BULLETINS

OF THE

CEYLON FISHERIES.

VOL. I.—BULLETINS 1–3. JANUARY 17, 1923.

CONTENTS.

FOREWORD.

It may not be out of place to put briefly on record the various stages in the development of the Ceylon Fisheries. Until about a decade ago the interest shown by the Ceylon Government in fishery questions was restricted to the Pearl Fisheries. These famous fisheries are of considerable historic interest, and, moreover, rank high amongst the Pearl Fisheries of the world. Prior to the year 1902 they had been prosecuted without any regard to the marine biological problems involved. In that year Professor (now Sir William) Herdman, F.R.S., made a thorough examination of the Pearl Banks, and an exhaustive series of reports was published dealing with the bionomics of the pearl oyster and the biological conditions of the Pearl Banks. As a direct outcome of Professor Herdman's work, a Marine Biologist was appointed to deal solely with the biological problems of the Pearl Banks. This officer was transferred to the Ceylon Company of Pearl Fishers, when that Company took over the lease of the Banks in 1906. In 1912, when the Company ceased its operations, the Pearl Banks reverted to the Ceylon Government, and the Director of the Colombo Museum was placed in charge of the scientific operations connected with the Pearl Banks. At an earlier date—1907—the Director, Colombo Museum, had been made Marine Biologist in addition to his other duties, in order to carry out investigations on the food fisheries, but little was done in this direction, mainly owing to the apathetic attitude of the Government. Since 1912 the present writer has made successive attempts to induce the Ceylon Government to take a practical interest in the food fisheries of the Island. These efforts, in spite of the set-back caused by the war, have achieved some success. In 1919 the Government sanctioned a Marine Biological Survey of the littoral waters of Ceylon, with a view to increasing our knowledge of the bionomics of the food fishes of Ceylon. This work is still in progress, and the valuable results achieved are being placed on record as quickly as the limitations of a small staff will allow.

On more than one occasion in recent years recommendations have been made urging the establishment of a fully equipped Fisheries Department, and in Ceylon Sessional Paper I. of

1922 the Industries Commission dealt with the Fisheries in an exhaustive manner, and recommended the immediate establishment of an independent Department of Fisheries.

Owing to financial reasons effect has not yet been given to these recommendations, but it is hoped that within a short time an independent Department of Fisheries will come into being. At present the fisheries investigations are being carried out by the Marine Biologist, assisted by an Assistant Marine Biologist, who is a trained Zoologist, and a Marine Superintendent, who is a nautical expert. A well-equipped trawler has been provided, and this has been fitted out with all the appliances necessary for modern oceanographical research. The trawler is used (1) in the inspections of the Pearl Banks, (2) in the Marine Biological Survey, and (3) in the periodic hydrographical cruises in the Gulf of Mannar.

The special problems with which the Department of Marine Biology is at present concerned are as follows :—

(1) Inspections of the Pearl Banks, with a careful examination of the distribution and growth rate of the pearl oyster and the hydrographical conditions of the Pearl Banks.

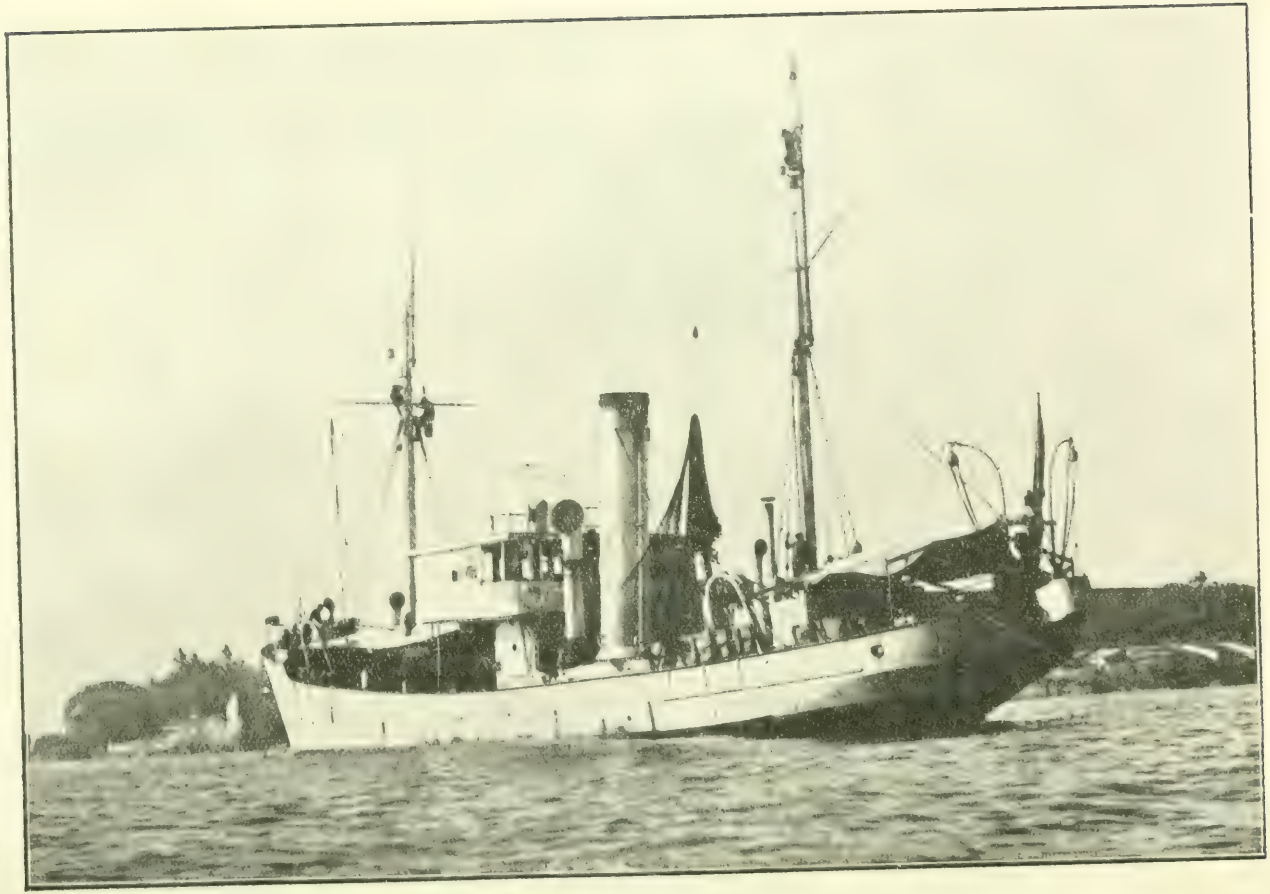
(2) The hydrographical conditions of the Gulf of Mannar, especially as regards the chemical analysis and temperature of the water at different depths and the movement of the water as determined by means of drift bottles and the Ekman Current Meter.

(3) Marine Biological Survey of the littoral waters of Ceylon by means of trawl, dredge, and tow-net in order to determine the distribution of the food fishes and the biological conditions of the littoral area.

The results of this work have hitherto been published in the Annual Administration Reports of the Ceylon Government, but as these reports are limited in size and scope, it has been found impossible to give a complete or adequate account of the work in progress. It was considered advisable, therefore, to establish a special publication to deal at greater length with the work being done by the Department of Marine Biology, and the present volume is the first of the new series.

JOSEPH PEARSON,

June 5, 1922. Editor.



Government Fisheries Steamer "Lilla."

GOVERNMENT FISHERIES STEAMER "LILLA."

THIS vessel is one of six trawlers purchased during the war from the Japanese Government for the purposes of mine sweeping. At the conclusion of the war she was handed over to the Fisheries Department and adapted to scientific work in the tropics. Built at Kobeshi in Japan in 1913, the "Lilla" is of the usual trawler design, and has the following dimensions and tonnage :—

A—Trawl winch.

B—Trawl gallows.

C—Deep sea sounding machine.

D—Nansen Petterson water bottle with boom.

E—Sounding machine with boom.

F—Eckman current meter with boom.

H—Steam capstan.

I—Steam windlass.

J—Davits for dredges.

K—Derricks.

M—Funnel.

O—Skylight and companion to Laboratory.

P—Skylight to cabin.

R—Cabin on main deck with chart room above.

S—Trawl wire quarter snatch block.

T—Ventilators.

U—Skylight of after cabin.

V—Gallery.

W—Engine room skylight.

X—Fore-castle head.

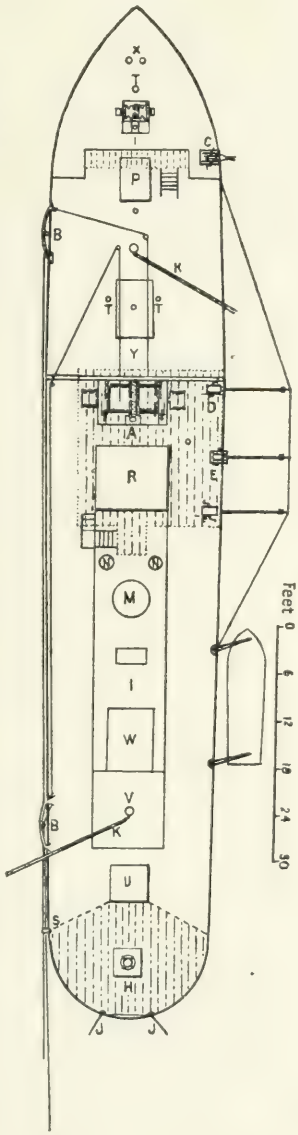
Y—Well-deck one foot below level of after deck.

Gross tonnage $249\frac{86}{100}$.

Registered tonnage $134\frac{93}{100}$.

Length over all. 126 feet 6 inches.

Length between perpendiculars, 120 feet.



Moulded depth, 12 feet.

Beam, 22 feet.

Bunker capacity, 120 tons giving a radius of 2,304 miles or twelve days steaming at 8 knots.

Fresh boiler water, 3,500 gallons.

Fresh drinking water, 4,000 gallons.

Draught loaded, 16 feet aft 11 feet forward.

Draught light: 11 feet 6 inches aft, 8 feet 6 inches forward.

Coal consumption from 8 to 10 tons for 24 hours.

Speed per hour, Welsh coal, 10 knots; Indian coal, 8 knots

Engines : Triple expansion surface condensing : I. H. P. 500 at 100 revolutions.

Electric lighting.

The trawl gear is on the port side, the gallows being placed as far aft as possible to give fullest spread obtainable in a vessel of this size. The starboard trawl gallows have been removed so as to leave that side of the ship clear for hydrographical work.

The dimensions of the trawling net are : head rope 70 feet of 3 feet rope, foot rope 100 feet of $2\frac{1}{2}$ inches steel wire, depth 80 feet, otter boards 8 feet 6 inches, breadth 4 feet 4 inches. Trawl net mesh 5 inches at head tapering to 1 inch at cod-end. Each drum of the trawl winch has 450 fathoms of $2\frac{1}{2}$ inches steel wire.

The Oceanographical equipment includes otter trawls, dredges, Agassiz trawls, "Sherbrutznet," "Yngle" trawl, Nansen nets, Hensen quantitative net, ordinary silk tow nets, Eckman current meters, water bottles of various types, large Lucas sounding machine (5,000 fathoms), small Lucas sounding machine (200 fathoms), Knudsen deep sea thermometers, Richter reversing thermometers and accessory winding apparatus fitted to steam capstan.

HYDROGRAPHICAL INVESTIGATIONS AT LAKE TAMBLEGAM.

By Joseph Pearson, D.Sc., F.R.S.E., F.L.S.

IN the course of the scientific investigations of the window-pane oyster fishery at Lake Tamblegam monthly records have been kept of the specific gravity of the water since September, 1915. At the end of each month the Government watcher collects samples of water from eight stations in the lake. The samples are placed in special stoppered bottles recommended by the International Council for the Exploration of the Sea, and are despatched to Colombo for examination. The samples are then tested by means of Knudsen hydrometers and corrections are applied by means of Dr. Knudsen's hydrographical tables.* An analysis of the results thus obtained are of exceptional interest as might be expected in view of the peculiar geographical position of Lake Tamblegam. This sheet of water is a shallow landlocked backwater connected with Trincomalee outer harbour, and has an area of nearly six square miles. It is connected with the sea by a narrow channel less than a quarter of a mile across. Flowing into the south-western and southern portions of the lake are several rivers, many of which are of little or no account except during the wet season, while the northern portion of the lake receives no rivers. The main portion of the lake is covered with soft slimy mud, and has a depth of from 5 to 8 feet. The wet season is from November to January, and the rest of the year is dry save for an occasional shower. Thus, for two or

* Cl. = Weight of chlorine in grammes in 1000 grs. of sea water.
S. = Total weight of salt in grammes in 1000 grs. of sea water.
$\%_{oo} = (S - 1)\ 1000$, where S. = specific gravity of sea water at 0° C. referred to distilled water at 4° C. So that a specific gravity of, say, 1·02542 is given as 25·42.

6(13)22—350

three months in the year during the season of torrential rains the lake receives an enormous amount of fresh water from the rivers flowing into the southern and south-western portions. During the remainder of the year this shallow stretch of water is subjected to the fierce rays of a tropical sun. The results of the water examination are what one would expect—a very low degree of salinity in December, the wettest and coolest month of the year, and a very high salinity in June the hottest month of the year, and the centre of highest salinity shifts from the mouth of the lake (December-February) to the head of the lake (June-October) with a transitional state of affairs in March, April, and May, and also in November.

