

Arctic Cod

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Chapter 4 Arctic Cod

Results

Relative Abundance and Distribution

The following discussions of relative abundance and distribution of Arctic cod result from two approaches to analyzing the spatial and temporal variation in catch rates (fish/d). In the first analysis we used a two-way ANOVA to address the overall relative contribution of years and sampling areas as sources of variation in CPUE over the 4-year study period. In the second set of analyses we addressed the spatial and intraseasonal variation observed in catch rates of Arctic cod within each sampling year.

Two-way ANOVA.— The two-way analysis of variance results are presented in Table 4.1. Both main effects and the interaction term were highly significant ($P < 0.0001$, $R^2 = 0.453$). The relative apportionment of the model sum of squares (SS) between the main effects of year (SS = 482.99) and area (SS = 1846.49) indicated that Arctic cod catch rates varied more between sampling areas than over time during our study. While interpretation of the main effect means comparisons is inappropriate due to the significant interaction term, the comparisons among interaction levels were revealing. We documented the highest catch rates in Simpson Cove and the lowest catch rates in Beaufort Lagoon regardless of sampling year (Table 4.1). These trends are addressed in greater detail in the following section.

Spatial differences.— Within-year comparisons of daily catch rates (fish/d) among net stations indicated spatial variability in the relative abundance of Arctic cod (Table 4.2; Figure 4.1). The trend of significant differences indicated a decline in abundance between the westernmost and easternmost locations. In 1988 net station SC01 differed from net station PB01. Arctic cod daily catch rates at net stations SC01 and SC04, in 1989, were higher than those at net stations KL05, KL10, JL12, and JL14. A similar general pattern was also present in 1990 and 1991, when daily catch rates at net stations SC01 and SC04 were higher than those at net stations BL02 and BL04. A decline in Arctic cod abundance from west to east was also suggested in the comparisons of daily catch rates between sampling areas. As indicated in the two-way analysis of variance, Simpson Cove daily catch rates were significantly higher than those from all other sampling areas during the four years of the study (Table 4.3; Figure 4.2). Daily catch rates in Kaktovik and Jago lagoons were intermediate between Simpson Cove and those from Beaufort Lagoon (1990 and 1991).

Temporal differences.— Significant differences in Arctic cod daily catch rates among time periods were present within each year. During the 1988, 1989, and 1990 open-water seasons, we detected no significant differences in daily catch rates for station SC01 after August 1 (Table 4.4; Figures 4.3-4.6). In contrast, net station SC04 had increasing daily catch rates between time periods 1 and 4 in 1989, 1990, and 1991 (Table 4.4; Figures

TABLE 4.1.— Two factor analysis of variance on log-transformed catch rates ($\ln(\text{CPUE}+1)$) and Tukey means comparisons for Arctic cod from coastal waters of the Arctic Refuge. Effects followed by the same letter are not significantly different ($P > 0.05$). Mean_g = geometric mean.

| Source | df | Sum of squares | Mean square | F-value | P-value |
|---------------|------|-------------------|-------------|----------------|---------|
| Model | | | | | |
| Year | 3 | 482.99 | 160.99 | 67.81 | 0.0001 |
| Area | 3 | 1846.49 | 615.50 | 259.24 | 0.0001 |
| Year×Area | 7 | 188.87 | 26.98 | 11.36 | 0.0001 |
| Error | 1281 | 3041.45 | 2.37 | | |
| Total | 1294 | 5559.81 | | | |
| | | | | | |
| Year | | Mean _g | | Tukey grouping | |
| 1988 | | 2.84 | | A | |
| 1989 | | 1.98 | | B | |
| 1990 | | 1.28 | | C | |
| 1991 | | 1.04 | | C | |
| Area | | Mean _g | | Tukey grouping | |
| Simpson | | 3.56 | | A | |
| Kaktovik | | 1.12 | | B | |
| Jago | | 1.08 | | B | |
| Beaufort | | 0.07 | | C | |
| Year×Area | | Mean _g | | Tukey grouping | |
| 1988-Simpson | | 4.77 | | A | |
| 1989-Simpson | | 4.36 | | A | |
| 1990-Simpson | | 2.91 | | B | |
| 1991-Simpson | | 2.66 | | B | |
| 1988-Jago | | 2.17 | | B | |
| 1988-Kaktovik | | 2.16 | | B | |
| 1990-Kaktovik | | 1.19 | | C | |
| 1989-Jago | | 1.10 | | C D | |
| 1991-Kaktovik | | 0.93 | | C D | |
| 1990-Jago | | 0.92 | | C D | |
| 1991-Jago | | 0.74 | | C D E | |
| 1989-Kaktovik | | 0.36 | | D E | |
| 1990-Beaufort | | 0.08 | | E | |
| 1991-Beaufort | | 0.05 | | E | |

TABLE 4.2.- Comparison of Arctic cod daily CPUE (fish/d) between fyke net stations in Arctic Refuge coastal waters, 1988-91. Within each year, those net stations with the same letter are not significantly different (Kruskal-Wallis test with Scheffé multiple comparisons). Net stations with dashed lines were not fished within that year.

| Station | Within year Scheffé groupings | | | |
|---------|-------------------------------|------|------|---------|
| | 1988 | 1989 | 1990 | 1991 |
| SC01 | A | A | A | A |
| SC04 | -- | A | A, B | A, B |
| KL05 | B | C | C | A, B, C |
| KL10 | B | B, C | C | B, C |
| JL12 | B | B, C | C, D | C, D |
| JL14 | B | B | B, C | A, B |
| PB01 | B, C | -- | -- | -- |
| PB02 | A, B | -- | -- | -- |
| BL02 | -- | | D, E | D |
| BL04 | -- | | E | D |

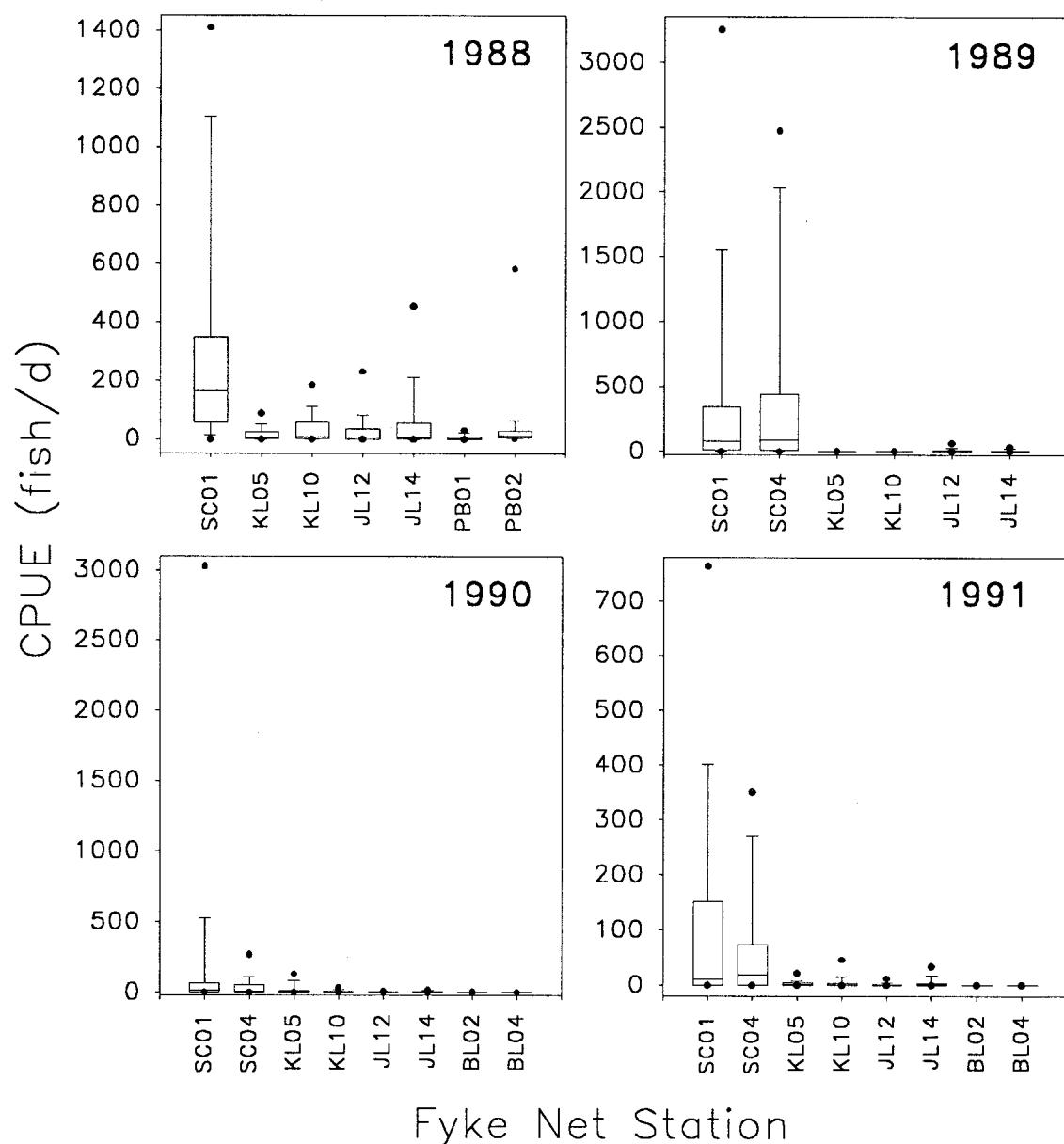


FIGURE 4.1.— Boxplots comparing daily CPUE (fish/d) observations between net stations for Arctic cod in Arctic Refuge coastal waters, 1988-91.

TABLE 4.3.— Comparison of Arctic cod daily CPUE (fish/d) between sampling areas in Arctic Refuge coastal waters, 1988-91. Within each year those sampling areas with the same letter are not significantly different (Kruskal-Wallis test with Scheffé multiple comparisons). Sampling areas with dashed lines were not fished within that year.

| Sampling area | Within year Scheffé groupings | | | |
|-----------------|-------------------------------|------|------|------|
| | 1988 | 1989 | 1990 | 1991 |
| Simpson Cove | A | A | A | A |
| Kaktovik Lagoon | B | C | B | B |
| Jago Lagoon | B | B | B | B |
| Pokok Bay | B | -- | -- | -- |
| Beaufort Lagoon | -- | | C | C |

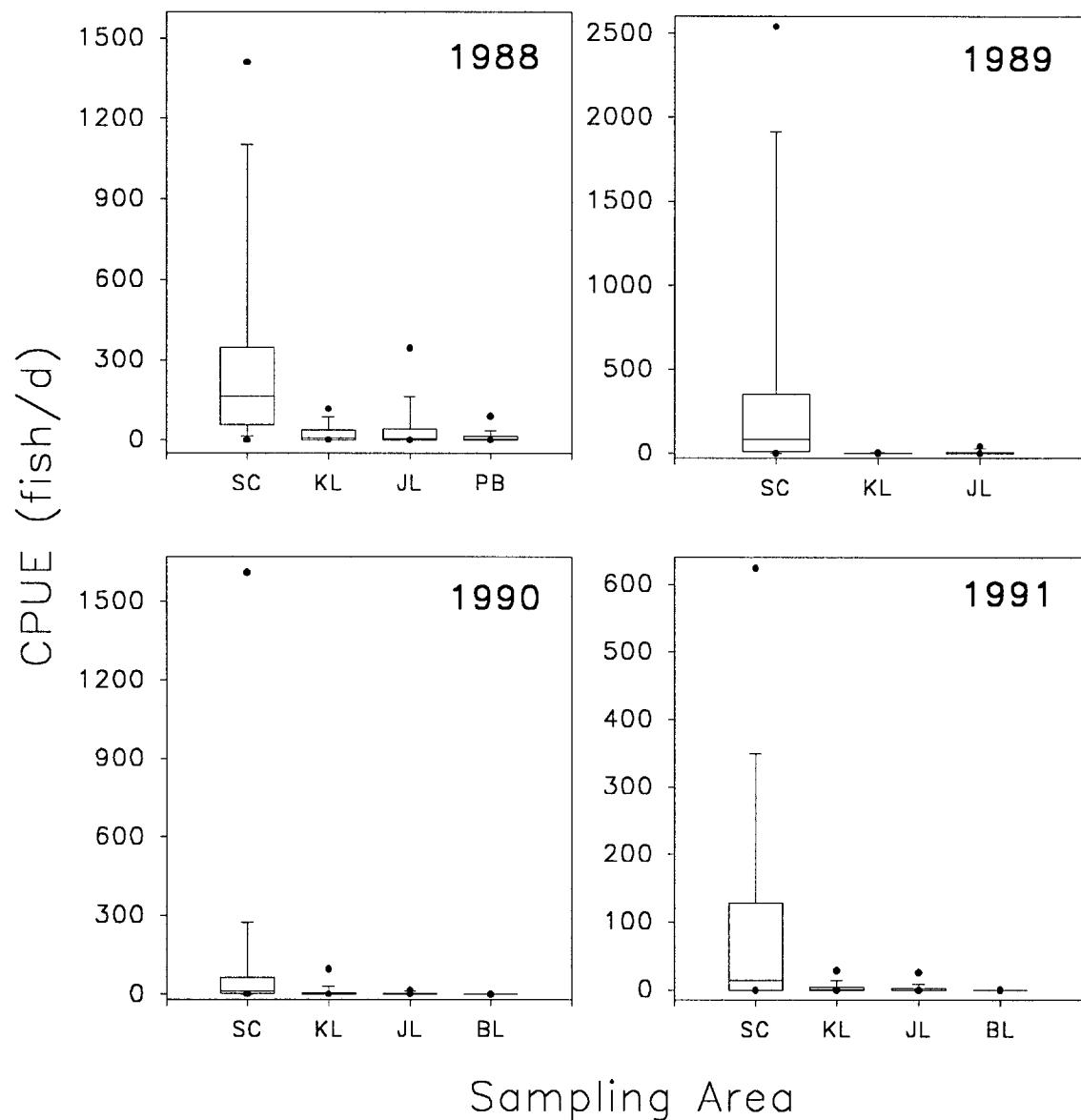


FIGURE 4.2.- Boxplots comparing daily CPUE (fish/d) observations between sampling areas for Arctic cod in Arctic Refuge coastal waters, 1988-91. SC = Simpson Cove; KL = Kaktovik Lagoon; JL = Jago Lagoon; PB = Pokok Bay; BL = Beaufort Lagoon.

