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AN ANALYSIS OF LUMPFISH FROM DATA ON INDIVIDUAL FISHERMEN IN THE NEWFOUNDLAND REGION

by

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ABSTRACT

The catch per unit effort of lumpfish from 1989 to 1994 is estimated from the daily catch records of 9 fishermen. In all regions covered, there was a decline in catch per unit effort over the period, with the greatest declines occuring along the North Coast of Newfoundland.

RÉSUMÉ

Les prises par unité d'effort de la lompe, de 1989 à 1994, sont estimées à partir des données sur les prises quotidiennes de neuf pêcheurs. Dans toutes les régions visées, il y a eu diminution des prises par unité d'effort au cours de la période, la baisse la plus accentuée ayant été observée sur la côte nord de Terre-Neuve.

Introduction

Hutchings and Myers (1994) have recently demonstrated the use of inshore catch per unit effort to describe trends in stock abundance for cod. Here we attempt to use similar methods to describe changes in lumpfish abundance. In this paper, we describe the catch per unit effort of individual fishermen.

Data and methods

These data were extracted from a data set on seal bycatch collected by the Marine Mammals section in DFO, St. John's (Fig. 1). We extracted data for the 9 longest, consistent time series in the record. Each fisherman recorded the number of nets in the water, the number of nets hauled and the weight of lump roe caught (Table 1). Two methods were used to estimate catch rates in the analysis.

First, we estimated the mean catch per haul each day the fishery took place during May and June. We then used the median of this, each year, as our index of stock abundance, and we calculated approximate confidence limits for the median.

As an alternative, we estimated the "mean catch per net day" which we defined as follows. To calculate the mean catch per net day for a given year the total number of net days and the total catch of lump roe must be calculated for that year. The total number of net days for year i is calculated by summing the number of nets in the water, for each day, over all the days of year i. The total catch for year i is computed by adding together all the catches of year i. The mean catch per net day is then computed by dividing the total catch by the total number of net days. It must be noted that calculating the mean catch per net day this way may be inaccurate, since stormy periods where nets are not checked for a week or more were used in the calculation of net days.

Results

CPUE appears to be declining in all regions. The decline is most pronounced along the North Coast of Newfoundland, where the CPUE has dropped by almost an order of magnitude (Fig. 2 and 3).

The declines are less along the Southwest Coast, but are still large. This region previously had very large CPUE's compared to other regions (Blackwood 1982). The low CPUE's in 1990 appear to be caused by very stormy conditions and pack ice.

The declines in the Burin Peninsula are less than elsewhere.

Conclusions

Our analysis clearly indicates the value of analyzing data from individual fishers over time. There are clear differences among fishers within each region, and among regions. Much of the variability in catch-per-unit effort can be eliminated by examining data on individuals. Our results support Hutchings and Myers (1994) analysis of the value of fixed gear catch-per-unit effort to assess fish populations.

We have also demonstrated that it is possible to assess the reliability of the data. We were able to estimate the confidence limits of the CPUE for the median catch per haul for each fisher over time. We were also able to assess the consistency of the data by comparing the consistency of the declines over time.

Our data indicates that there have been recent drastic declines in lumpfish around Newfoundland with the decline being most pronounced along the North coast.

References

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Hoaglin, D.C., Mosteller, F., Tukey, J.W. (eds.). (1983). Understanding robust and exploratory data analysis. Wiley, New York

Hutchings, J.A., Myers, R.A. (1994). What can be learned from the collapse of a renewable resource? Atlantic cod, *Gadus morhua*, of Newfoundland and Labrador. Can. J. Fish. Aquat. Sci. 51:2126-2146

Tables

TABLE 1. Statistics on the nine fishermen considered in this study. "Mean Nets Hauled" is the mean number of nets hauled per day of hauling nets. In other words, it does not include the days when there were no nets hauled.

