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The Inshore Capelin Fishery in NAFO Div. 3L in 1989

by

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Abstract

Data collected during the inshore capelin fishery in 1989 in NAFO Div. 3L were presented. Provisional inshore landings of 50,617 t in 1989 were almost as high as in 1988. Opening and closing dates varied among areas and gear sectors. Discarding was low and similar to that observed in 1988. Low percentage of females and problems in selling the catch were the dominant reasons for discarding the catch from traps and for purse seines it was the presence of 'redfeed' in the fish, closely followed by low percentages of females in the catch. The catch rates in 1989 were the second highest for capelin traps and highest for purse seines in their respective series. Both catch rates in 1989 were higher than those estimated in 1988. The catch was dominated by the 1986 year-class as three-year-olds comprising 75% of the total catch in numbers. Mean lengths-at-age for males and females were similar to those estimated in 1988.

Introduction

Capelin landings of 50,617 t in NAFO Div. 3L were the second highest reported for the inshore fishery (Table 1). In 1989 the fishery opened on June 7 for all areas (Fig. 1) except for St. Mary's Bay which opened on June 14 and Conception Bay which opened on June 16 for fixed gear and on June 17 for purse seiners. The purse seine fishery was closed on June 15 in St. Mary's Bay, reopened on June 17 to fish a reserve quota of 800 t, and closed on June 18. The fixed gear fishery in St. Mary's Bay was closed on June 17. On the Southern Shore the purse seine fishery was closed on June 20 and the fixed gear on

June 24. In Conception Bay the purse seine and fixed gear fisheries were closed on June 24. For Trinity Bay the purse seine fishery was closed on June 21 and the fixed gear on June 22. In Bonavista Bay the purse seine fishery was closed on June 22 and the fixed gear on June 26. For all areas of NAFO Div. 3L, a fishery for male production was opened on July 6. The TAC for the Div. 3L inshore fishery in 1989 was 46,100 t based on a market-related TAC for roe-bearing females.

The data presented here describe catch and effort from records collected by inshore fishermen and population characteristics of the catch based on biological samples from the commercial fishery.

#### Materials and Methods

Research logbooks were mailed to 34 purse seine and 96 fixed gear fishermen who fished in NAFO Div. 3L. Fishermen completed 27 purse seine and 82 fixed gear logbooks (Table 2). The proportion of fishermen who did not fish capelin in 1989 was very low (Table 2). Nine purse seiners from Div. 3K who fished in Div. 3L were also included in the analysis.

To improve the quality of logbook data, approximately 10% of the fishermen were visited prior to the 1989 fishery to explain how to change their record-keeping procedures. All new fishermen added to the survey were visited to explain the research logbook programme to them. In late August and September we tried to visit each fisherman to collect his logbook and to obtain a post-mortem of the fishery. This follow-up provided us with valuable information in interpreting the results of the logbook records.

Biological samples were collected from the commercial capelin fishery on the basis of two random samples per statistical section (Fig. 1) per gear type per week. From each sample 200 fish were measured for length, sex, and maturity stage (LSM). A stratified sample of 2 fish per sex per 1/2 cm length group was collected from each LSM sample for otoliths. The otoliths were used for age determinations by an experienced reader.

Effort data for capelin traps were examined based on the fishery strategy employed. In 1989 29 fishermen who filled out logbooks fished one trap and 45 others fished two traps. Of the 45 fishermen who fished more than one trap, 27

reported separate catch and effort data for each trap fished and 18 did not. Based upon interviews and examination of logbook data, we were able to determine that one fisherman fished both traps equally. To calculate effort in this case, the reported number of hauls and days fished was doubled. One fisherman fished both traps almost equally but failed to provide separate records for each of his two traps. To estimate effort for the two traps combined, an adjustment factor was derived from separated logbook data from 15 fishermen who used the same fishing strategy. The analysis indicated that doubling the reported hauls and multiplying by 0.94 would estimate total fishing hauls for both traps and doubling the reported fishing days would estimate total fishing days for both traps. Four fishermen who did not separate effort for their two traps used a strategy to fish one trap intensively and only fish the second trap when the main trap had insufficient capelin. To estimate effort for these data, an adjustment factor was derived from the records of 12 fishermen who fished in a similar manner. Total fishing hauls were calculated by doubling the reported hauls and multiplying by 0.67 and total fishing days for both traps by doubling the reported fishing days and multiplying by 0.85. It was not possible to determine the fishing strategy employed by the remaining 12 fishermen. For these, we developed an adjustment factor by combining the data for all 27 fishermen who kept separate records for each trap fished. Fishing effort for these 12 fishermen was estimated by doubling the fishing hauls and multiplying by 0.82 and doubling the number of fishing days and multiplying by 0.92. In 1989 fishermen who set two traps and concentrated their fishing to one trap tended to leave one trap fishing longer than the other which was different than 1988 when both traps were left and for similar numbers of days regardless of the fishing strategy employed (Nakashima and Harnum 1989).

