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Trends in discarding of Divisions 2J3KL cod by the Newfoundland offshore fleet for  
1981-86, with particular reference to size of fish

by

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Les Documents de recherche sont publiés dans la langue officielle utilisée par les auteurs dans le manuscrit envoyé au secrétariat.

### Abstract

Estimates of discarding based on Newfoundland Observer Program data for the domestic offshore fleet have risen steadily since 1981. This paper focuses on size of the discarded fish and presents the results of a three part study. The first part, a comparison of landing samples (after culling) obtained at sea and in port, indicated remarkable similarity between the two types with matching ranges and modal lengths. This exercise confirmed the absence of any systematic differences in the way fish samples were selected at sea or in port. The second stage of the study comparing landing samples obtained in port, both from vessels with and without observers, suggested no differences for fish less than 45 cm in length in terms of discarding. In the mid range of fish sizes there generally appeared to be a lower peak at the modes of the landing frequencies for vessels not carrying observers implying the retention of a larger proportion of 51-56 cm fish in the presence of observers. However, this pattern was not always consistent. For fish exceeding 65 cm the shapes of the frequencies were once again similar. The third part of the study which examined discarded size over time indicated not only an increase in the mean length of discarded fish of about 4 cm between 1982 and 1985 (sustained through 1986) but also a drop in the mean length of the catch between 1982 and 1985.

### Résumé

Les estimations fondées sur les données du Programme d'observateurs de Terre-Neuve, en ce qui concerne le poisson rejeté par la flotte hauturière domestique, ont augmenté de façon constante depuis 1981. Le présent article met l'accent sur la taille du poisson rejeté et présente les résultats d'une étude en trois parties. La première partie, qui consistait à comparer les échantillons des prises (après le tri) obtenus en mer et ceux obtenus dans le port, a indiqué une similarité remarquable entre les deux types d'échantillons, tant au point de vue des étendues que des longueurs modales. Cet exercice a confirmé qu'il n'y avait pas de différence systématique dans la manière dont les échantillons de poisson ont été choisis, en mer ou dans le port. La deuxième partie de l'étude, qui portait uniquement sur les échantillons des prises obtenus dans le port, visait à comparer les rejets dans le cas des navires ayant des observateurs à bord et de ceux qui n'en avaient pas. Cette comparaison a indiqué qu'il n'y avait pas de différence en ce qui concerne les poissons d'une longueur inférieure à 45 cm. Pour les poissons de taille intermédiaire, il semblait généralement que les modes pour les fréquences de débarquement dans le cas des navires transportant les observateurs avaient un sommet moins élevé, ce qui laisse entendre qu'en présence d'observateurs, on gardait une proportion plus grande de poissons d'une taille de 51-56 cm. Cependant, cette situation n'était pas toujours uniforme. Pour les poissons de la taille supérieure à 65 cm, les fréquences redevenaient semblables. La troisième partie de l'étude, qui visait à comparer la taille des poissons rejetés en fonction du temps, a indiqué que non seulement la longueur moyenne du poisson rejeté a augmenté d'environ 4 cm entre 1982 et 1985 (situation qui s'est maintenue en 1986), mais qu'en plus, la longueur moyenne des prises entre 1982 et 1985 a diminué.

## INTRODUCTION

Total removals as input for the assessment of Div. 2J3KL cod are derived solely from landing statistics. Therefore, fishing mortality on young ages is underestimated because of the exclusion of fish discarded at sea. Although in past years discarding of Div. 2J3KL cod was thought to be minimal, estimates of discarded weight of fish derived from direct observations for a portion of the domestic fleet (Newfoundland Observer Program) had risen steadily between 1981, the first year of observation and 1985 (Kulka 1986).

It has been hypothesized that the unreported discarding may be adversely affecting younger year-classes in the population. The purpose of this paper is to examine trends in size of fish discarded by the domestic fleet for the period 1981-86. The study is presented in three parts: the first, a comparison of landing samples collected by both observers and port sampling technicians, from the same trip is aimed at detecting differences between the two. Given a common population of fish that is being sampled, it is expected that samples and therefore sampling methodology should be essentially the same. The object is to confirm sample similarity. The second part of the study compares port samples (landings) collected from trips where observers were present, with samples from trips where observers were not present. The object of this analysis is to observe and account for any differences in the shape of compared frequencies that might indicate altered discarding practices in the presence of observers. The final part of the analysis is an examination of catches and discards at length over time in order to define trends in the discarding practices. From the three studies some conclusions can be drawn with respect to discarding practices of the domestic offshore fleet as a whole.

## METHODS

Length frequency data consisting of both port (Commercial Sampling Section, Newfoundland Region) and sea samples (Newfoundland Observer Program) were collected by standard methods during 1981-86. Also, estimates of discarding by weight were obtained by standard methods (Kulka and Firth 1985) for the same time period for about 10% of actual fishing effort. Catch and discard frequencies, the former referring to length data taken from fish catches prior to culling, were not available in the plants. On the other hand, landings (after culling) were available for sampling both at sea and in port and sometimes from the same trip. For the first part of the study, data were separated by trip, month, and unit area and compared qualitatively to determine if shapes of length-frequencies (and, therefore, sampling methods) were sufficiently similar between port and sea samples.

In the second part of the study, port samples from 1984 to 1986 were separated on the basis of whether they had been collected from vessels carrying observers or not. Samples were then grouped by unit area and month to ensure that comparisons of the frequencies from the two classifications, observers present or no observers present, were not greatly affected by areal and temporal differences. Data grouped in this fashion would then possibly indicate differential discarding practices between the two groups.

Finally, both catch and discard length data collected at sea between 1981 and 1986 were weighted using landing statistics of the Newfoundland offshore fleet by NAFO Division and month. Both weight and numbers at length were calculated and the resulting catch frequencies were overlaid by corresponding discard data. Data in certain size ranges, specifically, 41 cm and less corresponding to a 16" cutoff, 42-47 cm corresponding to the sizes between 16 and 18" cutoffs and greater than 47 cm were grouped and percent discards in the three size ranges were calculated. Resulting values were then plotted over the 6 year observed period. Also, mean sizes of both catch and discarded fish were calculated and compared among years.

## RESULTS

In a comparison of the available percent length composition data for observer and port landings, from the same trips, Fig. 1 depicts a consistent fit. Considering the small number of samples involved in each comparison, observer and port landing frequencies were remarkably similar with matching ranges and modal lengths. Overall, any differences in length compositions appear to be random in nature with no systematic bias apparent.

Port samples of landings classified with respect to presence or absence of observers during the period of fishing are presented in Fig. 2 (by unit area and month) and Fig. 3 (by NAFO Div.). For a total of twelve month/unit area comparisons over 3 years, several trends were apparent. Up to 45 cm, the percentages for "observer" versus "no observer" frequencies are nearly identical. This pattern suggests that the presence of an observer had no effect on the discard practices of compared vessels for the smallest sizes. This is to be expected because nearly 100% of fish in this size range were discarded even where observers were present. In the 45-65 cm range, the indications are not nearly as clear cut. In the majority of cases the peak of the mode is higher for landing frequencies from observed vessels, implying that more of the mid size fish are retained in the presence of observers. However, an opposite affect is observed for the 1985 summary graph. For fish exceeding 65 cm, proportions again appear to be similar between the two groups. Overall it appears that the presence of observers onboard domestic vessels does affect discarding practices for fish in the midrange sizes, but only to a limited extent.

Figures 4 and 5 depict size frequencies of the catch by numbers and weight from the Div. 2J3KL Newfoundland offshore cod fishery for 1981-86 overlaid by the corresponding discarded portions. Percent of discarded fish range from 7.2% by numbers (1.5% by weight) in 1981 to 24.5% (10.7% by weight) in 1986, January-August. Also, the pattern for percentage discarded by weight is illustrated in Fig. 6 both for the observed vessels from which the length samples were taken and for information summarized from fishing log records. The fishing log rate is about 15 times less than the observer estimate for 1981 dropping to 11 (1982), 6.2 (1983), 5.4 (1984), and 4.2 times in 1985. This would suggest greater proportions of actual discards are being reported in the fishing logs with time.

Percent of cod discarded at length was found to vary considerably from year to year. Figure 7, for the 6-year period, illustrates percent of fish discarded for individuals 41 cm and less (corresponding to a 16" cutoff), for fish between 42 and 47 cm (in the range between 16 and 18" cutoffs) and for fish greater than 47 cm (>18"). The data are separated into these groupings on the basis of anecdotal reports that some plants were requiring their vessel crews to cull fish at the 16 or 18" lengths. Below 42 cm, nearly 100% of fish were discarded except in 1981 and 1985. In the 42-47 cm range, discard rates rose from 1981 to 1983, then declined in 1984 and 1985. For fish greater than 47 cm there was an increase in 1985 but rates were relatively small in all years.

Figure 8, showing mean lengths of catches and discards for 1981 to 1986 provides an explanation why fish smaller than 48 cm were discarded to a lesser extent in 1985 and 1986 in terms of percent of catch. Although average size of discarded fish increased in 1983 to about 42 cm and remained relatively constant for the next 3 years, average size of catch declined during that period, particularly in 1985.

