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Review of request for an extension to the lobster fishing season in LFA 31A

by

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Abstract

A longstanding request by fishers in LFA 31A to extend their season to mid-July is reviewed. Landings and logbook catch per trap haul (CPTH) from LFA 31 and 32 have decreased substantially along the eastern shore since 1989. CPTH of short lobsters by 2 index fishers decreased and average size of market lobsters increased, suggesting decreased recruitment in recent years, although the evidence for this is ambiguous. A study of the reproductive ecology of lobsters in the Canso area indicates that a significant number of animals have already hatched their eggs by mid-July and would be captured in an extended season when ordinarily they would have been protected by the berried female restriction (yield loss). The steady increase in the size of animals captured through the season, particularly off Canso, also means that a season extension will result in capture of more large animals that ordinarily would have extruded eggs that summer (egg loss). The resulting decrease in yields and egg production may be offset to some extent in the Canso area by the larger animals taken in this fishery relative to the rest of the eastern shore, but the net effect was not quantified. A permanent season extension is not recommended in a time of decreasing yields.

Resumé

On étudie ici une revendication de longue date des pêcheurs de la ZPH 31A, qui souhaitent voir leur saison de pêche prolongée jusqu'à la mi-juillet. Les débarquements et les prises par levée de casiers consignées dans les journaux de pêche des ZPH 31 et 32 ont diminué sensiblement le long de la côte est depuis 1989. D'après les résultats obtenus par deux pêcheurs-repères, les prises de petit homard par levée de casiers ont dimininué et la grosseur moyenne des homards de taille marchande a augmenté, ce qui permet de croire à une baisse du recrutement ces dernières années, quoique les indices soient ambigus. Une étude de l'écologie de la reproduction des homards dans la région de Canso révèle qu'un nombre important de ces animaux a déjà fini de fertiliser ses oeufs à la mi-juillet. Cela signifie qu'ils seraient susceptibles d'être capturés si la saison était prolongée, tandis qu'actuellement ils sont protégés par la restriction sur les femelles oeuvées (perte de rendement). La hausse constante de la taille des spécimens pêchés, en particulier au large de Canso, signifie aussi qu'une prolongation de la saison aboutirait à la capture de homards plus gros, qui auraient ordinairement produit des oeufs durant l'été (perte d'oeufs). La baisse subséquente du rendement et de la production d'oeufs pourrait être compensée dans une certaine mesure, en ce qui concerne la région de Canso, par la capture de homards plus gros que dans le reste de la côte est, mais la valeur nette de cette compensation n'a pas été chiffrée. Une prolongation permanente de la saison de pêche n'est pas recommandée en pétiode de baisse de rendement.

Introduction

In 1989 lobster fishers in LFA 31 east of Whitehead requested a permanent season extension. This request was formally reviewed by CAFSAC (Pringle and Duggan, 1991) but not supported: 1) catches had increased to near record highs in other areas, but along the eastern shore they had reached only 20% of peak landings, 2) mean lobster size had decreased, suggesting increasing fishing pressure, and 3) exploitation rates had increased from about 0.3 to 0.5. The following recommendations were made: 1) that current effort levels and exploitation rates (i.e. 0.5) not increase; 2) that research on reproductive ecology of broodstock east of Whitehead be conducted to determine its contribution to both the stock as a whole (LFA 31 and 32); and 3) that the request be reassessed in 2-3 years.

The 1989 request for a season extension was not granted, but the season was eventually shifted by 10 days, from April 19-June 20 to April 29-June 30, to accommodate adverse weather in the exposed area east of Whitehead. This area was renamed LFA 31' and later LFA 31A, with the rest of LFA 31 west of Whitehead designated LFA 31B. In 1992 LFA 31A began and ended its season two weeks later than the April 29-June 30 official dates due to ice conditions. In 1993 the start of the season was delayed five days due to adverse weather. The closing date was extended by five days to July 5, but a further extension request to July 15 was not granted. Some fishers in this area want a permanent extension for the following reasons: to regain days lost due to storms (Pringle and Duggan 1991 confirmed 10-20% annual loss from the original season); that this is the only fishery left in the area; that an extension would simply return those days lost in the 1970's when the season was shortened, and; unemployment insurance qualifications (10 weeks are required for full benefits). The season in adjacent LFA's 29 and 31B are April 29-June 30 and April 20-June 20, respectively. LFA's 27 and 30 have seasons beginning and ending two to three weeks later than LFA 31A (May 16-July 15 and May 20-July 20, respectively).

The LFA 31/32 fishery was deemed collapsed in the 1970's when annual fishing yields were 5% of historical peak landings (Robinson, 1979). Although there was some recovery in stock abundance through the 1980's (Pringle and Duggan, 1991), CAFSAC recommended no increase in effort without a concomitant increase in minimum legal size (Miller *et al* 1987). It was further suggested that blocking the Strait of Canso by the Canso Causeway stopped larval flow from productive Georges Bay (Harding *et al.*, 1983) and therefore the perceived high reproductive capacity of the Canso grounds should be protected (Miller *et al.*, 1987). However, little was known about the reproductive ecology of eastern shore (LFA 31/32) lobster stocks. A study was launched in Canso (LFA 31A) to determine the role of temperature on embryonic development, and the impact of fishing pressure on egg production (R. Ugarte, unpublished data). Some of these data, along with information from fisher's logbooks, are used in this paper to demonstrate that a permanent season extension, and hence fishing effort and exploitation rate, should not be increased in LFA 31A nor for any portion of the eastern shore (LFA 31 and 32).

Methods and Materials

Historical lobster landings were obtained from Statistics Canada records and from the Scotia-Fundy Region's Statistics Division. Certain fishers voluntarily keep log books in which they record daily landed weight and number of trap hauls, from which catch per trap haul (CPTH) is calculated. Some fishers also record the numbers of "short" (prerecruits <81 mm CL) "berried" (embryo-bearing) females, and "market" (≥81 mm CL) lobsters. Mean weights for market lobsters can thus be calculated. Exploitation rates were calculated according to Miller *et al* (1987), with numbers per molt class determined from length frequency data (samples of ~500 lobsters chosen haphazardly from the catch of two to four fishers at the start and end of each fishing season), and

average time spent in each molt class from estimates of molt probability. Logbook data were analyzed for three representative ports (Canso, Bickerton, and Clam Bay) situated at the eastern, middle, and southern areas of the eastern shore, respectively.

A study involving the distribution of free-ranging tagged female lobsters with maturing ovaries or embryos, and animals in similar reproductive states caged at two depths (3m and 17m) was conducted in Canso from 1991-93. Ryan thermographs were anchored at the two depths during the study. During the 1992 fishing season in Canso, 30 boat days were spent at sea with three fishers working contiguous grounds throughout the season. The location, length, sex and embryo presence or absence were recorded for each lobster. Only results relevant to the season extension are presented here (the complete study will be documented elsewhere).

Results

Available fisheries statistics for the eastern shore (LFA 31+ 32 combined) are given in Figure 1. Catch (yield) and catch per trap haul (abundance) increased during the mid to late 80's, peaking in 1989. CPTH has dropped quite sharply during the last three years. Mean carapace length mirrored catches and catch rate, decreasing dramatically during the 80's, reaching a minimum when catch rates were highest, then increased in the early 90's as catch rates declined. Exploitation rates also increased to 1989, and with the exception of 1991, remained above 0.5 thereafter.

Yields in LFA 31 rose during the 1980's, peaking at nearly 500 metric tons in 1989 (Figure 2). The pattern was similar in the eastward LFA's (28 and 29). Catches in LFA 32 peaked in 1986 and 1990 and then remained stable. Catch per trap haul in three representative ports given in Figure 3 show sharp declines in Canso (LFA 31A) and Bickerton(LFA 31B) in recent years, with the greatest decline in Canso. CPTH rates in Clam Bay showed the same bimodality seen in total landings for LFA 32. Exploitation rates were generally lower in Canso than in Bickerton and Clam Bay (LFA 32), and appear to have remained relatively steady around the target 0.5 since 1989 (Figure 4).