North Coast

Fisherman 25

Year	Median Catch /Haul	Mean Catch /Net Day	Mean Nets in Water/Day	Mean Nets Hauled
1989	3.12	2.72	33.91	25.36
1990	1.20	0.94	50.63	28.31
1991	0.70	0.40	25.00	14.29
1992	1.51	0.72	19.67	10.97
1993	0.64	0.41	32.70	18.41
1994	0.15	0.10	22.04	14.42

Fisherman 14

Year	Median Catch /Haul	Mean Catch /Net Day	Mean Nets in Water/Day	Mean Nets Hauled
1989	3.23	2.21	40	29.23
1990	2.02	0.77	39	14.49
1991	1.48	0.54	39	14.44
1992	.	.	.	.
1993	0.39	0.05	29	3.22
1994	.	.	.	.

Fisherman 16

Year	Median Catch /Haul	Mean Catch /Net Day	Mean Nets in Water/Day	Mean Nets Hauled
1989	.	.	.	.
1990	3.01	0.58	17.95	3.90
1991	.	.	.	.
1992	1.33	0.73	14.00	5.69
1993	0.91	0.33	14.00	3.03
1994	0.68	0.23	25.61	8.57

Burin Peninsula

Fisherman 43

Year	Median Catch /Haul	Mean Catch /Net Day	Mean Nets in Water/Day	Mean Nets Hauled
1989	.	.	.	.
1990	6.05	1.80	29.51	8.41
1991	5.19	3.21	40.08	23.67
1992	0.00	0.73	30.00	23.16
1993	3.75	1.34	48.95	13.93
1994	.	.	.	.

Fisherman 42

Year	Median Catch /Haul	Mean Catch /Net Day	Mean Nets in Water/Day	Mean Nets Hauled
1989	.	.	.	.
1990	6.58	1.44	90	20.13
1991	6.49	1.56	70	16.32
1992	4.32	0.98	130	28.83
1993	8.40	1.82	188	39.95
1994	5.85	1.28	100	22.22

Fisherman 41

Year	Median Catch /Haul	Mean Catch /Net Day	Mean Nets in Water/Day	Mean Nets Hauled
1989	.	.	.	.
1990	1.47	0.47	23.23	6.38
1991	7.21	3.32	10.65	4.65
1992	4.18	1.38	16.50	5.60
1993	2.73	1.71	25.26	15.26
1994	1.11	0.25	40.00	12.10

Southwest Coast

Fisherman 38

Year	Median Catch /Haul	Mean Catch /Net Day	Mean Nets in Water/Day	Mean Nets Hauled
1989	.	.	.	.
1990	7.37	3.13	16.00	7.20
1991	13.61	5.46	12.00	4.55
1992	11.61	3.62	20.00	5.89
1993	3.35	1.23	27.86	10.28
1994	2.01	0.70	26.57	8.24

Fisherman 37

Year	Median Catch /Haul	Mean Catch /Net Day	Mean Nets in Water/Day	Mean Nets Hauled
1989	.	.	.	.
1990	3.27	1.81	30.37	18.03
1991	3.78	2.61	60.58	39.81
1992	2.34	1.81	80.00	45.22
1993	2.53	0.86	83.64	19.56
1994	1.89	0.92	71.00	33.57

Fisherman 34

Year	Median Catch /Haul	Mean Catch /Net Day	Mean Nets in Water/Day	Mean Nets Hauled
1989	34.02	16.92	20	7.57
1990	12.47	1.94	20	3.23
1991	11.34	7.78	20	10.18
1992	30.62	9.68	20	7.14
1993	6.05	1.78	30	7.30
1994	9.07	1.93	37	6.45

