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The introduction of hydraulic dredging into
the Thames Estuary cockle fishery

by

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The Thames Estuary is one of the three main cockle-producing areas in England and Wales. The average production from the seventy square miles of sandbank in the area is 50 000-60 000 cwt (2 500-3 000 tonnes), around one quarter of the total landings for the UK. Most of the fishing occurs on the Essex side of the estuary, but there is normally some gathering on the Kent side with access direct from the land. The method of fishing prior to 1967 was simple, the seven boats which made up the fishing fleet being beached on the cockle beds at low water and the cockles raked from the ground and loaded into the holds of the vessels for transport back to the boiling plants for processing.

In 1967, the continuous delivery hydraulic cockle dredge, developed by the Industrial Development Unit of the White Fish Authority, was introduced on an experimental basis into the Thames (Kerr 1969, White Fish Authority 1967, 1969). A year's commercial trial by one vessel using a 12 inch (300 mm) blade was completed by the end of 1968. By the end of 1969, six vessels were fishing with hydraulic dredges fitted with 18 inch (450 mm) blades. Recently, the one vessel which still gathered cockles by hand-raking stopped fishing, but the fleet has been increased by three additional vessels fitted with dredges.

One question of immediate interest, arising from the use of the dredge, was whether the resulting increased fishing capacity would lead to a great increase in cockle landings from the Thames Estuary. Landings for the last four years for all the main cockle-fishing areas of England and Wales are shown in Table 1. Landings have been exceptionally high in all areas, due to the large stocks available from the 1963 spatfall and the good demand resulting from limited supplies from Holland. Fishing has taken place on declining stocks, since the maximum fishable population occurred in 1966/67 and natural losses and heavy fishing have drastically reduced cockle numbers, despite spatfalls in 1965 and 1967.

Table 1 Cockle landings, 1967-70, in cwt.
(1 000 cwt = 50.8 tonnes)

Year	Thames Estuary	Burry Inlet	Wash
1967	85 000	139 000	95 000
1968	89 000	84 000	104 000
1969	107 000	89 000	129 000
1970	123 000	78 000	116 000

The cockle population in the Thames Estuary in January 1971 was estimated to be less than a quarter of that present in 1967. In the Burry Inlet and the Wash, a fall resulted in landings in 1970, with a further considerable reduction expected for 1971. In the Thames Estuary, however, landings rose in 1970 to over 120 000 cwt (6 300 tonnes) probably as a direct result of dredging, which allowed the exploitation of cockles at very low densities. Catches of over one tonne per hour were regularly obtained from grounds which would previously have been regarded as uneconomic. In considering total landings, it is important to take account of the wastage due to cockles which are smashed by dredging. About 20 per cent of the cockles reaching the hold of the vessel are badly damaged, about twice the loss caused by the old hand-raking method of fishing. Since damaged cockles cannot be processed, the yield in cockle flesh from dredged cockles would thus be around 10 per cent less than that obtained from the same quantity of cockles fished by hand.

A detailed study of this novel fishing method was made from the autumn of 1969 to the spring of 1971, when special forms asking for daily details of catches, effort and areas fished were issued to the fishermen. The main fishery was divided into six areas for this purpose, area 1 being just outside Leigh-on-Sea (the home port) and area 6 about ten miles away (see Fig. 1). Access to areas 4, 5 and 6 was limited to certain periods only, since these were situated in a gunnery range.

Catch per unit effort was calculated from the details recorded on the forms. The average fishing rate for each boat fell from just under 30 cwt (1 500 kg) of cockles/hour in December 1969 to 24 cwt (1 200 kg)/hour in June 1970. The catch-rate then rose to around 27 cwt (1 350 kg)/hour during the summer as undersized cockles grew and entered the fishery. The mean catch per unit effort during the period November 1970 to April 1971 was 15 per cent less than in the corresponding six months a year earlier. This is probably an underestimate, since the first six

months included a period when some of the fishermen were still learning to use the dredge. The drop in catch-rate was compensated for by longer fishing hours and catches remained high throughout 1970, reaching a maximum in August, when just under 3 000 cwt (150 tonnes) of cockles were landed each week by the fishing fleet.