Abundance (CPTH) of "shorts" (pre-recruits) recorded by one Canso fisher, has decreased steadily since 1989 (Figure 5A). A similar, although more variable (around mean of weekly catches) decreasing pattern was observed from an LFA 32 fisher's logbook (Figure 5B). The percentage of the catch in the first moult group (81-92mm CL) increased and the percentage in the third moult group decreased to a maximum and minimum, respectively, during the year of peak catches (1989, Figure 6). Subsequently the percentage of animals in the first moult group has remained relatively high and the percentage in the third mould group relatively low.

Catch composition during the 1992 and 1993 seasons in Canso (1 fisher) is shown in Figure 7. The percentage of market lobsters decreased through the season and at its end only about one-half of the catch was marketable, the other half consisted of berried females and shorts. CPTH of berried females increased steadily through the season in all areas (Figure 8). Catch rates for berried females were generally higher on the Canso grounds, and increased markedly during the last two to four weeks of the season, when the other grounds were already closed. CPTH of market lobsters in Bickerton (Figure 9) and Clam Bay (not shown) decreased steadily during each season; catches at the end of the season were almost half those at the beginning. In contrast, market catch rates at Canso remained relatively steady. The average weight of lobsters increased throughout the season in all areas and continued to rise in Canso after season closure elsewhere along the eastern shore (Figure 10).

Mature lobsters make seasonal migrations to shallow warmer areas during summer where higher

temperatures facilitate moulting, growth and egg development (Pringle and Burke 1993). The temperatures at the two cage sites (3 and 17 m depths) are given in Figure 11. Observations on embryo development with depth at Canso show the advantage to females of moving into warmer shallow waters during summer months. In 1991 embryos from animals kept in the 3m cages hatched much earlier than those kept at 17m (Figure 12). At 3 meters, over 60% of the females had hatched their eggs by mid July. There appears to be considerable variation in hatching times between years. For example, the time to when 80% of females had hatched their eggs at 3m occurred 15 days later in 1992 relative to 1991 (Figure 13). Yet, even with the later hatching, 42% of the berried females had already hatched their eggs by season closure on July 15 (Figure 14).

Discussion

Yields in LFA 31 (A&B) are in decline, in concert with other lobster stocks along the inner Scotian Shelf where exploitation rates commonly exceed 70% (Miller *et al* 1987). In LFA 31 exploitation rates have been maintained at about 50% with the dual objectives of eliminating large interannual variation in landings and rebuilding the stock to at least the 1950's levels (about 900 t annual catch), still only about one-third the peak historical catch (about 2,700 t). These objectives have obviously not been achieved, and an increase in effort is not advised.

There are some indications that lower catches along the eastern shore in recent years are due to lower recruitment. It has generally been accepted that the increased catches during the 80's were due to a recruitment pulse (Pringle and Burke 1993). The decreasing carapace length during the period of increasing catches, with the smallest mean size occurring during the year of peak catches (Figure 1), may therefore be due to the large numbers of small lobsters recruiting to the fishery. Similarly, the increased carapace length in more recent years may be reflecting lower recruitment. Note that this is contrary to the interpretation of Pringle and Duggan 1991, who suggested that decreasing mean sizes were due to increased fishing pressure, as evidenced by increased exploitation rates. Exploitation rates as presently calculated i.e. based on the ratio of lobsters in the first and second moult groups in the same year, are questionable, particularly since they assume constant recruitment (D. Pezzack, personal communication). Direct measure of prerecruits in the form of shorts per trap haul shows a decreasing trend for 5 consecutive years in both LFA 31 and 32, although it must be emphasized that each series represents catches from only one fisher fishing the same grounds annually, and the index does not correct for the addition of escape gaps in half the traps of the LFA 32 index fisher (Figure 5B). While port sampling showed an increase in the percent of animals in the first moult group during the recruitment pulse there has been no substantial decrease in more recent years as might be expected if recruitment were decreasing significantly. Thus the evidence for decreased recruitment is equivocal.

The increased mean size of animals caught during the season could be due to size specific changes in catchability, perhaps due to increasing water temperatures, or it could be due to inshore migration of larger animals. Whatever the cause, it is apparent that Canso fishers on average take larger animals than do fishers to the southwest simply because their season occurs later, when larger animals are more trappable. An extension to mid July would result in an even greater percentage of larger, reproductively active animals in the catch which under the current regime would have escaped the fishery to extrude eggs that summer. It is well known that larger animals produce more eggs. Similarly, the work on reproductive ecology in Canso shows that a relatively large percentage of females have already hatched their eggs by mid-July. With an extended season more of these animals become marketable when ordinarily they would have escaped the fishery to moult that year and enter the fishery as larger animals. Finally, the dramatic increase in the catch and subsequent handling of berried females in LFA 31A toward the end of the season may result in some egg loss. Thus the extension impacts both on egg production and yield, which is not recommended during a

period of decreasing yields possibly due to low recruitment. It must also be noted, however, that the later season in LFA 31 A, which results in a larger overall mean size of animals caught, may to some degree offset the egg and yield losses suggested above. A modelling approach is required to determine the net effects.

It is worth mentioning that despite the sustained catch rate of market lobsters in the Canso area late in the season, the increased proportion of berried and short lobsters in the catch (i.e. up to 1/2 by number) will increase fishers' workload.

Conclusions

1. Annual catch rates and landings from the Canso area lobster stock have been in decline since the peak in 1989, in concert with the decline in most stocks in the Scotia-Fundy Region. Exploitation rates in Canso appear to have remained relatively constant around 0.5, somewhat lower than elsewhere along the eastern shore.

2. Based on pre-recruit abundance and mean size of market lobsters, there is some evidence that annual recruitment has declined. However, this is not supported by recent changes in catch composition by moult group.

3. In addition to increasing fishing effort, an extension to mid-July would result in capture of more large animals that would ordinarily have extruded eggs that summer, with an associated loss in egg production.

4. A relatively large number of animals have already hatched their eggs by mid-July and these animals would be captured in an extended season, when ordinarily they would have been protected and returned to the water to moult and increase yields the following year.

5. The larger mean size of catches in LFA 31' may to some degree offset the decreased yields indicated under 3 & 4 above.

Recommendations

1. That the LFA 31A season not be extended to July 15.

2. That the loss in both egg numbers and yield resulting from season extensions be quantified.

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Pringle, J.D., and R.E. Duggan. 1991. Lobster stock assessment for LFA 31. CAFSAC Res. Doc. 91/21. 15pp.

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Robinson, D.G. 1979. Consideration of the lobster *(Homarus americanus)* recruitment overfishing hypothesis, with special reference to the Canso Causeway. Fish Mar. Serv. Tech. Rep. 834 (Part 3): 77-99.

