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International Council for the
Exploration of the Sea

CM 1980/K:25
Shellfish Committee

SOME OBSERVATIONS ON THE FECUNDITY OF NORWAY LOBSTERS IN
SCOTTISH WATERS

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Digitalization sponsored
by Thünen-Institut

ABSTRACT

The fecundity of Nephrops norvegicus (L.) has been determined in four areas around Scotland: Clyde, west of Kintyre, Loch Torridon, and Moray Firth. Estimates of the number of newly spawned eggs attached to the pleopods were obtained for females caught in baited creels in each area.

In two areas, Clyde and west of Kintyre, a comparison was made between the fecundity of creel-caught and trawl-caught Nephrops. Results suggested that trawling causes 11-22% loss of eggs (Table 1).

In the Moray Firth in June 1979, a comparison between females with recently spawned eggs and others with eggs about to hatch suggested that 32-51% of eggs were lost during development, the proportion lost being greater in small Nephrops (Table 2).

Résumé

La fécondité de Nephrops norvegicus (L.) a été déterminée dans quatre régions à l'entour de l'Écosse: à l'ouest de Kintyre, la Clyde, le loch Torridon et le golfe de Moray. On a obtenu des évaluations du nombre d'oeufs nouvellement déposés, attachés aux pléopodes, pour des femelles prises dans des casiers amorcés dans chaque région.

Dans deux des régions, à l'ouest de Kintyre et la Clyde on a comparé la fécondité des Nephrops pris dans des casiers ou en chalut. Les résultats ont suggéré que la pêche au chalut occasionne des pertes d'oeufs de 11 à 22%. (Tableau No 1)

Dans le golfe de Moray, en juin 1979, une comparaison des femelles aux oeufs nouvellement déposés avec des autres aux oeufs sur le point d'éclore a suggéré que de 32 à 51% des oeufs ont été perdus au cours de l'évolution le pourcentage d'oeufs perdus étant plus élevé chez les petits Nephrops. (Tableau No 2)

INTRODUCTION

In previous studies, the fecundity of Nephrops has been estimated by counting the oocytes in the mature ovary (Thomas, 1964; Fountaine and Warluzel, 1969), by counting newly spawned eggs attached to the pleopods of females caught by trawl (Farmer, 1974) or by both these methods (Figueiredo and Nunes, 1965; Eiriksson, 1970; Morizur, 1979). It is clear from these studies that the number of eggs actually spawned (ie attached to the pleopods) is generally less than the number of oocytes in the mature ovary. As pointed out by Farmer (1974) and others some eggs may not be released while others may fail to adhere to the pleopods. Furthermore, eggs may be lost owing to abrasion in the net. It is also evident that there is a steady loss of eggs during development so that by the time of hatching only a fraction of the original number of eggs are still attached to the pleopods (Figueiredo and Nunes, 1965; Morizur, 1979).

In this paper, we present some observations on the fecundity of Nephrops from four areas around Scotland, particular attention being given to estimation of the proportion of eggs lost owing to trawling and during incubation.

METHODS

Samples of ovigerous female Nephrops were obtained from the Clyde, west of Kintyre, Loch Torridon and the Moray Firth (Table 1). Most of the females were caught in baited creels but in two areas trawl caught animals were obtained at the same time for comparison. The duration of the trawl tows varied from 1-2 hours. Sampling generally took place in August-September, soon after spawning, with the green eggs on the pleopods at stage A¹. Samples from the Moray Firth were obtained in June 1979, when it was noticed that females with recently spawned eggs occurred in the same catches as females with brown eggs ready to hatch (Stage E).

All samples were treated in a similar manner. After measuring the carapace length the whole abdomen was removed from each female and preserved in 5% formal saline. The fixed eggs were removed from the pleopods, washed and then counted using an automatic fish egg counter (Parrish *et al.*, 1960). In this, the eggs are constrained to flow past a light beam photocell detector. The accuracy of the counter was gauged from repeat runs on the same sample and by manual counts of some samples. The maximum error in the measurements was found to be about 2%.

