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Investigations on the Bottom Conditions and the Possibilities for Marine Prawn and Fish Trawling on the North and East Coast of Ceylon

By

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INTRODUCTION

The execution of this survey was decided upon by Swedevelop in agreement with the Ceylon Fisheries Corporation and was a part of the investigations and studies for a fishery project at Trincomalee which was carried out by Scandia Consult.

The main purpose was to investigate the following aspects :—

(*a*) Bottom conditions, especially prawn trawling conditions ;

(*b*) Size of the potential prawn trawling catches ;

(*c*) Size and quality of the potential fish trawling catches ;

(*d*) Suitable sizes and types of boats and trawling gear ;

(e) Duration of trawl fishing season.

Earlier Investigations and Experiences from Trawling Along the East Coast

In earlier times both exploratory and commercial fish trawling had been tried on the East Coast, particularly on Pedro Bank. In the literature are mentioned the operations carried out by ' Violet ' 1907 (survey), by ' Lilla ' 1920–23 (survey), by ' Tongol ' and ' Bul Bul ' 1928–35 (commercial fishing). The results of the ' Lilla ' expedition are carefully related in a detailed report. These results are analysed and compared with the results of the present survey. Recently, prawn trawling had been tried in different areas. During the last decades a large amount of imformation has been collected from commercial and exploratory fishing around the coasts of Ceylon and on Wadge Bank. All this material has been carefully analyzed and recorded, among others, by G. de Bruin (prawn trawling), A. S. Mendis (trawler fishery), N. N. de Silva, A. C. J. Weerakoon (fish production), to mention a few of the Scientists. Other publications of interest are mentioned in the bibliography.

Of great value has also been the experiences related by M. M. Rasiah on prawn trawling and those of Captain M. de Mel on trawling on Wadge Bank.

Investigation Period

The investigation for the present study were planned to take place during the period May 18 to June 16, 1967, but due to lack of satisfactory equipment and survey vessels the test fishing started only on June 2. In the beginning, two 11 tons trawlers and the ' Canadian ', all of them stern trawlers

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of small size were used. It was found, however that a bigger vessel would be necessary for the investigations on the Pedro Bank. The 235 ton stern trawler, ' Myliddy ' was made available subsequently. She left Trincomalee on June 14 for the investigations on Pedro Bank. With this boat and a crew of 23 men, the programme was finished on June 27.

Methods, Gear and Survey Vessels

The sea bottoms were investigated with echosounder, sounding with lead and tallow and with otter trawls.

The prawn resources were examined using two different types of trawl nets, one Japanese (30 feet headline, 35 mm meshes in codend), the other Swedish (100 feet headline, 40 mm meshes in codend).

The fish were captured using an English Trawl of the Granton Type (80 feet headline, 80 mm meshes in codend).

For each haul, the effective fishing time was usually half an hour with the prawn trawls and one hour with the fish trawl. The trawling speed was 1½–3 knots with the prawn trawls, and usually 3–4 knots with the fish trawl.

Survey ships were stern trawlers, two ' 11 tons ' trawlers built of iron, the ten year old 45 feet wood trawler the ' Canadian ', and the one year old Yugoslavian 110 feet iron trawler ' Myliddy '. The 11 tons trawlers were not quite suitable for survey purposes. The ' Canadian ' was suitable for prawn trawling near the shore, but too old and worn down to be safe in open sea and too small in the strong monsoon winds.

Mr. M. Rasiah was skipper on board ' Canadian ' and Mr. M. de Mel Captain on board ' Myliddy '. Thanks to their skill, great experience and strong support it was possible to fulfil the programme as planned. Survey leader on board ' Canadian ' was the Swedish trawler skipper Stig Abrahamsson, and on board ' Myliddy ' was the author.

It may be emphasized that for reasons related to the survey aspect, it was suitable or necessary to work with lower speeds, smaller trawling gear, other size of meshes in the trawl and shorter trawling hauls than what will be the most effective in conjunction with a commercial trawling operation.

The three small trawlers worked the areas near the shore, especially in soft bottoms where prawns could be expected. During night, these boats anchored close to shore. The bigger vessel, ' Myliddy ', trawled the distant areas, i.e., the Pedro Bank, the region north of Pedro Bank, and Palk Bay. This vessel worked at first on a continuous basis, but later, when it became evident that the programme could be fulfilled in time, was put to anchor for about five hours each night on the trawling ground.

The trawling stations were spread uniformly over the whole area investigated. The general practice was to carry out a one hour haul, then steam for one hour before starting the next one hour haul, irrespective of the quantity of fish caught. In this way a large areas was quickly covered, but the average catches suffered, since no concentration was attempted over good fishing grounds, such as a commercial trawler would practice.

The results may therefore be regarded as representing a conservative estimate of the commercial importance of the fish resources.

Investigated Areas

The sea grounds of the North and East Caosts of Ceylon were investigated. These areas extend from Adams Bridge to 7° 30′ N. lat. 20 miles south of Batticaloa, the distance between these points being about 240 miles (450 km.). The Pedro Bank and the regions north of Pedro Bank were included in these investigation areas (Fig. 1 and Table I).

TABLE I

Areas investigated during the survey

Area	*Surface* *sq. km.*	*Depth* *fathoms*	*Distance to Trincomalee, nautical miles, steaming times*	*Bottom characteristics*	*Fishing season*	*Catch of fish per hour at experimental trawling*
1.* Palk Bay	2,500	5–8	140-180 n.m. 15–20 hours	fine, sand, mud, clay	for boats from east coast harbour April to September for boats from local or west coast harbour 10 months	820 kgs. (prawn trawl) 1,200 kgs. (fish trawl)
2. Point Pedro	abt. 2,000	2–7	70–120 n.m.	sand, coral sand, mud	—	—
3. Pedro Bank	3,600	7–80	70–120 n.m. 8–13 hours	flat hard shell-sand, gravel, rocks, corals	all year	365 kgs.
3.A North of Pedro Bank	1,400	10–80	120–170 n.m. 13–18 hours	flat sand, shell gravel	all year	100 kgs.
4. Mullaitivu	500	8–80	40–60 n.m. 4½–7 hours	mud, clay, sand stony	all year	100 kgs. (prawn trawl) 250 kgs. (fish trawl)
5. Trincomalee	600	8–80	10–30 n.m. 2–4 hours	sand, stony, rocks, corals	all year	100kgs.
6. Batticaloa	1,200	10–50	30–70 n.m.. 4–8 hours	rough and stony corals, sand mud	all year	6 kgs.

In older literature, for example Perason and Malpas (1926), no distinction is made between what is here termed Pedro Bank and the regions to its North, but here we have chosen to divide these waters in two separate regions, with the border line between them defined at lat. N. 10° 25′.

The investigated area, from the shore out to the edge of the continental shelf (to a depth of 100 fathoms) covers more than 15,000 sq. km. The width of the shelf ranges from about 8 miles in the Trincomalee and Batticaloa Regions to about 35 miles in the Pedro Bank Region.

Zones of 4 miles width along the coast of Ceylon and of 12 miles width along the south-east coast of India, as well as all areas outside these zones shallower than 5 or 6 fathoms have been excluded from fish trawling on account of three reasons.

The first reason was that the local fishery, which is largely based on bottom gears (fish traps. handlines etc.) and dirftnets made use of this area.

*Nos. refer to those marked in Figure 1.

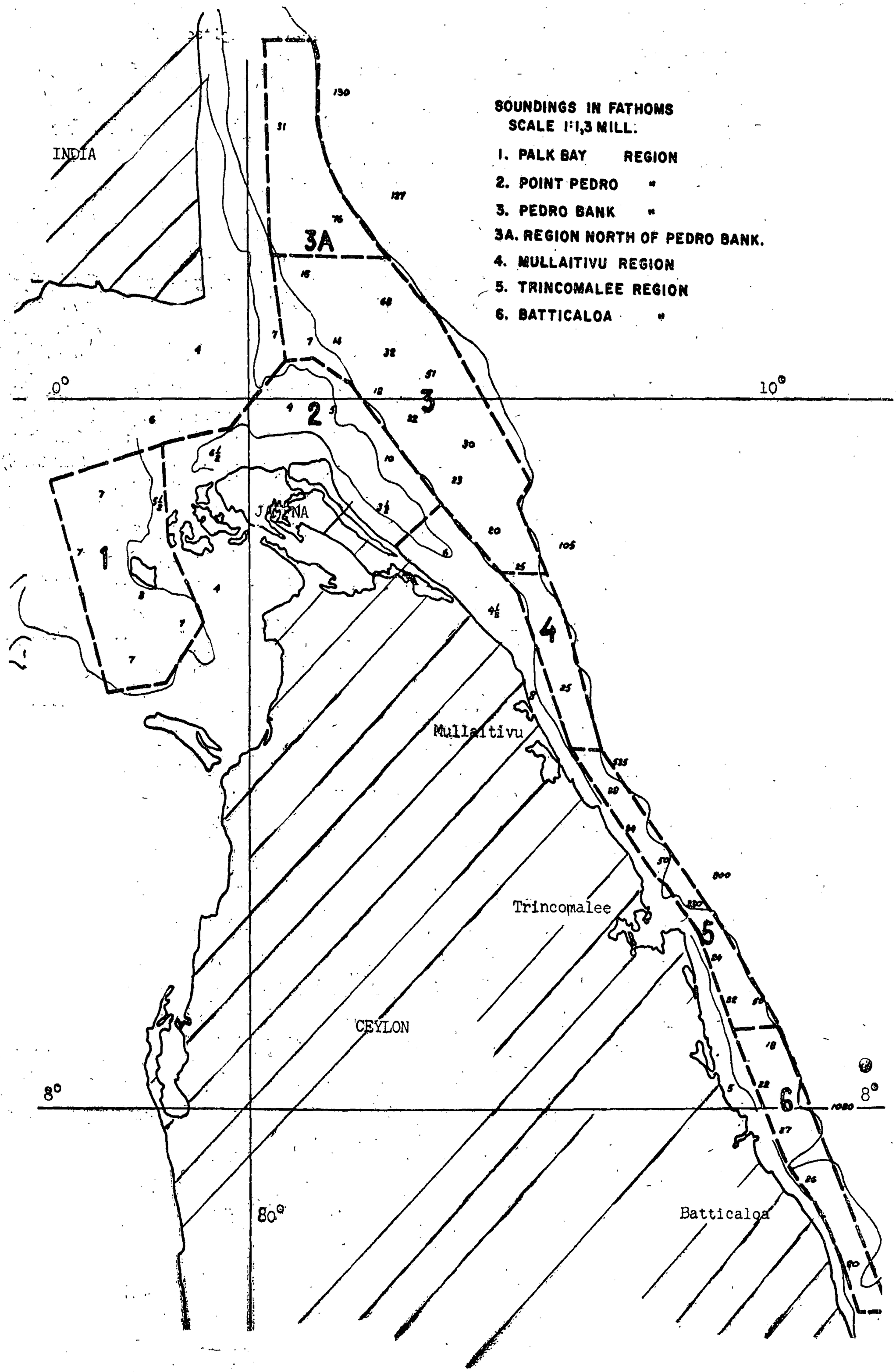

Fig. 1. Map of the Northern portion of Ceylon indicating the sea grounds investigated. (See Table I)

The second reason was that it would be dangerous or impossible to trawl in these shallow waters during the north-east monsoon, and in vast areas in the Point Pedro-Palk Strait region in the south-west monsoon as well.

The third reason was that the fish resources seemed to be poor on most of the shallow bottoms suitable for bottom trawling, which mainly consisted of pure sand (except Palk Bay).

On account of these circumstances, large parts of Palk Bay, the entire Point Pedro region and a 4 miles zone along the East Coast were excluded from fish trawling. About 10,000 sq. km of sea bed were investigated.

Winds and Hydrography

(*a*) WINDS

Dominating winds on the east coast are the north-east monsoon during November-March and the south-west monsoon during May-October. The wind velocity reaches 15 metres per sec. during several weeks in May-June and sometimes in November-January.

(*b*) CURRENTS

A constant bottom-drift of cold Antarctic water transports nutrient salts along the continental shelf on both sides of Ceylon up to at least the 10th northern latitude, i.e., slightly north of Point Pedro, which is the extreme northern point of Ceylon. The surface currents are changing with the monsoons, on the east coast mainly streaming in north-ward direction during February-July and in south-ward direction during October-December. The current can be very hard, up to 4–5 knots in some cases, according to information conveyed by the Commodore of the Ceylonese Navy.

(*c*) WATER TEMPERATURE

The surface water temperature over the year varies between 25 and 30° C. At 200 metres depth the temperature is 13–14° C and at 400 metres 11–12° C.

(*d*) SALINITY

The surface salinity is on the east coast of Ceylon 32·5–34 o/oo and on the west coast 34–35 o/oo.

Bottom Conditions

The continental shelf outside the Eastern Coast of Ceylon deepens slowly for about 10 miles out to 100 fathoms depth, and form there inclines sharply down to more than 2,000 metres. To the east of Point Pedro the shelf extends to the Pedro Bank, with depths varying between 10 and 100 fathoms. To the north and west of Pedro Point there are vast extremely shallow waters.

Bottoms suitable for trawling are found in all regions, but very good conditions prevail only north of the Trincomalee region.

Outside the above mentioned local fishing zone, about 8,000 sq. km. constitute good trawling grounds. Of these areas 3,000 sq. km. are soft bottoms situated in Palk Bay and south-east of Mullaitivu, 5,000 sq. km. hard bottoms on Pedro Bank and the regions north of Pedro Bank along the south-east coast of India.

The soft bottoms consist of mud including organic material and clay, the hard bottoms of sand, shell sand and flat rocks covered with Gorgonids and Sponges.

