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## Results of groundfish survey on Baffin Island Shelf (ICNAF Statistical Division 0B)

by

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I - Introduction.

From 16 September to 23 October a groundfish survey was carried out on board the R/V "Cryos" on the Baffin Island Shelf (ICNAF Statistical Area 0 B). In a preceding note (MINET, FOREST, PERODOU, 1977), biological data on Pandalus borealis KRØYER 1838 were presented, and this paper deals with informations on distribution, abundance and minimum trawable biomass estimates of the main commercial species of fishes caught during the survey.

II - Material and methods.

During the cruise a stratified random method of surveying was applied, using a stratification scheme set up on the canadian chart n° 7011 (MINET, FOREST, PERODOU, this meeting). Strata 024 and 025 were not sampled due to the depth and the roughness of the bottom (fig. 1, Tabl. I).

Fishes were sampled using a Lofoten research bottom trawl, during daylight hours, at standard 30 minutes haul stations, with towing speed of 3.5-4 knots. This gear has the following specifications : 31.2 m headline, 17.7 m footrope, 140 mm mesh in the wings and body, 50 mm mesh in the codend.

A total of 64 stations were occupied with this trawl but only 62 were usable for computation.

The stock size estimates and minimum trawable biomass were calculated from the mean catches in number and weight in each individual stratum using the swept area method.

So, the minimum biomass  B  for each species is given by :

$$B = \sum B_h = \sum \overline{Y}_h \frac{N_h}{b}$$

$B_h$ = minimum  trawable biomass in the stratum  h

$\overline{Y}_h$ = mean yield in the stratum  h

$N_h$ = surface of the stratum  h

b   = mean area swept per tow (0.015 square Nautical mile).

The variance of this estimate is given by :

$$s_B^2 = \sum \frac{N_h^2}{b^2} \frac{s_h^2}{n_h}$$

where :

$s_h^2$ = variance of yields in the stratum  h

$n_h$ = number of tows in the stratum  h.

III - Results.

Data on total catches for main commercial species are included in tables II and following.

1. Greenland halibut (tabl. III).

This species occurs on the whole surveyed area and it is the most abundant with nearly  2.4 metric tons caught.

Highest mean numbers are obtained at depth of 100-150 fath. and 150-200 fath. (respectively 136 and 163/half-hour), and they are much lower between 200 and 700 fath. depth. However, the yields in weight are roughly constant, which means that fishes caught are larger in deep water than in shallow water.

The biomass, minimum in shallow water, increases with depth to reach a maximum between 200-300 fath. depth (23,800 metric tons) and then decreases.

The minimum trawable biomass is estimated close to 78,000 metric tons for the whole area surveyed.

2. Redfish (tabl. IV).

The Atlantic Redfish is the second species in the commercial catches of the R/V "Cryos" in weight as well as in number.

The best catches in number and weight were obtained in
strata 020 (120 kg/half-hour), 021 (89 kg/half-hour) and 026 (142 kg/
half-hour).

The mean yields in number and weight are increasing with
depth with a maximum between 200 and 300 fath. depth and then they
are decreasing. However, the mean weight of individual fish increases
with the depth.

In the same way, the biomass is maximum between 200 and 300
fath. depth (19,700 metric tons) and the minimum trawable biomass is
estimated close to 35,000 metric tons for the whole area.

3. Polar cod (tabl. V).

This species is the most important in number with 13,463
specimens caught, but the bulk of them was fished during only one set
(stratum 012, 980 kg/half-hour).

Only few specimens occur in the catches between 100 and
300 fath. depth, and they are absent in the deep sets.

The minimum trawable biomass is maximum between 100-150
fath. depth, and is estimated close to 43,300 metric tons for the
whole area surveyed. However, the standard error of this estimate
is very high : Polar cod is more a pelagic than a benthic species
and its catch by a bottom trawl in large quantities is only occa-
sional.