RESULTS AND DISCUSSION

The relationship between the number of eggs and the carapace length of the females from each area are given in Figures 1 and 2. In each case a linear regression appeared to model the data adequately. It is evident from Figure 1 that trawl-caught females have fewer eggs on average than creel-caught females from the same area, suggesting that eggs may be lost in the trawl, presumably owing to abrasion. The proportion of eggs lost ranged from 11 to 16% in the Clyde and from 14 to 22% in samples from west of Kintyre. Clearly fecundity in Nephrops is likely to be seriously underestimated if trawl-caught females are used.

¹ Egg stages given according to the classification of Figueiredo and Barraca (1963).

Figure 2b shows that recently spawned females carry significantly more eggs than those close to hatching. We should point out that in Figure 2b we are comparing females at the end of one spawning period (1978-79) with other females at the beginning of the next spawning (1979-80). The normal incubation period lasts for 8-9 months in Scottish waters, and any overlap between successive spawning seasons arises simply because some females spawn much earlier than others. Thus, not only are we comparing different spawning groups but we are probably comparing late spawners from one year with early spawners in the next. It is not known whether the fecundity of early spawners differs from later ones. Certainly, there was no indication of any difference in fecundity in two years' data from Loch Torridon. On this basis, we have assumed that the data in Figure 2b arises from the loss of eggs during development rather than from differences in fecundity in successive years. The data suggest that 32-15% of eggs were lost during development. The proportion lost appears to be greater in small Nephrops. These results are in reasonable agreement with those of Morizur (1979). He found that 45-50% of eggs were lost over the whole incubation period in the females from the Bay of Biscay. A much higher egg loss of about 75% was reported by Figueiredo and Nunes (1965) for Portuguese waters. To explain these different results Morizur (1979) put forward the idea that egg loss may be caused by predation. It may be significant that ovigerous females are more abundant in trawl catches off Portugal than they are in Scottish waters (Figueiredo and Thomas, 1967). This suggests that females off Portugal spend rather more time out of their burrows than their Scottish counterparts and the risk of predation is quite likely to be greater.

Variations in fecundity between areas are illustrated in Figure 3. Clyde females appear to carry fewer eggs than elsewhere, as Thomas (1964) also found from observations on the number of oocytes in the ovaries.

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TABLE 1 Details of samples

Area	Position	Date	Fishing Method	No of Observation
Clyde		Aug 77	Creel	33
			Trawl	28
West of Kintyre		Aug 77	Creel	69
			Trawl	45
Loch Torridon		Sept 77 and 78	Creel	61
Moray Firth		June 79	Creel	35 (20 stage E) (15 stage A)

TABLE 2 Number of eggs recently spawned and about to hatch on the pleopods of different sized females caught in baited creels in the Moray Firth during June 1979

Carapace length (mm)	No of Eggs		Egg loss Absolute No	%
	Recently spawned (Stage A)	About to hatch (Stage E)		
30	1320	640	680	51.5
35	1870	1060	810	43.3
40	2400	1490	910	37.9
45	2950	1910	1040	35.2
50	3490	2340	1150	33.0
55	4020	2760	1260	31.3