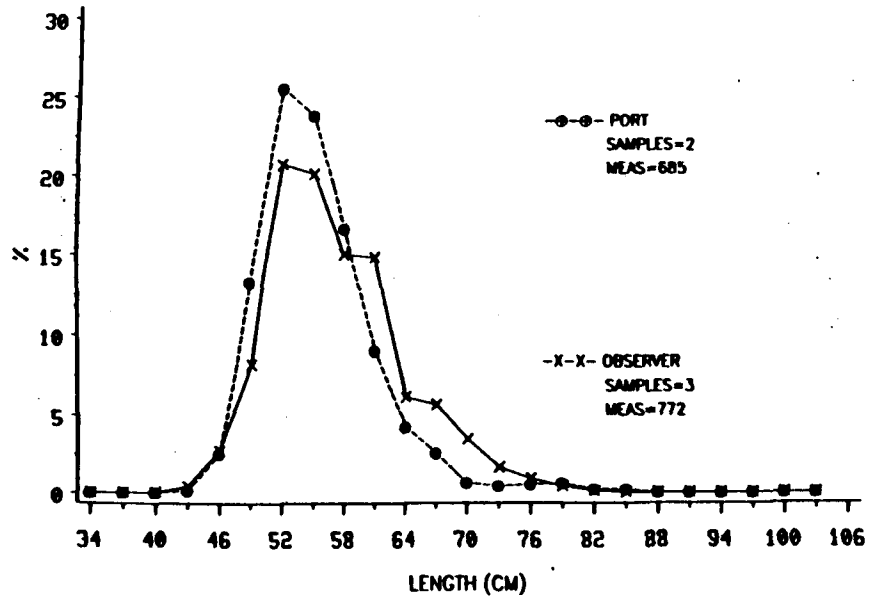
#### DISCUSSION

It has been contended that discard estimates derived by observers should be regarded as minimum because of heresay evidence of more extensive discarding on unobserved (and perhaps undeterred vessels) which make up the major portion (about 90%) of offshore domestic trips (Kulka 1986). Overall, it appears that the presence of observers onboard domestic vessels does affect discarding practices for fish in the midrange sizes, but only to a limited extent. Rate of discarding has risen consistently since 1981 for observed vessels as has the average size of discarded fish (with the exception of 1986). A pulse of 31 cm fish in the catches in that year contributed to the slight decline in size of discarded fish. One of the key factors contributing to the sharp rise in rate of discarding in 1985 and 1986 is a greater proportion of smaller fish in the catch. Coupled with very large catches which tended to lead to less discriminant culling, discarding of Div. 2J3KL cod has risen to significant proportions, about 1 in every 4 fish caught. A change in the average size of fish caught, the quality of fish in the catch and possibly fishing policy regarding marketable size of fish will likely have a significant affect on the rate of discarding.

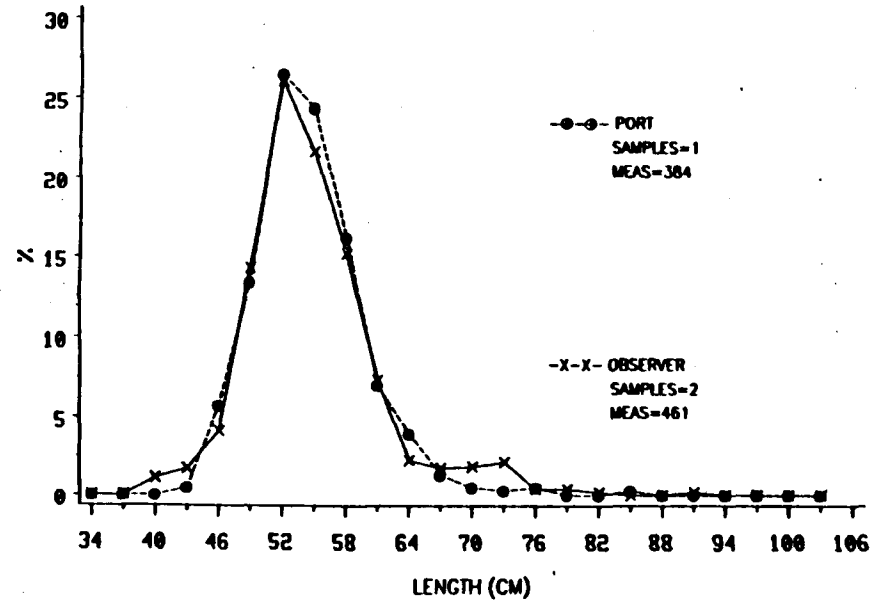
#### REFERENCES

- Kulka, D. W. 1986. Estimates of discarding by the Newfoundland offshore fleet in 1985 with reference to trends over the past 5 years. NAFO SCR Doc. 86/95, Ser. No. N1221. 20 p.
- Kulka, D. W., and J. R. Firth. 1985. Observer Program Training Manual - Newfoundland Region. Can. Tech. Rept. of Fish and Aquat. Sci. No. 1355.

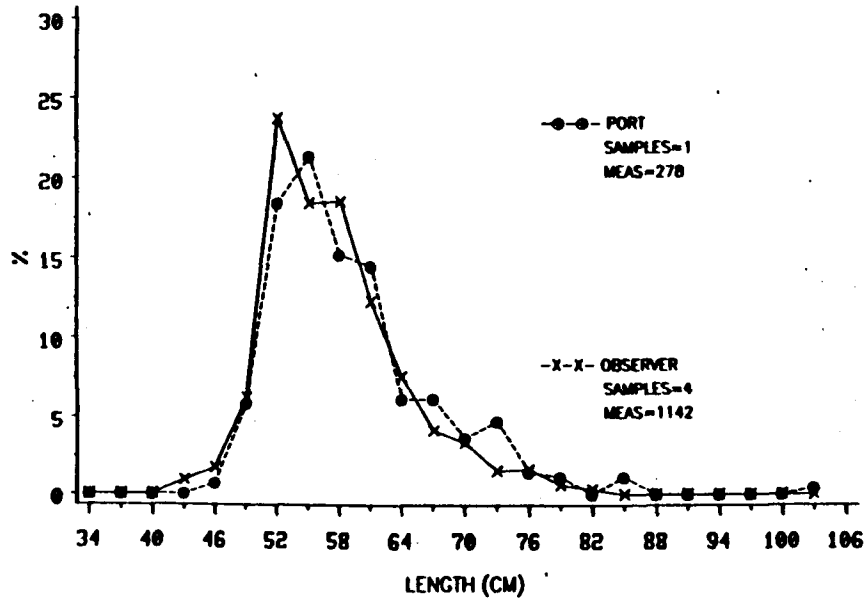
COD NFLD (OT)  
 JANUARY 1986 - UNIT 3KC  
 PORT US. OBSERVER : TRIP 1



COD NFLD (OT)  
 JANUARY 1986 - UNIT 3KC  
 PORT US. OBSERVER : TRIP 2



COD NFLD (OT)  
 FEBRUARY 1986 - UNIT 3KG  
 PORT US. OBSERVER : TRIP 3



COD NFLD (OT)  
 FEBRUARY 1986 - UNIT 3KC & 3KG  
 PORT US. OBSERVER : TRIP 4

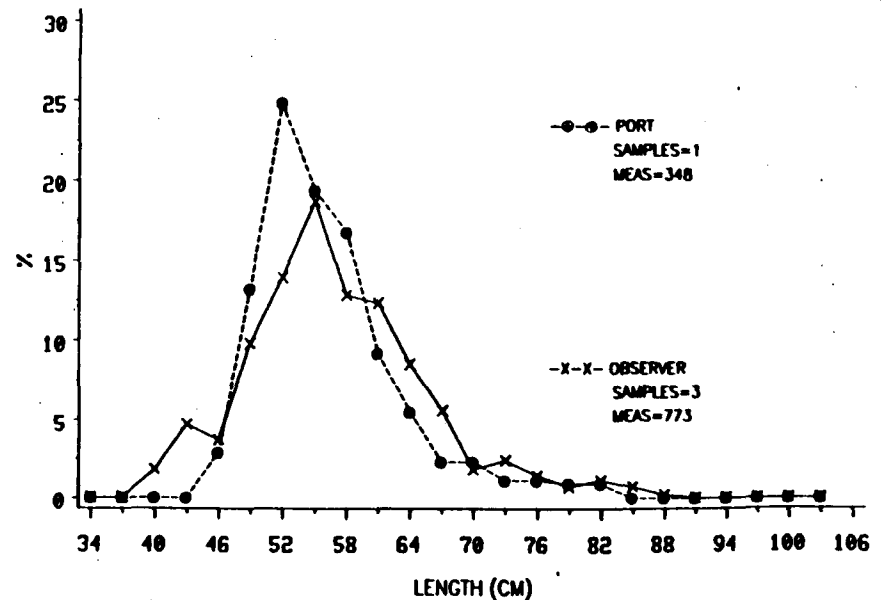
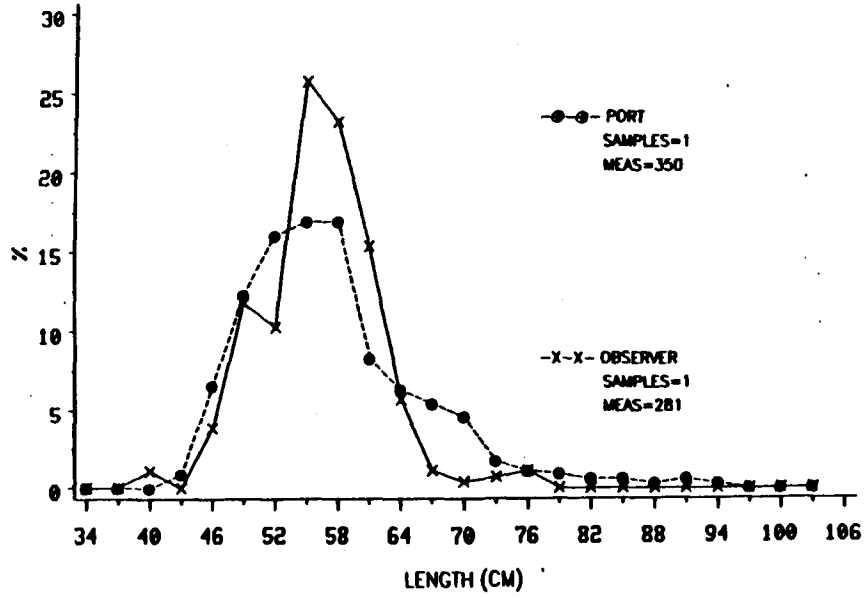
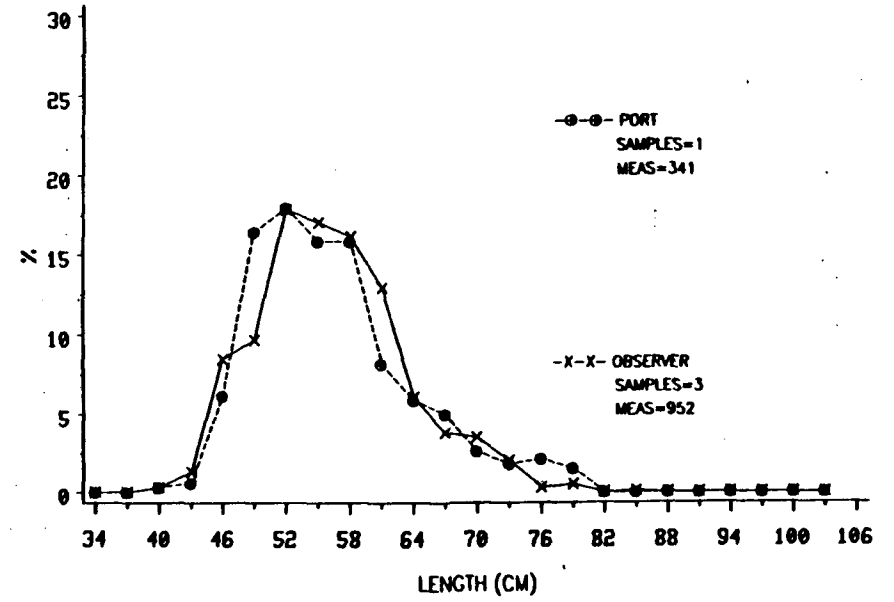


Fig. 1. Comparison of port vs observer landing samples from the same trips by Nfld. trawlers fishing 2J3KL cod during 1985 and 1986.