4. Wolffishes (tabl. VI).

They occur on the whole area surveyed, but are not
numerous. The mean yields in weight are maximum between 100-150
fath. depth (11.5 kg/half-hour), and roughly constant in deeper
water.

The minimum trawable biomass is estimated close to
10,000 metric tons, with 5,000 metric tons between 100-150 fath.
depth.

5. Roundnose grenadier (tabl. VII).

The Roundnose grenadier is absent in the catches of
the R/V "Cryos" between 100-200 fath. depth, and is very scarce
between 200-300 fath. depth. Then, the mean yields in weight and
number increase with the depth, and the best yields are obtained in
strata 016 (26 kg/half-hour) and 018 (35 kg/half-hour).

The minimum trawable biomass is maximum between 500 and 700 fath. depth (3,000 metric tons), but this species is also present in deeper water, and only a part of the stock was actualy sampled during the cruise. So, the minimum trawable biomass estimated for the whole area surveyed (5,000 metric tons) is underestimated.

6. Roughhead grenadier (tabl. VIII).

This species occur on the whole area surveyed, except in strata 01, 02, 04 and 011. Best yields in weight are obtained in strata 013 (37 kg/half-hour) and 020 (10 kg/half-hour).

There is no obvious relation between mean yields in number and depth, but the mean catches in weight decrease in deeper water, so the trawable biomass is maximum between 100-150 fath. depth and decreases between 300-700 fath. depth.

The minimum trawable biomass is estimated close to 5,000 metric tons for statistical area 0 B.

7. Other commercial species.

Other commercial species were caught during the R/V "Cryos" cruise, but in smaller quantities ; they are mainly american plaice and skates.

For american plaice, mean yields in number and weight are maximum between 100-150 fath. depth and then decrease. The minimum trawable biomass is estimated close to 4,000 metric tons for the whole area.

Skates occur in most strata between 100 and 500 fath. depth and are absent between 500-700 fath. depth. The trawable biomass reachs a maximum between 100-150 fath. depth (732 metric tons) and decreases. It is estimated close to 1,600 metric tons for the whole area surveyed.

IV - Discussion.

This study provides some data on distribution and abundance of commercial fishes caught during the R/V "Cryos" cruise in October 1977. Minimum trawable biomass are also somputed by swept area method. Due to the well known limits of this method, these estimates have to be considered more as coefficients which are independant of the area swepted by the trawl than as actually values of the biomass.

## References

MINET (J.P.), FOREST (A.) and PERODOU (J.B.), 1977.- New biological
data on the shrimp, Pandalus borealis, in the Baffin island
waters (ICNAF Statistical Area O). ICNAF Res. Doc. 77/XI/70,
16 p.


MINET (J.P.), FOREST (A.) and PERODOU (J.B.), 1978.- Stratification
scheme for ICNAF Statistical Area O. This meeting.

Table I.  List of strata areas and trawling station numbers for
Statistical Division ØB (R/V "Cryos" groundfish survey,
16 September-23 October 1977).

| Depth range (fm) | Stratum No. | Number of sets | Area (sq nautical miles) | Total   area |
|---|---|---|---|---|
| 100 | 011 | 1 | 630 | 630 |
| 100-150 | 01 | 2 | 536 | |
| | 02 | 1 | 1282 | |
| | 012 | 3 | 1914 | 6314 |
| | 013 | 2 | 1390 | |
| | 019 | 2 | 1192 | |
| 150-200 | 03 | 3 | 1136 | |
| | 07 | 1 | 1336 | |
| | 08 | 4 | 1666 | |
| | 09 | 3 | 1524 | 7728 |
| | 014 | 2 | 560 | |
| | 020 | 2 | 1114 | |
| | 025 | 0 | 392 | |
| 200-300 | 04 | 2 | 742 | |
| | 06 | 3 | 1252 | |
| | 010 | 2 | 660 | |
| | 015 | 2 | 824 | 7648 |
| | 021 | 5 | 2270 | |
| | 026 | 3 | 1900 | |
| 300-500 | 05 | 2 | 450 | |
| | 016 | 3 | 1106 | |
| | 017 | 3 | 1208 | 5930 |
| | 022 | 2 | 818 | |
| | 027 | 5 | 2348 | |
| 500-700 | 018 | 2 | 1430 | 2054 |
| | 023 | 2 | 624 | |
| 700-900 | 024 | 0 | 1712 | 1712 |
| TOTAL | | 62 | 32016 | 32016 |