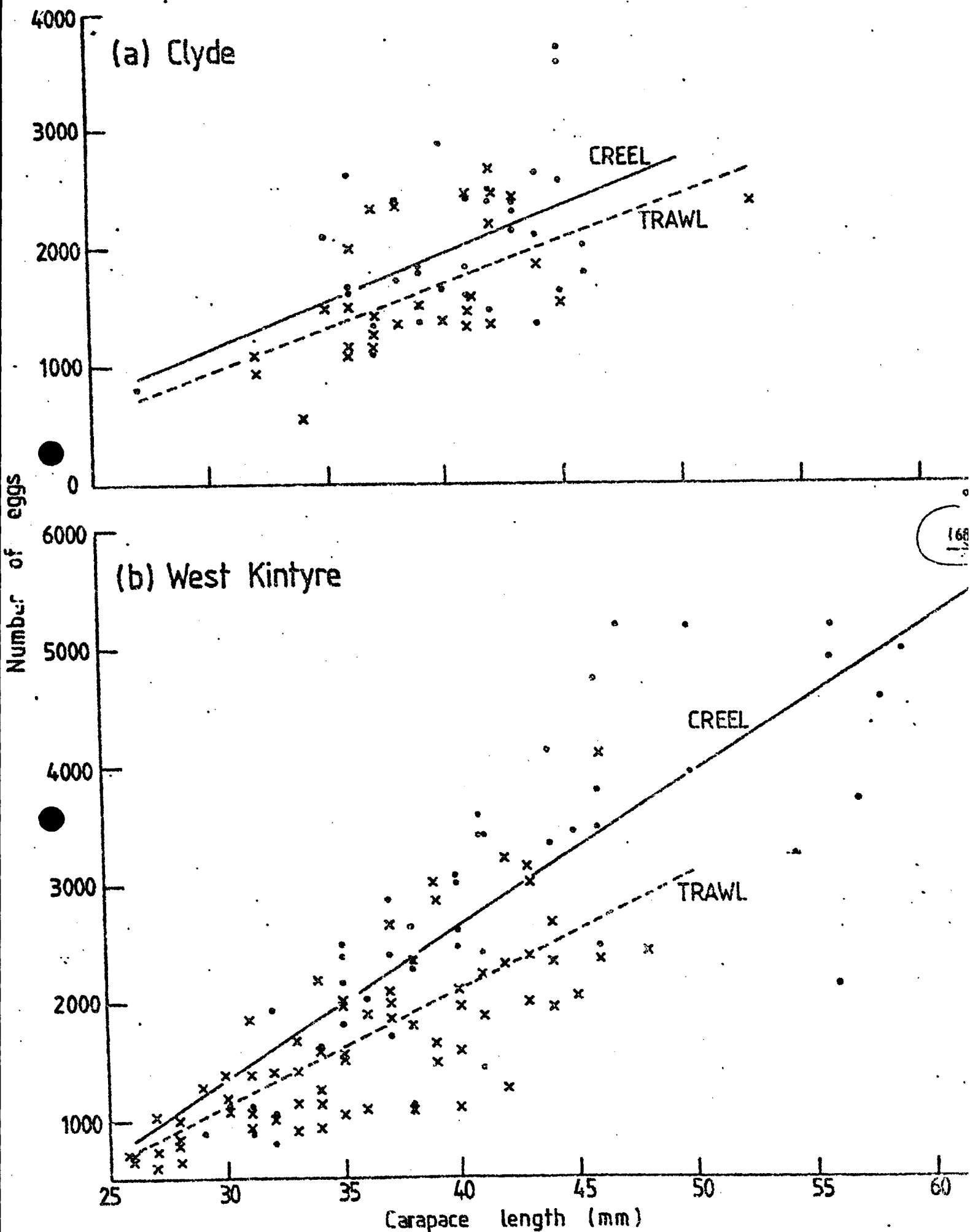