TABLE 4.4.-- Comparison of Arctic cod daily CPUE (fish/d) between time periods in Simpson Cove. For each net station/sampling area those time periods with the same letter, within each year, are not significantly different (Kruskal-Wallis test with Scheffé multiple comparisons). Time period 1 corresponds to the period from the first sampling day to July 31. Time period 2 corresponds to the period from August 1 to August 14. Time period 3 corresponds to the period from August 15 to August 31. Time period 4 corresponds to the period from September 1 to the last sampling day. Locations with dashed lines were not fished during that time period.

| Within year Scheffé groupings | | | | |
|-------------------------------|------|------|------|------|
| Time Period | 1988 | 1989 | 1990 | 1991 |
| Net Station - SC01 | | | | |
| 1 | A | B | A | C |
| 2 | A | A | A | B |
| 3 | A | A | A | A |
| 4 | A | A | A | A,B |
| Net Station - SC04 | | | | |
| 1 | -- | C | B | C |
| 2 | -- | B,C | A,B | B |
| 3 | -- | A,B | A,B | A |
| 4 | -- | A | A | -- |
| Simpson Cove | | | | |
| 1 | A | B | B | C |
| 2 | A | A | A,B | B |
| 3 | A | A | B | A |
| 4 | A | A | A | A |

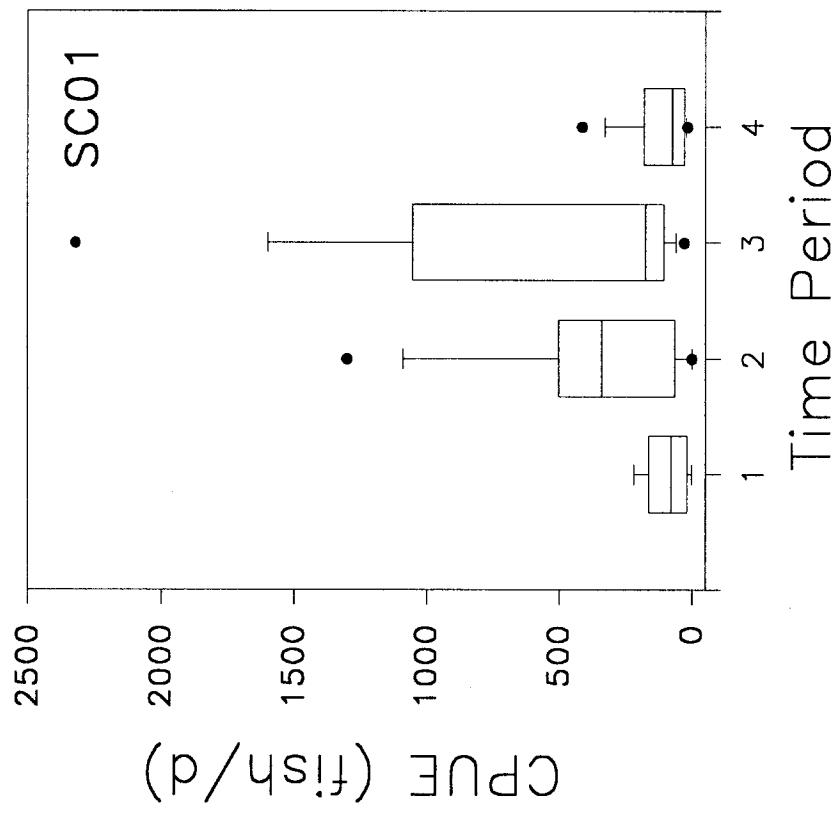


FIGURE 4.3.— Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Simpson Cove in 1988. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

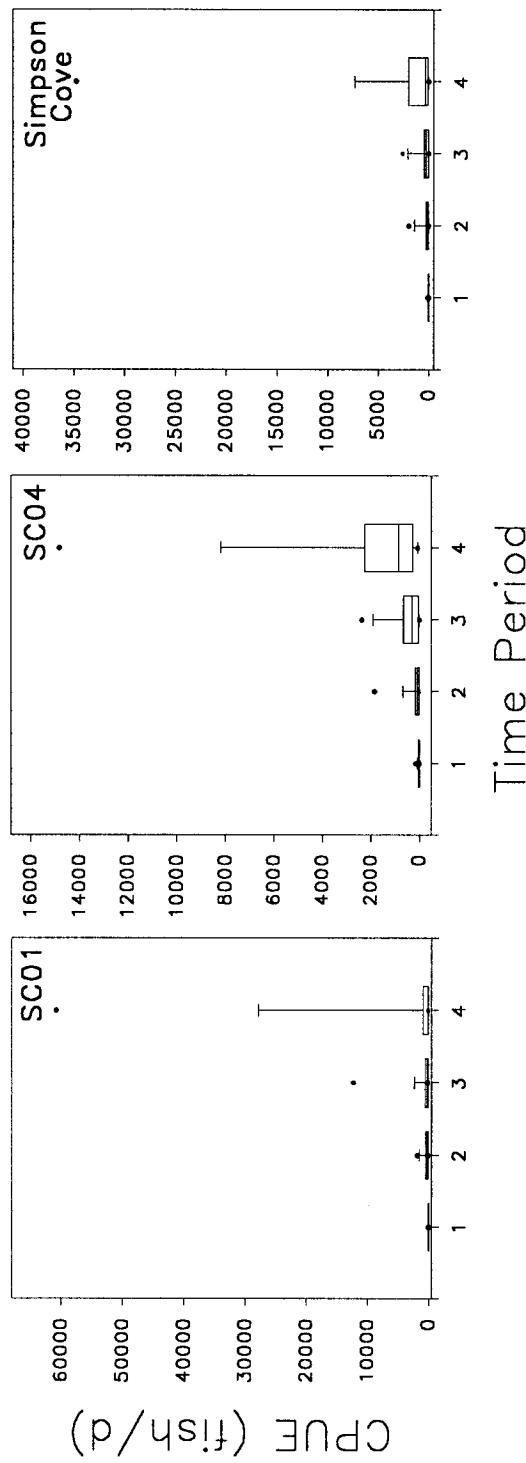


FIGURE 4.4.— Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Simpson Cove in 1989. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

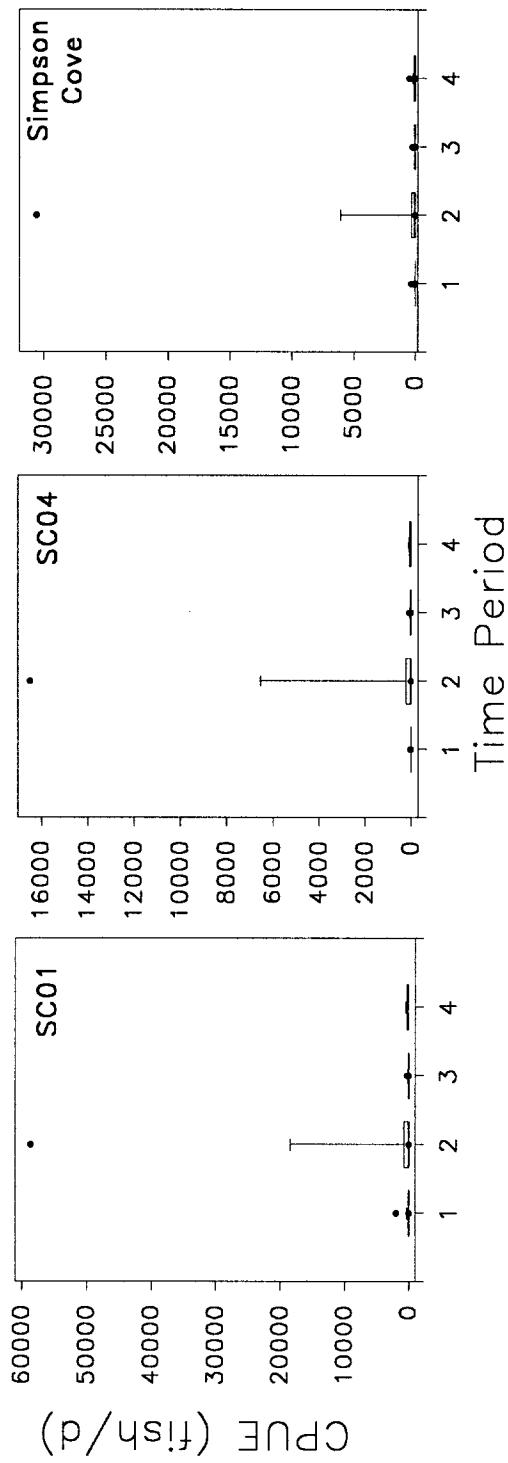


FIGURE 4.5.— Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Simpson Cove in 1990. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

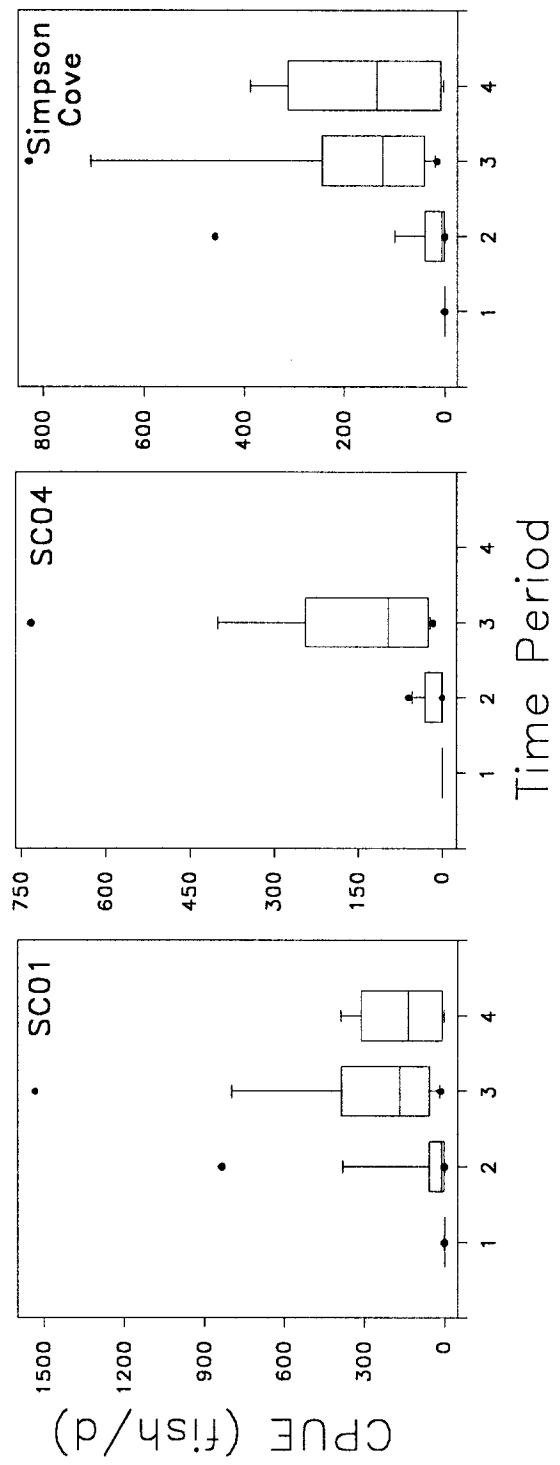


FIGURE 4.6.— Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Simpson Cove in 1991. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

4.4-4.6). Kaktovik Lagoon net stations KL05 and KL10 showed within-season increases in daily catch rates during all four years (Table 4.5, Figures 4.7-4.10). In Jago Lagoon, daily catch rates increased at net station JL12 in 1988 and 1989, and at net station JL14 in 1989 (Table 4.6; Figures 4.11-4.14). Few significant differences were noted in Arctic cod daily catch rates in Pokok Bay and Beaufort Lagoon stations, which could be attributable to the low overall catch rates: 0-14 fish/d in 1990 and 0-1.5 fish/d in 1991 (Table 4.7; Figures 4.15-4.17).

Arctic cod daily catch rates varied between years within locations (Table 4.8; Figures 4.18-4.21). For net stations KL05 and JL14 (excluding 1990), KL10, and JL12, 1988 daily catch rates were higher than all other years. Daily catch rates of Arctic cod at net stations SC01 and SC04 were lower during the latter years of the study. Although CPUE at net station BL02 did not differ between 1990 and 1991, net station BL04 catch rates were lower in 1990.

