SEA FISH INDUSTRY AUTHORITY

Seafish Technology

NORTH NORFOLK COAST FISHERY

EVALUATION OF DREDGES FOR WHELK FISHING

Internal Report No. 1395

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SUMMARY

The whelk fishery of the North Norfolk Coast is in severe decline with almost all the traditional inshore grounds now devoid of whelks. The nearest productive grounds to Wells-next-the Sea are 30 miles away at Cromer Knoll. This is beyond the range of some vessels and is difficult for others to work. One of the objectives of the exercise was to survey for new grounds.

Baited pots are the traditional method of fishing whelks. The whelks are attracted by the bait from up to 20 m away.

Dredges have been used successfully for most molluscan shellfish in the Wash but so far have not been tried for whelks. The second objective was to see how far dredges could be used to harvest whelks and also be used as a survey tool. Two types of dredge were used - the Baird and the Dutch mussel dredge. The latter required some modification to make it tow properly. The trials were carried out on the 9.75 m ALISON CHRISTINE. The grounds were surveyed by both dredge and shanks of whelk pots.

The densities of whelks on the grounds were extremely low and it is difficult to draw form conclusions. However it is clear that pots laid for 48 hours or so do draw whelks from an are of 20 m radius and when the densities are low the dredge would have to scour a large area which is expensive in fuel and gear. There is also strong evidence to the effect that the habitat would be damaged especially during the spawning season. All the grounds fished showed good populations of crab. Further work is planned to search for whelk resources off the Lincolnshire Coast in February 1990.

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1. INTRODUCTION

This interim report describes part of a MAFF funded project to gather information on the UK fisheries for the whelk (Buccinum undatum). This species is largely underexploited in United Kingdom waters and, depending on the strength of market demand, could provide a useful seasonal fishery in some areas. The aims of this Commission were:-

1. To evaluate two designs of dredge for catching whelks.

2. To quantify the dredges' catching power relative to creels on known whelk ground.

3. To make some assessment of the grounds and stocks off the coasts of Norfolk and Lincolnshire.

2. OBJECTIVES

The objective was to establish a design of towed dredge suitable for surveying and sampling for whelks. Dredging was also to be assessed as a method of commercial capture, and its efficiency compared with the current method of baited pots.

If a suitable design of whelk dredge could be established, it was to be used to assess stock potentials for the expansion of the whelk fishery and promoted as a fishing method.

3. EQUIPMENT AND METHODS

3.1 Trials Vessel

The vessel used for the trials was the "ALISON CHRISTINE" LN179. She is 9.75m (32 ft) G.R.P. Cyngnus Marine Hull powered by a Volvo D50 engine delivering 90 B.H.P. The vessel skippered by Allan Frary operates out of Wells on the North Norfolk coast. The vessel's Navstar 2000D - Navigator was used for navigation and location of tows.

3.2 Dredges

Two dredges were manufactured to drawings M8679A1 and M8681A1 (Fig. No. 1 and No. 2). The vessel's hydraulic pot hauler was modified to work with a small gantry to shoot and haul the dredge. The gantry and the standard Norfolk whelk pot are shown in Fig. No. 3.

3.3 Methods

The two dredge designs were based on a Baird and Dutch mussel dredge respectively. They were assessed for handling characteristics and then fished to try to establish a relationship between the dredge catch rates and those of the whelk pots. A short shank of 10 pots was shot, then hauled after approximately 24 hours. The contents of the pots were then noted. Tows were made along the line of pots and, where appropriate, at right angles to the line of pots. The dredge catch was then compared with the contents of the pots.

As it is known that whelks are passive until they detect food (Himmelman 1982), a further experiment was also carried out. The dredge was towed along a chosen line prior to the pots being shot on that line. The pots were shot and left to fish for eight hours.

Tows were then made with the dredge parallel to the line of pots and at 20m and 60m down-tide from them. The pots were then hauled and their contents compared to that of the dredge.

This was to test the hypothesis that the whelks would be stimulated to move by the bait and become more vulnerable to capture by the dredge.