## Results

### Discards

Discarding rates in 1989 for purse seines was 21% (Table 3) and 23% for traps (Table 4) which were slightly higher than the 14% and 17% respectively in 1988 (Nakashima and Harnum 1989) and were considerably lower than the 35% and 74% respectively observed in 1987 (Nakashima and Harnum 1988). Capelin caught but not landed for sale were considered as discards in this analysis with no distinction between those released alive and those dumped (dead capelin).

Capelin given to other fishermen were included in the estimates of discarding (Tables 3 and 4) but were excluded in assigning proportional weight to the reasons for discarding (Tables 5 and 12).

In 1989 the principle reason for discarding capelin varied among areas (Table 3). A low percentage of females in the catch was the main reason for discarding from traps in Bonavista Bay and the Southern Shore. Discarding related to boat quotas imposed by processors, inability to sell the catch, and filled quotas were especially problematic in Conception Bay and St. Mary's Bay. Similar to 1988 (Nakashima and Harnum 1989), most of the discards from traps in Trinity Bay were males picked from the catch to increase the percentage of females in the landed catch. For purse seiners in St. Mary's Bay discarding was strongly related to low percentages of females, whereas in Conception Bay 'redfeed' was important. Discards from purse seine sets in Bonavista Bay and Trinity Bay were due to low percentages of females followed closely by 'redfeed' content. Unlike the trap fishery, purse seiners did not experience significant problems selling their catch.

#### Catch/effort

Detailed records from logbooks collected from 36 purse seiners (Tables 3 and 7) and from 119 capelin traps (Tables 4 and 8) were analyzed to calculate catch/effort indices. Fishing effort in 1989 was lower than estimated in 1988. The days fished and number of hauls per trap in 1989 were lower than most years except 1987 (Table 6). Purse seiners in Div. 3L fished 7.8 days per vessel and averaged only 17.4 sets (Table 7). Those results suggest that the fishing time in 1989 was considerably shorter than in previous years.

Catch rates for purse seiners and capelin trap fishermen varied among areas (Tables 7 and 8). The lowest purse seine catch/day (C/D) occurred in Trinity Bay followed by Conception Bay then St. Mary's Bay and extremely high rates for Bonavista Bay (Table 7). While the low rate for Trinity Bay followed previous patterns (Nakashima and Harnum 1988), the very high C/D in Bonavista Bay was unexpected. All four catch rates calculated were highest in Bonavista Bay. The average C/D for a purse seine vessel in NAFO Div. 3L in 1989 was 24.3 t. The catch/set (C/S) in the four areas ranged from 8.3 t to 15.7 t and averaged 10.9 t.

While the average C/D in 1989 was higher than in 1988, the mean C/S was lower. The C/D of 5.5 t in Bonavista Bay was the lowest estimated in 1989. The next was Conception Bay followed by Trinity Bay and then the Southern Shore. A very high C/D of 25.8 t was determined for traps in St. Mary's Bay based on the results from two fishermen. As in 1988 (Nakashima and Harnum 1989) the catch/haul (C/H) reflected a similar pattern as C/D. In 1989 the average C/D for capelin traps was 6.7 t and the average C/H was 3.6 t.

#### By-catch

The total reported by-catch of cod was 48.1 t for 119 traps fished in 1989 which represented 1.0% of reported logbook landings of capelin (Table 4). Herring by-catch in traps was incidental (Table 4).

#### Age Composition

The age composition of the commercial catch was estimated from 92 samples based on 33 purse seine, 53 capelin trap, and 6 beach seine samples (Table 9). The mean number of otolith pairs read per sample in 1989 varied from 37.2 for purse seines to 39 for beach seines (Table 9).

Age composition of the inshore catch from 1979 to 1989 are presented in Table 10. In 1989, the dominant 1986 year-class as three-year-olds represented 75% of the catch (Table 10). The 1989 fishery was projected to be dominated by a strong 1986 year-class comprising 92% of the mature biomass (Anon. 1988). With respect to age composition of the total catch, the 1985 year-class as four-year-olds and the 1982 year-class as five-year-olds were relatively weak. The 1984 year-class was very weak with males absent and only 1.9% females in the 1989 catch.

The age composition of the Div. 3L catch in 1989 was similar to that of the Div. 3K inshore catch (Carscadden et al., 1990).

#### Mean Lengths-at-Age

The mean lengths-at-age of males and females caught during the 1989 capelin fishery are presented in Table 11.

## Discussion

Discarding was slightly higher in 1989 than observed in 1988 for both traps and purse seines. When discarding was reported for traps, the major reasons were low percentage of females in the catch and problems in selling the catch or the quota being taken (Table 12). The presence of 'redfeed' in females and a low percentage of females in the catch were given as the major reasons for discarding fish by purse seiners (Table 12). Spent females were not a factor in discarding fish in 1989.