Simpson Cove had higher Arctic cod daily catch rates in 1988 and 1989 than in 1990 and 1991 (Table 4.8; Figures 4.18-4.21). Daily catch rates in Kaktovik and Jago lagoons were higher in 1988 than in all other years. Beaufort Lagoon daily catch rates did not differ between 1990 and 1991.

Between-year comparisons of Arctic cod daily catch rates, by location within a time period, indicated significant differences. Daily catch rates in Simpson Cove for time periods 1 and 2 indicated decreases from 1988 to 1991 (Table 4.9; Figure 4.22). In Simpson Cove, at net stations SC01 and SC04, daily catch rates during time period 3 were lower in 1990 than in all other years (Table 4.9; Figure 4.23). Arctic cod daily catch rates during time period 4 at net station SC01 and in Simpson Cove were constant over the four years. Declines in daily catch rates in Kaktovik and Jago lagoons were noted between 1988 and 1991 for time periods 2 and 3 (Tables 4.10-4.11; Figures 4.24-4.27). We detected few differences between 1990 and 1991 daily catch rates for Beaufort Lagoon stations BL02 and BL04, by time period (Table 4.12).

Length Frequency Distributions

Trends in Arctic cod length frequency distributions generally showed unimodal patterns throughout years, areas, and time periods (Figures 4.28-4.35). Absence or scarcity of Arctic cod during some years prevented assessment of distributions through a given season (Figures 4.30, 4.32, 4.35). In Simpson Cove during the first sampling period (July 9-31), the length frequency distribution mode occurred around 90-100 mm FL in 1988 and 1990, and around 140-150 mm FL in 1989. Insufficient catch in 1991 ($N = 4$) precluded an interpretation of modal length (Figure 4.28). During the second time period (August 1-15), the mode occurred at 90-100 mm FL except in 1989 when the majority of Arctic cod occurred at 120 mm FL. The third and fourth sampling periods (August 15-31 and September 1-14, respectively) showed modes around 90-110 mm FL except in 1989. Again, the mode during 1989 occurred at lengths 40 to 50 mm FL greater than those of the other years (Figure 4.29). In Kaktovik Lagoon, during 1988 and 1990, the length modes remained between 90-110 mm FL throughout the season (Figure 4.30). In 1989, length frequency modes of the third and fourth sampling periods occurred between 110-120 mm FL

TABLE 4.5.— Comparison of Arctic cod daily CPUE (fish/d) between time periods in Kaktovik Lagoon, 1988-91. For each net station/sampling are those time periods with the same letter, within the same year, are not significantly different (Kruskal-Wallis test with Scheffé multiple comparisons). Time period 1 corresponds to the period from the first sampling day to July 31. Time period 2 corresponds to the period from August 1 to August 14. Time period 3 corresponds to the period from August 15 to August 31. Time period 4 corresponds to the period from September 1 to the last sampling day.

| Within year Scheffé groupings | | | | |
|-------------------------------|------|------|------|------|
| Time Period | 1988 | 1989 | 1990 | 1991 |
| Net Station - KL05 | | | | |
| 1 | B | B | B | C |
| 2 | A | B | B | B,C |
| 3 | A | B | A | A,B |
| 4 | A | A | A | A |
| Net Station - KL10 | | | | |
| 1 | B | C | B | C |
| 2 | A | C | B | B,C |
| 3 | A | B | A,B | A |
| 4 | A | A | A | A,B |
| Kaktovik Lagoon | | | | |
| 1 | B | C | B | B |
| 2 | A | C | B | B |
| 3 | A | B | A | A |
| 4 | A | A | A | A |

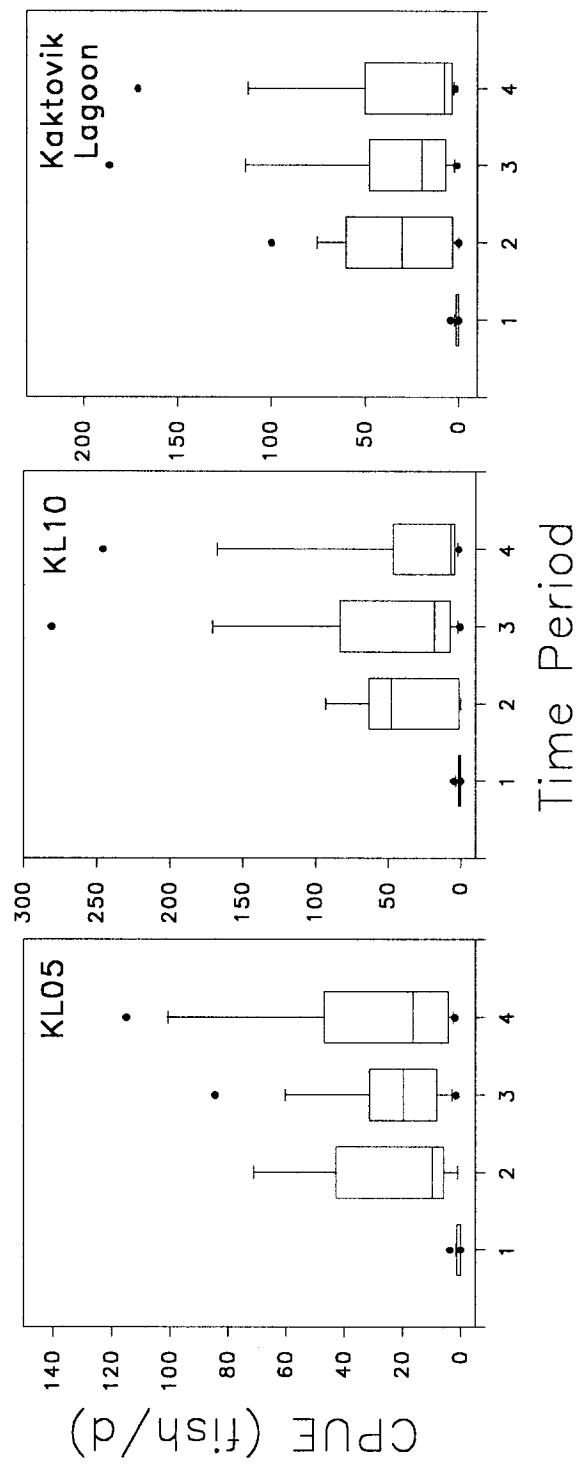


FIGURE 4.7.—Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Kaktovik Lagoon in 1988. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

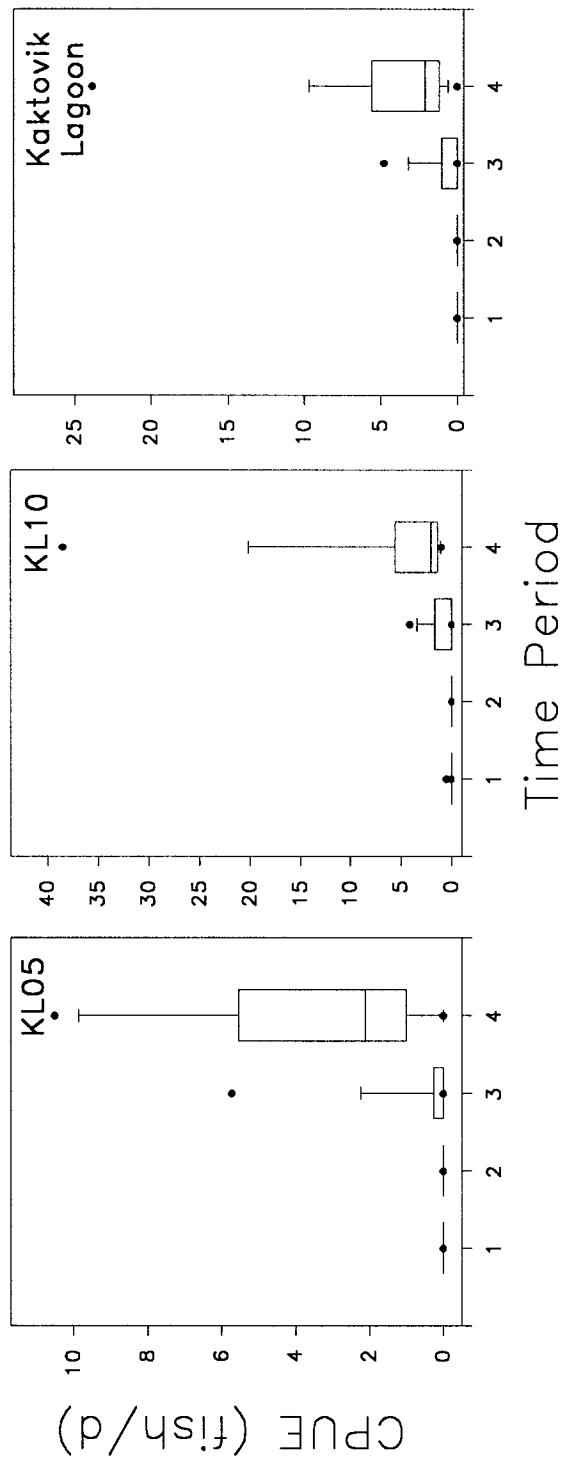


FIGURE 4.8.—Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Kaktovik Lagoon in 1989. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

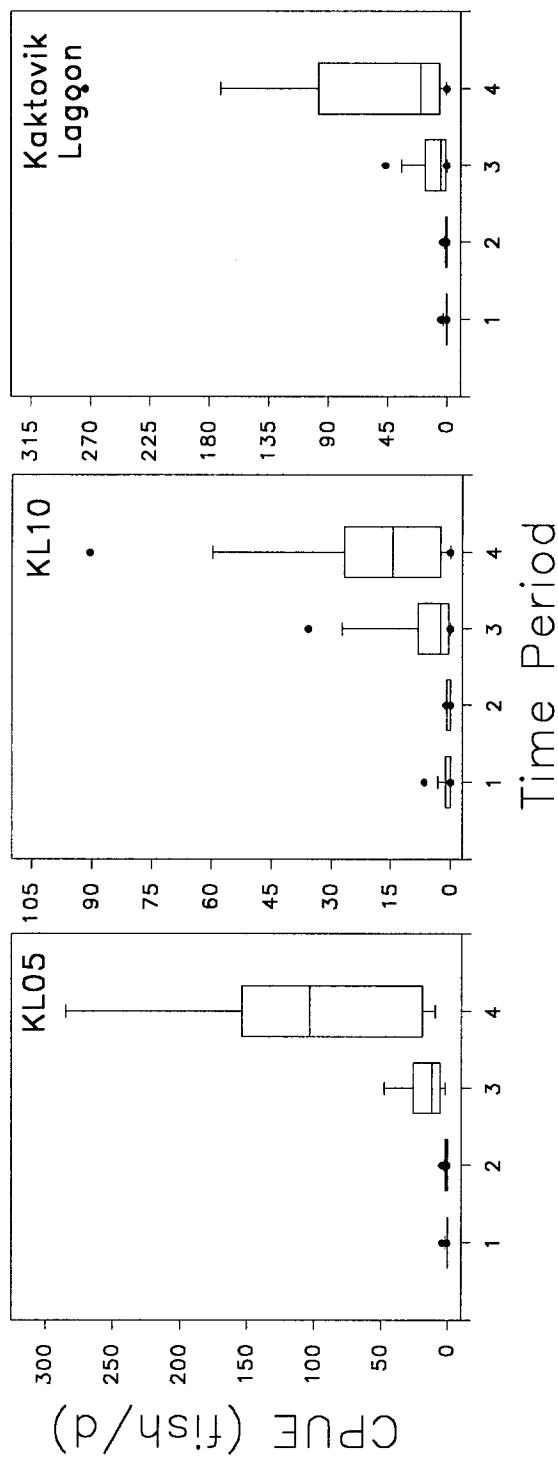


FIGURE 4.9.— Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Kaktovik Lagoon in 1990. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

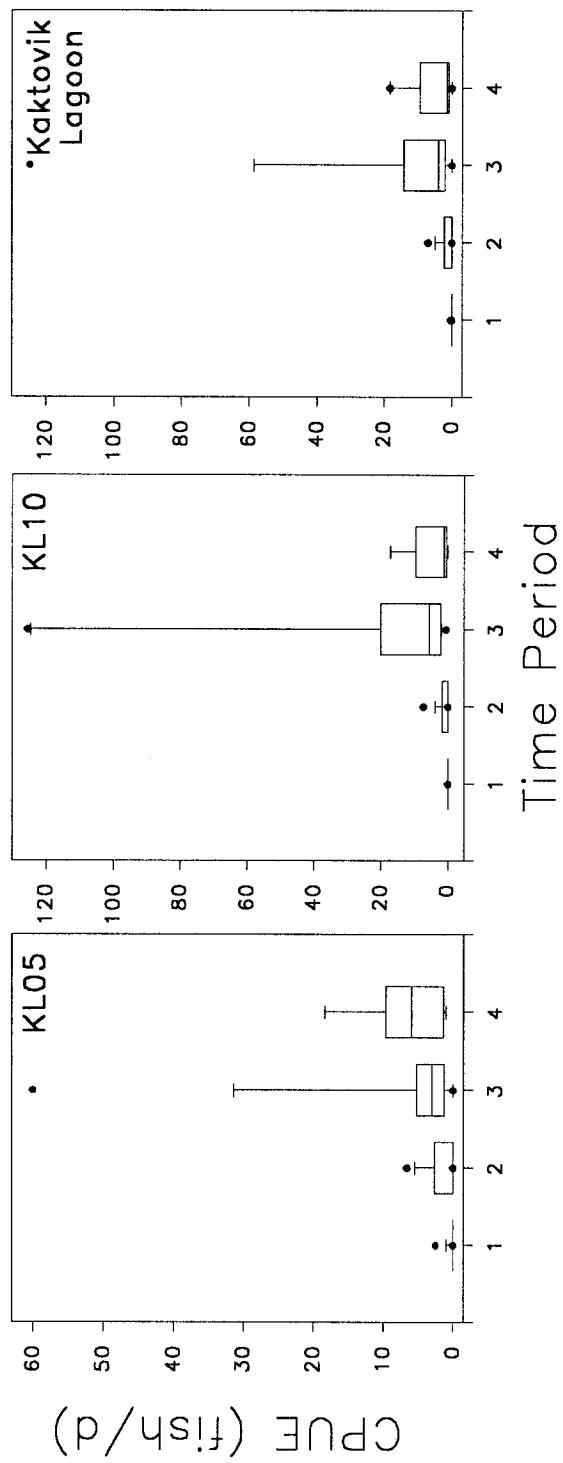


FIGURE 4.10.—Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Kaktovik Lagoon in 1991. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