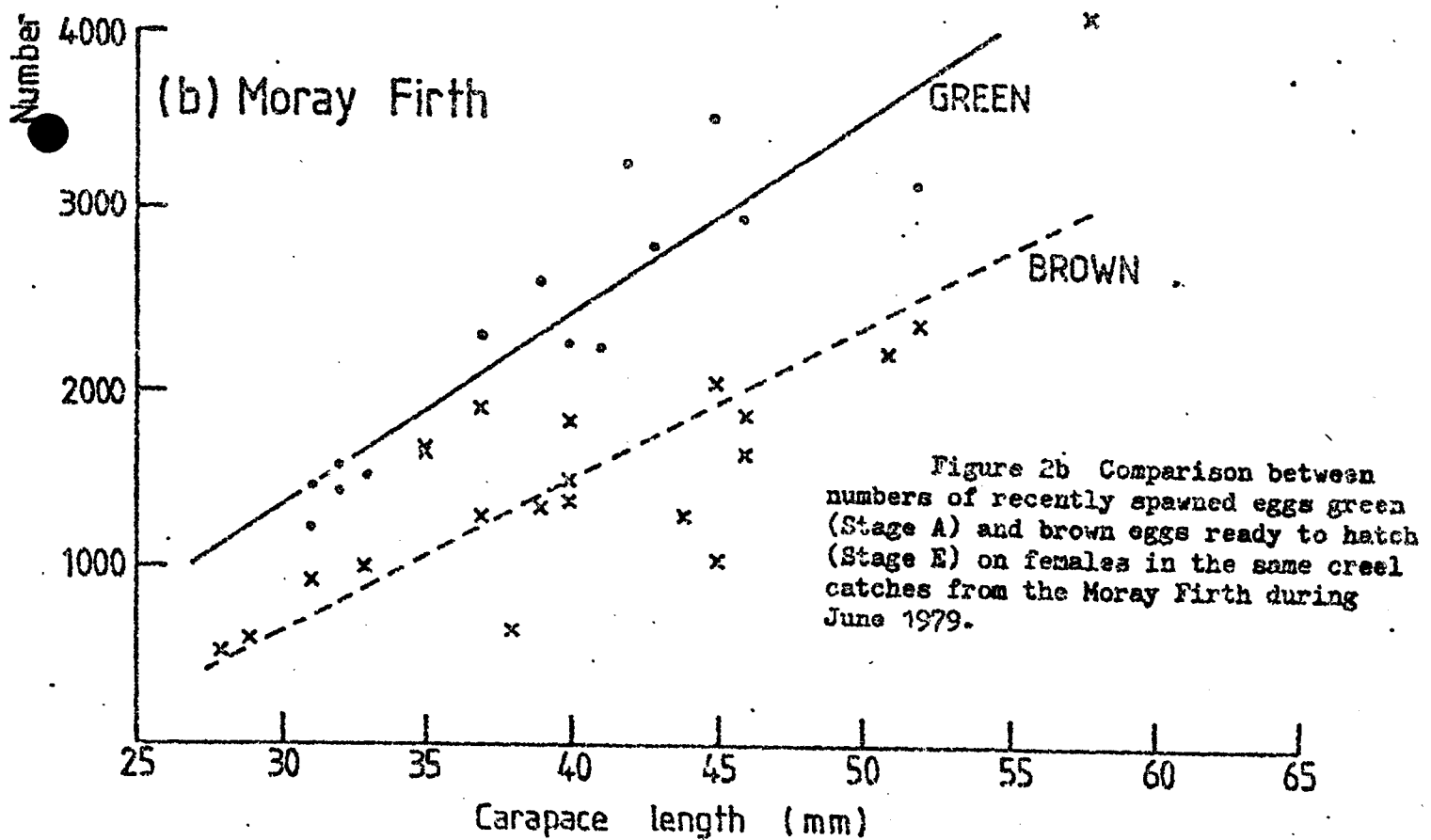