An examination of charts 1 to 12 is interesting, as they show the distribution of water of different salinities for each month of the year. No. 1 refers to the lowest salinity and No. 8 to the highest. There is no relation as regards degree of salinity between the numbers in the different months. Thus, the highest salinity in December is less than the lowest salinity in June. These charts are therefore only valuable as indicating relative salinities. The actual specific gravities are given in the detailed statement found in Appendix I., and a summary of these results is given in Appendix II.

It is interesting to note that the centre of *highest* salinity moves along the northern portion of the lake starting from the entrance of the lake in December with the advent of the rains, taking up a position at the entrance of the lake for about three months from December, and then slowly shifting its position back to the head of the lake along the northern portion during the months of February to June. This centre remains at the head of the lake till October when the centre of high salinity returns to the entrance. Similarly, the centre of *lowest* salinity moves slowly along the southern portion of the lake. From November to April the centre of lowest salinity is at the head of the lake, and as the year goes on the centre passes eastwards along the southern section of the lake, and ultimately takes up its position at the mouth of the lake in July, where it remains for about four months. Chart 13 gives the tracks of the highest (continuous line) and the lowest (broken line) throughout the year.

The striking thing about these seasonal changes in salinity is the suddenness with which the conditions change in November and December. This is best seen by an examination of the mean salinities given in Appendix II., or by studying the curve of mean salinities throughout the year given in chart 14. It is this marked change in salinity at the end of the year that determines the breeding season of *Placuna placenta*. At the end of December and the beginning of January the water in the lake is practically fresh, and spawning takes place about the end of January. The spawning season is clearly defined, and is not spread over many months as is probably the case in the pearl oyster (*Margaritifera vulgaris*).

APPENDIX I.

Date and Station.	‰	Date and Station.	‰
September, 1915.		*December, 1915.*	
Station 1 ..	28·24	Station 1 ..	2·67
Do. 2 ..	28·11	Do. 2 ..	2·53
Do. 3 ..	28·06	Do. 3 ..	2·67
Do. 4 ..	28·43	Do. 4 ..	5·49
Do. 5 ..	28·48	Do. 5 ..	4·34
Do. 6 ..	27·72	Do. 6 ..	6·65
Do. 7 ..	28·25	Do. 7 ..	6·81
Do. 8 ..	28·30	Do. 8 ..	17·60
October, 1915.		*January, 1916.*	
Station 1 ..	28·53	Station 1 ..	11·06
Do. 2 ..	28·63	Do. 2 ..	12·16
Do. 3 ..	28·67	Do. 3 ..	13·69
Do. 4 ..	28·34	Do. 4 ..	12·78
Do. 5 ..	27·95	Do. 5 ..	13·48
Do. 6 ..	—	Do. 6 ..	11·14
Do. 7 ..	27·72	Do. 7 ..	14·21
Do. 8 ..	27·62	Do. 8 ..	13·72
November, 1915.		*February, 1916.*	
Station 1 ..	16·66	Station 1 ..	25·69
Do. 2 ..	18·66	Do. 2 ..	26·07
Do. 3 ..	18·08	Do. 3 ..	26·55
Do. 4 ..	17·76	Do. 4 ..	24·53
Do. 5 ..	21·88	Do. 5 ..	24·25
Do. 6 ..	21·83	Do. 6 ..	24·02
Do. 7 ..	17·08	Do. 7 ..	25·84
Do. 8 ..	17·52	Do. 8 ..	25·23

Date and Station.	π
March, 1916.	
Station 1	25·65
Do. 2	25·59
Do. 3	25·61
Do. 4	25·64
Do. 5	26·01
Do. 6	25·94
Do. 7	26·91
Do. 8	27·07
April, 1916.	
Station 1	30·22
Do. 2	28·40
Do. 3	28·56
Do. 4	27·71
Do. 5	27·96
Do. 6	27·96
Do. 7	27·61
Do. 8	27·77
May, 1916.	
Station 1	19·45
Do. 2	20·29
Do. 3	21·37
Do. 4	21·31
Do. 5	20·38
Do. 6	23·50
Do. 7	23·17
Do. 8	23·09
June, 1916.	
Station 1	28·53
Do. 2	28·75
Do. 3	28·80
Do. 4	28·79
Do. 5	28·32
Do. 6	28·27
Do. 7	27·89
Do. 8	27·42
July, 1916.	
Station 1	24·55
Do. 2	21·64
Do. 3	24·01
Do. 4	25·72
Do. 5	25·04
Do. 6	24·11
Do. 7	26·00
Do. 8	25·78

Date and Station.	π
August, 1916.	
Station 1	28·14
Do. 2	27·87
Do. 3	27·95
Do. 4	27·79
Do. 5	27·48
Do. 6	27·38
Do. 7	26·87
Do. 8	26·47
October, 1916.	
Station 1	28·25
Do. 2	28·15
Do. 3	28·14
Do. 4	27·51
Do. 5	27·41
Do. 6	27·83
Do. 7	27·19
Do. 8	27·25
November, 1916.	
Station 1	28·92
Do. 2	28·91
Do. 3	29·14
Do. 4	28·92
Do. 5	28·08
Do. 6	28·08
Do. 7	27·07
Do. 8	27·07
December, 1916.	
Station 1	4·56
Do. 2	3·44
Do. 3	6·32
Do. 4	13·48
Do. 5	13·37
Do. 6	9·89
Do. 7	12·68
Do. 8	15·12
January, 1917.	
Station 1	13·68
Do. 2	14·26
Do. 3	14·75
Do. 4	14·80
Do. 5	17·48
Do. 6	15·77
Do. 7	17·87
Do. 8	17·97

Date and Station.		‰
February, 1917.		
Station 1	..	11·09
Do. 2	..	11·30
Do. 3	..	11·84
Do. 4	..	12·81
Do. 5	..	14·97
Do. 6	..	14·93
Do. 7	..	15·90
Do. 8	..	17·09
March, 1917.		
Station 1	..	14·36
Do. 2	..	13·39
Do. 3	..	16·41
Do. 4	..	18·25
Do. 5	..	18·37
Do. 6	..	18·57
Do. 7	..	16·96
Do. 8	..	16·86
April, 1917.		
Station 1	..	22·63
Do. 2	..	21·98
Do. 3	..	23·50
Do. 4	..	24·89
Do. 5	..	25·22
Do. 6	..	25·77
Do. 7	..	25·32
Do. 8	..	24·59
May, 1917.		
Station 1	..	22·85
Do. 2	..	21·24
Do. 3	..	21·59
Do. 4	..	24·34
Do. 5	..	24·20
Do. 6	..	24·08
Do. 7	..	23·72
Do. 8	..	23·65
June, 1917.		
Station 1	..	28·22
Do. 2	..	28·02
Do. 3	..	27·73
Do. 4	..	28·02
Do. 5	..	28·25
Do. 6	..	27·47
Do. 7	..	27·84
Do. 8	..	27·79

Date and Station.		‰
July, 1917.		
Station 1	..	29·08
Do. 2	..	28·89
Do. 3	..	—
Do. 4	..	28·67
Do. 5	..	28·57
Do. 6	..	28·53
Do. 7	..	28·00
Do. 8	..	28·00
August, 1917.		
Station 1	..	23·14
Do. 2	..	23·56
Do. 3	..	23·24
Do. 4	..	24·57
Do. 5	..	25·64
Do. 6	..	24·89
Do. 7	..	25·21
Do. 8	..	—
September, 1917.		
Station 1	..	24·47
Do. 2	..	24·89
Do. 3	..	21·45
Do. 4	..	25·10
Do. 5	..	25·43
Do. 6	..	24·78
Do. 7	..	25·55
Do. 8	..	25·43
October, 1917.		
Station 1	..	28·28
Do. 2	..	28·00
Do. 3	..	27·84
Do. 4	..	27·79
Do. 5	..	27·47
Do. 6	..	27·57
Do. 7	..	27·68
Do. 8	..	27·68
November, 1917.		
Station 1	..	18·77
Do. 2	..	18·77
Do. 3	..	18·87
Do. 4	..	18·87
Do. 5	..	18·92
Do. 6	..	18·92
Do. 7	..	18·06
Do. 8	..	18·45

Date and Station.	‰
December, 1917.	
Station 1 ..	1·93
Do. 2 ..	2·03
Do. 3 ..	4·20
Do. 4 ..	9·46
Do. 5 ..	9·45
Do. 6 ..	7·50
Do. 7 ..	9·45
Do. 8 ..	9·77
January, 1918.	
Station 1 ..	5·37
Do. 2 ..	5·27
Do. 3 ..	5·06
Do. 4 ..	5·27
Do. 5 ..	5·37
Do. 6 ..	5·43
Do. 7 ..	5·43
Do. 8 ..	5·43
February, 1918.	
Station 1 ..	21·32
Do. 2 ..	21·01
Do. 3 ..	20·03
Do. 4 ..	21·37
Do. 5 ..	20·95
Do. 6 ..	20·61
Do. 7 ..	20·35
Do. 8 ..	20·89
March, 1918.	
Station 1 ..	22·91
Do. 2 ..	23·24
Do. 3 ..	24·24
Do. 4 ..	23·09
Do. 5 ..	24·24
Do. 6 ..	24·56
Do. 7 ..	20·99
Do. 8 ..	18·18
April, 1918.	
Station 1 ..	26·26
Do. 2 ..	27·03
Do. 3 ..	27·03
Do. 4 ..	27·09
Do. 5 ..	27·04
Do. 6 ..	27·04
Do. 7 ..	27·04
Do. 8 ..	26·94

Date and Station.	‰
May, 1918.	
Station 1 ..	27·74
Do. 2 ..	28·21
Do. 3 ..	27·89
Do. 4 ..	27·51
Do. 5 ..	27·95
Do. 6 ..	28·00
Do. 7 ..	27·89
Do. 8 ..	27·79
June, 1918.	
Station 1 ..	28·99
Do. 2 ..	28·94
Do. 3 ..	28·82
Do. 4 ..	28·82
Do. 5 ..	28·82
Do. 6 ..	28·82
Do. 7 ..	28·72
Do. 8 ..	28·51
July, 1918.	
Station 1 ..	27·95
Do. 2 ..	28·57
Do. 3 ..	28·47
Do. 4 ..	27·95
Do. 5 ..	28·24
Do. 6 ..	28·05
Do. 7 ..	27·95
Do. 8 ..	27·99
August, 1918.	
Station 1 ..	29·50
Do. 2 ..	29·55
Do. 3 ..	28·79
Do. 4 ..	28·69
Do. 5 ..	28·69
Do. 6 ..	29·14
Do. 7 ..	28·54
Do. 8 ..	27·95
September, 1918.	
Station 1 ..	30·00
Do. 2 ..	30·10
Do. 3 ..	28·94
Do. 4 ..	29·14
Do. 5 ..	28·76
Do. 6 ..	28·94
Do. 7 ..	28·66
Do. 8 ..	28·40

Date and Station.	₹
October, 1918.	
Station 1 ..	23·89
Do. 2 ..	22·43
Do. 3 ..	23·01
Do. 4 ..	23·73
Do. 5 ..	23·73
Do. 6 ..	23·08
Do. 7 ..	22·86
Do. 8 ..	23·28
November, 1918.	
Station 1 ..	18·47
Do. 2 ..	19·44
Do. 3 ..	19·76
Do. 4 ..	20·83
Do. 5 ..	20·73
Do. 6 ..	20·31
Do. 7 ..	18·89
Do. 8 ..	19·64
December, 1918.	
(No samples received)	
January, 1919.	
Station 1 ..	4·52
Do. 2 ..	3·54
Do. 3 ..	11·24
Do. 4 ..	11·24
Do. 5 ..	10·38
Do. 6 ..	9·83
Do. 7 ..	11·78
Do. 8 ..	12·31
February, 1919.	
Station 1 ..	17·50
Do. 2 ..	17·93
Do. 3 ..	20·09
Do. 4 ..	20·63
Do. 5 ..	21·83
Do. 6 ..	21·27
Do. 7 ..	21·27
Do. 8 ..	21·56
March, 1919.	
Station 1 ..	23·11
Do. 2 ..	22·41
Do. 3 ..	23·91
Do. 4 ..	21·96
Do. 5 ..	24·31
Do. 6 ..	25·24
Do. 7 ..	25·45
Do. 8 ..	25·93

