Dispersion of tagged lobsters (Homarus americanus)
in two areas of Northumberland Strait

by

Donald R. Maynard and Yvon Chiasson
Department of Fisheries and Oceans
Invertebrates Research Section
Marine Biology Research Centre
Université de Moncton
Moncton, NB
E1A 3E9

ABSTRACT

In 1982, totals of 4954 and 4919 lobsters (Homarus
americanus) were tagged with sphyrion spaghetti tags and released
at Beach Point and Egmont Bay, Prince Edward Island respectively.
Of these, 423 lobsters (9% of number tagged) in Beach Point and
613 (12%) in Egmont Bay were recovered. The rates of dispersion
of combined male and female tagged lobster was higher in Egmont
Bay than Beach Point, 1.1748 km^2/day and 0.5996 km^2/day, respec-
tively. The majority (99%) of the lobsters recaptured from the
Beach Point area remained on the Prince Edward Island coast
within the 20 fathom contour, while the lobsters recaptured that
were released from the Egmont Bay area, were found on both the
Prince Edward Island and New Brunswick sides of Northumberland
Strait.

RESUME

Des totaux respectifs de 4954 et 4919 homards (Homarus
americanus) ont été marqués (étiquette spagetti de type
"sphyrion") et relâchés dans les régions de Beach Point et de la
baie de Egmont (Ile du Prince Edouard), en 1982. Les retours ont
été de 423 homards (9%) et de 613 homards (12%) pour les régions
de Beach Point et de la baie de Egmont respectivement. La vites-
se de dispersion des homards mâles et femelles combinés a été
plus élevée dans la région de la baie de Egmont (1,1748 km2/jour)
comparativement à la région de Beach Point (0,5996 km2/jour). La
majorité des homards provenant de la Baie de Egmont ont été re-
capturés sur les côtes de l'Ile du Prince Edouard et du Nouveau-
Brunswick.

INTRODUCTION

Tagging studies in the Beach Point and Egmont Bay areas of
Northumberland Strait have investigated movements, growth and
survival (Wilder, 1963), movements (Campbell and Maynard, unpu-
blished data; Robinson, unpublished data) and growth at molt, of
lobsters (Homarus americanus) (Conan et al., 1982). A comprehen-
sive overview of the movement in Egmont Bay has been restricted,
as only legal size lobsters were tagged in previous studies
(Wilder, 1963; Campbell et al., 1983). Growth at molt was shown
to be significantly different for Beach Point and Egmont Bay
areas (Conan et al., 1982). However a comparison of the disper-
sion of all sizes of lobsters in these two areas has not been
completed.

This paper presents the preliminary results comparing the
dispersion of tagged lobsters over a two year period in each of
the above areas of Northumberland Strait.

MATERIALS AND METHODS

A total of 4954 lobsters in Beach Point and 4919 lobsters in Egmont Bay were caught with traps, tagged and released in July 1982 and late October 1982 respectively. The lobsters were tagged with an orange sphyrion spaghetti tag (Scarratt and Elson, 1965), and released immediately at the capture site. The LORAN-C coordinates of release sites and information on each tagged lobster were recorded.

The study was advertised using posters and the media, in the areas surrounding the tagging sites on Prince Edward Island, New Brunswick and Nova Scotia. The objective was to ensure that a high proportion of recaptured lobster tags were returned with information such as recapture location, depth, sex and carapace size. Observers were stationed on the wharves in the Beach Point and Egmont Bay areas to receive tags and information from fishermen as they landed their lobster catches.

The tagging and tag recovery data were entered and processed on a HP9845. Recapture sites were determined from recovery information and plotted on a map. The straight line distance from release to recapture site was calculated by: Distance = $60 \cdot \cos^{-1}$ [sin $(LAT_{re}) \cdot \sin (LAT_{re})$ + cos $(LAT_{re}) \cdot \cos (LAT_{rc})$ cos $(LNG_{rc} - LNG_{re})$], where re is the release site, rc is the recapture site, LAT is the latitude and LNG is the longitude.

Distances moved were tested for differences between the sexes of each area and the same sexes between each area with a Kruskal-Wallis test at $P = 0.05$.

The rate of dispersion of tagged lobsters was calculated by the mean square dispersion coefficient (km^2/day): (Saila and Flowers, 1968; Campbell, et al. 1983).

$$a^2 = \frac{1}{n} \left[\frac{r^2}{t} - \frac{(r \cos 0)^2}{t} \right]$$

where n= number of individual tag recoveries;
      r= apparent "straight line" distance traveled (km) from release to recapture point;
      t= time (days) from release to recapture.
All angles (0) are presented as deviations of true north.

