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THE FECUNDITY OF ENGLISH CHANNEL PLAICE

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(Text-figs. 1–2)

This paper is the fourth in a series dealing with the fecundity of flatfish (Bagenal 1957*a*, *b*, 1958), and is concerned with the egg numbers in ripening female plaice *Pleuronectes platessa* L. caught in the English Channel.

On 27 November 1957, eighty-five plaice with maturing ovaries were caught in Rye Bay, Sussex; on 1 December, eight similar fish were caught in Lyme Bay, and during December sixty-four locally caught female plaice were brought in to the Plymouth Laboratory. The dates of the collections were chosen because in January 1957 I had found that a small proportion of the Plymouth plaice were spent. All the fish caught in November and December were at a suitable stage for fecundity estimation: that is, the eggs were well developed though none had begun to turn translucent.

The treatment of the fish was similar to that already described (Bagenal, 1957*a*) for long rough dabs, except that the Rye Bay and Lyme Bay plaice were weighed on a spring balance to the nearest quarter ounce and these weights were subsequently transformed to grammes; the Plymouth fish were weighed to the nearest 5 g. The paper on long rough dabs should be consulted for details of the laboratory methods of preservation, the estimation of the fecundity and the statistical analysis of the data.

I would like to thank Captain C. A. Hoodless and the crew of R.V. 'Sarsia' for their help at sea and Mr A. D. Mattacola and the Plymouth Laboratory staff for their help on land and also Miss Sheila Morris who counted the eggs.

RESULTS

The data are summarized in Tables 1 and 2 along with the fecundity data for the Clyde (from Bagenal, 1958) and for the Southern Bight of the North Sea (from Simpson, 1951). The relations of fish length and fecundity are shown in Figs. 1 and 2. The relations of age and fecundity are given in Table 3.

Plymouth

The fecundity of the Plymouth female plaice is the same as that of the Clyde fish; the difference between the two values for the expected fecundity ($\hat{F}$) of a 37 cm plaice could easily be due to random subsampling errors.

Simpson (1957) has found the fecundity of plaice from the Irish Sea to be similar to Clyde and Plymouth fish. The nearest locality from which he determined the fecundity was Cardigan Bay. It would be interesting to know the fecundity of the plaice that spawn off St Ives.

Plaice seem to be rare off Plymouth until mid-December at which time they begin to appear in increasing numbers prior to spawning in early January. We do not know where they come from.

TABLE 1. SUMMARY OF PLAICE FECUNDITY DATA

	Clyde	Plymouth	Lyme Bay	Rye Bay	North Sea
Number of fish	61	64	8	85	223
Mean length (cm)	38·33	42·47	37·57	38·35	37·13
Mean weight (g.)	585·8	758·8	688·1	518·8	518·4
Mean age	5·2	6·3	5·0	6·4	7·3
Mean fecundity	158,845	212,769	255,888	139,127	84,928
$\hat{W}$ for 37 cm	526·4	516·4	661·4	470·97	517·27
$\hat{F}$ for 37 cm	137,266	137,470	244,311	127,093	84,019

TABLE 2. THE MEAN FECUNDITY (IN THOUSANDS) OF EACH 3 CM LENGTH GROUP OF ENGLISH CHANNEL FEMALE PLAICE

Length group	Plymouth		Lyme Bay		Rye Bay	
	Number	Fecundity	Number	Fecundity	Number	Fecundity
30	—	—	—	—	6	70·21
33	5	125·06	4	172·80	23	89·62
36	8	113·88	2	131·20	16	117·82
39	10	129·62	—	—	14	125·83
42	13	207·71	1	324·95	12	186·60
45	14	247·20	—	—	6	173·25
48	8	266·62	—	—	2	250·60
51	3	313·82	—	—	2	268·53
54	2	419·85	—	—	1	230·35
57	—	—	1	768·55	1	264·15
60	1	709·55	—	—	—	—
63	—	—	—	—	2	442·63

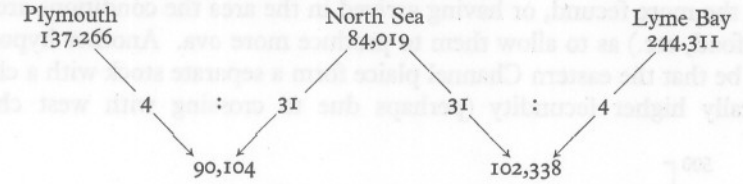
Rye Bay

The fecundity of the eighty-five Rye Bay plaice is intermediate between that of Plymouth and North Sea fish. From marking experiments in Rye Bay (Wimpenny, 1953) we know that the plaice migrate both into the North Sea and to the west. Wimpenny's results are summarized below.