Four catch rate indices were estimated for capelin traps and for purse seines based on logbook data (Tables 13 and 14). Catch/day (C/D) is the preferred index because it combines both landings and discards to estimate catch. If the discards were in the same proportion to landings in all years then landings could be utilized in place of the catch. However, the level of discarding varies among years. We assumed that catch/set (C/S) and catch/haul (C/H) more likely reflect school size and may not necessarily indicate changes in biomass. The C/D per capelin trap in 1989 was 6.7 t which was marginally higher than 1988 and the second highest in the entire series (Table 13). The C/D per purse seiner was 24.3 t which was the highest rate in the series (Table 14). Both indices indicated that capelin spawning biomass in 1989 was high.

## Acknowledgments

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Table 1. Inshore capelin landings (t) by fishing gear (vessels <21 m in length) by area (Bonavista Bay = BB, Trinity Bay = TB, Conception Bay = CB, Southern Shore = SS, St. Mary's and Trepassay Bays = SMB) in Div. 3L. The mobile fleet was issued ringnet licences until 1982 and purse seine licences from 1983 to the present.

| Year  | Area | Ringnet and<br>purse seine (<21 m) | Beach<br>seine | Capelin<br>trap | Total |
|-------|------|------------------------------------|----------------|-----------------|-------|
| 1978  | BB   | -                                  | 341            | 12              | 353   |
|       | TB   | 429                                | 1756           | 284             | 2469  |
|       | CB   | 487                                | 1687           | 1298            | 3472  |
|       | SS   | -                                  | 82             | 38              | 120   |
|       | SMB  | -                                  | 6              | -               | 6     |
|       | 3L   | 916                                | 3872           | 1632            | 6420  |
| 1979  | BB   | 45                                 | 680            | 45              | 770   |
|       | TB   | 1144                               | 991            | 1163            | 3298  |
|       | CB   | 2087                               | 1727           | 4250            | 8064  |
|       | SS   | 15                                 | 70             | 93              | 178   |
|       | SMB  | 4                                  | 2              | -               | 6     |
|       | 3L   | 3295                               | 3470           | 5551            | 12316 |
| 1980  | BB   | 1388                               | 205            | 124             | 1717  |
|       | TB   | 2541                               | 603            | 1612            | 4756  |
|       | CB   | 3226                               | 457            | 3591            | 7274  |
|       | SS   | -                                  | 80             | 239             | 319   |
|       | SMB  | 284                                | -              | 95              | 379   |
|       | 3L   | 7439                               | 1345           | 5661            | 14445 |
| 1981  | BB   | 3714                               | 89             | 62              | 3865  |
|       | TB   | 6006                               | 1006           | 2267            | 9279  |
|       | CB   | 4670                               | 202            | 5537            | 10409 |
|       | SS   | -                                  | 14             | 51              | 65    |
|       | SMB  | 820                                | 3              | -               | 823   |
|       | 3L   | 15210                              | 1314           | 7917            | 24441 |
| 1982  | BB   | 3429                               | 169            | 133             | 3731  |
|       | TB   | 7687                               | 463            | 2445            | 10595 |
|       | CB   | 5511                               | 174            | 5944            | 11629 |
|       | SS   | 9                                  | 33             | 314             | 356   |
|       | SMB  | 1056                               | 58             | 9               | 1123  |
|       | 3L   | 17692                              | 897            | 8845            | 27434 |
| 1983  | BB   | 2580                               | 96             | 527             | 3203  |
|       | TB   | 3801                               | 603            | 4445            | 8849  |
|       | CB   | 6349                               | 166            | 5500            | 12015 |
|       | SS   | -                                  | 3              | 3               | 6     |
|       | SMB  | 983                                | 6              | 12              | 1001  |
|       | 3L   | 13713                              | 874            | 10487           | 25074 |
| 1984  | BB   | 3805                               | 49             | 2037            | 5891  |
|       | TB   | 4928                               | 799            | 5531            | 11258 |
|       | CB   | 6628                               | 89             | 6806            | 13523 |
|       | SS   | -                                  | 17             | 672             | 689   |
|       | SMB  | 1714                               | 28             | 159             | 1901  |
|       | 3L   | 17075                              | 982            | 15205           | 33262 |
| 1985  | BB   | 2286                               | 115            | 1593            | 3994  |
|       | TB   | 1624                               | 545            | 6816            | 8985  |
|       | CB   | 3649                               | 211            | 6804            | 10664 |
|       | SS   | 33                                 | 9              | 348             | 390   |
|       | SMB  | 1284                               | 12             | 121             | 1417  |
|       | 3L   | 8876                               | 892            | 15682           | 25450 |
| 1986* | BB   | 3323                               | 199            | 3197            | 6719  |
|       | TB   | 4005                               | 648            | 12142           | 16795 |
|       | CB   | 7454                               | 133            | 9589            | 17176 |
|       | SS   | 37                                 | 52             | 1362            | 1451  |
|       | SMB  | 5685                               | 34             | 337             | 6056  |
|       | 3L   | 20504                              | 1066           | 26627           | 48197 |
| 1987* | BB   | 2140                               | 76             | 2139            | 4355  |
|       | TB   | 1644                               | 193            | 6780            | 8617  |
|       | CB   | 1317                               | 120            | 3084            | 4521  |
|       | SS   | 106                                | 32             | 633             | 771   |
|       | SMB  | 712                                | 0              | 0               | 712   |
|       | 3L   | 5919                               | 421            | 12536           | 18976 |
| 1988* | BB   | 3664                               | 157            | 3960            | 7781  |
|       | TB   | 4275                               | 164            | 15417           | 19856 |
|       | CB   | 7064                               | 210            | 10586           | 17860 |
|       | SS   | 220                                | 33             | 3194            | 3447  |
|       | SMB  | 3636                               | 228            | 605             | 4469  |
|       | 3L   | 18859                              | 792            | 33762           | 53413 |
| 1989* | BB   | 2730                               | 111            | 4352            | 7193  |
|       | TB   | 4566                               | 163            | 14665           | 19393 |
|       | CB   | 8319                               | 75             | 8566            | 16960 |
|       | SS   | 129                                | 27             | 2983            | 3139  |
|       | SMB  | 3311                               | 1              | 619             | 3932  |
|       | 3L   | 19055                              | 377            | 31185           | 50617 |