RESULTS

There were 423 recoveries at Beach Point and 613 at Egmont Bay which represent 9% and 12%, respectively, of the numbers tagged. The tubing on which the tag number was printed would sometimes become detached from the filament leader and anchor,

leaving only the unnumbered tag on the lobster. Unnumbered tag recoveries from Beach Point and Egmont Bay were 59 and 11 respectively.

The locations of the tag recoveries, including the unnumbered tags are plotted on Figures 1 and 2.

The range of movement by sex and tagging site is summerized in (Table 1).

Comparison with a Kruskal-Wallis test showed that the distances moved by males and females are significantly different ($P \leq 0.05$) in Beach Point (Table 2) while in Egmont Bay there is no difference (Table 3). The distance moved for the same sex differ significantly ($P \leq 0.05$) between the two areas (Table 4a,b). The rates of dispersion, of combined males and females, are 0.5996 km^2/day and 1.1748 km^2/day for Beach Point and Egmont Bay respectively.

DISCUSSION AND CONCLUSION

Unnumbered tags recovered constituted 6% of the total tag returns and did not represent a large loss of information. Results of the statistical tests indicate that Beach Point male and female lobsters differ in distance moved, while in Egmont Bay the distance moved by males and females did not differ significantly. (Table 2, 3). Further comparison of the same sex from the two areas shows that the movement of lobsters in the two areas is significantly different (Table 4a, b).

Comparison of the dispersion between the two areas reveals that the lobsters from Beach Point do not disperse as far as those from Egmont Bay.

Figure 2 shows that in Egmont Bay the lobsters disperse coast to coast in the Northumberland Strait, traveling through depths of 10 to 15 fathoms. In Beach Point, the dispersion of 99% of the recaptured lobsters is restricted to the Prince Edward Island coast within the 20 fathom depth contour, (Figure 1). It is possible that the depth of the water may be a factor restricting the dispersion of lobsters in Beach Point. The absence of deep water in the Egmont Bay area could allow a greater dispersion of lobsters.

In conclusion, lobsters in the Egmont Bay area disperse over an area covering both the Prince Edward Island and New Brunswick sides of the Northumberland Strait. The lobsters in the Beach Point area disperse mainly along the Prince Edward Island coast. If future management strategy for the lobster fishery (e.g. carapace increase) includes sub-dividing the lobster districts 8 or 7B1 it should be taken into consideration that through natural

dispersion lobsters would cross a mid strait boundary in Western Northumberland Strait but not in Eastern Northumberland Strait.

ACKNOWLEDGEMENTS

BIBLIOGRAPHY

Campbell, A., S.E. Bellis, G.E. Fawkes, and C. Hastey. 1983. Computer programs for analysis of lobster (Homarus americanus) movements from tag release - recapture data. Can. Ms. Rep. Fish. Aquat. Sci. 1705: 22pp.

Conan, G.Y., D.G. Robinson, and D.R. Maynard. 1982. Growth at molt of lobsters in two areas of Northumberland Strait, Canada. ICES, Shellfish Committee, C.M. 1982/K:35.

Saila, S.B., and J.M. Flowers. 1968. Movements and behaviour of berried female lobsters displaced from offshore areas to Narrangansett Bay, Rhode Island. J. Cons. 31: 342 - 351.

Scarratt, D.J., and P.F. Elson. 1965. Preliminary trials of a tag for salmon and lobsters. J. Fish. Res. Board Can. 22: 421 - 423.

Wilder, D.G. 1963. Movements growth and survival of marked and tagged lobsters liberated in Egmont Bay, Prince Edward Island. J. Fish. Res. Board Can. 20: 305 - 318.

Table 1. Range of movement and percentage of lobsters recovered
          from the Egmont Bay and Beach Point studies.

Distances moved (km)	Egmont Bay, P.E.I.		Beach Point, P.E.I.	
	% of males	% of females	% of males	% of females
0 - 5	7.29	3.99	73.28	63.00
5.1 - 10	32.53	35.07	15.53	8.00
10.1 - 15	15.54	15.54	6.50	16.00
15.1 - 20	12.13	13.15	3.61	5.00
20.1 - 25	10.19	8.36	0.36	1.00
25.1 - 30	15.05	14.34	0	0
30.1 - 35	3.88	3.98	0.72	0
35.1+	3.39	5.57	0	7.00

Table 2 - Kurskal-Wallis test of distances moved of Beach Point
          male lobsters versus Beach Point female lobsters.

      Beach Point male lobsters   Beach Point female lobsters

Sample size 276   100
Sum (ranks) 49834.0   21042.0

                            H Statistic

Number of tied groups: 31
Correction factor D 0.97749
H 5.66893
Degrees of freedom 1
Alpha 0.01722

Table 3 - Kruskal-Wallis test of distances moved of Beach Point
          male lobsters versus Egmont Bay female lobsters.