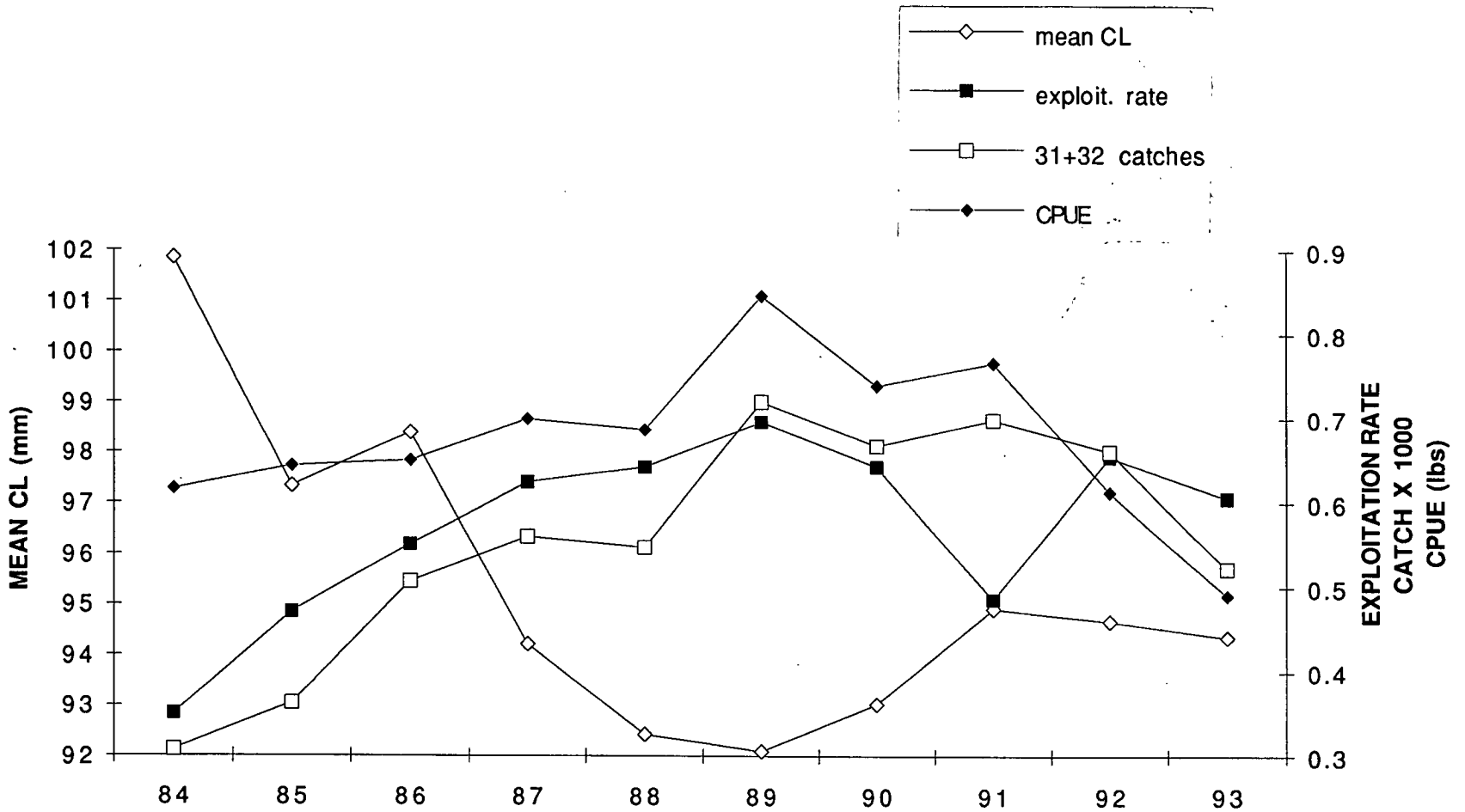


Figure 1. Mean carapace length of catch, exploitation rates, catches and catch per trap haul for the eastern shore of Nova Scotia (LFA 31 and 32 combined)

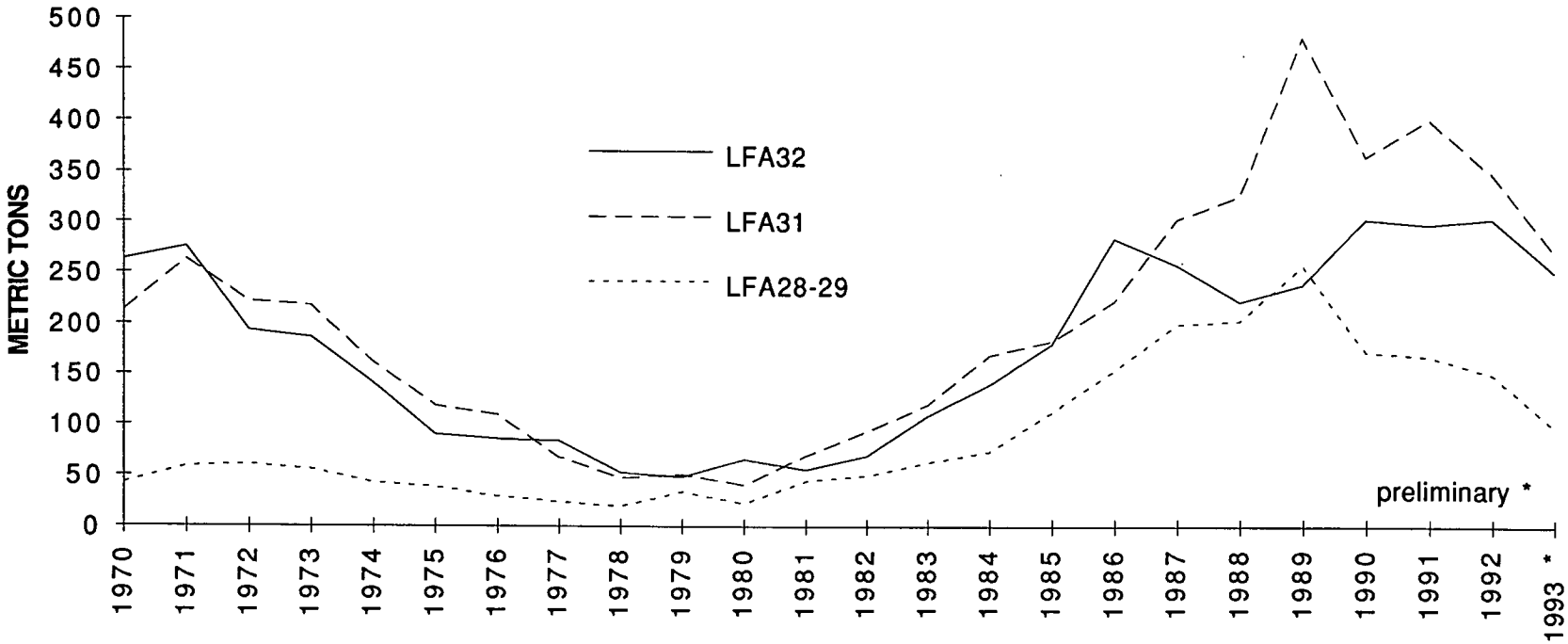


Figure 2. Lobster catches in LFA 31 and adjacent LFA's

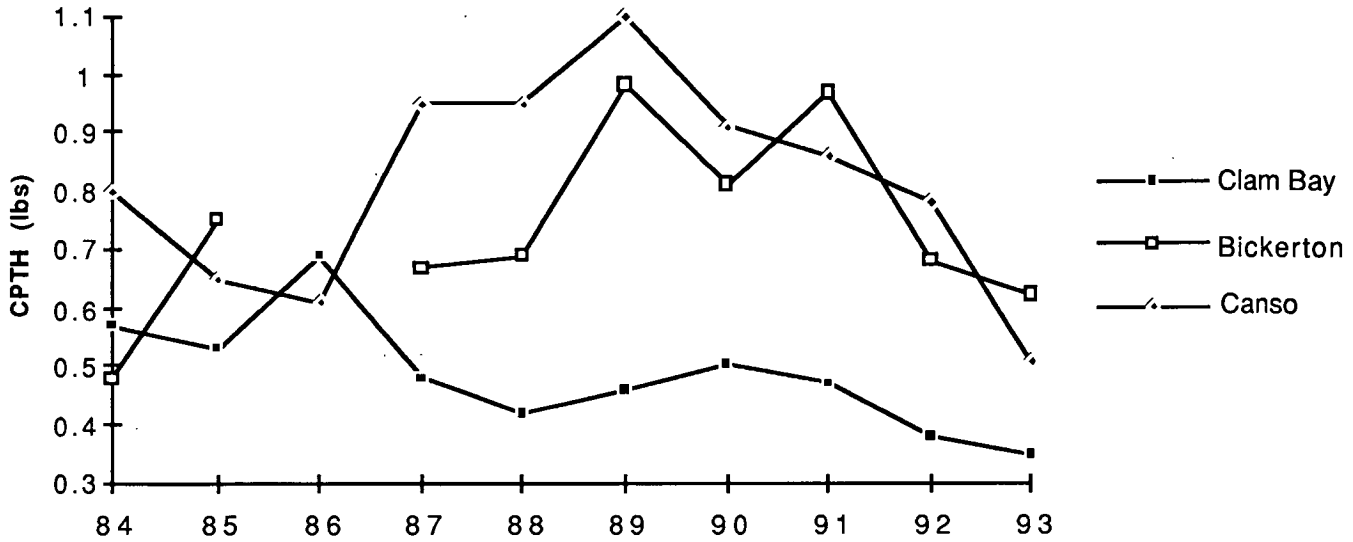


Figure 3. Catches per trap haul for representative ports in LFA 31A (Canso), 31B (Bickerton) and 32 (Clam Bay)