COD NFLD (OT)  
 MARCH 1986 - UNIT 3LS  
 PORT VS. OBSERVER : TRIP 5



COD NFLD (OT)  
 MARCH 1986 - UNIT 3LR & 3LS  
 PORT VS. OBSERVER : TRIP 6



COD NFLD (OT)  
 APRIL 1985 - UNIT 3KG  
 PORT VS. OBSERVER : TRIP 7

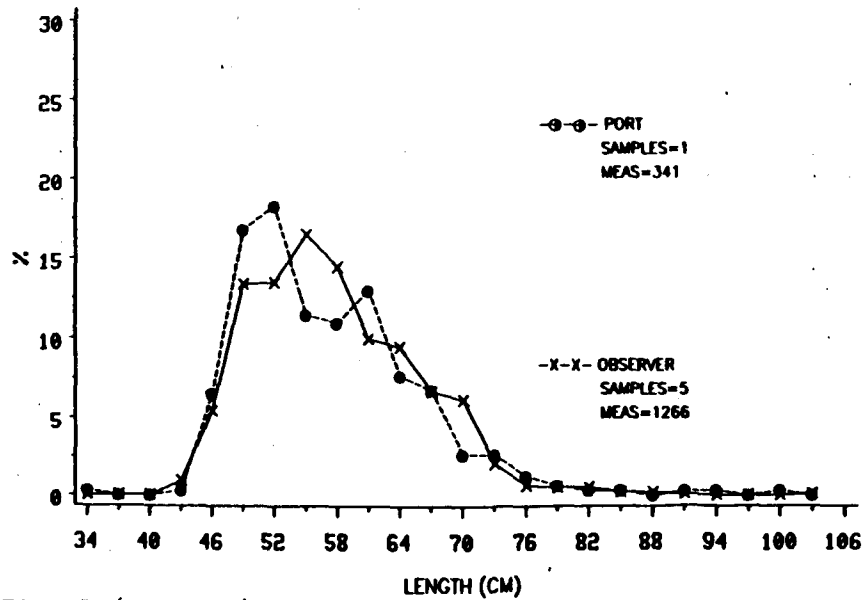
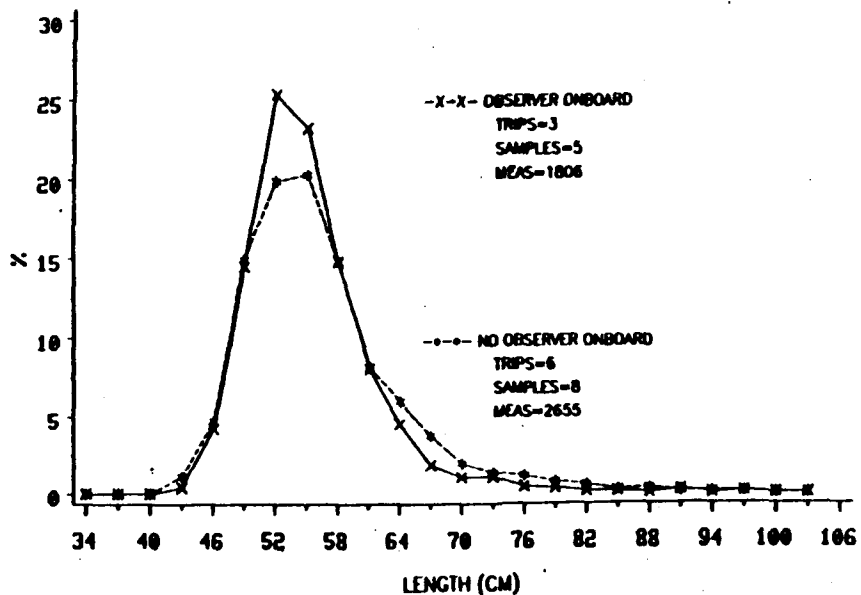


Fig. 1 (Cont'd.)

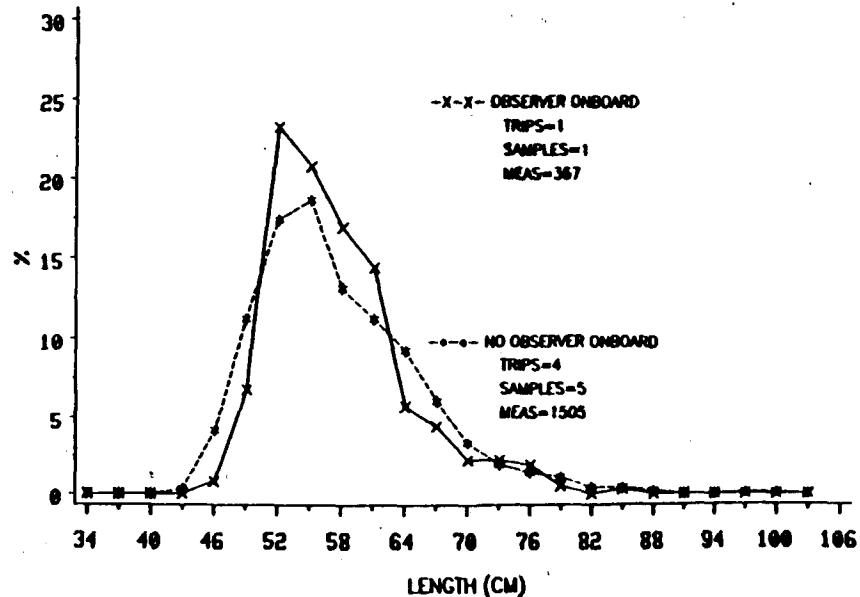
COD NFLD (OT)  
JAN., 1986 - UNIT 3KC

PORT SAMPLING



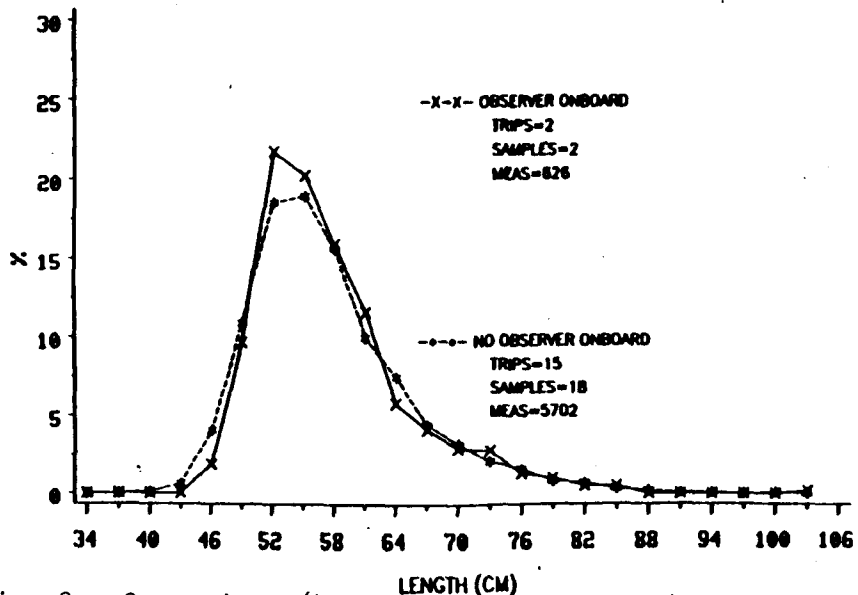
COD NFLD (OT)  
JAN., 1986 - UNIT 3KG

PORT SAMPLING



COD NFLD (OT)  
FEB., 1986 - UNIT 3KG

PORT SAMPLING



COD NFLD (OT)  
MAR., 1986 - UNIT 3LR & 3LS

PORT SAMPLING

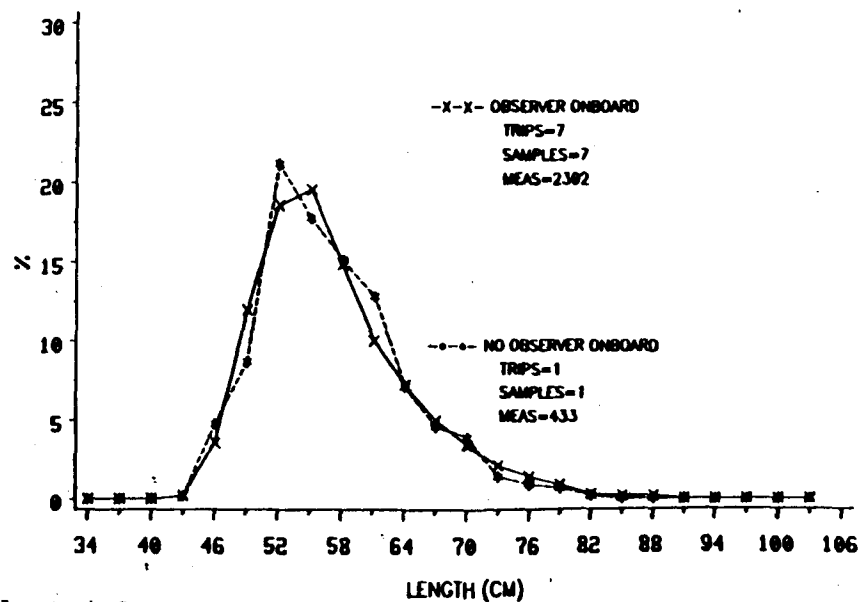
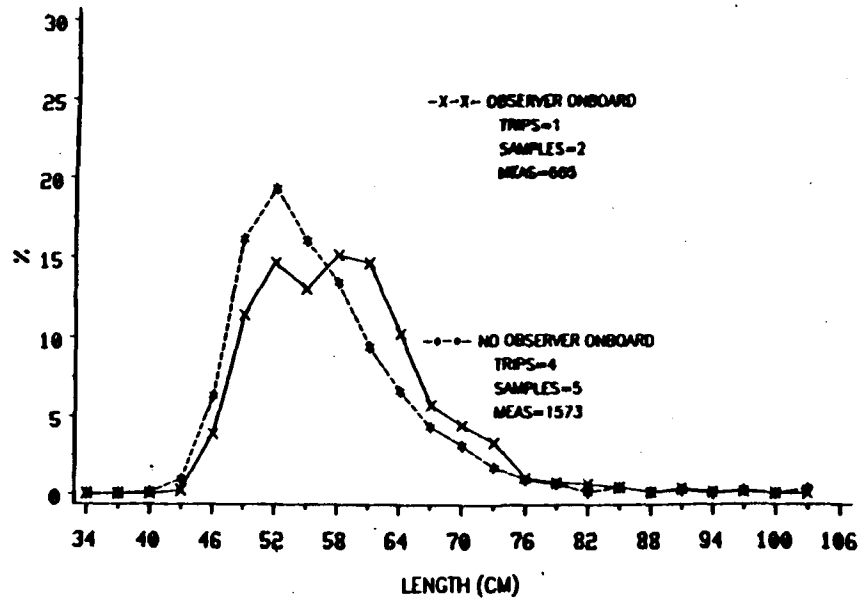


Fig. 2. Comparison (by unit area and month) of port samples collected from trips with observers onboard and those with no observers onboard by NFLD trawlers fishing 2J3KL cod during 1984 to 1986.