4. RESULTS

4.1 The Dredges

The Baird type dredge (Fig No. 1) proved to be a very good general sampling tool, and gave a very good indication of the nature of the bottom in the areas dredged. Bottom contact was always good, indicating that the diving plate was holding the dredge on the bottom without the use of excessive weight. Care needs to be taken when the dredge is being shot away. It is important that the boat has way on it and this usually means the dredge has to be shot into the tide. The dredge should also be kept clear of the propeller wash when shooting. Failure to observe the above points led to the dredge overturning and having to be reshot.

Dredging in water up to 11 fathoms (20m) was performed without problems. A minimum warp length to depth ratio of 3:1 was used. A rake type blade and a straight blade (Fig. No. I) were made for the trial. Only the rake type blade was used, however, as its digging action was considered more appropriate for whelk fishing.

First tows with the Dutch mussel dredge indicated very little ground contact. A 56lb (25.5 kg) weight was then fastened to the towing eye of the dredge in order to improve ground contact. On repeating the tow, the blade was polished showing better ground contact. It was still thought that the dredge was doing very little digging, and the ground contact was very light in the depth of water and on the hard bottom being worked. This dredge would work in shallow water and on a soft bottom where filling with mud would be problem with the Baird dredge.

4.2 The Dredging Trials

Six days dredging was completed, four tows were made with the Dutch dredge and 18 with the Baird dredge. Tows were made in four areas that had been productive whelk grounds (Fig. No.4). Tows were also made on the only one of the old whelk grounds still producing commercial quantities of whelks.

Only one of the old whelk grounds, Latitude 53:04°91° Longitude 00:04°94°, showed any indication of a population of whelks and then not in commercial quantities. The shank of ten try pots used collected only 20 whelks over a period of 48 hours. Four tows over the same ground with the Baird dredge collected two whelks. Ten pots on good ground might be expected to yield 50-100kg of whelks.

All the tows with the dredge and the try pots showed a large crab population on the old whelk grounds. Tows made on the 27th July, 1989 were on the currently productive whelk ground. The ten try pots used as a stimulator produced eight whelks in eight hours. The tow down the line of stimulator pots prior to their being laid produced eight whelks. The two tows performed down tide of the pots produced only one whelk. Tow 21 also on known good whelk ground produced only eight whelks.

Pots laid for commercial fishing and hauled during the trial gave catches of 150kg, 125kg, 234kg, from 45 pots. These pots were left for 24 and 48 hours on the good whelk ground in the area of Cromer Knoll.

All the tows on the old whelk ground and the try pots showed a large crab population. The quantity of empty oyster shell indicated that the whole area must have been a vast oyster bed in the past.

5. OBSERVATIONS ON DREDGING COMPARED TO POTTING

The Baird dredge proved a useful tool for bottom sampling and capable of taking whelks when they were in its path. When searching for animals with a population density as low as $0.05m^{-2}$ and $0.024m^{-2}$, (J.H. Himmelman 1984), the limitation of a dredge this small is the area it can cover.

Tows of approximately 0.6 of a nautical mile were made. If longer tows than this were attempted, the dredge filled up with sand and mud and rubbish. The area covered by the dredge for a tow is 0.6 x 1853 x o.65 = $722m^2$. Pots left for a period of two days will capture whelks from up to 20m away (J. H. Himmelman 1984). This would give a shank of 25 pots spaced at 14 fathom intervals (25.6 m) an effective fishing area of:-

$(25 \times 25.6) + 40 \times 40 = 27{,}000m^2$

It would require approximately 38 tows with the dredge to cover this area.

It is possible that a much larger vessel towing an adapted beam trawl or a four ganged scallop type dredge might achieve reasonable catch rates. But this type of dredging would present its own problems. The increased fuel consumption might be offset by the elimination of the cost of the bait.

A more important consideration is the damage this type of dredging may be inflicting on the whelk grounds. Once the whelk egg mass is dislodged from its anchorage, it floats away and does not reach maturity. This type of damage would be almost inevitable when using dredges.

6. OBSERVATIONS ON THE WHELK FISHERY

For the size of vessel currently pursuing this fishery, pots or creels are very efficient. A three man crew can land whelks at a rate of 0.75 tonnes/h or more from pots that have been laid for 24 hours on grounds with an average population of whelks.