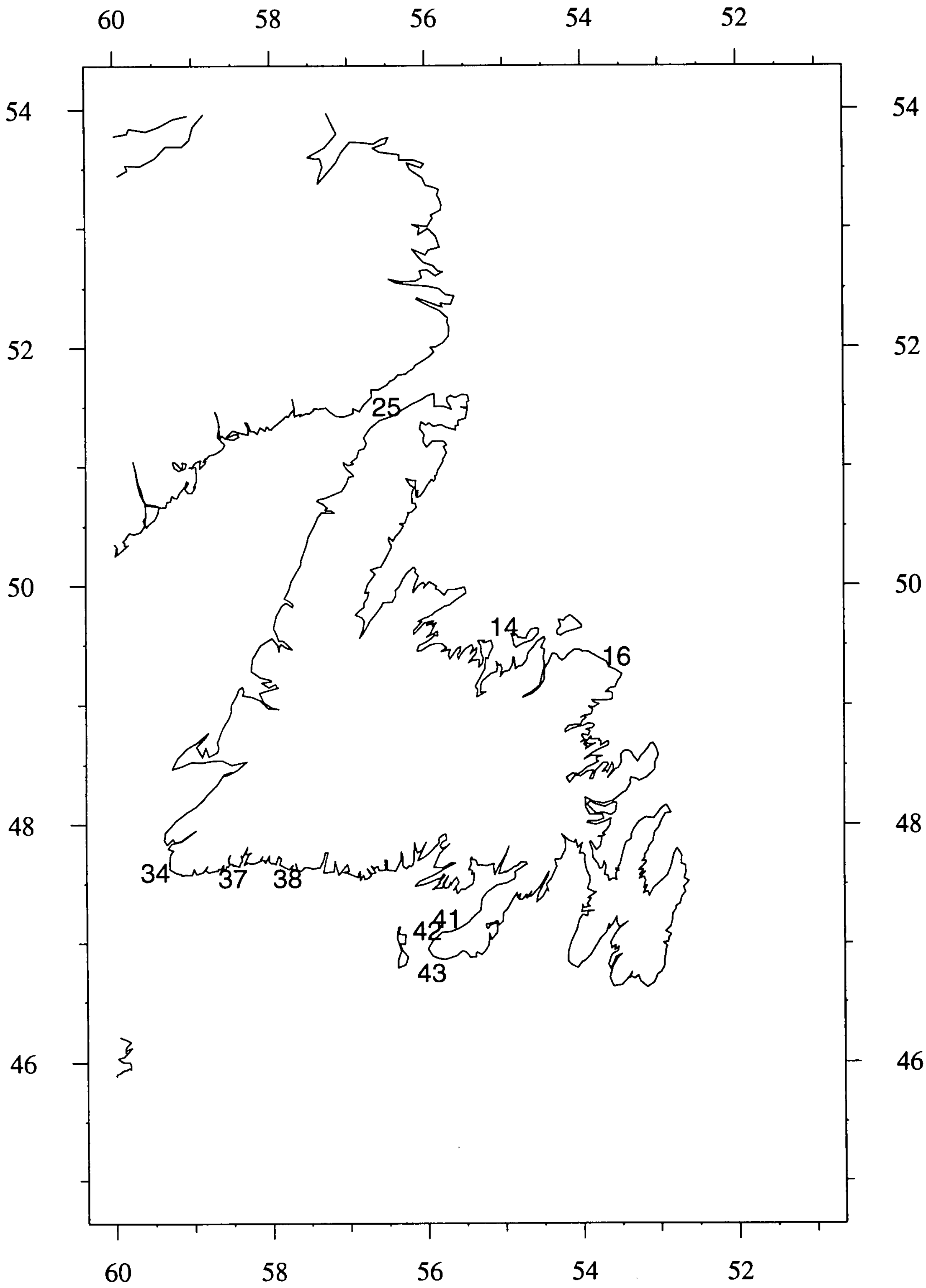


Fig. 1. Map showing the fishing area considered in the analysis.

