FLUCTUATIONS IN OYSTER PRODUCTION IN THE FAL ESTUARY

By J. H. Orton, D.Sc.

Professor of Zoology, Liverpool University

Introduction

In the course of studies during the last five years on the breeding and spat-fall of oysters (*Ostrea edulis*) on the producing grounds, Blackwater and Roach Rivers, in the Thames Estuary, good spat-falls have been observed. In 1935 an exceptionally good fall occurred on these grounds at a period when adult stocks of oysters were at a very low ebb. Good spat-falls have also occurred since that time. It was therefore considered worth while to investigate whether comparatively good spat-falls had occurred also in the Fal Estuary and at the same time compare the existing conditions with those found in surveys in 1924 and 1926 (Orton, 1927 *a* and *b*). The Fal Estuary beds may be regarded as at least second in national importance to the Thames Estuary beds for the production of oysters. Moreover, as suggestions have been made that the oyster pest, the American slipper limpet, *Crepidula fornicata*, might become introduced and establish itself on the Fal beds, it was desirable to find out whether *Crepidula* had yet been found on the oyster grounds.

By the courtesy of the Truro Town Clerk, Mr L. J. Carlyon, and the River Committee, permission was given for the desired survey, which was carried out on February 23 1939. The expenses of the research were defrayed from a grant from the Durning-Lawrence Bequest, Liverpool University; acknowledgement is gladly tendered.

Survey of the Beds

On the day of the survey only ten boats were at work. Most of the boats were visited in turn and their dredge-hauls scrutinized and recorded. The bailiff, Mr Tyache, reported that recently about 12 boats per day had been working. From figures of the daily catches of five sailing boats from February 24 to March 3 (kindly supplied along with other valuable assistance by the bailiff, Mr Tyache), the average daily catch per boat each using two dredges was 133 oysters of legally takeable size, i.e. with minimum span in any direction of $2\frac{5}{8}$ in. The daily catches ranged from 100 to 207. The price of these oysters at the time was very low, namely about 4*s*. 6*d*. per hundred. In the same period the average daily catch per man per rowing boat (haul on tow) was 99 oysters, the daily catches ranging from 79 to 123.

The state of the beds can be closely estimated from these figures of the daily catches and the detailed report on the examination of the dredge-hauls given in Table I.

TABLE I. ANALYSIS OF DREDGE-HAULS FOR OYSTERS, TRURO GROUNDS, FAL ESTUARY, FEBRUARY 23 1939

Ten boats seen at work. Price of oysters 4*s.* 6*d.* per 100

		Small oysters		Large oysters	
		About 1 in.	1–2½ in.	2⅝ in. and over	Remarks
A. River above Turnaware Bar: rowing boats only					
Haul 1. Boathouse	Living	2	3	0	None of dead bored
Hauls made in absence:					
Haul 2	Living	36	10	0	None bored
	From 9.30 to 10.45 only 7 large caught				
Haul 3. Clenhalls Flat	Living	14	11	1	2 *Carcinus* with *Sacculina*
Hauls at least 3:					
Totals	Living	52	24	1	
Average living per haul		17·3	8	0·3	Culch fairly clean and abundant
		25·3			
B. Truro Lake. Turnaware Bar: rowing boat only					
1	Living	17	5	2	Culch very dirty
C. Truro Lake: sailing boats. North and middle of East Bank: sailing boat, good breeze					
2, 3	Living	13	1	12	5 one inch dead, none bored
4, 5	,,	0	4	4	
6, 7	,,	30	2	19	Struck a bed inshore
8, 9	,,	20	2	6	6 spat on a stipes of *Laminaria*
	One shell found February 22 carrying three 1938 spat about 1 in. Culch abundant but very dirty				
Parsons Bank: sailing boat, wind slight, one dredge					
10	Living	4	0	0	Good bag of culch
11	,,	3	0	4	,,
	One shell found February 22 bearing seven 1938 spat about 1 in. Culch abundant, but very dirty				
Mylor Bank to Penarrow: sailing boat, fair breeze					
12	Living	4	1	5	Culch old and heavily overgrown with sponges and *Lithothamnion*. 2 pairs of *Archidoris* in copula; clump of *Buccinum* spawn
13	,,	0	0	5	
14	,,	2	0	0	
15	,,	0	0	1	
16	,,	0	0	2	
	Note. No dumps seen in any hauls on any grounds				
Sums for 15 hauls		76	10	58	
Averages per haul		5·0	0·7	3·9	Approximate catch per man per day = 133 legal oysters
Average total per haul			9·6		

The river beds above Turnaware Bar, Table IA, are fairly well stocked with small oysters, the average haul working out at about 17·3 one year old and 8·0 two or more year old small. These beds, however, at the end of the 1938–9 season carried very few large (legal) oysters, only one large oyster being taken in three hauls. It is clear that there had been reasonable spat-falls in 1937 and 1938, but there were few survivors from previous years.

On Turnaware Bar (Table IB) a good supply of 1938 young and a few of previous years occurred; these were similar in amount to those found in the river.

On the banks (Table IC) the supply of small oysters is very poor, not more than four to six per haul being taken in the average haul. Hauls 2, 3, 6 and 7 on the East Bank are probably exceptional, as they were taken from a small patch of ground which could only be worked satisfactorily under the favourable conditions of tide and wind existing at the time. If, therefore, these hauls be excluded the average catch per haul on the banks is 3 one year old, less than 1 more than one year old small, and 2·4 large, with a total of 6·1 oysters per haul. When the presumed exceptional hauls are included the average rises to 5·1 one year old, 0·7 more than one year old small and 3·9 large, giving a total of 9·7 oysters per haul. Such a high average is seen to be improbable when a comparison is made with those results of extensive dredging in 1924 and 1926 given in the reports for those years. The comparison is given in Table II.