The whelk fishery on the North Norfolk coast has seen a steady decline over the past ten years. Almost all of the accessible inshore grounds are now devoid of whelks. The remaining whelk grounds nearest to Wells are in the area of Cromer Knoll, some 30 miles away. This is close to the range limit of the boats pursuing the fishery from the ports on the North Norfolk coast. The whelk fishery from Wells has seen a decline in the fleet from 30 to 3 vessels over the past 15 years. Whelk fishermen in Brancaster have changed entirely to catching shrimps and brown crabs. The whelk landings in Winterton have seen a severe decline from 19.2 tonnes in 1977 to 4.7 tonnes in 1988. In the whelk fishery covered by the Eastern Sea Fisheries district for 1988, the average price of whelks was £295 tonne and the total value of landings in this area was £214,966. This represents a valuable fishery that seems about to collapse.

The factors resulting in the disappearance of the whelk from the inshore grounds on this coast are unknown. Possible causes are overfishing, a change in the environment or a combination of the two.

7. CONCLUSIONS

Both the dredges used were suitable for bottom sampling with adjustments being made for the local conditions from which the samples are being taken. But animals with such a low population density as the whelk would prove difficult to detect or accurately survey using such a small dredge.

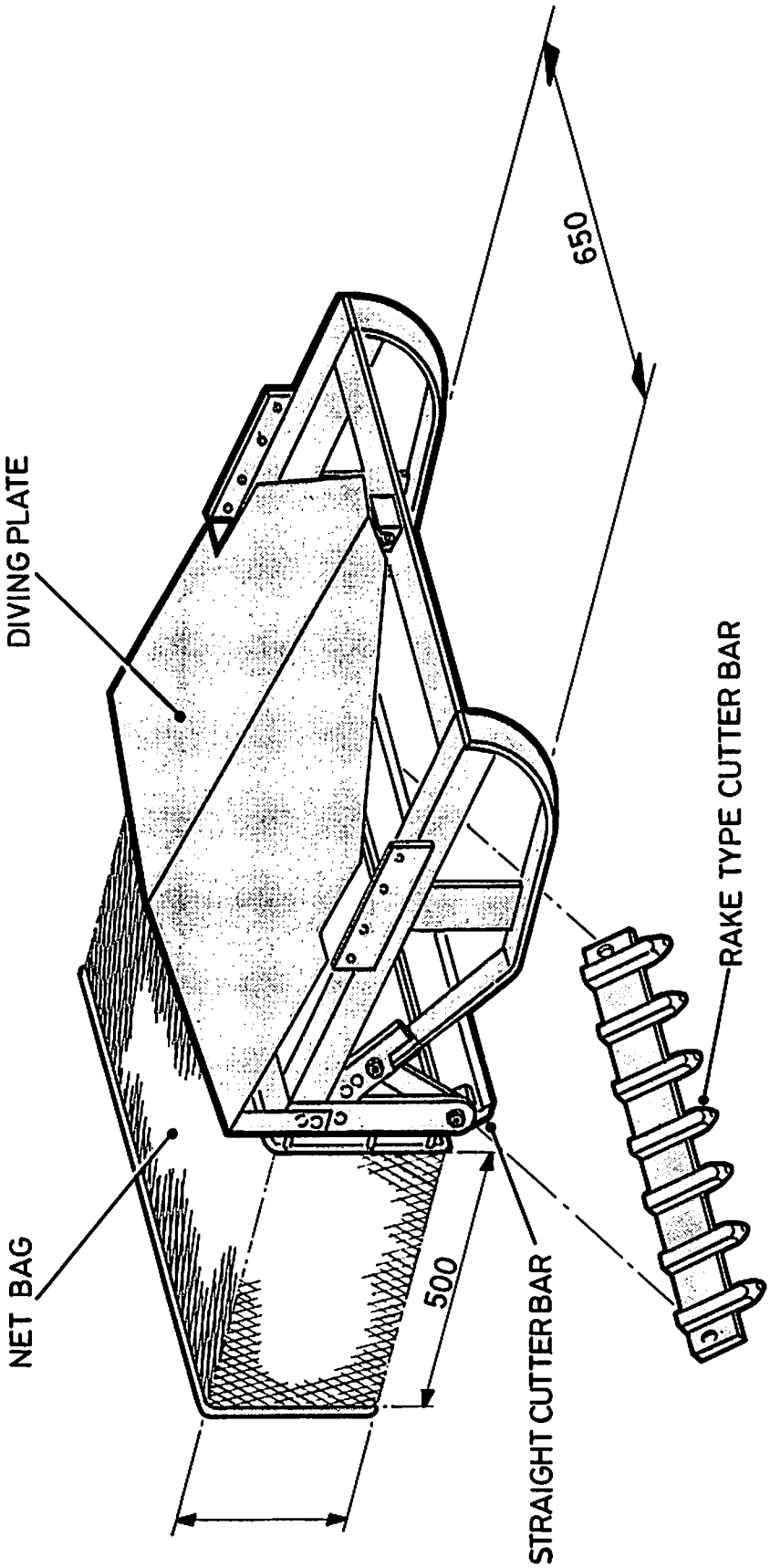
The use of pots over a fixed time period would prove a better method although the need to return to a chosen site at 24 or 48 hours later would be time consuming.