\* provisional

Table 2. Responses from a logbook survey conducted in Div. 3L, 1981-89.

| Year               | No. contacted | No. logbooks returned | Did not fish capelin | Logbooks not returned |
|--------------------|---------------|-----------------------|----------------------|-----------------------|
| <u>Purse seine</u> |               |                       |                      |                       |
| 1981               | 70 (7)*       | 37 (44)               | 11                   | 22                    |
| 1982               | 91 (7)*       | 54 (61)               | 10                   | 27                    |
| 1983               | 75 (9)*       | 37 (46)               | 7                    | 31                    |
| 1984               | 63 (3)*       | 39 (42)               | 3                    | 21                    |
| 1985               | 45 (3)*       | 30 (33)               | 2                    | 13                    |
| 1986               | 36 (7)*       | 27 (34)               | 0                    | 9                     |
| 1987               | 37            | 23                    | 4                    | 10                    |
| 1988               | 34 (7)*       | 26 (33)               | 3                    | 5                     |
| 1989               | 34 (9)        | 27 (36)               | 2                    | 5                     |
| <u>Fixed gear</u>  |               |                       |                      |                       |
| 1981               | 119           | 74                    | 13                   | 32                    |
| 1982               | 136           | 81                    | 36                   | 19                    |
| 1983               | 131           | 66                    | 38                   | 27                    |
| 1984               | 142           | 91                    | 20                   | 31                    |
| 1985               | 93            | 61                    | 8                    | 24                    |
| 1986               | 87            | 56                    | 5                    | 26                    |
| 1987               | 93            | 62                    | 14                   | 17                    |
| 1988               | 95            | 70                    | 8                    | 17                    |
| 1989               | 96            | 82                    | 2                    | 12                    |

\* fishermen who reside in Div. 3K but fished in Div. 3L. These are added to the 'No. logbooks returned' column in parentheses.

Table 3. Total purse seine landings (t) compiled from logbooks in 1989.

| Area           | Landings by logbook | Discards by logbook* | No. of fishermen |
|----------------|---------------------|----------------------|------------------|
| Bonavista Bay  | 767.7               | 176.9                | 10               |
| Trinity Bay    | 1126.5              | 230.4                | 14               |
| Conception Bay | 2602.0              | 572.0                | 23               |
| St. Mary's Bay | 1126.9              | 197.5                | 21               |
| Div. 3L        | 5623.1              | 1176.8               | 36               |

\* includes capelin given to other fishermen

Table 4. Total capelin trap landings (t) compiled from logbooks in 1989.

| Area           | Landings by logbook | Discards by logbook* | By-catch |         | No. of fishermen | No. of traps |
|----------------|---------------------|----------------------|----------|---------|------------------|--------------|
|                |                     |                      | Cod      | Herring |                  |              |
| Bonavista Bay  | 827.8               | 270.0                | 9.9      | +       | 16               | 24           |
| Trinity Bay    | 1954.9              | 302.4                | 19.4     | 0       | 26               | 40           |
| Conception Bay | 1496.4              | 357.1                | 15.1     | 0       | 24               | 43           |
| Southern Shore | 522.7               | 194.6                | 3.7      | +       | 6                | 10           |
| St. Mary's Bay | 113.3               | 25.9                 | +        | 0       | 2                | 2            |
| Div. 3L        | 4915.1              | 1150.0               | 48.1     | +       | 74               | 119          |

\* includes capelin given to other fishermen



Table 5. Percent contribution by weight of reasons for discarding capelin in 1989. (This excludes capelin given to other fishermen.)