Although the catch-rate decreased over the 18 month period, the values fluctuated from month to month as a result of a series of cockle beds being successively depleted. Typical month to month variation can be seen in Figure 2, where the catch-rates of two boats are plotted over the 18 month study period. There was a decline in catch-rate from November 1969 until the early summer of 1970, when it rose as young cockles grew and entered the fishery. The numbers of these were small in 1970 however, and the catch-rate fell again until early in 1971, when it increased due to the previously unexploited beds in area 6 becoming accessible in the early morning, before firing occurred on the gunnery range. By the spring of 1971, the catch-rate had fallen once more. The slight rise shown by boat A in May 1971 was due to the exploitation of a new bed of cockles found on the offshore Barrow Sands. Because of the poor recruitment in the last few years, catch-rates are expected to continue to fall throughout 1971.

The main aim of the research was to determine the effects of dredging on both fishable and undersized cockle populations. A special study has been made of the effects of dredging on cockle spat (i.e. cockles in their first year, normally less than 15 mm across) and the results will be published separately. A detailed study was made of the fishable cockle stocks between November 1969 and November 1970. The stocks in areas 1 and 2 had suffered a very high mortality before November 1969, due in part to the grounds being dug by hand for bait (mainly Nereis and Arenicola). Although large catches were made in these areas before 1969, no fishing was recorded during 1969 and 1970, when nearly all the fishing took place in areas 3B, 4 and 5 (Fig. 1). From transect surveys made in the summers of 1969 and 1970, estimates of total mortality in the period between the surveys were obtained for each area. The fishing mortality was calculated from the information provided on the forms. A summary of the results is shown in Table 2. A very high total mortality occurred in all areas, including area 6 where no fishing had taken place. The cause of the high natural mortality (up to 50 per cent) has not been established. Fishing mortality in areas 4 and 5 (14 and 12 per cent) was comparable with that occurring in other areas, such

as South Wales, but the fishing mortality in area 3B (34 per cent) was abnormally high and gave cause for concern. The high level of exploitation of this area was due to its close proximity to the home port and its accessibility at all times, and because it was sheltered and fishable in all weathers. As a result of heavy fishing, cockle densities were reduced to below 100/m², yielding catches of under 15 cwt (760 kg)/hour. Despite this, fishing continued in this area, especially during bad weather. As a result of the increased effort needed to sustain yields, there was some evidence that the cockle ground itself was being damaged, and when the fishermen themselves expressed a wish for some form of conservation, consideration was given to the limitation of fishing effort.

Table 2 Fishable cockle stocks

Survey area	Estimated stock of cockles (x 10 ⁶)		Mortality (%) Nov 1969 to Nov 1970		
	Nov 1969	Nov 1970	Total	Fishing	Natural
3B	220	80	59	34	25
4	1 630	560	66	14	52
5	1 300	720	45	12	33
6	-	-	50*	nil	50

*From partial survey.

The hydraulic dredge is a convenient, manageable fishing unit and the most obvious method of control would be to limit the number of dredges, for example by a licensing scheme. Unfortunately, such control is not permitted by the by-laws governing inshore fisheries, and the proposal was not considered practicable. Another method of control would be to limit the catch by a quota system, but marketing arrangements make it undesirable to stop fishing completely should the quota be filled. The most practical solution, in the present situation, would be to limit the width of the dredge blade and to close off areas to fishing if they are in danger of being overfished. These measures are under consideration by the local regulating authority. Whatever form of control is used, it is clear that detailed information will be needed on the level of cockle stocks in all areas.

SUMMARY

- 1 Cockle landings for the Thames Estuary rose in 1970 to over 120 000 cwt (6 300 tonnes), probably as a direct result of the change-over to hydraulic dredging, which has enabled the fishermen to exploit cockles in the low-density beds found over much of the estuary.
- 2 The mean catch per unit effort fell by 15 per cent in the period between the winter of 1969/70 and the winter of 1970/71.
- 3 Catches have been maintained by working for longer periods on beds of lower densities.
- 4 High mortality and poor recruitment have resulted in low stocks of cockles over much of the estuary. Factors other than fishing have been the cause of this decline, except in one area (3B) where fishing has been at an exceptionally high level.
- 5 The possibility of the conservation of the remaining stocks has been considered, and limitation of the width of the dredge blade and the closure of potentially overfished areas have been recommended.