8. FURTHER WORK

8.1 Survey of the area at the entrance to the Wash and of the old whelk grounds between Gibralter Point and Donna Nock.

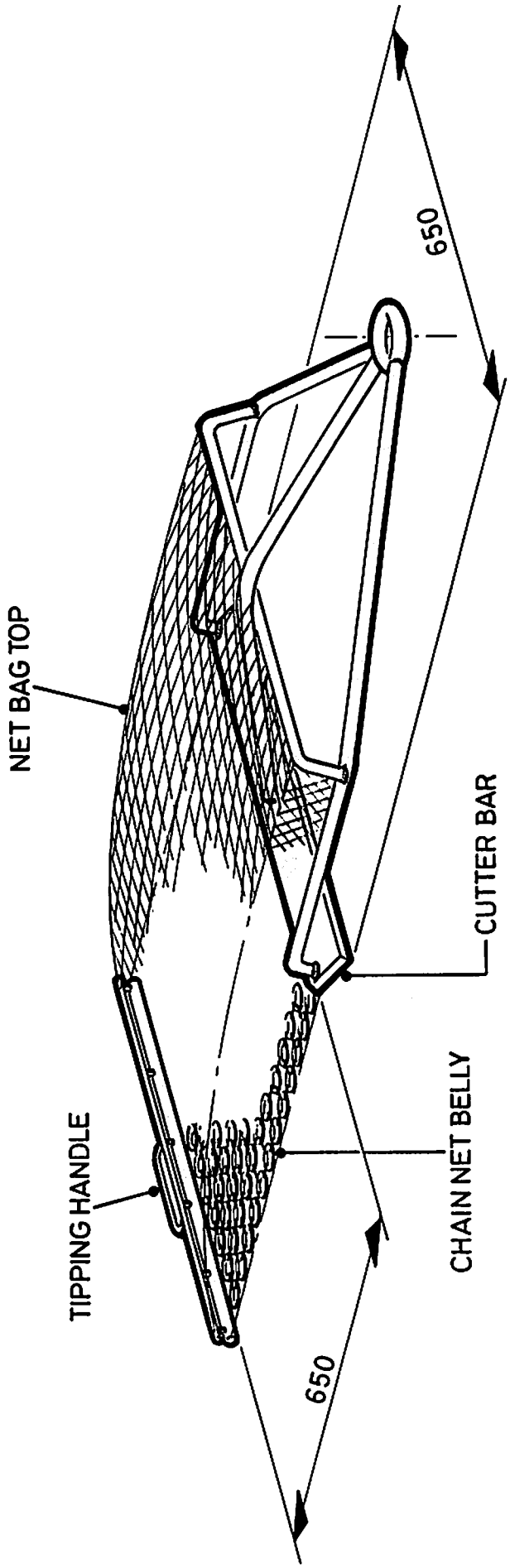
8.2 Trials should be done to establish an optimum soak time for whelk pots.

8.3 A larger boat should be used for the survey in order that a full sized Dutch mussel dredge can be tested for catching whelks. (MAFF trials D Kay 1989).

