WHITE FISH AUTHORITY

Industrial Development Unit

Field Report No. 587

SQUID JIGGING TRIALS

ABOARD R.V. SQUILLA

INTRODUCTION

The jigging trials carried out aboard ARCTIC HUNTER during September 1976 demonstrated that on some occasions at night, loliginid squid could be attracted by artificial lights and caught using Japanese automatic jigging machines. However, the low catch rates achieved and the operational experience obtained suggested that this method of fishing might find only a limited application in the UK. It was felt that the commercial viability of jigging would depend upon suitable operating conditions and the location of sufficiently large stocks of squid. It was concluded that jigging was an unsuitable method of fishing in exposed offshore locations because of the operational difficulties associated with rough seas. (see F.R. 450).

At certain times of the year squid occur regularly at several inshore grounds around the UK coast in response to feeding and spawning activities. Further trials were conducted in one of these areas, the Moray Firth, during December 1976 using a portable gear "package" consisting of jigging equipment modified for use aboard an inshore class of vessel. No squid were caught by jigging but squid landings by commercial seine net vessels during the same period were also negligible and it was concluded that with the onset of winter the squid had moved out of the immediate area and into deeper water (see F.R. 470).

In view of the inconclusive results obtained during 1976 it was proposed to continue the inshore jigging trials during 1977. The area most favoured for these trials was the western end of the English Channel where good catches of squid had been made by local trawlermen from September 1976 right up until February 1977. One of the most prolific grounds was reported to lie between Plymouth and Looe and discussions with staff of the N.E.R.C. Marine Biological Association at

Plymouth confirmed that they regularly caught squid in this region each year during the autumn and winter months. During the period September - February MBA provide facilities for visiting scientists wishing to carry out neurophysiology studies on live squid which are required on a daily basis. MBA operates four research vessels of which at least one (SQUILLA) is normally engaged full time fishing for squid during this period of the year. R.V. SQUILLA was built in 1973 and was designed specifically for catching and handling squid. The vessel possesses both bottom trawling and seining capability and is equipped with a circulating seawater system for holding squid alive in tanks.

In view of MBA's facilities and specific experience of the local fishery it was decided to seek an arrangement whereby a co-operative squid fishing programme could be mounted aboard R.V. SQUILLA over an 8 week period extending from September to December 1977. It was agreed that whilst the vessel must fulfill her primary role of providing daily catches of live squid for the scientists WFA would be able to utilise the vessel for 2 nights each week on jigging trials. It was considered that the daylight trawling/seining operations would provide useful indications of squid abundance, fluctuations in density etc. and would also enable rough comparisons to be made between the effectiveness of each of the three fishing methods. The specific aims of the WFA programme were as follows:

1. To assess the performances of trawling and seining for squid during daylight and to attempt to demonstrate the feasibility of jigging for squid at night using light attraction techniques.

2. To compare the use of various underwater and surface lights for attracting squid and to observe the effect of different moon phases on catch rates.

3. To attempt to detect squid and to monitor their behavioural response during jigging operations with the 200 Khz pole mounted echo sounder system.

4. To investigate the use of different hauling speeds, lure colour combinations and hook sizes for catching squid.

5. To make further assessments of the operational characteristics of the two makes of jigging machine.

MBA for their part, intended to conduct biological investigations on squid during the ~~is~~ period including the capture and release of tagged squid which would provide information on growth rates and migration patterns in local waters.

The proposed fishing programme for SQUILLA is shown in Appendix I.

TRIALS VESSEL

SQUILLA is basically constructed to a stern trawler design although the addition of a Beccles coiler also enables the vessel to carry out demersal seining. Vessel details are given below while various aspects of the vessel can be seen in Plates I - IV

Name: R.V. SQUILLA Reg. No. PH 90

Built: 1973 Tees Marine, Middlesborough

Tonnage: Gross:73 Nett: 20

L.O.A. 64

Main Engine: Kelvin Series T developing 320 H.P. and driving Slack and Parr CP propeller

Auxiliary: Lister. 32 H.P. driving 18 KVA Stamford Generator

Winches: Hydraulic Braatvag LP hydraulic trawl winch - capacity 2 x 300Fm x 13" circ. 4 warp.

