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Gill Net Catch Per Unit Effort for Greenland Halibut From the Canadian Fishery

by

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Methods

Commercial gill net catch-per-unit effort data has been collected on Canadian boats since 1986. We restricted our analyses to vessels for which effort was directed for Greenland halibut. The data reports are on a smaller spatial scale than NAFO Subdivisions; data are summarized for 8, 8, 14, 11, and 14 subunits for 2G, 2H, 2J, 3K, and 3L NAFO Subdivisions, respectively.

We began our analysis with a multiplicative model of CPUE; however, it was clear that this data would be difficult to model using traditional multiplicative models because effort and CPUE have changed drastically among areas. Instead of using the multiplicative model we estimated the CPUE for each subunit area separately, and examined the trends graphically. For each subunit, we then examined the data using plots and a multiplicative model to distinguish between changes due to seasonal changes in exploitation and changes in the tonnage class of vessel.

We plotted data for which there was at least 3 years of data in which there were more than 3 "analytical records". No other data was considered in the analysis. An exception was made for region 2G, in which exploitation by Canadian gill nets began in 1993. Following Hutchings and Myers (1994), we divided the data into inshore and offshore regions for 3K, and 3L. Inshore subunits were defined as those in contact with the coast and offshore subunits were those not in contact with the coast.

One difficulty with the data is that effort was not recorded for all boats. For this reason, the CPUE is more reliable than the trends in effort. Effort is reported as number of trap days and number of clearances per 100-m gill net. Catch-per-unit effort (CPUE) is measured as kilograms (kg) per 100m net haul. In general, we found that we could not improve on the average CPUE for the year. In two cases, we eliminated tonnage class 5 vessels from inshore regions that appeared to show anomalous patterns.

Results and Discussion

Catch per unit effort has plummeted from 1986 to 1994 in all regions (Fig. 1).

The CPUE in most inshore regions was so low by 1990 that fishing was curtailed. The drop in CPUE showed different patterns among regions in the decline. In region 3Ki (Funk Island) the CPUE remained relatively higher than in 3Kd and h (White Bay and Notre Dame Bay, respectively) (Fig. 1a). 3Kd and h are sheltered bays and they may have been exploited first and after these bays were fished out fishing effort moved out of the bays (e.g. 3Ki). Since we do not have data prior to 1986, we can not back this up graphically. But, historically, CPUE from research vessels from 1967 to 1969, in western Notre Dame Bay (3Kh) ranged from 150-400 pounds per 50-fathom gillnet (about 68-182 kg per 100m net haul) (Lear, 1970). There was no recorded research done in eastern Notre Dame Bay (3Ki) (Lear, 1970).

There was only research done in White Bay (3Kd) using the longline, but even these catches were high (500-750 pounds/32lines/hour) (about 227-341 kg) (Lear, 1970).

In 1988, effort had shifted to offshore regions (Fig. 1). There were higher catch rates, initially, but these were reduced to low levels, and effort moved to other areas by 1991. Note that for regions further offshore, e.g. 3Kg, effort began later (1990) and lasted longer (to 1993). In all offshore subunits in 3K, the CPUE began around 4-5 kg. per 100m net haul, and ended around 1-2 kg per 100m net haul (Fig. 1a).

For 3L, the pattern is similar to that in 3K; there was a gradual decline in CPUE and effort declining to around 2 kg per 100m net haul or less over the time period (Fig. 1a). Historically, in the mid 1960's, the average catch of Greenland halibut in Trinity Bay (3Lb) was 400 pounds per 50-fathom gillnet (Lear, 1970) , which is approximately 90 kg per 100m net haul. But, by the late 1960's the average catch was 50 pounds per 50-fathom gillnet (about 23 kg per 100m net haul) (Lear, 1970). Today, the CPUE in Trinity Bay (3Lb) is less than 1 kg per 100m net haul. In Bonavista (3La), in 1968, CPUE from Research vessels was approximately 50 pounds per 50-fathom gillnet (about 23 kg per 100m per net haul), which is 8 times as much as CPUE of 3La over the past 8 years.

There is also a general pattern of decline throughout 2J (Fig. 1b). The subunit 2Ji had the largest CPUE, initially, and the greatest effort over the period. 2Ji is in the southwest corner of 2J. CPUE declined from a high of 14 kg per 100m haul in 1987, to less than 2kg per 100m haul by 1991. After this, CPUE in very low for this region. There are no historical data for area 2J, 2G, or 2H. It was not until after the traditional fishing grounds (3K and 3L) were fished out that the more northern areas were exploited.

Canadian gill net effort began in 2G in 1993 with high catch rates (above 6 kg per 100m net haul), but over the period of just one year, CPUE declined greatly (Fig. 1b).