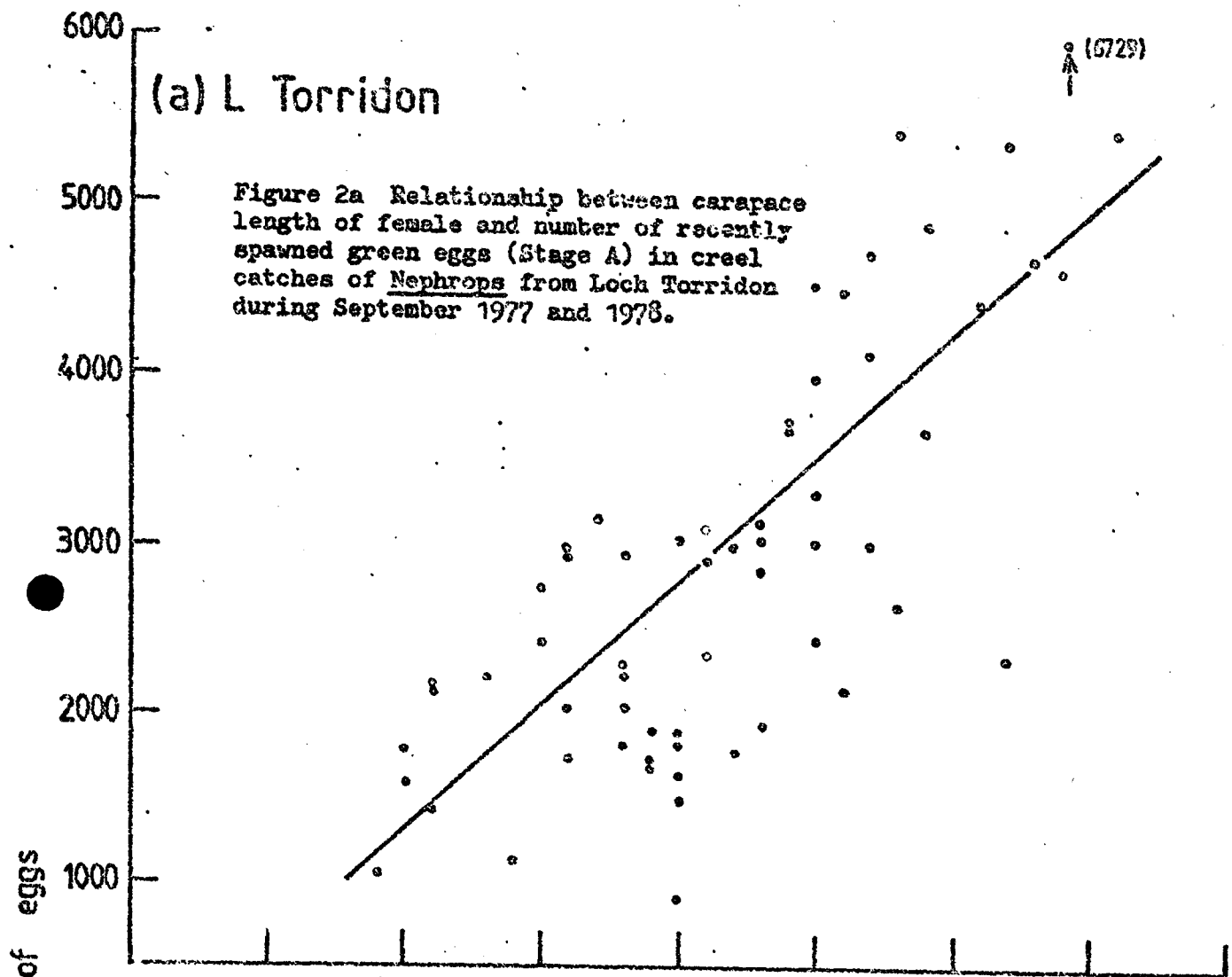