TABLE 4.6.— Comparison of Arctic cod daily CPUE (fish/d) between time periods in Jago Lagoon, 1988-91. For each net station/sampling area those time periods with the same letter, within the same year, are not significantly different (Kruskal-Wallis test with Scheffé multiple comparisons). Time period 1 corresponds to the period from the first sampling day to July 31. Time period 2 corresponds to the period from August 1 to August 14. Time period 3 corresponds to the period from August 15 to August 31. Time period 4 corresponds to the period from September 1 to the last sampling day.

| Within year Scheffé groupings | | | | |
|-------------------------------|------|------|------|------|
| Time Period | 1988 | 1989 | 1990 | 1991 |
| Net Station - JL12 | | | | |
| 1 | B | C | A | B |
| 2 | A | C | A | A,B |
| 3 | A | B | A | A |
| 4 | A | A | A | A,B |
| Net Station - JL14 | | | | |
| 1 | C | B | A | B |
| 2 | A,B | B | A | A |
| 3 | A | A | A | A |
| 4 | B,C | A | A | A |
| Jago Lagoon | | | | |
| 1 | C | B | A | B |
| 2 | B | B | A | A,B |
| 3 | A | A | A | A |
| 4 | B | A | A | A |

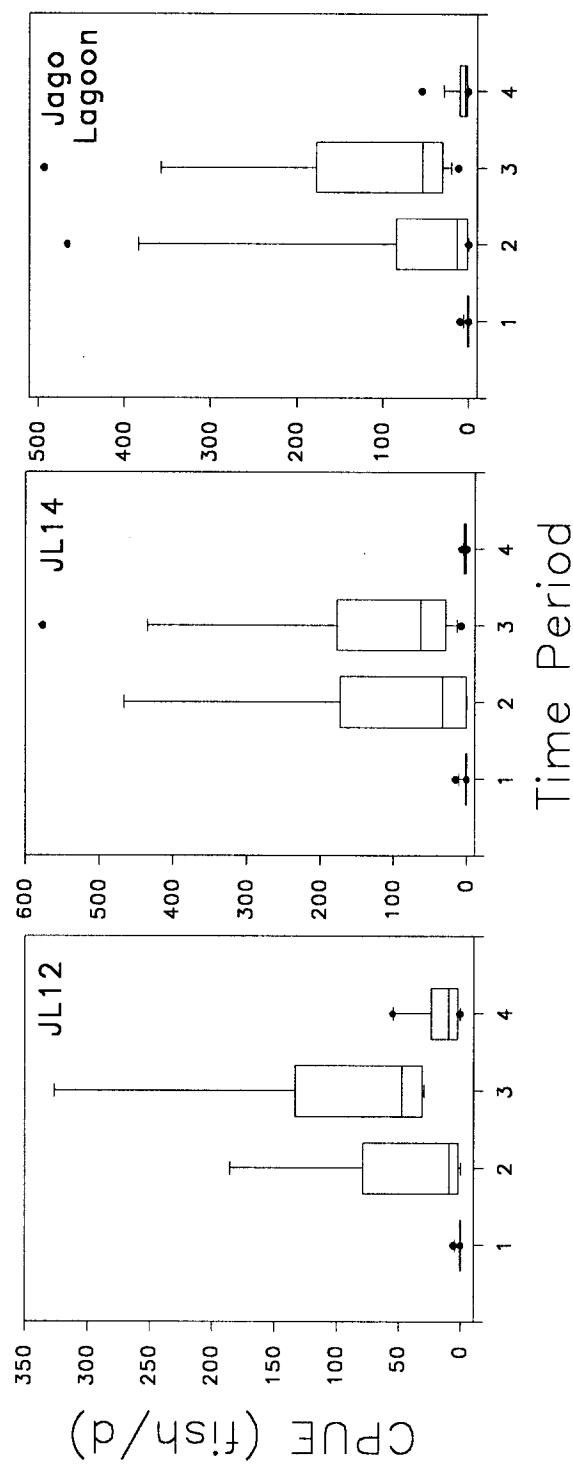


FIGURE 4.11.—Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Jago Lagoon in 1988. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

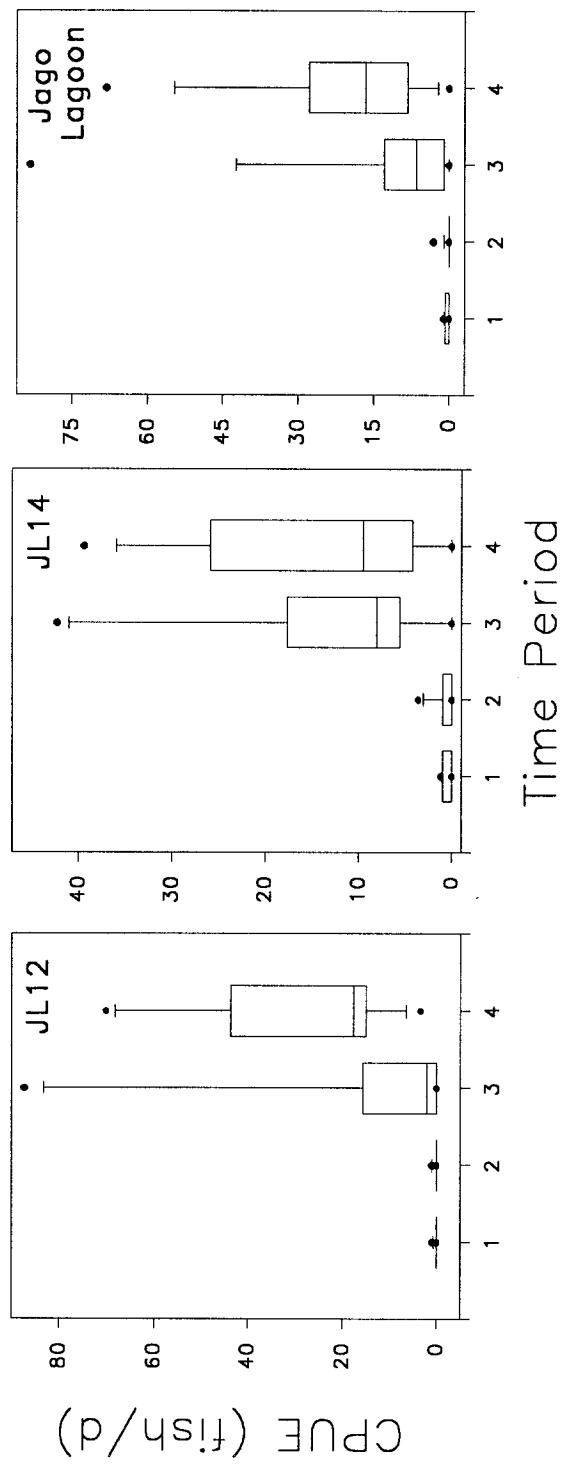


FIGURE 4.12.—Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Jago Lagoon in 1989. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

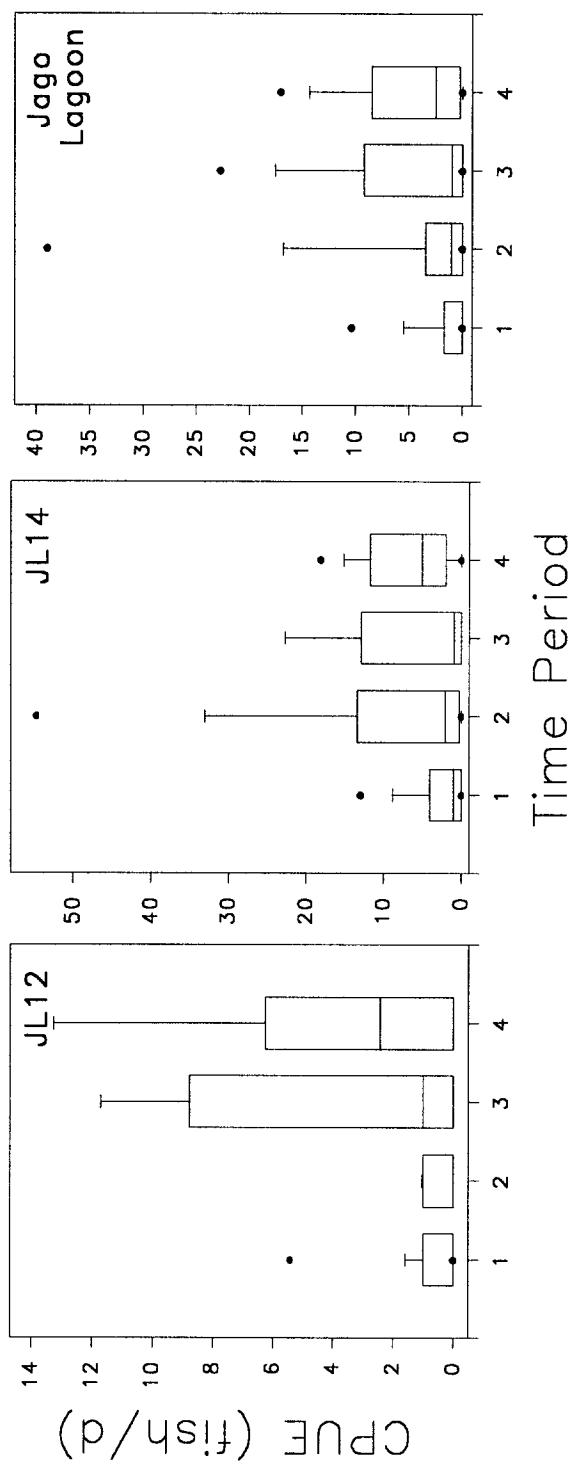


FIGURE 4.13.—Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Jago Lagoon in 1990. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

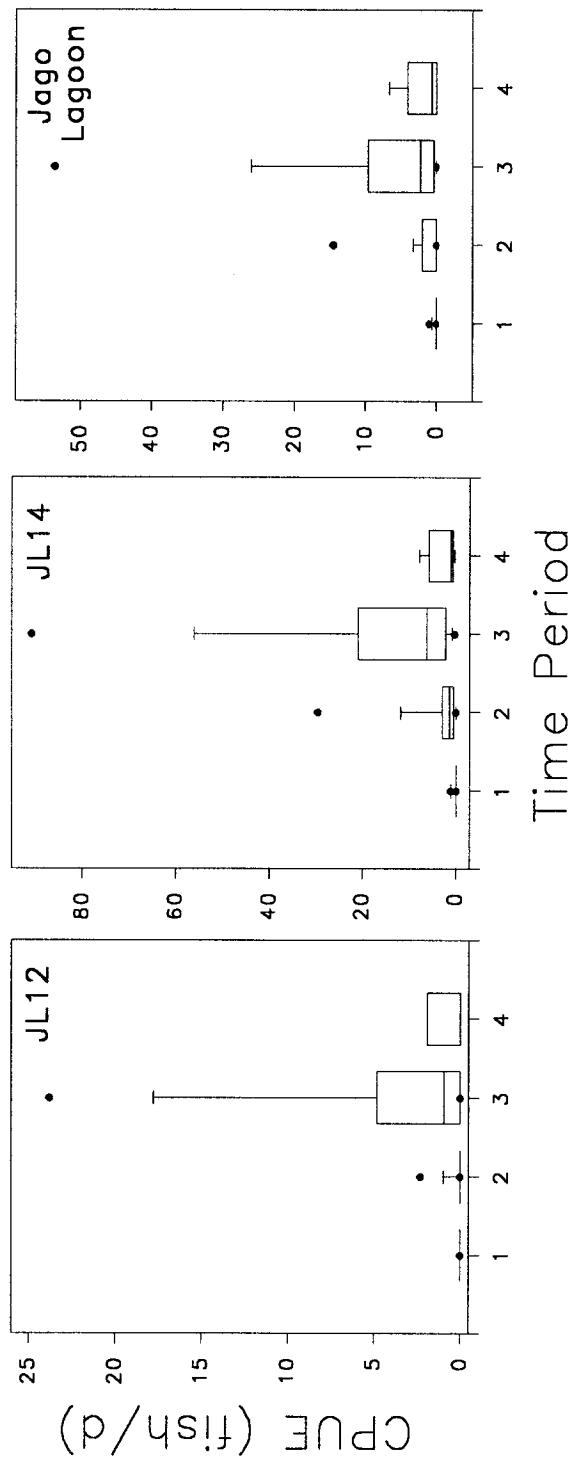


FIGURE 4.14.—Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Jago Lagoon in 1991. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

