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The Canadian Fishery for Shrimp (*Pandalus borealis*) in Division OA, 1982

by

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#### INTRODUCTION

Fishing effort for shrimp in Division OA in 1982 was considerably reduced compared to 1981. Preliminary catch statistics (to December 31, 1982) show that 2,655 tons (53%) of the 5,000 tons allocated were taken. This compares to the 4,300 tons (86%) taken in the same Division in 1981. A total of eight vessels participated in this fishery at various times during the season. Canadian owned vessels expended a substantial proportion of their total 1982 effort off the Labrador coast (Division 2H).

Observer data and vessel logs are available from the fishery to provide information on fishery trends, distribution, catch and effort, by-catches and shrimp discards in Division OA. For 1982, all observer data are included in the review but vessel logs are incomplete. Data from previous years (Parsons and Veitch, 1980; Parsons et al., 1981) have been updated.

#### MATERIALS AND METHODS

Monthly summaries of catch and effort data were compiled from observers' set and catch records and from vessel logs for the years 1979 to 1982. Distribution of effort and the associated CPUE (from observer reports) for 1981 and 1982 were plotted by Danish statistical square. Only observer data were used since they comprise the most complete source of information.

Measurements of carapace length (0.5 mm) were obtained for both total catches and discarded animals and used to construct length frequencies for each month at 100 m depth intervals. The 1981 length compositions have been extensively updated from the previous report (Parsons et al., 1981).

Observers collected data on by-catches in the shrimp fishery and these are presented as a percentage of the total observed catch for each month. Some rough estimates of the percent of shrimp discards also were obtained from observers' reports and vessel logs.

## RESULTS AND DISCUSSION

### Catch per unit effort

Monthly shrimp catches (tons) per hour fished in Division OA from 1979 to 1982 are given in Table 1. These data identify years in which observer reports and/or vessel logs were lacking. Observer coverage was low in 1979 but has been consistently high since. Vessel logs were lacking for 1980 but provide a good source of information for 1981. Logs for the 1982 season are incomplete. It is anticipated that those outstanding will be available later in 1983.

Both data bases have been considered as reasonable indices of abundance (Parsons et al., 1981). A comparison of the monthly catch rates from 1979 to 1982 is given in Fig. 1. In most years, there is a characteristic decline in catch rates over the fishing season. The 1981 data show good agreement when the two data sources are relatively complete. The weighted catch per hour for the period July to September from observers' reports was 315,344 and 409 kg from 1980 to 1982, respectively. From vessel logs, the July-September rates were 338 kg for 1981 and 296 kg for 1982. The latter is not considered representative since the 1982 vessel logs are lacking for some of the larger, more efficient trawlers.

The 1980 catch rate (315 kg per hour) appears somewhat higher than the 254 kg reported for a French trawler fishing in the OA-1B area during the same period (Derible et al., 1980) and the rates for Norwegian vessels fishing Division 1B (Jakobsen and Torheim, 1981). However, six 722 GRT Trawlers of the Royal Greenland Trade Department attained catch rates of 468 kg per hour in Division 1B (Carlsson, 1981), considerably higher than the average for vessels of tonnage classes 4, 5, and 6 in the adjacent zone.

The 1981 catch rate for vessels fishing Division OA (344 kg per hour) is again lower than the 441 kg attained by the Greenland 'standard' vessels in Division 1B (Carlsson, 1981) but similar to rates obtained by the French trawler in July and August (Dupouy et al., 1981) in areas of 1B immediately adjacent Division OA.

Observers' reports for 1982 show an increase in the catch rate to 409 kg per hour for the July to September period. This increase might have been due to growth and recruitment of the smaller animals observed in 1981. Data presented at the 1981 NAFO shrimp meeting provided evidence of possible strong recruitment to the fishery in 1982 and 1983 (Dupouy et al., 1981; Kanneworff, 1981; Parsons et al., 1981). On the other hand, standardization of effort has not been attempted for vessels of three tonnage classes which have fished in Division OA due to a small comparative data base. Therefore, the fluctuations in catch rates over the last few years in Division OA, at least in part, might be due to changes in fleet performance rather than changes in abundance of the stock itself.

Geographically, the distribution of fishing effort was generally similar in 1981 (Fig. 2) and 1982 (Fig. 3). Fishing occurred in Division OA, usually between the 58° and 59° W meridians in both years. From June to August 1981, fishing was concentrated between 67°30'N and 67°50'N very close to the international boundary. Fishing effort north of 68°N increased significantly during September and October but shifted back to the more southerly areas in November and December. In 1982, however, effort in all months was concentrated south of 68°, between the parallels mentioned above. The shifts in effort in 1981 were associated with areas of optimum catch rates but, in 1982, it is worth noting that good catch rates in October associated with low effort just north of the 'preferred' area did not attract the fleet as in the previous year.

#### Length Composition

Commercial length frequencies for 1981 and 1982 by month and 100 m depth intervals are given in Fig. 4 and 5. An update of the 1981 data (Parsons et al., 1981) supports the previous observation of three obvious modes around 19, 23 and 27 mm carapace length occurring in the catches in Division OA. The smallest size group became an increasingly important component of the catch up to October after which larger animals dominated. Length distributions did not differ greatly by depth except for November and December when greater proportions of ovigerous animals occurred in deep water.

Interpretation of the 1982 length frequencies (Fig. 5) is complicated by the occurrence of a group of animals in a broad size range between 20 and 24 mm

carapace length. Presumably, the 23 mm mode of 1981 occurs in the 26-27 mm mode (a composite group) in 1982. The 19 mm mode of the previous year now appears to be represented by two modes of 21 and 23 mm. The fast-slow growing concept is a possible explanation. A smaller mode at 18 mm becomes most obvious in September but, based on catch rates of this size (age) group, may not be as strong as the corresponding group of the previous year. Differences in size at depth are not obvious until October when a greater proportion of larger, ovigerous animals occurred in deeper water. Eggs were laid in September of both years.

#### Shrimp Discards

Quantification of the discarding of shrimp remains a problem, in many cases due to the manner in which the catch is handled. Table 2 provides some estimates of discards from observer records and vessel logs. Reliability in the data from the latter source is highly questionable for most months. High rates of discards observed from May to July 1980 did not occur during the same period in 1981 and 1982. The high rates in 1980 were due to a substantial amount of shrimp around 23 mm occurring in the catches during those months (Parsons *et al.*, 1981). In 1981, discards appeared highest in September and October, possibly reflecting increased catches of shrimp around 19 mm during these months (Fig. 4). Indeed, length frequencies of discarded animals (Fig. 6) show that this size group comprised most of the discards in 1981.

The discard rates for 1982 are more or less in line with commercial length frequencies (Fig. 5) which indicate some increase in the proportions of smaller animals in the catch during the August-September period. However, measurements of discarded animals (Fig. 7) indicate that most were from the 21 mm size group, again suggesting that the 18 mm group may not be as strong as the corresponding group of the previous year.

#### By-catches

Species composition of observed monthly catches in Division OA in 1981 and 1982 is presented in Table 3. Redfish again occurred most frequently as a by-catch but proportions continued to decline from the high levels observed in 1980 (Parsons and Veitch, 1980). Other species usually represented less than 1% of the total catch weight.

#### CONCLUSIONS

Interpreting the catch per unit effort from July to September as an index of abundance, there appears to be no decline in shrimp stock size in Division OA from 1980 to 1982. In fact, an observed increase in 1982 may reflect improved recruitment. It is cautioned, however, that the lack of a standardized measure of effort may be responsible for some of the observed differences between years. Catch rates in various areas of Division OA over the season suggest that there may be some seasonal northward displacement of the stock, especially during September and October.