Date and Station.	₹
April, 1919.	
Station 1 ..	25·56
Do. 2 ..	25·23
Do. 3 ..	26·62
Do. 4 ..	26·94
Do. 5 ..	26·84
Do. 6 ..	27·26
Do. 7 ..	26·51
Do. 8 ..	26·62
May, 1919.	
Station 1 ..	26·75
Do. 2 ..	26·54
Do. 3 ..	26·75
Do. 4 ..	27·18
Do. 5 ..	27·39
Do. 6 ..	26·96
Do. 7 ..	27·39
Do. 8 ..	27·49
June, 1919.	
Station 1 ..	29·43
Do. 2 ..	29·15
Do. 3 ..	28·95
Do. 4 ..	28·63
Do. 5 ..	28·85
Do. 6 ..	28·21
Do. 7 ..	28·63
Do. 8 ..	28·63
July, 1919.	
Station 1 ..	27·54
Do. 2 ..	27·64
Do. 3 ..	27·76
Do. 4 ..	27·96
Do. 5 ..	27·86
Do. 6 ..	27·64
Do. 7 ..	27·96
Do. 8 ..	27·76
August, 1919.	
Station 1 ..	30·67
Do. 2 ..	30·35
Do. 3 ..	29·65
Do. 4 ..	29·27
Do. 5 ..	29·01
Do. 6 ..	29·47
Do. 7 ..	28·86
Do. 8 ..	28·44

Date and Station.	‰
September, 1919.	
Station 1	25·50
Do. 2	25·78
Do. 3	26·42
Do. 4	26·74
Do. 5	—
Do. 6	26·96
Do. 7	24·27
Do. 8	23·31
October, 1919.	
Station 1	18·50
Do. 2	18·22
Do. 3	20·12
Do. 4	21·55
Do. 5	20·45
Do. 6	20·70
Do. 7	19·76
Do. 8	20·46
November, 1919.	
Station 1	7·45
Do. 2	7·40
Do. 3	8·69
Do. 4	12·19
Do. 5	11·78
Do. 6	10·22
Do. 7	12·01
Do. 8	14·67
December, 1919.	
Station 1	11·89
Do. 2	12·01
Do. 3	12·05
Do. 4	11·89
Do. 5	12·43
Do. 6	12·52
Do. 7	12·81
Do. 8	12·93
February, 1920.	
Station 1	20·83
Do. 2	21·40
Do. 3	23·94
Do. 4	23·70
Do. 5	23·60
Do. 6	25·11
Do. 7	22·12
Do. 8	22·93

Date and Station.	‰
March, 1920.	
Station 1	22·93
Do. 2	22·35
Do. 3	23·31
Do. 4	22·06
Do. 5	23·05
Do. 6	22·43
Do. 7	22·09
Do. 8	21·38
April, 1920.	
Station 1	21·77
Do. 2	22·47
Do. 3	22·99
Do. 4	22·12
Do. 5	22·06
Do. 6	22·85
Do. 7	21·82
Do. 8	21·56
May, 1920.	
Station 1	23·99
Do. 2	26·14
Do. 3	26·72
Do. 4	27·12
Do. 5	26·87
Do. 6	26·87
Do. 7	26·64
Do. 8	27·41
June, 1920.	
Station 1	27·82
Do. 2	29·04
Do. 3	28·21
Do. 4	28·82
Do. 5	28·51
Do. 6	27·96
Do. 7	28·75
Do. 8	28·50
July, 1920.	
Station 1	29·69
Do. 2	30·30
Do. 3	29·79
Do. 4	29·65
Do. 5	29·55
Do. 6	29·43
Do. 7	29·24
Do. 8	28·12

Date and Station.	₹
August, 1920.	
Station 1 ..	29·71
Do. 2 ..	29·53
Do. 3 ..	29·69
Do. 4 ..	29·34
Do. 5 ..	28·86
Do. 6 ..	27·48
Do. 7 ..	28·56
Do. 8 ..	27·82
September, 1920.	
Station 1 ..	29·65
Do. 2 ..	29·29
Do. 3 ..	29·43
Do. 4 ..	28·08
Do. 5 ..	28·28
Do. 6 ..	28·66
Do. 7 ..	28·08
Do. 8 ..	27·84
October, 1920.	
Station 1 ..	27·54
Do. 2 ..	27·34
Do. 3 ..	26·00
Do. 4 ..	25·72
Do. 5 ..	25·18
Do. 6 ..	25·16
Do. 7 ..	24·91
Do. 8 ..	24·84
November, 1920.	
Station 1 ..	14·58
Do. 2 ..	14·81
Do. 3 ..	14·20
Do. 4 ..	19·53
Do. 5 ..	20·24
Do. 6 ..	18·09
Do. 7 ..	17·64
Do. 8 ..	17·48
December, 1920.	
Station 1 ..	8·78
Do. 2 ..	10·56
Do. 3 ..	10·67
Do. 4 ..	11·36
Do. 5 ..	11·91
Do. 6 ..	11·85
Do. 7 ..	11·46
Do. 8 ..	11·75

Date and Station.	₹
January, 1921.	
Station 1 ..	0·15
Do. 2 ..	0·00
Do. 3 ..	0·00
Do. 4 ..	2·09
Do. 5 ..	2·46
Do. 6 ..	2·24
Do. 7 ..	3·44
Do. 8 ..	3·01
February, 1921.	
Station 1 ..	16·12
Do. 2 ..	16·99
Do. 3 ..	15·31
Do. 4 ..	20·43
Do. 5 ..	21·70
Do. 6 ..	22·76
Do. 7 ..	21·72
Do. 8 ..	23·46
March, 1921.	
Station 1 ..	24·43
Do. 2 ..	24·01
Do. 3 ..	25·11
Do. 4 ..	25·78
Do. 5 ..	26·14
Do. 6 ..	25·88
Do. 7 ..	26·19
Do. 8 ..	26·10
April, 1921.	
Station 1 ..	22·09
Do. 2 ..	22·73
Do. 3 ..	20·85
Do. 4 ..	24·17
Do. 5 ..	24·31
Do. 6 ..	24·14
Do. 7 ..	24·82
Do. 8 ..	24·59
May, 1921.	
Station 1 ..	28·86
Do. 2 ..	28·56
Do. 3 ..	28·82
Do. 4 ..	28·76
Do. 5 ..	27·98
Do. 6 ..	28·48
Do. 7 ..	28·37
Do. 8 ..	27·95

Date and Station.	‰
June, 1921.	
Station 1 ..	29·78
Do. 2 ..	30·06
Do. 3 ..	29·01
Do. 4 ..	29·01
Do. 5 ..	28·67
Do. 6 ..	28·63
Do. 7 ..	27·90
Do. 8 ..	27·67
July, 1921.	
Station 1 ..	27·82
Do. 2 ..	27·60
Do. 3 ..	27·92
Do. 4 ..	28·14
Do. 5 ..	28·02
Do. 6 ..	27·82
Do. 7 ..	27·73
Do. 8 ..	27·70
August, 1921.	
Station 1 ..	24·66
Do. 2 ..	24·87
Do. 3 ..	23·79
Do. 4 ..	26·00
Do. 5 ..	24·88
Do. 6 ..	25·52
Do. 7 ..	25·10
Do. 8 ..	25·10
September, 1921.	
Station 1 ..	28·15
Do. 2 ..	28·25
Do. 3 ..	28·63
Do. 4 ..	28·31
Do. 5 ..	27·99
Do. 6 ..	28·31
Do. 7 ..	26·81
Do. 8 ..	27·03

Date and Station.	‰
October, 1921.	
Station 1 ..	25·04
Do. 2 ..	24·98
Do. 3 ..	23·74
Do. 4 ..	23·09
Do. 5 ..	23·12
Do. 6 ..	23·50
Do. 7 ..	20·40
Do. 8 ..	22·89
November, 1921.	
Station 1 ..	13·37
Do. 2 ..	13·69
Do. 3 ..	16·12
Do. 4 ..	16·50
Do. 5 ..	17·35
Do. 6 ..	16·03
Do. 7 ..	16·81
Do. 8 ..	16·67
December, 1921.	
Station 1 ..	1·69
Do. 2 ..	2·66
Do. 3 ..	1·74
Do. 4 ..	3·28
Do. 5 ..	3·80
Do. 6 ..	3·03
Do. 7 ..	4·02
Do. 8 ..	4·10
January, 1922.	
Station 1 ..	8·40
Do. 2 ..	9·26
Do. 3 ..	12·00
Do. 4 ..	15·04
Do. 5 ..	14·54
Do. 6 ..	13·22
Do. 7 ..	15·19
Do. 8 ..	15·12

APPENDIX II.

Records of Mean Specific Gravities at each Station for each Month of the Year from 1915 to end of 1921.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.	Station 7.	Station 8.	Mean.
January ..	7·01	7·13	9·03	9·23	9·83	8·92	10·54	10·49	9·02
February ..	18·76	19·22	19·63	20·58	21·21	21·45	21·20	21·86	20·49
March ..	22·23	21·86	23·10	22·79	23·69	23·77	23·10	22·59	22·89
April ..	24·75	24·54	24·91	25·49	25·57	25·84	25·52	25·34	25·24
May ..	24·94	25·16	25·52	26·04	25·79	26·31	26·20	26·23	25·77
June ..	28·79	28·99	28·59	28·68	28·57	28·23	28·29	28·09	28·53
July ..	27·77	27·44	27·59	28·01	27·88	27·60	27·81	27·56	27·71
August ..	27·64	27·62	27·18	27·26	27·43	27·31	27·19	27·16	27·35
September ..	27·67	27·19	27·15	27·63	27·79	28·06	26·94	26·72	27·39
October ..	25·72	25·39	25·36	25·39	25·04	24·64	24·36	24·86	25·09
November ..	16·89	17·38	17·84	20·66	19·85	19·07	18·22	19·07	19·00
December ..	5·25	5·54	6·27	10·99	9·22	8·57	9·57	11·88	8·38

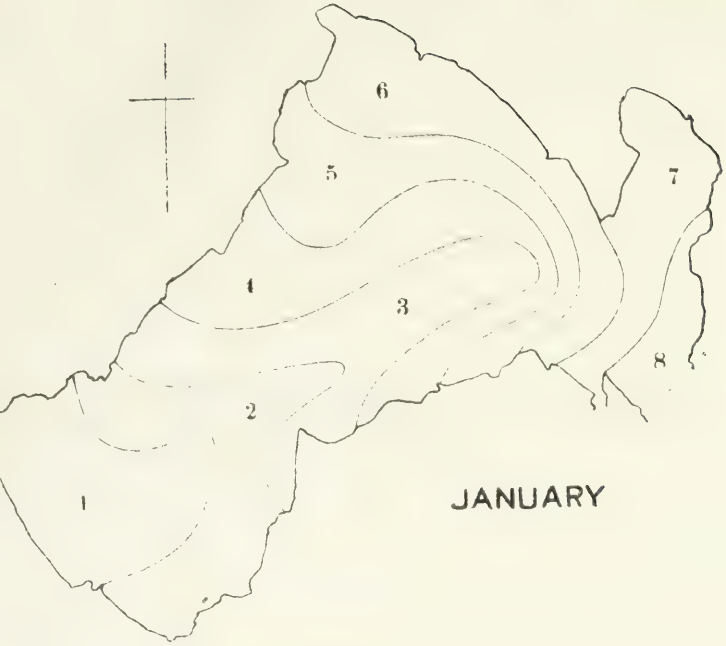


Chart 1. Chart 2.

Isohalines giving relative densities (No. 1 = lowest density ; No. 8 = highest density).

Chart 3.

Chart 4.

Chart 5.

Chart 6.

Isohalines giving relative densities (No. 1 = lowest density ; No. 8 = highest density).

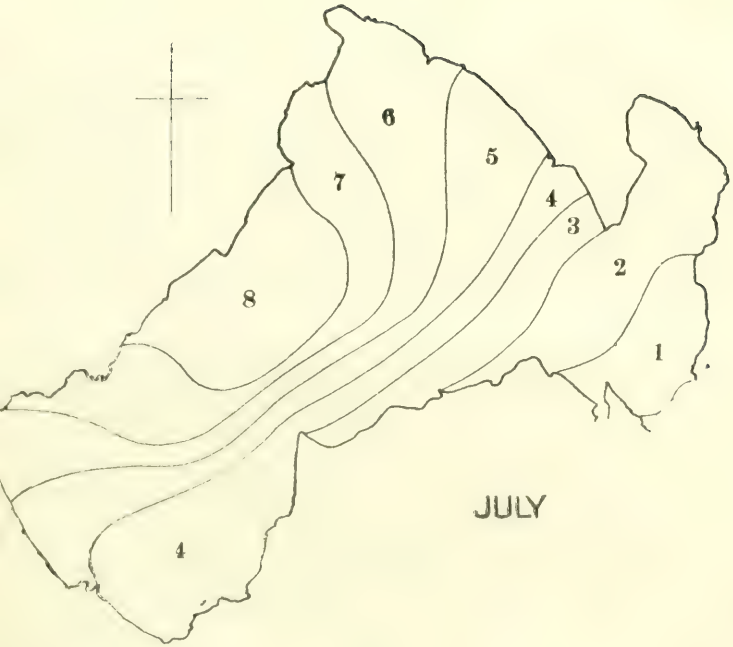


Chart 7.