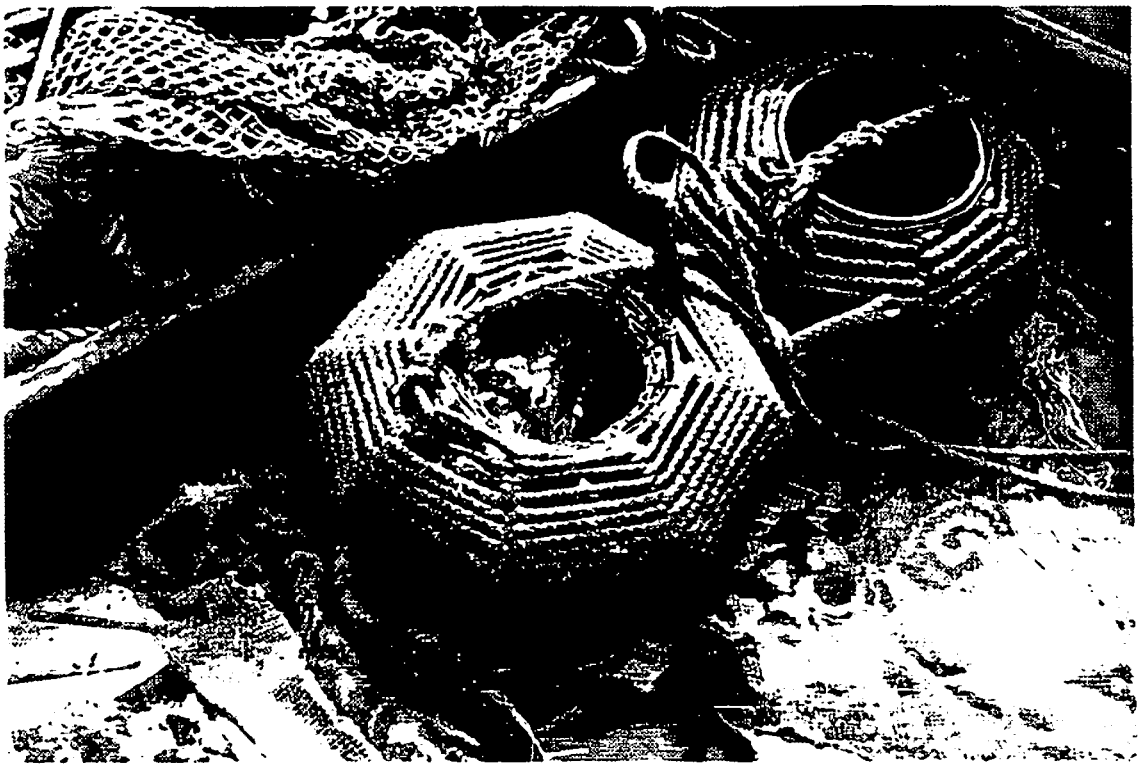


Baird Type Whelk Sampling Dredge

Fig.1



Sampling Dredge Based on Dutch Mussel Dredge Fig.2



Sheringham Iron and Rope Whelk Pot

Pot Hauler and Gantry

Fig N°3

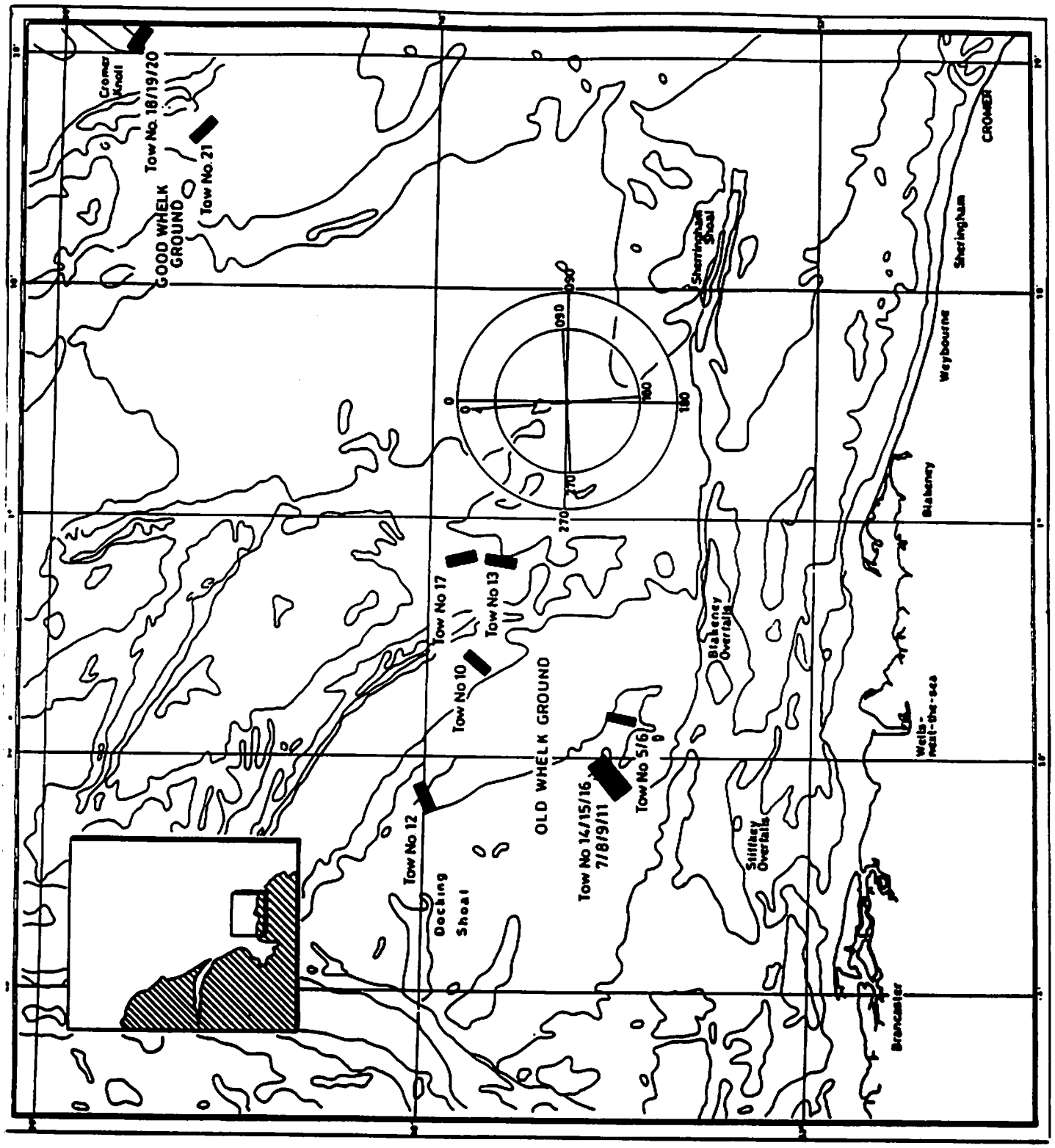


Chart Area of Whelk Survey

Fig. 4.

					WHELK DREDGING							Sheet# 1 Off 7
	DATE	19:7:89		VESSEL	Alison Christine		Type Of	Dredge	Dutch			
Tow		Shoot			Haul		ENG	SPEED	Direc	Water	Warp	Remarks /Catch
No	Lat	Long	Time	LAT	Long	Time	R.P.M	Kn	Tow	Depth	Length	
			6:00									Sailed
	53:17:28	1:20:28										Hauled 1 shank pots for 6 nets Whelks
1										11 Fm	175m	Trial tow with Dutch dredge/ 1St tow
												Blade not polished 10 Min tow on track of
												1 St shank no catch
2			11:10									Tow with 56 lb Weight on towing eye
												Blade polished catch 1Almond Whelk
3												Riciprocal tow 3-large/ 3-med/3-small
												Whelks added to dredge when shot
												Catch,2 small Whelks lost
4										10Fm	100m	Trial shot with Baird dredge
												Blade Ang 45Deg 1St tow point
												Turned over 1St shot ,righted when left to
												sink
												towed 0.5 nm Catch 11Whelks Bag full
												weed Horse mussel ,starfish ,brown crab,