Comparison of length frequencies describing the size composition of the catch in 1981 and 1982 is complicated by the bimodality described above. However, shrimp of these sizes (20-24 mm) should be approaching full recruitment in a fishery employing a 40 mm mesh size. A mode around 18 mm in 1982 does not appear to be as strong as the corresponding size (age) group (19 mm) observed in 1981. Discard data also support this observation. Although the former will be approaching full recruitment size in 1983, further improvements in recruitment beyond those predicted in 1981 may not be anticipated (provided the data from this segment of the resource agree with data from other areas).

Shrimp discarding in 1982 was 'observed' to be slightly reduced from rates reported for the previous year. This may be in part a reflection of variability in year-class strength of the partially-recruited age groups. The major by-catch species continues to be redfish but a further reduction in the proportion of redfish caught was observed between 1981 and 1982.

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Table 1. Catch and CPUE (MT per hour fished) by month for Division OA, 1979-82.

| Month                      | 1979 <sup>1</sup> |       | 1980  |       | 1981  |       | 1982  |       |
|----------------------------|-------------------|-------|-------|-------|-------|-------|-------|-------|
|                            | Catch             | CPUE  | Catch | CPUE  | Catch | CPUE  | Catch | CPUE  |
| <b>A. Observer Reports</b> |                   |       |       |       |       |       |       |       |
| May                        |                   |       | 1     | 0.496 |       |       |       |       |
| June                       |                   |       | 26    | 0.481 | 364   | 0.487 |       |       |
| July                       |                   |       | 13    | 0.410 | 862   | 0.413 | 588   | 0.561 |
| Aug.                       | 48                | 0.346 | 177   | 0.328 | 795   | 0.322 | 653   | 0.384 |
| Sept.                      | -                 | -     | 48    | 0.261 | 728   | 0.306 | 398   | 0.317 |
| Oct.                       | 5                 | 0.121 | -     | -     | 784   | 0.256 | 471   | 0.287 |
| Nov.                       |                   |       | 22    | 0.671 | 798   | 0.248 | 421   | 0.318 |
| Dec.                       |                   |       | 74    | 0.343 | 75    | 0.161 | -     | -     |
|                            | 53                | 0.296 | 360   | 0.340 | 4406  | 0.305 | 2531  | 0.363 |
| <b>B. Vessel Logs</b>      |                   |       |       |       |       |       |       |       |
| June                       |                   |       |       |       | 347   | 0.465 |       |       |
| July                       |                   |       | 54    | 0.445 | 756   | 0.419 | 31    | 0.359 |
| Aug.                       |                   |       |       |       | 665   | 0.307 | 249   | 0.300 |
| Sept.                      | 42                | 0.512 |       |       | 585   | 0.297 | 139   | 0.279 |
| Oct.                       | 64                | 0.220 |       |       | 833   | 0.258 | 89    | 0.243 |
| Nov.                       | 248               | 0.231 |       |       | 743   | 0.249 |       |       |
| Dec.                       | 16                | 0.140 | 62    | 0.306 | 72    | 0.149 |       |       |
|                            | 370               | 0.237 | 116   | 0.358 | 4001  | 0.299 | 506   | 0.285 |

<sup>1</sup> west of 58°W

Table 2. Shrimp discards in Division OA in 1980, 1981, and 1982.

| Month                      | 1980                  |            | 1981                  |            | 1982                  |            |
|----------------------------|-----------------------|------------|-----------------------|------------|-----------------------|------------|
|                            | Observed catch (tons) | % discards | Observed catch (tons) | % discards | Observed catch (tons) | % discards |
| <b>A. Observer Reports</b> |                       |            |                       |            |                       |            |
| May                        | 1.4                   | 18.0       |                       |            |                       |            |
| June                       | 25.6                  | 15.5       | 363.9                 | 2.7        |                       |            |
| July                       | 12.6                  | 15.7       | 862.4                 | 2.6        | 587.8                 | 2.4        |
| Aug.                       | 176.5                 | 6.0        | 795.1                 | 4.4        | 653.3                 | 3.3        |
| Sept.                      | 48.5                  | 2.4        | 727.9                 | 5.6        | 398.3                 | 3.4        |
| Oct.                       |                       |            | 784.4                 | 5.7        | 471.0                 | 3.4        |
| Nov.                       | 21.6                  | 0.0        | 797.7                 | 3.3        | 420.7                 | 2.9        |
| Dec.                       | 74.2                  | 1.3        | 74.8                  | 4.2        |                       |            |
| <b>B. Vessel Logs</b>      |                       |            |                       |            |                       |            |
| June                       |                       |            | 347.4                 | 2.3        |                       |            |
| July                       | 53.9                  | 0.2        | 755.8                 | 1.5        | 30.6                  | 4.1        |
| Aug.                       |                       |            | 664.9                 | 1.4        | 248.5                 | 0.6        |
| Sept.                      |                       |            | 585.2                 | 3.0        | 138.7                 | 1.7        |
| Oct.                       |                       |            | 833.0                 | 5.1        | 88.5                  | 4.5        |
| Nov.                       |                       |            | 742.8                 | 3.7        |                       |            |
| Dec.                       | 62.0                  | 0.0        | 71.9                  | 4.1        |                       |            |

Table 3a. By-catch, Division OA, 1981.

| Species Name           | June        |         | July        |         | August      |         | September   |         | October     |         | November    |         | December    |         |
|------------------------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|
|                        | Weight (MT) | Catch % | Weight (MT) | Catch % | Weight (MT) | Catch % | Weight (MT) | Catch % | Weight (MT) | Catch % | Weight (MT) | Catch % | Weight (MT) | Catch % |
| Shrimp (Pandalus)      | 315.885     | 96.18   | 793.175     | 92.23   | 705.792     | 85.23   | 667.613     | 89.75   | 661.140     | 84.21   | 691.628     | 72.10   | 61.599      | 59.20   |
| American Plaice        | .182        | .06     | 1.867       | .22     | 1.788       | .22     | 1.065       | .14     | 2.725       | .35     | 2.844       | .30     | .352        | .34     |
| Cod                    |             |         | .020        | .00     | .095        | .01     | .006        | .00     | .048        | .01     | .365        | .04     | .044        | .04     |
| Arctic Cod             |             |         | .306        | .04     | .579        | .07     | .213        | .03     | 1.515       | .19     | .193        | .02     | .028        | .03     |
| Haddock                |             |         | .007        | .00     | .002        | .00     |             |         | .002        | .00     | .001        | .00     |             |         |
| Halibut                | .060        | .02     | .127        | .01     | .065        | .01     | .081        | .01     | .024        | .00     | .169        | .02     | .050        | .05     |
| Redfish (Marinus)      | .010        | .00     |             |         |             |         |             |         |             |         |             |         |             |         |
| Redfish (unspecified)  | 10.467      | 3.19    | 58.300      | 6.78    | 107.290     | 12.96   | 45.853      | 6.16    | 70.985      | 9.04    | 85.706      | 8.93    | 8.340       | 8.01    |
| Turbot                 | .323        | .10     | 3.205       | .37     | 6.176       | .75     | 6.150       | .83     | 11.298      | 1.44    | 11.919      | 1.24    | .966        | .93     |
| Witch                  | .018        | .01     | .032        | .00     | .720        | .09     | .331        | .04     | .128        | .02     |             |         |             |         |
| Yellowtail             |             |         |             |         | .002        | .00     | .005        | .00     | .020        | .00     | .020        | .00     | .001        | .00     |
| Capelin                | .001        | .00     | .186        | .02     | .463        | .06     | .350        | .05     | .970        | .12     | .909        | .09     | .157        | .15     |
| Eelpouts/Blennies      |             |         |             |         |             |         |             |         |             |         | .001        | .00     |             |         |
| Grenadier (Common)     |             |         |             |         |             |         |             |         |             |         | 3.224       | .34     | .294        | .28     |
| Skate (unspecified)    | .064        | .02     | .230        | .03     | .208        | .03     | .477        | .06     | 1.767       | .23     | 1.268       | .13     | .176        | .17     |
| Skate (Thorny)         | .010        | .00     | .019        | .00     | .133        | .02     | .076        | .01     | .386        | .05     | 1.424       | .04     | .035        | .03     |
| Wolffish (Broadhead)   | .003        | .00     | .114        | .01     | .022        | .00     | .045        | .01     | .093        | .01     | 1.227       | .13     | .164        | .16     |
| Wolffish (Striped)     | .015        | .00     | .100        | .01     | .438        | .05     | .318        | .04     | .409        | .05     | .402        | .04     | .031        | .03     |
| Wolffish (Spotted)     | .045        | .01     | .128        | .01     | .245        | .03     | .112        | .02     | .238        | .03     | .069        | .01     |             |         |
| Wolffish (unspecified) | .033        | .01     | .278        | .03     | .374        | .05     | .010        | .00     | .008        | .00     | .003        | .00     | .001        | .00     |
| Squid (Illex)          |             |         |             |         | .006        | .00     |             |         |             |         |             |         |             |         |
| Sil. Thr. Rockling     |             |         |             |         |             |         |             |         | .200        | .03     |             |         |             |         |
| Basking Shark          | 1.500       | .46     | 2.360       | .27     | 3.100       | .37     | 21.050      | 2.83    | 30.940      | 3.94    | 156.919     | 16.36   | 31.330      | 30.11   |
| Greenland Shark        | .002        | .00     | .033        | .00     | 1.089       | .13     | .486        | .07     | 2.587       | .33     | 2.292       | .24     | .497        | .48     |
| Cusk                   |             |         |             |         |             |         |             |         |             |         |             |         |             |         |
| Other                  |             |         |             |         |             |         |             |         |             |         |             |         |             |         |
| By-catch Total         | 12.532      | 3.81    | 66.817      | 7.76    | 122.312     | 14.77   | 76.229      | 10.24   | 123.974     | 15.79   | 267.621     | 27.89   | 42.461      | 40.80   |
| Grand Totals           | 328.415     | 100.00  | 859.987     | 100.00  | 828.097     | 100.00  | 743.821     | 100.00  | 785.102     | 100.00  | 959.243     | 100.00  | 104.059     | 100.00  |