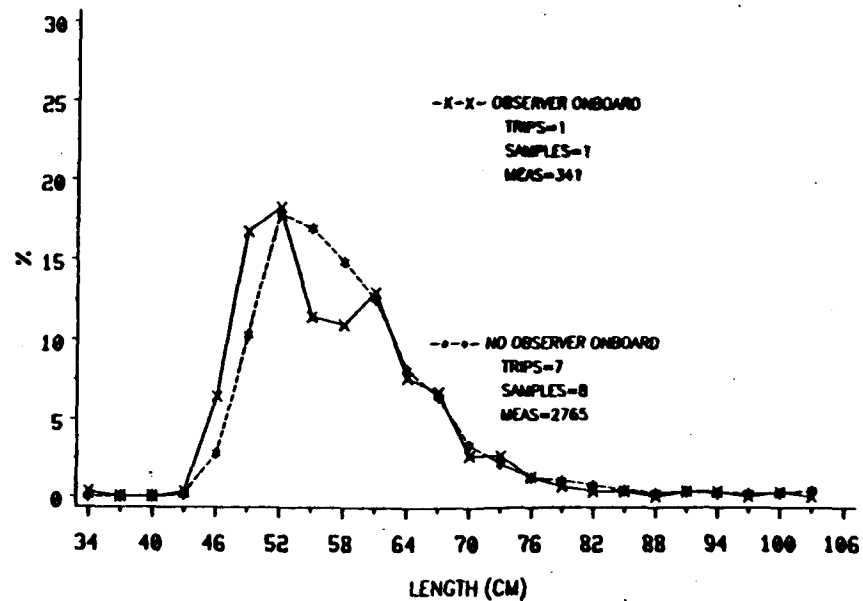
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MARCH, 1985 - UNIT 3KG

PORT SAMPLING



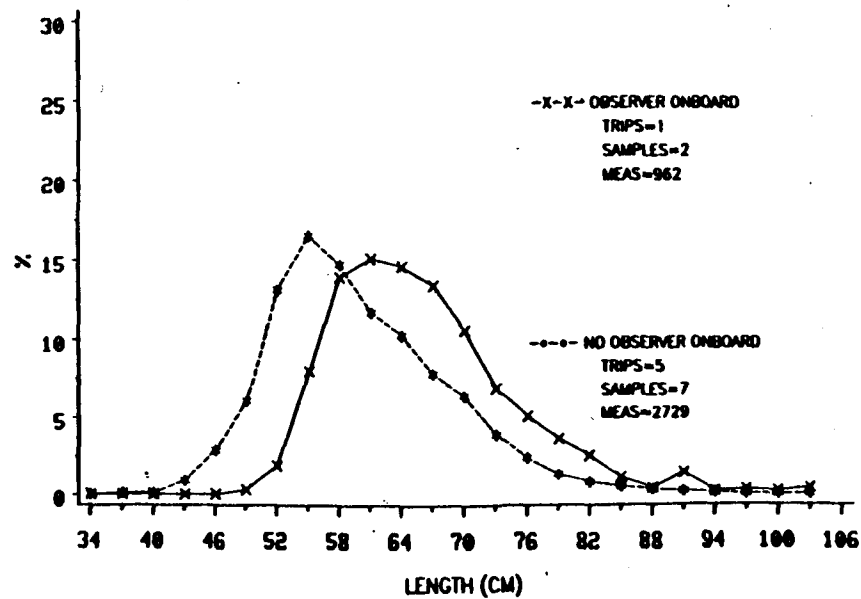
COD NPLD (OT)  
APRIL, 1985 - UNIT 3KG

PORT SAMPLING



COD NPLD (OT)  
MAY, 1985 - UNIT 3KC

PORT SAMPLING



COD NPLD (OT)  
APR., 1984 - UNIT 2JN

PORT SAMPLING

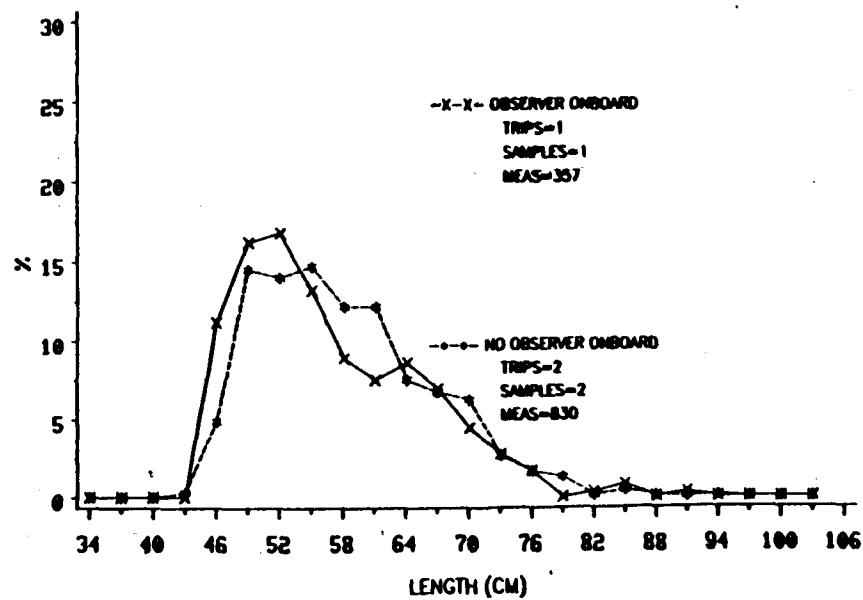
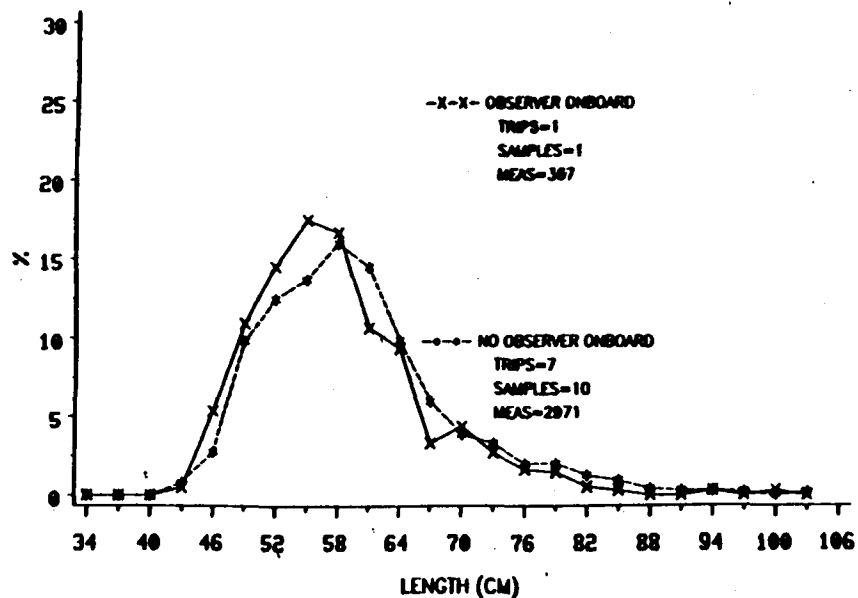
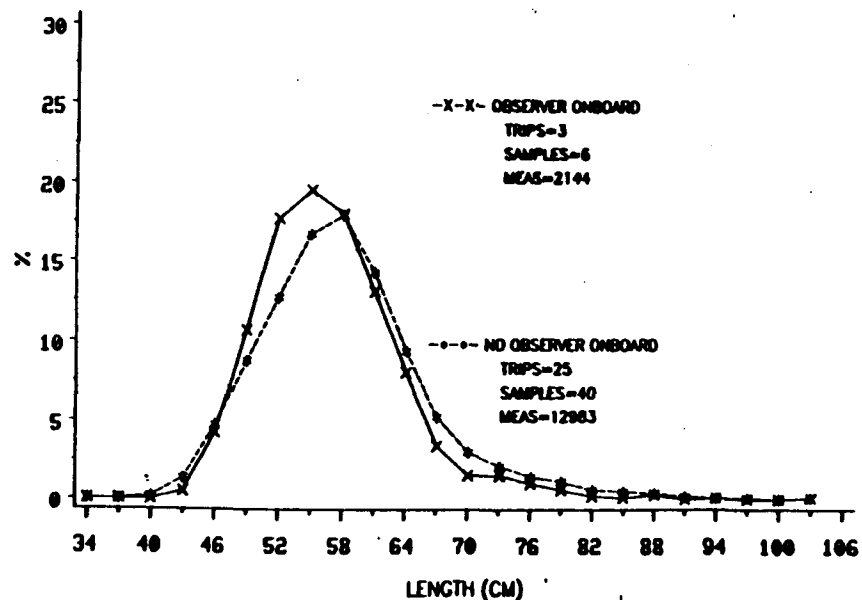


Fig. 2 (Cont'd.)