Oceanographic winch.

Power block (tilting gantry)

Electrical equipment: Decca Navigator MK 21

Decca radar MK 101

Decca autopilot 350

Simrad echosounder

Kelvin Hughes VHF radio

Kelvin Hughes HF radio

TRIALS EQUIPMENT

The two Hamade and two Uematsu jigging machines were installed along the starboard side of the vessel using rail clamps (see figure 1). This method of attachment had proved very convenient aboard GIRL IRENE last year and, unlike direct welding, caused no damage to the superstructure. The starboard side of the vessel was chosen for jigging because of the offset position of the casing which provided wider access along this side and, also, because the oceanographic davit formed a convenient point for attaching the lighting array. Since the last trials aboard GIRL IRENE the machine stands had been altered in height to coincide with the SQUILLA'S rail and the netting tray support clamps had been modified to allow the netting trays to be retracted fully inboard.

The portable 1.3 KVA generator for the Uematsu machines was operated on deck as shown in Figure 1 but stored under the whaleback when not required. The 6 KVA generator for the Hamade machines was placed in a canvas-covered wooden crate lashed to the after deck. The exposed nature of this position was recognised but it was feared that to mount it under the whaleback would interfere with the operation of the anchor windlass and also impede the opening of the escape hatch from the crews accommodation.

It had originally been hoped to install the 18 KVA Japanese lighting array but the physical dimensions and weight of a generator of this size and its effect on vessel stability were considered and the idea was dismissed as impracticable. A compromise was reached in the choice of a 10 KVA portable generator which would enable the ex ARCTIC HUNTER standby 9 KVA quartz iodide fluorescent lighting system to be used and also the incandescent lighting array employing 6 x 1.5 KVA bulbs. The electric lamps and cables were lashed to a supporting wire/rope fastened to the "A" frame, oceanographic davit and the whaleback deck railings. The lighting generator was secured to the casing just aft of the whaleback. In addition the four Providus 6000 B.P. gas lamps were fastened to halyard ropes passing through bulldog grips attached to the supporting wire strop. This system enabled the lamps to be raised and lowered for igniting purposes. Since the GIRL IRENE trials fittings and valves had been obtained enabling propane rather than butane gas to be used with the lamps as recommended by the Manufacturers (see F.R. 470 for explanation).

NARRATIVE

SQUILLA had remained inoperative since late Spring following a fouled propeller which had caused extensive engine damage. Unfortunately, repairs took longer than first envisaged and the start of the jigging trials was delayed almost two months. Installation of equipment was carried out over the period 21 - 23 October and the first trials week commenced on 24th October. The trawling results are summarised in Table 1. Operation of the seine net for comparative purposes was not considered feasibl

TRIALS WEEK 1 (24 - 28 October)

Monday 24th October

SQUILLA left Plymouth at 0945 and proceeded to the usual trawling grounds near Looe where one short tow was conducted with the trawl. Sea conditions were extremely rough (SW 7-8) and the vessel returned to port at 1400. The weather conditions were considered unsuitable for jigging operations.

Tuesday 25th October

SQUILLA left Plymouth at 0830 and proceeded to the Looe trawling grounds. Prior to trawling the jigging machines were tested; the Uematsu machines were found to work correctly but a power failure was apparent in the generator for the Hamade machines. The vessel conducted three tows and returned to port at 1500. In harbour the generator was removed from the vessel and taken ashore for examination where it was confirmed that sea water ingress had damaged the field windings which required replacement.

The weather conditions remained favourable for jigging and SQUILLA left harbour at 1645 and proceeded to the Looe trawling grounds. Jigging commenced with the two Uematsu machines only at 1830 over the same area in which trawling had been conducted earlier in the day. The wind was S1-2 with $^{4}/_{10}$ - $^{10}/_{10}$ cloud cover. The quartz-iodide lighting array was utilised and one juvenile squid was seen on the surface within a few minutes of switching on the lights, although it later disappeared. At 1930 the underwater light was switched on at maximum luminosity and lowered to 10 fm. depth and later 20 fm. depth. A shoal of mackerel or scad were seen to repeatedly swim in and out of the illuminated zone a few metres below the surface but no further squid were seen.