Table 3b. By-catch, Division 0A, 1982.

| Species Name          | July        |         | August      |         | September   |         | October     |         | November    |         |
|-----------------------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|
|                       | Weight (MT) | Catch % | Weight (MT) | Catch % | Weight (MT) | Catch % | Weight (MT) | Catch % | Weight (MT) | Catch % |
| Shrimp (Pandalus)     | 476.300     | 95.40   | 539.294     | 92.27   | 355.855     | 93.77   | 387.719     | 92.76   | 329.309     | 84.53   |
| American Plaice       | .469        | .09     | 1.337       | .23     | .214        | .06     | .184        | .04     | .287        | .07     |
| Cod                   | .004        | .00     | .140        | .02     | .187        | .05     | .026        | .01     | .095        | .02     |
| Arctic Cod            | .004        | .00     | .159        | .03     | .036        | .01     | .036        | .01     | .055        | .01     |
| Halibut               | .096        | .02     | .135        | .02     | .031        | .01     | .026        | .01     | .360        | .09     |
| Redfish (unspecified) | 17.237      | 3.45    | 30.692      | 5.25    | 18.598      | 4.90    | 16.629      | 3.98    | 27.534      | 7.07    |
| Turbot                | 2.117       | .42     | 5.574       | .95     | 2.471       | .65     | 3.580       | .86     | 6.239       | 1.60    |
| Witch                 | .034        | .01     | 0.032       | .01     | .135        | .04     | .006        | .01     |             |         |
| Yellowtail            |             |         |             |         | .006        | .00     | .022        | .01     |             |         |
| Eelpouts/Blennies     | .384        | .08     | 1.248       | .21     | .462        | .12     | .691        | .17     | .614        | .16     |
| Grenadier (Roughhead) |             |         |             |         | .015        | .00     |             |         |             |         |
| Sand lance (Offshore) | .002        | .00     | .003        | .00     |             |         |             |         |             |         |
| Long-horn Sculpin     |             |         |             |         | .003        | .00     |             |         | 1.233       | .32     |
| Skate (unspecified)   | .254        | .05     | .727        | .12     | .315        | .08     | .650        | .16     |             |         |
| Skate (Thorny)        | .013        | .00     | .165        | .03     | .249        | .07     | .134        | .03     |             |         |
| Wolffish (Broadhead)  | .019        | .00     | .068        | .01     | .013        | .00     | .023        | .01     | .205        | .05     |
| Wolffish (Striped)    | .003        | .00     | .038        | .01     | .005        | .00     | .094        | .02     | .239        | .06     |
| Wolffish (Spotted)    | .023        | .00     | .085        | .01     | .154        | .04     | .261        | .06     | .674        | .17     |
| Squid (Illex)         | .002        | .00     | .052        | .01     |             |         |             |         |             |         |
| Sil. Thr. Rockling    |             |         | .002        | .00     |             |         |             |         |             |         |
| Greenland Shark       | 2.500       | .50     | 2.700       | .46     | 1.000       | .26     | 8.120       | 1.94    | 22.815      | 5.86    |
| Other                 | .041        | .01     | 2.332       | .40     | .027        | .01     | .104        | .02     | .186        | .05     |
| By-catch Totals       | 22.961      | 4.59    | 45.193      | 7.73    | 23.634      | 6.22    | 30.273      | 7.24    | 60.289      | 15.47   |
| Grand Totals          | 449.250     | 100.00  | 584.479     | 100.00  | 379.483     | 100.00  | 417.986     | 100.00  | 389.587     | 100.00  |