TABLE 4.7.— Comparison of Arctic cod daily CPUE (fish/d) between time periods in Pokok Bay\Beaufort Lagoon, 1988-91. For each net station\sampling area those time periods with the same letter, within the same year, are not significantly different (Kruskal-Wallis test with Scheffé multiple comparisons). Time period 1 corresponds to the period from the first sampling day to July 31. Time period 2 corresponds to the period from August 1 to August 14. Time period 3 corresponds to the period from August 15 to August 31. Time period 4 corresponds to the period from September 1 to the last sampling day. Locations with dashed lines were not fished during that time period.

| | | Within year Scheffé groupings | | |
|-------------|-----------|-------------------------------|-----------------|------|
| Time Period | | 1988 | 1990 | 1991 |
| | PB01 | | BL02 | |
| 1 | | B | B | A |
| 2 | | A, B | B | A |
| 3 | | A | B | A |
| 4 | | A | A | A |
| | PB02 | | BL04 | |
| 1 | | -- | A | A |
| 2 | | A | A | A |
| 3 | | A | A | A |
| 4 | | A | A | A |
| | Pokok Bay | | Beaufort Lagoon | |
| 1 | | B | B | A |
| 2 | | B | B | A |
| 3 | | A | B | A |
| 4 | | A | A | A |

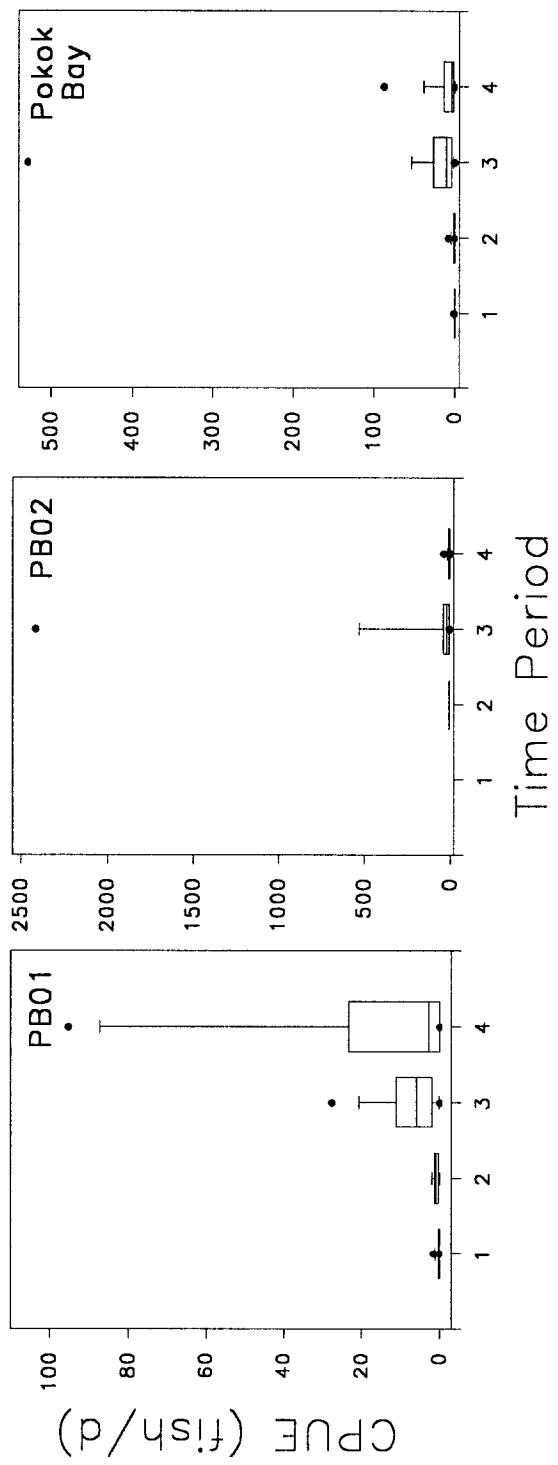


FIGURE 4.15.—Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Pokok Bay in 1988. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

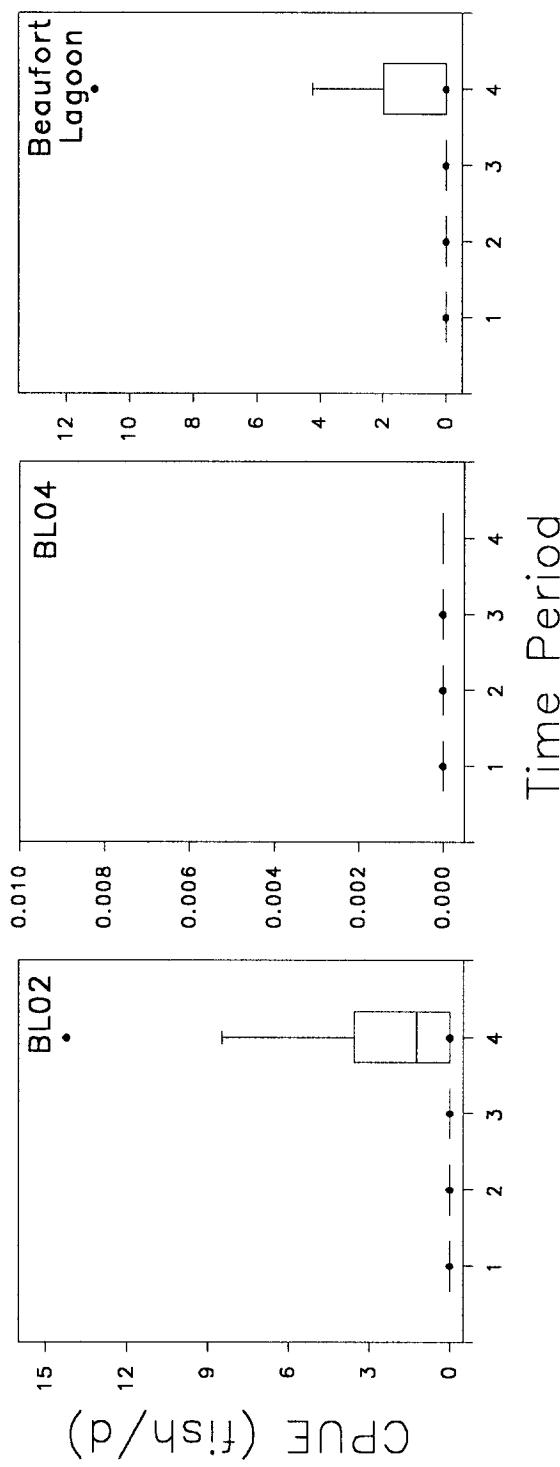


FIGURE 4.16.—Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Beaufort Lagoon in 1990. 1 = the first sampling day to Jul 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

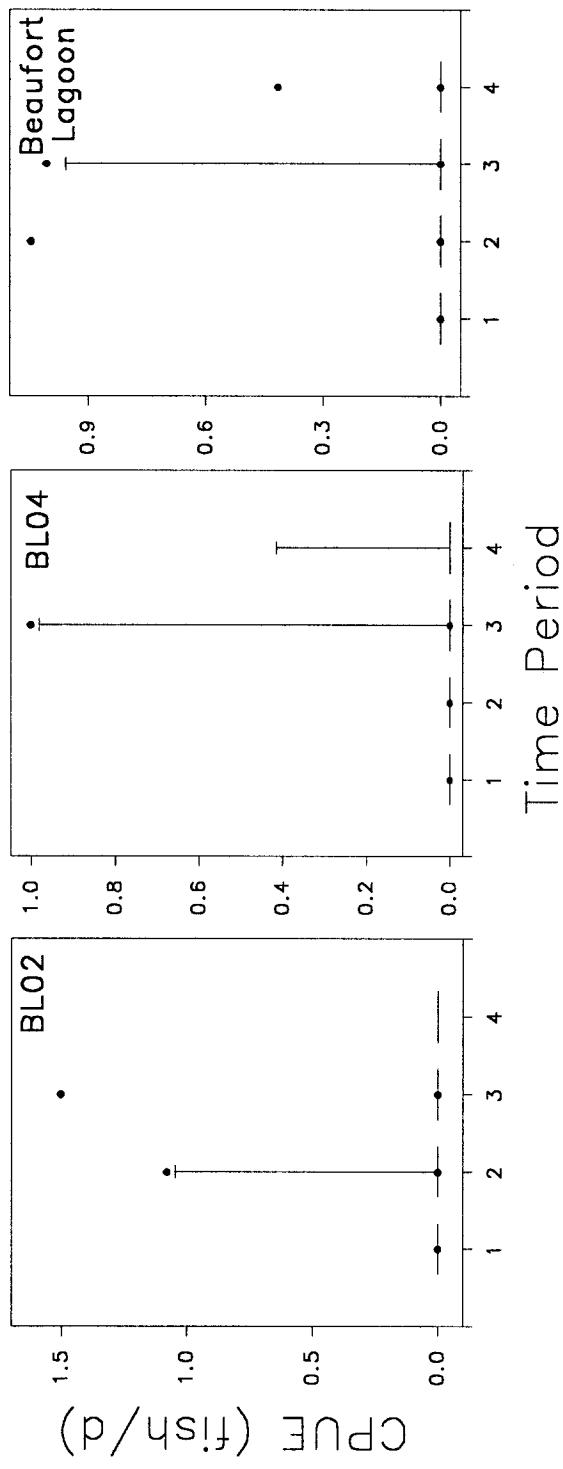


FIGURE 4.17.—Boxplots comparing daily CPUE (fish/d) observations between time periods for Arctic cod in Beaufort Lagoon in 1991. 1 = the first sampling day to July 31; 2 = August 1 to 14; 3 = August 15 to 31; 4 = September 1 to the last sampling day.

TABLE 4.8.— Comparison of Arctic cod daily CPUE (fish/d) between years. For each net station/sampling area those years with the same letter are not significantly different (Kruskal-Wallis test with Scheffé multiple comparisons). Locations with dashed lines were not fished during that year.

| Year | Within location Scheffé groupings | | |
|------|-----------------------------------|-------------|-----------------|
| | Net Station | Net Station | Sampling Area |
| | SC01 | SC04 | Simpson Cove |
| 1988 | A | -- | A |
| 1989 | A,B | A | A |
| 1990 | B,C | B | B |
| 1991 | C | B | B |
| | KL05 | KL10 | Kaktovik Lagoon |
| 1988 | A | A | A |
| 1989 | C | B | C |
| 1990 | A,B | B | B |
| 1991 | B | B | B |
| | JL12 | JL14 | Jago Lagoon |
| 1988 | A | A | A |
| 1989 | B | B | B |
| 1990 | B | A,B | B |
| 1991 | B | B | B |
| | BL02 | BL04 | Beaufort Lagoon |
| 1990 | A | B | A |
| 1991 | A | A | A |

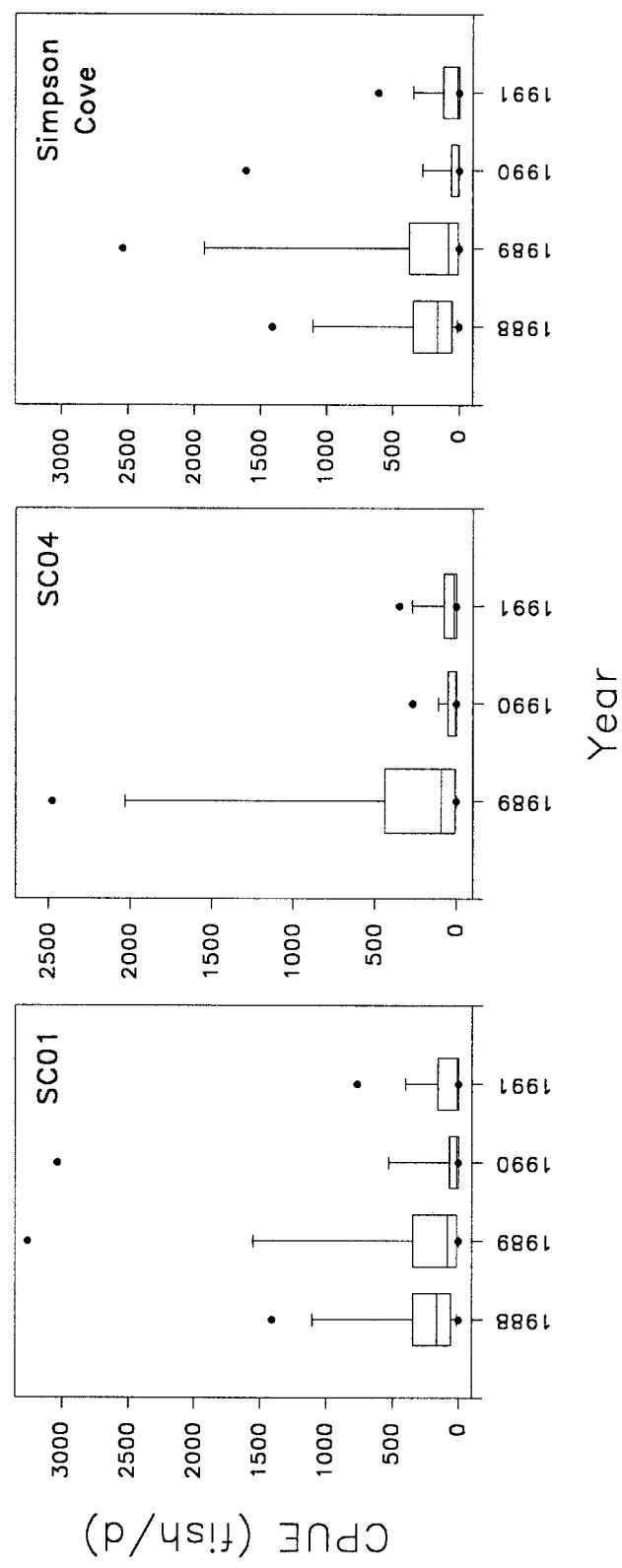


FIGURE 4.18.—Boxplots comparing daily CPUE (fish/d) observations between years for Arctic cod in Simpson Cove.