      Beach Point male lobsters   Egmont Bay female lobsters

Sample size 195   253
Sum (ranks) 43142.0   57434.0

                            H Statistic

Number of tied groups: 81
Correction factor D 0.99931
H 0.21893
Degrees of freedom 1
Alpha 0.68083

Table 4a - Kruskal-Wallis test of distances moved of Beach Point
          male lobsters versus Egmont Bay male lobsters.

     Beach Point male lobsters   Egmont Bay male lobsters

Sample size 276   195
Sum (ranks) 43992.5   67163.5

                        H Statistic

Number of tied groups: 61
Correction factor D 0.99488
H 212.26539
Degrees of freedom 1
Alpha 0.0000

Table 4b - Kruskal-Wallis test of distances moved of Beach Point
          female lobsters versus Egmont Bay female lobsters.

     Beach Point female lobsters   Egmont Bay female lobsters

Sample size 100   253
Sum (ranks) 10365.5   52115.5

                        H Statistic

Number of tied groups: 66
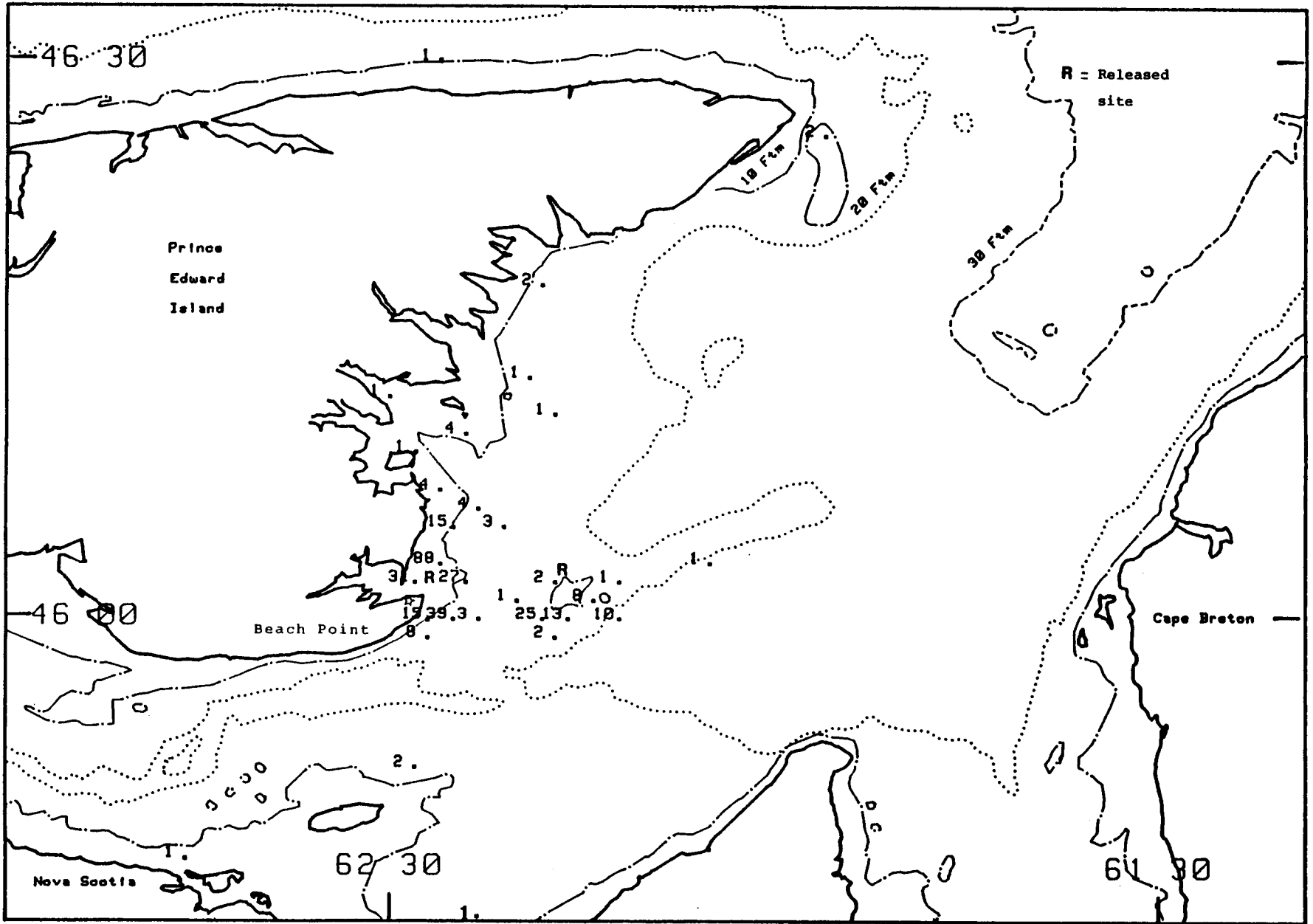Correction factor D 0.99910
H 72.14192
Degrees of freedom 1
Alpha 0.0000

Figure 1.