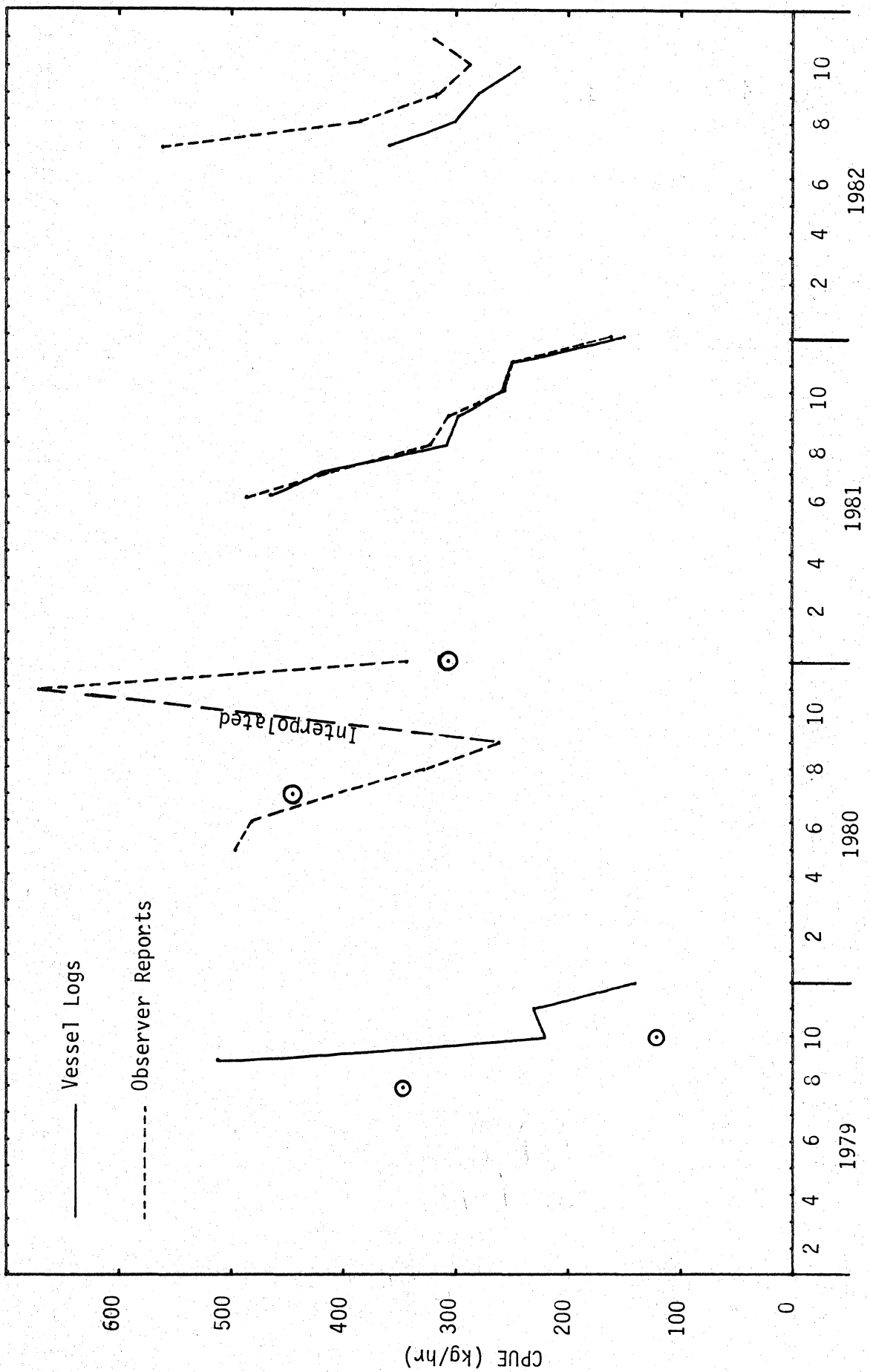


Fig. 1 Monthly catch (kg) per hour fished for vessels of tonnage classes 4,5 and 6 in Division 0A, 1979-82

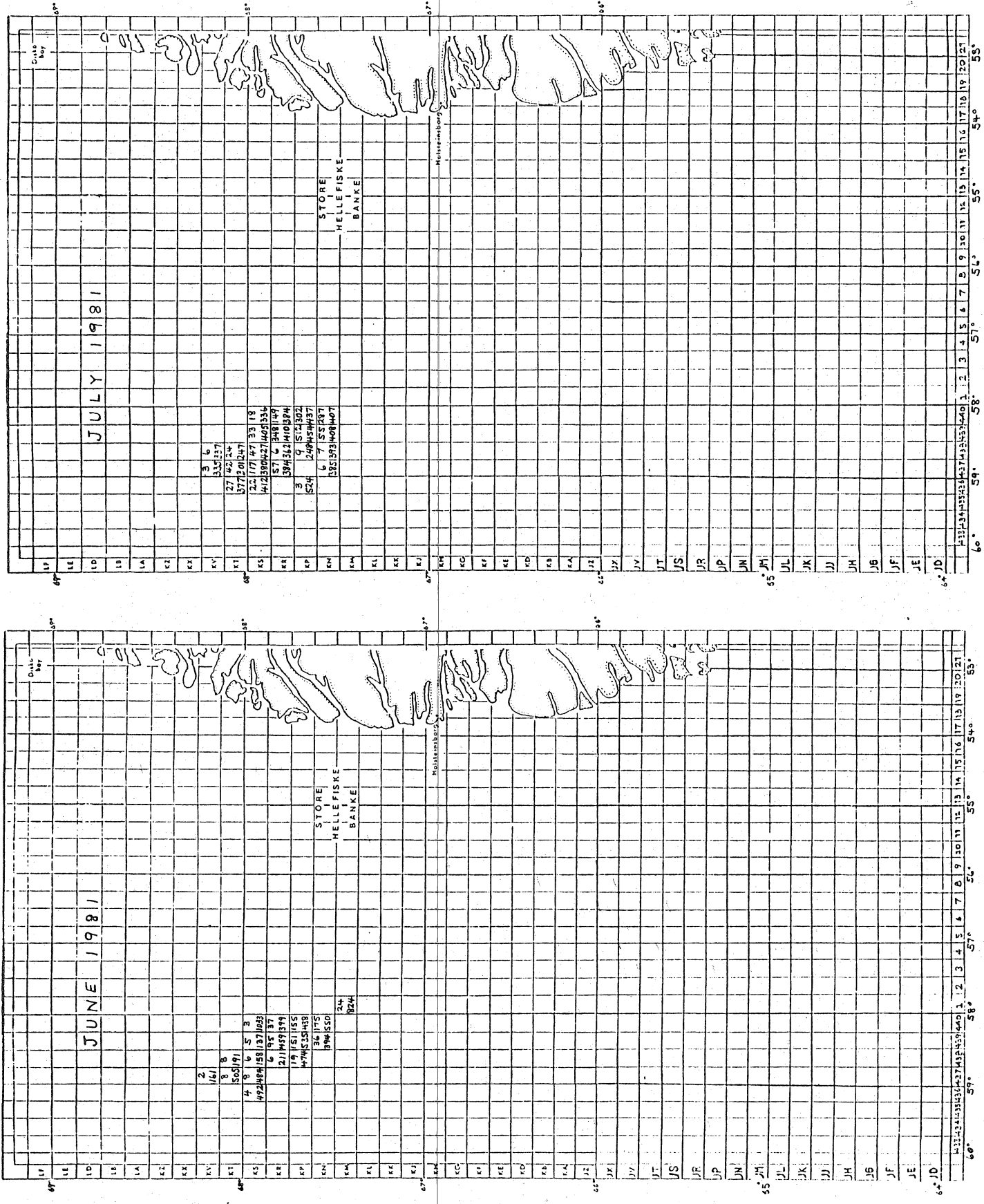


Fig. 2. Hours fished (upper) and kg/hr (lower) by statistical square, 1981.