About 2,000 sq. km. in the Trincomalee and Batticaloa regions are partially rough and steep bottoms, which are difficult or impossible to trawl.

On the Pedro Bank the bottom is generally hard and flat, but with some areas slightly rough. Nevertheless the whole area can be trawled in directions south-west to north-east and most areas in all directions. Spots have been found with rocks, coral reefs or wrechs, where trawls can be damaged or lost. After marking, these spots will cause no trouble. The small damages experienced in other spots were of sorts that they can be avoided by the use of bobbins on the ground rope. Moreover intense trawling will make the bottoms less rough.

North of the Pedro Bank the bottom seems to be flatter and still better for trawling than on the Pedro Bank, but with poorer fish resources.

In Palk Bay soft muddy bottoms are found all over the area in waters deeper than 2 fathoms. The region will be unapproachable from the east during the north-east monsoon since only 3–4 fathoms deep waters intervene. For that reason this region can be exploited only 7 or 8 months per year by big trawlers.

The Mullaitivu region consist mainly of soft muddy bottoms from about 5 fathoms depth out to the edge of the shelf, with about 50 fathoms depth between lat. 9° (off Kokkilai) and 9° 25′.

In the Trincomalee and Batticaloa regions the investigated areas cover a surface area of about 2,000 sq. km. Rough bottoms will, however, limit trawling operations in this area.

In the northern part of the Trincomalee region and in most parts of the Batticaloa region, the bottoms appeared fairly flat on the echosounder. But the trawl fastened, or was very badly damaged, on sandrocks or corals at several points. However, if the trawl were to be equipped with bobbins, it will probably be easy to find suitable trawling areas in these regions as well. The fish catches, however, were much lower than on Pedro Bank.

Malpas (1926) writes about the surveys conducted on ' Lilla ' " Areas X and XI (Batticaloa to Mullaitivu) provide good trawling grounds and although our catches were not particularly large, these areas should not be entirely neglected ".

Harbours

From Adams Bridge along the north and east coast down to the south point of Ceylon (Dondra Head) there are no other harbours available than Trincomalee, where vessels bigger than 50 tons can go in to a quay. The only natural harbour, Trincomalee apart, is Kayts at Palk Bay west of Jaffna, where boats of the size of the ' Canadian ' and smaller can anchour in lee. However, it is impossible for bigger trawlers to reach this harbour during the north-east monsoon on account of the vast shallow areas which must be passed.

The waters along the whole coast are shallow and the shore consists of sand beaches, except in the Trincomalee Bay. Therefore, it is impossible to build fishing harbours at a reasonalbe cost at other locations than Trincomalee, where Cod Bay seems to offer the most suitable harbour localization.

Navigational Aids

Navigation is particularly difficult in the shallow areas of the Point Pedro region and Palk Bay, even in broad daylight. For intensive fishing, using big trawlers, it will become necessary to add new lighthouses and navigation marks. Along the approach to Palk Bay from Point Pedro Region it is desirable that one or two light-buoys and some other marks be anchored. On the islands in Palk Bay the building of two or three more lighthouses are proposed. The positions of some wrecks ought, furthermore, to be marked. For better convenience and safety, lighthouses and other navigation marks should be erected or anchored at several other locations along the east coast as

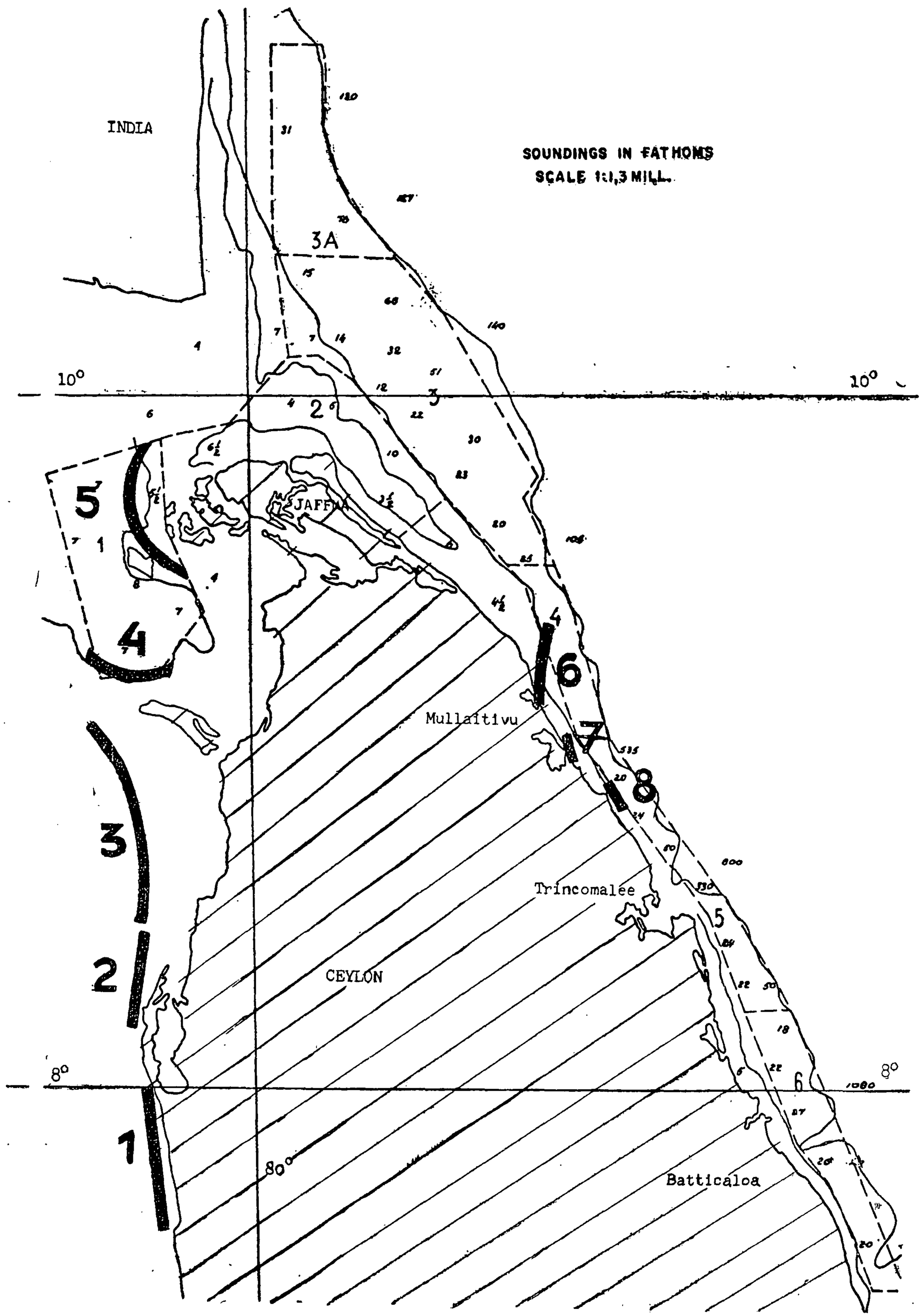

Fig. 2. Map of the Northern Portion of Ceylon indicating the areas where prawn trawling surveys had been carried out. (See table II)

well. To facilitate trawling on Pedro Bank, it is recommended to install a more intense light source in the Point Pedro lighthouse and to anchor a light buoy about 15 miles north-east of Point Pedro (Lat. 10°, Long. 80° 30′).

Distances from Trincomalee to the Fishing Grounds

The principal waters for a bottom trawl fishery on the east coast will be represented by the Pedro Bank. The distance from there to Trincomalee will on the average be about 110 miles, or 12 hours of steaming with a speed of 9 knots. The corresponding distance between Wadge Bank and Colombo is 150 miles or 17 hours of steaming. Steaming times to the other trawling areas are given in Table 1.

Prawn Trawling and Prawn Resources

Exploratory trawling for prawns had been carried out recently on the north-western and north-eastern coasts of Ceylon. Areas where such surveys had been carried out are indicated in Fig. 2 and Table II.

TABLE II

Catches of prawns from trawling operations carried out by Captain Pyne along the coasts of Ceylon

(Extracted from a compilation by Dr. de Bruin.)

Region[1]	*Season*	*Year*	*Depth (fathoms)*	*Wind direction*	*Total catch (lbs.)*	*Catch per hour (kgs.)*
WEST COAST						
1	November-January	1963–64	3–8	NE	1,300	25
2	April	1964	4	NE	30	14
1	April	1963	3–8	SW	404	10
2	April	1964	3–4	SW	10	0.1
2	November, December, January	1964–65	3–6	NE	240	1
3	March	1964	?	NE	9	0·2
3	January, February	1965	?	NE	370	4
NORTH COAST (Palk Bay)						
4	April, May	1965	?	SW	325	2·5
4	September	1964	?	SW	2	0·3
4	October, January	1964–65	?	NE	1,430	6
4	June 19 (night)	1967	6–7	SW	9	4
4	June 20 (day)	1967	5–7	SW	0·5	0·2
5	April	1965	4–7	SW	42	0·7
5	June 19 (day)	1967	7	SW	2·5	0·5
5	October	1963	4–8	NE	40	0·5
EAST COAST (Mullaitivu region)						
6	September	1963	4–15	SW	1,150	5·4
6	October	1963	9–13	NE	176	5·6
6	May, June	1964	?	SW	275	2
6	July, August, September	1964	10–16	SW	1,350	6
6	June 22 (night)	1967	9–10	SW	3	1·5
7	September	1963	9–11	SW	28	7
8	September	1963	12–18	SW	18	1

[1] Region numbers refer to those marked in figure 2.

1967 SEB

The trials made earlier by Rasiah, Pync, de Bruin and others (Appendix A) show that prawns can be trawled in Palk Bay and Mullaitivu over a period of serveral months, but the catches show substantial fluctuations and are in most cases too small to be of commercial interest. During the best part of the season, the hourly catch varied between 6 and 12 kgs. on the average.

During the Survey now being reported prawns were found only on the soft bottoms and even there in very small quantities. In Palk Bay and the Mullaitivu Region a few pounds were caught in 7 out of a total of about 30 hauls of half an hour's duration. In addition single prawns were caught in some areas near Batticaloa. In this region the soft bottoms, which are situated close to the shore, are of very small size. Therefore, they are no importance for a commercial fishing operation conducted from Trincomalee.

Fish Trawling and Fish Resources

A complete liot os trawling hauls carried out during the survey along with charts indicating the position of these hauls, the fish catches for each haul in the respective areas and a specimen copy of the form used for the trawling records are given in Appendices ' B ' to ' G '.

The percentage distribution of the different fish species by regions is given in Table III while Table IV compares the results obtained during the 1967 survey with those of earlier ones done by ' Violet ' and ' Villa '.

TABLE III

Percental distribution of fish species and average individual weights

Region	*Fish trawl*		*Prawn trawl*	
	% of total catch	*average weight (kgs)*	*% of total catch*	*average weight (kgs)*
PALK BAY				
Mackerels, Seer	1	—	½	—
Mullets [1]	2	—	—	—
Silver Bellies	26	0·2[2]	91	0·01–0·02
Spotted Batfish (Painthi)	60	2	—	—
Skates, Sharks	11	—	8½	1–100
Prawns (Penaeidae)	—	—	—	0·02
PEDRO BANK				
Mackerels, Seer	4	1–3	—	—
Mullets [1]	81	2–4	—	—
Silver Breams etc.	3	½	—	—
Skates, Sharks	12	1–150	—	—
NORTH OF PEDRO BANK				
Mullets [1]	39	3	—	—
Silver Breams	42	½	—	—
Skates, Sharks	19	—	—	—
MULLAITIVU				
Mackerels, Seer	53	½–5	—	—
Mullets [1]	12	2–4	—	—
Silver Bellies	18	0·1	—	—
Silver Breams	7	—	—	—
Skates, Sharks	10	1–40	—	—

[1] Incl. Groupers, Snappers, Rock Cod and similar demersal fishes.
[2] Incl. Pomprets and similar varieties.

TABLE IV

Comparison of the trawling results obtained by surveys conducted on board "Violet" 1907, "Lilla" 1920, "Myliddy" and "Canadian" 1967

Region	*Number of hauls*	*Total trawling time (hours)*	*Edible fishes*		*Catch of fish per hour (lbs)*
			1st class	*2nd class*	
PALK BAY					
Lilla	22	22			230
Myliddy (fishtrawl)	2	1			2,700
(prawntrawl)	10	5			1,800
POINT PEDRO					
Lilla	15	15			52
Myliddy	1	0·2			900
Canadian	11	10	65%	35%	110
PEDRO BANK (including north of Pedro Bank)					
Violet	18	26			263
Lilla	26	32·½	85%	14%	126
Myliddy	25	28	86%	14%	600
MULLAITIVU					
Lilla	15	15			48
Myliddy	6	5	90%	10%	430
Canadian	18	10	2%	98%	150
TRINCOMALEE					
Lilla	22	22			35
Myliddy	6	4	80%	20%	280
Canadian	3	1·½			
BATTICALOA					
Lilla	15	15			41
Myliddy	6	5	56%	44%	120
Canadian	3	2·½			

On Pedro Bank average fish yield was about 300 kgs. (650 lbs.) per hour. If hauls at depths beyond 45 fathoms and hauls being complete failures on account of other reasons, which was the case for 5 out of 21 hauls, were to be excluded, the average catch per hour rises to 350 kgs (770 lbs).

The catches consisted to 86 per cent. of highly valuable fishes, mainly belonging to such bottom-feeding species as Sea Bass, Snappers, Sea Bream (Serranidae, Lutianidae, Lethrinidae), Seer and Horse Mackerel (Scomberomorus, Carangidae). The remaining 14 per cent was made up of less valuable fishes, mostly Skates and Sharks Table IV.