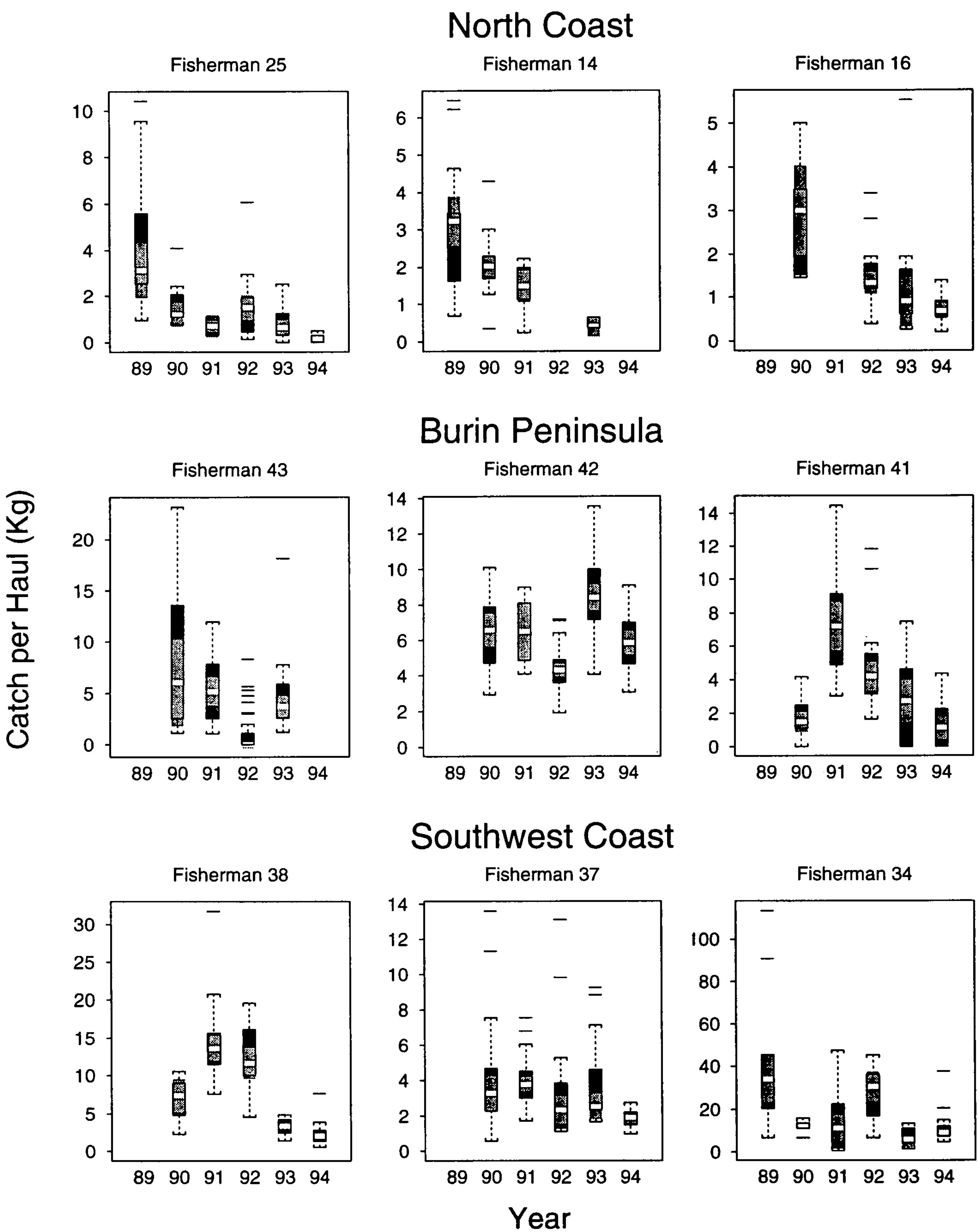


Fig. 2. Box and whisker plots (Hoaglin *et al.* 1983) of the mean catch of lumpfish roe per haul. The white line in the middle of the box shows the median. The lightly shaded region indicates the 95% confidence interval for the median. The outline of the darkly shaded box gives the upper and lower quartile. The whiskers are drawn to the nearest value not beyond 1.5*(inter-quartile range) from the quartiles. Horizontal lines indicate outliers.