| Area               | Redfeed | Low % females | Small females | Females picked out | Females spawned out | No market/ quota filled | Misc. | Not given |
|--------------------|---------|---------------|---------------|--------------------|---------------------|-------------------------|-------|-----------|
| <u>Traps</u>       |         |               |               |                    |                     |                         |       |           |
| Bonavista Bay      | 12      | 51            | 3             | 1                  | -                   | 16                      | 16    | 1         |
| Trinity Bay        | 2       | 29            | +             | 47                 | -                   | 17                      | 4     | 1         |
| Conception Bay     | 27      | 27            | -             | +                  | 2                   | 41                      | 3     | +         |
| Southern Shore     | -       | 51            | 9             | -                  | 2                   | 37                      | 1     | -         |
| St. Mary's Bay     | 12      | -             | -             | -                  | -                   | 88                      | -     | -         |
| <u>Purse Seine</u> |         |               |               |                    |                     |                         |       |           |
| Bonavista Bay      | 39      | 49            | -             | -                  | -                   | -                       | 12    | -         |
| Trinity Bay        | 32      | 40            | -             | -                  | -                   | 7                       | 21    | -         |
| Conception Bay     | 66      | 15            | 1             | -                  | -                   | 4                       | 5     | 9         |
| St. Mary's Bay     | 3       | 80            | -             | -                  | -                   | 13                      | 4     | -         |

Table 6. Average fishing days (D) and average number of trap hauls (H) per capelin trap per area in Div. 3L from 1981-89. (Number of traps given in parentheses.)

| Year | Measure of effort | Areas in Div. 3L |           |            |                |            |
|------|-------------------|------------------|-----------|------------|----------------|------------|
|      |                   | Bonavista        | Trinity   | Conception | Southern Shore | St. Mary's |
| 1981 | D                 | -                | 10.4 (15) | 16.8 (21)  | 13.6 (5)       | --         |
|      | H                 | -                | 12.1      | 21.1       | 11.8           | -          |
| 1982 | D                 | -                | 14.6 (23) | 24.2 (48)  | 13.0 (10)      | -          |
|      | H                 | -                | 18.0      | 30.3       | 12.5           | -          |
| 1983 | D                 | 14.0 (1)         | 17.2 (25) | 19.8 (40)  | -              | -          |
|      | H                 | 12.0             | 21.9      | 21.3       | -              | -          |
| 1984 | D                 | 13.7 (7)         | 19.5 (36) | 18.2 (31)  | 19.0 (8)       | 19.0 (1)   |
|      | H                 | 26.0             | 30.9      | 26.4       | 22.4           | 47.0       |
| 1985 | D                 | 11.4 (16)        | 13.3 (23) | 16.8 (24)  | 10.5 (8)       | -          |
|      | H                 | 19.8             | 18.4      | 23.8       | 9.4            | -          |
| 1986 | D                 | 11.8 (14)        | 15.3 (33) | 24.9 (22)  | 17.7 (6)       | 6.3 (2)    |
|      | H                 | 17.7             | 24.4      | 28.8       | 20.8           | 2.5        |
| 1987 | D                 | 6.3 (15)         | 7.7 (31)  | 7.3 (25)   | 5.0 (7)        | -          |
|      | H                 | 13.9             | 14.3      | 11.2       | 6.9            | -          |
| 1988 | D                 | 9.0 (16)         | 11.6 (44) | 12.6 (34)  | 8.8 (10)       | 11.1 (1)   |
|      | H                 | 16.4             | 22.5      | 17.0       | 14.7           | 17.0       |
| 1989 | D                 | 8.2 (24)         | 8.1 (40)  | 7.0 (43)   | 7.6 (10)       | 2.7 (2)    |
|      | H                 | 17.3             | 16.2      | 12.2       | 9.7            | 8.0        |

Table 7. Catch/effort data for purse seiners from the 1989 logbook survey.

| Area           | No. days fished | No. sets made | Landings per logbook (t) | Landings and discards per logbook (t) | No. of purse seiners |
|----------------|-----------------|---------------|--------------------------|---------------------------------------|----------------------|
| Bonavista Bay  | 25              | 60            | 30.7/day<br>12.8/set     | 37.8/day<br>15.7/set                  | 10                   |
| Trinity Bay    | 71              | 163           | 15.9/day<br>6.9/set      | 19.1/day<br>8.3/set                   | 14                   |
| Conception Bay | 135             | 300           | 19.3/day<br>8.7/set      | 23.5/day<br>10.6/set                  | 23                   |
| St. Mary's Bay | 49              | 102           | 23.0/day<br>11.0/set     | 27.0/day<br>13.0/set                  | 21                   |
| Div. 3L        | 280             | 625           | 20.1/day<br>9.0/set      | 24.3/day<br>10.9/set                  | 36                   |

Table 8. Catch/effort data for capelin traps from the 1989 logbook survey.

| Area           | No. days fished | No. hauls made | Landings per logbook (t) | Landings and discards per logbook (t) | No. of traps |
|----------------|-----------------|----------------|--------------------------|---------------------------------------|--------------|
| Bonavista Bay  | 197.9           | 414            | 4.2/day<br>2.0/haul      | 5.5/day<br>2.7/haul                   | 24           |
| Trinity Bay    | 323.2           | 648            | 6.0/day<br>3.0/haul      | 7.0/day<br>3.5/haul                   | 40           |
| Conception Bay | 299.9           | 524            | 5.0/day<br>2.9/haul      | 6.2/day<br>3.5/haul                   | 43           |
| Southern Shore | 76.1            | 97             | 6.9/day<br>5.4/haul      | 9.4/day<br>7.4/haul                   | 10           |
| St. Mary's Bay | 5.4             | 16             | 21.0/day<br>7.1/haul     | 25.8/day<br>8.7/haul                  | 2            |
| Div. 3L        | 902.5           | 1699           | 5.4/day<br>2.9/haul      | 6.7/day<br>3.6/haul                   | 119          |