					WHELK DREDGING							Sheet#2 Off7
	DATE	20:7:89		VESSEL	Alison Christine		Type Of	Dredge	Baird			
Tow		Shoot			Haul		ENG	SPEED	Direc	Water	Warp	Remarks /Catch
No	Lat	Long	Time	LAT	Long	Time	R.P.M	Kn	Tow	Depth	Length	
	53:04:66	0:56:26	10:30									Shoot try pots
5	53:05:11	00:51:72	13:19	53:04:78	00:56:69	14:02	800	2.5Kn	SE	6Fm	30m	Blade Ang 45Deg 1St tow point
												Up side down 1St shot,Reshot+0.2nm
												Catch white mud ,weed,oyster shell,starfish
												100 Kg total
6	53:05:10	:00:51:72	14:55	53:04:78	00:51:69	15:40	800		SE	6Fm	30m	Dutch Dredge 56Lb on towing eye
												Catch Weed, shore crab ,starfish, 20Kg,
												(no mud),Chain mat & blade cutting edge
												polished
7	53;05;46	00;48;44	16:05	53:04:98	0:48:58	16:23	800	1.5Kn	SSE	5Fm	30m	Baird Blade Ang 45 Deg 1 St tow point
												Catch,Weed,oyster shell,starfish, crab,
												one whelk, 10Kg total
8	53:05:46	0:48:39	16:51	53:05:29	17:04	17:04	800	1.0Kn		6Fm	30m	Change blade ANG to 65 Deg 1St tow point
												Catch,Weed,old oyster shell,starfish,
												15Kg total
9	53:05:44	0:48:39	17:17	53:05:07	00:48:94	17:41	800	1.6Kn	SE	6Fm	30m	blade Ang 65 Deg 1St tow point,dredge
												upsidedown RTn to way point reshoot
												Catch, Weed,old oyster shell,starfish,crab
												15Kg total

					WHELK DREDGING							Sheet#3 Off 7
	DATE	21:7:89		VESSEL	Alison Christine		Type Of	Dredge	Baird			
Tow		Shoot			Haul		ENG	SPEED	Direc	Water	Warp	Remarks /Catch
No	Lat	Long	Time	LAT	Long	Time	R.P.M	Kn	Tow	Depth	Length	
	53:04:69	0:56:26	9:39									Start haul try pots
	53:08:42	0:58:27	17:22	53:08:60	0:57:04							1St try pot postion
	53:07:76	0:55:11	17;38	53:07:92	0:05:47							2Nd trypot position
10	53:08:05	00:53:62	1800				900		NW	6Fm	40m	Blade Ang 65 Deg 1St tow point
												Bag full of weed

					WHELK DREDGING							Seet#4 Off 7
	DATE	22:7:89		VESSEL	Alison Christine		Type Of	Baird				
Tow		Shoot			Haul		ENG	SPEED	Direc	Water	Warp	Remarks /Catch
No	Lat	Long	Time	LAT	Long	Time	R.P.M	Kn	Tow	Depth	Length	
			11:36									1 St try pots of 21:7:89 Hauled,36 whelks
												&crabs
	53:05:52	0:49:36	11:47									Re-Shot try pots
11	53:04:95	0:48:39	12:02	53:05:45	00:48;37	12:16	800	1.6Kn	NW	7Fm	40m	Baird Blade Ang 65 Deg 1St tow point
												Catch,old oyster shell,starfish,weed
												Haul shank 2 30Whelks
	53:08:69	00:58:66	13:57	53:08:56	00:58:98	14:03						Re-shoot pots
12	53:08:47	0:58:09	14:10									Blade Ang 65Deg 1St tow point
												Dredge up sidedown Re-shoot
	53:09:60	00:57:94	15:40	+1nm			800	4/5Kn	NW	8Fm	45m	3Rd towing point
												Dredge empty towing to fast
												Re-shoot up tide
13	53:08:48	00:58:84	16:13	53:09:08	0:58	16:24	800	3.5Kn	NW	8Fm	45m	Try slow tow 1St tow point
												Catch, Weed,2 holes in belly
				53:08:38	0:58:29	16:54						Haul try pots, 12Whelks & Crabs
	53:05:15	0:48:50	18:09	53:04:96	00:48:73							Try pots shot