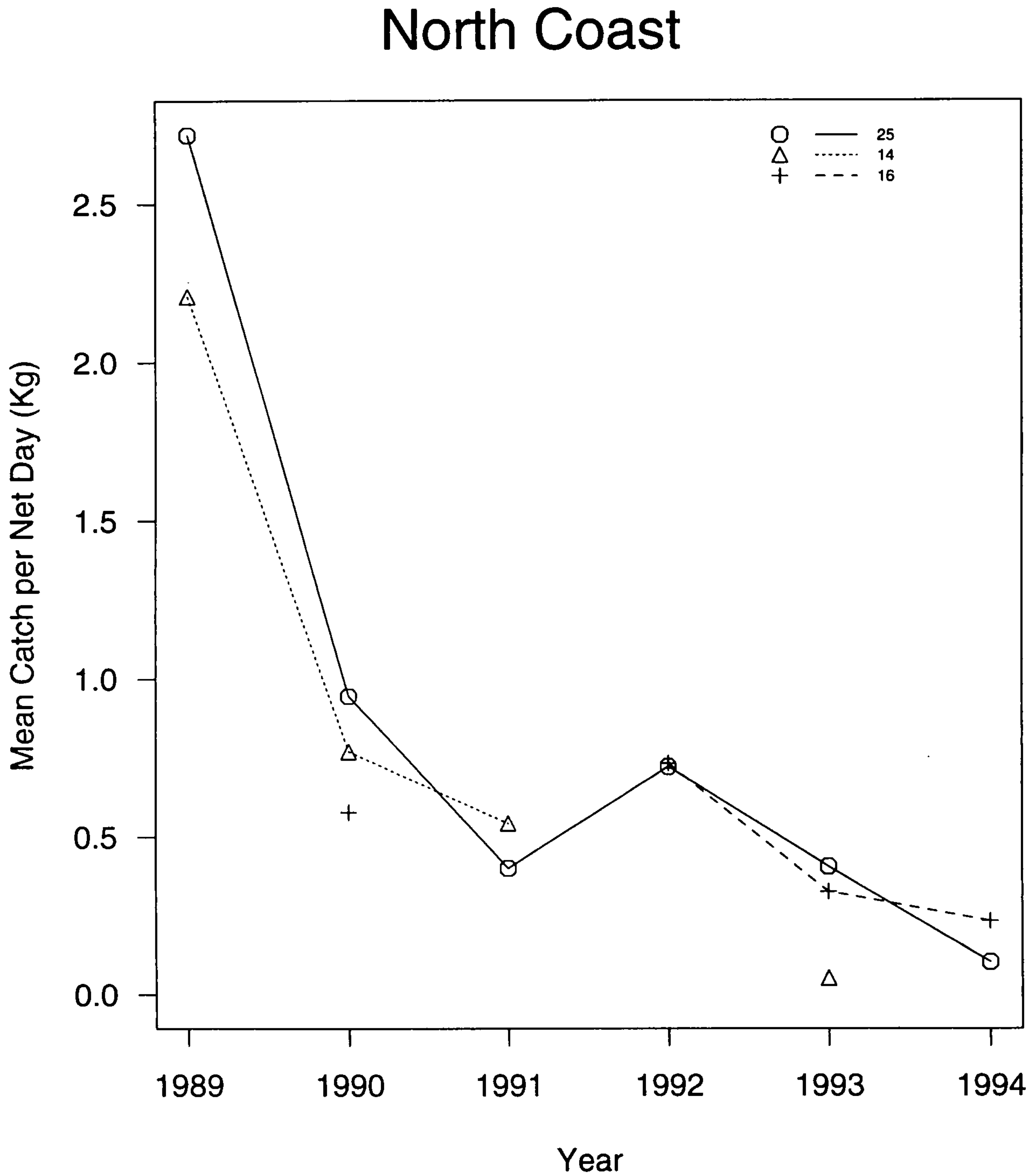