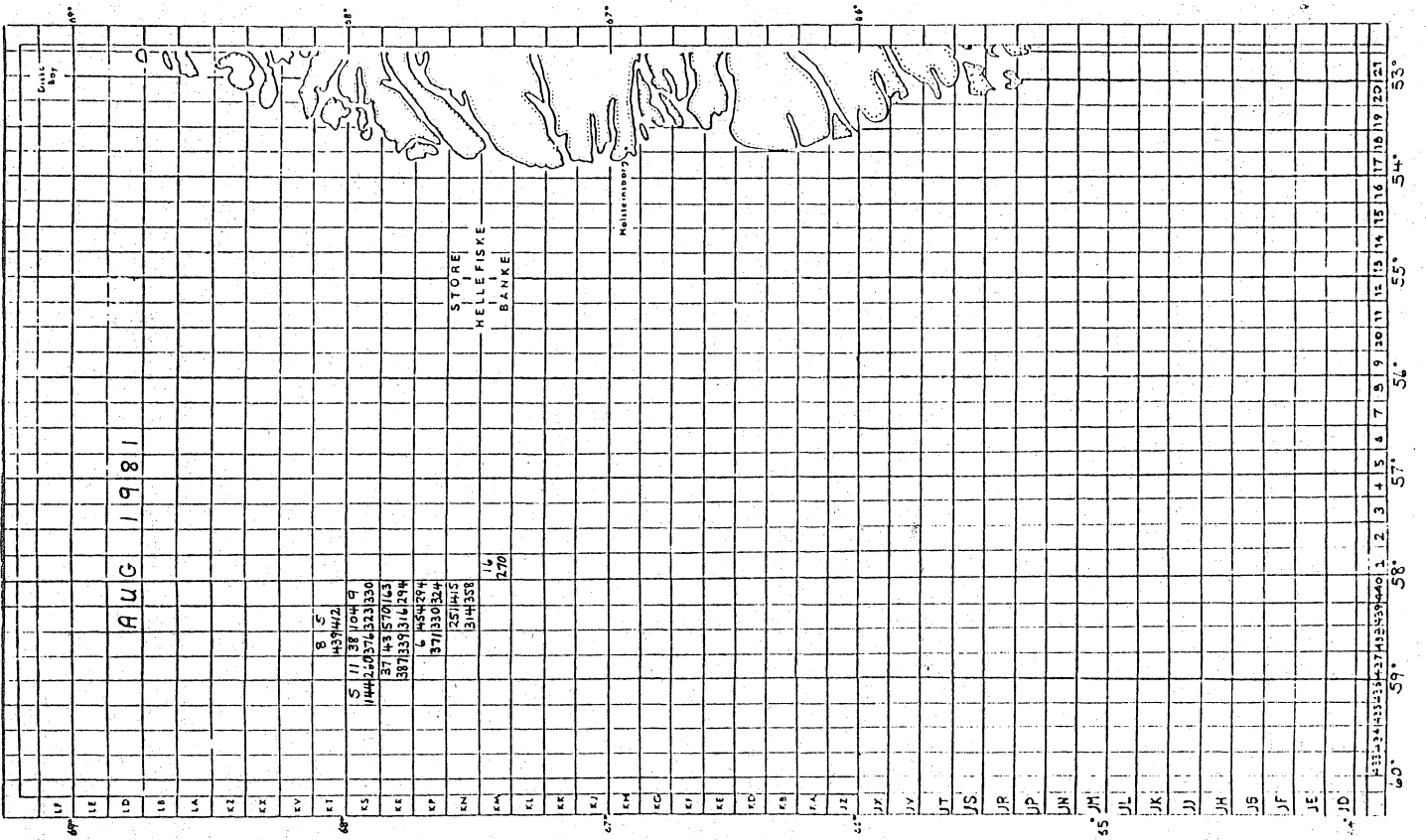
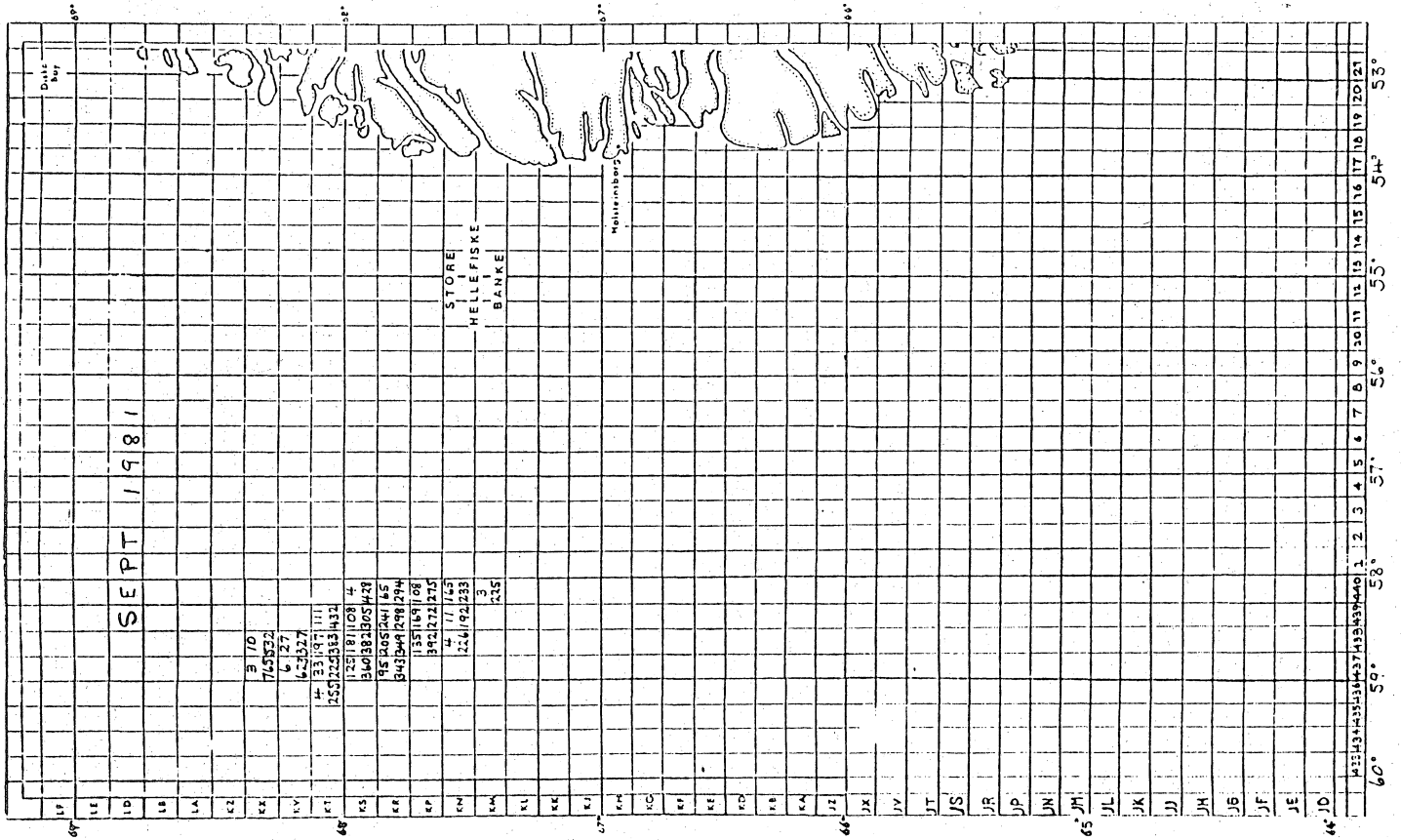


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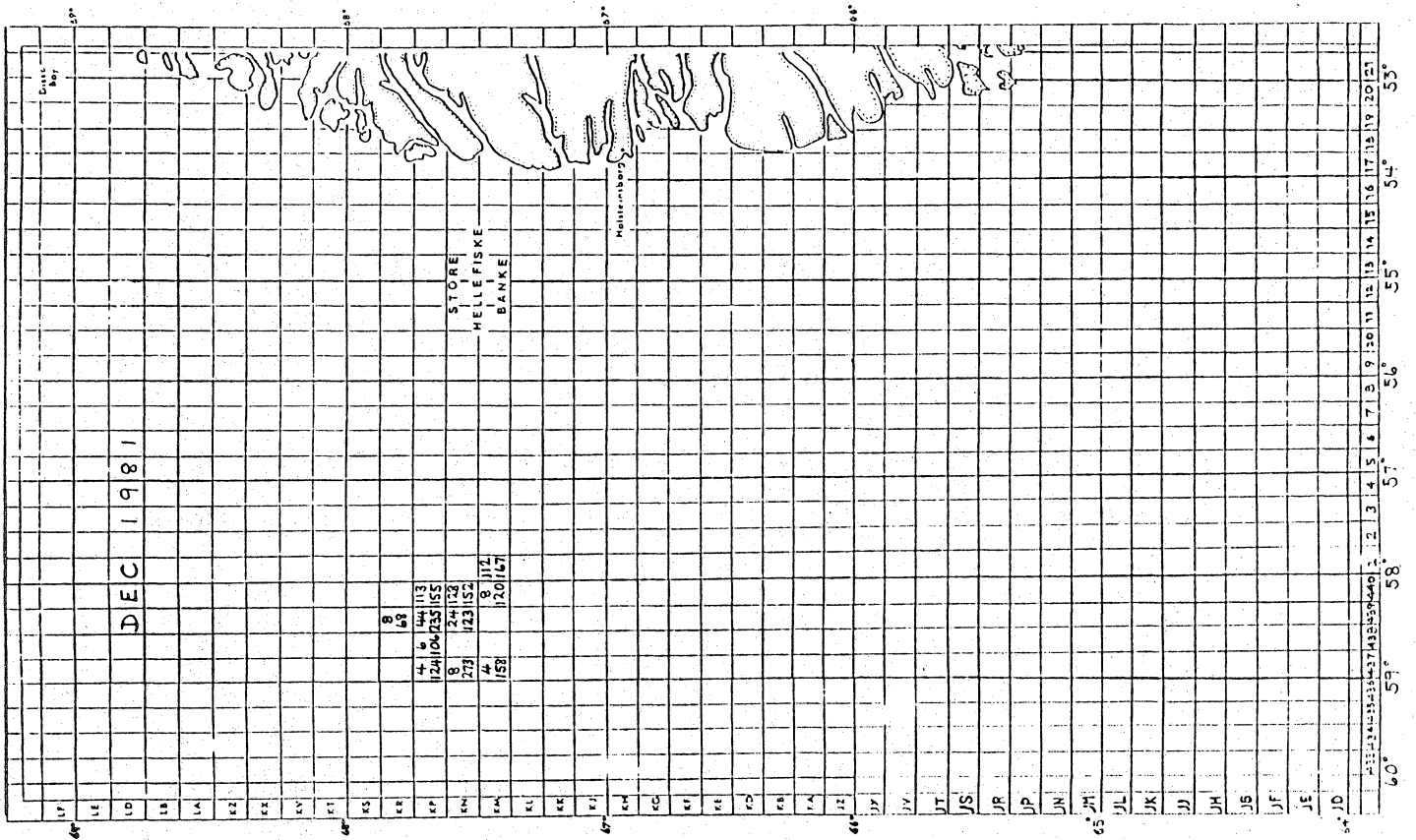