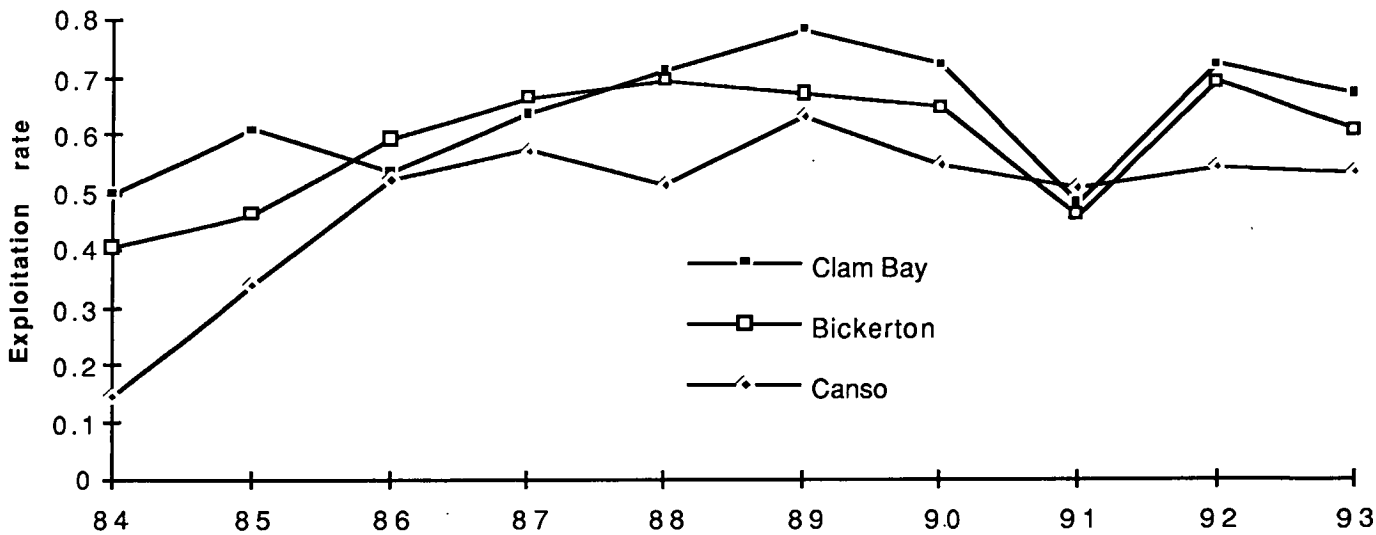
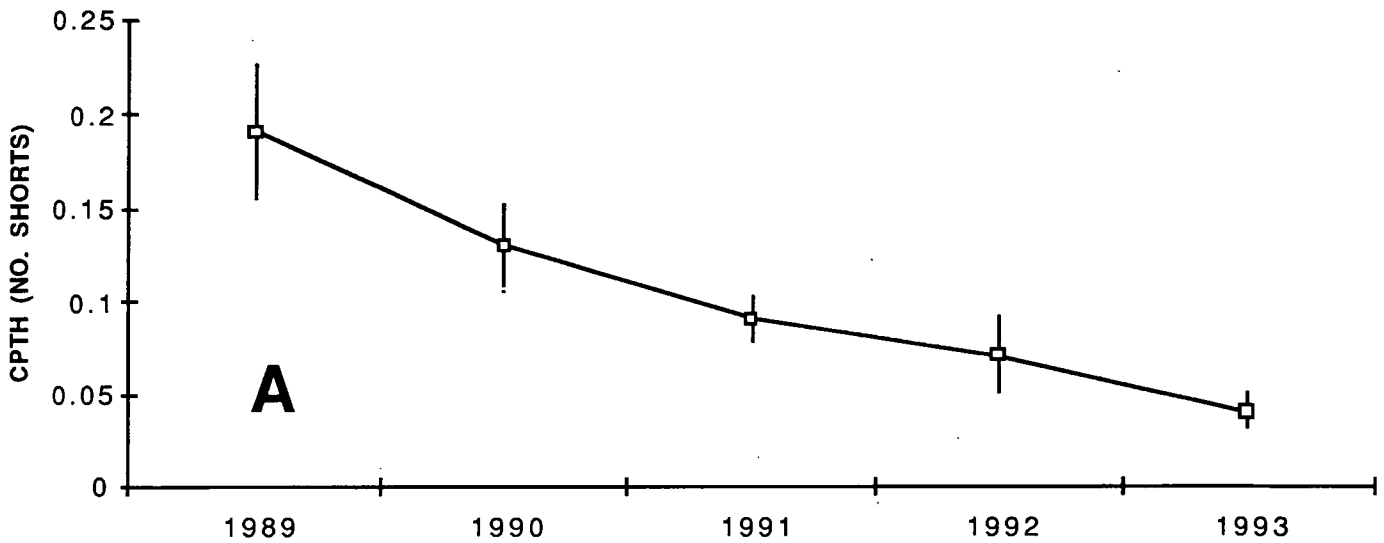


Figure 4. Exploitation rates calculated from port samples at Clam Bay (LFA 32), Bickerton (LFA 31B) and Canso (LFA 31A)



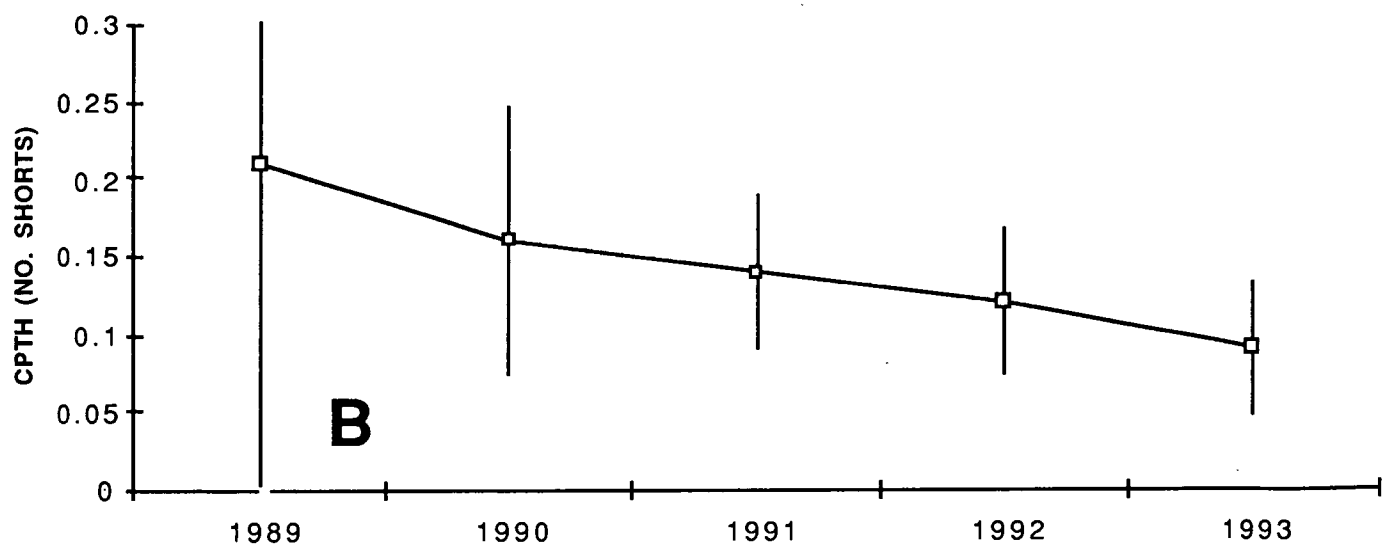


Figure 5. Catch per trap haul of "short" (precrecruit) lobsters for 1 fisher in A - LFA 31A (Canso), and B - LFA 32 (Harrigan Cove). Note that half of traps used in B had escape vents installed for the 1993 season. Error bars represent +/- 1 standard deviation of weekly catches..