Conclusion

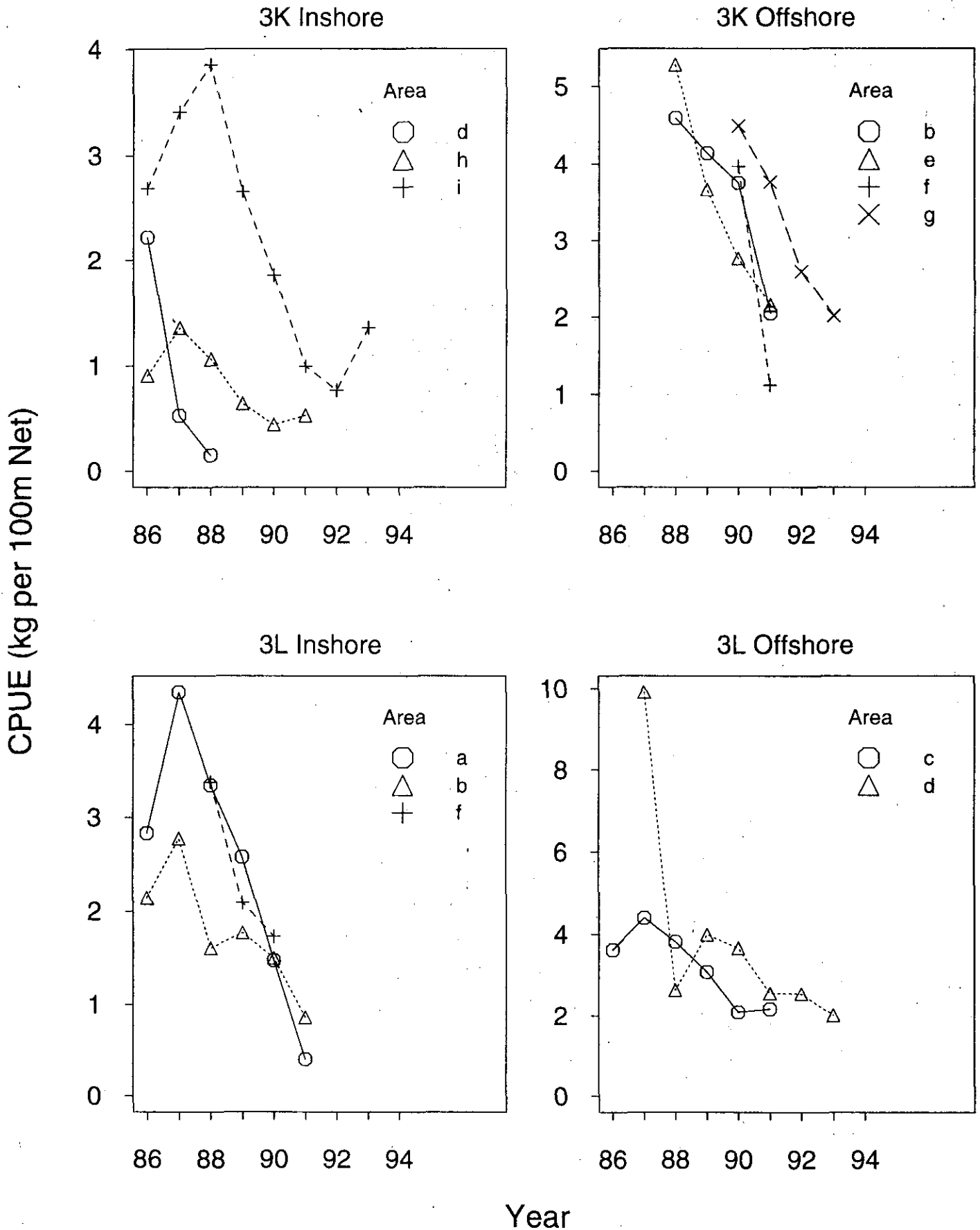Gillnet catch per unit effort has declined in all regions.

References

Hutchings, J. A., and R. A. Myers. 1994. What can be learned from the collapse of a renewable resource? Atlantic cod, *Gadus morhua*, of Newfoundland and Labrador. Can. J.