Released	No.	Local returns	Eastward movement	Westward movement
January	300	56	31	4
April	?	87	49+	—
July	No tendency to move to the westward			
October	Suggested that what little movement there had been was in a westerly direction			

Three of the four westerly moving plaice were caught off Brixham (West end of Lyme Bay) and one from off South Ireland. Mixtures of west channel and

North Sea plaice in the ratio of 4:31 should produce a mean fecundity for 37 cm fish of between 90 and 102 thousand eggs.



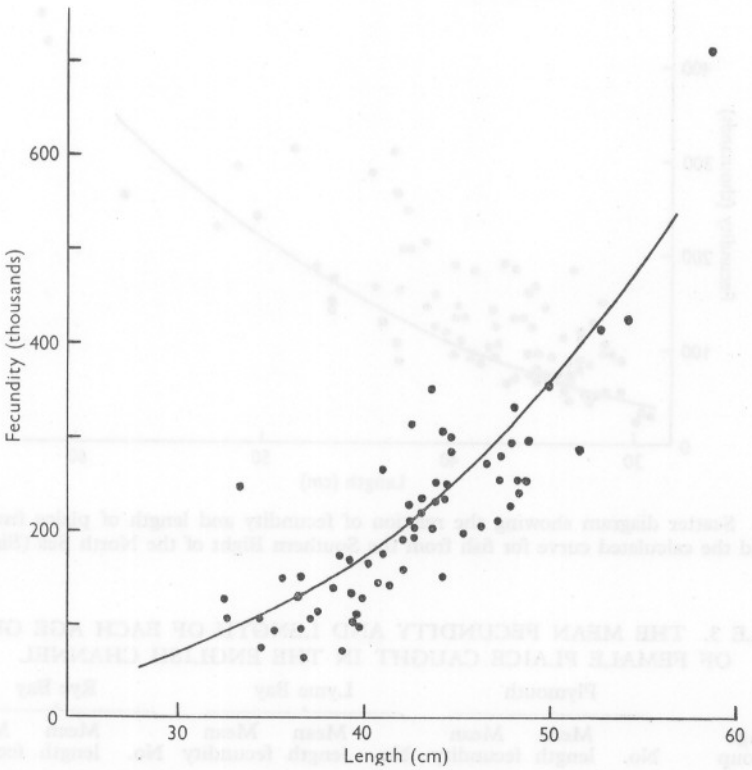


Fig. 1. Scatter diagram showing the relation of fecundity and length of plaice from Plymouth and the calculated curve for Clyde fish (Bagenal, 1958).

The actual fecundity of 127 thousand eggs for 37 cm plaice might be the average of fish mainly derived from the North Sea, but with a mixture of more plaice from the west than marking experiments suggest do exist in the area: over one-third of the population would have to be of western origin. Moreover, the scatter diagram (Fig. 2) shows that the general level of fecundity for the Rye Bay population as a whole is above that of the North Sea.

Simpson (1959) discusses the spawning of North Sea plaice and believes that 'the spawning area in the eastern English Channel is not an independent

spawning area, but is, in effect, a spill-over from the main Southern Bight area'. If this is true either the spill-over is not of typical North Sea fish but selects the more fecund, or having arrived in the area the conditions are such (more food, etc.) as to allow them to produce more ova. Another hypothesis would be that the eastern Channel plaice form a separate stock with a characteristically higher fecundity (perhaps due to crossing with west channel