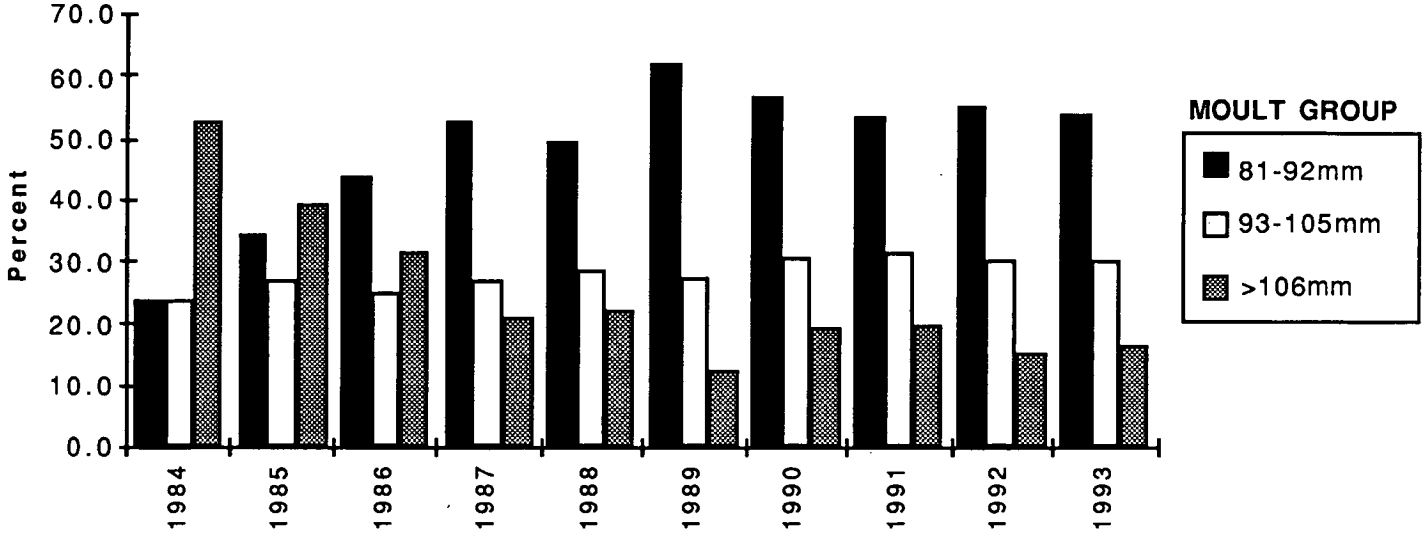


Figure 6. Percent of animals in each moult group from port samples (begin and end of season combined) taken in CANSO.

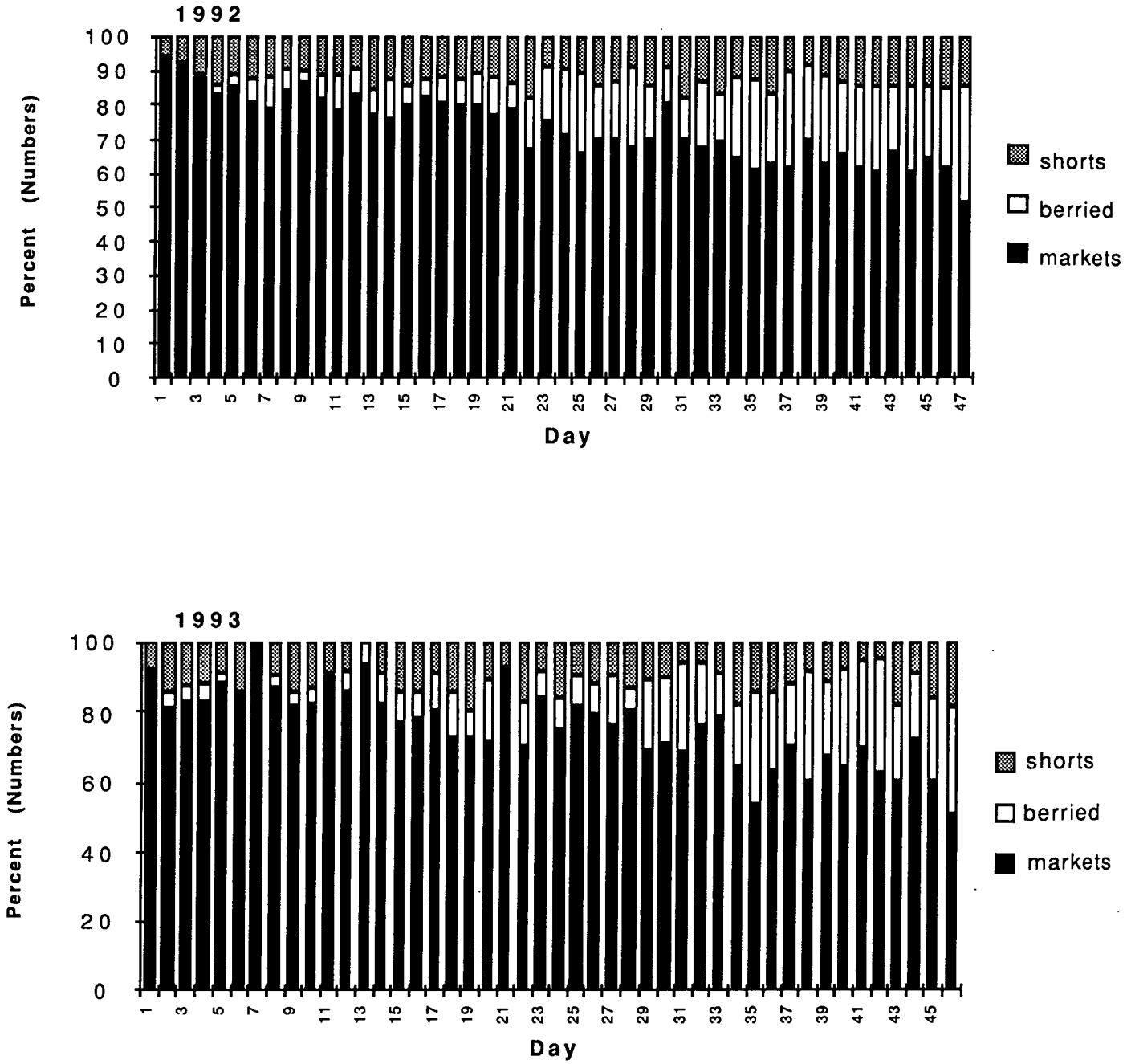


Figure 7. Catch composition as percent of lobsters caught by one fisher at Canso in 1992 and 1993