Table II.  Total weight (kg) and number caught for main commercial species during the
R/V "Cryos" groundfish survey in ICNAF Statistical Division ØB.

| Scientific name | Common name | Total catches | |
| --- | --- | --- | --- |
| | | W (kg) | N |
| Raja sp. | Skates | 37 | 125 |
| Boreogadus saida | Polar cod | 993 | 13463 |
| Gadus morhua | Atlantic cod | 7 | 6 |
| Macrourus berglax | Roughhead grenadier | 139 | 393 |
| Coryphaenoides rupestris | Roundnose grenadier | 175 | 418 |
| Anarhichas sp. | Wolffishes | 305 | 54 |
| Sebastes m. mentella | Redfish | 1029 | 8983 |
| Sebastes m. marinus | Redfish | 19 | 9 |
| Hippoglossoides platessoides | American plaice | 94 | 266 |
| Hippoglossus hippoglossus | Atlantic halibut | 4 | 2 |
| Reinhardtius hippoglossoides | Greenland halibut | 2348 | 4693 |

**Table III.** Greenland halibut: mean yields in number and weight (kg/half hour) and minimum trawable biomass estimates (metric tons) for each stratum, group of strata and for the whole area surveyed during the R/V "Cryos" groundfish survey (16 September-23 October 1977, Statistical Division (BB).

$X_h$, $S_h$ : mean yield in number and standard deviation in the stratum h;

$X$, $S$ : mean yield in number and its standard error in a group of strata;

$Y_h$, $S_h$ : mean yield in weight and standard deviation in the stratum h;

$Y$, $S$ : mean yield in weight (kg/half hour) and its standard error in a group of strata;

$B_h$, $SB_h$ : minimum trawable biomass estimated and its standard error in the strata h;

$B$, $SB$ : minimum trawable biomass estimated and its standard error in a group of stratum.