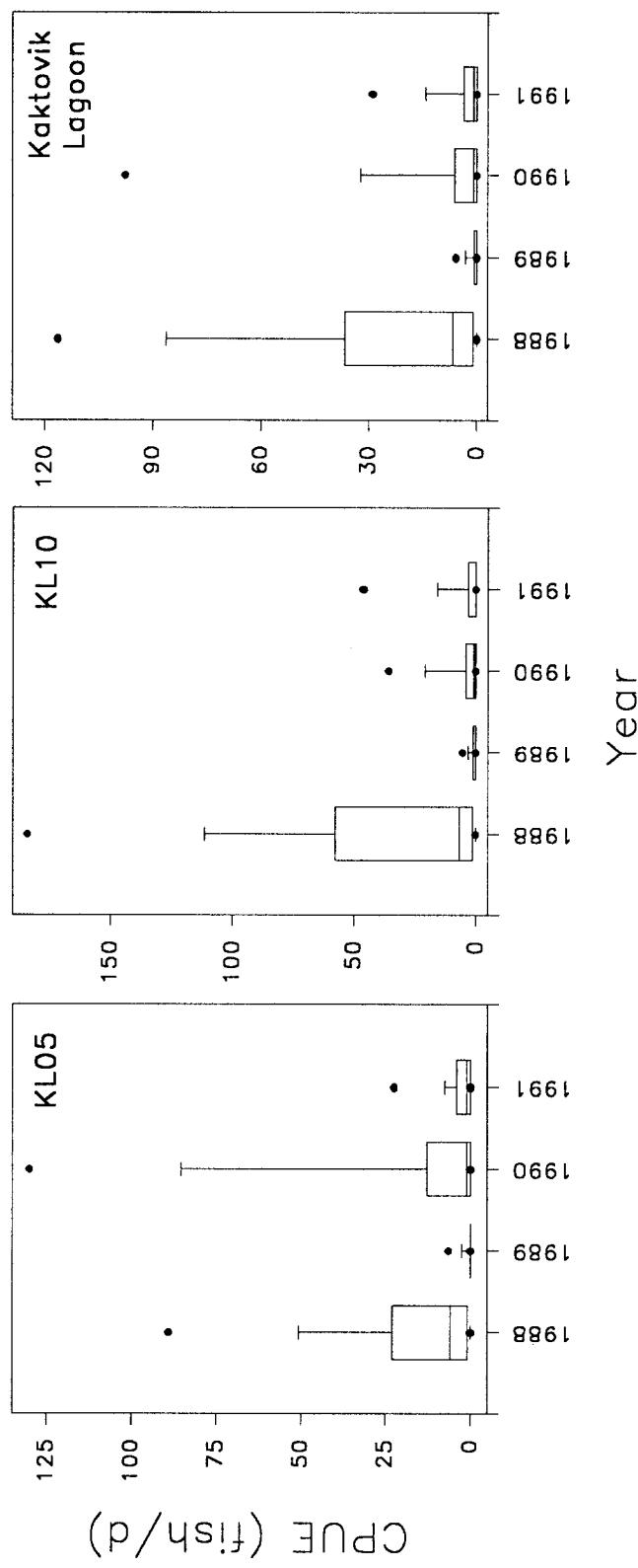


FIGURE 4.19.—Boxplots comparing daily CPUE (fish/d) observations between years for Arctic cod in Kaktovik Lagoon.

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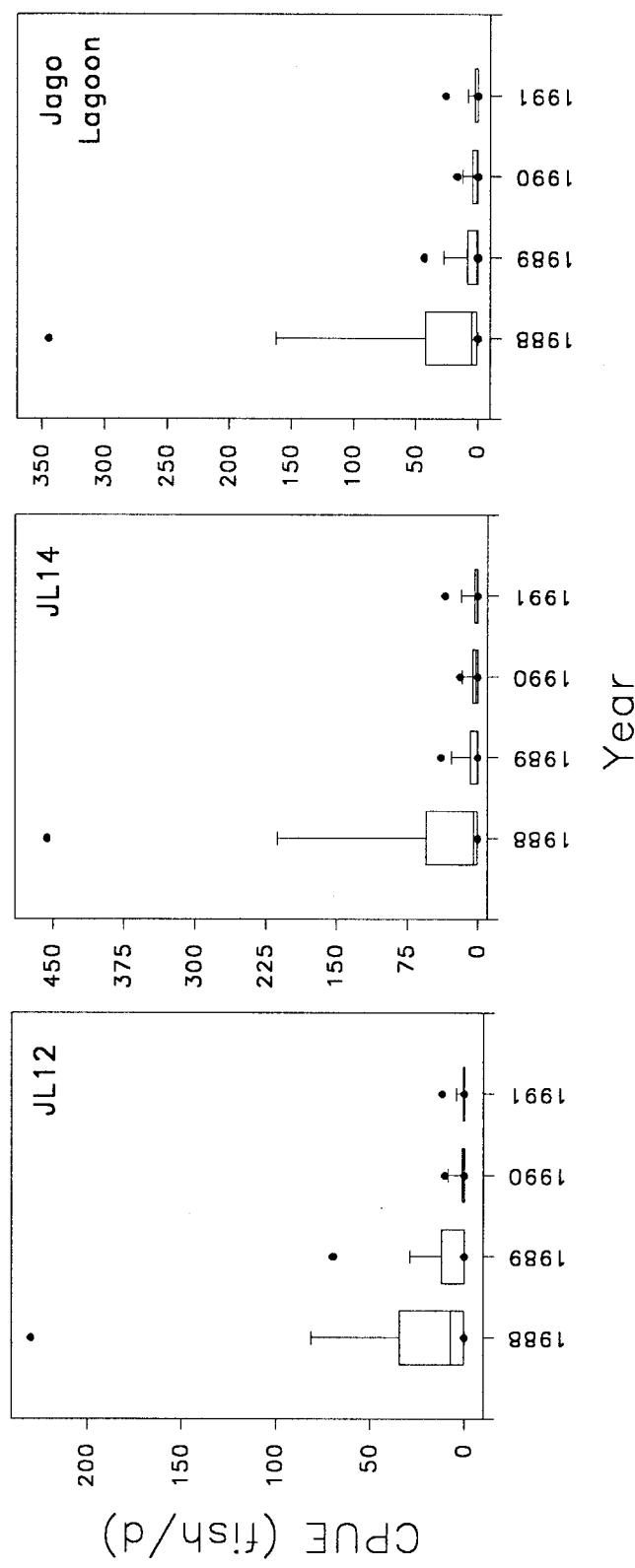


FIGURE 4.20.—Boxplots comparing daily CPUE (fish/d) observations between years for Arctic cod in Jago Lagoon.

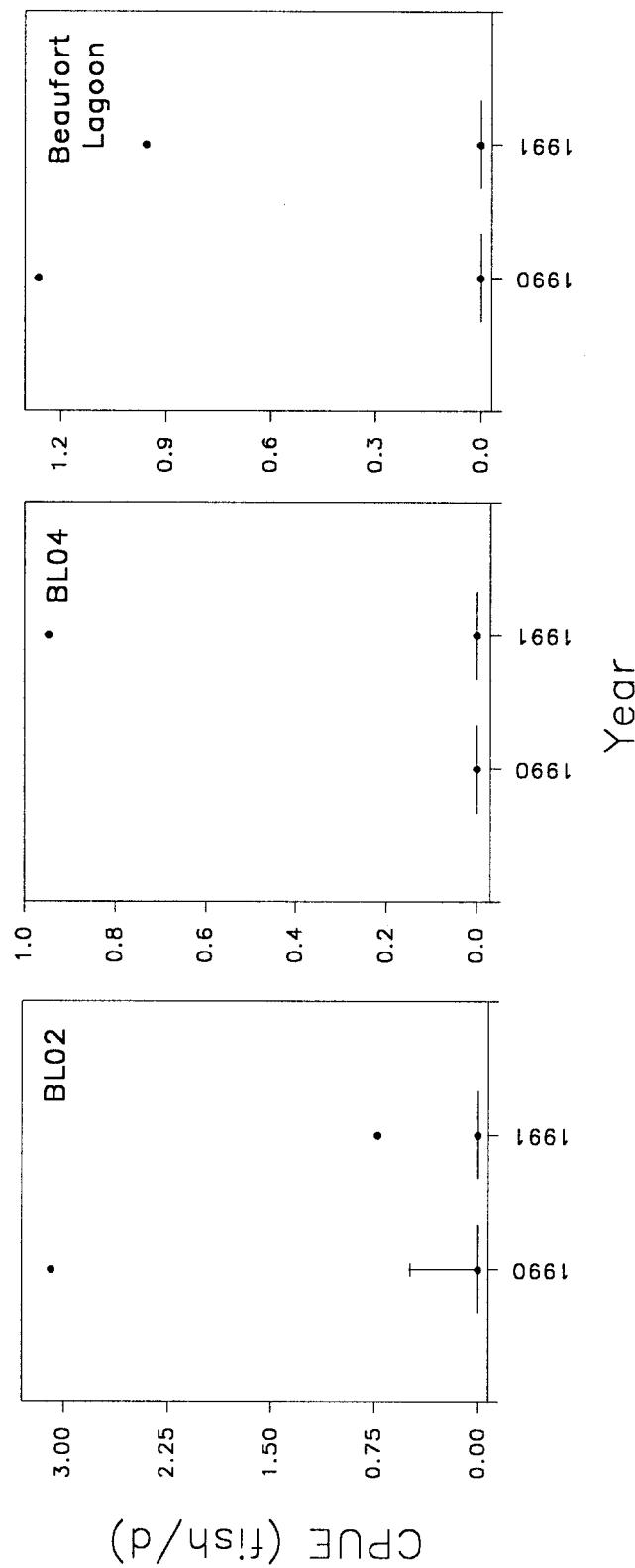


FIGURE 4.21.—Boxplots comparing daily CPUE (fish/d) observations between years for Arctic cod in Beaufort Lagoon.

TABLE 4.9.— Comparison of Arctic cod daily CPUE (fish/d) between years in Simpson Cove. For each net station/sampling area those years with the same letter, within the time period, are not significantly different (Kruskal-Wallis test with Scheffé multiple comparisons). Locations with dashed lines were not sampled during that year.

| Year | Within location Scheffé groupings | | |
|--|-----------------------------------|------|--------------|
| | SC01 | SC04 | Simpson Cove |
| Time Period 1 - first day to July 31 | | | |
| 1988 | A | -- | A |
| 1989 | B | A | B |
| 1990 | A,B | A | B |
| 1991 | C | B | C |
| Time Period 2 - August 1 to August 14 | | | |
| 1988 | A,B | -- | A |
| 1989 | A | A | A |
| 1990 | A,B | A,B | A,B |
| 1991 | B | B | B |
| Time Period 3 - August 15 to August 31 | | | |
| 1988 | A | -- | A |
| 1989 | A | A | A |
| 1990 | B | B | B |
| 1991 | A | A | A |
| Time Period 4 - September 1 to last day | | | |
| 1988 | A | -- | A |
| 1989 | A | A | A |
| 1990 | A | B | A |
| 1991 | A | -- | A |