The best catches were taken in depths between 10 and 40 fathoms. Skates seem to be more common on shallow bottoms, above the 20 fathoms level.

In Palk Bay the average yield was, using prawn trawl, about, 800 kgs of fishes (1,800 lbs.) per hour. When using fish trawl, the catches were still higher, but only two hauls were carried out.

When discounting the presence of a few highly valuable fishes Mullets, Mackerels, the catches consisted to 93 per cent. of Silver Bellies and Painthi (Leiognathus, Drepane), the remaining 7 per cent being constituted by skates and sharks. Silver Bellies and Painthi are in this connection classified as 1st class edible fishes, in order to distinguish them from skates and sharks Appendix E, page 84).

In the region north of Pedro Bank and in the Mullaitivu region south of Pedro Bank, the fish yield was roughly half the hourly catch experienced on Pedro Bank or about 150 kgs (330 lbs.) per hour. The composition of the catches was about the same as the one recorded on Pedro Bank.

In the Trincomalee and Batticaloa regions, the catches were smaller, representing on the average about 100 respectively 60 kgs (200 resp. 130 lbs.) per hour, and showed appreciable fluctuations, which probably were due to the, with respect to trawling, difficult bottom conditions.

Malpas (1926) states regarding the trawling fishery on Pedro Bank : " This is the only area around the eastcoast of Ceylon which shows promise for a trawl fishing enterprise ". According to his records the average hourly catch on Pedro Bank was 126 lbs. compared to a figure of 195 lbs. on Wadge Bank.

On trawling on Wadge Bank Pearson and Malpas (1926) writes :

" Our first trawlings over this area were not promising an average catch of only 70 lbs. being obtained for 31 one hours trawls, but a later trial made over the Wadge Bank proper, instead of spreading up the coast, showed fish to be very plentiful. On this occasion we adopted the commercial practice of fishing continuously through the day and obtained the following results, (including 1,2% of inedible fish). The figures have reference to 36 trawls extending over 43 hours ".

The following figures are excerpted from Person and Malpas 1926 :

Wadge Bank	*Total catch*	*Edible fishes*		*Inedible fishes*
		1st class	*2nd class*	
	lbs.	*lbs.*	*lbs.*	*lbs.*
Average catch per hour	195·32	170·14	22.86	2.32
Percentage	100	87·11	11·70	1·19

If all effective hauls of ' Lilla ' on Wadge Bank, with the first period included, are taken into consideration the average catch per hour was 145 lbs.

Evidently the results of ' Lilla ' do not show any significant difference between Wadge Bank and Pedro Bank neither with respect to the yield nor as regards the composition of the catch. Of interest is the opinion of Captain de Mel on ' Myliddy ', who usually fish commercially with this trawler on Wadge Bank. According to him, our catches on Pedro Bank were very similar to those encountered on Wadge Bank, but the size of the fishes were probably on the average, somewhat bigger.

Malpas gives no details on the trawling speed, nor the size and type of trawl used in conjuction with the survey carried out on board ' Lilla ' along the east coast of Ceylon during July–September 1920 and August–September 1921. However, his views on the trawling conditions and the fish resources correspond well to the experiences gained by us in June 1967, on board ' Myliddy '. The principal difference concerns the magnitude of the average hourly catch, which for the survey carried out by ' Lilla ' was substantially lower than the comparative figure obtained by us. The reason for this discrepancy is the use by ' Lilla ' of a much smaller trawl net of small mesh size, combined with a lower trawling speed.

Both surveys were based on hauls of one hour duration. Of great importance is that both surveys have resulted in similar conclusion. ' Violet ' (1907) too got the best results east of Calimere Point.

It may be emphazised that ' Myliddy ' and ' Canadian ' conducted as many hauls and trawling hours on the Pedro Bank and in the Mullaitivu region as ' Lilla ' but far less in the other regions, i.e., Palk Bay, the Trincomalee and Batticaloa area. On account of the bigger catches per hour, a total catch of 16 tons in 91 hauls during 92 hours was recorded, compared with ' Lilla's ' total catch of 5.4 tons in 115 hauls during 121 hours.

Prospects for a future commercial trawling operation

The task was to determine the potential of a commercial trawling operation, from the point of view of long-term exploitation of a fleet of vessels, working on a year around basis.

The prawn resources were too limited for the development of a special prawn trawling fishery.

The fish resources were in general, very good, especially on the Pedro Banks, both as regards the quantity as quality.

It was obvious that commercial fishing will yield bigger catches than those experienced in connection with an exploratory trawling operation. Moreover, the commercial trawling can be rendered more effective by the introduction of better technical equipment, such as :

Bobbins on the ground rope of the trawl.

Higher trawling speed, about 5 knots, compared to a survey speed of 3-4 knots.

Bigger size of the trawl, the headrope more than 100 feet.

Bigger size of the meshes in the wings and the front part of the trawl.

Radiotelephone equipment on all trawlers for better planning and mutual direction to the highest yielding areas at any given period.

Marking of rocks and wrecks and other dangerous points. The importance of this has been pointed out by Weerakoon, (1955) who states: " Exact figures are not available to me but I have gathered, from what the Department's Extension Officers have reported about the time they have to spend on work in connection with wrecks, that for want of adequate shelters you are already losing about 2 dozen ' mechanised boats ' a year, that is about 10 per cent. of your average annual issue of these boats ".

Not only positive factors are to be expected from an intensive tarwling opertion. It is necessary to calculate with at least following negative factors :

Intensive exploitation over several years will reduce the present crop of fish to a state of balance, with a standing crop of younger and more rapid growing fishes than now.

The bottom conditions can be changed and deteriorated for the fishes by the continuous scraping of the trawls. The Gorgonids and Sponges, where the fishes are hiding, will successively disappear in the zones of trawling.

Jelly fish will, during some periods, cause trouble and decrease the size and brilliance of the catch.

With regard to the high quality of the catch required for the project, the hauls should be limited to two hours. About one hour per haul will be required for handling, unloading and shooting of the trawl (incl. steaming within the fishing ground). A total of 7-8 hauls can thus be carried out during an average fishing day.

The experiences gained on Wadge Bank do not indicate any occurrence of seasonal variations resulting in smaller catches during the north-east monsoon, i.e. from November to February, on the contrary bigger catches are rather to be expected. However, in order to be on the safe side, it might be better to calculate with a lower average catch on a year around basis, than that of the month when the survey was conducted.

All factors considered, it appears to be possible *at present* to arrive at an average hourly catch of 350 kgs. when trawling on Pedro Bank, which in terms of the corresponding daily and annnal catches will come out to 5 and 1,000 tons respectively. However, catches of this magnitude will probably not be reached when operating a fleet of many trawlers over a period of several years in these waters, With due respect of the latter, conservative calculations indicate an average hourly catch of the order of 250 to 300 kgs. (550 to 660 lbs.), giving rise to a daily catch of 3·5 to 4·5 tons. or 21 to 27 tons per scheduled eight days trip (of which 6 days of effective trawling). By introducing a system of alternating crews, it should be possible to schedule 30-40 trips per year and boat, resulting in an annual catch of 700 to 800 tons, when trawling on Pedro Bank.

For the other regions, the catch potential may be calculated in a similar manner, i.e. as a function of the fish resources and the distance from Trincomalee to the fishing grounds.

These calculations correspond well with the result obtained from the operation of the four Yugoslavian trawlers on Wadge Bank during 1966 and 1967, and on Pedro Bank, during July-November 1967 (Appendix H and I).

Other fishing methods than trawling

For a commercial fishing project at Trincomalee, bottom trawling will be the most important fishing method. But during some seasons, shoals of pelagic fishes approach the coastal areas. For limited periods, it may thus be more profitable to apply other fishlng methods and gear, i.e. midwater trawling, purse seining, longlining and driftnetting.

Potential fish resources

The questions relating to the potential fish production along the Ceylonese coast have been discussed during symposiums in Colombo in March and December 1965. The figures mentioned at these discussions are of importance for our calculations, even if they are ' more in the nature of guesses ' (S.S.H. Silva, 1965).

The standing crop of fish and the growth rate can never be estimated by means of limited trawling surveys. The annual catches of fish, the size of the individual fish, the growth rate etc. will be affected by an intense commercial fishing operation. First after a long period of extensive fishing, say over a twenty year period, it will be possible to establish accurate estimate of the actual productivity of fish. For that reason it be desirable to estimate the number of trawler on some other basis and not only on the experiences from Ceylonese waters.

Dr. N. N. de Silva 1964, and other scientists have made comparisons with North Sea fisheries. This region is particularly suitable for such a purpose as intense fishing and research have been going on there for many decades. When comparing resources and size of fishing fleet, it must be taken into consideration that the fishing fleet in the North Sea is too big and consequently over fishing is a reality in this sea. Restrictions of the catches and landings have been introduced long ago. On the Ceylonese east coast in may consequently be correct to calculate in the first stage with not more than one third of the fish trawlers used in the corresponding area in the North Sea region. That means about 30 trawlers (60-70 feet) for the trawling area investigated off the East coast of Ceylon. (11,000 sq. km. or 3,000 sq. miles). These 30 trawlers would catch about 20,000 tons of fish a year corresponding to half the present catches along the north and east coast. Certainly the catches of the trawlers would be taken on deeper waters than those of the present local fishermen. But nevertheless they would strongly influence the local fisheries.

With this calculation the fish catch per sq. km. will be 2 tons. It is considerably lower than the productivity calculated by Ceylon Fisheries Corporation in its 10-year plan 1968. For that reason these calculations seem to indicate that there will be no risk for over exploiting if a 30 trawler fleet is built up based on a fishing harbour at Trincomalee. The building up of the trawler fleet has however to be carried out successively and carefully in several steps with not more than 3-4 trawlers in each step.

Perhaps the most profitable size of the Trincomalee harbour in the first period will be for 10-15 trawlers. The harbour in a later period can easily be enlarged to the double capacity.

On the Pedro Bank only a maximum of 6 or 8 trawlers operating on a year around basis appear feasible. Perhaps a catch much higher than 5,000 tons i.e. 2 tons per sq. km. (corresponding to 7 trawlers) will be possible, say up to 10,000 tons, which is corresponding more to the size of productivity per sq. mile calculated by Ceylonese experts. Such a high off take however requires a very intense fishing, which will definitely change the composition and the standing crop of fish, as well as the biological equilibrium in such a way that no prognosis is possible as regards the future catches.

Since the biological conditions are the same on Wadge Bank as on Pedro Bank the best prognosis for the future development of trawling on Pedro Bank would be to calculate with the same development as on Wadge Bank.

It must be strongly emphazised that calculations of this kind, trying to evaluate future catches depending on certain techincal and biological basic conditions, are mostly in vain. The irrational factors of human beings are the main deciding dimentioners of the production of fish catches. The above mentioned calculations must be seen in such a perspective. Of that reason the building up of the harbour and the fishing fleet is recommended to be done in several steps.

SUMMARY

The investigation area has been the coastal waters from Adams Bridge in North to a point some miles south of Batticaloa, at depths varying from about 6 fathoms to about 80 fathoms at the edge of the continental shelf. The survey was carried out during the period May 18-July 3, 1967.

The main purpose was to collect as much information as possible about the prawn and nsh resources and the trawling conditions of waters subject to exploitation in an integrated fishery project based on a harbour in Trincomalee.

Main results

(*a*) The bottom are in general suitable for trwaling, except in the Trincomalee and Batticaloa regions.

(*b*) The prawn resources are restricted to soft bottoms, i.e. almost only to Park Bay and Mullaitivu Region.

(*c*) The fish resources are very good or Pedro Bank, about the same as on Wadge Bank, good in Palk Bay and fairly good in the regions north and south of Pedro Bank.

Conclusions and recommendations

1. A fishing harbour it recommended to be built in Trincomalee for 10–15 trawlers.

2. On Pedro Bank in should be possible to develop trawling fisheries in the same way as on Wadge Bank. Fisheries based on trawling can be developed in the other regions too.

ACKNOWLEDGEMENTS

I wish to thank the Chairman and Directors of the Ceylon Fisheries Corporation, its officials and fishery biologists for their storng support and advice. I also want to thank Mr. M. Rasiah and Captain M. de Mel and the crews of the trawlers placed at our disposal.