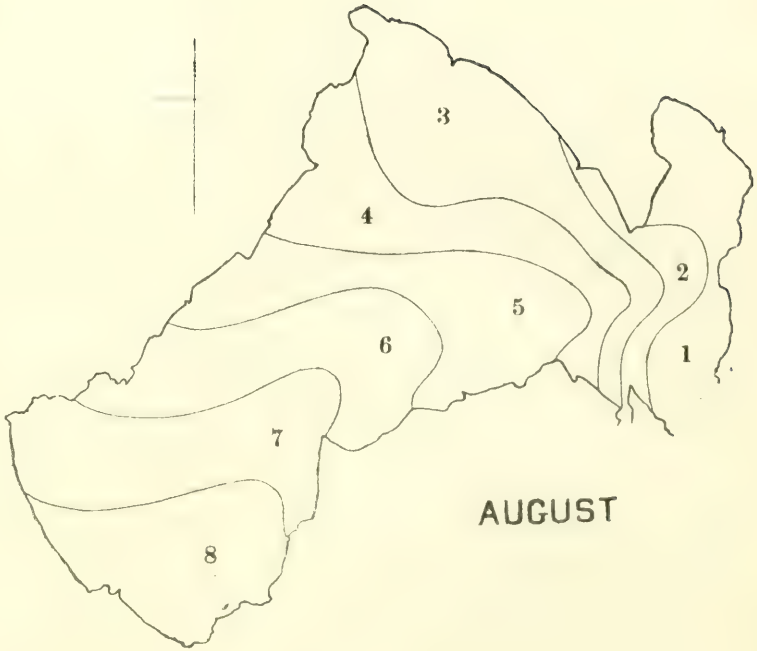


Chart 8. (Omitting 1917.)

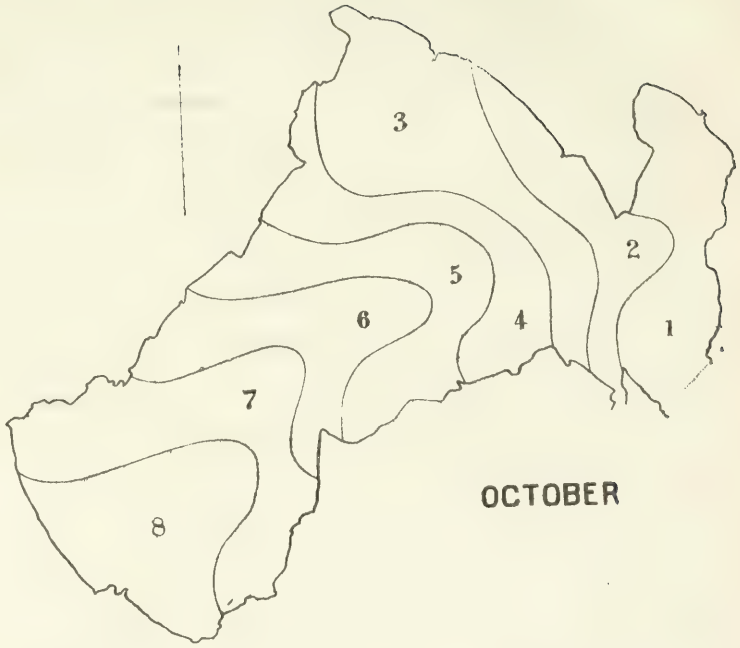
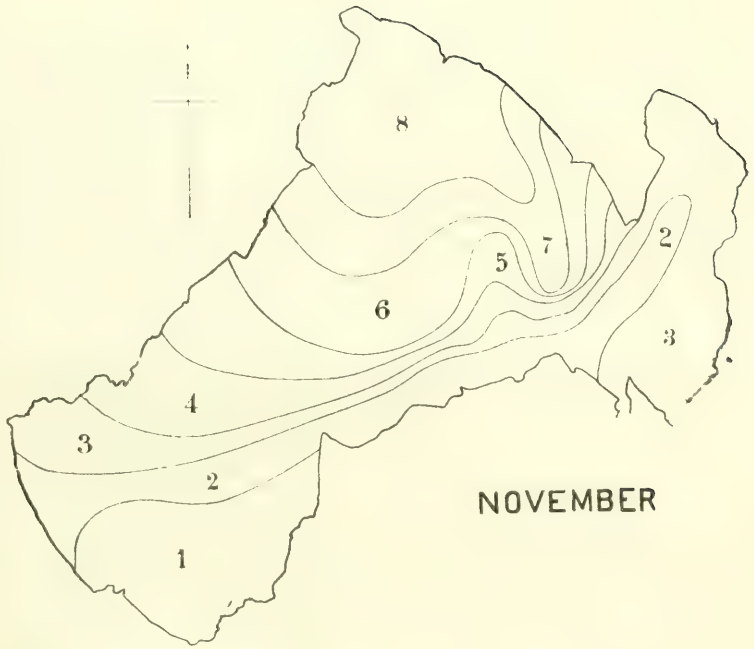


Chart 9. (1918 only.)

Chart 10. (Omitting 1918 and 1919.)

Isohalines giving relative densities (No. 1 = lowest density ; No. 8 = highest density).



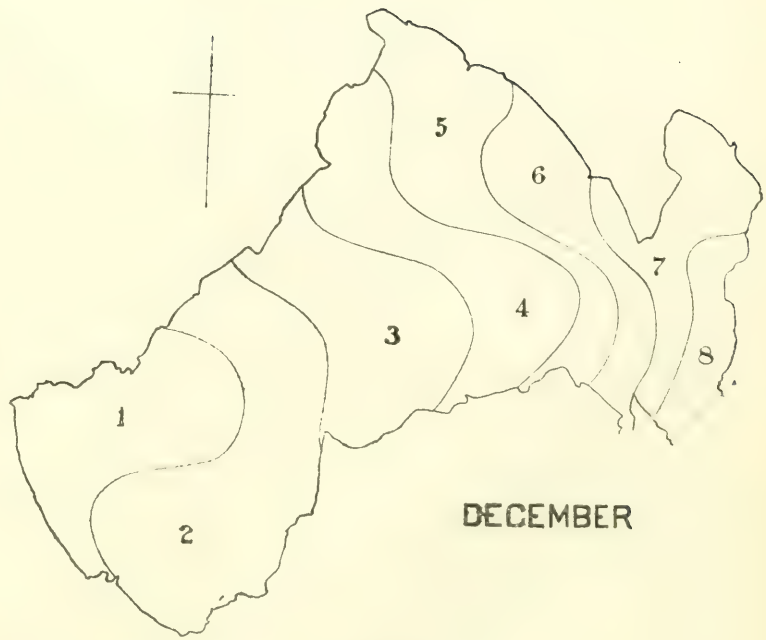


Chart 11. (Omitting 1916 and 1919.)

Chart 12.

Isohalines giving relative densities (No. 1 = lowest density : No. 8 = highest density).

Chart 13.

Illustrating the shifting of the centres of highest salinity (continuous line), and lowest salinity (broken line) throughout the year.

Chart II.

Giving mean specific gravity for each month in the year.

STATISTICS DEALING WITH THE GROWTH RATE, &c., OF PLACUNA PLACENTA.

By Joseph Pearson, D.Sc., F.R.S.E., F.L.S.

FOR the last ten years systematic measurements of *Placuna placenta* have been made at Lake Tamblegam. In all over 13,000 oysters have been measured for weight, length of short diameter (hinge diameter), and length of long diameter and in the present paper the results of this work are summarized. These measurements were taken at the following inspections :—

1912	..	May, June, September.
1913	..	January, May, September.
1914	..	January, April, October.
1915	..	January, April, July, September, December.
1916	..	March, August, September.
1917	..	January, May, September.
1918	..	January, March, September.
1919	..	February, June-July, August.
1920	..	January-February, May, October.

At these inspections oysters of all ages were examined, representing the following birth years :—1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1919, and 1920.

So far as I am aware this is the most complete series of measurements of a bivalve mollusc so far attempted, and the results are of sufficient interest to justify their being placed on record. Some of the more important results of the work are the determination of (1) growth rate (linear) of *Placuna placenta* up to the eighth year : (2) the growth rate (weight) ; (3) the relation between the short and long diameters; (4) the relation between the weight and linear measurement at all stages in the life history.

Growth Rate (*Linear*).

In Appendix I. an analysis of the linear dimensions (short diameter) of the different age groups of oysters, as well as the mean measurements, are given. In Appendix III., these mean measurements are arranged in order of age. In Fig. 1 these mean measurements are plotted, and thus a very reliable curve of the mean growth rate can be obtained. This curve, which gives the growth rate over seven years, is instructive. It will be seen that *Placuna placenta* attains a growth of 170 mm (short diameter) at the beginning of the eighth year. Nearly half this growth takes place in the first twelve months, so that the curve is very steep at first and becomes increasingly flatter as the mollusc grows older. The actual increase in the seventh year is only 10 mm., compared with 75 mm. in the first year.

Growth Rate (*Weight*).

Details of the weights of the different age groups at each inspection are given in Appendix II. From the mean measurements thus obtained we are able to give the mean measurements of all groups of oysters in order of age (*vide* Appendix III.). In Fig. 2 these mean measurements are plotted, and a curve of the mean growth is obtained. This curve is the reverse of that obtained in the case of the linear growth, that is to say, the rate of growth increases as the age increases. Thus, the weight increases by 20 grms. in the first year, by 50 grms. in the fourth year, and by 85 grms. in the seventh year, the mean weight at the beginning of the eighth year being 360 grs.

From these two curves the following mean measurements for linear growth and weight are given for every six months up to the beginning of the eight year :—

		Short Diameter. (mm.)	Weight. Grms.
First Year	February	—	—
	August	50	8
Second Year	February	75	20
	August	90	35

		Short Diameter. (mm.)	Weight. Grms.
Third year	February	102	55
	August	110	75
Fourth year	February	118	100
	August	125	125
Fifth year	February	132	150
	August	139	175
Sixth year	February	146	205
	August	152	235
Seventh year	February	157	275
	August	162	315
Eighth year	February	166	360

Relation between Weight and Short Diameter.

The measurements have been analysed to give a comparison between weight in grammes and short diameter in millimeters. The results are given in Appendix VI. From these figures we obtain the following results :—

Mean Weight. Grms.	Mean Short Diameter. mm.	Mean Weight. Grms.	Mean Short Diameter. mm.
5	57·5	125	126·4
15	74·6	135	129·3
25	85·2	145	129·8
35	92·9	155	132·3
45	98·0	165	133·2
55	103·1	175	136·2
65	105·0	185	138·5
75	109·7	195	139·1
85	113·2	205	141·4
95	117·1	215	143·1
105	120·3	225	147·2
115	122·8	235	147·3
—	—	245	148·3

In my Administration Report (Marine Biology) for 1920–21 I gave these measurements, but made the error of giving the mean short diameter as 1 mm. less than what it should have

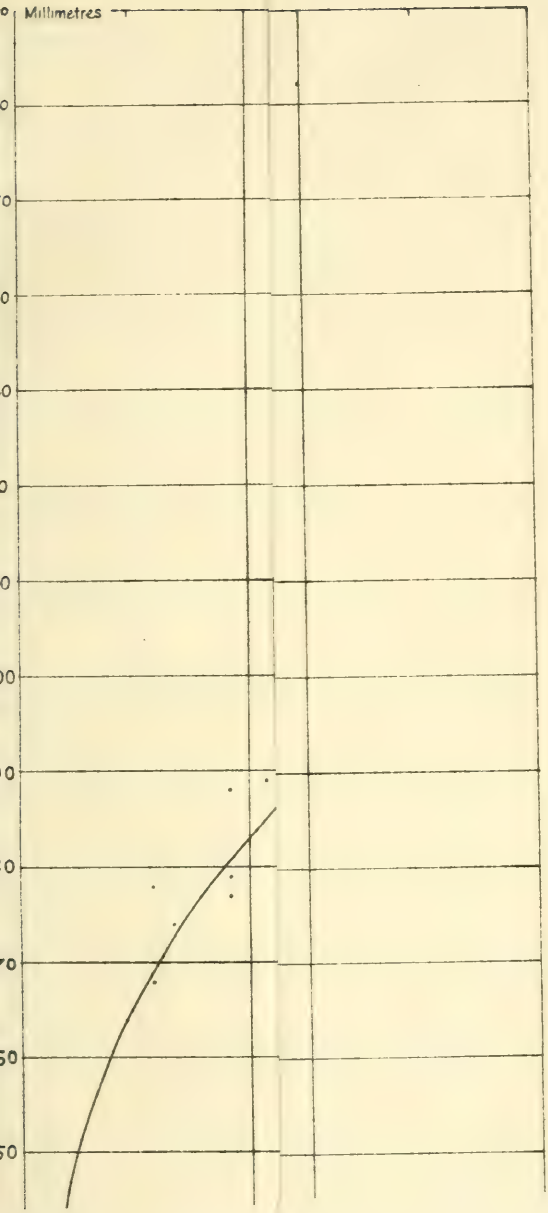
been. From these comparative mean measurements a curve can be constructed to show the relation of x (the weight in grammes) to y (the measurement of the short diameter in mm.). This curve is shown in Fig. 3. From these results I was able to derive a formula* $y - 98 = 90\left(\frac{x-45}{x+125}\right)$ which is a close approximation of the actual results. Mr. A. J. Bamford, the Superintendent of the Colombo Observatory, suggests another formula, which gives a slightly closer approximation than my own. This formula is $x = 0{\cdot}0052\left(\frac{y-1}{10}\right)^4$ or for practical purposes $x = \frac{1}{200}\left(\frac{y-1}{10}\right)^4$