REFERENCES

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- WHITE FISH AUTHORITY, 1967. Continuous delivery dredge for cockles. Research Bulletin No. 25.
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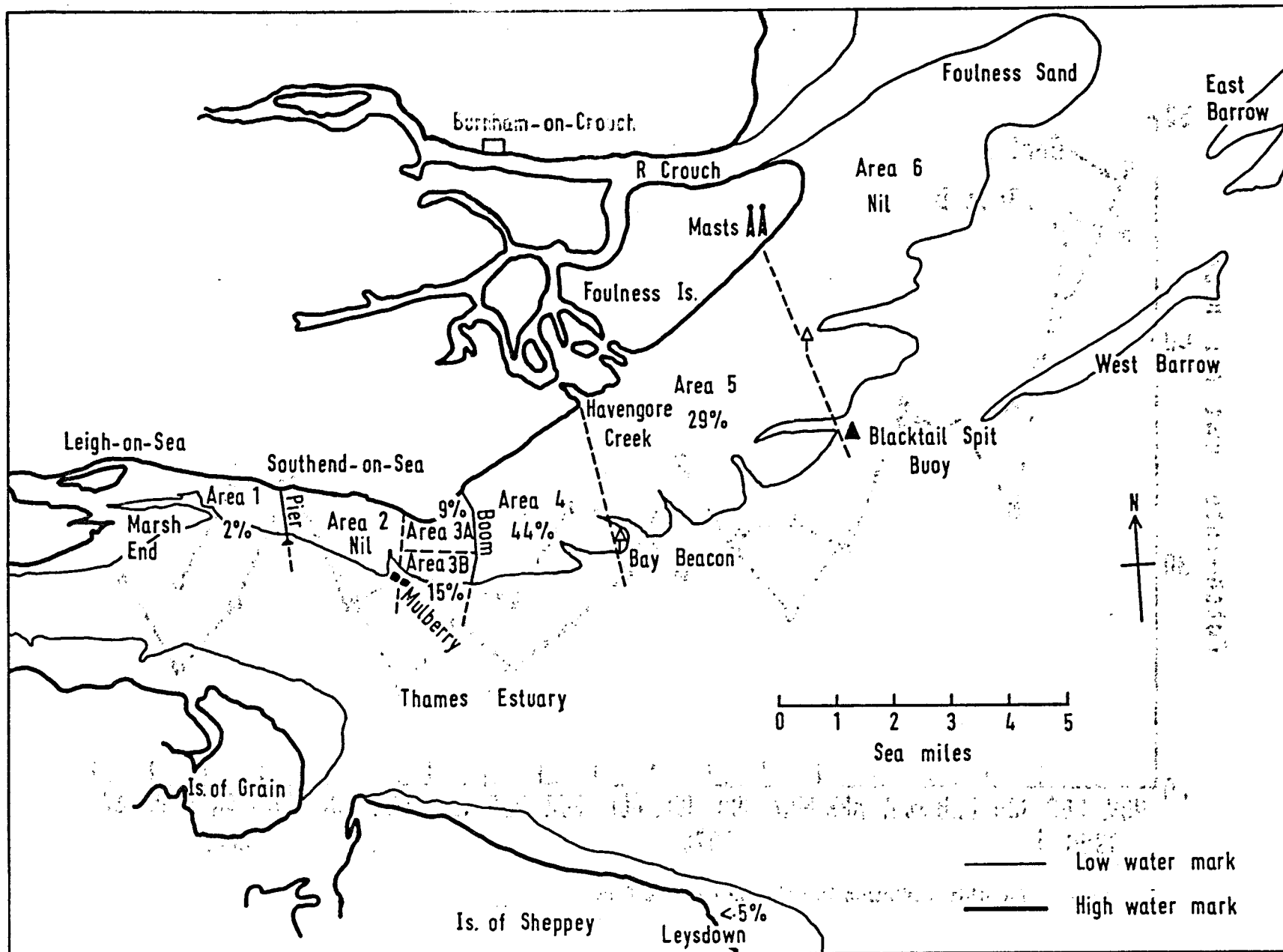


Figure 1 The cockle fishing areas of the Thames Estuary with the percentage of total catch from each area during the period November 1969–November 1970.