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APPENDIX A—Result of Exploratory Fishing done by the "Canadian" and "North Star"

CATCHES LANDED BY CAPTAIN PYNE DURING THE PERIOD DECEMBER 1963 TO MAY 1965 (WITH PRAWN TRAWL)

(FIGURES COMPILED BY DR. DE BRUIN)

Area	*Vessel*	*Year and month*	*Monsoon*	*Number of days of fishing*	*Gear used*	*Number of hauls*	*Range of depths in Fathoms*	*Total fishing time in hours*	*Total catch in lbs.*	*Catch in pounds*		*Breakdown of catch into Species lbs.*
										Per haul	*Per hour*	
Chilaw to Karrukkapona	KBB 2,*	Dec. 63	NE	3	PT	28	(4-6)	11	562	20	51	Prawns 532, Silver Biddies Rock fish, Mullet, Cat-Fish, Skates and mixed varieties 30
Chilaw to Karrukkapona	KBB 2,*	Jan. 63	NE	2	PT and LPT	13	—	6	435	33	72	Prawns 424 mixed varieties 11
Chilaw to Karrukkapona	Cana dian	April 63	SW	10	PT and TN	42	(3-8)	42	5,428	129	143	Prawns 404, Silver Biddie 140, mixed varieties 4,849 Small fish 35
Chilaw to Karrukkapona	Canadian	Nov. 63	NE	5	PT and TN	23	—	3	2,531	110	133	Prawns 333, mixed varie- 2,198
Chilaw to Karrukkapona	Canadian	Jan. 64	NE	1	PT	4	(7-8)	4	191	48	48	Prawn, 5 mixed variety 186
Chilaw to Karrukkapona	Canadian	April 64	NE	1	PT	1	4	1	278	278	278	Prawn 30, mixed fish 240 Koduwa 8
Kalpitiya	Candaian	Jan. 64	NE	10	PT	59	(3-5)	59	20,191	342	342	Silver biddies 8,180, mullet 3,708, cat fish 3,475 skate 140, mixed varieties 4,688
Kalpitiya	Canadan	Feb. 64	NE	9	PT	59	(2-5)	57	37,359	633	655	Silver biddies 14,848, mullet 6,935, cat fish 7,690, skate 1,405, mixed varieties 6481
Kalpitiya	Canadian	Dec. 64	NE	3	PT	15	(2-4)	15	3,109	207	207	Silver biddies 1,017, rock fish 971, cat fish 512 mixed varieties 609
Kalpitiya	Canadian	Jan. 65	NE	2	PT	8	(3-4)	80	2,411	301	30	Silver biddies 725, rock fish 326, cat fish 454, mixed varieties 641, skate 264
Kalpitiya	North tar	Feb. 64	NE	4	PT	26	(3-5)	23	11,691	450	508	Silver biddies 5,003, mullet 1,977, cat fish 2,680, skate 1,590, mixed varieties 441
Kalpitiya	North Star	March 64	NE	2	PT	11	—	11	4,724	429	429	Silver biddies 2,780, mullet 70, cat fish 708, skate 575, mixed varieties 591
Kalpitiya	North Star	April 64	SW	6	PT	35	(3-4)	42	11,634	332	279	Silver biddies 3,174, mullet 2,068, cat fish 2,077, skate 2,590, prawn 10 mixed varieties 1,715
Kalpitiya	North Star	Nov. 64	NE	7	PT	41	(3-5)	41	16,494	402	402	Silver biddies 8,161, mullet 2,452, cat fish 2,885 skate 205, prawn 208, mixed varities 2,583
Kalpitiya	North Star	Dec. 64	NE	11	PT	76	(3-6)	76	47,503	625	625	Prawn 18, silver biddies 17,043, rock fish 948 mullet 8,983, cat fish 8,680, mixed varieties 11,831

*Small wooden motorised 3½ ton boat.

APPENDIX A—(*Contd.*)

CATCHES LANDED BY CAPTAIN PYNE DURING THE PERIOD DECEMBER 1963 TO MAY 1965 (WITH PRAWN TRAWL)

(FIGURES COMRILED BY DR. DE BRUIN)

Area	*Vessel*	*Year and month*	*Monsoon*	*Number of days of fishing*	*Gear used*	*Number of hauls*	*Range of depths in Fathoms*	*Total fishing time in hours*	*Total catch in lbs*	*Catch in pounds*		*Breakdown of catch into Species lbs.*
										Per haul	*Per hour*	
Kalpitiya	North Star	Jan. 65	NE	6	PT	31	—	30	11,746	379	391	Rock fish 48, mullet 1,965 cat fish 2,364, skate 410 mixed varieties 1,858 prawns 14, silver biddies 5,087
Mannar	North Star	March 54	NE	5	PT	21	—	22	7,240	345	329	Prawns 9, silver biddies 4,455, mullet 830, cat fish 295, skate 855, mixed variety 791
Mannar	North Star	Jan. 65	NE	5	PT	28	—	27	13,755	491	509	Prawn 245, silver biddies 7,087, mullet 4,258, cat fish 590, skate 210, mixed varieties 1,365
Mannar	North Star	Feb. 65	NE	3	PT	13	—	14	8,471	652	605	Prawn, 126 silver biddies 3,220, rock fish 1,870 mullet 1,705, cat fish 306 mixed varieties 1,244
Talaimannar	North Star	Sept. 64	SW	1	PT	5	—	4	3,792	754	942	Prawns 2, silver biddies 2,380, mixed varieties 1,410
Talaimannar	North Star	Sept. 64	NE	5	PT	36	—	34	14,499	403	426	Prawns 84.½, silver biddies 8,830, cat fish 829, skate 719, mixed varieties 4030.½
Talaimannar	North Star	Jan. 65	NE	1	PT	1	—	1	430	430	430	Prawns 20, rock fish 400, skate 10
Pesalai	North Star	Oct. 64	NE	13	PT	81	—	87	27,022	334	310	Prawns 1,325, silver biddies 13,172, rock fish 7,035, cat fish 1,285, skate 1,495, mixed varieties 2,710
Pesalai	North Star	April 65	SW	2	PT	12	—	12	3,382	278	278	Prawns 183, silver biddies 2,350, rock fish 204 mullet 145, skate 500
Pesalai	North Star	May 65	SW	9	PT	56	—	56	23,958	428	427	Prawns 142, silver biddie, 16,350, rock fish 4,226, cat fish 1,225, skate 1,500, mixed varieties 515
Kayts	Canadian	Oct. 63	NE	4	PT	21	(4-8)	22	2,355	112	107	Prawns 38.½, silver biddies 1,015, skate 250, mixed varieties 1,052
Kavts	Canadian	April 65	SW	7	PT	28	(4-7)	27	4,606	165	170	Prawns 42, silver biddies 70 cat fish 442, rcok fish 825, skate 1,001, mixed varieties 2,426
KK.S.	Canadian	Oct. 63	NE	5	PT	21	(5-8)	19	2,467	117	130	Prawns 2, silver biddies 70 mixed varieties 2,395
Boulder Point	Canadian	Sept. 63	SW	2	PT	7	(11-18)	7	337	48	48	Prawns 18.½, silver biddies 150, mixed varieties 168.½
Nayaru	Canadian	Sept. 63	SW	1	PT	1	(9-11)	2	478	478	239	Prawns 28, silver biddies 100, mixed varieties 350

Kokkilai	..	Canadian	..	Sept. 63	..	SW	..	1	..	PT	..	3	..	(12–18)	..	3	..	180	..	60	..	60	..	Mullet 30, mixed varieties 150
Mullaltivu	..	Canadian	..	May 63	..	SW	..	4	..	PT	..	12	..	(4–7)	..	11	..	90	..	8	..	8	..	Prawns 85, mixed varieties 5
		Canadian	..	Sept. 63	..	SW	..	14	..	PT	..	88	..	(48–15)	..	96	..	17,495	..	199	..	182	..	Prawns 1,150, sliver biddies 905, mixed varieties 15,440
		Canadian	..	Oct. 63	..	NE	..	2	..	PT	..	12	..	(9–13)	..	14	..	3,272	..	273	..	234	..	Prawns 176, mixed varieties 3,096
		North Star	..	May 64	..	SW	..	1	..	PT	..	2	..	—	..	2	..	547	..	274	..	273	..	Prawns 12, silver biddies 251, mixed varieties 284
		North Star	..	June 64	..	SW	..	10	..	PT	..	66	..	—	..	69	..	13,908	..	211	..	201	..	Prawns 178, silver biddies 2,979, cat fish 33, skate 423, mixed varieties 10,295
		North Star	..	July 64	..	SW	..	5	..	PT	..	31	..	—	..	31	..	2,759	..	89	..	88	..	Prawns 445. ½ silver biddies 960, mixed varieties 1353. ½
		North Star	..	August 64	..	SW	..	10	..	PT	..	54	..	(10–14)	..	54	..	15,645	..	290	..	290	..	Prawns 748, silver biddies 6,369, skate 880, mixed varieties 7,496, cat fish 152
		North Star	..	Sept. 64	..	SW	..	4	..	PT	..	25	..	(11–16)	..	28	..	4,841	..	194	..	172	..	Prawns 128, silver biddies 1,147, skate 80, mixed varieties 3,486

APPENDIX B—Form for the trawling records

TEST TRAWLING

Date : 21.6.1967
Length of trawl (metres) :
Duration (minutes) : 60
Direction of haul (course) : NE
Depth (fathoms) : 7–9–11
Surface current (direction, speed) : 2 knots to NE
Speed of boat (knots) : 3 knots
Trawl (rise of head line, feet) : 80 (Granton)
Length of wires (fathoms) : 30 (+50 f. bridles)
Boat : Length 100 feet Myliddy

Region : Pedro Bank Haul No : 136
Time, Start : 18·10 Finish : 19·10
Long. : 80° 9′ Long : 80° 12′
Lat. : 10° 8′ Lat. : 10° 12′
Bottom conditions : Sand, gravel, hard bottom (material, steep, rough etc.)
Wind direction : SW
Wind force : 5–8 m/sec.
Meshes in codend : 88 mm.
Engine, power : 450 Type : Alpha diesel

Catch	*Weight lbs.*	*Number*
Prawns, species	0	0
Fishes, species		
1. Paraw*	200	about 40
2. Kossa*	100	8
3. Red mullet*	—	—
4. Grey mullet*	950	about 150
5. Kuruvilli*	—	—
6. Tolan*	—	—
7. Modila*	50	5
8. Small fishes	250	—
9. Skates	20	—
10. Skate (big red one)	300	1
11. Lobster	5	1
12. Sponge, hexacoralas	—	—
Total	1,875	

Catch of fish per hour : 850 kgs.
Remarks : The trawl slightly damaged.

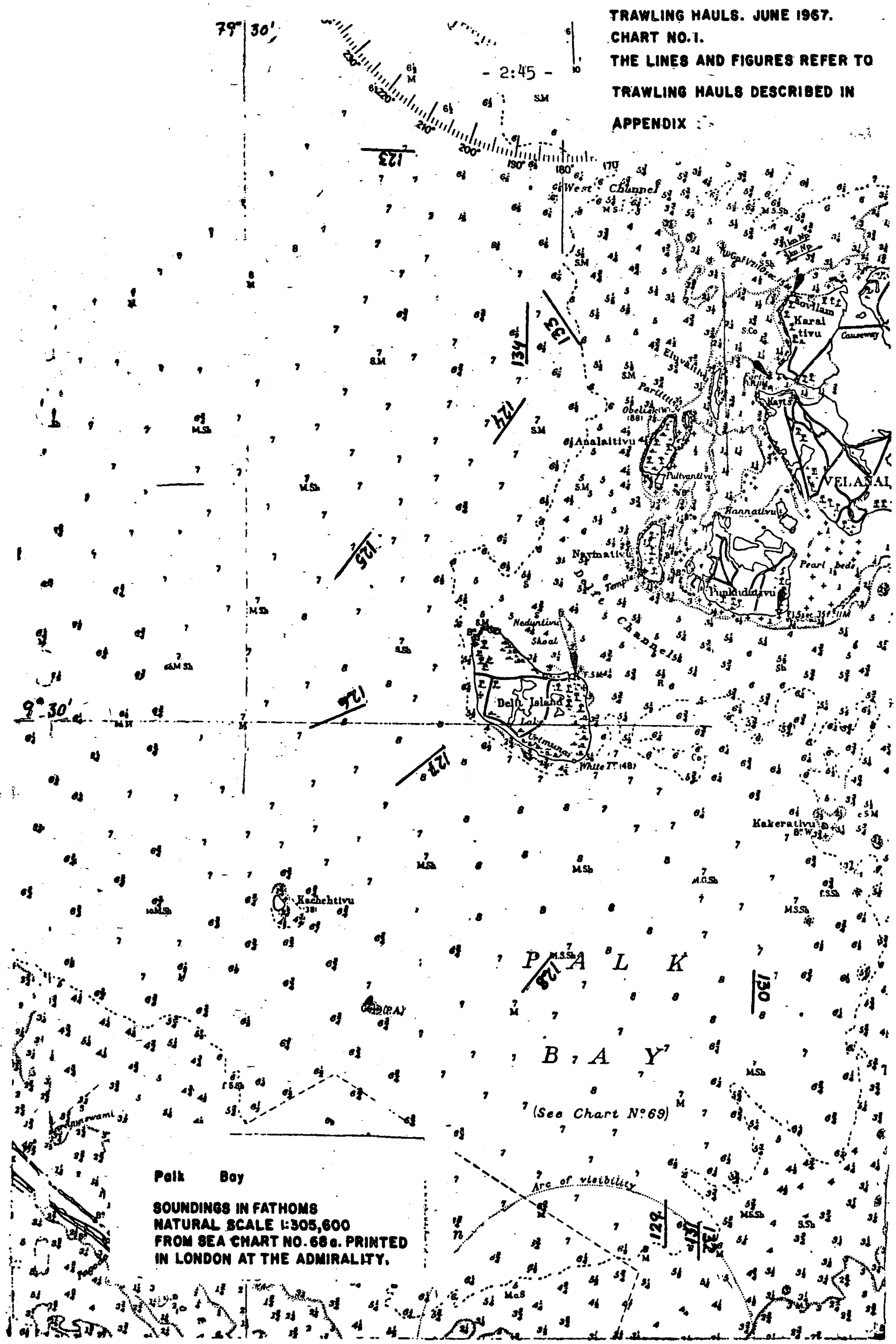
Catch of prawns per hour : 0 kgs.
Signed : S. E. Berg.

Local Names.