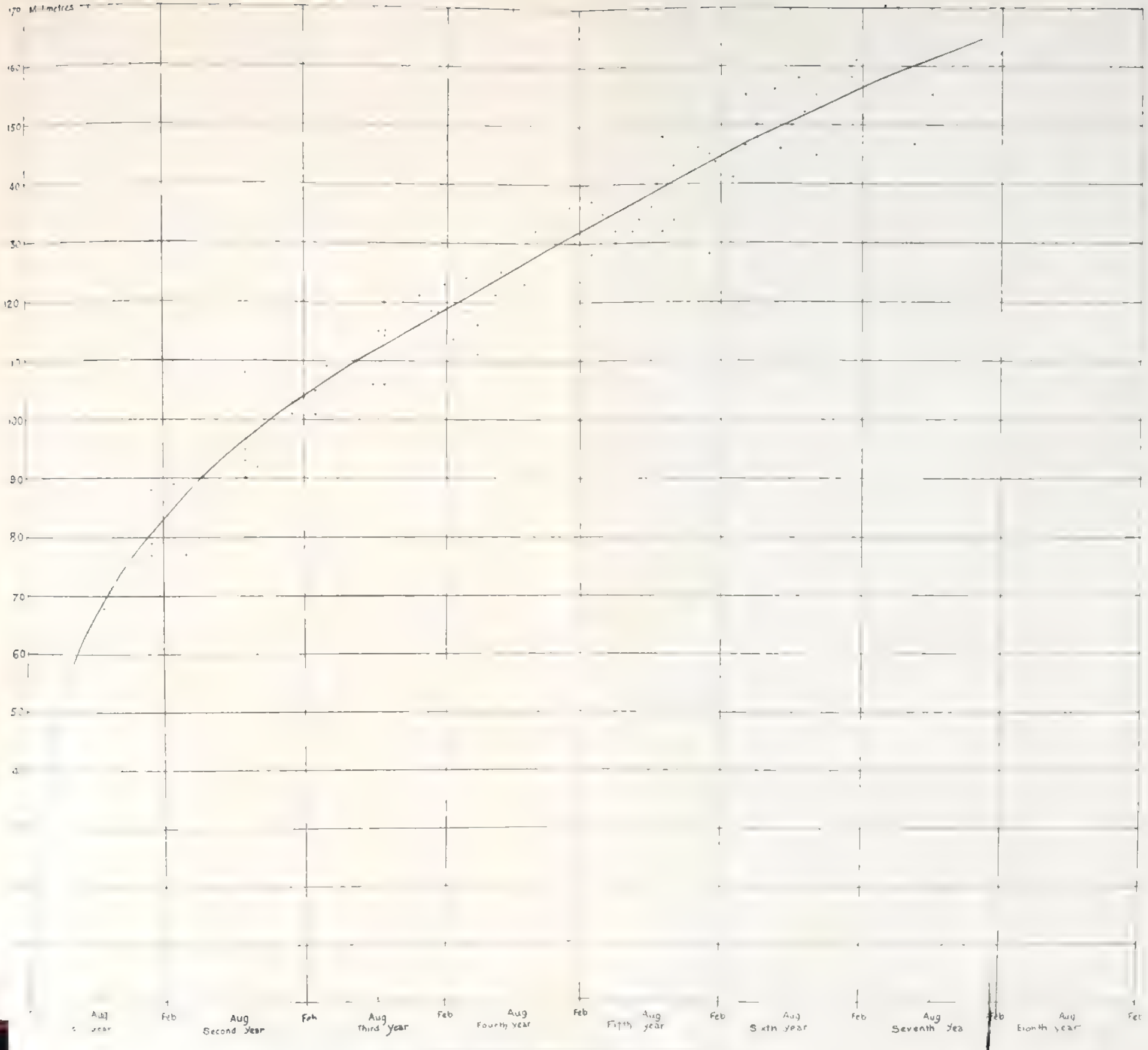
Relation between Short Diameter and Long Diameter.

The measurements have been further analysed to show the relation between short diameter and long diameter. These are given in Appendix VII., and the results are as follows :—

Short Diameter. mm.	Long Diameter. mm.	Short Diameter. mm.	Long Diameter. mm.
15 ..	17·57	112·5 ..	121·03
25 ..	27·26	117·5 ..	126·26
35 ..	40·07	122·5 ..	130·78
45 ..	48·81	127·5 ..	134·72
55 ..	58·80	132·5 ..	139·92
65 ..	70·50	137·5 ..	144·76
75 ..	81·40	142·5 ..	149·18
85 ..	92·30	147·5 ..	154·00
92·5 ..	99·88	152·5 ..	158·28
97·5 ..	104·16	157·5 ..	163·12
102·5 ..	109·70	162·5 ..	167·27
107·5 ..	115·85	167·5 ..	175·20

* The formulæ given here differ slightly from those given by me in my Administration Report (Marine Biology) for 1920–21 for the reasons indicated above.


Millimetres


170 Millimetres
160
150
140
130
120
110
100
90
80
70
60
50
Aug
Feb
Aug
Second Year
Feb
Aug
third year
Feb
Aug
Fourth year
Feb
Aug
Fifth year
Feb
Aug
Sixth year
Feb
Aug
Seventh Yea
Feb
Aug
Eighth year
Feb

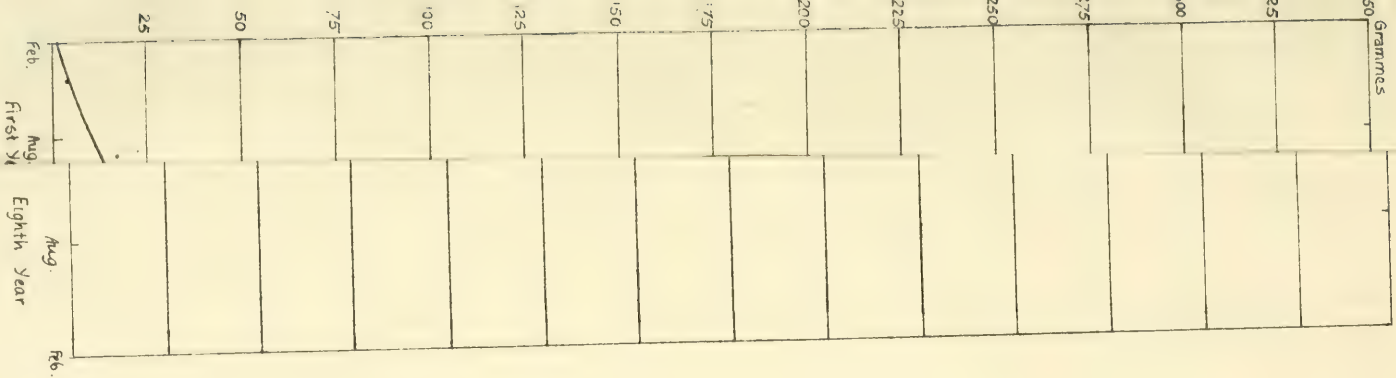


Fig. 3. Curve showing relation between length and weight.

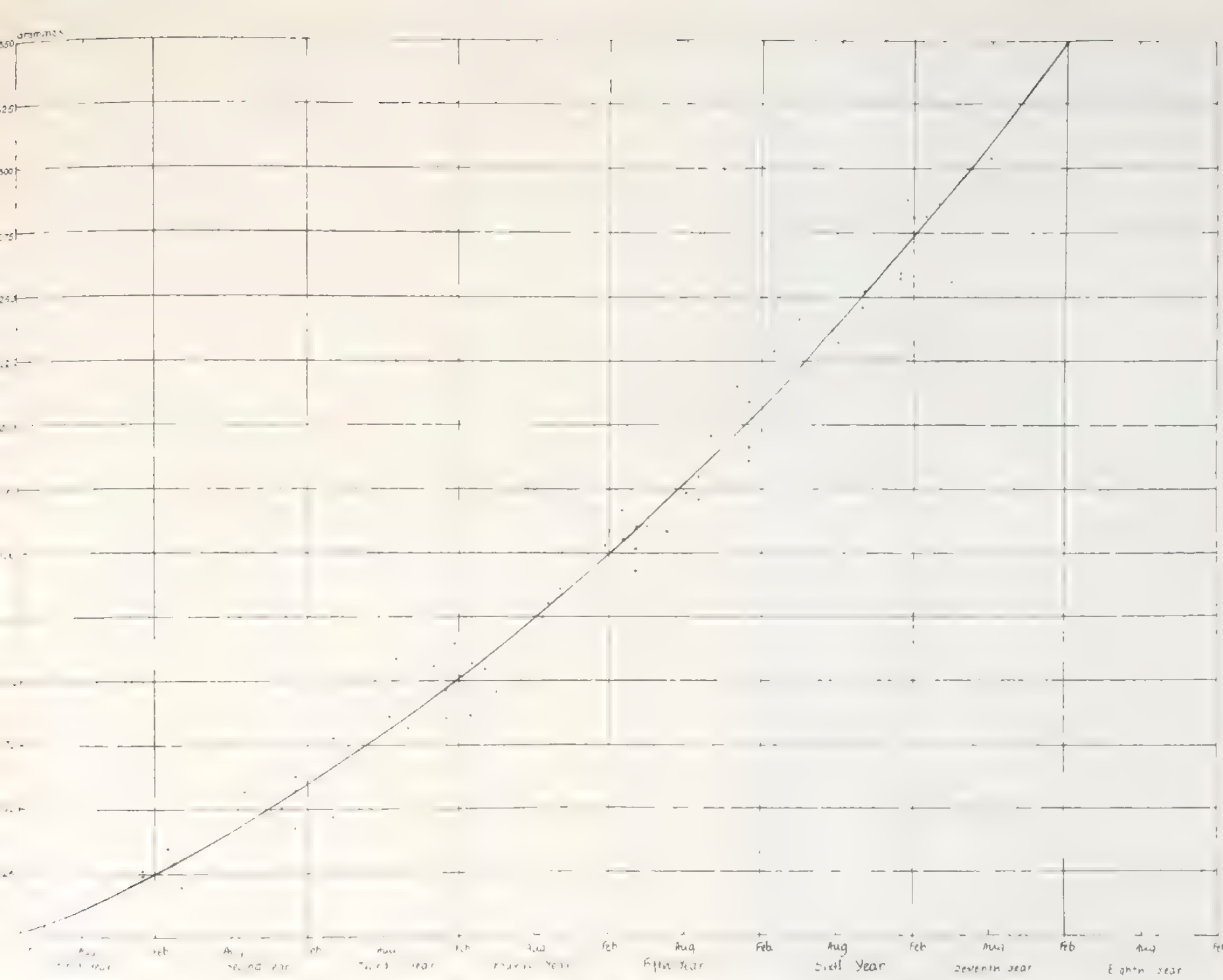
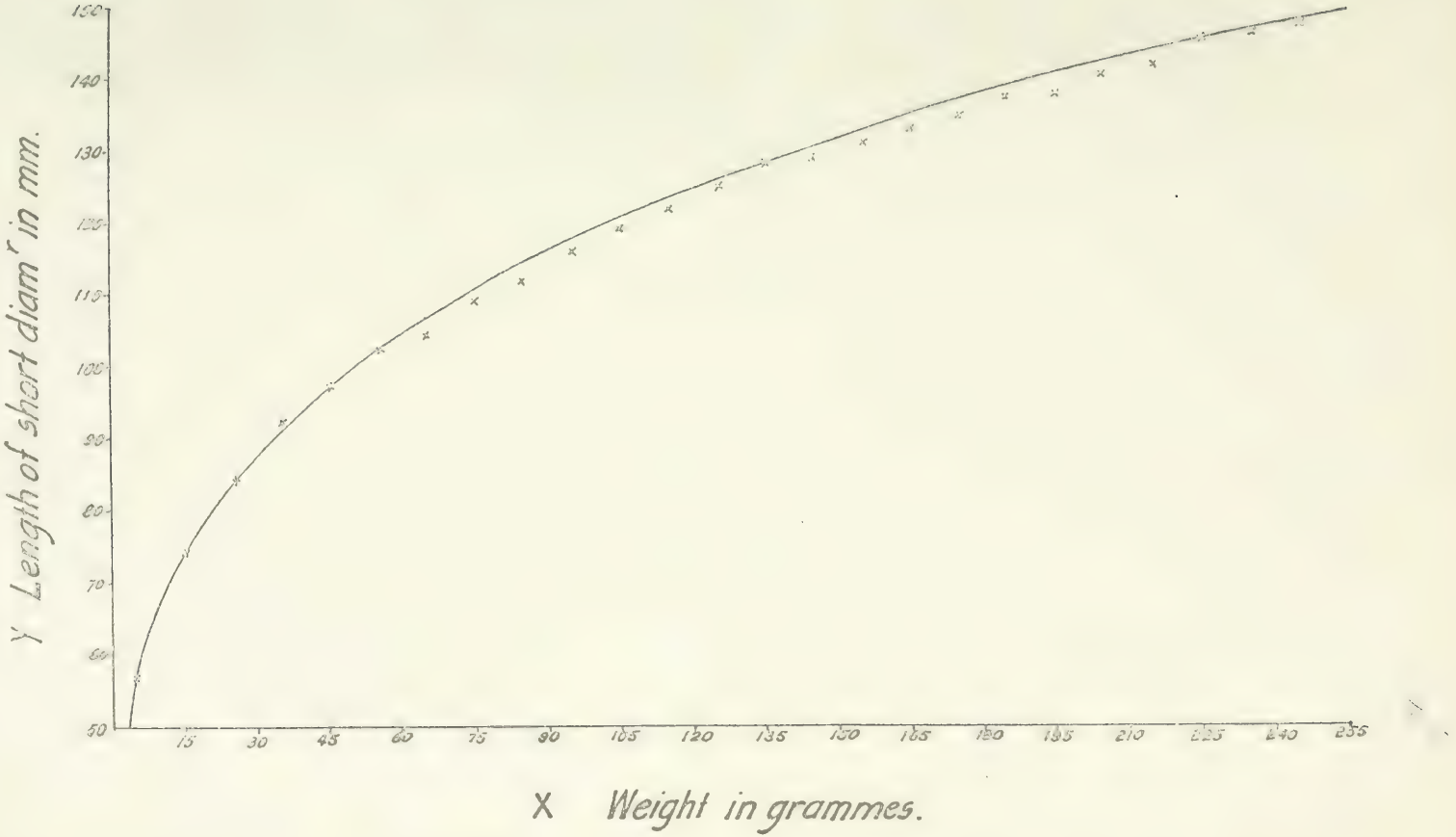
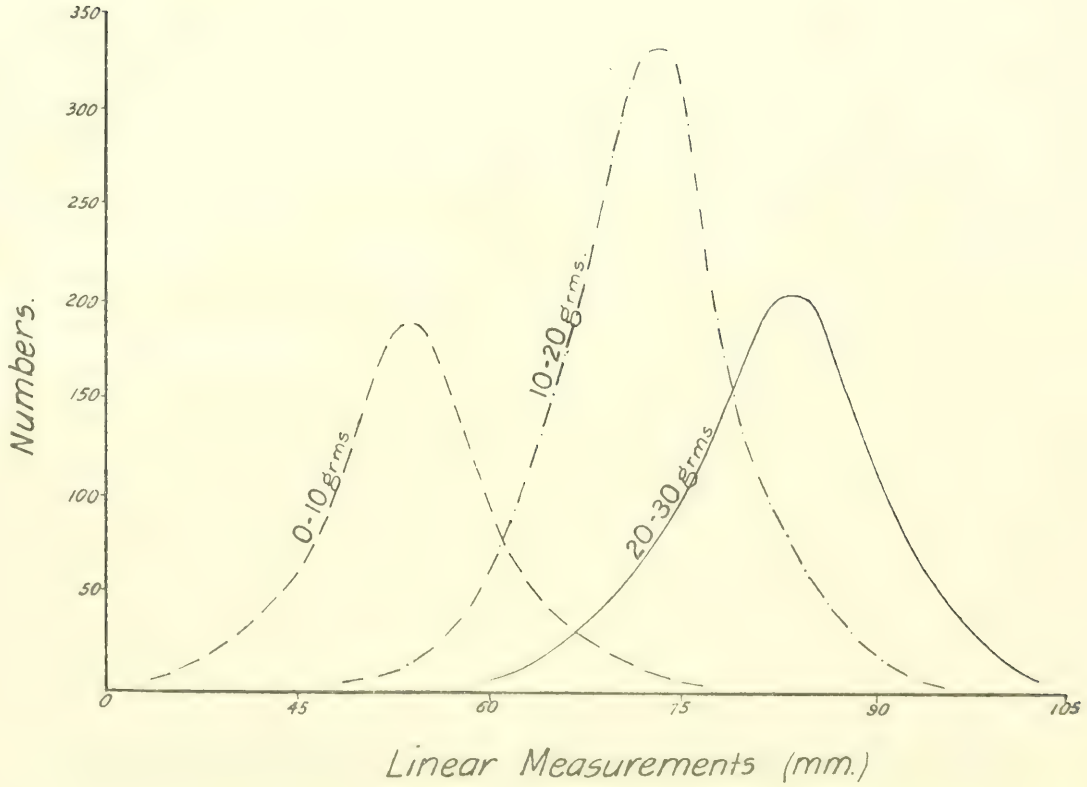