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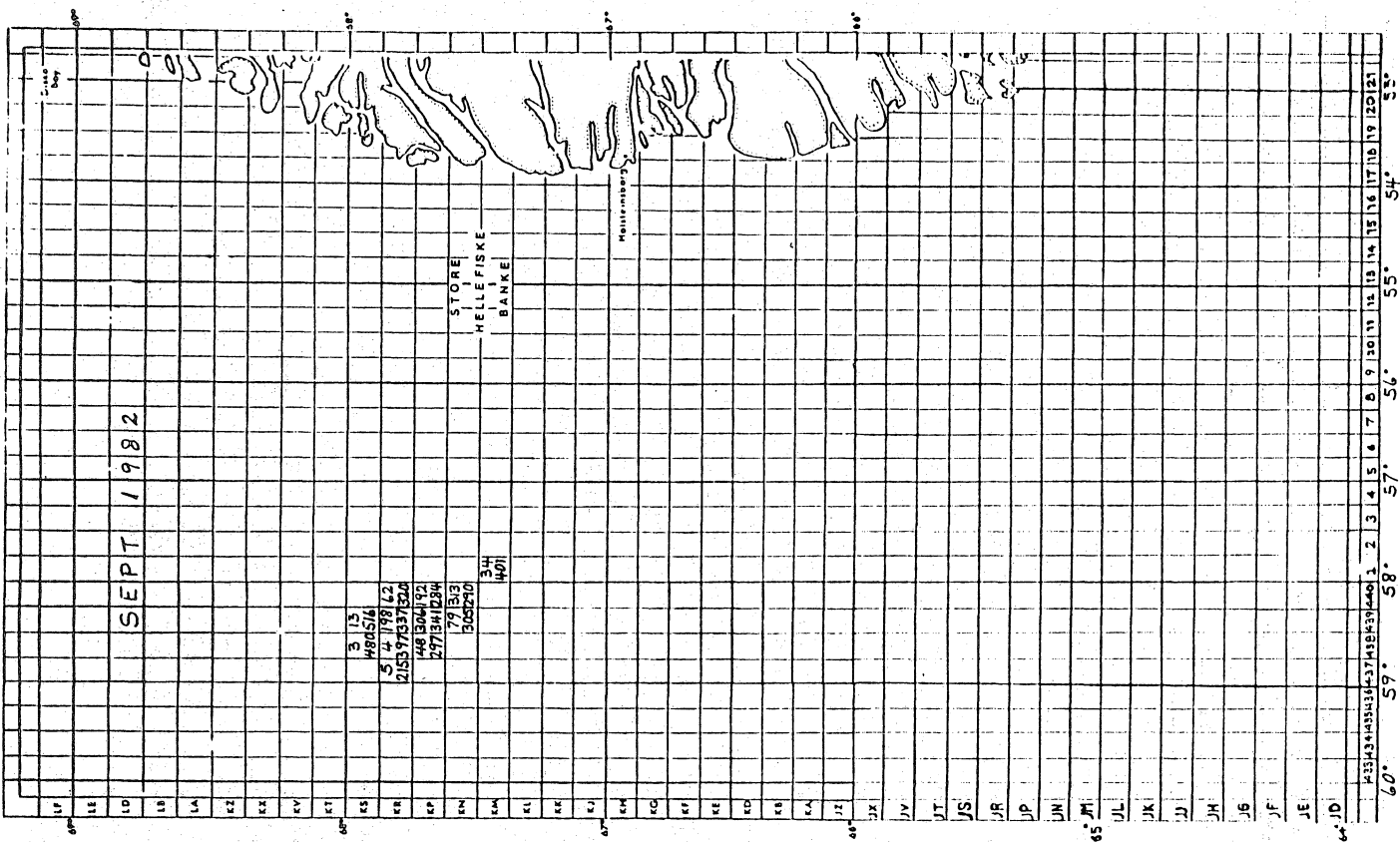
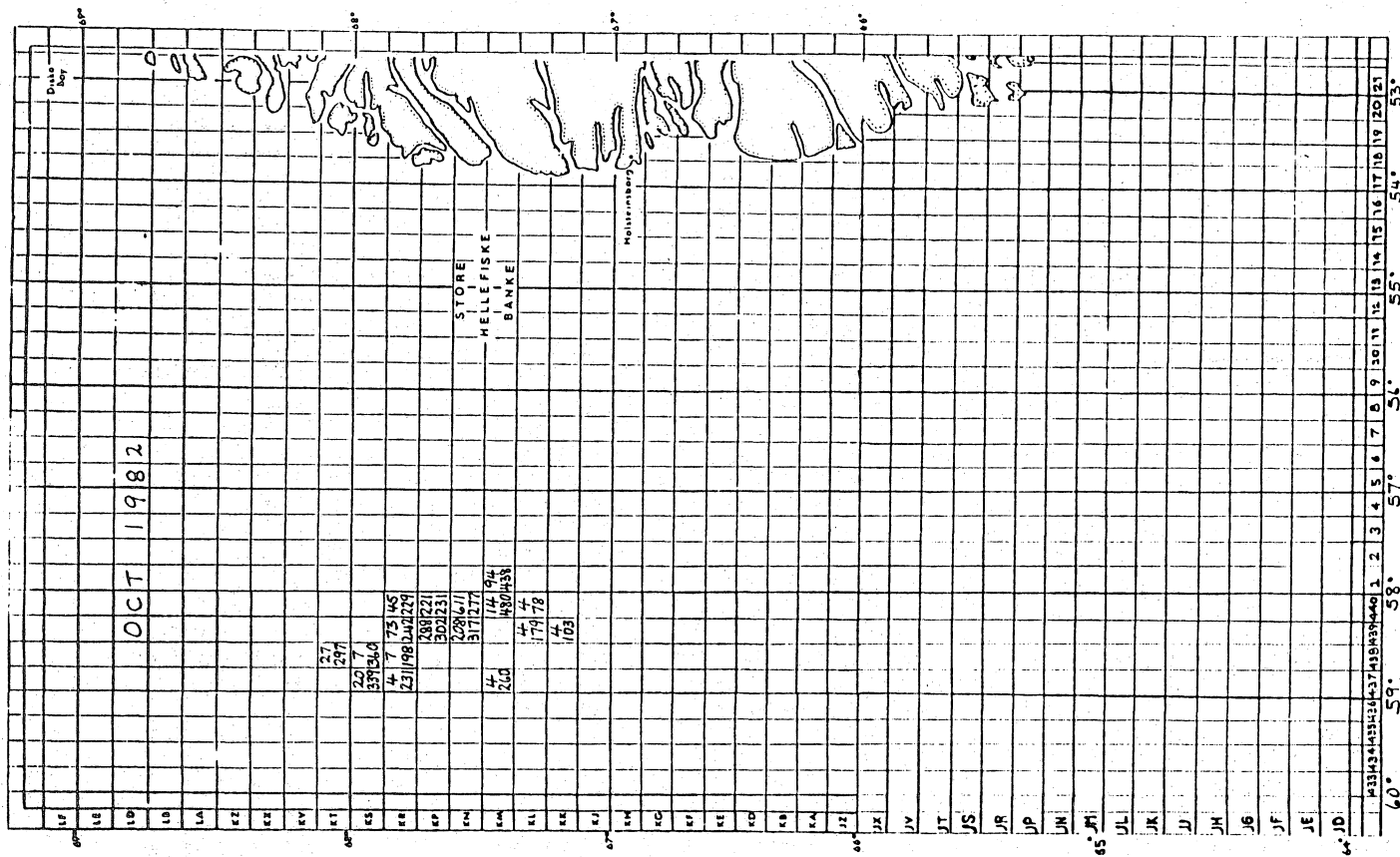