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| Depth (fath) | 100 | 100-150 | | | | | 150-200 | | | | | | 200-300 | | | | | | | 300-500 | | | | 300-700 | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stratum number | 011 | 01 | 02 | 012 | 013 | 019 | 03 | 07 | 08 | 09 | 014 | 020 | 06 | 010 | 015 | 021 | 026 | 05 | 016 | 017 | 022 | 027 | 018 | 023 | |
| $X_h$ | 18.0 | 45.5 | 187.0 | 83.0 | 239.0 | 86.5 | 174.7 | 285.0 | 250.3 | 92.7 | 24.0 | 43.0 | 141.0 | 87.5 | 31.5 | 12.8 | 18.0 | 30.0 | 40.3 | 21.3 | 6.5 | 5.4 | 40.5 | 10.5 | 86.9 |
| $S_h$ | | 54.4 | | 49.7 | 15.6 | 61.5 | 93.2 | | 213.4 | 113.1 | 7.1 | 4.2 | 167.2 | 33.2 | 13.4 | 13.0 | 15.1 | 19.8 | 31.8 | 26.6 | 0.7 | 5.0 | 3.5 | 14.9 | 8.7 |
| $X$ | 18.0 | | | 135.9 | | | | | 161.4 | | | | | | 47.6 | | | | | 97.2 | | | 31.4 | | |
| $S$ | 18.0 | | | 12.8 | | | | | 29.0 | | | | | | 15.7 | | | | | 4.8 | | | 3.6 | | |
| $Y_h$ (kg/half hour) | 3.0 | 11.3 | 40.0 | 44.0 | 41.5 | 21.5 | 20.7 | 38.0 | 30.5 | 30.0 | 12.0 | 39.5 | 44.3 | 124.0 | 37.5 | 34.8 | 33.3 | 38.0 | 96.7 | 49.0 | 12.0 | 12.2 | 50.3 | 16.0 | 37.5 |
| $S_h$ | | 16.3 | | 25.4 | 9.2 | 5.0 | 9.6 | | 11.4 | 30.4 | 1.4 | 2.1 | 20.3 | 86.3 | 31.8 | 37.3 | 16.5 | 25.3 | 84.7 | 77.9 | 4.2 | 6.7 | 2.1 | 22.6 | 3.7 |
| $Y$ (kg/half hour) | | | | 35.6 | | | | | 33.2 | | | | | | 45.4 | | | | | 36.6 | | | 47.0 | | |
| $S$ | | | | 4.8 | | | | | 4.0 | | | | | | 8.3 | | | | | 13.4 | | | 5.0 | | |
| $B_h$ (metric tons) | 190 | 423 | 3517 | 5777 | 3957 | 1758 | 1611 | 3482 | 3485 | 3136 | 461 | 4547 | 3807 | 5614 | 2120 | 5419 | 4344 | 1173 | 7334 | 3729 | 673 | 1965 | 5934 | 685 | 77500 |
| $SB_h$ (metric tons) | 190 | 422.8 | | 1922 | 619.7 | 286.2 | 432.3 | | 690.6 | 1831.6 | 38.4 | 114.6 | 1004.4 | 2761.5 | 1271.7 | 2595.8 | 1241.7 | 555.6 | 3885.7 | 3728.7 | 168.3 | 484.2 | 147.1 | 684.8 | 7605.5 |
| $B$ (metric tons) | 190 | | | 15432 | | | | | 16722 | | | | | | 23823 | | | | | 14874 | | | 6619 | | |
| $SB$ (metric tons) | 190 | | | 2125.9 | | | | | 2041.5 | | | | | | 4359.4 | | | | | 5438.1 | | | 700.5 | | |