At 2230 the vessel steamed a few miles inshore. The 200 Khz echosounder revealed a duster of echoes around the underwater light which accompanied the light as it was slowly raised. The echoes were ascribed to plankton rather than fish or squid since a dense cloud of plankton was visible surrounding the light when it was eventually brought to the surface. By 0230 no squid had been seen and jigging operations were terminated.

The vessel remained at sea in preparation for trawling operations.

Wednesday 26th October

SQUILLA conducted four tows on the Looe trawling grounds and returned to port at 1430. The weather conditions remained favourable for jigging and the vessel left harbour at 1650 and proceeded to the W. Rutts area. The weather at this time was S 2-3 with a slight swell. Jigging commenced at 1800 with the two Uematsu machines and with the quartz-iodide lighting array switched on. At 1915 the underwater lamp was switched on at maximum luminosity and lowered 6 fm. below the surface. By 1930 one juvenile squid and two garfish had appeared on the surface but had remained for a few minutes only.

The vessel steamed a few miles to westward and a second drift commenced at 2000. The quartziodide lights and the underwater lamp were switched on and one juvenile squid was attracted to the surface where it remained for about 15 minutes. A battery powered underwater light was attached to line III. At 2130 one squid was attracted to the surface and was seen swimming in the vicinity of line I. The squid disappeared into the shaddow beneath the vessel and was caught a few minutes later on line IV. No further squid were seen and at 2200 the drift was terminated.

The vessel steamed to westward and made two further drifts during the course of the night. No further squid were seen and jigging operations were suspended at 0230. The vessel remained at sea in preparation for trawling operations.

Thursday 27th October

SQUILLA conducted three tows on the Looe trawling grounds and returned to port at 1400.

Friday 28th October

Crew's day off in respect of two nights jigging operations.

TRIALS WEEK 2 (7-11 November)

During this period continual SW gales prevented any form of fishing activity apart from Tuesday when the wind moderated sufficiently to allow three tows to be made with the trawl.

TRIALS WEEK 3 (21-25 November)

Monday 21st November

SQUILLA left Plymouth at 0910 and proceeded to the Looe trawling grounds. The weather was NE 6-7 and although the land provided some degree of shelter fishing conditions were made difficult by flying spray and short choppy seas. The vessel conducted one tow and returned to port at 1330. Jigging was not considered feasible.

Tuesday 22nd November

SQUILLA left Plymouth at 0900 and proceeded to the Looe trawling grounds where three tows were conducted. The vessel returned to port at 1500. The weather remained NW 3-4with a slight swell and these conditions were considered acceptable for jigging purposes. SQUILLA left harbour at 1900 and proceeded to the Looe trawling grounds. Jigging commenced at 2030 with all four machines. (The generator for the Hamade machines had been repaired the previous week). The lures of line VIII had previously been daubed with luminous paint and three battery-powered underwater lights were attached to the fishing lines at intervals. The lures of line VII were each baited with strips of mackerel caught earlier in the trawl and two rubby dubby bags of crushed mackerel and pilchard were suspended over the ship's starboard side. Initially the incandescent lighting array was used but this was later replaced by the gas lamps. The latter provided such relatively poor illumination that it was decided to revert to the quartz-iodide

used on previous occasions. The 500W underwater lamp was also lowered to a depth of about 10 fm. No squid were seen although one scad was attracted to the surface.

At 2330 the vessel steamed eastwards to within a few miles of Rame Head where a second drift was conducted. No squid were caught however and jigging operations ceased at 0200. The vessel returned to port at 0325.

Wednesday 23rd November

SQUILLA left Plymouth at 0815 and proceeded to the Looe trawling grounds where three tows were conducted. The vessel returned to port at 1500. The weather remained NW 3-4 and SQUILLA left harbour at 1830 and headed for the Eddystone Rocks. However on clearing the outer harbour the wind strength increased to NW 6-8 and the jigging attempt was abandoned.

Thursday 24th November

SQUILLA left Plymouth at 0830 and proceeded to the Looe trawling grounds where four tows were conducted. The vessel returned to port at 1530.

Friday 25th November

Crews day off in respect of working on previous Saturday.