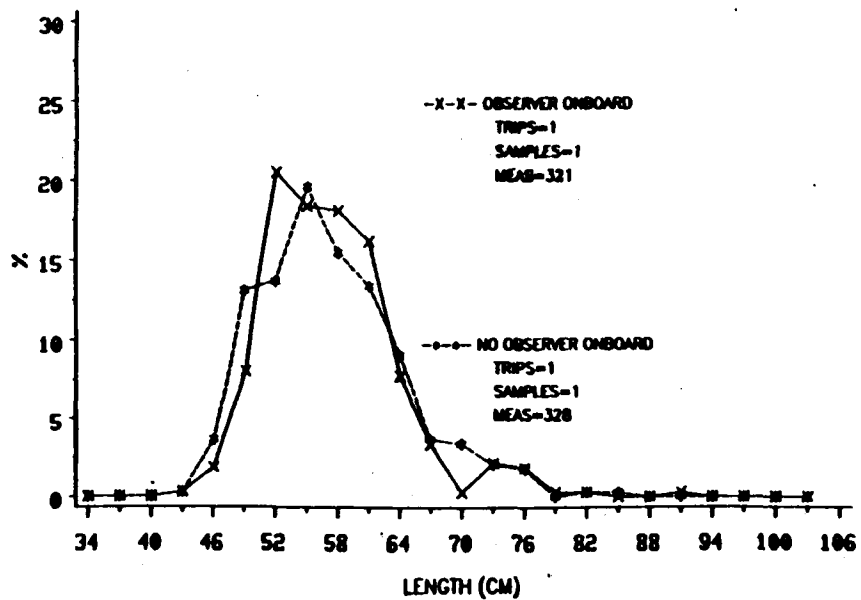
COD NFLD (OT)  
 FEB., 1984 - UNIT 3KG  
 PORT SAMPLING



COD NFLD (OT)  
 JAN., 1984 - UNIT 3LD  
 PORT SAMPLING



COD NFLD (OT)  
 MARCH, 1984 - UNIT 3LC  
 PORT SAMPLING



COD NFLD (OT)  
 MAR., 1984 - UNIT 3LI  
 PORT SAMPLING

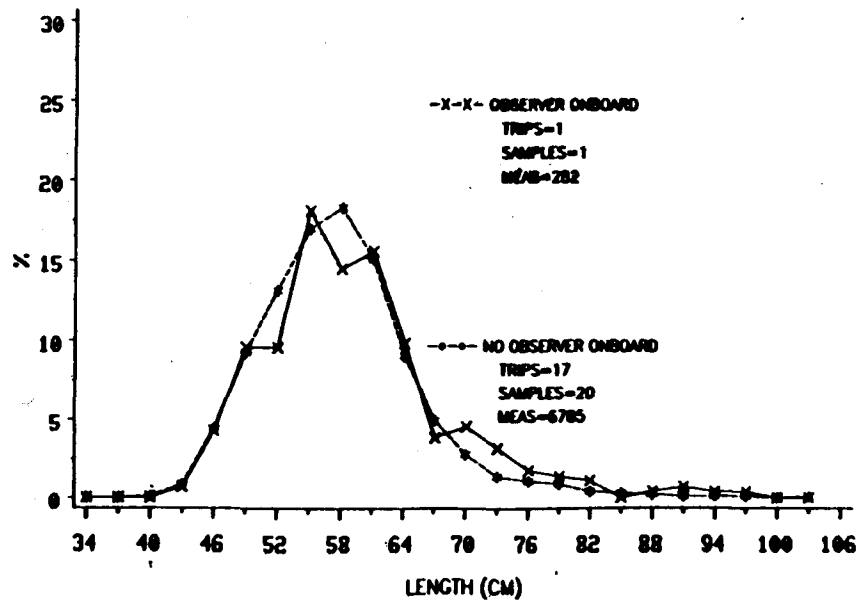
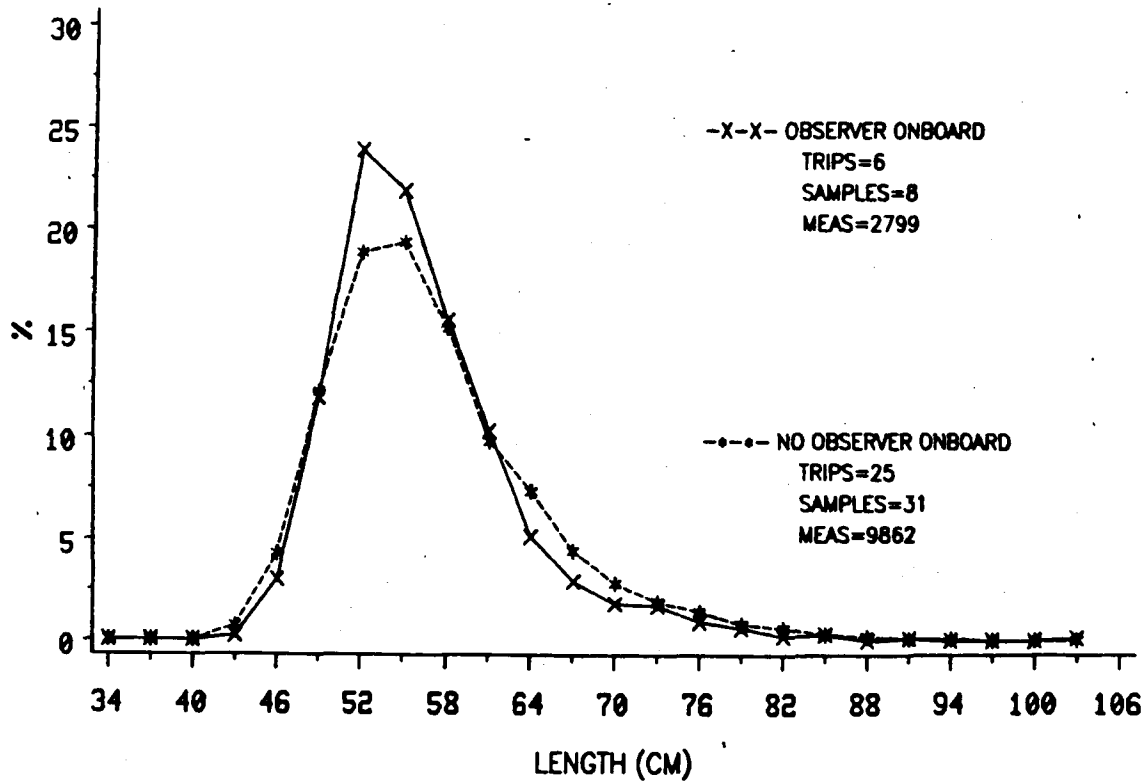


Fig. 2. (Cont'd.)

PORT SAMPLING



COD NFLD (OT)  
DIVISION 3L  
MARCH, 1986

PORT SAMPLING

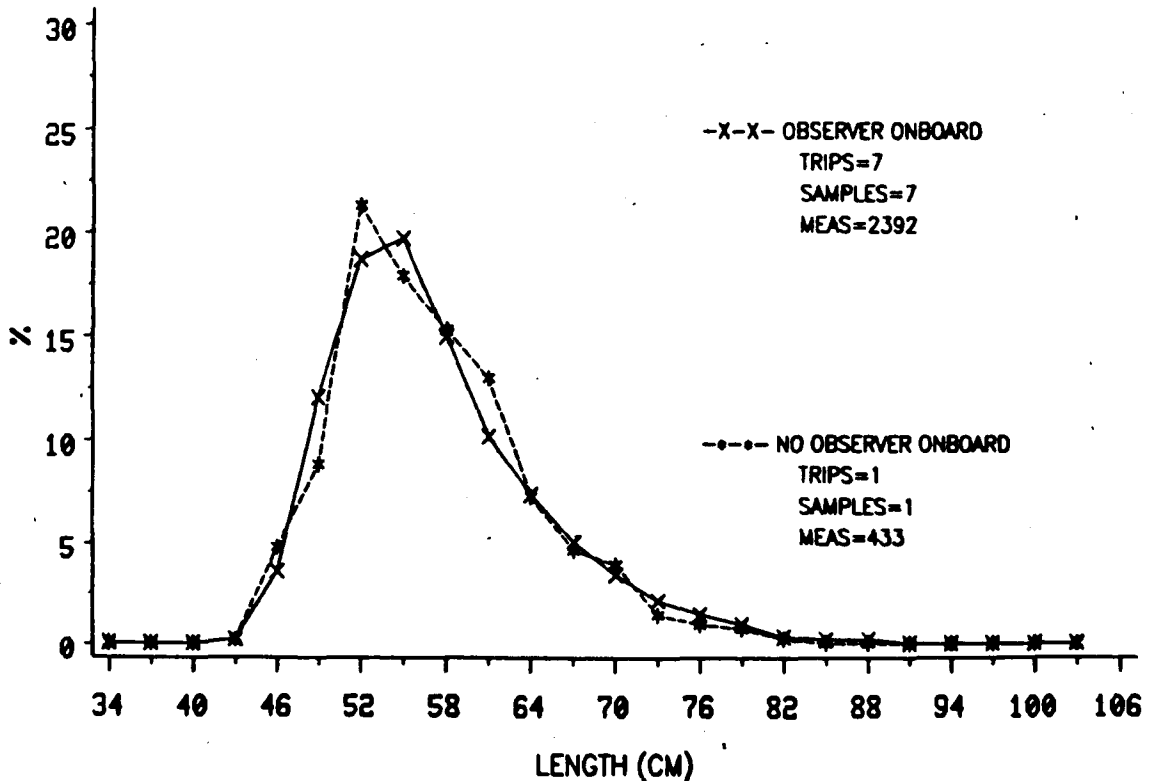


Fig. 3. Comparison (by NAFO Division) of port samples collected from trips with observers onboard and those with no observers onboard by Nfld. trawlers fishing 2J3KL cod during 1984 to 1986.