**Table IV.** Redfish: see Table III for legend and symbols.

| Depth (fath) | 100 | 100-150 | | | | | 150-200 | | | | | | 200-300 | | | | | | | 300-500 | | | | 300-700 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stratum number | 011 | 01 | 02 | 012 | 013 | 019 | 03 | 07 | 08 | 09 | 014 | 020 | 04 | 06 | 010 | 015 | 021 | 026 | 05 | 016 | 017 | 022 | 027 | 018 | 023 | |
| $Z_h$ | 2.0 | | | 0.7 | 211.0 | | 35.0 | 1.0 | 243.0 | 34.3 | 238.0 | 1135.5 | 7.5 | 91.3 | 182.0 | 129.0 | 312.8 | 477.0 | | 77.7 | 15.0 | 120 | 38.6 | 2.0 | 2.0 | 143.3 |
| $S_d$ | | | | 1.15 | 130.1 | | 31.2 | | 220.5 | 14.5 | 179.6 | 1160.2 | 4.5 | 109.1 | 254.6 | 86.3 | 342.5 | 436.0 | | 49.1 | 24.3 | 165.5 | 29.6 | 1.4 | 2.8 | 38.2 |
| $X$ | | | | 46.7 | | | | | 258.5 | | | | | | 256.6 | | | | | 49.4 | | | | 2.0 | | |
| $S$ | 2.0 | | | 20.3 | | | | | 129.6 | | | | | | 79.8 | | | | | 18.0 | | | | 0.9 | | |
| $Y_h$ (kg/half hour) | 0.5 | | | 0.2 | 15.5 | | 0.7 | 0.5 | 11.8 | 1.7 | 24.0 | 74.0 | 1.0 | 2.0 | 36.5 | 16.5 | 43.4 | 74.3 | | 19.0 | 4.7 | 28.5 | 9.2 | 0.5 | 0.5 | 16.8 |
| $S_h$ | | | | 0.3 | 19.1 | | 0.6 | | 12.5 | 0.6 | 26.9 | 65.1 | 0.0 | 10.4 | 51.6 | 13.4 | 34.5 | 58.6 | | 13.5 | 8.1 | 37.5 | 6.9 | 0.0 | 0.7 | 3.3 |
| $Y$ (kg/half hour) | | | | 3.5 | | | | | 16.3 | | | | | | 37.5 | | | | | 12.1 | | | | 0.5 | | |
| $S$ | 0.5 | | | 1.0 | | | | | 7.3 | | | | | | 10.2 | | | | | 4.2 | | | | 0.2 | | |
| $B_h$ (metric tons) | 21.6 | | | 22.3 | 1477.8 | | 52.2 | 45.8 | 1342.7 | 174.5 | 921.9 | 5654.5 | 50.9 | 601.1 | 1652.4 | 932.6 | 6757.6 | 9687.1 | | 1441.4 | 387.0 | 1599.1 | 1481.7 | 49.0 | 21.4 | 34374.7 |
| $SB_h$ (metric tons) | 21.6 | | | 21.4 | 1287.1 | | 25.8 | | 715.8 | 37.7 | 729.8 | 3515.0 | 0.0 | 515.3 | 1652.4 | 336.9 | 2402.4 | 4410.8 | | 592.5 | 386.7 | 1486.9 | 494.8 | 0.0 | 21.4 | 6841.3 |
| $B$ (metric tons) | 21.6 | | | 1500.1 | | | | | 8191.7 | | | | | | 19681.7 | | | | | 4909.2 | | | | 70.4 | | |
| $SB$ (metric tons) | 21.6 | | | 1287.3 | | | | | 1685.4 | | | | | | 5319.6 | | | | | 4710.4 | | | | | | |

Table V.  Polar cod:   see Table III for legend and symbols.

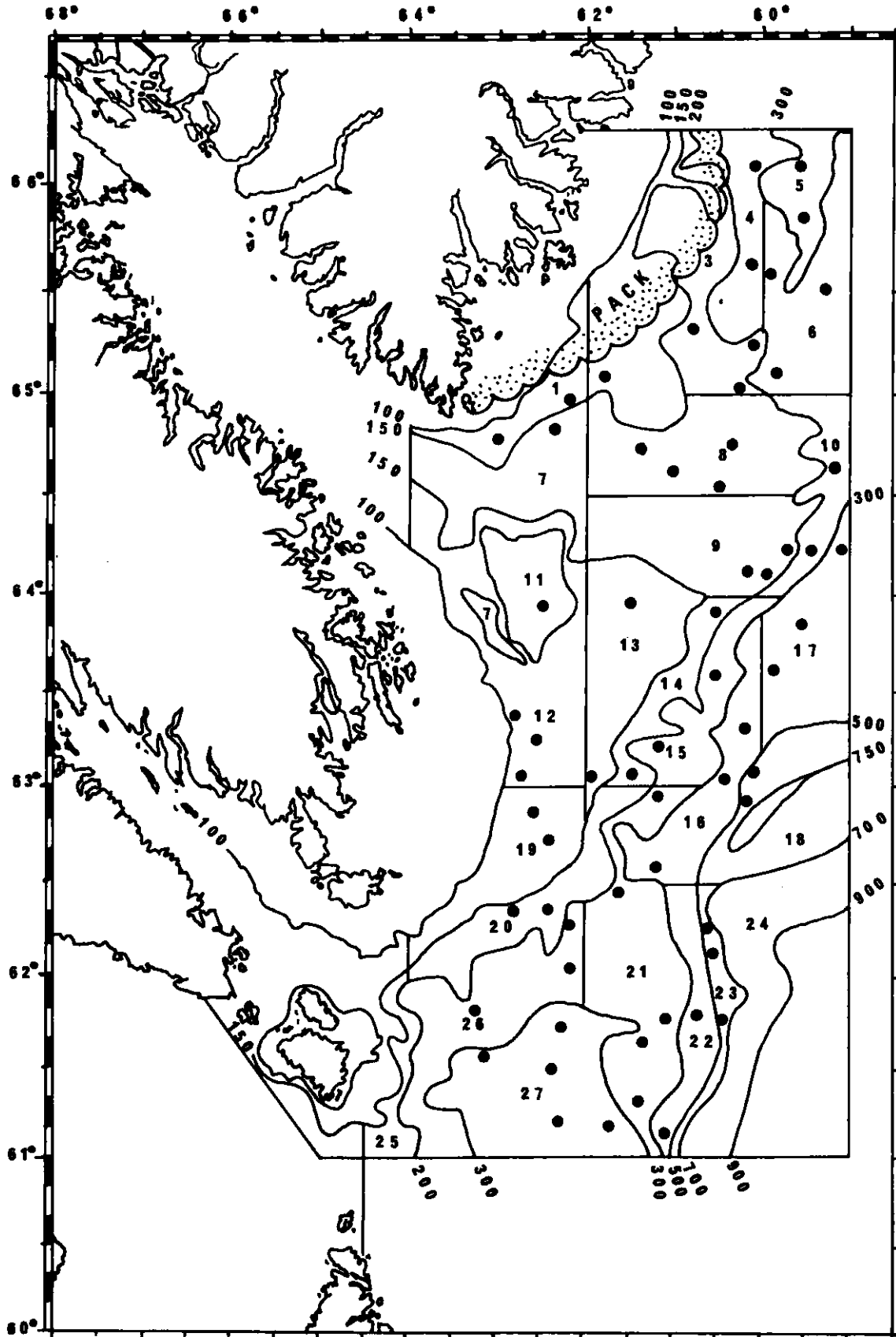Table VI.  Wolffishes:   see Table III for legend and symbols.