Fig. 3. Continued.





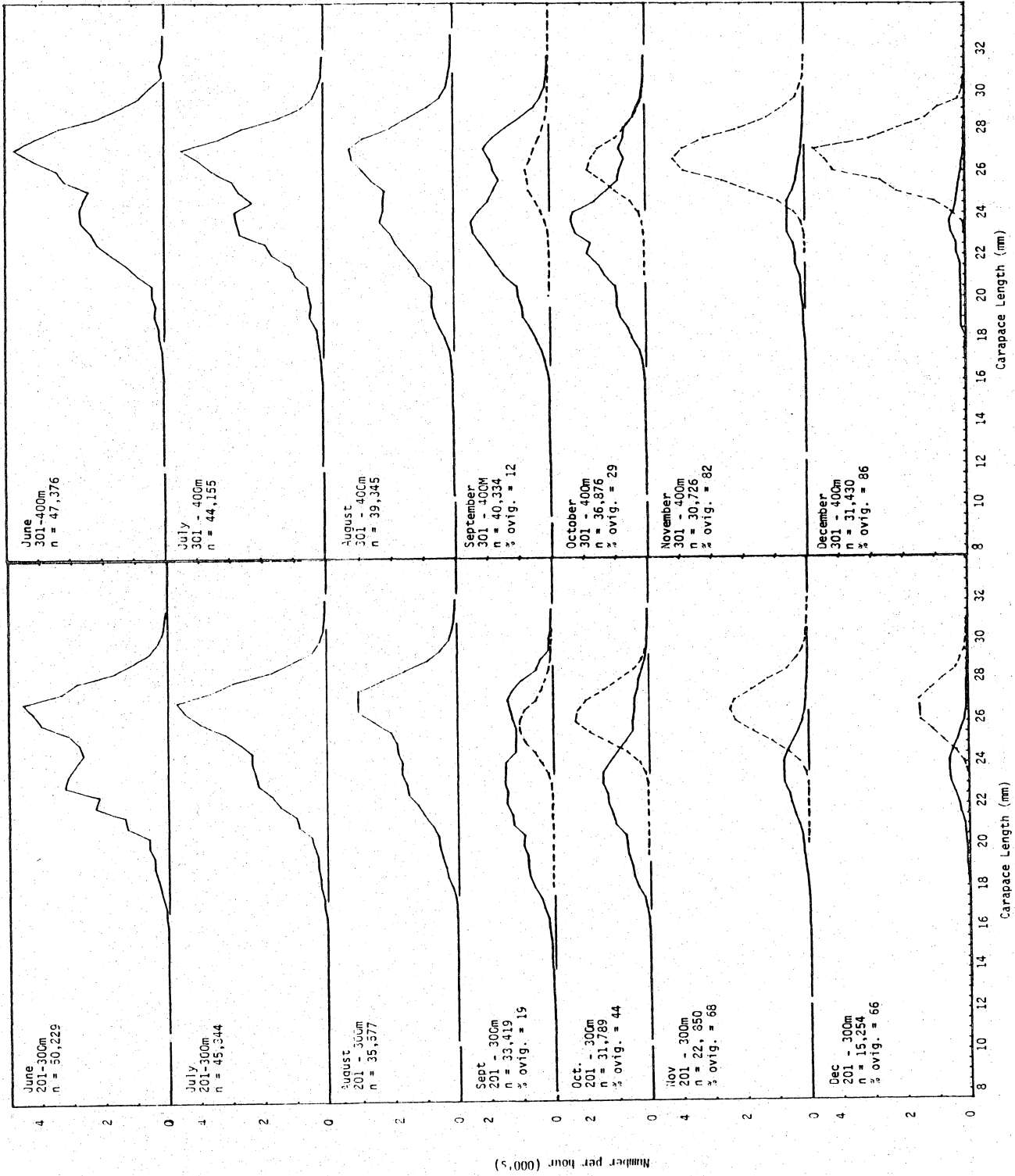


Fig. 4. Commercial length frequencies, Division 0A, 1981. Ovigerous animals represented by broken line.