PORT SAMPLING

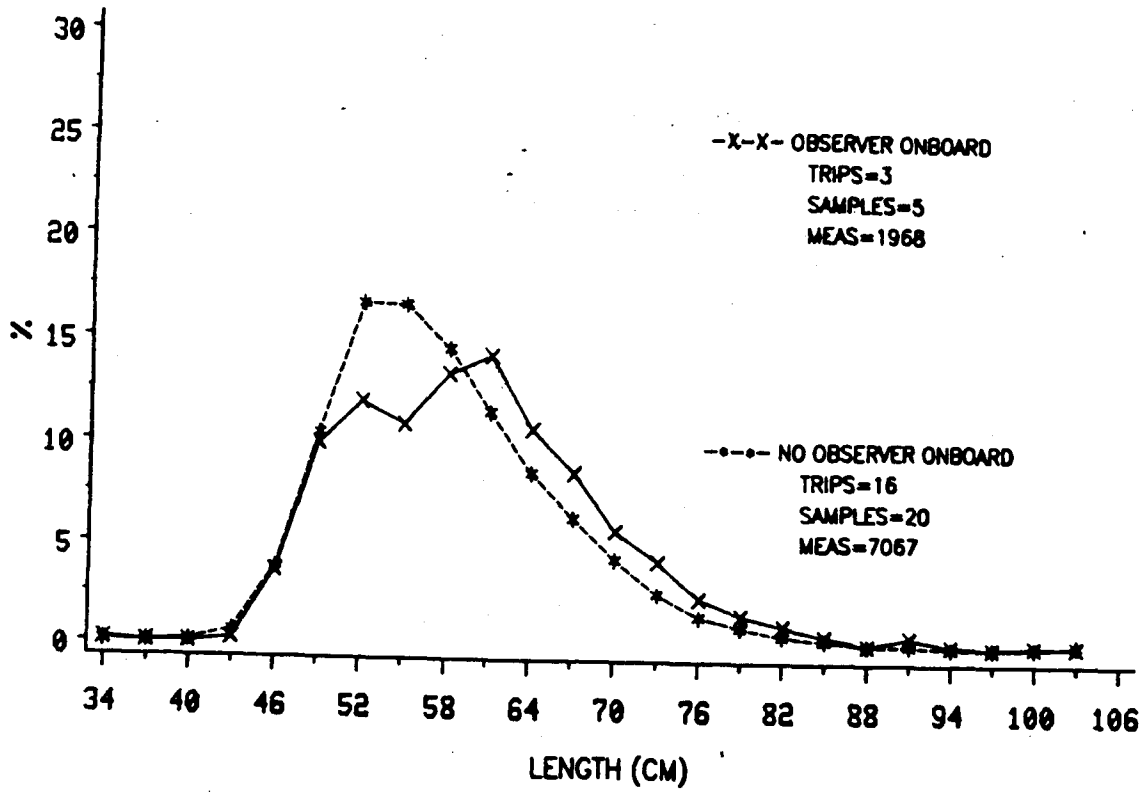
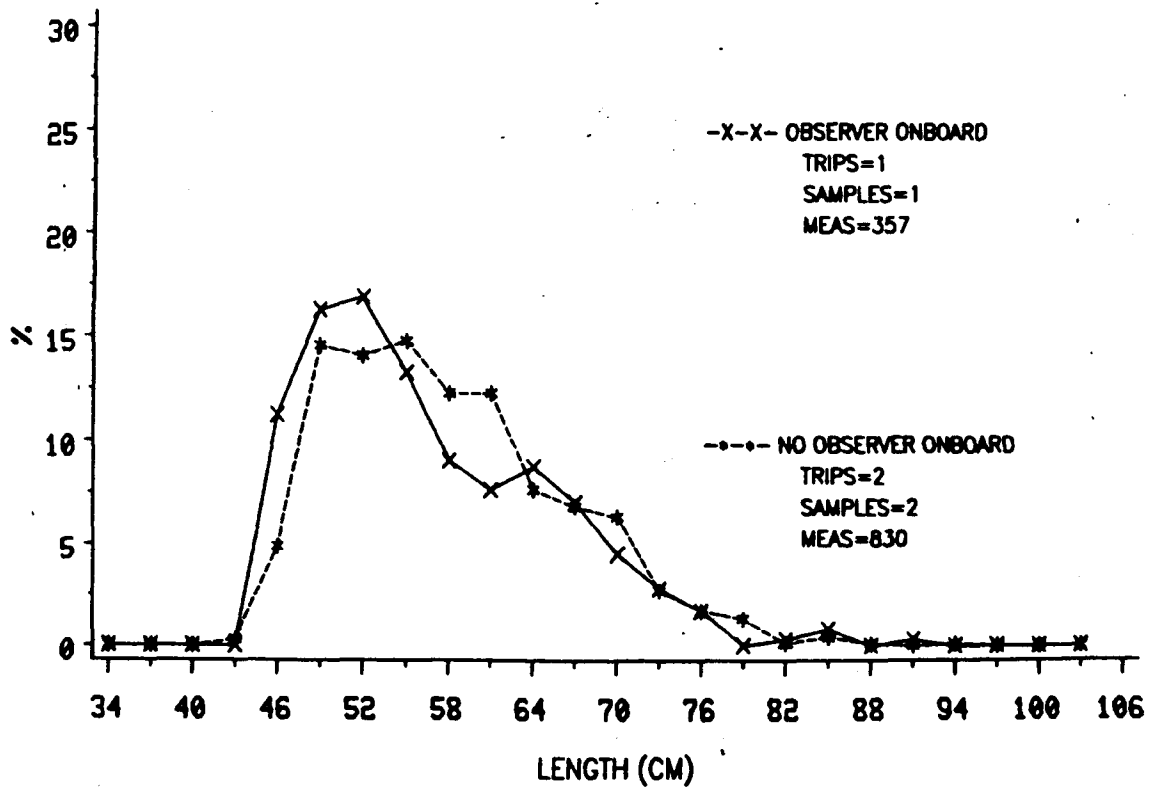


Fig. 3 (Cont'd.)

PORT SAMPLING



COD NFLD (OT)  
DIVISION 3K  
FEBRUARY, 1984

PORT SAMPLING

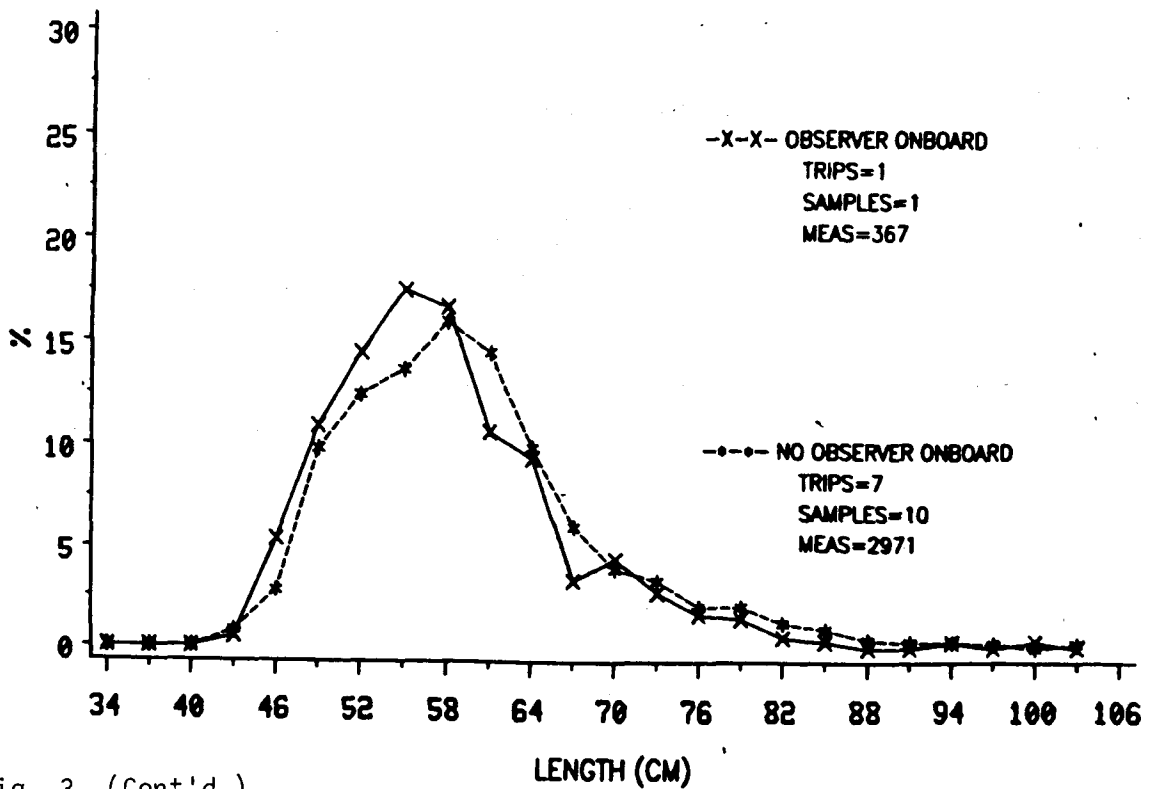


Fig. 3. (Cont'd.)

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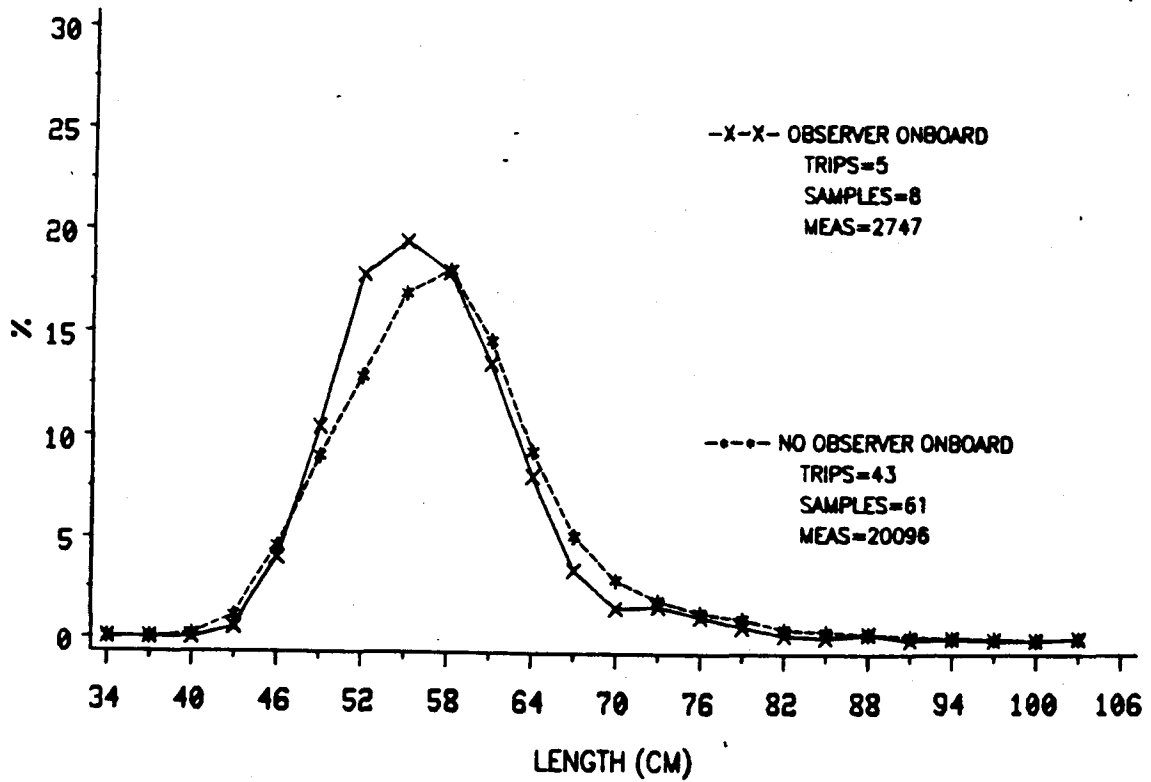


Fig. 3 (Cont'd.)