TRIALS WEEK 4 (5-9 December)

In view of the worsening weather conditions, the apparent scarcity of squid and a further breakdown of the generator for the Hamade machines it was decided to terminate the trials programme at the end of the current week, one week earlier than planned.

Monday 5th December

SQUILLA left harbour at 0900 and proceeded to the Looe trawling grounds. One tow was conducted but no squid were caught and the vessel returned to port. The weather conditions remained SE6 with a heavy swell and jigging operations were not considered feasible.

Tuesday 6th December

SQUILLA left Plymouth at 0830 and proceeded to an area a few miles north of Eddystone Rocks since this area had yielded squid during the previous week whereas the Looe grounds appeared to be completely barren. Four tows were conducted and the vessel returned to port. The weather remained moderate with winds E4 and a heavy swell. However with the forecast of imminent gales it was considered unwise to attempt jigging operations.

Wednesday 7th December

Vessel remained in port. Weather SE gale 8.

Thursday 8th December

SQUILLA left Plymouth at 0830 and proceeded to the Eddystone grounds where 4 tows were conducted. The vessel returned at 1500. The weather remained SE4 with a heavy swell but with the forecast of imminent gales it was decided to abandon any further jigging attempts. The Hamade machines were dismantled and taken ashore.

Friday 9th December

SQUILLA left Plymouth at 0815 and proceeded to the Eddystone grounds where 3 tows were conducted. The vessel returned to harbour at 1430 by which time a SW gale 8-9 had developed. The remaining equipment was dismantled and taken ashore.

Saturday 10th December

The trials party returned to Hull.

DISCUSSION

The two after jigging machines necessarily occupied the deck space normally taken by the seine rope coils and which, it was thought, would interfere with the vessel's normal method of shooting and hauling the seine net. An alternative working arrangement was not considered feasible and the hope for comparative seine net trials had to be abandoned. However squid were caught in the trawl on most occasions (see table 1) but the tremendous variation in catch rates appears to indicate either widely dispersed "shoals" or else rapid local migrations in response to physical factors such as water temperature changes. The catch rate variations can be partly explained by the periods of cold northerly and easterly flows which caused trawl catches of both fin fish and squid to decline markedly at these times. Similar results were experienced by the local commercial vessels (see Appendix II).

The jigging results also tend to suggest that the squid are dispersed at night, since, at most, only one or two individual squid were attracted to the lights at each station. However, the scanty results obtained are not sufficient to allow firm conclusions to be drawn about the effectiveness of this method of fishing, particularly in view of the fact that the delayed start to the trials and the unfavourable weather conditions encountered combined to limit the number of nights spent jigging to a total of three out of a possible maximum of sixteen.

The quartz-iodide lights appeared to be much brighter than the incandescent lights of equal rated wattage although the light emitted seemed to be of "harsher" quality. The gas lamps provided very little luminosity compared with either of the two electric lamp systems but the illumination might have been improved by placing the lamps further outboard and closer to the sea surface. There was no noticeable difference in light intensity as a result of changing from butane to propane gas operation. The underwater lamp functioned well and on one occasion attracted sea life which was recorded as a compact group of marks on the echosounder paper. Gradual raising of light to the surface also induced the marks to ascend and they were eventually ascribed to plankton rather than to squid or fish. However, this observation emphasises the sensitivity of the 200 Khz echosounder and had concentrations of squid been present in the area at any time it is felt that they would easily have been detected by the echosounder.

The concensus of opinion amongst the local fishermen was that squid were most abundant in trawl catches made during rough weather, particularly immediately following a storm. During fine weather squid catches tended to decline, diminishing to almost nil if the calm weather persisted for more than a few days. The fishermen suggested that during fine weather periods the squid could be found in the vicinity of rocks and wrecks, however, with the onset of rougher sea conditions the squid either became dislodged from their rocky habitat through wave action or strong currents and became dispersed over a wide area or else they actively sought flat-bottomed and trawlable grounds at this time, perhaps following their food of young fish.