Table 9. Summary of the commercial samples collected from the inshore capelin fishery in 1989 in Div. 3L.

| Gear type    | No. of LSM/stratified samples | No. of otoliths aged | Mean number of otoliths aged per sample $\pm$ SD |
|--------------|-------------------------------|----------------------|--|
| Purse seine  | 33                            | 1229                 | 37.2 $\pm$ 2.5                                   |
| Capelin trap | 53                            | 2060                 | 38.9 $\pm$ 2.7                                   |
| Beach seine  | 6                             | 234                  | 39.0 $\pm$ 2.5                                   |
| TOTAL        | 92                            | 3523                 |  |

Table 10. Age compositions (%) from the inshore commercial capelin fishery in Div. 3L, 1979-89.

|                       | Age |      |      |      |      |     |
|-----------------------|-----|------|------|------|------|-----|
|                       | 1   | 2    | 3    | 4    | 5    | 6   |
| <b>Males</b>          |     |      |      |      |      |     |
| 1979                  | -   | -    | 47.6 | 36.3 | 15.1 | 0.9 |
| 1980                  | -   | 0.2  | 53.4 | 43.4 | 2.9  | 0.1 |
| 1981                  | 9.0 | 1.9  | 29.7 | 37.7 | 20.6 | 1.2 |
| 1982                  | 0.1 | 0.5  | 88.8 | 10.0 | 0.6  | -   |
| 1983                  | -   | 2.3  | 62.9 | 34.0 | 0.9  | -   |
| 1984                  | -   | 0.4  | 37.5 | 61.5 | 0.7  | -   |
| 1985                  | -   | 5.8  | 66.3 | 26.4 | 1.5  | 0.1 |
| 1986                  | -   | 0.3  | 56.0 | 43.1 | 0.5  | -   |
| 1987                  | -   | 0.3  | 12.7 | 85.4 | 1.6  | -   |
| 1988                  | -   | 5.3  | 72.4 | 19.6 | 2.7  | +   |
| 1989                  | -   | 0.4  | 79.3 | 20.3 | -    | -   |
| <b>Females</b>        |     |      |      |      |      |     |
| 1979                  | -   | 0.8  | 59.1 | 25.4 | 11.3 | 3.4 |
| 1980                  | 0.1 | 3.3  | 64.6 | 31.1 | 0.4  | 0.6 |
| 1981                  | 5.8 | 5.6  | 54.0 | 20.1 | 14.0 | 0.6 |
| 1982                  | 0.2 | 2.4  | 76.4 | 13.0 | 6.4  | 1.6 |
| 1983                  | -   | 6.4  | 59.1 | 32.1 | 2.3  | 0.2 |
| 1984                  | -   | 2.8  | 41.5 | 47.1 | 8.3  | 0.3 |
| 1985                  | -   | 16.7 | 58.0 | 16.0 | 8.7  | 0.6 |
| 1986                  | -   | 0.2  | 66.1 | 28.9 | 3.7  | 1.1 |
| 1987                  | -   | 6.6  | 21.7 | 63.6 | 7.7  | 0.3 |
| 1988                  | -   | 14.2 | 50.8 | 11.5 | 21.4 | 1.4 |
| 1989                  | -   | 1.5  | 72.5 | 21.8 | 1.9  | 2.3 |
| <b>Sexes combined</b> |     |      |      |      |      |     |
| 1979                  | -   | 0.2  | 50.3 | 33.8 | 14.2 | 1.5 |
| 1980                  | -   | 1.7  | 58.9 | 37.3 | 1.7  | 0.4 |
| 1981                  | 7.4 | 3.2  | 42.7 | 28.7 | 17.2 | 0.9 |
| 1982                  | 0.1 | 1.4  | 83.1 | 11.4 | 3.2  | 0.7 |
| 1983                  | -   | 4.6  | 60.7 | 32.9 | 1.7  | 0.1 |
| 1984                  | -   | 1.7  | 39.6 | 53.7 | 4.8  | 0.2 |
| 1985                  | -   | 12.4 | 61.3 | 20.2 | 5.8  | 0.4 |
| 1986                  | -   | 0.3  | 62.3 | 34.2 | 2.5  | 0.7 |
| 1987                  | -   | 4.0  | 18.0 | 72.5 | 5.2  | 0.2 |
| 1988                  | -   | 11.3 | 59.0 | 14.6 | 14.3 | 0.8 |
| 1989                  | -   | 1.0  | 75.4 | 21.2 | 1.1  | 1.3 |

Table 11. Mean total lengths-at-age (mm) of capelin from the inshore commercial fishery, NAFO Div. 31, 1981-89.