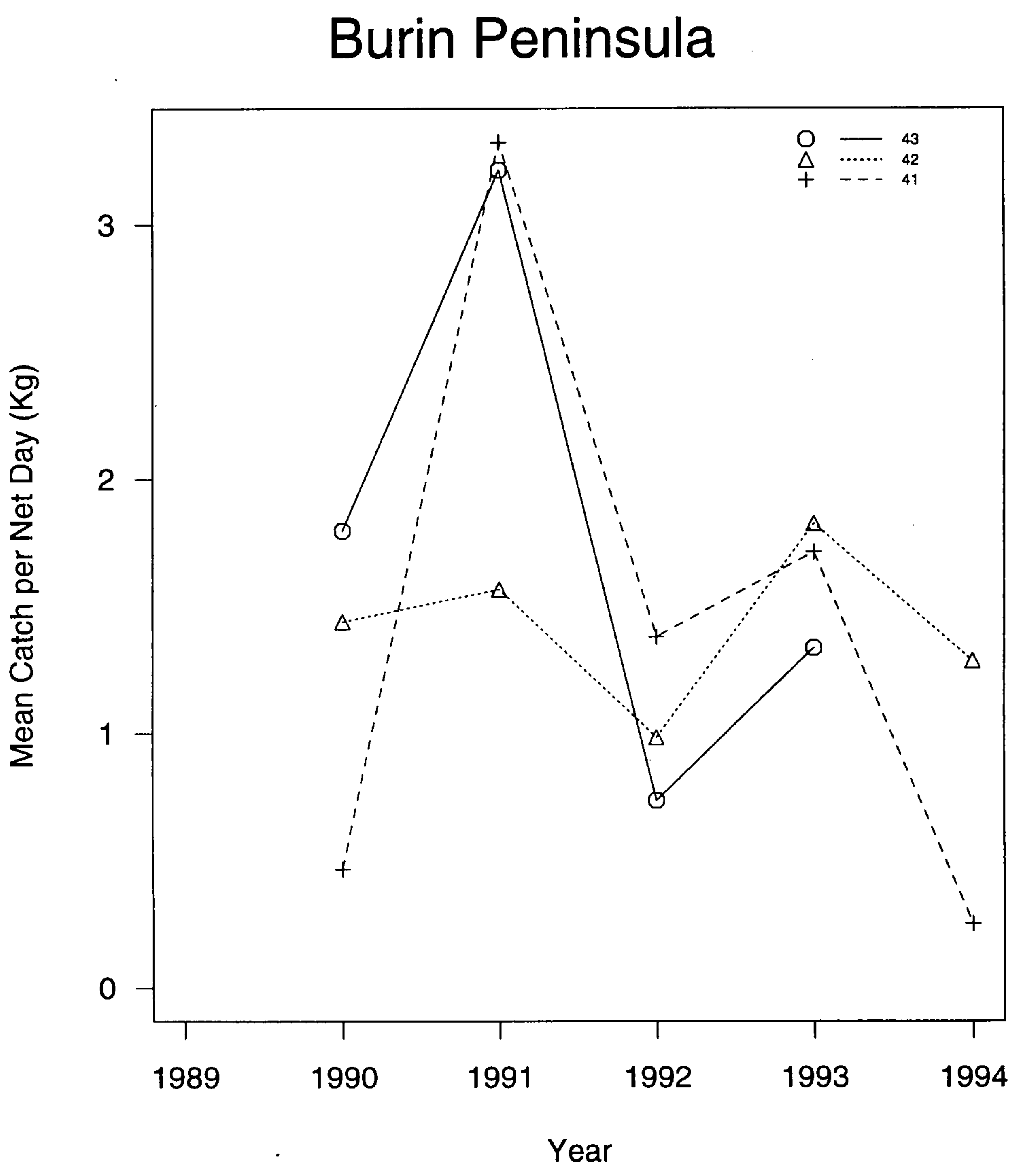