Discussions were held with the crew of the Looe vessel MI AMOR who reported that they had recently been feathering for mackerel over the edge of a group of rocks just offshore in 10-12 fm. of water. They detection a fish mark close to the seabed which they thought was mackerel. However, when the commenced fishing they repeatedly hooked squid (most tore free before they could be brought aboard) and not mackerel. The echosounder trace from their Atlas 420 unit (unfortunately not retained) allegedly showed the "fish" echo to rise off the seabed and spread towards the surface. As the vessel drifted off the rocks the echosounder trace became blank and squid catches ceased abruptly. It should be noted that fishing was conducted towards nightfall during a period of several days calm weather. Several other fishermen were also reported to have caught squid during the summer either whilst feather for mackerel or during local angling charter sessions. In almost all cases it was stated that fishing had been conducted during periods of calm sea conditions and that the areas fished had been rocky rather than smooth-bottomed terrain. In one particular case it was stated that the boat had returned with 7 stones of squid after a days' fishing using one mackerel line. Large num ers of squid were also reported to have been hooked and lost before they could be brought aboard.

SUMMARY

1. Observations by local fishermen suggest that squid congregate naturally around underwater obstructions such as rocks and wrecks during periods of calm weather but disperse widely over adjacent areas during rough weather. Squid can be caught by day by trawling and seining. catch rates tend to be very variable, being highest during rough weather particularly after a storm. Catch rates dwindle to nothing if calm weather persists for any length of time.

2. Although the SQUILLA results are extremely limited squid can be caught in the Channel at night using jigging techniques and light attraction over smooth-bottomed ground. However, the squid would appear to be too widely dispersed over such areas for this method of fishing to be commercially viable.

3. At least one fishing vessel MI AMOR has detected a "shoal" of squid using a conventional echosounder. The pattern of squid behaviour witnessed on this occasion would appear to confirm the squid's preference for a rocky habitat during calm weather.

4. Several local vessels have caught squid accidentally whilst feathering for mackerel or whilst engaged in angling trips. These catches have been made during the day and chiefly over rocky ground. Catch rates of up to 7 stones/line have been recorded with many more squid being reported lost before they could be hauled aboard. One amateur fisherman reported catching squid at night without light attraction using a fish baited handline, however, there is insufficient evidence at this stage to establish any diurnal variation in catch rates since nearly all catches have been made during the day whilst fishing for other species.

5. For jig fishing to be successful good weather conditions and suitable concentrations of squid are essential. Observations suggest that these conditions might be met in the Channel during the summer months in the vicinity of rocks or other underwater obstructions. It is therefore recommended that further trials be mounted during 1978 aimed at

assessing the feasibility of commercial jig fishing for squid in this region. Since this fishery is likely to be non-continuous due to weather constraints or the pursuit of other species it is recommended that the equipment should reflect the seasonal nature of the fishery. In its simplest form a line of jigs might be stored upon an eccentric drum which could be changed for a conventional gurdy spool during feathering operations for mackerel. However, it will probably be necessary to construct a new jigging machine designed specifically for small vessels and featuring portability and either manual or automatic operation. The requirement for night fishing and light attraction equipment would depend upon the results obtained during the day.

APPENDIX 1

SQUILLA PROPOSED FISHING PROGRAMME

	Aug.	Sept.	Oct.	Nov.	Dec.
S	6	3 ↑ Instal.	1	29	26 [24]
S	7	4 ↓ Instal.	2	30	27 ○ [25]
M	8	◑ 5 ↑	3	31	28
T	9	6 Fishing	4	1	29
W	10	7	◑ 5	2	30
T	11	8	6	3	1
F	12	9 ↓	7	◑ 4	2
S	13	10	8	5	◑ 3
S	14	11	9	6	4
M	15	12	10 ↑	7 ↑	5 ↑
T	16	● 13	11 Fishing	8 Fishing	6 Fishing
W	17	14	● 12	9	7
T	18	15	13	10	8
F	19	16	14 ↓	● 11 ↓	9 ↓
S	20	17	15	12	● 10
S	21	18	16	13	11
M	11	19	17	14	12 ↑
T	23	◐ 20	18	15	13 Fishing
W	24	21	◐ 19	16	14
T	25	22	20	◐ 17	15
F	26	23	21	18	16 ↓
S	27	24	22	19	◐ 17
S	28	25	23	20	18
M	[29] ↑	26 ↑	24 ↑	21 ↑	19
T	30 Installation	○ 27 Fishing	25 Fishing	22 Fishing	20
W	31	28	○ 26	23	21
T	1	29	27	24	22
F	2 ↓	30 ↓	28 ↓	○ 25 ↓	23

Key

● New Moon

◑ First Quarter

○ Full Moon

◐ Last Quarter

[ ] Public Holiday

APPENDIX II

Daily trawl catches in Whitsand Bay by the Looe vessel Ganesha during the period 30.10.77 - 1.12.77 (results based upon an average of 9 hours fishing time daily)= 2 or 3 tows).