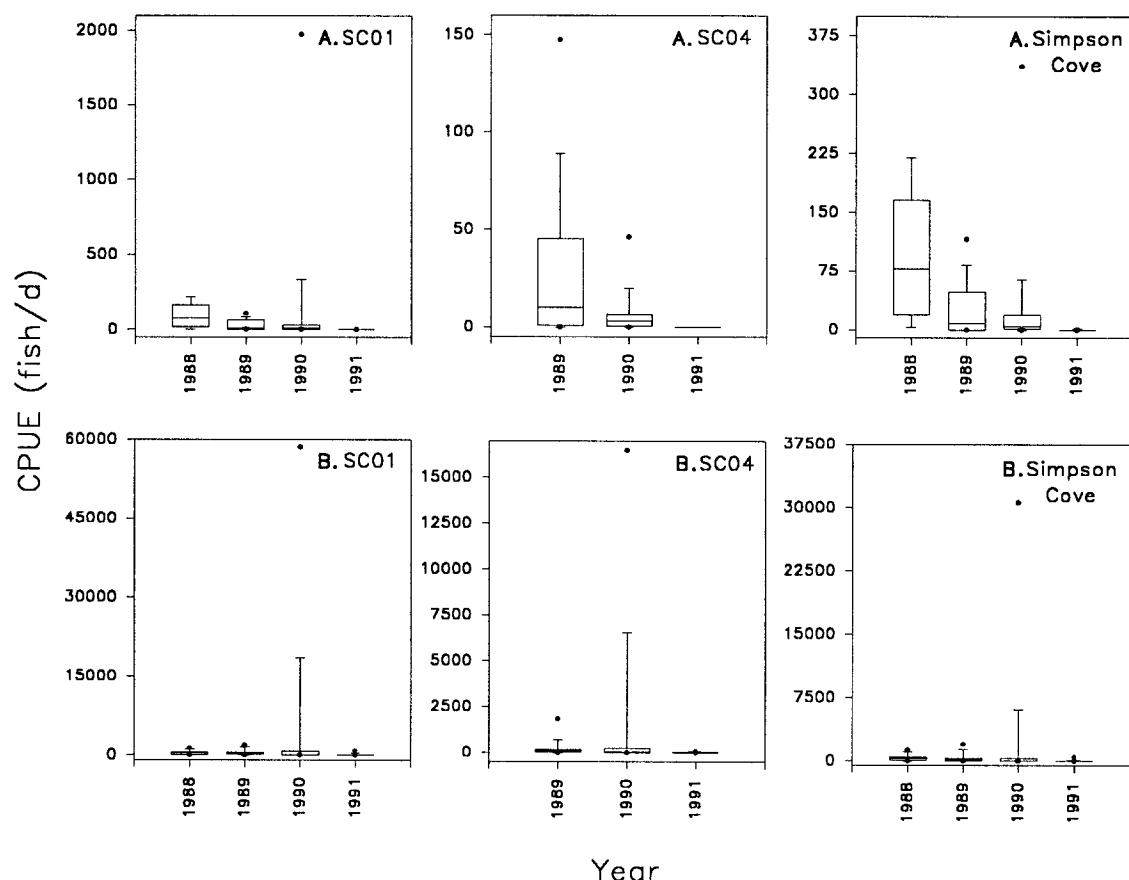


FIGURE 4.22.— Boxplots comparing daily CPUE (fish/d) observations between years for Arctic cod in Simpson Cove. A = time period 1, the first sampling day to July 31. B = time period 2, August 1 to August 14.

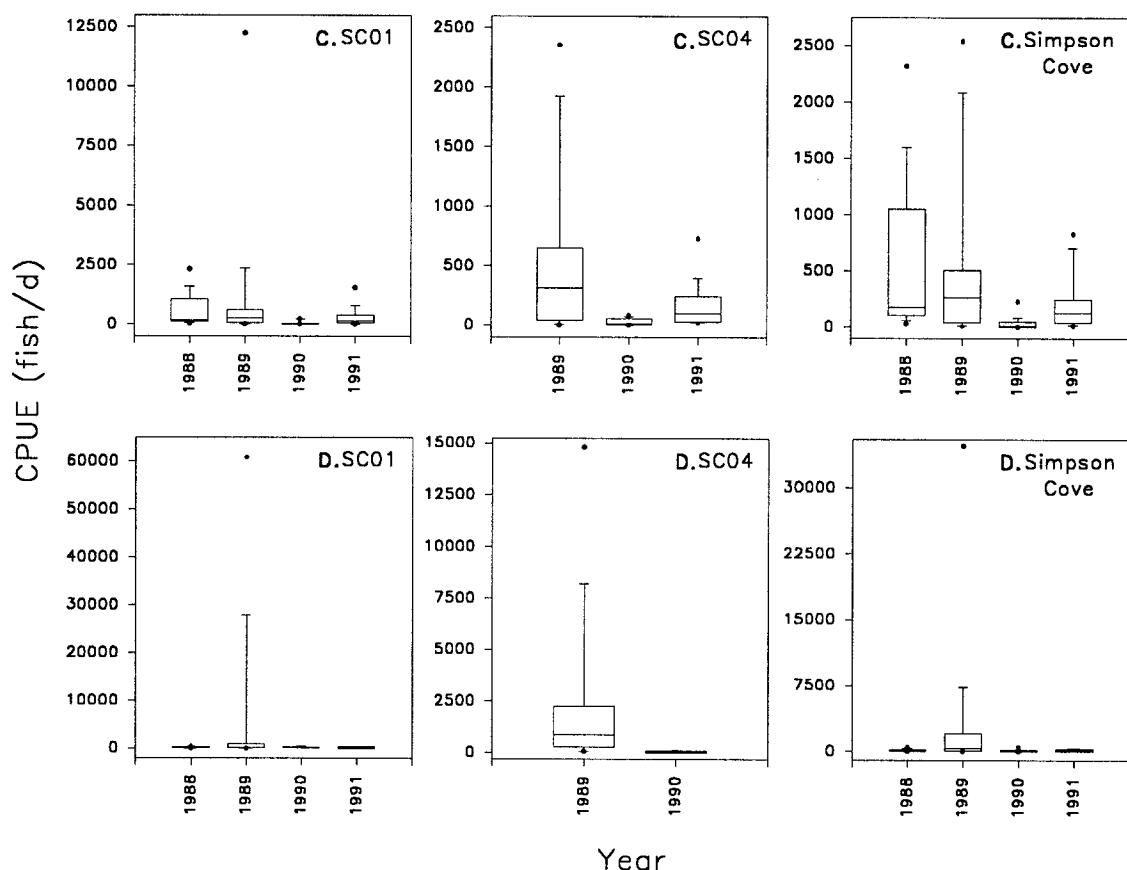


FIGURE 4.23.— Boxplots comparing daily CPUE (fish/d) observations between years for Arctic cod in Simpson Cove. C = time period 3, August 15 to August 31. D = time period 4, September 1 to the last sampling day.

TABLE 4.10.— Comparison of Arctic cod daily CPUE (fish/d) between years in Kaktovik Lagoon. For each net station/sampling area those years with the same letter, within the time period, are not significantly different (Kruskal-Wallis test with Scheffé multiple comparisons).

| Year | Within location Scheffé groupings | | |
|--|-----------------------------------|------|-----------------|
| | KL05 | KL10 | Kaktovik Lagoon |
| Time Period 1 - first day to July 31 | | | |
| 1988 | A | A | A |
| 1989 | A | B | B |
| 1990 | A | A, B | A, B |
| 1991 | A | B | B |
| Time Period 2 - August 1 to August 14 | | | |
| 1988 | A | A | A |
| 1989 | B | B | C |
| 1990 | B | B | B |
| 1991 | B | B | B |
| Time Period 3 - August 15 to August 31 | | | |
| 1988 | A | A | A |
| 1989 | C | C | C |
| 1990 | A, B | B, C | B |
| 1991 | B | A, B | B |
| Time Period 4 - September 1 to last day | | | |
| 1988 | A, B | A | A |
| 1989 | B | A | B |
| 1990 | A | A | A |
| 1991 | B | A | B |

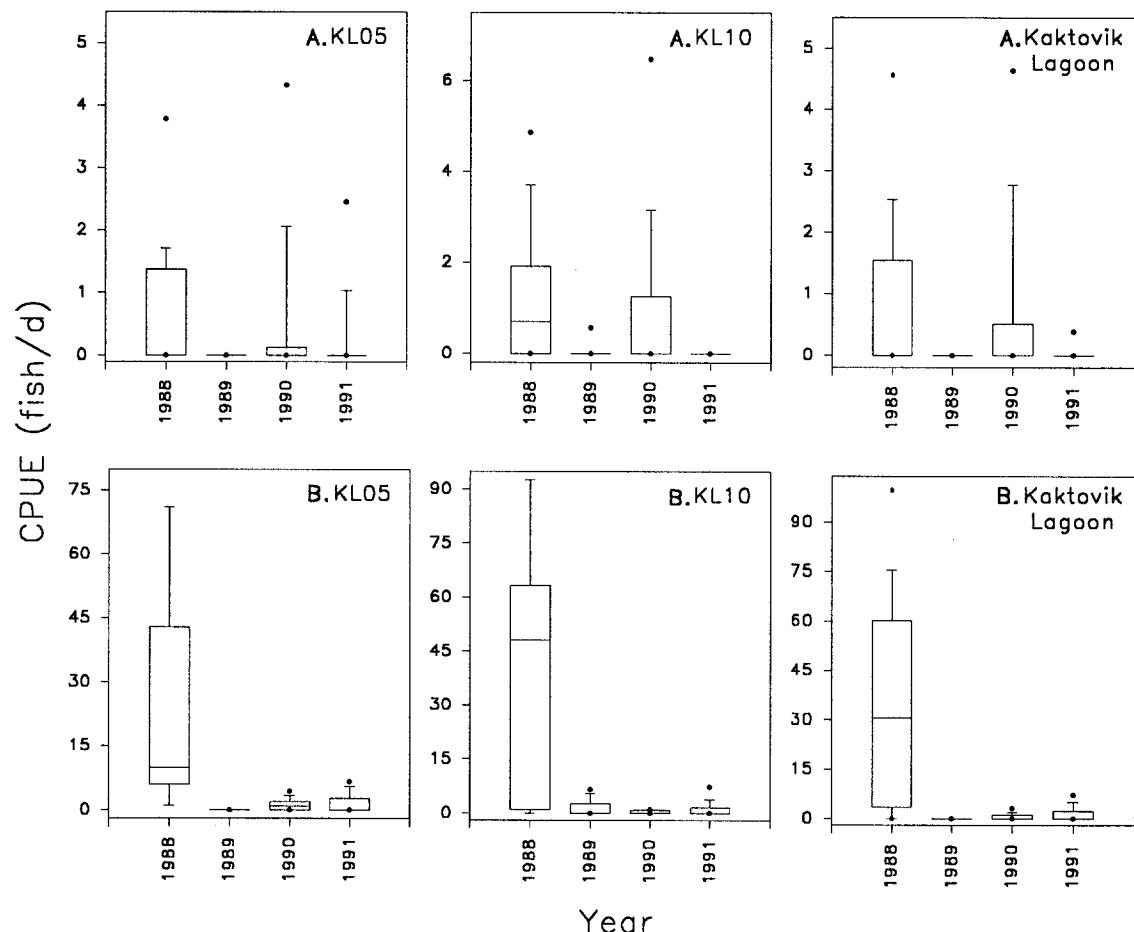


FIGURE 4.24.— Boxplots comparing daily CPUE (fish/d) observations between years for Arctic cod in Kaktovik Lagoon. A = time period 1, the first sampling day to July 31. B = time period 2, August 1 to August 14.

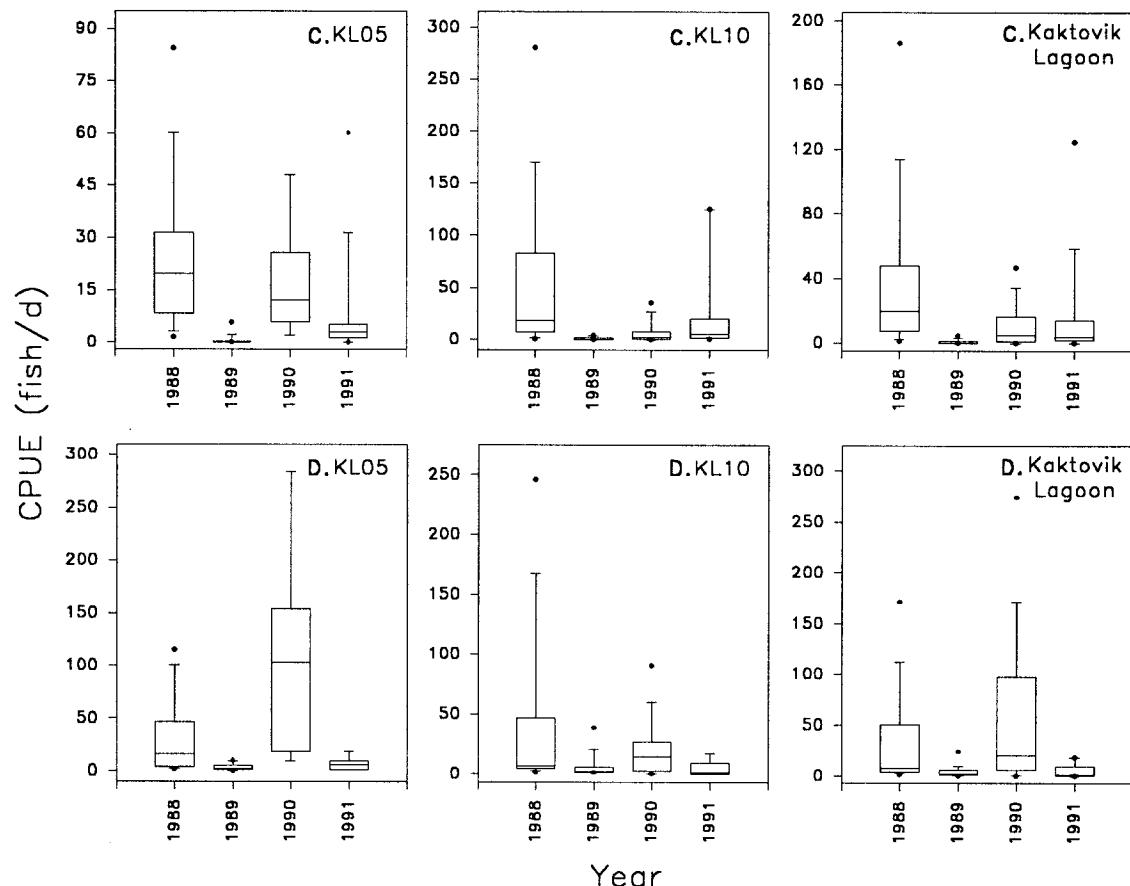


FIGURE 4.25.— Boxplots comparing daily CPUE (fish/d) observations between years for Arctic cod in Kaktovik Lagoon. C = time period 3, August 15 to August 31. D = time period 4, September 1 to the last sampling day.