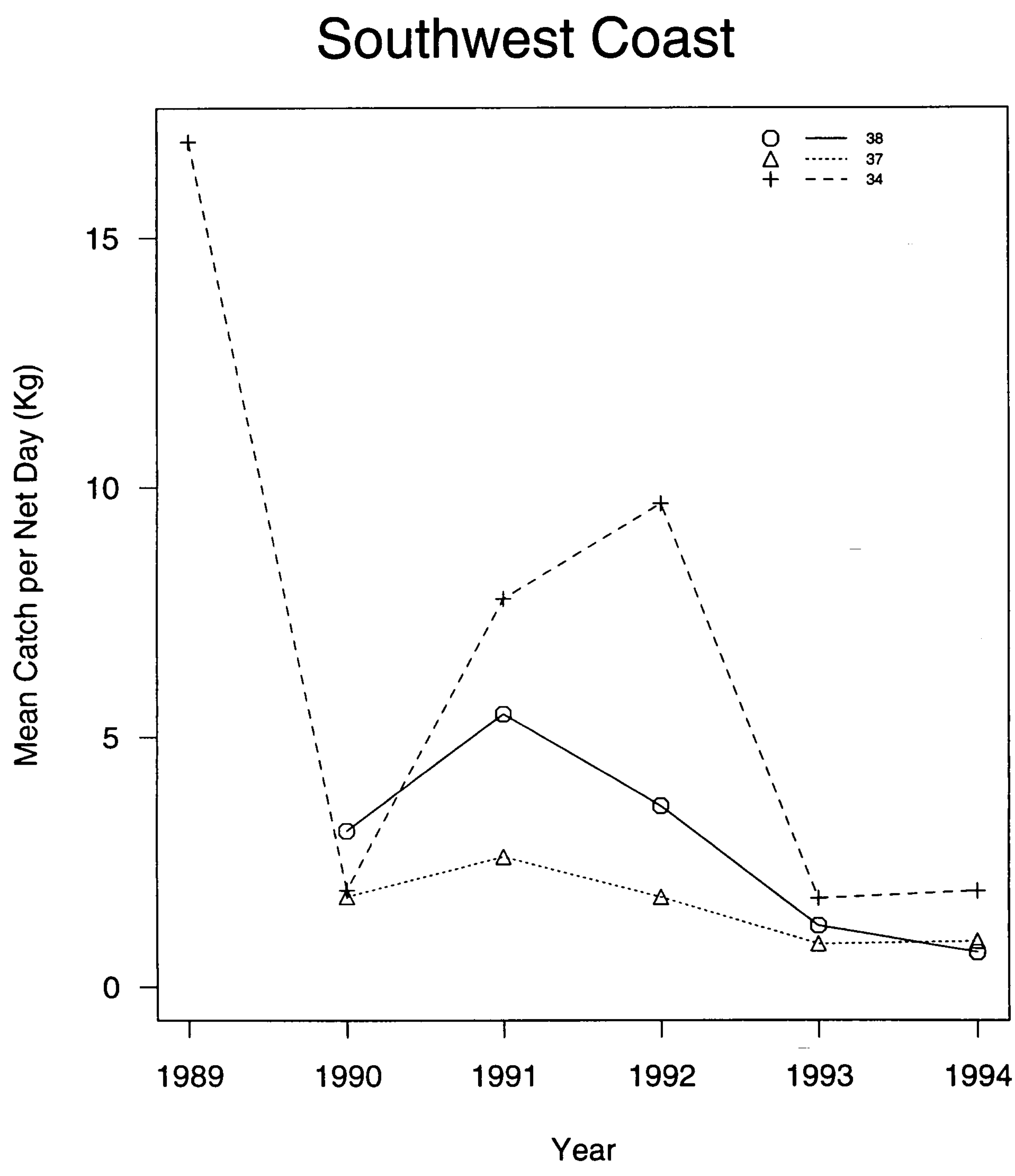