Date	Total weight fin fish caught (ST)	Total weight Squid caught (ST)
30 October	28	10½
1 November	50	66½
2 "	56	64½
3 "	54	77½
4 "	13	63¾
6 "	28	108½
8 "	16	37
11 "	38	51¼
12 "	13	4
13 "	58	96¼
15 "	15	40
16 "	14	32
17 "	10½	31
18 "	38	29
19 "	6	28
20 "	47	57
21 "	7	16¾
22 "	6½	16¼
23 "	3½	3½
24 "	33	11
26 "	12	8¼
27 "	19	19¼
29 "	24	12
30 "	43	13
1 December	84	9

Changed from Gollop trawl 12 fm. footrope to Gourock 480 trawl but continued use of 40 fm. sweeps and 10 fm. spreader wires.
Includes 30 st mackerel
Includes 70 st. mackerel.

TABLE 1 SQUILLA - Trawling results

Date	Tow Number	Tow Time	Decca Positions	Depth (fm)	Weather	Catch	Remarks
October 24	1	1130 1200	A4.5 D34 A5.3 D42	22	SW 6-8	40 squid (10 living) + whiting/mackerel/scad assortment	Towing W. squid size med-large Catch rate high
October 25	1	1025 1055	A4.5 D34 A5.3 D42	22	S-SW 1-2	30 squid (10 living) + fish	Towing W. squid size med-large Catch rate high
	2	1115 1145	A5.3 D42 A4.5 D34	22	"	20 squid (18 living) + 20st mackerel	Towing E with tide
	3	1205 1235	A4.5 D34 A5.3 D42	22	"	30 squid (12 living) + 10st mackerel	Towing W
October 26	1	0900 1000	A4.5 D34.5 A6.4 D46	24	S 3	20 squid (3 living) + assorted fish	Towing W squid size small-med catch rate low
	2	1020 1115	A6.4 D46 A4.7 D38	22	"	10 squid (2 living) + fish	Towing NE
	3	1130 1215	A4.7 D38 A45 D34	24	"	6 squid (1 living) + fish	Towing E SE
	4	1230 1315	A4.5 D34 A5.2 D30	26	"	4 squid (2 living) + fish	Towing SE
October 27	1	0910 1010	A4.8 D31 A4.8 D40	22	S 3	8 squid (2 living) + fish	Towing NW. Squid size small-med. catch rate low
	2	1020 1120	A4.8 D40 A4.8 D31	22	"	8 squid (5 living) + fish	Towing SE
	3	1130 1230	A4.8 D31 A5.0 D42	22	"	6 squid (0 living) + fish	Towing NW

TABLE 1 SQUILLA - Trawling Results

Date	Tow Number	Tow Time	Decca Positions	Depth (fm)	Weather	Catch	Remarks
October 31		V/L	Alongside		SW 8-9		
November 1	1	½ hr.	A4.5 D34 A4.5 D39	22	N/Av	5 squid (2 living) + fish	Towing NW
November 2	1	½ hr.	A4.5 D31 A4.7 D40	22	"	3 squid (0 living) + fish	Towing SW
	2	½ hr.	A5.5 D34 A4.8 D40	22	"	14 + squid (14 living) + fish	Towing NE
November 3		V/L	Alongside		SW 8 - 9		
November 4	1	1 hr.	A4.5 D34 A 5.4 D44	22	N/AV	9 + Squid (9 living) + fish	Towing W Squid catch rate high.
	2	½ hr.	A5.4 D44 A6.7 E32	22	"	20 + squid (20 living) + fish	Towing SW
	3	½ hr.	A6.7 E32 A5.4 D44	22	"	10 squid (6 living) +fish	Towing NE
November 7		V/L	Alongside		SW 7-8		
November 8	1	¾ hr.	A4.7 D36 A6.2 D42	23	SW 4-5	27 squid + fish	Towing SW squid catch rate high.
	2	¾ hr.	A6.3 D43 A6.8 E33	24	"	20 squid + fish 10 living	Towing W
	3	¾ hr.	A6.8 E33 A6.3 D43	24	"	10 squid + fish	Towing E