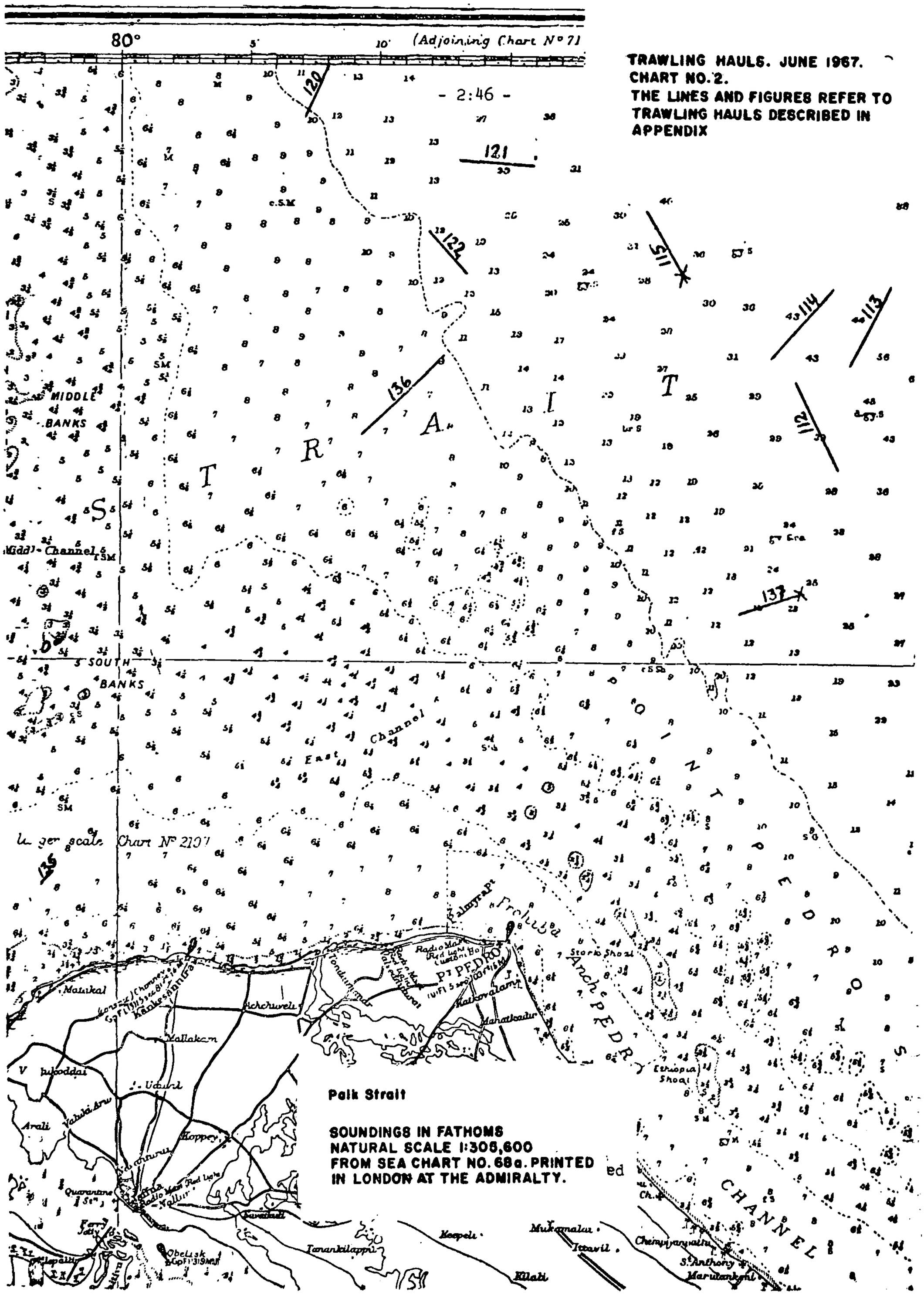
APPENDIX C

Location and Listing of Trawling Hauls Carried out During the Period 22nd May to 27th June 1967

(7 Charts and list of trawling hauls).

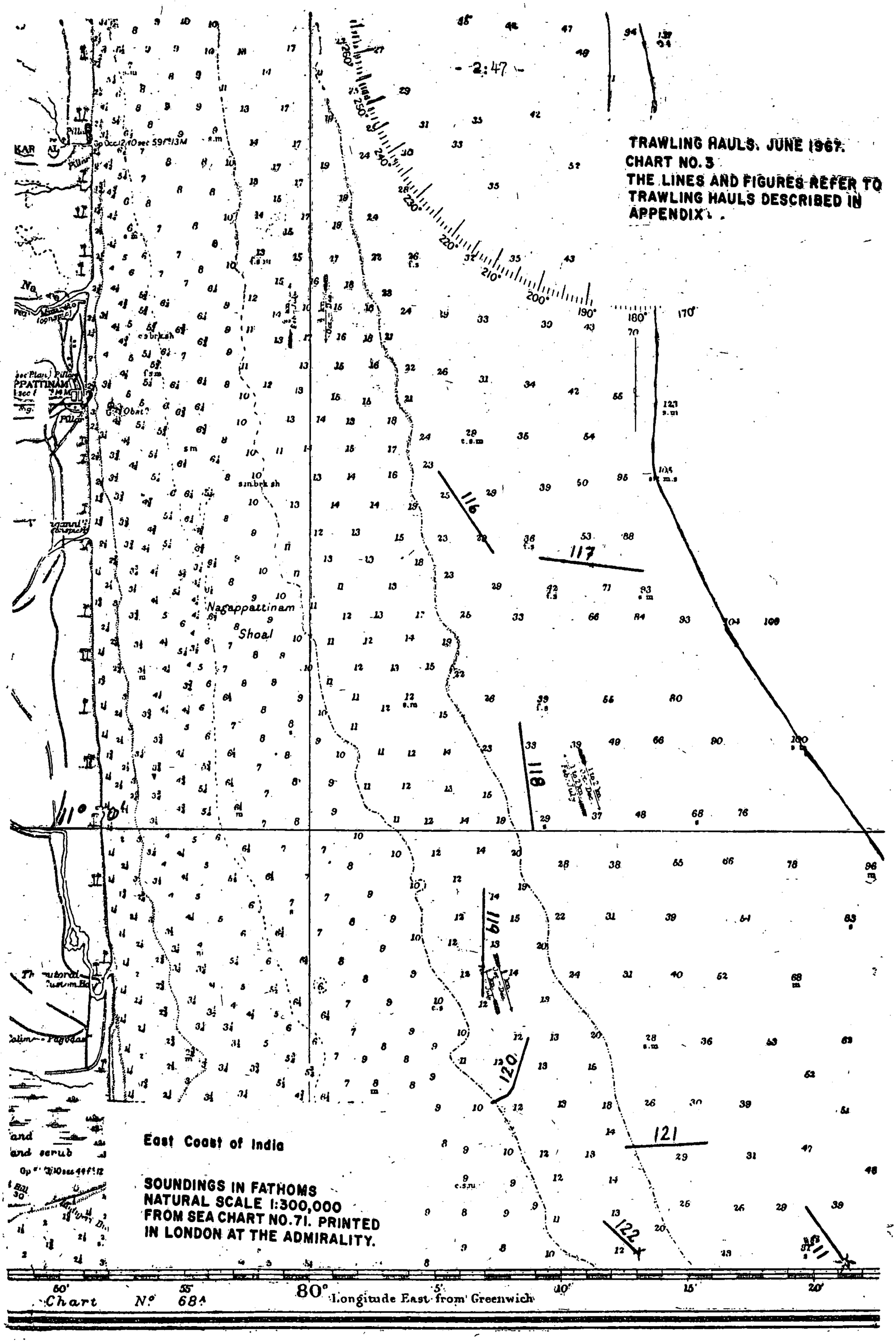

TRAWLING HAULS. JUNE 1967.
CHART NO. 1.
THE LINES AND FIGURES REFER TO
TRAWLING HAULS DESCRIBED IN
APPENDIX
79° 30'
9° 30'
West Channel
Karai tivu
Causeway
Elu vaitivu
Parittivu
Obelisk
Analaitivu
Pultivantivu
Hannativu
VELANAI
Pearl beds
Nayinativu
Temple
Punkudutivu
Neduntivu
Shoal
Deep Channel
Delft Island
Lake
Urimunai
White Tr. (48)
Kakerativu
Kachchtivu
P A L K
B A Y
(See Chart N° 69)
Arc of visibility
Palk Bay
SOUNDINGS IN FATHOMS
NATURAL SCALE 1:305,600
FROM SEA CHART NO. 68a. PRINTED
IN LONDON AT THE ADMIRALITY.

APPENDIX C

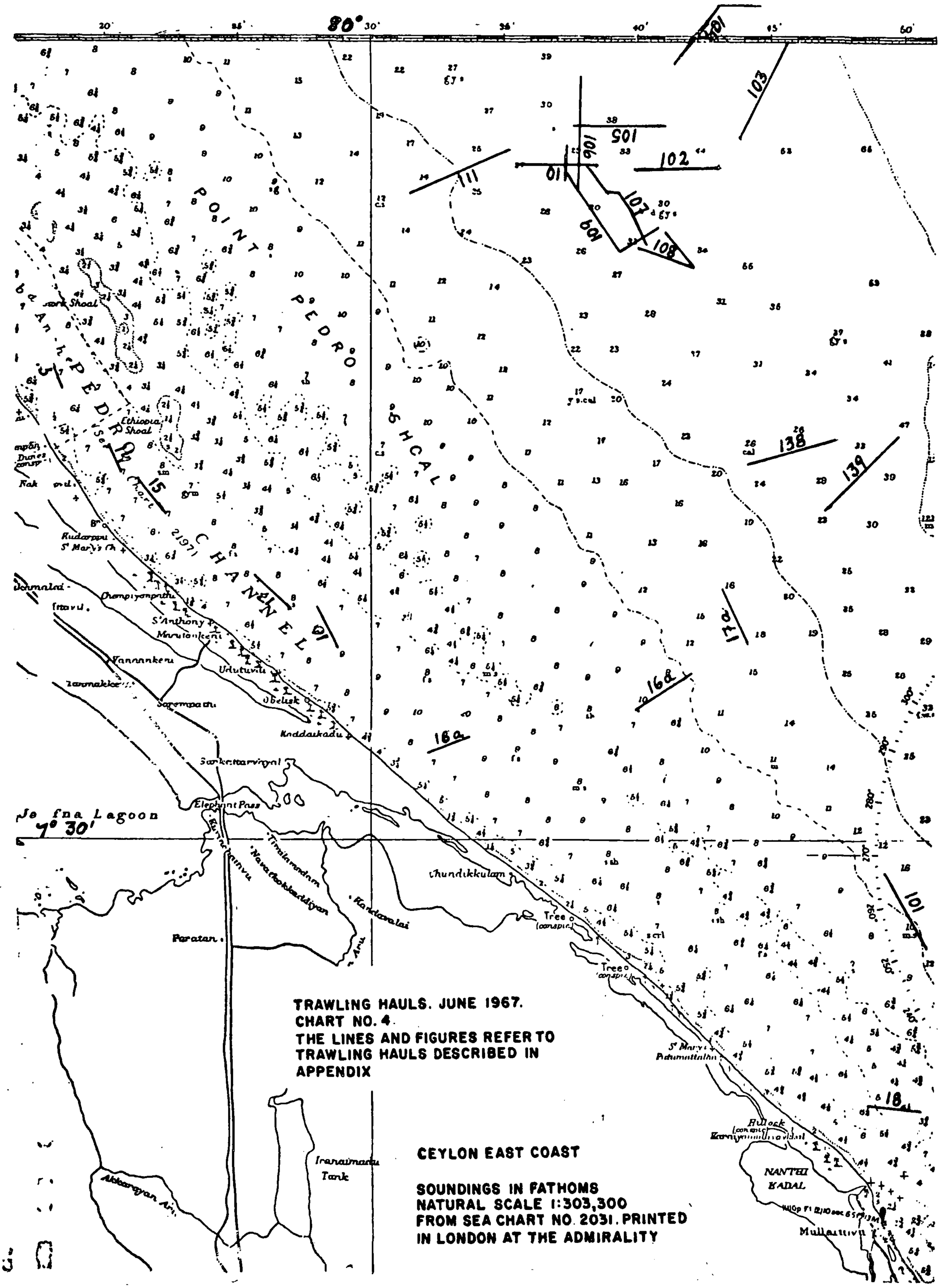


TRAWLING HAULS. JUNE 1967.
CHART NO. 2.
THE LINES AND FIGURES REFER TO TRAWLING HAULS DESCRIBED IN APPENDIX

APPENDIX C


TRAWLING HAULS. JUNE 1967.
CHART NO. 3
THE LINES AND FIGURES REFER TO TRAWLING HAULS DESCRIBED IN APPENDIX C.
East Coast of India
SOUNDINGS IN FATHOMS
NATURAL SCALE 1:300,000
FROM SEA CHART NO. 71. PRINTED IN LONDON AT THE ADMIRALITY.
Nagappattinam Shoal
116
117
118
119
120
121
122
80° Longitude East from Greenwich
Chart No. 68A