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Lear, W.H. 1970. The biology and fishery of the Greenland halibut (*Reinhardtius hippoglossoides* (Walbaum)) in the Newfoundland area
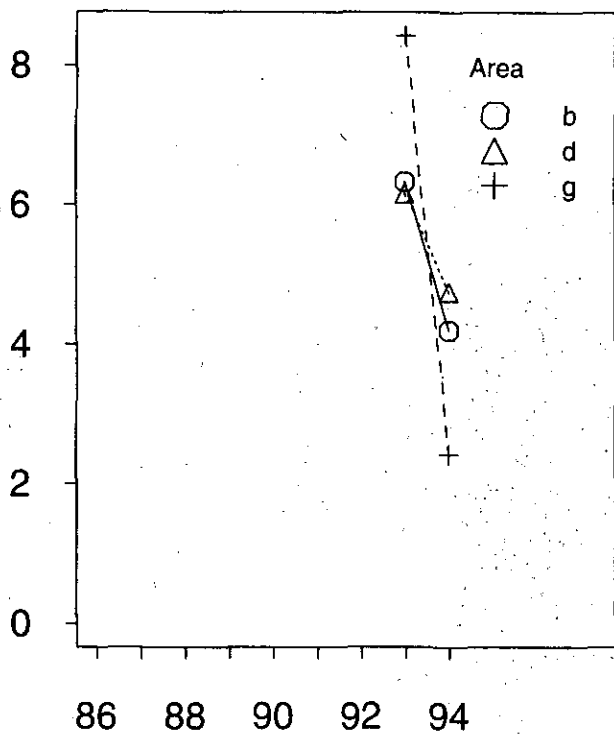
Figures

Fig. 1. Catch-per-unit effort (CPUE) in kilograms per 100m net haul for Greenland halibut for subunits 8, 8, 14, 11, and 14 for 2G, 2H, 2J, 3K, and 3L NAFO Subdivisions respectively from 1986 to 1994. a) NAFO Subdivisions 3K and 3L (inshore and offshore), and b) NAFO Subdivisions 2G, 2H, 2J.
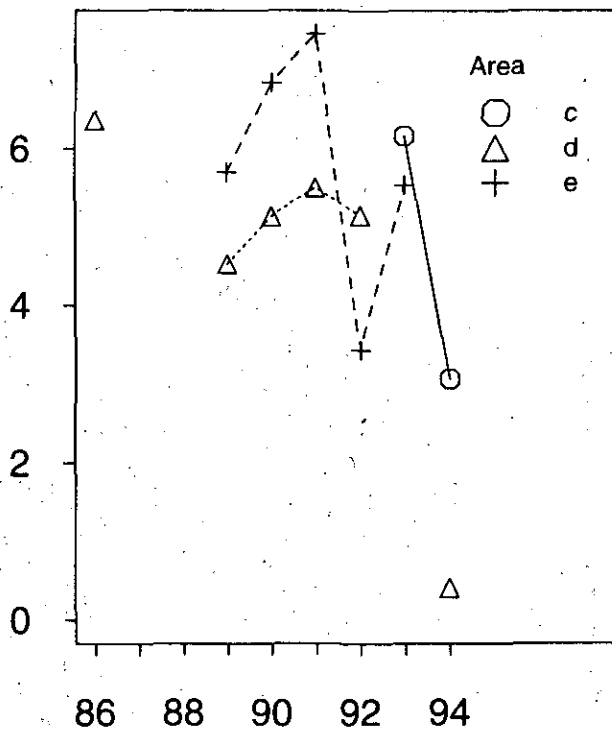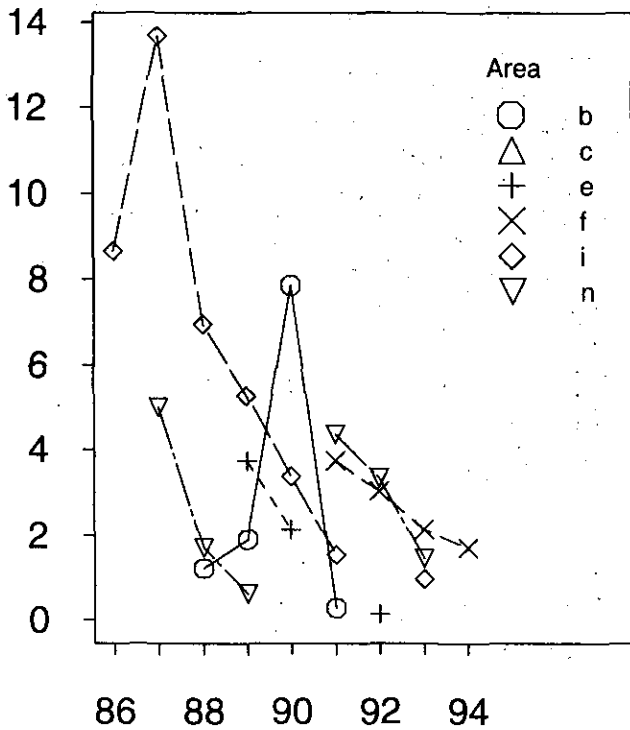
CPUE (kg per 100m Net)

Year

2G

2H

2J

CPUE (kg per 100m Net)

Year