TABLE 1 SQUILLA - Trawling Results

Date	Tow Number	Tow Number	Decca Positions	Depth (fm)	Weather	Catch	Remarks
November 9		V/L	Alongside		SW 7-9		
November 10		"	"		"		
November 11		"	"		"		
November 14		V/L	Alongside		SW 7-9		
November 15		V/L	Alongside		"		
November 16	1	¾ hr.	A4.5 D34 A5.3 D42	22	SW 6	13 + squid (9 living) + fish	Towing W. Squid Catch Rate high
November 17	1 - 4	4 x ¾ hr.	A4.5 D34 A5.4 D42	22	SW 4	12 + squid (total) (6 living) + fish	Towing E-W
November 18	1-3	3 x ¾ hr.	A4.5 D34 A6.3 D46	22	SW 4	33 + squid (27 living) + fish	Towing NE-SW. Squid catch rate high.
November 19	1-2	2 x ½ hr.	A4.5 D34 A5.1 D38	21	SW 3	20 + squid (20 living) + fish	Towing WSW-ENE
November 21	1	1040 1110	A4.7 D38 A6.2 D44	23	NE6 - 7 heavy spray choppy seas	5 squid (0 living) + fish	Towing SW
November 22	1-3	3 x ½ hr.	A5.9 D40 A4.5 D34	24	NW 3-4 slight swell	13 + squid (9 living) + fish	Towing E-W

TABLE 1 SQUILLA - Trawling Results

Date	Tow Number	Tow Time	Decca Positions	Depth (fm.)	Weather	Catch	Remarks
December 8	1-4	4 x ½ hr.	A8.2 C33.5	26	SE 4 mod. swell.	8 squid (1 living) + fish	North of Eddystone reef.
December 9	1-3	3 x ½ hr.	A5.5 C30 A7.0 C37	26	S-SW 6-8	11 + squid (6 living) + fish	North of Eddystone reef.