TABLE 4.11.- Comparison of Arctic cod daily CPUE (fish/d) between years in Jago Lagoon. For each net station/sampling area those years with the same letter, within the time period, are not significantly different (Kruskal-Wallis test with Scheffé multiple comparisons).

| Year | Within location Scheffé groupings | | |
|--|-----------------------------------|------|-------------|
| | JL12 | JL14 | Jago Lagoon |
| Time Period 1 - first day to July 31 | | | |
| 1988 | A | A, B | A |
| 1989 | A | A, B | A, B |
| 1990 | A | A | A |
| 1991 | A | B | B |
| Time Period 2 - August 1 to August 14 | | | |
| 1988 | A | A | A |
| 1989 | B | B | B |
| 1990 | B | A, B | B |
| 1991 | B | A, B | B |
| Time Period 3 - August 15 to August 31 | | | |
| 1988 | A | A | A |
| 1989 | B | B | B |
| 1990 | B | B | B |
| 1991 | B | B | B |
| Time Period 4 - September 1 to last day | | | |
| 1988 | A, B | A | A, B |
| 1989 | A | A | A |
| 1990 | B, C | A | B |
| 1991 | C | A | B |

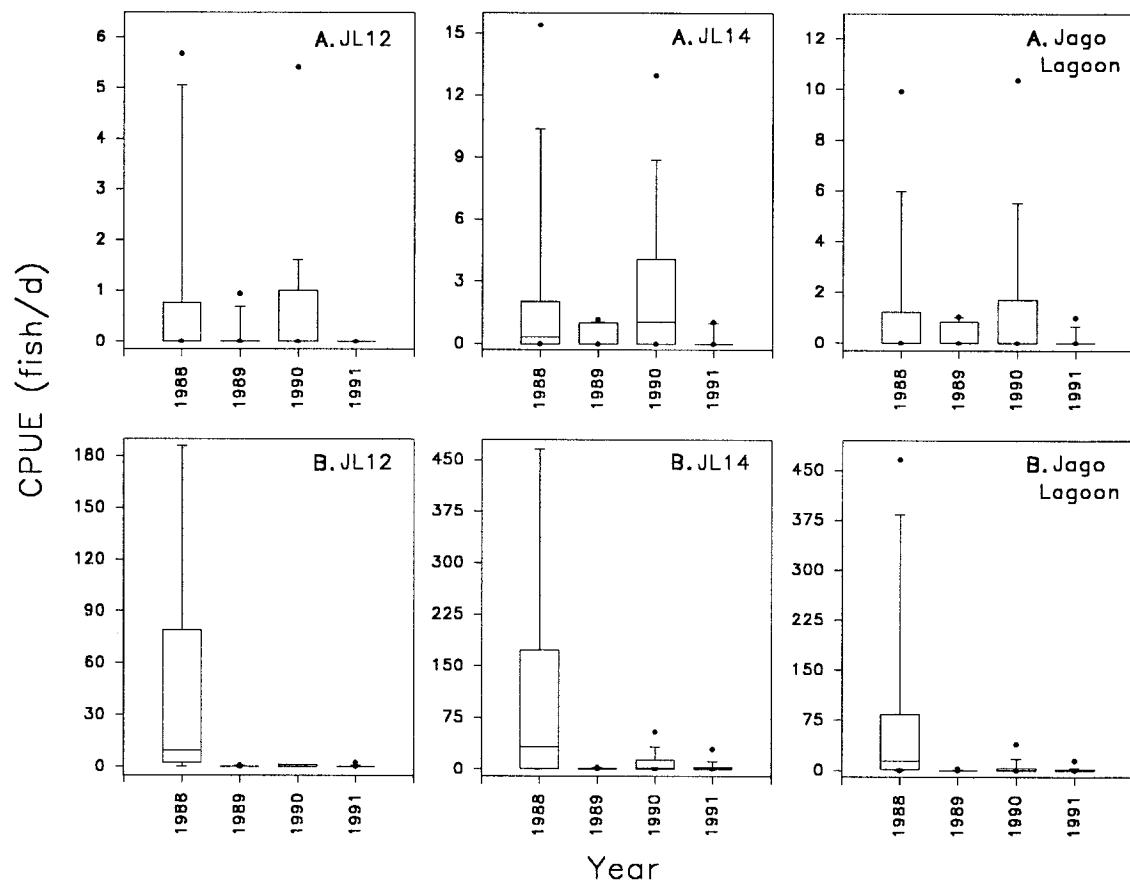


FIGURE 4.26.— Boxplots comparing daily CPUE (fish/d) observations between years for Arctic cod in Jago Lagoon. A = time period 1, the first sampling day to July 31. B = time period 2, August 1 to August 14.

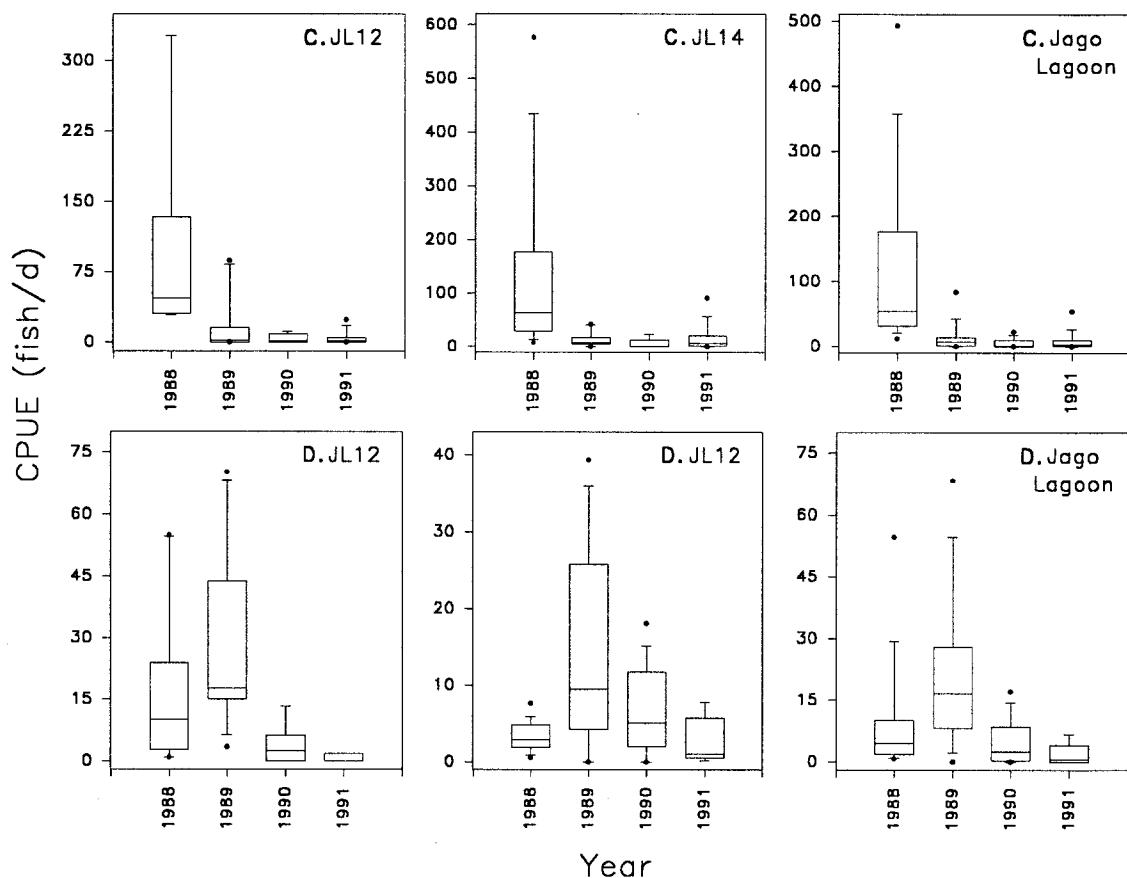


FIGURE 4.27.— Boxplots comparing daily CPUE (fish/d) observations between years for Arctic cod in Jago Lagoon. C = time period 3, August 15 to August 31. D = time period 4, September 1 to the last sampling day.

TABLE 4.12.— Comparison of Arctic cod daily CPUE (fish/d) between years in Beaufort Lagoon. For each net station/sampling area those years with the same letter, within the time period, are not significantly different (Kruskal-Wallis test with Scheffé multiple comparisons).

| Year | Within location Scheffé groupings | | |
|---|-----------------------------------|------|-----------------|
| | BL02 | BL04 | Beaufort Lagoon |
| Time Period 1 - first day to July 31 | | | |
| 1990 | A | A | A |
| 1991 | A | A | A |
| Time Period 2 - August 1 to August 14 | | | |
| 1990 | A | A | A |
| 1991 | A | A | A |
| Time Period 3 - August 15 to August 31 | | | |
| 1990 | A | A | A |
| 1991 | A | A | A |
| Time Period 4 - September 1 to last day | | | |
| 1990 | A | A | A |
| 1991 | B | A | B |

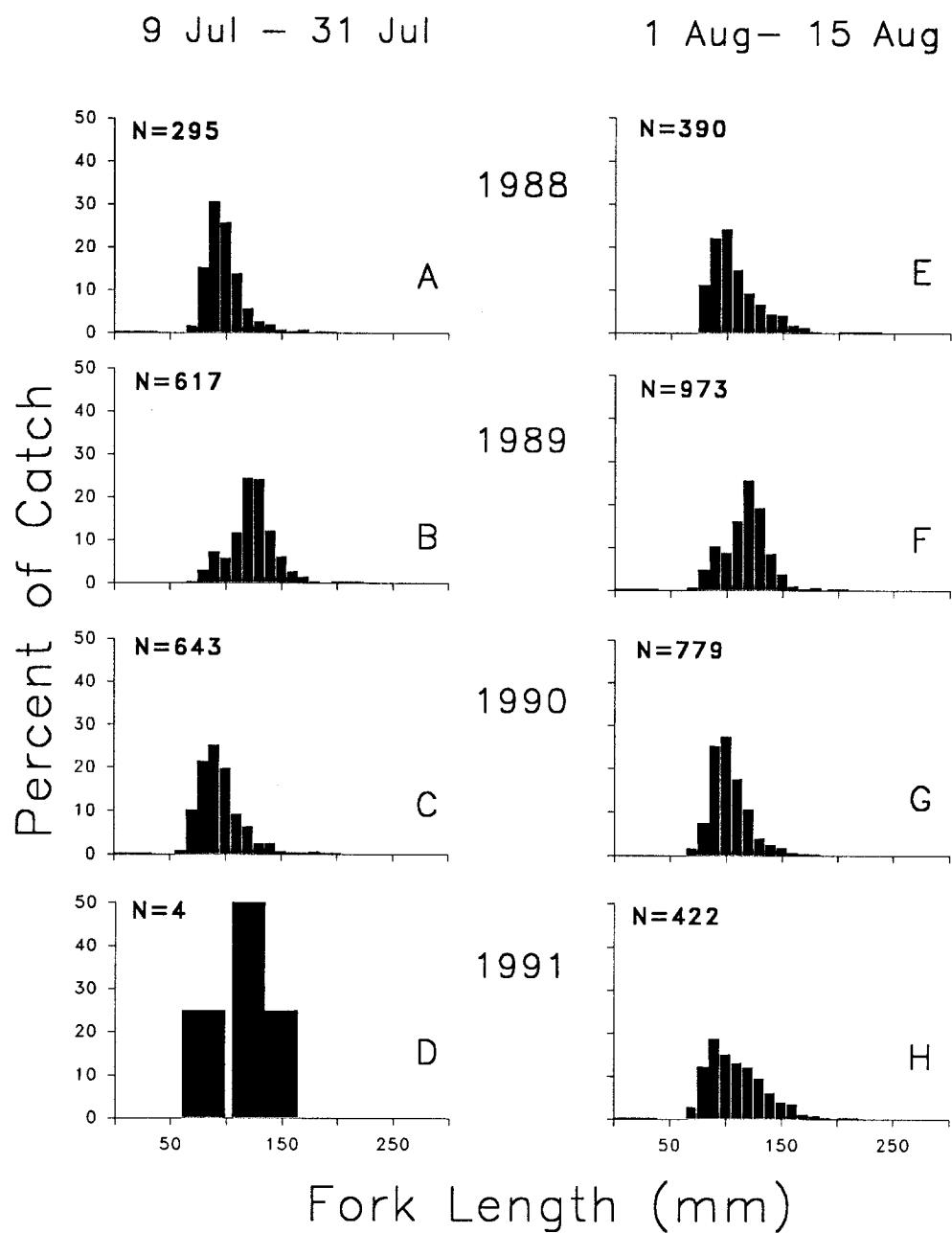


FIGURE 4.28.-- Length frequencies of Arctic cod captured by fyke nets in Simpson Cove, plotted by year for July 9 to August 15.