Recovery sites of lobsters released at Beach Point, 1982.

64 30 64 00

46 50

R=Released
site

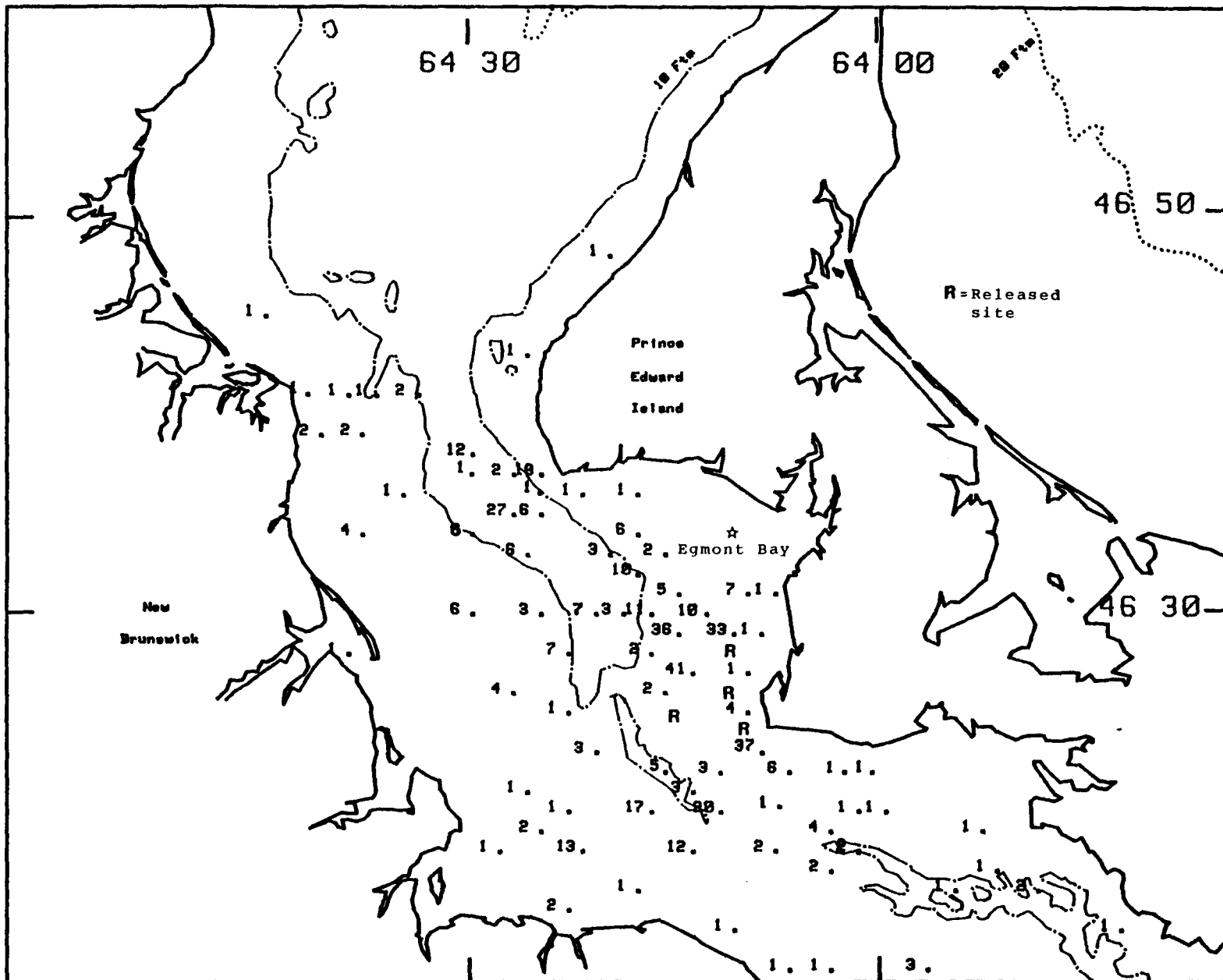Prince

Edward

Island

Egmont Bay

46 30

New
Brunswick

Figure 2.

Recovery sites of lobsters released at Egmont Bay, 1982.