Fig. 2. – Curve h wing gr wth rate (we ght) f *Placuna placenta.*



. Fig. 3.—Curve showing relation between length and weight.



Figs. 4–11.—Curves showing relation between different weight groups and the linear measurement.

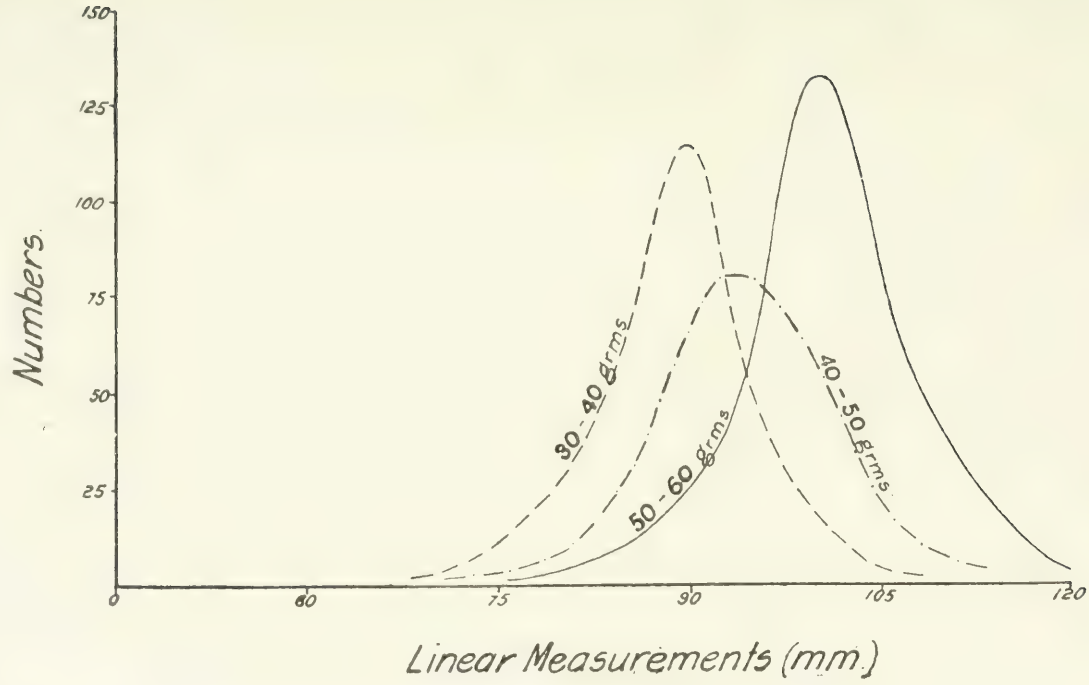

150
125
100
75
50
25
Numbers
30 - 40 grms
50 - 60 grms
40 - 50 grms
0
60
75
90
105
120
Linear Measurements (mm.)

Fig. 5.

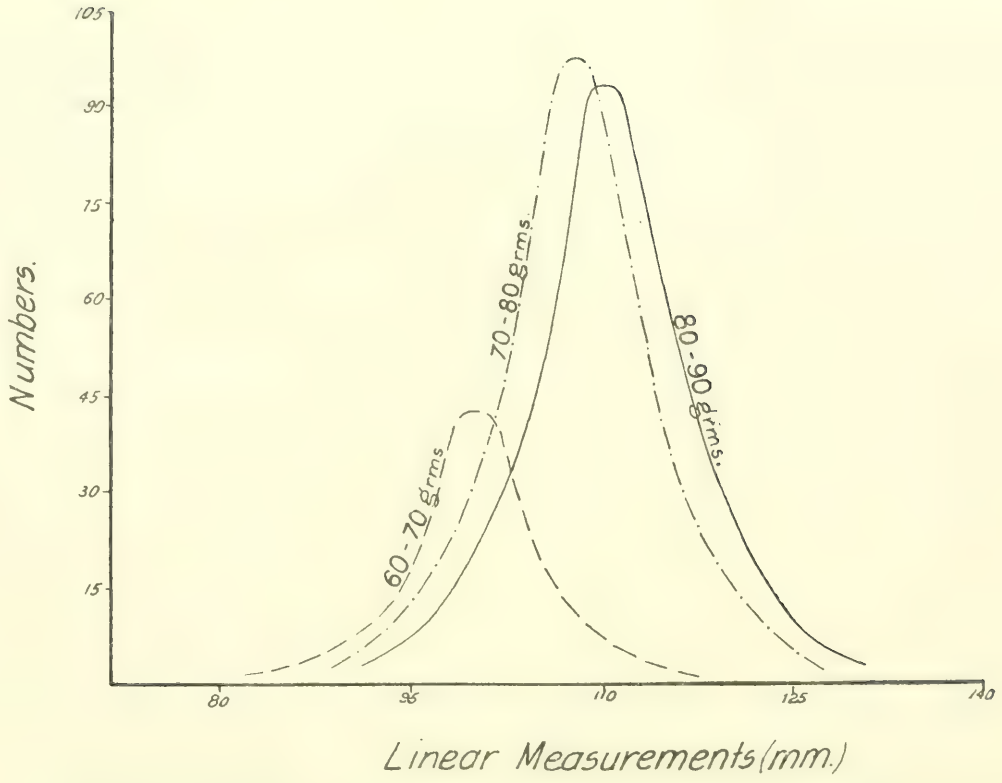

105
90
75
60
45
30
15
Numbers.
60-70 grms.
70-80 grms.
80-90 grms.
80
95
110
125
140
Linear Measurements (mm.)

Fig. 6.

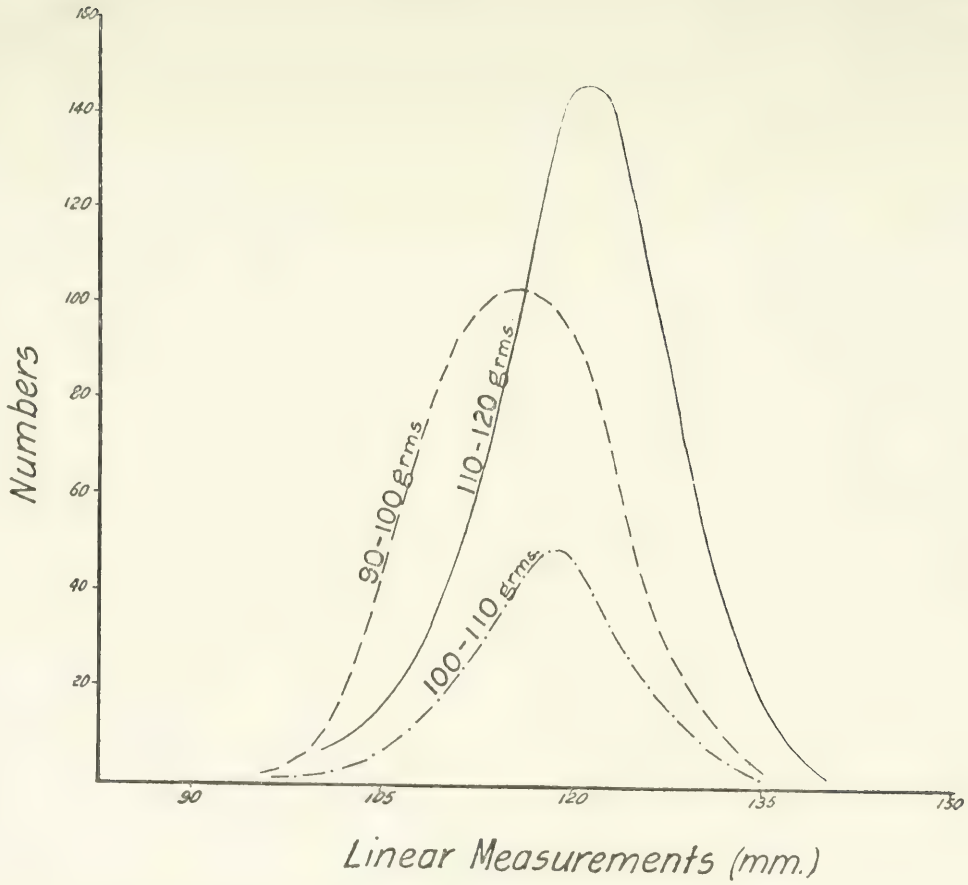

Numbers
160
140
120
100
80
60
40
20
90-100 grms.
110-120 grms.
100-110 grms.
90
105
120
135
150
Linear Measurements (mm.)

Fig. 7.