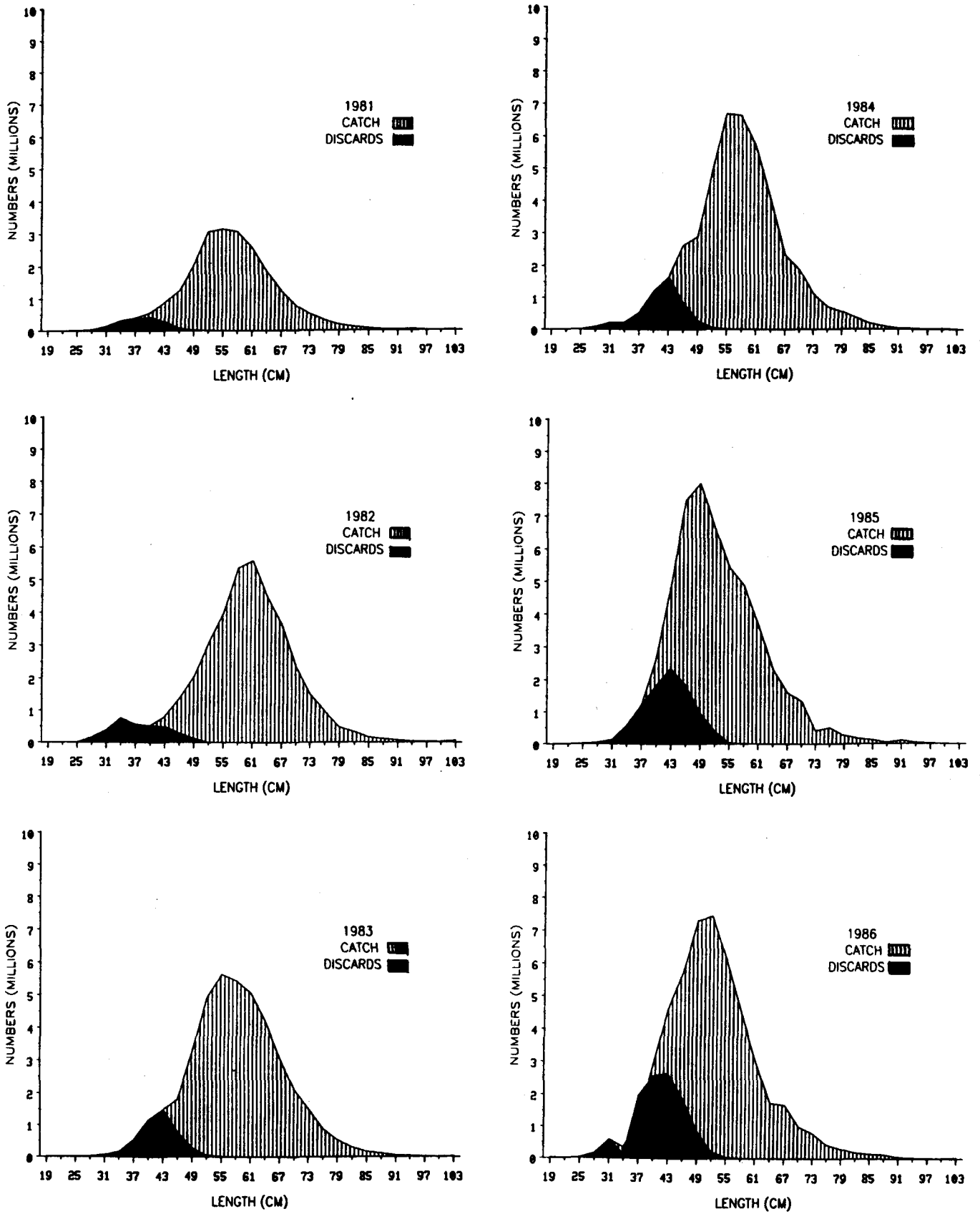


Fig. 4. Trends in the size of 2J3KL cod caught and discarded in terms of numbers for the Newfoundland offshore fleet, 1981-86.

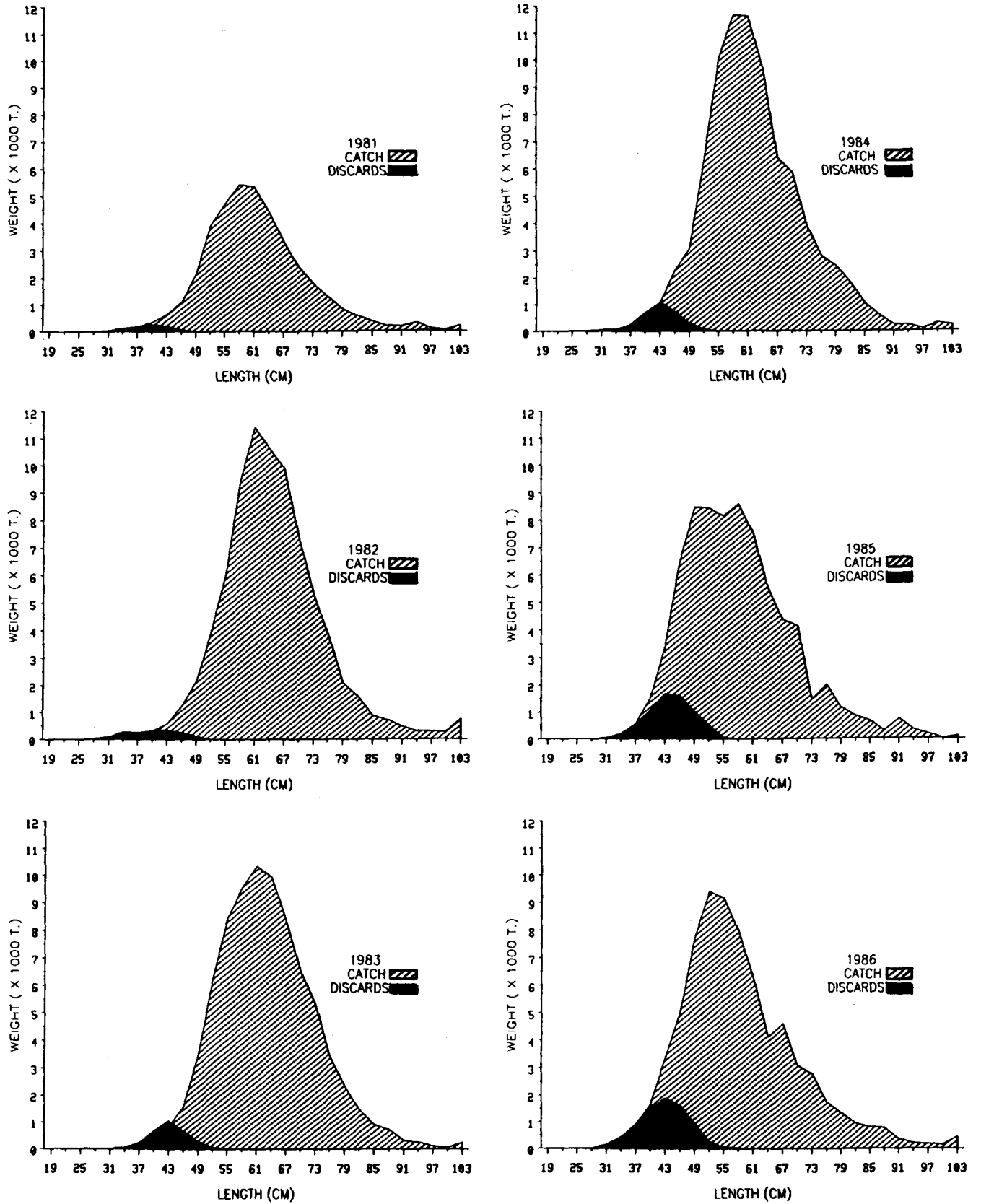


Fig. 5. Trends in the size of 2J3KL cod caught and discarded in terms of weight for the Newfoundland offshore fleet, 1981-86.