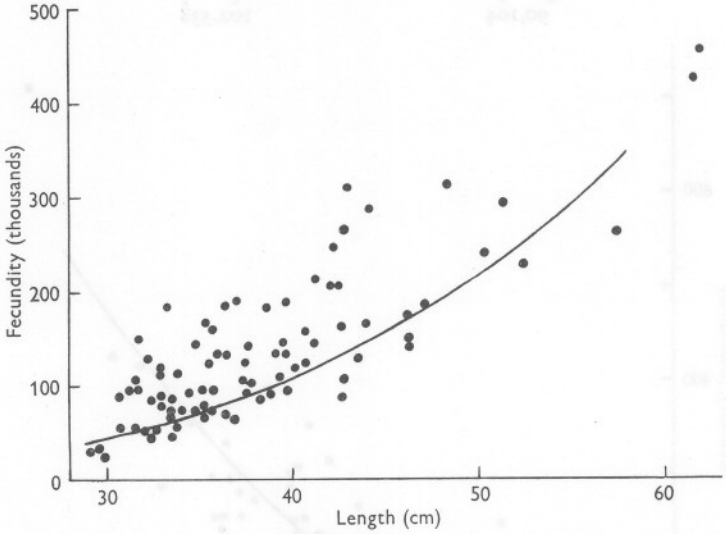


Fig. 2. Scatter diagram showing the relation of fecundity and length of plaice from Rye Bay and the calculated curve for fish from the Southern Bight of the North Sea (Simpson, 1951).

TABLE 3. THE MEAN FECUNDITY AND LENGTH OF EACH AGE GROUP OF FEMALE PLAICE CAUGHT IN THE ENGLISH CHANNEL

	Plymouth			Lyme Bay			Rye Bay		
Age group	No.	Mean length	Mean fecundity	No.	Mean length	Mean fecundity	No.	Mean length	Mean fecundity
II	—	—	—	—	—	—	4	31·3	96·4
III	4	36·2	162·1	2	32·7	242·6	10	32·9	77·6
IV	4	38·6	164·9	1	36·2	158·8	9	34·9	124·3
V	15	40·6	172·8	3	33·1	103·2	16	34·6	107·8
VI	11	42·3	198·6	1	41·8	325·0	13	37·6	124·0
VII	12	41·5	183·6	—	—	—	9	37·0	122·9
VIII	6	46·9	298·5	—	—	—	4	42·7	221·1
IX	6	46·6	239·3	1	57·9	768·6	8	43·3	139·3
X	2	53·4	419·9	—	—	—	3	43·7	154·0
XI	—	—	—	—	—	—	2	44·5	206·0
XII	—	—	—	—	—	—	2	46·7	277·1
XIII	—	—	—	—	—	—	—	—	—
XIV	—	—	—	—	—	—	1	52·5	230·4
XV	—	—	—	—	—	—	1	57·5	264·2
XVI	—	—	—	—	—	—	1	51·3	296·6
XVII	—	—	—	—	—	—	1	61·7	427·9

fish). This would involve the return of those adult fish that migrate into the North Sea as well as the return of the young that have drifted there as eggs and larvae The return of young to the exact breeding place of their parents is well known in salmonids and birds.

The growth rate of eighty-five Rye Bay plaice as shown in Table 3 is comparable to that given by Wimpenny (1947) after allowance is made for the time of year of the collections. The rate of growth is faster than that of North Sea plaice, and this is similar to the situation at Flamborough.

It is perhaps significant that the smaller areas such as Flamborough and Rye Bay that are out-lyers of the main North Sea plaice grounds carry stocks with higher fecundities, and faster growth rates.

Lyme Bay

The eight Lyme Bay plaice have a high mean fecundity but this is to some extent increased by one fish of 58 cm in length which was exceptionally fecund.

Four hours fishing off Brighton, and some 12 h trawling in Poole Bay did not yield any plaice and the eight females from Lyme Bay were caught in over 4 h fishing.

In the middle region of the Channel therefore plaice are very scarce in late November, and even at Plymouth they do not appear to become plentiful until mid-December. It is not possible at this stage to confirm an inverse relation between fecundity and population density, because of the complications imposed by migration. Nor is a relation between fecundity and condition immediately apparent. This is shown by the North Sea plaice which were in better condition than those in Rye Bay (a 37 cm fish has a heavier expected weight) but had a lower fecundity.

SUMMARY

The plaice off Plymouth are shown to have a level of fecundity comparable to the Irish Sea and Clyde. The plaice in Rye Bay have a fecundity intermediate between that of the Clyde–Irish Sea–Plymouth fish, and the North Sea plaice, but this is apparently not produced by a mixing of the two populations, either the environment favours a high fecundity, or the Eastern Channel plaice form a separate stock.

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