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Fig. 1.  Location of trawling stations during the R/V "Cryos" groundfish survey
(16 September-23 October 1977) in ICNAF Statistical Division ØB.

Table VII. Roundnose grenadier: see Table III for legend and symbols.

**Per-stratum values (columns = stratum number, grouped by depth in fathoms)**

| Statistic | 100: 011 | 100–150: 013 | 100–150: 019 | 200–300: 021 | 300–500: 016 | 300–500: 017 | 300–500: 022 | 300–500: 027 | 500–700: 018 | 500–700: 023 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\bar{x}_h$ | | 34.5 | 1.5 | 4.6 | 38.7 | 15.0 | 12.5 | 0.6 | 65.0 | 38 | 12.8 |
| $s_h$ | | 48.8 | 2.1 | 9.2 | 42.2 | 22.6 | 14.9 | 0.9 | 29.7 | 45.3 | 3.2 |
| $\bar{y}$ (kg/half hour) | | 18.5 | 1.5 | 3.4 | 14.0 | 6.3 | 10.0 | 0.4 | 23.0 | 14.5 | 5.2 |
| $s_h$ | | 26.2 | 2.1 | 7.1 | 10.8 | 10.1 | 11.3 | 0.6 | 17.0 | 17.7 | 1.5 |
| $B_h$ (metric tons) | | 1763.9 | 122.6 | 529.4 | 1062.1 | 524.5 | 561.1 | 64.4 | 2256.0 | 620.6 | 5618.1 |
| $s_{B_h}$ (metric tons) | | 1763.9 | 122.6 | 491.4 | 473.8 | 483.9 | 448.9 | 39.5 | 1177.0 | 535.0 | 1604.6 |

(Strata 01, 02, 012 in 100–150; 07, 08, 09, 014, 020 in 150–200; 06, 010, 015, 026 in 200–300; 05 in 300–500 — blank.)