APPENDIX C

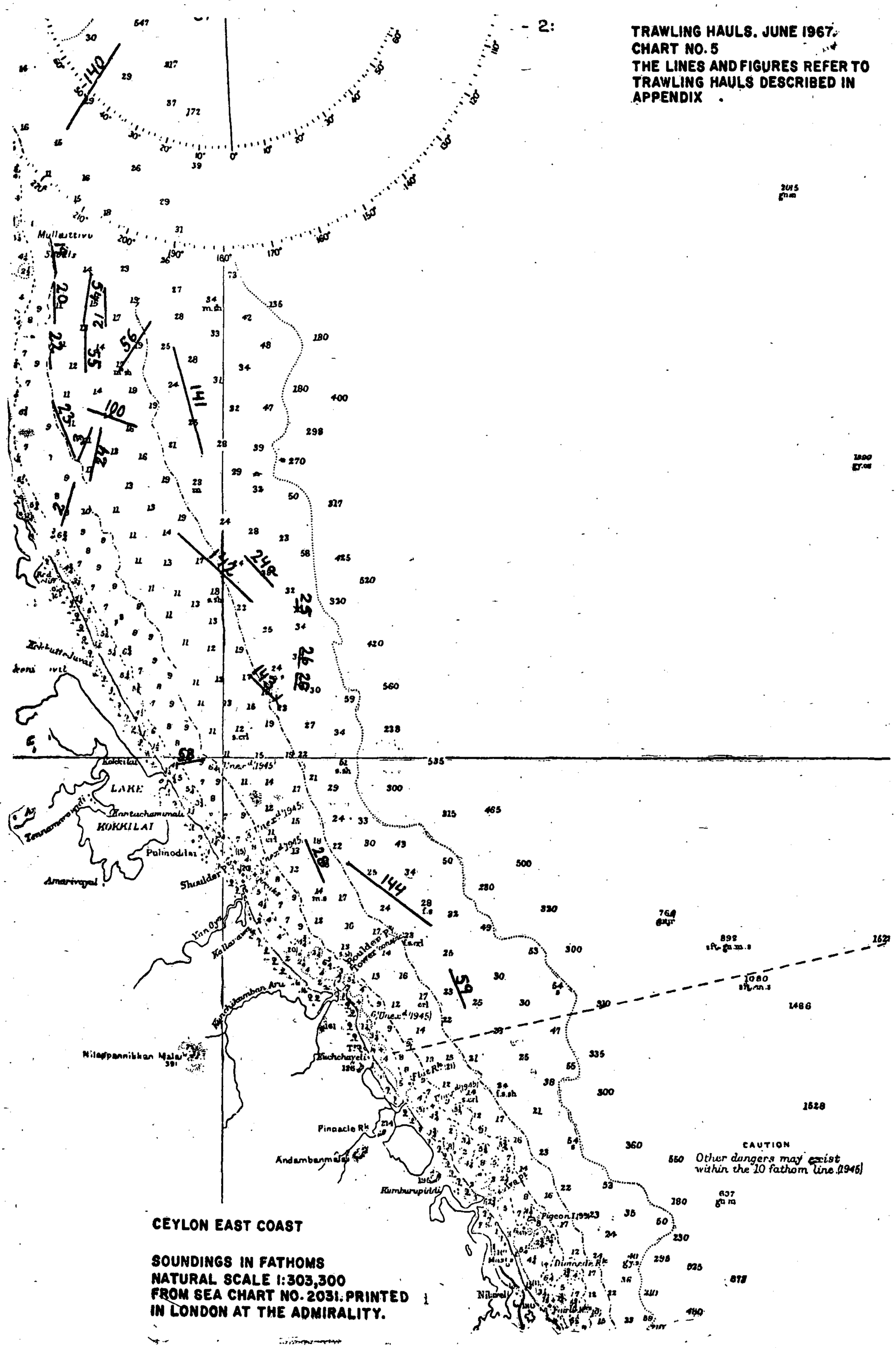


TRAWLING HAULS. JUNE 1967.
CHART NO. 4.
THE LINES AND FIGURES REFER TO TRAWLING HAULS DESCRIBED IN APPENDIX

CEYLON EAST COAST

SOUNDINGS IN FATHOMS
NATURAL SCALE 1:303,300
FROM SEA CHART NO. 2031. PRINTED IN LONDON AT THE ADMIRALITY

APPENDIX C

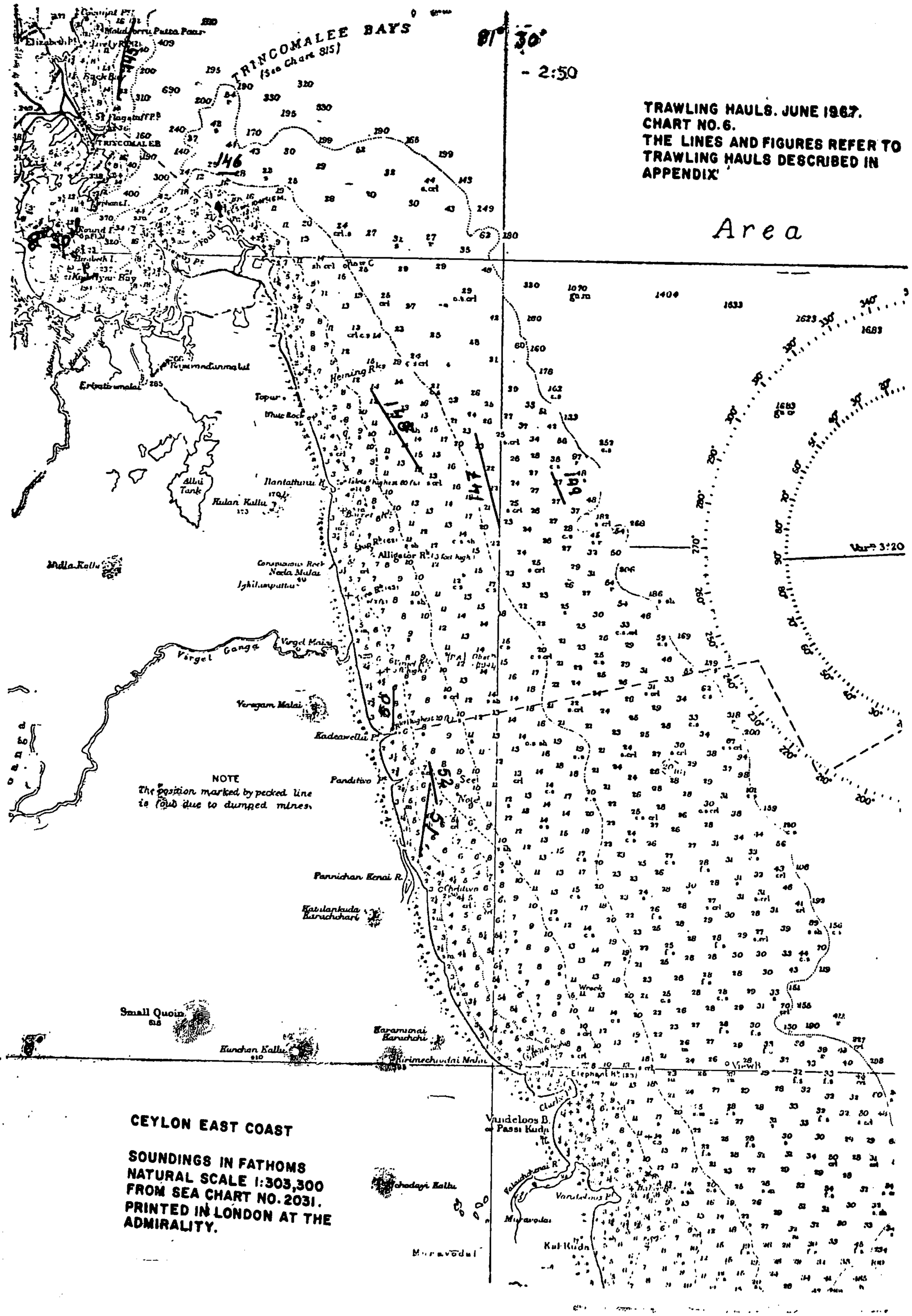


TRAWLING HAULS. JUNE 1967.
CHART NO. 5
THE LINES AND FIGURES REFER TO TRAWLING HAULS DESCRIBED IN APPENDIX .

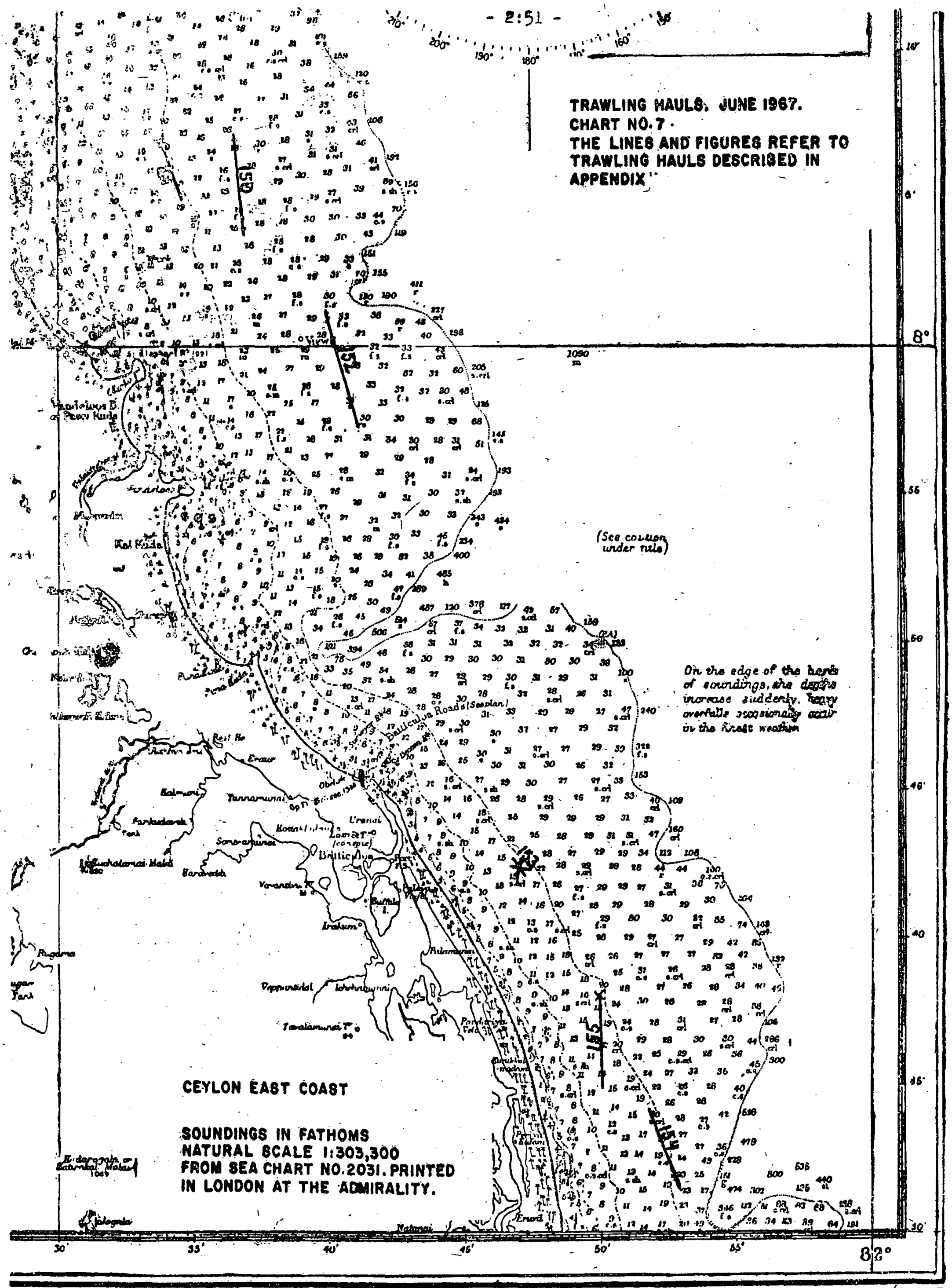
CEYLON EAST COAST

SOUNDINGS IN FATHOMS
NATURAL SCALE 1:303,300
FROM SEA CHART NO. 2031. PRINTED IN LONDON AT THE ADMIRALITY.

APPENDIX C


TRINCOMALEE BAYS
(See Chart 815)
TRAWLING HAULS. JUNE 1967.
CHART NO. 6.
THE LINES AND FIGURES REFER TO TRAWLING HAULS DESCRIBED IN APPENDIX
Area
NOTE
The position marked by pecked line is fouled due to dumped mines.
CEYLON EAST COAST
SOUNDINGS IN FATHOMS
NATURAL SCALE 1:303,300
FROM SEA CHART NO. 2031.
PRINTED IN LONDON AT THE ADMIRALITY.