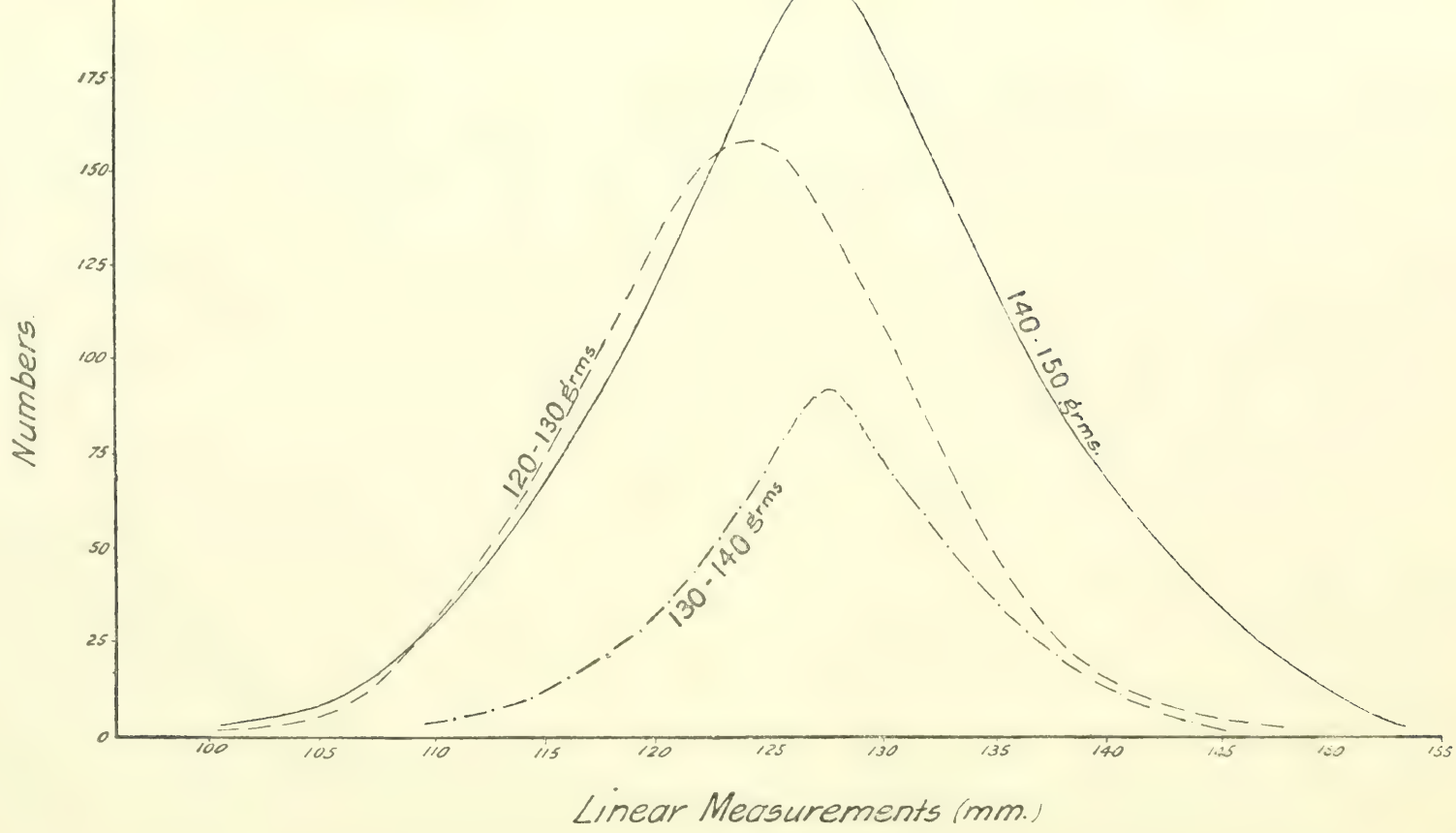

Numbers
175
150
125
100
75
50
25
0
120-130 grms.
130-140 grms.
140-150 grms.
100
105
110
115
120
125
130
135
140
145
150
155
Linear Measurements (mm.)

Fig. 8.

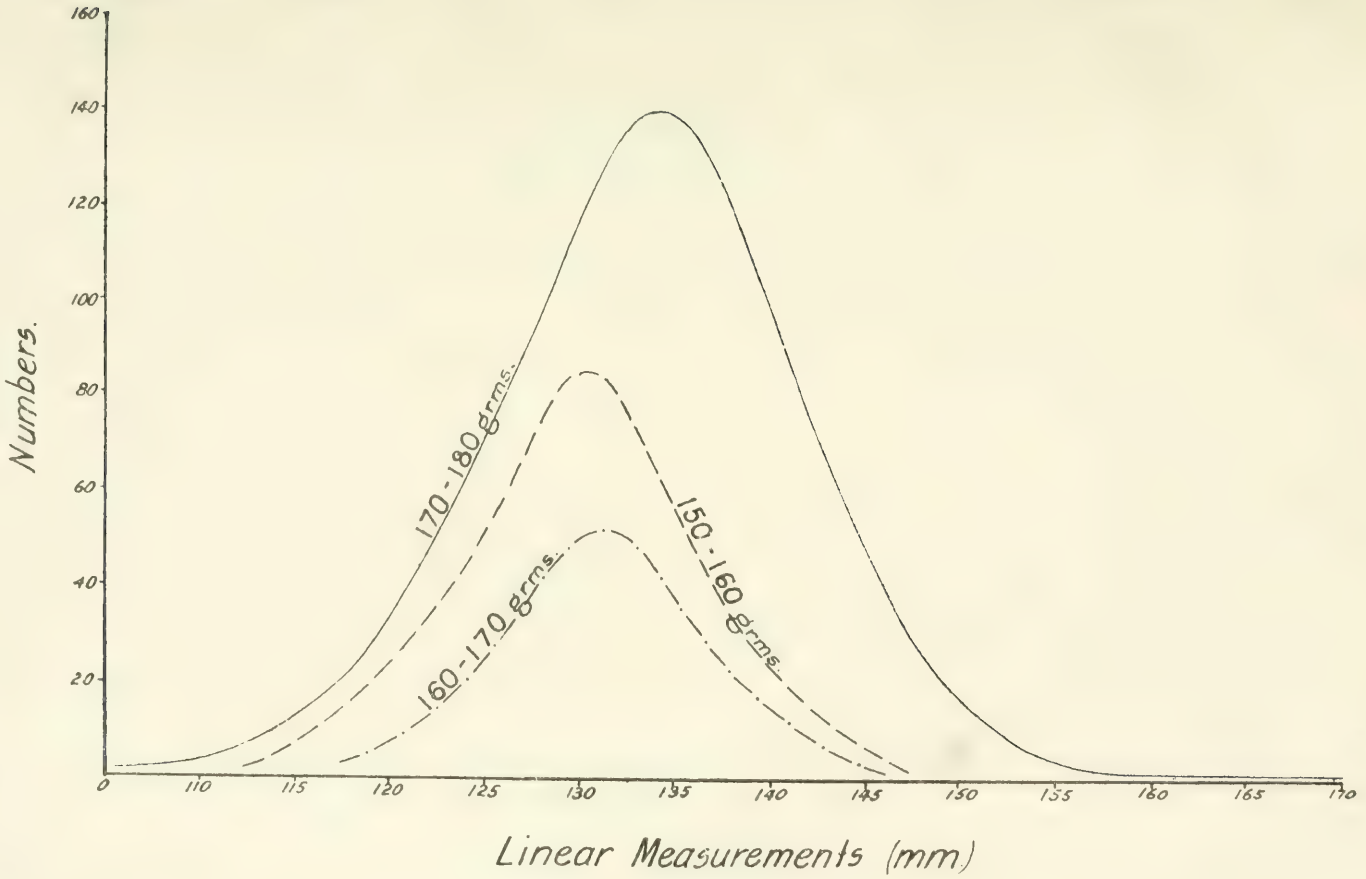

Numbers.
160
140
120
100
80
60
40
20
0
110
115
120
125
130
135
140
145
150
155
160
165
170
170-180 grms.
160-170 grms.
150-160 grms.
Linear Measurements (mm)

Fig. 9.

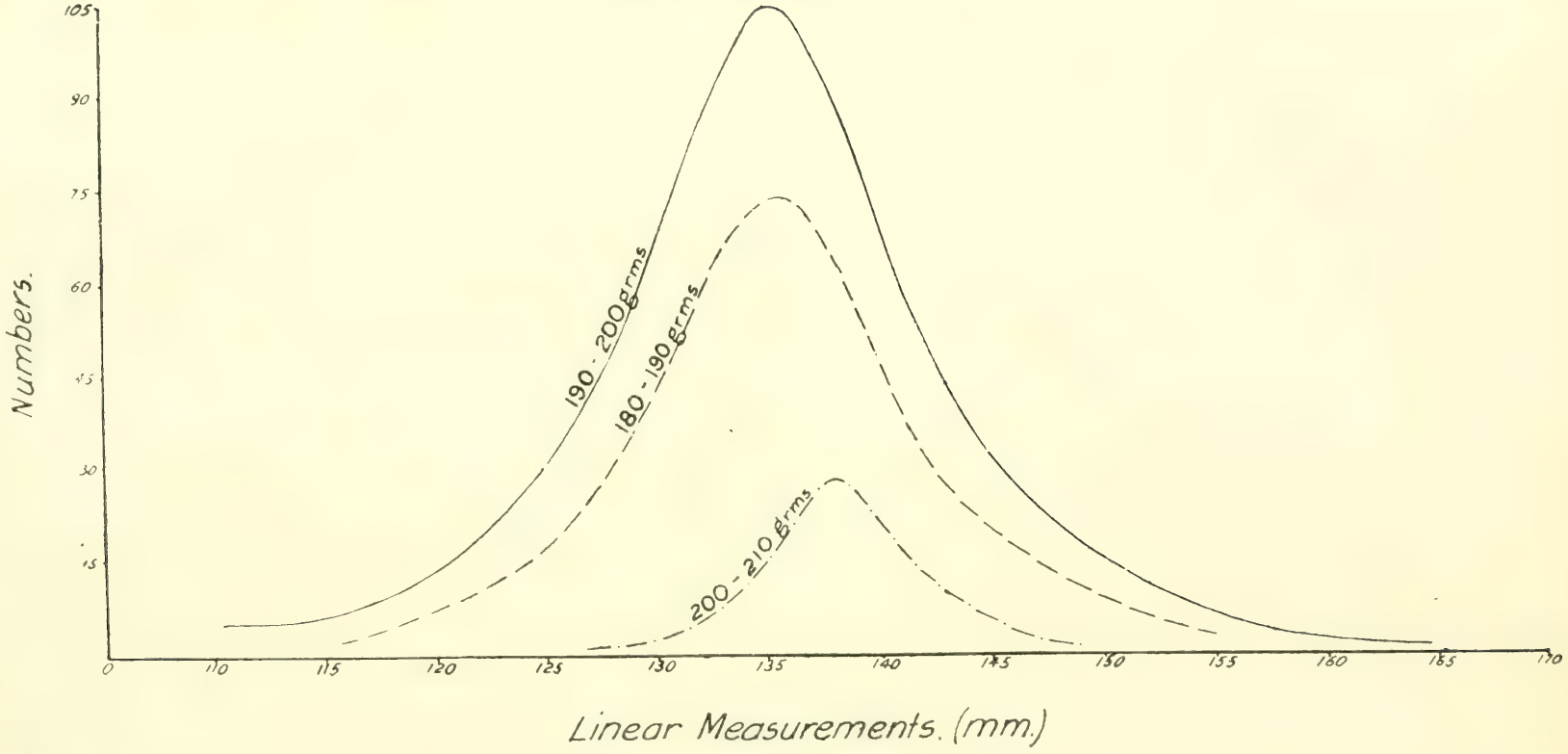

105
90
75
60
45
30
15
Numbers.
190 - 200 grms
180 - 190 grms
200 - 210 grms
0
110
115
120
125
130
135
140
145
150
155
160
165
170
Linear Measurements. (mm.)

Fig. 10.

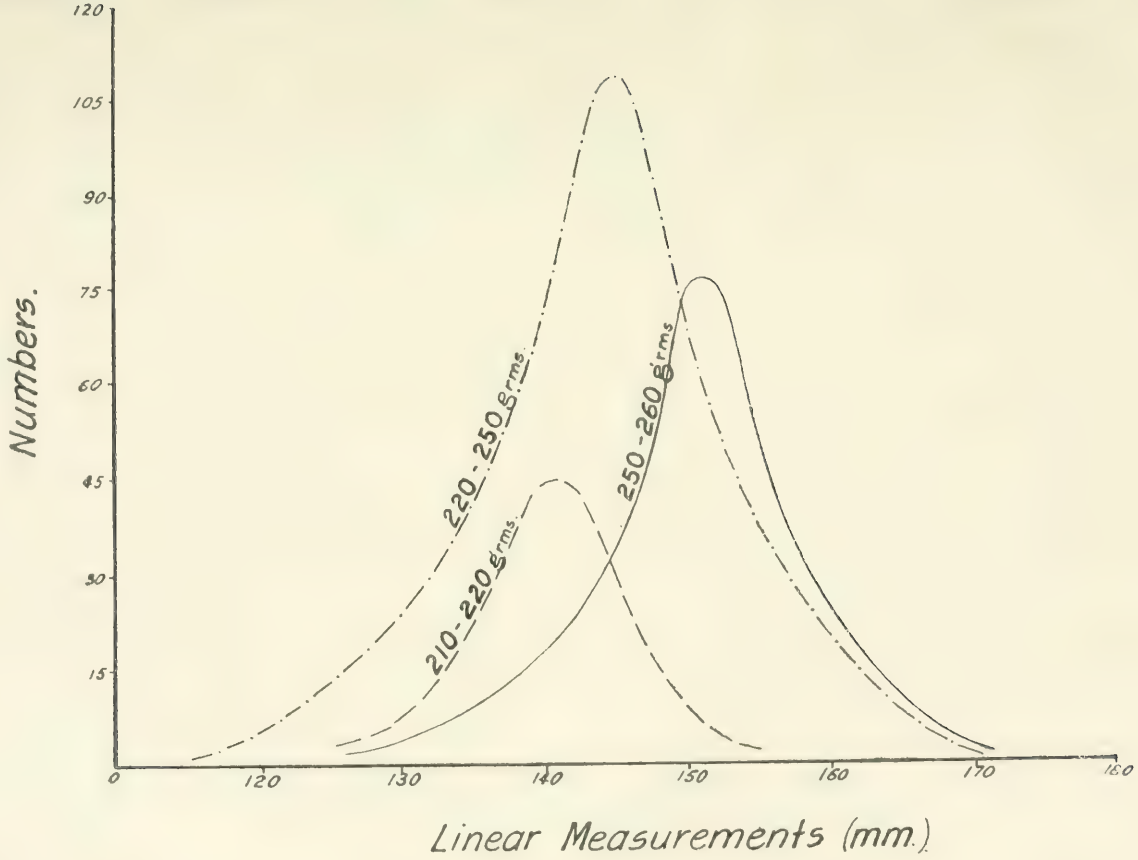

Numbers.
120
105
90
75
60
45
30
15
0
120
130
140
150
160
170
180
Linear Measurements (mm.)
220 - 250 grms.
210 - 220 grms.
250 - 260 grms.