**Per-depth-range values**

| Depth (fath) | $\bar{x}$ | $s$ | $\bar{y}$ (kg/half hour) | $s$ | $B$ (metric tons) | $s_B$ (metric tons) |
|---|---|---|---|---|---|---|
| 100–150 | 7.9 | 7.6 | 4.4 | 4.1 | 1886.5 | 1768.1 |
| 200–300 | 1.4 | 1.2 | 1.0 | 0.9 | 529.4 | 491.4 |
| 300–500 | 12.2 | 5.5 | 5.4 | 2.0 | 2212.1 | 851.4 |
| 500–700 | 56.8 | 17.6 | 20.4 | 9.2 | 2876.6 | 1292.9 |

Table VIII. Roughhead grenadier: see Table III for legend and symbols.

**Per-stratum values (columns = stratum number, grouped by depth in fathoms)**

| Statistic | 013 | 019 | 03 | 07 | 08 | 09 | 014 | 020 | 06 | 010 | 015 | 021 | 026 | 05 | 016 | 017 | 022 | 027 | 018 | 023 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\bar{x}_h$ | 34.5 | 1.5 | 1.3 | 1 | 0.8 | 9.0 | 4.0 | 17.0 | 3.0 | 12.0 | 13.5 | 6.4 | 15.7 | 1.5 | 6.7 | 1.3 | 2.5 | 7.6 | 8.5 | 4.0 | 7.0 |
| $s_h$ | 48.8 | 2.1 | 2.3 | | 0.9 | 8.7 | 1.4 | 1.4 | 1.7 | 2.8 | 0.7 | 4.4 | 12.7 | 2.1 | 5.5 | 1.5 | 10.6 | 5.3 | 0.7 | 5.7 | 1.8 |
| $\bar{y}$ (kg/half hour) | 18.5 | 1.5 | 0.7 | 1.0 | 0.3 | 3.0 | 1.0 | 8.0 | 1.0 | 6.5 | 1.5 | 1.6 | 5.3 | 0.5 | 1.0 | 0.7 | 1.5 | 1.6 | 1.5 | 0.5 | 2.5 |
| $s_h$ | 26.2 | 2.1 | 1.1 | | 0.3 | 4.4 | 0.0 | 2.8 | 1.0 | 2.1 | 0.7 | 2.5 | 3.1 | 0.7 | 1.7 | 1.2 | 2.1 | 1.9 | 0.7 | 0.7 | 0.9 |
| $B_h$ (metric tons) | 1763.9 | 122.6 | 58.2 | 91.6 | 28.6 | 313.6 | 38.4 | 611.3 | 85.9 | 294.3 | 84.8 | 249.1 | 694.6 | 15.4 | 75.9 | 55.5 | 84.2 | 257.7 | 187.1 | 21.4 | 5008.1 |
| $s_{B_h}$ (metric tons) | 1763.9 | 122.6 | 51.9 | | 30.8 | 263.1 | 0.0 | 152.8 | 49.6 | 67.9 | 28.3 | 174.8 | 229.8 | 15.4 | 75.9 | 55.2 | 84.2 | 140.4 | 49.0 | 21.4 | 1843.5 |

**Per-depth-range values**

| Depth (fath) | $\bar{x}$ | $s$ | $\bar{y}$ (kg/half hour) | $s$ | $B$ (metric tons) | $s_B$ (metric tons) |
|---|---|---|---|---|---|---|
| 100–150 | 7.9 | 7.6 | 4.4 | 4.1 | 1886.5 | 1768.1 |
| 150–200 | 5.3 | 1.2 | 2.3 | 0.7 | 1135.7 | 377.2 |
| 200–300 | 6.8 | 1.9 | 2.7 | 0.6 | 1408.7 | 302.1 |
| 300–500 | 5.7 | 1.5 | 1.8 | 0.5 | 488.7 | 189.3 |
| 500–700 | 7.1 | 1.3 | 1.2 | 0.4 | 168.5 | 53.5 |
| Total | 7.0 | 1.8 | 2.5 | 0.9 | 5008.1 | 1843.5 |