APPENDIX C


TRAWLING HAULS. JUNE 1967.
CHART NO. 7.
THE LINES AND FIGURES REFER TO TRAWLING HAULS DESCRIBED IN APPENDIX
(See caution under title)
On the edge of the bank of soundings, the depths increase suddenly. Heavy overfalls occasionally occur in the fresh weather
CEYLON EAST COAST
SOUNDINGS IN FATHOMS
NATURAL SCALE 1:303,300
FROM SEA CHART NO. 2031. PRINTED IN LONDON AT THE ADMIRALITY.
Batticaloa Roads (Seaplane)
Batticaloa
Eravur
Tannamunai
Kalmunai
Karaitivu
Pottuvil
Arugam
Tangalla
Hambantota
Galle
Colombo
Negombo
Trincomalee
Point Pedro
Jaffna
Mullaitivu
Kankesanturai
Mannar
Talaimannar
Kayts
Pamban
Rameswaram
Tuticorin
Kilakarai
Vedaranyam
Nagapattinam
Karaikal
Pondicherry
Madras
Ennore
Pulicat
Sriharikota
Nellore
Kakinada
Vizagapatam
Bimlipatam
Engraved 1888
2031

APPENDIX C—(*Contd.*)

A list of the trawling hauls cavied out by "11-tons trawlers" "Canadian" and "Myliddy" during the period 22 May - 27 June, 1967

Haul numbers:
Arelndicated in the charts at the beginning of this appendix

Region numbers:
Numbers refer to those given Figure 1

1. Palk Bay
2. Point Pedro
3. Pedro Bank
3A. North of Pedro Bank
4. Mullaitivu Region
5. Trincomalee
6. Batticaloa

Type of trawl:
Japanese prawn trawl J 30 (30 feet head line)
Swedish prawn trawl S 100 (100 feet head line)
English fish trawl E 80 (80 feet head line)

Haul No.	*Date*	*Region No.*	*Depth fathoms*	*Trawling time Minutes*	*Position Latit.*	*(Start) Longit.*	*Position Latit.*	*(Finish) Longit.*	*Type of trawl*	*Vessel*	*Bottom*
1	22.5.67	5	10–14	20	8° 29′	81° 12,7′	8° 29,2′	81° 13,2′	J 30	11 T	Mud
2	3.6.67	4	7	-30	9° 8,5′	80° 53,5′	9° 10′	80° 54′	S 100	Canadian	Sand
3	4.6.67	4	7–8	30	9° 11′	80° 54′	9° 11,5,	80° 54,5′	S 100	Candaian	Mud
4	5.6.67	2	5–6	30	9° 54′	80° 10′	9° 55,5′	80° 12′	S 100	Canadian	Sand
5	5.6.67	2	4	30	9° 55,5′	80° 12′	9° 57′	80° 14′	S 100	Canadian	Sand
6	5 .6.67	3	4-7	120	9° 53′	80° 11′	9° 55′	80° 16′	J 30	11 T	Sand
7	5.6.67	3	6–7	30	9° 57′	80° 16′	9° 58′	80° 17′	J 30	11 T	Sand
8	5.6.67	3		10	9° 59′	80° 17′	9° 59,5′	80° 17,5′	S 100	Canadian	Sand
9	6.6.67	2	6	30	9° 51,5′	80° 5′	9° 50′	80° 5′	S 100	Canadian	Mud
10	6.6.67	2	7	45	9° 52′	79° 58′	9° 53′	79° 59′	S 100	Canadian	Mud
11	6.6.67	2	3–7	30	9° 49′	80° 3,5′	9° 50′	80° 4′	J 30	11 T	Mud
12	6 .6.67	2	7	45	9° 51′	80° 0′	9° 52′	80° 1′	J 30	11 T	Sand
13	8.6.67	2	6	60	9° 48′	80° 18′	9° 45,6′	80° 19′	S 100	Canadian	Sand
14	8.6.67	2	7	18	9° 44,5′	80° 20′	9° 44′	80° 20′3,	S 100	Canadian	Coral
15	8 .6.67	2	7	60	9° 43′	80° 21′	9° 41′	80° 22′	S 100	Canadian	Shellsand
16	9.6.67	2	8	40	9° 37′	80° 28,7′	9° 38,2′	80° 27,5′	S 100	Candaian	Sand
17	9.6.67	2	—	60	9° 38,5′	80° 27,3′	9° 39,4′	80° 25,5′	S 100	Canadian	Sand
15A	10.6.67	4	7.1/2–9.½	60	9° 33′	80° 32′	9° 33,5′	80° 34,5′	S 100	Canadian	Shellsand
16A	10.6.67	4	9.1/2–10	30	9° 35′	80° 39,5′	9° 36′	80° 41,5′	S 100	Canadian	Sand
17A	10.6.67	4	7	30	9° 37′	80° 45′	9° 38,5′	80° 44,5′	S 100	Canadian	Sand
18	11.6.67	4	5–8	19	9° 20′	80° 49′	9° 20′	80° 50′	S 100	Canadian	Sand
19	11.6.67	4	9.½	30	9° 18,2′	80° 53′	9° 17,5′	80° 53′	S 100	Canadian	Mud
20	11.6.67	4	—	60	9° 17,5′	80° 53′	9° 15,5′	80° 53′	S 100	Canadian	Mud
21	11.6.67	4	14	30	9° 15,5′	80° 55′	9° 16,5′	80° 55′	S 100	Canadian	Mud
22	12.6.67	4	10	30	9° 16′	80° 52,5′	9° 15′	80° 52,5′	J 30	Canadian	Mud
23	12.6.67	4	10/11	30	9° 13′	80° 53′	9° 11′	80° 53,5′	J 30	Canadian	Mud
24	12.6.67	4	11/14	30	9° 10′	80° 54,5′	9° 11′	80° 55′	J 30	Canadian	Mud
24A	12.6.67	4	25/27	30	9° 7′	81° 1′	9° 6,5′	81° 2′	J 30	Canadian	Mud
25	12.6.67	4	33	5	9° 6′	81° 3′	9° 5,5′	81° 3′	J 30	Canadian	Mud, rock
26	12.6.67	4	30	7	9° 4′	81° 3′	9° 3,5′	81° 3′	J 30	Canadian	Mud
27	12.6.67	4	24–28	30	9° 3,5′	81° 3′	9° 2′	81° 3′	J 30	Canadian	Mud
28	12.6.67	5	14–15	30	8° 57′	81° 3′	8° 55,5′	81° 3,5′	J 30	Canadian	Mud
50	15.6.67	5	5	43	8° 12,5′	81° 26′	8° 14′	81° 26′	J 30	Canadian	Mud, sand
51	15.6.67	6	5	75	8° 10,5′	81° 26,5′	8° 7,6′	81° 27′	S 100	Canadian	Mud
52	15.6.67	6	7	37	8° 11′	81° 8′	8° 10′	81° 28′	J 30	Canadian	Mud
53	16.6.67	6	4	30	8° 6′	81° 28′	8° 5′	81° 28,2′	J 30	Canadian	Mud, sand
54	22.6.67	4	9–10	60	9° 17,2′	80° 54,7′	9° 15,5′	80° 54,5′	S 100	Canadian	Mud
55	22.6.67	4	81/2–10	60	9° 15,5′	80° 54,5′	9° 13,8′	80° 54,5′	S 100	Canadian	Mud
56	22.6.67	4	12–14	60	9° 14′	80° 56′	9° 15,5′	80° 57′	S 100	Canadian	Mud
57	22.6.67	4	6	5	9° 5′	80° 55,4′	9° 5′	80° 55,4′	J 30	Canadian	Rock
58	22.6.67	4	5–9	30	8° 59,5′	80° 58′	8° 0′	80° 59,3′	J 30	Canadian	Mud, sand
59	23.6.67	5	24	20	8° 52′	81° 9′	8° 51,2′	81° 9′	J 30	Canadian	Sand, rock
100	14.6.67	4	13–16	30	9° 12′	80° 56,5′	9° 12,5′	80° 55′	E 80	Myliddy	Mud
101	15.6.67	4	10–11	70	9° 29′	80° 49′	9° 26′	80° 50,5′	E 80	Myliddy	Mud, sand
102	15.6.67	3	32–46	60	9° 4,5′	80° 41′	9° 54,5′	80° 43′	E 80	Myliddy	Sand

Total 42 haul sprown trawls wlth "Canadian" and "11 tons trawlers"

APPENDIX C—(*Contd.*)

Haul No.	*Date*	*Region No.*	*Depth fathoms*	*Trawling time Minutes*	*Position Latit.*	*(Start) Longil.*	*Position Latit.*	*(Finish) Longit.*	*Type of trawl*	*Vessel*	*Bottom*
103	15.6.67	3	48–68	60	9° 55,5′	80° 44′	10° 0′	80° 46′	E 80	Myliddy	Hard
104	15.6.67	3	45–66	60	10° 0′	80° 45′	9° 57′	80° 42′	E 80	Myliddy	Sand
105	15.6.67	3	33–42	60	9° 56′	80° 41′	9° 56′	80° 38′	E 80	Myliddy	Hard
106	15.6.67	3	28–32	60	9° 58′	80° 38′	9° 55′	80° 38′	E 80	Myliddy	Hard
107	15.6.67	3	26–29–30	120	9° 55′	80° 38′	9° 52′	80° 40′	E 80	Myliddy	Hard
108	15.6.67	3	30–32	120	9° 52′	80° 40′	9° 52,5′	80° 41′	E 80	Muliddy	Sand
109	15.6.67	3	29–32	240	9° 52,5′	80° 41′	9° 54,5′	80° 38′	E 80	Muliddy	Hard
110	16.6.67	3	28–30	60	9° 54,5′	80° 38,5′	9° 54,5′	80° 35,5′	E 80	Myliddy	Flat hard
111	16.6.67	3	12–28	60	9° 55′	80° 35′	9° 54′	80° 31′	E 80	Myliddy	Flat hard
112	16.6.67	3	30	60	10° 8′	80° 27′	10° 10′	80° 26′	E 80	Myliddy	Flat hard
113	16.6.67	3	43–55	55	10° 11′	80° 28′	10° 14′	80° 29′	E 80	Myliddy	Flat hard
114	16.6.67	3	44–51	60	10° 11,5′	80° 25′	10° 14′	80° 27,5′	E 80	Myliddy	Hard
115	16.6.67	3	30–35	60	10° 14′	80° 21,5′	10° 16′	80° 20′	E 80	Myliddy	Hard, rough
116	17.7.67	3	23–26–28	60	10° 43′	80° 5,5′	10° 40′	80° 7,5′	E 80	Myliddy	Hard
117	17.6.67	3	39–46–50	45	10° 40′	80° 9′	10° 39,5′	80° 13,5′	E 80	Myliddy	Hard
118	17.6.67	3	30–29	60	10° 34′	80° 8,5′	10° 30′	80° 9′	E 80	Myliddy	Hard
119	17.6.67	3	12–13	60	10° 28′	80° 7′	10° 24′	80° 7′	E 80	Myliddy	Sand (mud.)
120	17.6.67	3	11–12	60	10° 20′	80° 7′	10° 22′	80° 8′	E 80	Myliddy	Sand, hard
121	17.6.67	3	14–28	60	10° 18,5′	80° 13′	10° 18,5′	80° 16′	E 80	Myliddy	Hard
122	17.6.67	3	12–12	30	10° 16′	80° 12′	10° 15′	80° 13′	E 80	Myliddy	Steep rocks (or wreck)
123	18.6.67	1	7	30	9° 51′	79° 37′	9° 51′	79° 35′	S 100	Myliddy	Mud
124	19.6.67	1	7	30	9° 42′	79° 41′	9° 41′	79° 41′	S 100	Myliddy	Mud
125	19.6.67	1	7	30	9° 37′	79° 35,5′	9° 36′	79° 35′	S 100	Myliddy	Mud
126	19.6.67	1	8	30	9° 30′	79° 34′	9° 30′	79° 33′	S 100	Myliddy	Mud
127	19.6.67	1	8	30	9° 29′	79° 38′	9° 28′	79° 37′	S 100	Myliddy	Mud
128	19.6.67	1	8	30	9° 22′	79° 42,5′	9° 21′	79° 42′	S 100	Myliddy	Mud
129	19.6.67	1	6–6.½	30	9° 10,5′	79° 47′	9° 12′	79° 47′	S 100	Myliddy	Mud
130	19.6.67	1	6.½–7.½	30	9° 21′	79° 50,5′	9° 20′	79° 50,5′	S 100	Myliddy	Mud
131	20.6.67	1	5–6	30	9° 10′	79° 48,5′	9° 11′	79° 48,5′	S 100	Myliddy	Mud
132	20.6.67	1	7	30	9° 11,5′	79° 48,5′	9° 10,5′	79° 48,5′	S 100	Myliddy	Mud
133	21.6.67	1	6	30	9° 44′	79° 43′	9° 45′	79° 42′	E 80	Myliddy	Mud
134	21.6.67	1	7	30	9° 43,5′	79° 41′	9° 45′	79° 41′	E 80	Myliddy	Mud
135	21.6.67	2	7.½	10	9° 51,5′	79° 57′	9° 51,5′	79° 57′	E 80	Myliddy	Mud, coral pieces
136	21.6.67	3	7–9–11	60	10° 8′	80° 9′	10° 12′	80° 12′	E 80	Myliddy	Hard sand
137	21.6.67	3	12–14	45	10° 2′	80° 24′	10° 3′	80° 25,5′	E 80	Myliddy	Rock Rough
138	22.6.67	3	23–29	60	9° 43,5′	80° 44′	9° 44′	80° 47′	E 80	Myliddy	Flat, hard
139	22.6.67	3	27–39	60	9° 42′	80° 47′	9° 45′	80° 49,5′	E 80	Myliddy	Flat, hard
140	22.6.67	4	23–110	35	9° 23′	80° 54′	9° 26′	80° 56′	E 80	Myliddy	Mud, steep
141	22.6.67	4	26–28	60	9° 15′	80° 58′	9° 11′	80° 59′	E 80	Myliddy	Mud
142	23.6.67	4	15–22	60	9° 8′	80° 58′	9° 5,5′	81° 2′	E 80	Nyliddy	Mud
143	23.6.67	4	20	30	9° 3′	81° 1′	9° 2,5′	81° 2′	E 80	Myliddy	Mud, rocks (or wreck)
144	23.6.67	5	20–31	60	8° 56′	81° 8′	8° 53′	81° 11′	E 80	Myliddy	Sand
145	25.6.67	5	30–50–40	30	8° 36′	81° 15′	8° 39′	81° 16′	E 80	Myliddy	Mud, up and down
146	25.6.67	5	28	5	8° 33′	81° 19′	8° 33′	81° 19,5′	E 80	Myliddy	Rocks
147	25.6.67	5	23–25	55	8° 20′	81° 30′	8° 23,5′	81, 29′	E 80	Myliddy	Hard
148	26.6.67	5	14–14	60	8° 25′	81° 25′	8° 22′	81° 27′	E 80	Myliddy	Flat hard
149	26.6.67	5	27	20	8° 22′	81° 32′	8° 21	81° 32,5′	E 80	Myliddy	Rough rocks
150	26.6.67	6	26–27	60	8° 7′	81° 37′	8° 4′	81° 37′	E 80	Myliddy	Flat
151	26.6.67	6	19	30	8° 5′	81° 34′	8° 7′	81° 34′	E 80	Myliddy	Rocks or wreck
152	26.6.67	6	29–30	60	8° 1′	81° 40′	7° 57′	81° 41′	E 80	Myliddy	Flat, hard
153	27.6.67	6	16	10	7° 42,5′	81° 47′	7° 42,5′	81° 47′	E 80	Myliddy	Corals, rocks
154	27.6.67	6	19-21	60	7° 34′	81° 52′	7° 32′	81° 52,5	E 80	Myliddy	Flat, corals
155	27.6.67	6	14-15	60	7° 35′	81° 50′	7° 37′	81° 50′	E 80	Myliddy	Flat but rough

Total 56 hauls with "Myilddy", of which 10 with prawntrawl and 46 with fishtrawl.