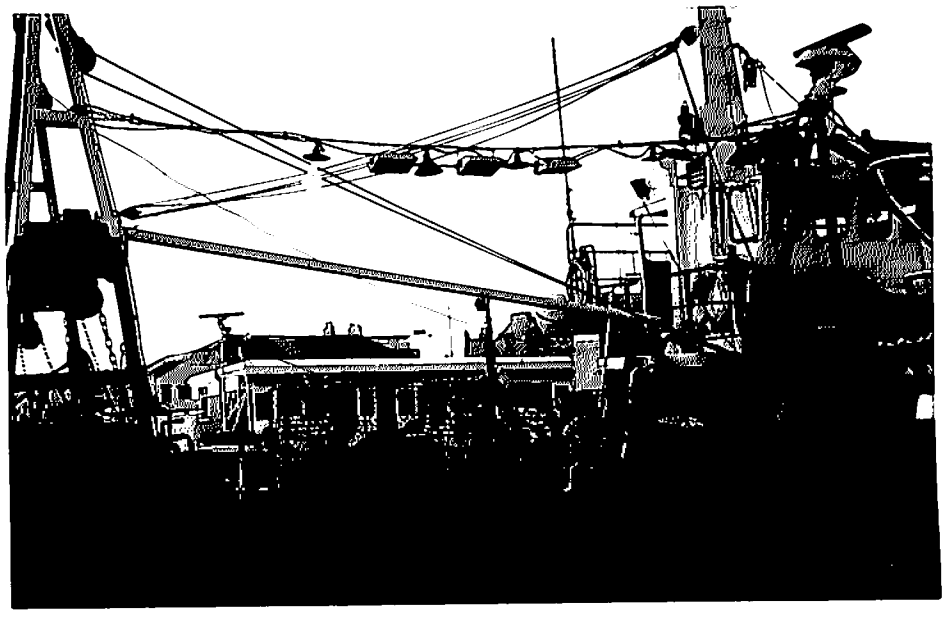
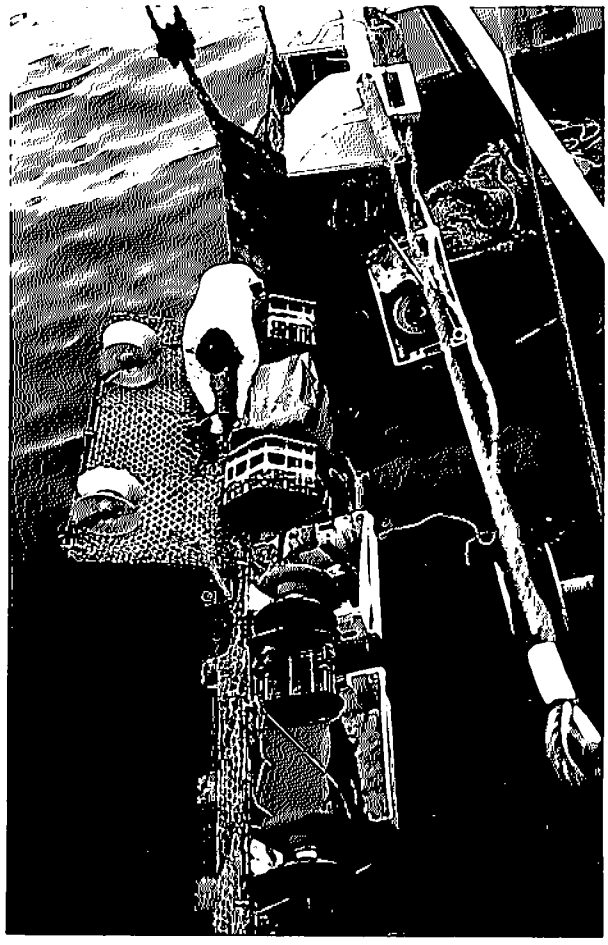


Plate 1. General view of R.V. Squilla

Plate 2. Overhead Lighting array showing the quartz-iodide floodlights, incandescent bulbs and the halyard assemblies for the four gas lamps.



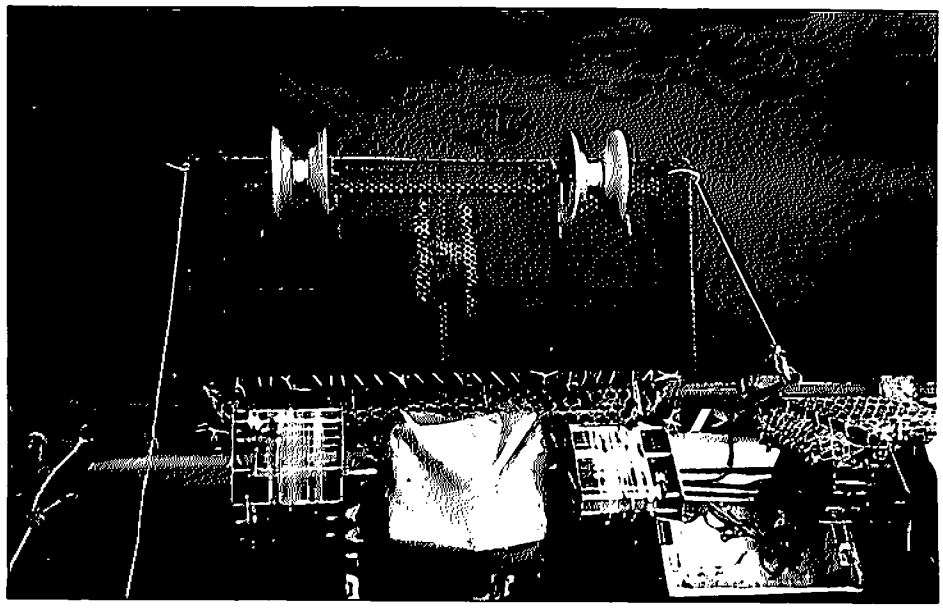


Plate 3. After deck showing relative position of the light source to the ships rail

Plate 4. One jigging machine assembly. Additional netting has been attached to the inner edge of the wire mesh tray to form a squid collecting chute.