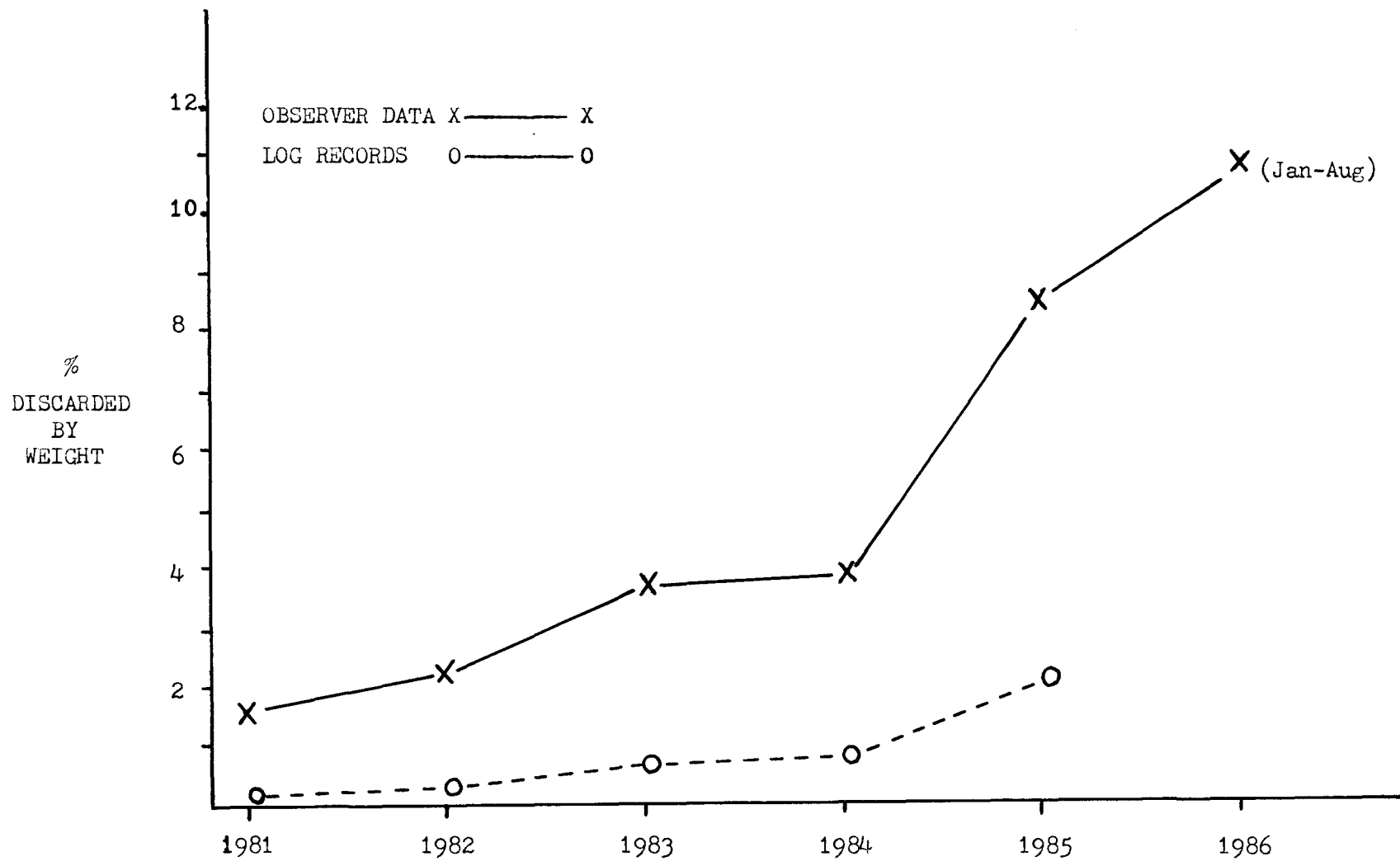


Fig. 6. Patterns of discarding of cod for the Newfoundland offshore fleet in 2J 3KL, 1981-86.

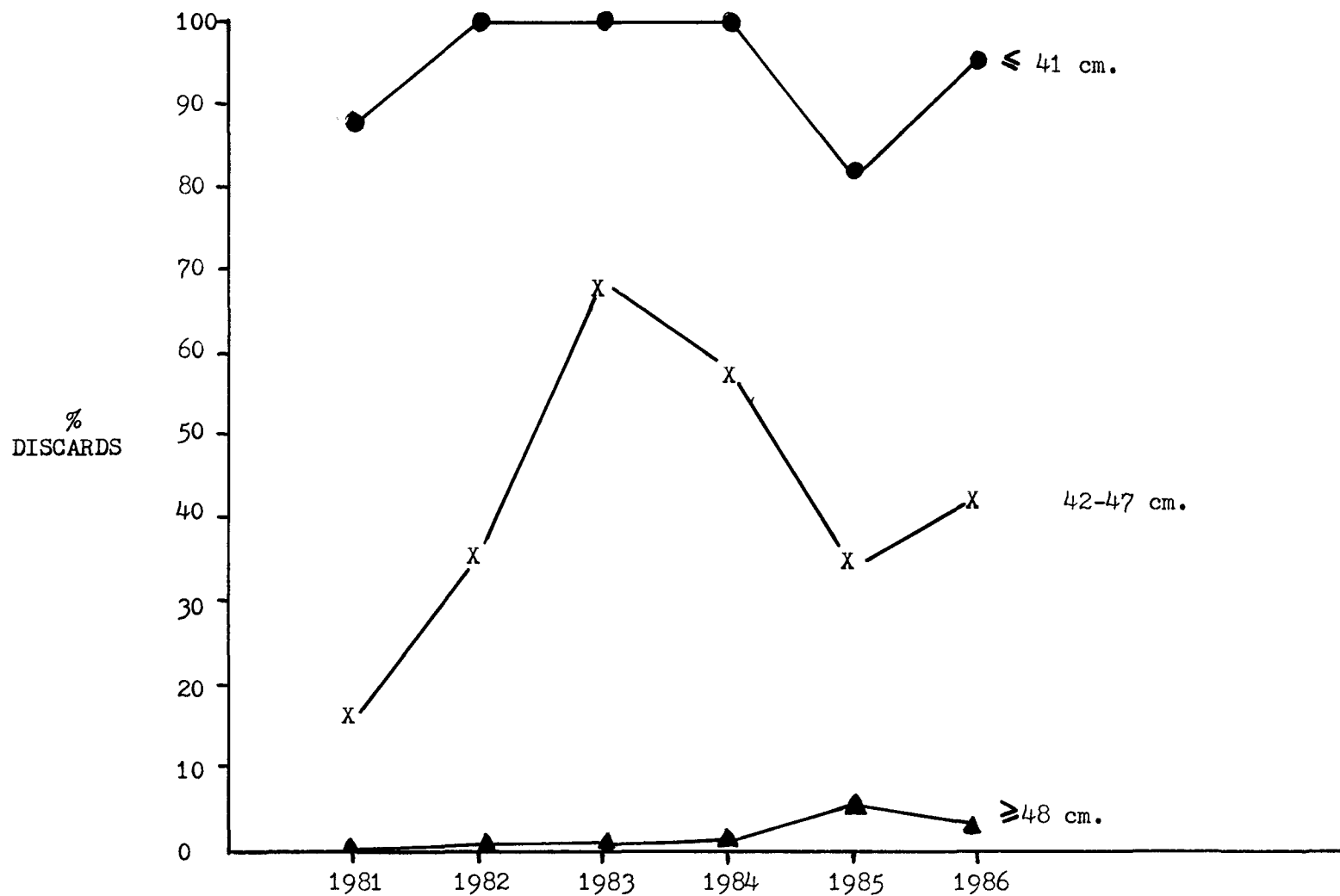


Fig. 7. Rates of discarding by numbers in three size categories, less than or equal to 41 cm, 42-47 cm. and greater than or equal to 48 cm.

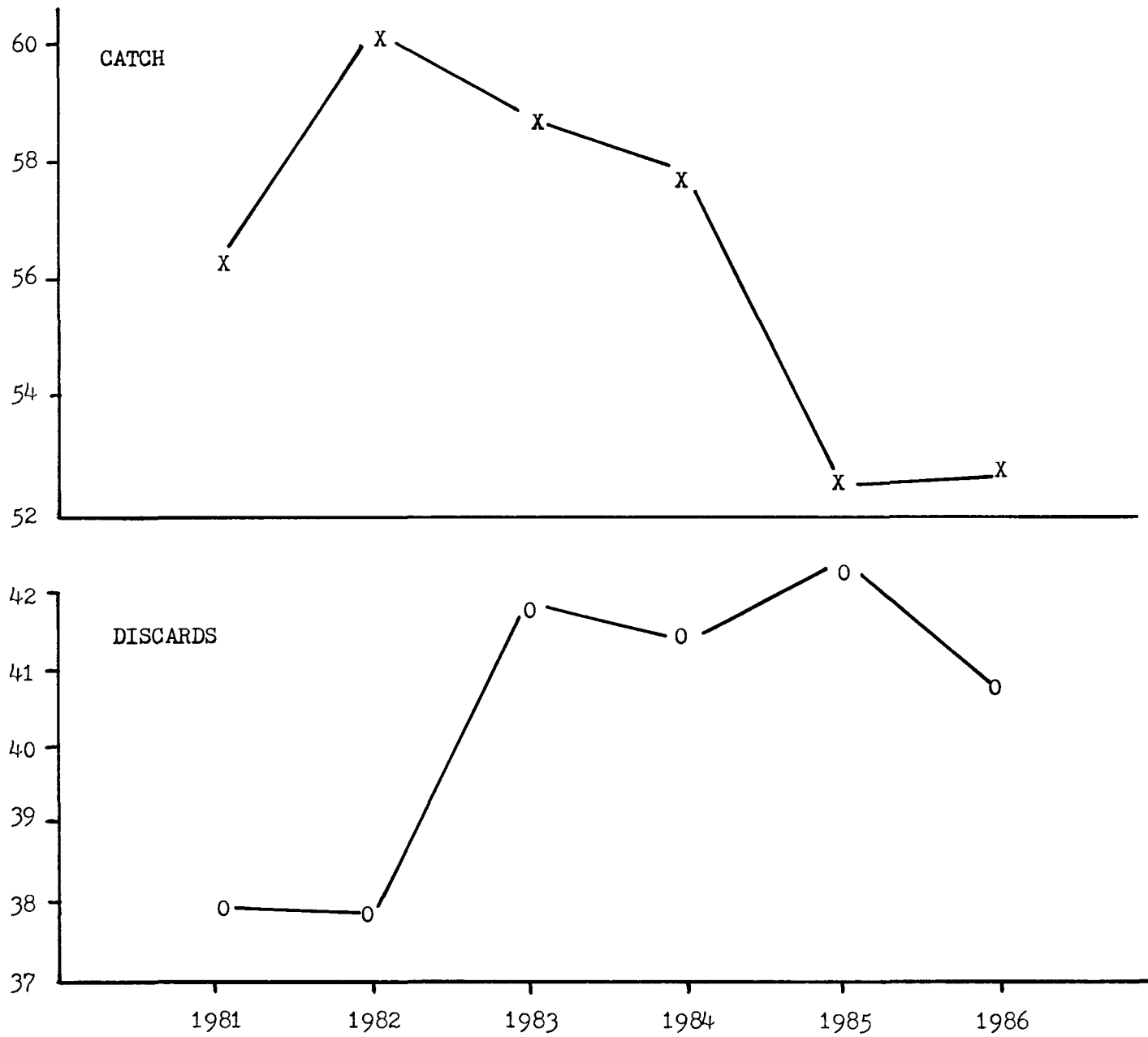


Fig. 8. Mean size of catch and discards for 2J3KL Cod taken by the Newfoundland offshore fleet.