APPENDIX D

Trawling catches on Pedro Bank (102–122 ; 136–139) and north of Pedro Bank (117–119) recorded during the investigations by "Myliddy", June 15–22, 1967

Haul No.[1]	*Depth fathoms*	*Total catch per haul*	*Catch of fish per hour*	*Catch per hour of edible fish* 1st class (gutted —10%)	2nd class (gutted —20%)	Net weight	*Remarks*
		lbs.	*kg.*	*kg.*	*kg.*	*kg.*	
102	32–46	150	70	63	0	63	—
103	48–68	4	2	2	0	2	Wires too short, trawl not at bottom
104	45–66	180	80	32	36	68	Trawl probably only partly at bottom
105	33–42	375	170	71	72	143	
106	28–32	950	430	345	11	356	
107	26–29–30	800	180	142	18	160	
108	30–32	700	160	132	9	141	—
109	29–32	2,700	300	264	9	273	—
110	28–30	300	135	122	0	122	—
111	12–28	320	145	28	90	118	Trawl partly damaged
112	30	950	430	360	18	378	—
113	43–45	50	23	21	0	21	Trawl not at bottom, wires too short
114	44–51	450	200	180	0	180	—
115	30–35	100	45	40	0	40	Trawl very bad damaged
116	23–26–28	100	45	20	18	38	—
117	39–46–93	15	10	9	0	9	Haul finished at the shelf edge
118	30–39	360	160	113	29	142	—
119	12–13	400	180	160	9	160	—
120	11–12	700	315	205	72	277	—
121	14–28	1,200	540	325	145	470	—
122	12–12	—	—	—	—	—	Tawl destroyed, coxend lost
136	7–9–11	1,875	845	530	205	735	—
137	12–14	200	90	81	0	81	Trawl badly damaged
138	23–29	1,300	580	458	36	494	—
139	27–39	1,900	860	650	100	750	—
Total		16,069	5,990	4,353	868	5,221	

Average 25 hauls (29 hours)	250 kg.
	555 lbs.
Average Pedro Bank (102–115)	270 kg.
(120–122)	600 lbs.
Average North of Pedro Bank (116–119)	105 kg.
	235 lbs.

[1] For location of haul numbers refer to charts in Appendix C.

APPENDIX E

Trawling catches in Palk Bay recorded during the investigations by " Myliddy " in June, 1967

Haul No.[1]	*Depth fathoms*	*Total catch per haul*	*Catch of fish per hour*	*Catch of prawns per hour*	*Catch per haur of edible fish*			*Remarks*
					1st class (gutted —10%)	*2nd class (gutted —20%)*	*Net weight*	
		lbs.	*kg.*	*kg.*	*kg.*	*kg.*	*kg.*	
123	7	100	90	—	90	0	90[1]	—
124	7	350	315	1	252	50	302[1]	—
125	7	1	1	—	—	—	—[1]	Trawl probably not at bottom
126	8	1,650	1,500	1	1,350	110	1,460[1]	—
127	8	230	210	—*x*	27	145	172[1]	Trawl partly damaged by a sawfish
128	8	1,500	1,350	½	1,200	120	1,320[1]	—
129	6–6·½	800	720	5	715	4	719[1]	—
130	6·½–7·½	1,900	1,700	4	1,600	72	1,672[1]	—
131	5–6	320	290	—*x*	260	4	264[1]	—
132	7	1,300	1,200	½	1,200	0	1,200[1]	—
133	6	2,400	2,200	—	1,780	72	1,852[2]	—
134	7	300	270	—	80	145	225[2]	—

[1] Prawn trawl (with 40 mm. meshes in codend).

[2] Fish trawl (with 80 mm. meshes in codend).

x Prawn catches less than ½kg.

APPENDIX F

Trawling catches in the Mullativu (4), Trincomalee (5) and Batticaloa Regions (6) recorded during the investigation by "Myliddy" in June, 1967

Haul No.[1]	*Region No.*	*Depth fathoms*	*Total catch of fish*	*Catch of fish per hour*	*Catch per hour of edible fish*			*Remarks*
					1st class (gutted —10%)	*2nd class (gutted —20%)*	*Net weight*	
			lbs.	*kg.*	*kg.*	*kg.*	*kg.*	
100	4	13–16	14	13	12	0	12	Otter board dug down in mud
101	4	10–11	12	5	0	4	4	Speed too low ?
140	4	23–110	250	200	145	32	177	—
141	4	26–28	300	135	130	0	130	—
142	4	15–22	1,200	540	445	35	480	—
143	4	20	260	235	210	0	210	—
144	5	20–31	105	50	45	0	45	—
145	5	30–50–40	50	45	40	0	40	—
146	5	28	240	108	98	0	98	—
147	5	23–25	100	49	44	0	44	—
148	5	14–14	440	200	57	110	167	—
149	5	27	150	202	182	0	182	—
150	6	26–27	100	45	40	0	40	—
151	6	19	120	108	9	80	89	—
152	6	29–30	100	45	40	0	40	—
153	6	16	20	54	50	0	50	—
154	6	19–21	180	81	13	54	67	—
155	6	14–15	50	23	21	0	21	

[1] For location of haul numbers refer to charts in Appendix C.

APPENDIX G

Trawling catches recorded during the investigations by " Canadian " and " 11-tons" trawlers, May, 22–June 23, 1967 (with prawn trawls)

Regions : 2. Point Pedro
4. Mullaitivu
5. Trincomalee
6. Batticaloa

Haul No. **	Region No.	Depth fathoms	Total catch per hour lbs.	Catch of fish per hour kg.	Catch of prawns per hour kg.	Catch per hour of edible fish: 1st class (gutted —10%) kg.	270 class (gutted —20%) kg.	Net weight kg.	Boat	Remarks
1	4	10–12	6	10	—	9	0	9	11-T	—
2	4	7	2	2	—	—	—	—	Canadian	Wries too short
3	4	7–8	300	270	—	230	28	258	Canadian	—
4	2	5–6	34	35	—	16	12	28	Canadian	—
5	2	4	—	—	—	—	—	—	Canadian	—
6	3	4–7	5	2	—	2	0	2	11-T	—
7	3	6–7	20	10	—	4	4	8	11-T	—
8	3	—	—	—	—	—	—	—	Canadian	Corals, trawl caught at bottom
9	2	6	50	25	—	13	8	21	Canadian	—
10	2	7	30	20	—	13	0	13	Canadian	—
11	2	3–7	20	20	—	8	8	16	11-T	—
12	2	7	30	20	—	8	8	16	11-T	—
13	2	6	25	13	—	6	5	11	Canadian	—
14	2	7	4	6	—	3	3	6	Canadian	—
15	2	7	6	3	—	2	1	3	Canadian	—
16	2	8	50	33	—	15	15	30	Canadian	—
17	2	—	75	35	—	15	15	30	Canadian	—
15A	4	7½–9½	75	35	—	30	4	34	Canadian	—
16A	4	9½–10	26	12	—	8	2	10	Canadian	—
17A	4	7	—	—	—	—	—	—	Canadian	Trawl damage
18	4	5–8	—	—	—	—	—	—	Canadian	—
19	4	9½	10	10	—	5	2	7	Canadian	—
20	4	—	—	—	—	—	—	—	Canadian	—
21	4	14	21	21	—	0	16	16	Canadian	—
22	4	10	35	30	—	27	5	32	Canadian	—
23	4	10–11	40	35	—	30	0	30	Canadian	—
24	4	11–14	60	55	—'	50	0	50	Canadian	—
24A	4	25–27	250	250	—'	14	202	216	Canadian	—
25	4	33	—	—	—	—	—	—	Canadian	Trawl cought at bottom
26	4	30	—	—	—	—	—	—	Canadian	Otter board dug down into mud
27	4	24–28	60	55	—	49	0	49	Canadian	—
28	5	14–15	200	180	—	3	160	163	Canadian	—
50	5	5	25	15	—	14	0	14	Canadian	—
51	6	5	770	289	1	260	0	260	Canadian	—
52	6	7	7	6	—x	6	0	6	Canadian	—
53	6	4	40	40	—	36	0	36	Canadian	—
54	4	9–10	263	131	3	118	0	118	Canadian	—
55	4	8½–10	104	47	—	40	6	46	Canadian	—
56	4	12–14	8	4	—	4	0	4	Canadian	—
57	4	6	—	—	—	—	—	—	Canadian	Trawl caught at bottom
58	4	5–9	8	8	—	7	0	7	Canadian	—
59	5	24	—	—	—	—	—	—	Canadian	—
		Total	2,659	1,727	4	1,045	504	1,549		

** For location of haul numbers refer to charts in Appendix C.

x ' Prawn catches, less than 1/2 kg.

APPENDIX H

Trawler catches recorded on Pedro Bank during August-November, 1967

STATISTICS COMPILED BY CEYLON FISHERIES CORPORATION

Trawler	*"Myliddy"*	*"Myliddy"*	*"Beruwala"*	*"Myliddy"*	*"Beruwala"*	*"Pesalai"*	*"Maple Leaf"*
ARRIVAL	28.8.67	22.9.67	22.9.67	17.10.67	23.10.67	28.10.67	1.11.67
UNLOADING	30.8–2.9	22.9–23.9	28.9–30.9	17.10–18.10	23.10–24.10	28.10.29–10	1.11–2.11
DEPARTURE	16.8.67	5.9.67	10. 9.67	1.10.67	6.10.67	12.10.67	14.11.67
	(lbs.)	*(lbs.)*	*(lbs.)*	*(lbs.)*	*(lbs.)*	*(lbs.)*	*(lbs.)*
Fish roe	217	235	213	230	350	150	45
Big mullet	61,921	48,528	48,313	28,332	26,635	16,179	7·730
Big attissa	21,982	19,220	13,191	24,245	18,762	5,690	5·330
Small mullet	12,061	9,895	8,440	50	5,200	4,789	1·750
Detta	2,503	3,118	2,014	2,584	2,748	922	870
Parati	3,196	770	511	2,300	1,515	5,123	3·070
Kossa	2,182	2,735	1,310	869	1,305	1,094	300
Pothubara	4,655	4,615	4,227	8,720	4,255	3,255	3.370
Paraw	2,116	1,055	885	1,745	1,222	1,031	1·055
Jeela	228	70	100	83	60	155	110
Shark liver	47	—	—	17	45	444	—
Shark (big)	1,154	105	—	773	485	2,990	1,163
Shark (small)	—	—	—	—	60	—	—
Mudilla	15	—	—	63	130	150	20
Kirimora	57	70	80	220	362	336	335
Shark fins	90	3	—	50	13	140	35
Shark pieces	—	—	—	740	—	—	—
Pahindi (big)	767	150	340	130	455	567	430
Pahindi (small)	—	—	—	—	—	380	25
Seer	—	—	—	18	60	120	230
Anjila	—	—	—	—	84	37	—
Cuttle fish	—	—	2,930	—	3,349	5,460	2·025
Skate (big)	—	—	—	—	—	5,608	—
Skate (small)	—	—	—	—	—	20	—
Balodi	—	—	—	120	10	45	—
Anguluwa	—	—	—	—	—	360	70
Pathamediya	—	—	—	—	20	185	35
Wauwalaya	—	—	—	—	—	—	25
Maskarala	—	—	—	—	—	4,224	705
Lobster	—	—	—	—	3¼	—	—
Crushed fish (mixed)	95	—	50	105	2,835	217	545
			110				
Total	1,13,286	90,569	82,714	76,875	69,858¼	60,971	29,273
Tons	50.57	40.43	35.69	34.32	31.19	27.22	13.07
Value (Rs.)	69,376.68	54,434.90	49,144.03	43,742.67	38,442.94	26,670.91	14,530.00
Catch share (Rs.)	10,355.28	5,985.46	4,747.02	3,482.83	2,483.93	1,554.76	839.01

APPENDIX I

Trawler catches recorded on Wadge and Pedro Banks

Trawler	*Year*	*Wadge Bank*	*Pedro Bank*	
		Catch per boat per hour of trawling lbs.	*Catch per boat per hour of trawling lbs.*	*Catch per boat per day of trawling tons*
Violet (Howell 1913)[1]	1906–07	170	263	
Lilla (Malpas 1926)[1]	1920–23	145 (195)	126	
Tongol and Bulbul (Medcof 1963)[2]	1928–30	—	about 285	
Raglan Castle (Medcof 1963)[2]	1949–50	ca 500–600	407	
Braconglen (Mendis 1967)[2]	1956–63	670	—	
Maple Leaf (Medcof 1963)[2]	1953–54	ca 538	—	
Maple Leaf (Mendico 1965)[2]	1956—63	ca 550	—	
Maple Leaf (Mendis 1967)[2]	1964–65	ca 575	—	
Grandara (Mendis 1967)[2]	1966	450	—	
Beruwala, Peaslai, Myliddy, Meegamuwa (Fish. Crop.) calculated from Statistical Report)[2]	1966	ca 600	—	
Myliddy (Berg)[1]	1967	—	600	
Beruwala, Myliddy, Persalai (Fish. Corp.)[2]	1967	—	about 500	3,3
Maple Leaf (Fish. Crop.)[2]	1967	—		1,0
Potential future catches[2]				
Mendis (1967)		575	about 400	
Berg (1968)		about 600	500	3,5

[1] Survey.

[2] Commercial trawling.