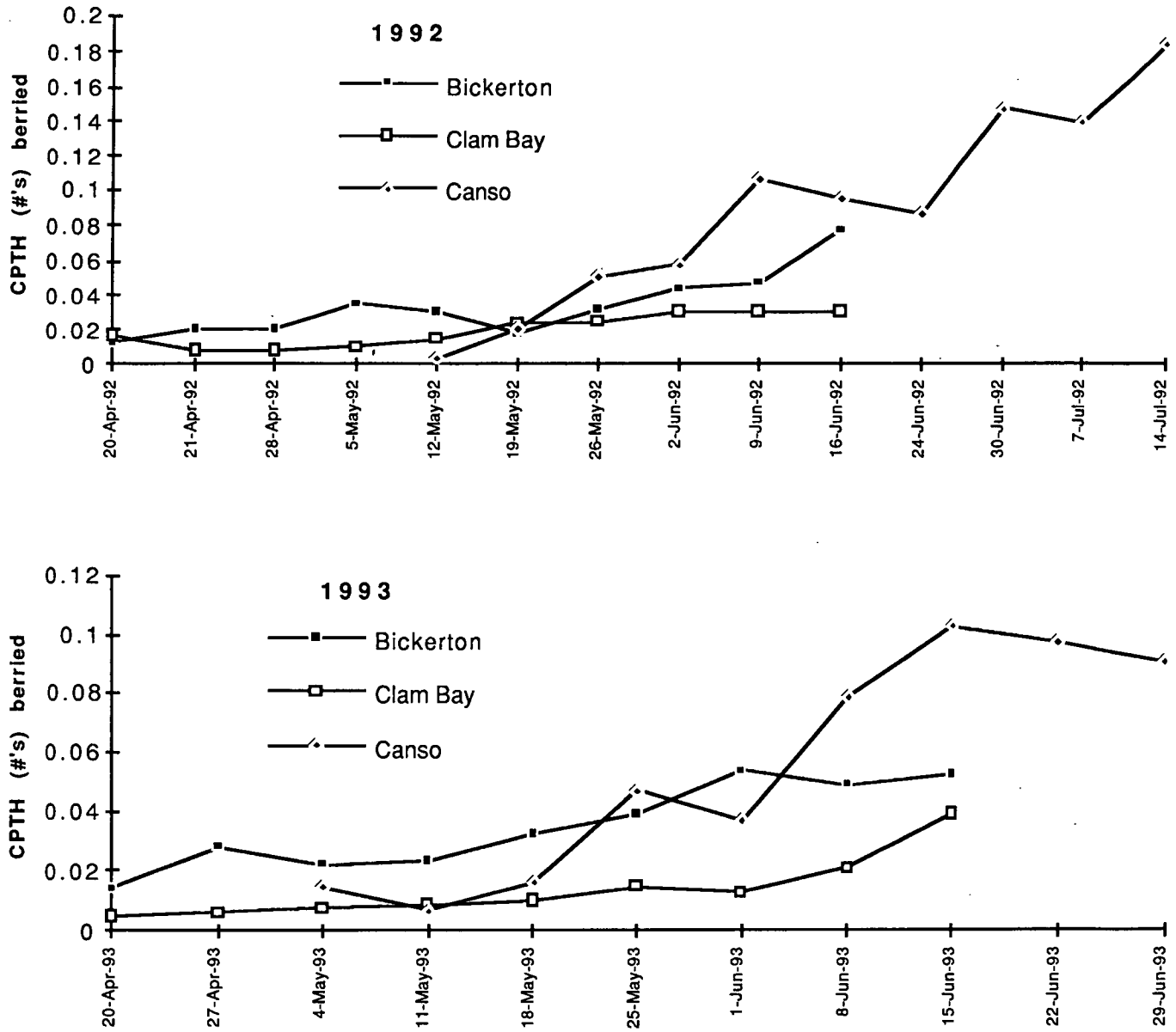
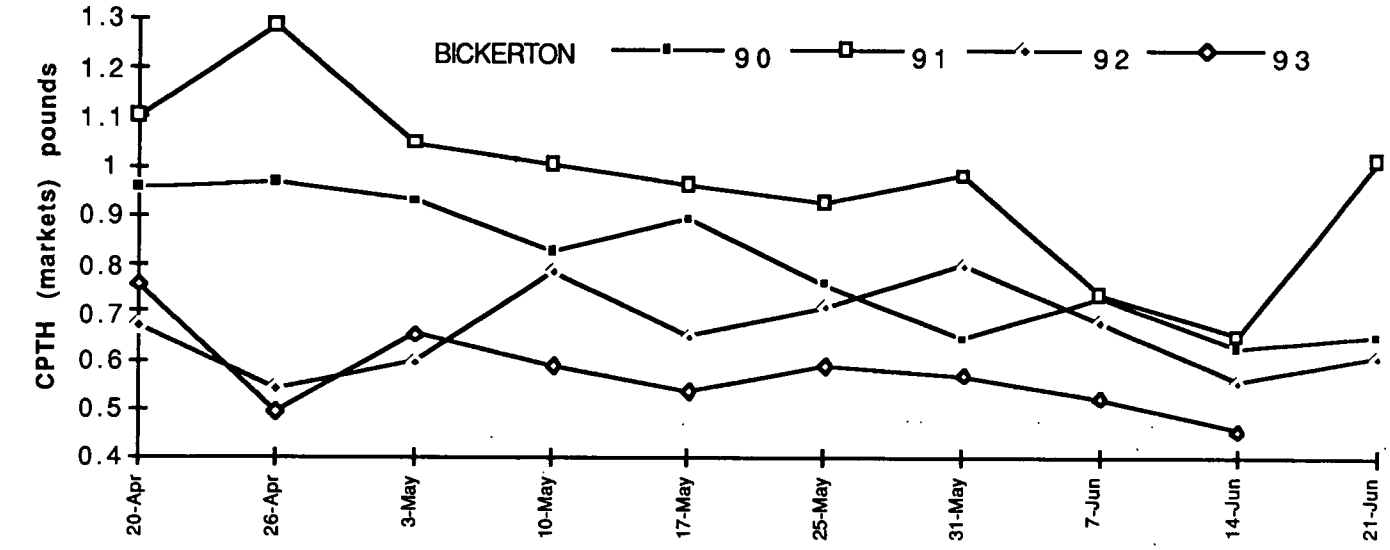


Figure 8. Catch per trap haul in numbers of berried females for representative ports in LFA 31A (Canso), 31B (Bickerton) and 32 (Clam Bay) in 1992 and 1993.



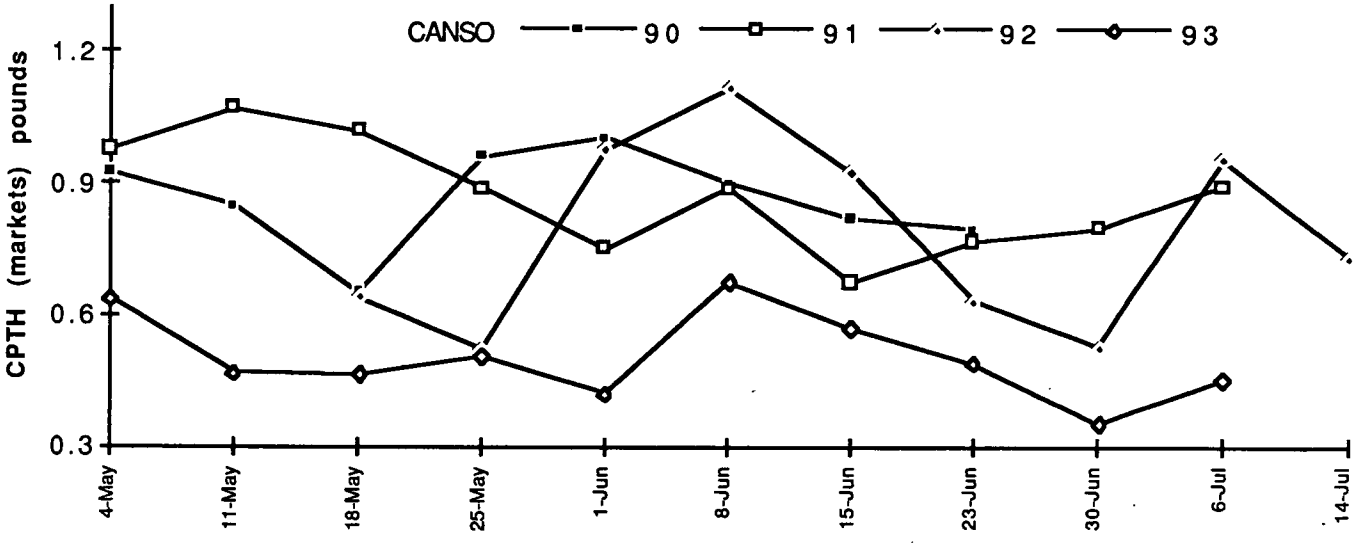


Figure 9. Weekly mean catch per trap haul of market lobsters for Bickerton (LFA 31B) and Canso (LFA 31A) from 1990 to 1993, all fishers' logbooks combined.