Figure 1 Relationship between carapace length of female and number of recently spawned green eggs (Stage A) in creel and trawl catches of *Nephrops* from the Clyde and West of Kintyre during August 1977.



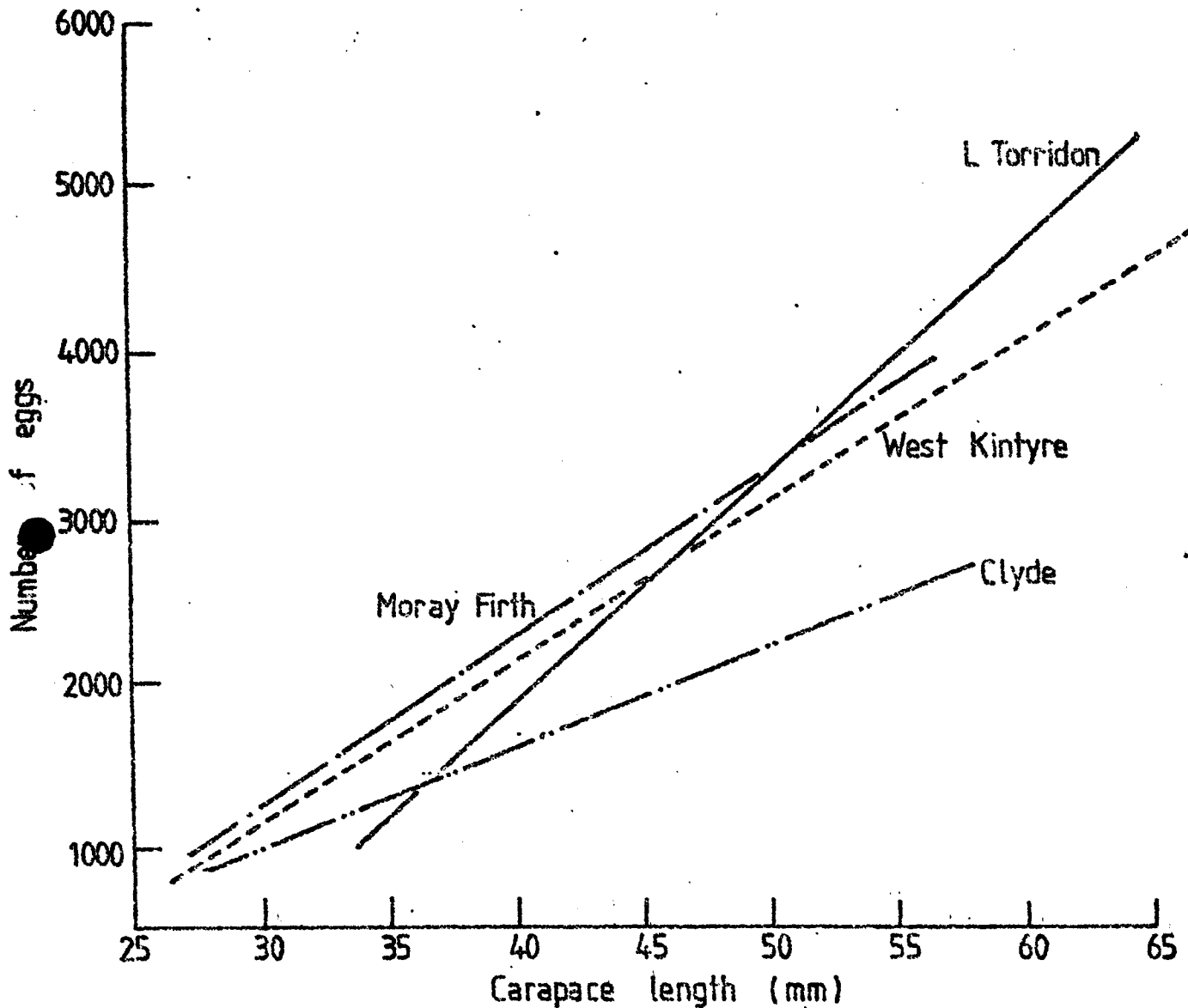


Figure 3 Comparison between fecundity of recently spawned female *Nephrops* caught by creels in Clyde (- . . - . ., equation of fitted regression: $N = 81.25 L - 1261.0$), West of Kintyre (- - - -, $N = 129.66 L - 2520.8$), Moray Firth (- . - ., $N = 108.11 L - 1918.9$) and Loch Torridon (————, $N = 148.15 L - 3888.9$). In the above equations N = number of eggs and L = carapace length (mm).