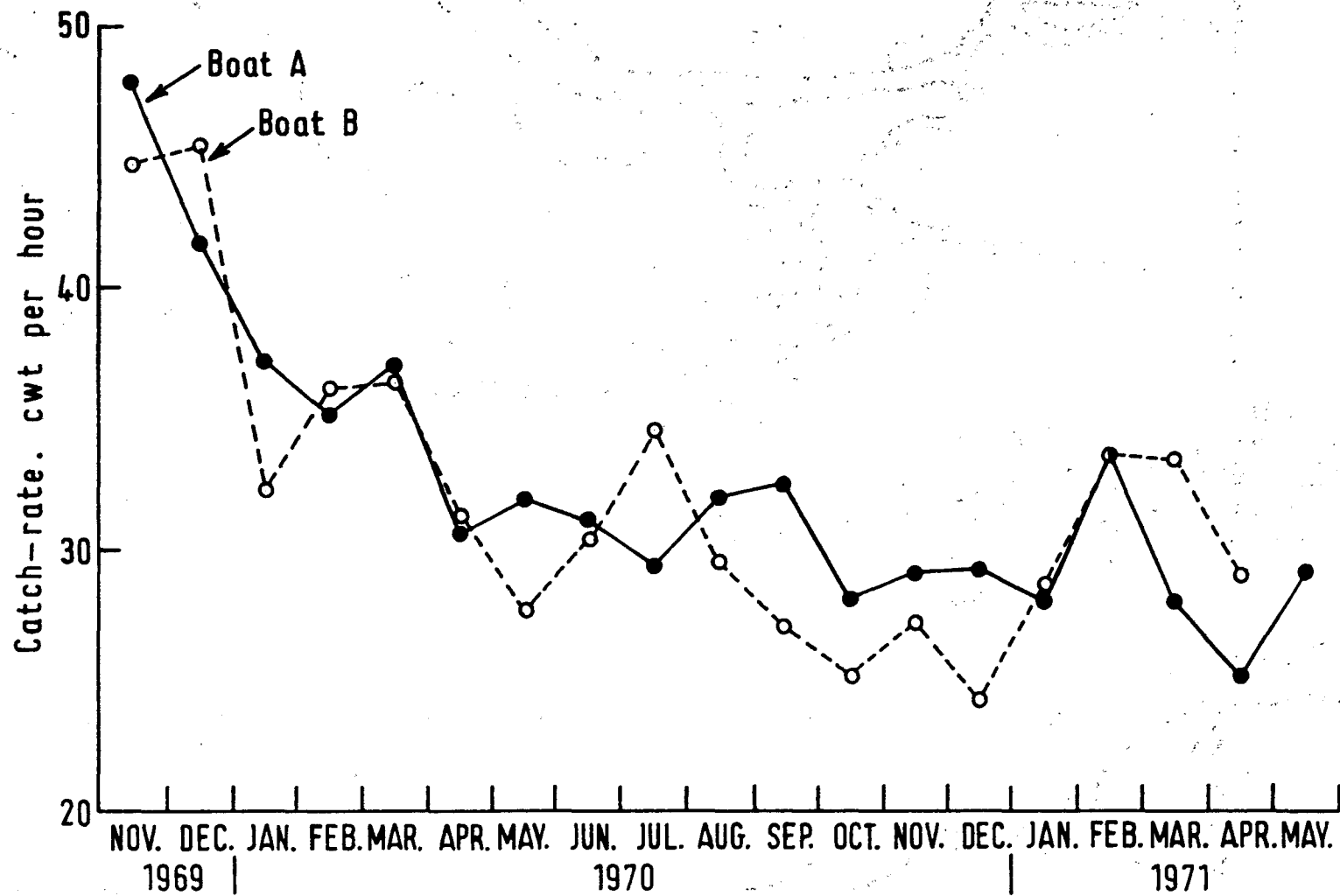


Figure 2 Monthly variation in catch per unit effort.