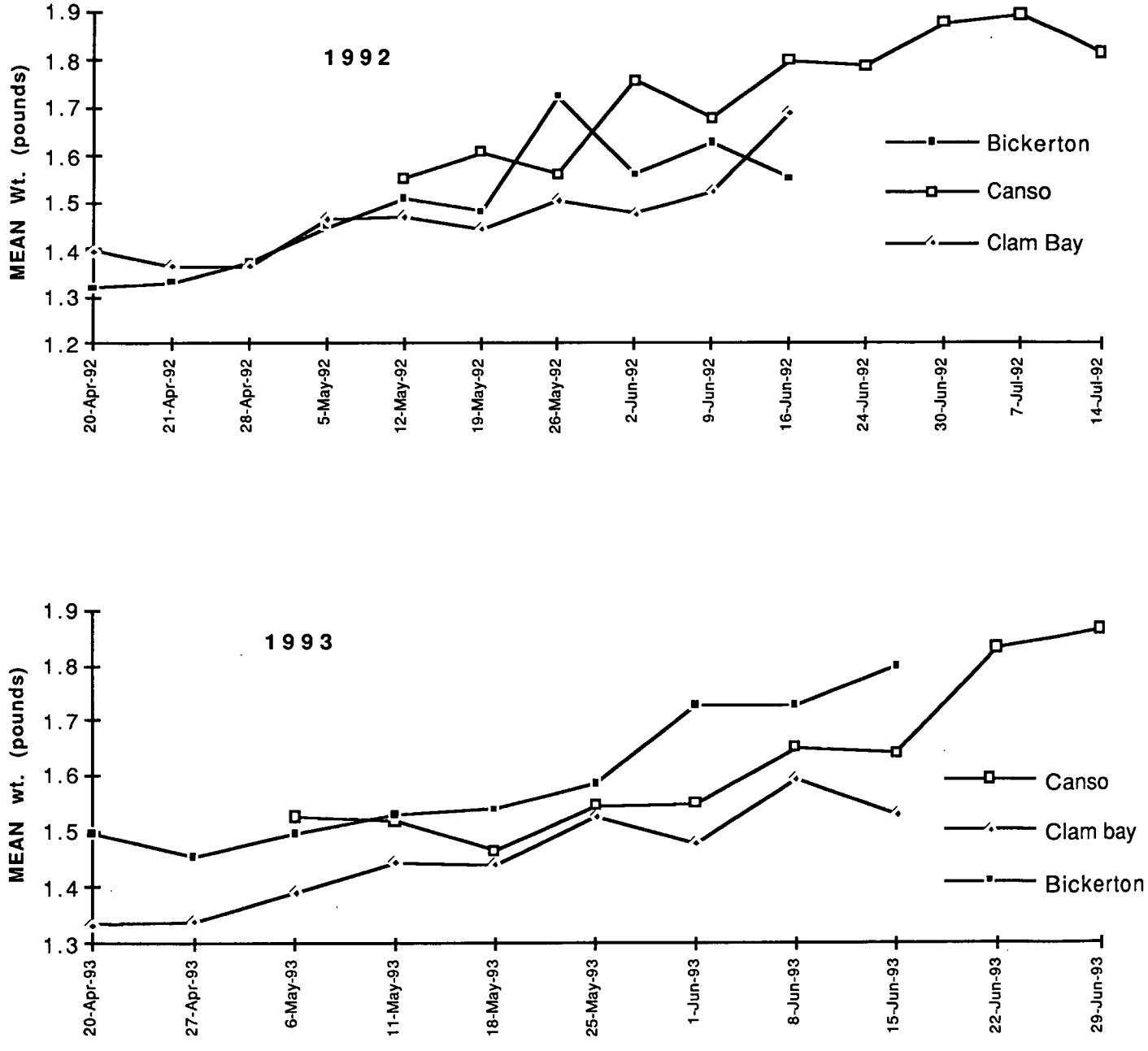


Figure 10. Weekly mean weights of market lobsters from catches of LFA 31A (Canso) 31B (Bickerton) and 32 (Clam Bay) fishers who report catch weight and numbers in logbooks.

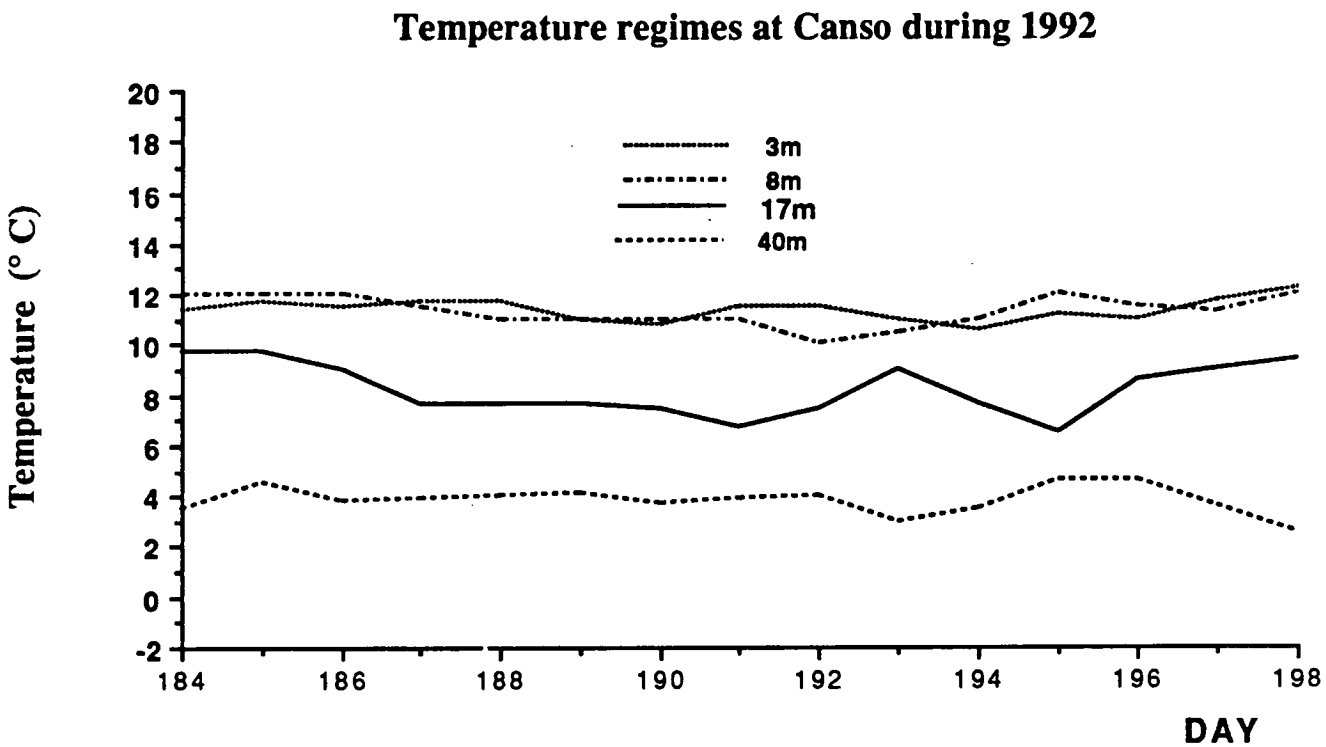


Figure 11. Temperature regimes at Canso during 1992 at various depths, including depths and locations were experimental cages were kept (3 and 17 meters).

