spring spawners penetrate the central area of the North Sea only in small numbers.

In 1950, the spring spawners represented 41.4% of the catch from the northern area.

As is normal, the average number of keeled scales was somewhat higher for the autumn spawners than for the spring spawners, or respectively 14.70 and 14.67.

#### **Stomach Contents.**

Among the 1,044 stomachs examined only 81, or 7.8%, were found to have some contents: 17, or 1.6%, full; 32, or 3.1%, half-full and 32, or 3.1%, a quarter full.

The contents observed consisted for the greater part of copepods and smaller quantities of schizopods.

### III. Forecasts for the Full-Herring Campaign 1952.

If we analyse the composition of the last fished full-herring concentrations (1951), we ascertain that the three-year-old herrings (yearclass 1948), which joined the full-herring concentrations for the first time, were only very poorly represented (3.4%). On the other hand, the five-year-old herrings (year-class 1946) were exceptionally well represented (30.5%). The four-year-olds (year-class 1947) and the

Table 20. Full Herring. Average Length and Average Value of  $L_1$  of each Year-Class.

|          |      |      | -      |        | ~      |        |      |      |   | -    |      |         | -      |        |        |      |      |      |
|----------|------|------|--------|--------|--------|--------|------|------|---|------|------|---------|--------|--------|--------|------|------|------|
|          |      | 1    | Length | ı of Y | ear-Cl | asses, | em.  |      |   |      |      | $L_1 o$ | f Year | -Class | es, in | mm.  |      |      |
| Born in: |      |      |        |        |        |        |      |      | ĺ | 1948 | 1947 | 1946    | 1945   | 1944   | 1943   | 1942 | 1941 | Mean |
| Age:     | 3    | 4    | 5      | 6      | 7      | 8      | 9    | 10   | Ł |      |      |         |        |        |        |      |      |      |
| Northern | 23.9 | 26.3 | 26.8   | 27.2   | 28.0   | 28.6   | 28.1 | 28.5 | 1 | 100  | 110  | 114     | 108    | 114    | 133    | 112  | 115  | 114  |
| Central  | 24.3 | 25.8 | 26.5   | 27.2   | 27.6   | 27.6   | 27.6 | 28.5 |   | 119  | 116  | 108     | 112    | 101    | 108    | 107  | 110  | 111  |
| Total    | 24.2 | 25.9 | 26.6   | 27.2   | 27.9   | 28.2   | 27.8 | 28.5 | T | 114  | 115  | 109     | 110    | 109    | 123    | 109  | 113  | 112  |

six-year-olds (year-class 1945) were well represented (16.3% and 18.0% respectively).

Relying upon the above-mentioned percentages, we may expect that the 1948 year-class will not be well represented in the next nor in the later concentrations, whereas the 1947, 1946 and 1945 year-classes will always assure a large share until they reach an old age.

However, to infer from this that the coming season will yield large catches, would be to judge prematurely.

As is being constantly pointed out, good catches do not depend solely on the density of the concentrations, but rather upon the weather and hydrological conditions, which occur during the campaign. Also, it would not be the first time that the exploitation of the concentrations was adversely affected by them and in this way belie the favourable forecasts of a campaign.

In consequence, it is only if the weather and the hydrological conditions affect the exploitation favourably that we may expect, in 1952, a satisfactory full-herring season.

Ch. Gilis.

## Spent-Herring Concentrations on the Belgian and French Coasts, 1951-52.

## A. Fishery.

I. Period, Fishing Grounds and Methods.

The spent-herring season 1951-52 was of longer duration than the previous one. The

first catches were landed on 12. December 1951 and the last on 29. February 1952. During this period there were 61 days of sale, viz., 18 in December, 21 in January and 22 in February. The previous campaign started 6 days earlier, but finished also a month sooner (from 6. Dec. till 27. Jan.) and counted only 42 days of sale.

As in 1950—51, it was only at the beginning of the season that dense spent-herring concentrations were to be found in the Belgian territorial waters. As from January, the spentherring left once and for all the Belgian waters and from then onwards the Belgian trawlers were active in the areas between the lightvessels "Ruytingen" and "Dyck" as well as in areas further north.

Concerning the fishing methods, it must be mentioned, that in contrast with the previous season, the fishery with the "bull-net" again met with great success and this time both among the largest and the smallest trawlers.

## II. Activity of the Herring Fleet and Catch.

A total of 52 trawlers took part in the spentherring campaign 1951—52, or 15 less than during the previous season:—

|       | Nun     | nber    |                         |           |
|-------|---------|---------|-------------------------|-----------|
| Class | 1950-51 | 1951-52 | Туре                    | H.P.      |
| I     | 13      | 6       | shrimp boats            | 79        |
| II    | 21      | 8       | coastal trawlers        | 80-119    |
| III   | 27      | 29      | medium-sized trawlers . | 120 - 239 |
| IV    | 6       | 9       | small deep-sea trawlers | 240 - 300 |

Table 21. Full Herring. Racial Characters. Percentage Distribution and Means.

| Number of Vertebrae <sup>1</sup> ) |     |  |                |     |     |         |   | Number of K <sub>2</sub> |            |              |                         |                |   |   |   |                |
|------------------------------------|-----|--|----------------|-----|-----|---------|---|--------------------------|------------|--------------|-------------------------|----------------|---|---|---|----------------|
| Origin                             | 55  | 56   | 57             | 58  | 59  | Average |   | 11                       | 12         | 13           | 14                      | 15             | 16  | 17                                      | 18  | Average        |
| Northern                           | 2.3 | 41.9                                       | 47.7           | 7.9 | 0.2 | 56.62   |   |                          | 0.2        | 5.8          | 35.5                    | 44.5           | 11.5                                      | 2.3                                     | 0.2                                       | 14.69          |
| Central                            | 5.8 | 41.2                                       | 49.0           | 4.0 |     | 56.51   |   | 0.2                      | 0.2        | 6.3          | 34.1                    | 44.1           | 13.5                                      | 1.1                                     | 0.5                                       | 14.69          |
| Tota1                              | 4.4 | 41.5                                       | 48.5           | 5.5 | 0.1 | 56.55   |   | 0.1                      | 0.2        | 6.1          | 34.7                    | 44.3           | 12.7                                      | 1.5                                     | 0.4                                       | 14.69          |
| 1. group<br>2. group               |     | $\begin{array}{c} 30.2\\ 43.2 \end{array}$ | $52.9 \\ 47.8$ |     | 0.7 |         | - | 0.1                      | 0.7<br>0.1 | $8.7 \\ 5.7$ | $\substack{31.2\\35.2}$ | $44.2 \\ 44.3$ | $\begin{array}{c} 13.0\\ 12.7\end{array}$ | $\begin{array}{c} 1.5\\ 1.6\end{array}$ | $\begin{array}{c} 0.7 \\ 0.3 \end{array}$ | 14.67<br>14.69 |

<sup>1</sup>) The census for the vertebrae covered 1,044 spines, of which there were 27, or 2.59%, with one or more fused vertebrae. These spines have been eliminated from our material.