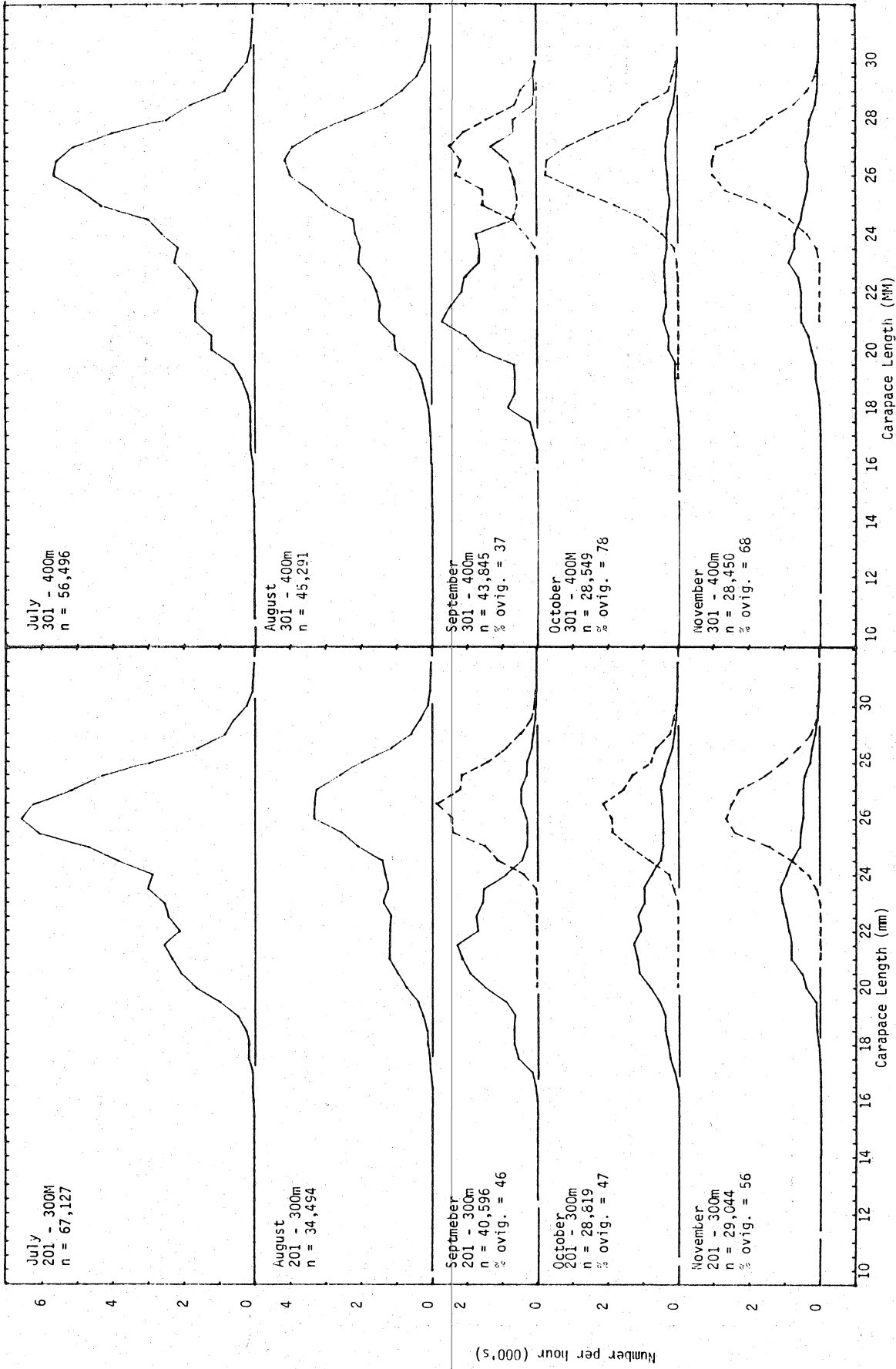


Fig. 5. Commercial length frequencies, Division OA, 1982. Ovigerous animals represented by broken line.

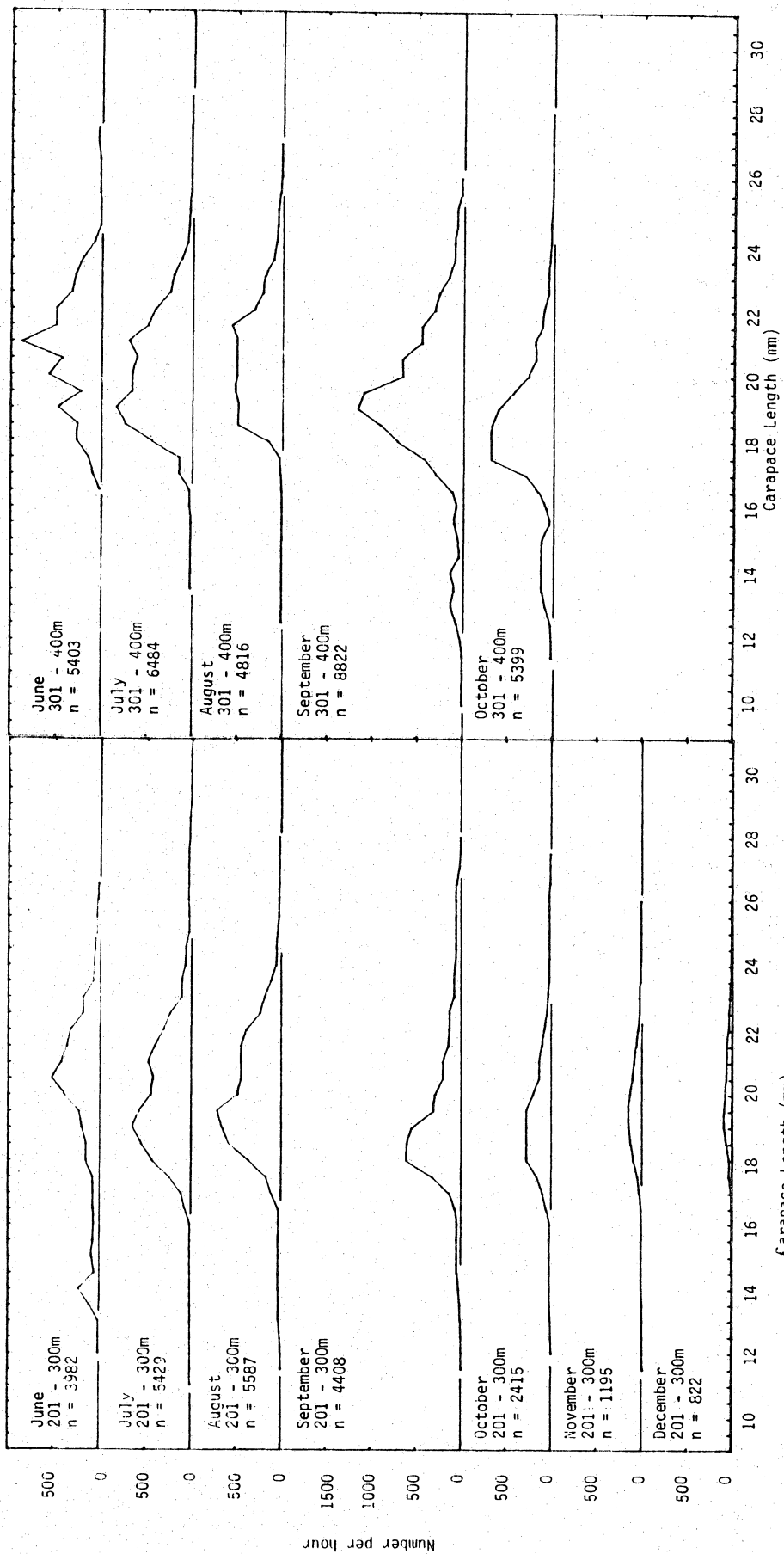


Fig. 6. Discard length frequencies, Division OA, 1981.

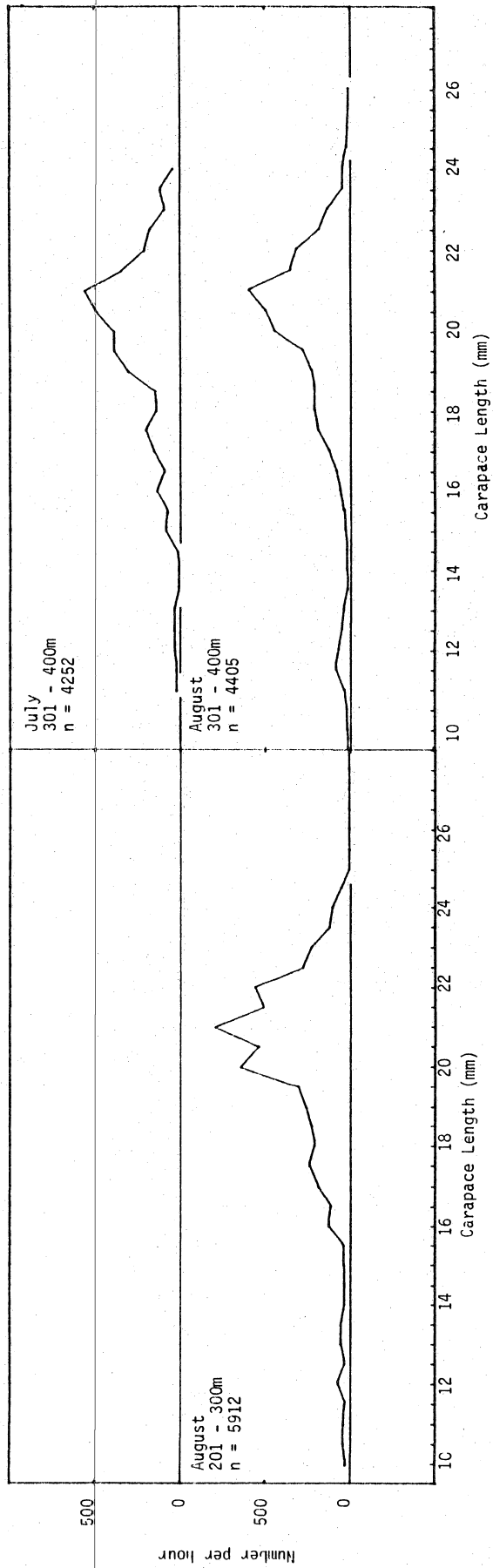


Fig. 7. Discard length frequencies, Division 0A, 1982.