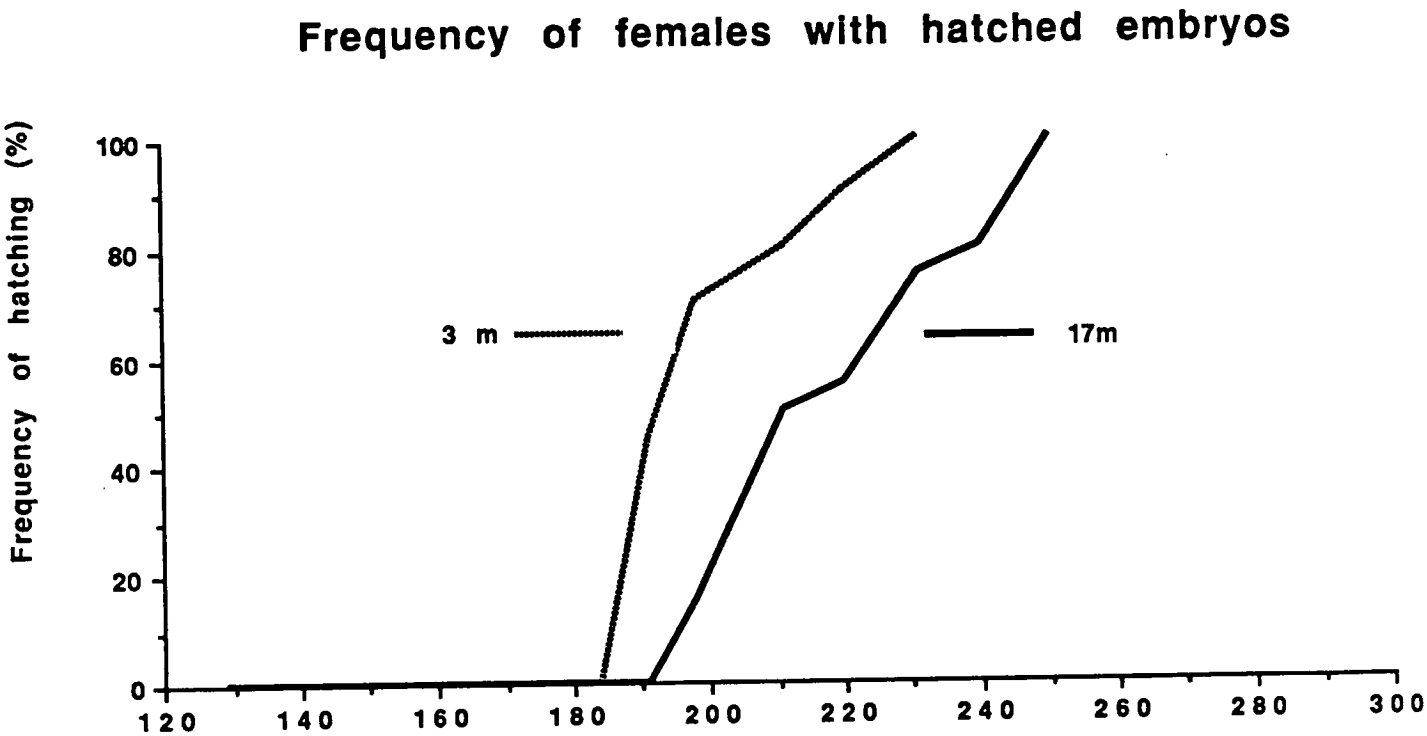


Figure 12. Frequency of females with hatched embryos at Canso in 1991, both experimental depths.

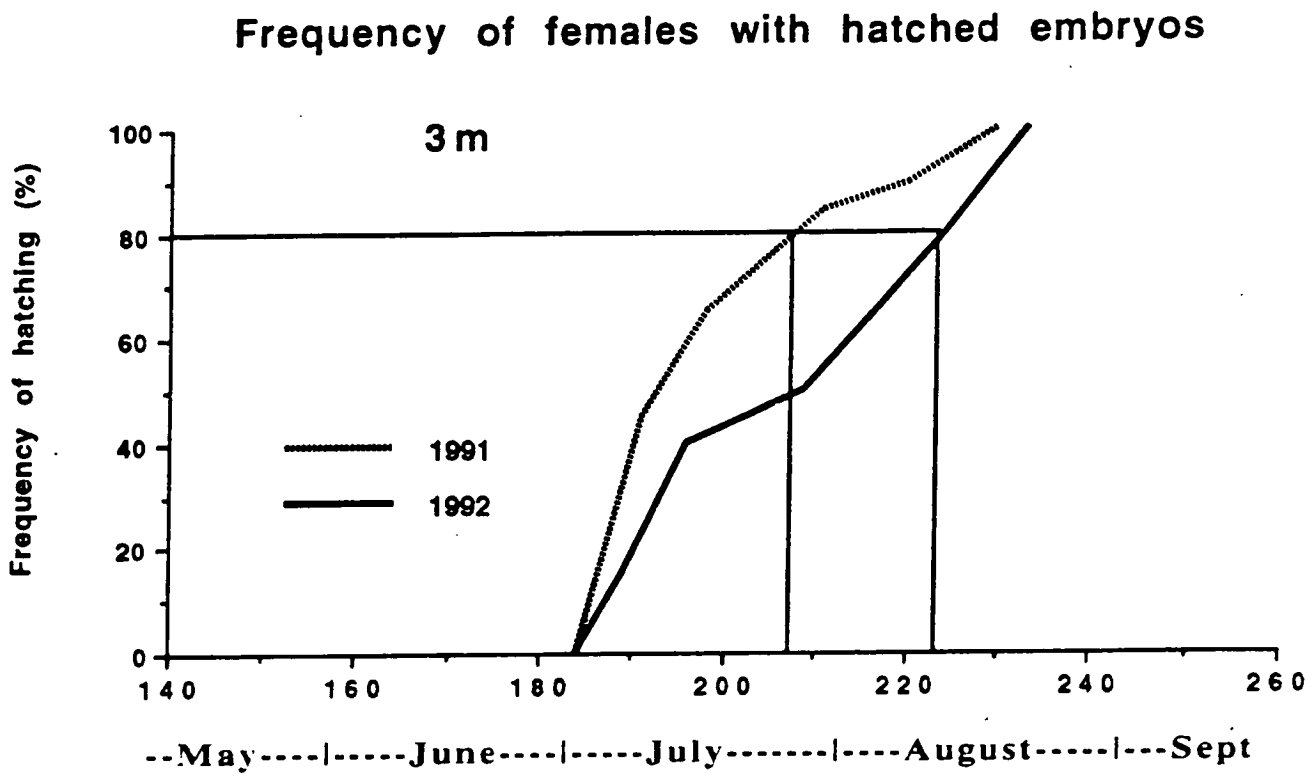


Figure 13. Frequency of females with hatched embryos at Canso, 3 meters,1991 and 1992.

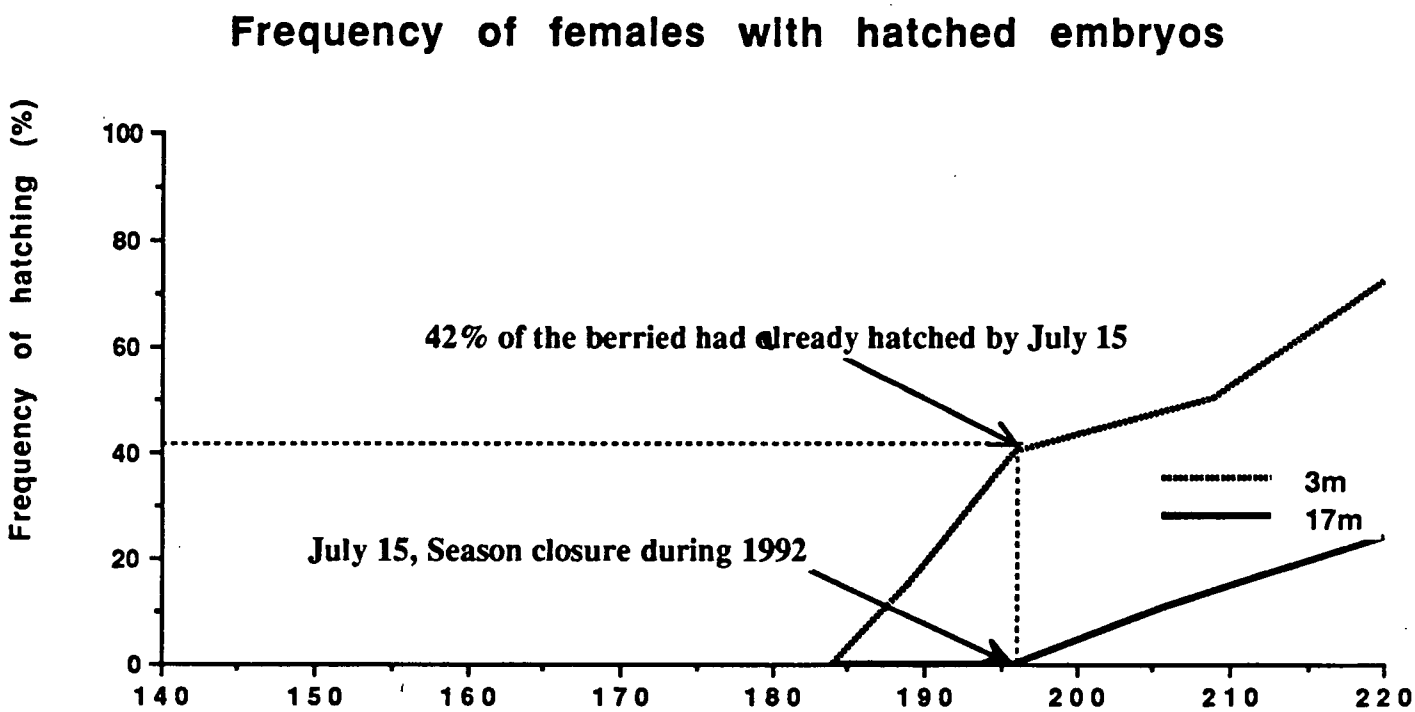


Figure 14. Frequency of females with hatched embryos at Canso in 1992, both experimental depths.