					WHELK DREDGING							Sheet #5 Of7
	DATE	25:7:89		VESSEL	Alison Christine		Type Of	Dredge	Baird			
Tow		Shoot			Haul		ENG	SPEED	Direc	Water	Warp	Remarks /Catch
No	Lat	Long	Time	LAT	Long	Time	R.P.M	Kn	Tow	Depth	Length	
			11:30									Sailed
												Haul try pots, 2 in pot7,2 in pot 9,
	53:04:91	00:48:94	13:10									2 in pot12,
												2 in pot 17,18&19,all pots had crabs&
												Hermit crabs (total 20 Whelks)
						13:26						Steam to old muddy ground to shoot try pots
						13:50						Pots hauled, crabs, no Whelks,Ret"n to
												1St location to try dredging at good end
												of try pots
14	53:04:86	0:48:23	14:18	53:05:15	0:49:15	14:33	800	2.25	E	7Fm	45m	Baird Blade Ang 45 Deg 1St tow point
												Catch,1Whelk, Oyster shell, 1Hermit crab
												crab, starfish, weed, stones (flint)
15	53:04:86	0:48:20	14:52	53:05:26	00:48:70	15:05	800	2	NE	7Fm	45m	As in 14, Catch, 1Whelk, Oyster shell
												1 Hermit crab, Crab,
												Starfish, stones (sand stone)
16	53:04:95	00:48:80	15:19	53:04:59	0:49:46	13:35	800	2	SE	7Fm	45m	
												(As 14)
	53:04:83	0:49:14	15:46									
												Pots re-shot SE

					WHELK DREDGING							Sheet# 6 Off 7
	DATE	25:7:89		VESSEL	Alison Christine		Type Of	Dredge	Baird			
Tow		Shoot			Haul		ENG	SPEED	Direc	Water	Warp	Remarks /Catch
No	Lat	Long	Time	LAT	Long	Time	R.P.M	Kn	Tow	Depth	Length	
			19:22									Move to haul try pots,1 Whelk in pot 5
17	53:09:56	00:58:97	19:24	53:08:89	00:58;30	19:35	800	3.2	NW	8Fm	50m	As in 14,Catch, Stones &weed net belly out
	53:06:16	00:50:97	20:36	53:05:97	0:51:19	19:42						Re-shoot try pots

					WHELK DREDGING							Sheet #7 Off7
	DATE	27:7:89		VESSEL	Alison Christine		Type Of	Dredge	Baird			
Tow		Shoot			Haul		ENG	SPEED	Direc	Water	Warp	Remarks /Catch
No	Lat	Long	Time	LAT	Long	Time	R.P.M	Kn	Tow	Depth	Length	
			2:00									Sailed
18	53:18:01	1:20:53	6:00	53:17:56	1:21:05	6:23	800	2	SE	11Fm	75m	Catch,Whelks, Size,L,42mm,50mm,
												50mm,88mm,54mm,39mm,53mm,
												46mm,
				53:17:85	1:20:41	6:49						Haul shank of pots,125 Kg Whelks from
												45 potsSteam back to tow #18 shot pots
						7:25						on tow 18
19	53:17:84	01:20:95	9:15	53:18:18	1:20:40	9:28	800	2	NW	11Fm	75m	Tow 20m down tide of pots,no Whelks
20			9:47			9:59	800	2	NW	11Fm	75m	tow 60m down tide(0.4Nm),
												Catch, 1whelk 43mm long
												move to clear ground
21	53:16:11	01:16:87	10:32	53:16:44	1:16:28	10.49	800	2		11Fm	75m	Catch, 8 Whelks,stones,
												Size,89mm,93mm,92mm,96mm,100mm,
												87mm,
	53:01:91	0:49:06	14:02									Try pots hauled, Catch, 8 Whelks, Size,
												93mm,94mm,86mm,84mm,82mm,
22	53:04:87	0:49:15	14:10	53:04:96	0:49:55	14:20	800	2	SE	7Fm	45m	Catch, Oyster shell ,stones,crab,weed,

Sheringham Iron and Rope Whelk Pot

Pot Hauler and Gantry

Fig N°3