|                | Age |     |     |     |     |
|----------------|-----|-----|-----|-----|-----|
|                | 2   | 3   | 4   | 5   | 6   |
| <b>Males</b>   |     |     |     |     |     |
| 1981           | 153 | 172 | 180 | 185 | 188 |
| 1982           | 125 | 187 | 194 | 198 | 205 |
| 1983           | 136 | 182 | 190 | 191 | -   |
| 1984           | 159 | 182 | 190 | 194 | 180 |
| 1985           | 136 | 179 | 194 | 199 | 192 |
| 1986           | 159 | 182 | 190 | 189 | -   |
| 1987           | 159 | 186 | 194 | 192 | -   |
| 1988           | 159 | 184 | 198 | 201 | 213 |
| 1989           | 159 | 184 | 195 | -   | -   |
| <b>Females</b> |     |     |     |     |     |
| 1981           | 135 | 149 | 165 | 172 | 172 |
| 1982           | 131 | 162 | 179 | 189 | 196 |
| 1983           | 139 | 160 | 173 | 183 | 190 |
| 1984           | 141 | 161 | 173 | 180 | 186 |
| 1985           | 135 | 155 | 174 | 183 | 187 |
| 1986           | 137 | 159 | 172 | 185 | 191 |
| 1987           | 144 | 164 | 174 | 182 | 192 |
| 1988           | 138 | 163 | 180 | 188 | 194 |
| 1989           | 142 | 162 | 178 | 190 | 192 |

Table 12. Percent contribution to weight of reasons for discarding capelin in Div. 3L, 1981-89. (This analysis excludes capelin given to other fishermen.)

| Area               | Redfeed | Low % females | Small females | Females picked out | Females spawned out | No market/ quota filled | Misc. | Not given |
|--------------------|---------|---------------|---------------|--------------------|---------------------|-------------------------|-------|-----------|
| <b>Traps</b>       |         |               |               |                    |                     |                         |       |           |
| 1981               | 13      | 43            | 1             | 10                 | +                   | 22                      | 3     | 8         |
| 1982               | 4       | 57            | +             | 19                 | 1                   | 4                       | 13    | 2         |
| 1983               | 17      | 37            | +             | 3                  | +                   | 18                      | 13    | 12        |
| 1984               | 1       | 31            | -             | 35                 | 6                   | 15                      | 11    | 1         |
| 1985               | 30      | 26            | 4             | 5                  | 3                   | 22                      | 4     | 5         |
| 1986               | 45      | 28            | +             | 10                 | +                   | 5                       | 10    | 2         |
| 1987               | 59      | 22            | 1             | +                  | 2                   | 9                       | 7     | +         |
| 1988               | 4       | 27            | 6             | 28                 | 6                   | 8                       | 17    | 5         |
| 1989               | 12      | 36            | 2             | 12                 | 1                   | 30                      | 7     | +         |
| <b>Purse seine</b> |         |               |               |                    |                     |                         |       |           |
| 1981               | 32      | 35            | 14            | 8*                 | +                   | 8                       | +     | 3         |
| 1982               | 45      | 41            | 3             | -                  | +                   | +                       | 10    | 1         |
| 1983               | 70      | 17            | 1             | -                  | +                   | 5                       | 3     | 4         |
| 1984               | 18      | 76            | .             | .                  | .                   | 1                       | ?     | .         |
| 1985               | 61      | 15            | 9             | 1                  | 3                   | 4                       | 5     | 2         |
| 1986               | 52      | 35            | 1             | +                  | 1                   | 3                       | 8     | 1         |
| 1987               | 73      | 4             | 2             | -                  | 1                   | 2                       | 11    | 7         |
| 1988               | 58      | 21            | 5             | -                  | 8                   | 5                       | 3     | -         |
| 1989               | 43      | 37            | +             | -                  | -                   | 6                       | 10    | 4         |

\* use of separators at sea

Table 13. Catch/effort of capelin traps in Div. 3L utilizing research logbook data.

| Year | L = Logbook landings (t) |        | C = Logbook landings and discards (t) |        |
|------|--------------------------|--------|---------------------------------------|--------|
|      | L/day                    | L/haul | C/day                                 | C/haul |
| 1981 | 2.2                      | 1.9    | 2.9                                   | 2.5    |
| 1982 | 2.7                      | 2.2    | 3.1                                   | 2.5    |
| 1983 | 2.4                      | 2.1    | 3.4                                   | 3.0    |
| 1984 | 2.6                      | 1.7    | 2.9                                   | 1.9    |
| 1985 | 2.9                      | 2.0    | 4.6                                   | 3.2    |
| 1986 | 3.2                      | 2.4    | 4.6                                   | 3.4    |
| 1987 | 5.1                      | 2.9    | 8.8                                   | 5.0    |
| 1988 | 5.3                      | 2.9    | 6.2                                   | 3.4    |
| 1989 | 5.4                      | 2.9    | 6.7                                   | 3.6    |

Table 14. Catch/effort of purse seines in Div. 3L utilizing research logbook data.