TABLE II. COMPARATIVE STATE OF THE BEDS ON THE BANKS IN 1924, 1926 AND 1939

As indicated by dredge-hauls in sailing boats only

Date	No. of hauls	Small per haul	Large per haul	All oysters per haul	Size of ring	Daily catch of large per man
Nov. 1924	237	6·4	4·2	10·6	$2\frac{1}{2}$	300–325
Dec. 1926	387	2·8	1·3	4·1	$2\frac{5}{8}$	About 100
Feb. 1939	11	3·7	2·4	6·1	$2\frac{5}{8}$	About 133

The results from the small number of dredge-hauls in 1939 in comparison with those for 1924 and 1926 can only be taken as indicative of the conditions on the beds at that time. Since in 1926 a man's daily catch was about 100 with an average of 1·3 oysters per haul, it is probable that in 1939 when the average catch was about 133 the average number of large per haul would be $\frac{133}{100} \times 1{\cdot}3$, i.e. about 1·7. It is reasonable to infer that the dredging on February 23 1939 was on the whole unusually good and this conclusion is supported by the fact that the sailing boat hauls were taken near the time of low water on a fair spring tide with mostly a good breeze. The figure for the average of small and large oysters per haul may be concluded to be rather higher than would be given by a large number of hauls in variable weather.

Bearing this in mind it is possible to compare the state of the grounds in the years 1924, 1926 and 1939.

The stocks on the beds in 1939 were rather better than in the slump period in 1926. With the ring at $2\frac{5}{8}$ in. 4·1 oysters per haul were taken in 1926 and rather more in 1939. In November 1924 when the beds were in a more flourishing state the average number of oysters per haul was 10·6, and 4·2 oysters per haul were legal with the ring at $2\frac{1}{2}$ in.

Discussion

Although the beds are a little better than in 1926, the state must be regarded as unsatisfactory. With the favourable weather in recent years for oyster spat-falls the beds on the banks might be expected to show a recovery towards the condition in 1924. The river beds are probably stocked with more young oysters than were on the banks in 1924, and may be considered to be in a fairly satisfactory state. Too few hauls were taken on Turnaware Bar to determine the stock accurately, but the indications are that the stocks of young are very much less than in 1924, when an average of 56·4 young per dredge-haul were taken (Orton, 1927*a*, p. 31). As Turnaware Bar is a settling ground for spat, heavier stocks might reasonably be expected.

Conclusions

The poverty of the grounds at Turnaware and on the banks in comparison with the reasonable stocks of young in the river is correlated with the presence of clean culch in the river and dirty culch on the banks. In the view of the writer the condition of the culch on the banks is the main deterrent to the recovery of these excellent spatting grounds. In all the hauls seen the culch was abundant but either dirty or, as on the Falmouth North Bank, heavily overgrown with marine organisms, especially with sponges and *Lithothamnion*.

It was noticed that the dumpy oysters which formed rather more than 40 % of the oyster population in 1924 and 1926 (Orton, 1927*a*, p. 32) were totally absent. In these years the bulk of the dumps were undersize for legal oysters. These dumps which were valuable as a stable spawning stock are not now present on the grounds, with the consequent loss of a real spawning asset to the beds. A fair proportion of older young oysters 1–$2\frac{1}{2}$ in. were found recently dead in the river, but few on the banks. None of these was bored by tingle. No indications of deposits of oil were seen. The American slipper limpet, *Crepidula fornicata*, was not found, and appears to be unknown.

Recommendations

The outstanding feature of the beds is the lack of sufficient clean culch on the banks. It is therefore recommended that culch be dredged from the edges of the banks and sides of the Channel (where it is mostly clean) and redistributed over the banks on the same day as dredged. There are other

ways of supplying the culch necessary but the one suggested seems the simplest. As it will take many years in the economic conditions under which the beds are administered to supply all the culch which might be usefully employed on the banks, it would appear that there should be no delay in making a beginning.

It is suggested that twelve men working six sailing boats might be employed under the supervision of the bailiff for one or two weeks in the year in June catching culch from the edges and spreading it over the banks. In this way clean culch would be available on the banks at about the time the oyster larvae are ready to settle. Perseverance in this procedure may be expected to result in the ultimate recovery of the beds and their maintenance in good condition.

It is recommended that the bailiff be asked to report periodically to the River Committee whether the American slipper limpet has been seen on the beds. Samples of this limpet have been supplied to the bailiff, who will ensure that the dredgermen are also familiar with this important pest in oyster cultivation.

Summary

A survey of the Fal Estuary Beds in February 1939 gave evidence that the stocks of oysters were only slightly better than in the slump period of 1926.

The failure of the beds to show the recovery expected in recent years is attributed largely to the absence of sufficient clean culch on the banks.

It is suggested that means be taken to scatter clean culch over the banks in June yearly to prevent further decline of the beds and assist in their more rapid recovery to a flourishing condition.

The American slipper limpet, *Crepidula fornicata*, was not found and appears to be unknown on the beds.

REFERENCES

Orton, J. H., 1927*a*. Report on a survey of the Fal Estuary Oyster Beds (November 1924) with notes on the biology of the oyster, Falmouth 1926, p. 29; Summary in *Journ. Mar. Biol. Assoc.*, Vol. xiv, pp. 615–628.

—— 1927*b*. Observations on the Fal Estuary Oyster Beds during 1926, including a study of over-fishing. *Journ. Mar. Biol. Assoc.*, Vol. xiv, p. 930.