Fig. 3. Mean catch per net day of lumpfish roe for each fishermen during each year that there was data.


Burin Peninsula
43
42
41
3
2
1
0
1989
1990
1991
1992
1993
1994
Year
Mean Catch per Net Day (Kg)

- fig3b -


Southwest Coast
38
37
34
Mean Catch per Net Day (Kg)
0
5
10
15
1989
1990
1991
1992
1993
1994
Year

- fig3c -

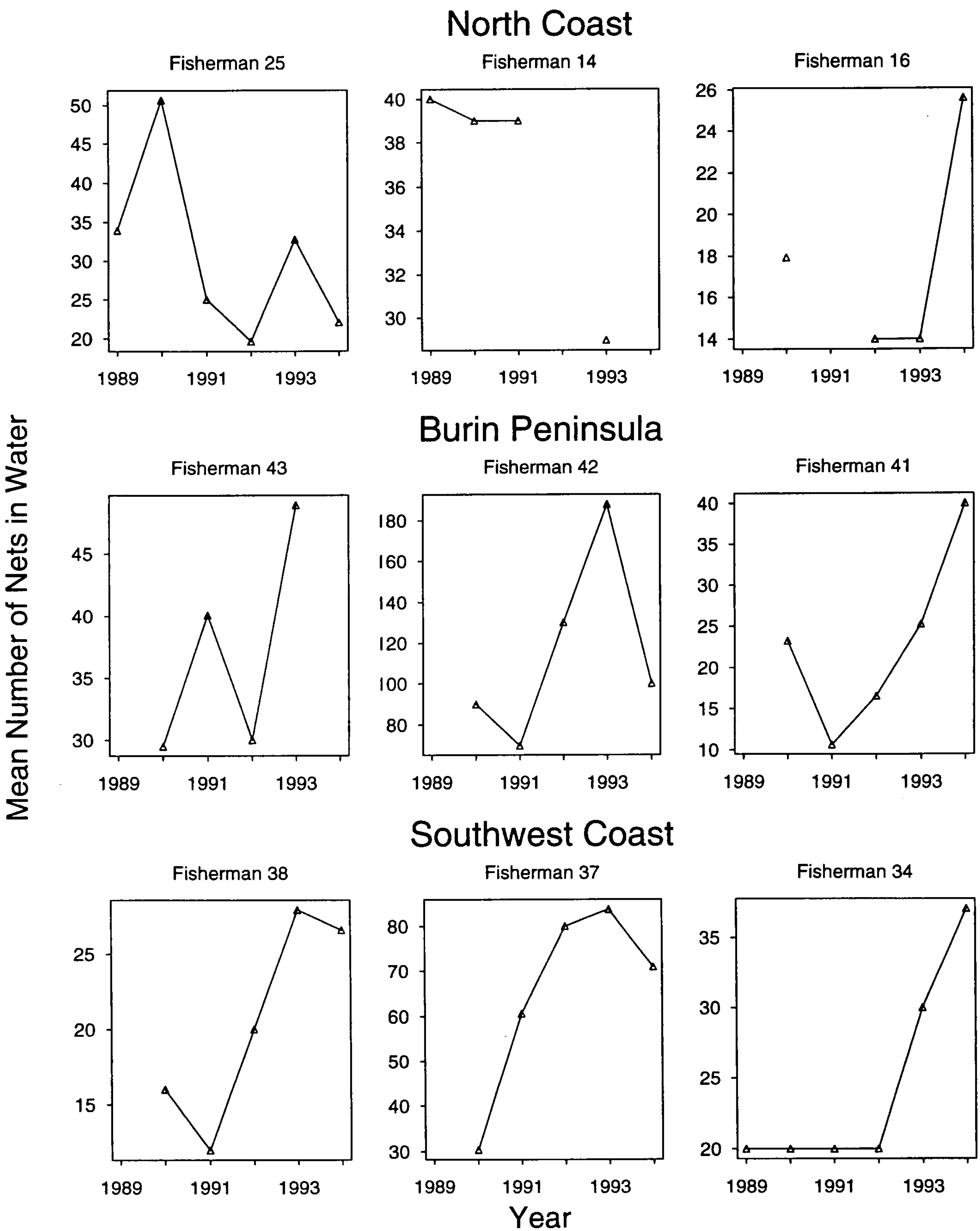


Fig. 4. Mean number of nets in water for each fisherman during each year that there was data.