| Year | L = Logbook landings (t) |       | C = Logbook landings and discards (t) |       |
|------|--------------------------|-------|---------------------------------------|-------|
|      | L/day                    | L/set | C/day                                 | C/set |
| 1981 | 6.9                      | 3.4   | 9.4                                   | 5.3   |
| 1982 | 13.5                     | 6.7   | 16.4                                  | 8.1   |
| 1983 | 10.4                     | 5.4   | 18.8                                  | 9.7   |
| 1984 | 12.3                     | 6.2   | 14.3                                  | 7.2   |
| 1985 | 10.5                     | 5.5   | 16.4                                  | 8.6   |
| 1986 | 14.4                     | 8.6   | 19.0                                  | 11.4  |
| 1987 | 13.4                     | 9.0   | 18.1                                  | 12.1  |
| 1988 | 18.1                     | 8.9   | 20.7                                  | 10.2  |
| 1989 | 20.1                     | 9.0   | 24.3                                  | 10.9  |

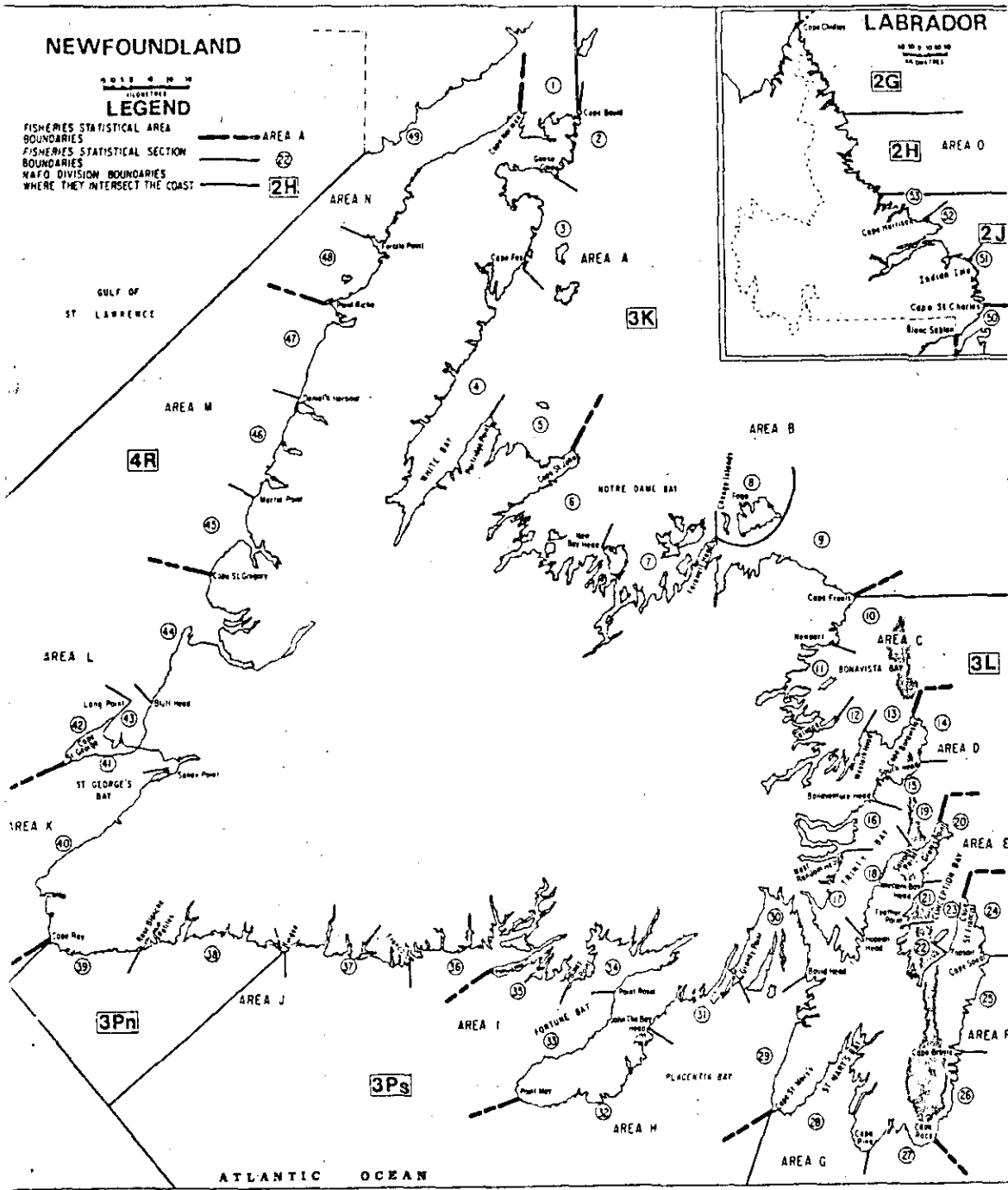


Fig. 1. Statistical areas (C = Bonavista Bay; D = Trinity Bay; E = Conception Bay; F = Southern Shore; G = Trepassey and St. Mary's Bay) and sections (numeric) in Div. 3L along the coast of Newfoundland.