Fig. 11.

APPENDIX I.

Linear Measurements (Short Diameter) of Different Age Groups of Oysters at each Inspection.

First Year.

Date when Measurements were taken.	Number of Specimens measured.	Mean Measurement. mm.
April, 1914 ..	65	28·73
May, 1917 ..	146	19·07
May, 1920 ..	165	51·78
September, 1913	1,332	68·21
September, 1917	171	78·05
October, 1920	62	74·62
January, 1914	390	77·31
January, 1915	4	88·75
January, 1918	29	79·22

Second Year.

March, 1918 ..	30	89·50
April, 1914 ..	595	77·57
September, 1913	121	90·68
September, 1915	36	93·61
September, 1917	129	95·87
September, 1918	9	108·05
October, 1914	320	93·14
October, 1920	115	92·03
December, 1915	25	110·11
January, 1914	39	101·74
January, 1915	72	103·47
January, 1918	50	99·50
February, 1919	33	104·93

Third Year.

March, 1916 ..	265	105·74
March, 1918 ..	100	101·35
April, 1914 ..	297	96·97
April, 1915 ..	6	109·16
June-July, 1919	43	110·06
August, 1919	41	106·53
August-September, 1916	139	115·09
September, 1913	55	120·13
September, 1915	47	114·73

Date when Measurements were taken.	Number of Specimens measured.	Mean Measurement. mm.
September, 1917	21	106·55
September, 1918	109	115·02
October, 1914	144	114·54
December, 1915	70	121·60
January, 1915	127	118·64
January, 1917	89	116·48
January-February, 1920	38	118·02
February, 1919	137	123·23
Fourth Year.		
March, 1916 ..	145	123·92
March, 1918 ..	35	113·78
April, 1914 ..	16	118·75
April, 1915 ..	36	123·33
May, 1917 ..	146	116·41
May, 1920 ..	12	111·67
June-July, 1919	132	121·94
July, 1915 ..	3	125·80
August, 1919	140	123·46
August-September, 1916	246	131·63
September, 1913	130	132·85
September, 1915	273	128·92
September, 1917	83	127·32
September, 1918	68	123·53
October, 1914	83	132·74
October, 1920	80	118·25
December, 1915	258	131·50
January, 1915	118	136·87
January, 1918	59	123·51
January, 1917	85	130·21
January-February, 1920	272	130·89
February, 1919	120	132·09
Fifth Year.		
March, 1916 ..	153	137·50
March, 1918 ..	115	128·84
April, 1914 ..	145	137·99
April, 1915 ..	24	135·42
May, 1917 ..	245	132·50
May, 1920 ..	64	130·94
June-July, 1919	122	132·18
July, 1915 ..	11	134·31
August, 1919	109	136·68
August-September, 1916	175	140·61
September, 1915	37	148·71

Date when Measurements were taken.	Number of Specimens measured.	Mean Measurement. mm.
September, 1917	102	135·30
September, 1918	40	132·87
October, 1914	57	143·20
October, 1920	46	134·02
December, 1915	6	146·67
January, 1915	60	145·92
January, 1917	187	141·59
January, 1918	224	128·43
January-February, 1920	176	144·74
February, 1919	65	146·81
Sixth Year.		
March, 1916 ..	15	156·16
March, 1918 ..	69	141·20
April, 1914 ..	2	155·00
April, 1915 ..	5	147·50
May, 1917 ..	401	148·98
May, 1920 ..	25	150·70
June-July, 1919	34	156·33
July, 1915 ..	18	146·67
August, 1919	29	150·95
August-September, 1916	15	158·83
September, 1917	150	149·33
September, 1918	46	152·08
October, 1914	31	157·02
October, 1920	2	145·00
January, 1915	16	160·63
January, 1917	31	158·95
January, 1918	43	140·40
January-February, 1920	26	161·16
February, 1919	32	151·10
Seventh Year.		
March, 1918 ..	1	162·50
April, 1915 ..	1	172·50
May, 1920 ..	2	170·00
June-July, 1919	1	147·50
August, 1919	2	155·00
August-September, 1916	1	177·50
February, 1919	6	162·50
Eighth Year.		
August, 1919	1	162·50

APPENDIX II.

Weights of Different Age Groups of Oysters at each Inspection.

First Year.

Date when Observations were made.	Number of Oysters measured.	Mean Weight. Grms.
May, 1920 ..	31	4·92
September, 1913	1,194	13·02
September, 1917	164	17·53
October, 1920	61	22·50
January, 1914	391	14·21
January, 1915	5	24·50
January, 1918	29	26·64

Second Year.

March, 1918 ..	30	35·84
April, 1914 ..	569	20·97
September, 1913	113	33·65
September, 1915	20	33·25
September, 1917	110	38·36
September, 1918	8	57·50
October, 1914	321	36·00
October, 1920	116	42·58
December, 1915	18	51·95
January, 1914	40	43·62
January, 1915	72	58·61
January, 1918	35	63·64
February, 1919	37	60·20

Third Year.

March, 1916 ..	265	62·27
March, 1918 ..	102	62·11
April, 1915 ..	6	78·33
April, 1914 ..	310	47·13
June-July, 1919	44	87·95
August, 1919	70	90·64
August-September, 1916	153	86·68
September, 1913	67	109·88
September, 1915	40	93·75
September, 1917	21	89·87
September, 1918	110	93·75
October, 1914	143	82·67
December, 1915	72	106·45
January, 1915	114	96·54
January, 1917	91	104·42

Date when Observations were made.	Number of Oysters measured.	Mean Weight. Grms.
January, 1918	30	86·67
January-February, 1920	38	115·66
February, 1919	139	102·28
Fourth Year.		
March, 1916	139	107·86
March, 1918	36	87·08
April, 1914	15	105·50
April, 1915	47	109·63
May, 1917	149	106·09
May, 1920	13	97·50
June-July, 1919	130	116·88
August, 1919	139	131·31
August-September, 1916	238	126·10
September, 1913	89	122·28
September, 1915	279	133·38
September, 1917	84	132·61
September, 1918	66	133·19
October, 1914	83	137·86
October, 1920	79	135·41
December, 1915	237	144·46
January, 1915	129	150·33
January, 1917	83	149·18
January, 1918	54	148·68
January-February, 1920	275	155·60
Fifth Year.		
March, 1916	154	157·37
March, 1918	117	168·14
April, 1914	148	162·23
April, 1915	23	153·58
April, 1919	120	144·12
May, 1917	275	162·80
May, 1920	64	162·27
June-July, 1919	128	160·71
August, 1919	105	175·89
August-September, 1916	173	174·89
September, 1915	38	193·55
September, 1917	95	172·19
September, 1918	41	181·64
October, 1914	60	197·50
October, 1920	45	198·05
December, 1915	6	216·67
January, 1915	60	210·50
January, 1917	197	187·55
January, 1918	225	192·96
January-February, 1920	176	217·16
February, 1919	63	199·64

Sixth Year.

Date when Observations were made.	Number of Oysters measured.	Mean Weight. Grms.
March, 1916	15	247·17
March, 1918	68	230·66
April, 1914	3	235·83
April, 1915	5	207·50
May, 1920	25	242·30
June-July, 1919	34	219·56
August, 1919	29	233·01
August-September, 1916	13	236·73
September, 1918	45	251·61
October, 1914	32	253·30
October, 1920	2	247·50
January, 1915	13	258·65
January, 1918	38	260·13
January-February, 1920	25	289·05
February, 1919	31	282·50

Seventh Year.

March, 1918	1	282·51
April, 1915	1	287·50
May, 1917	33	257·65
May, 1920	10	291·00
August, 1919	2	305·00
February, 1919	9	351·38

APPENDIX III.

Linear Measurements and Weights of the Different Age Groups at each Inspection from 1912 to 1920.

[NOTE.—Figures in brackets give the mean measurement. The other figures give the range.]

May, 1912.

Year.	Short Diameter mm.	Weight. Grms.	Number examined.
1912	28–75 (56·5)	—	118

June, 1912.

1911	100–133 (118)	—	56
1912	57–100 (74·5)	-	254

September, 1912.

Year.	Short Diameter. mm.	Weight. Grms.	Number examined.
1911	106–140 (124)	—	45
1912	63–136 (98)	—	864

January, 1913.

1912	81–150 (113)	—	63

May, 1913.

1912	100–140 (124·8)	—	64
1913	25–90 (46·25)	—	484

September, 1913.

1910	97–157 (132·85)	112–172 (122·28)	130
1911	87–147 (120·13)	72–112 (109·88)	55
1912	72–102 (90·68)	17–52 (33·65)	121
1913	27–97 (68·21)	2–42 (13·02)	1,332

January, 1914.

1912	87–117 (101·74)	32–72 (43·62)	39
1913	52–102 (77·31)	2–37 (14·21)	390

April, 1914.

1909	152–157 (155·00)	222–262 (235·83)	2
1910	117–162 (137·99)	122–217 (162·23)	145
1911	102–137 (118·75)	87–122 (105·50)	16
1912	72–127 (96·97)	22–87 (47·13)	297
1913	47–102 (77·57)	2–47 (20·97)	595
1914	12–42 (28·73)	—	65

October, 1914.

1909	142–172 (157·02)	217–257 (253·30)	31
1910	122–162 (143·20)	147–227 (197·50)	57
1911	112–152 (132·74)	107–172 (137·86)	83
1912	82–137 (114·54)	47–127 (82·67)	144
1913	67–122 (93·14)	12–47 (36·00)	320

January, 1915.

Year.	Short Diameter. mm.	Weight. Grms.	Number examined.
1909	142–172 (160·63)	216–287 (258·65)	16
1910	127–167 (145·92)	157–262 (210·50)	60
1911	117–157 (136·87)	112–222 (150·33)	118
1912	92–142 (118·64)	72–137 (96·54)	127
1913	77–102 (103·47)	37–72 (58·61)	72
1914	77–102 (88·75)	22–27 (24·50)	4

April, 1915.

1909	172 (172·50)	287 (287·50)	1
1910	132–157 (147·50)	197–212 (207·50)	5
1911	122–147 (135·42)	137–197 (153·58)	24
1912	97–137 (123·33)	77–142 (109·63)	36
1913	102–122 (109·16)	67–87 (78·33)	6

July, 1915.

1910	137–162 (147·67)	—	18
1911	112–142 (134·31)	—	11
1912	112–142 (125·80)		3

September, 1915.

1911	132–172 (148·71)	137–227 (193·55)	37
1912	102–152 (128·92)	87–197 (133·38)	273
1913	102–127 (114·73)	62–117 (93·75)	47
1914	72–107 (93·61)	22–57 (33·25)	36

December, 1915.

1911	137–157 (146·67)	187–257 (216·67)	6
1912	112–157 (131·50)	87–232 (144·46)	258
1913	97–152 (121·60)	77–127 (106·45)	70
1914	87–112 (110·10)	27–72 (51·95)	25

March, 1916.

1911	142–167 (156·16)	212–287 (247·17)	15
1912	117–157 (137·50)	102–212 (157·37)	153
1913	102–147 (123·92)	72–142 (107·86)	145
1914	82–127 (105·74)	27–107 (62·27)	265

August-September, 1916.

1910	177 (177·50)	299 (299·00)	1
1911	147–167 (158·83)	227–272 (236·73)	15
1912	117–157 (140·61)	132–237 (174·10)	175
1913	107–147 (131·63)	92–147 (126·10)	246
1914	87–132 (115·09)	42–112 (86·68)	139

January, 1917.

Year.	Short Diameter. mm.	Weight. Grms.	Number examined.
1911	137–172 (158·95)	229–300 (256·16)	31
1912	102–162 (141·59)	127–272 (187·55)	187
1913	112–152 (130·21)	112–187 (149·18)	85
1914	87–142 (116·48)	57–142 (104·42)	89

May, 1917.

1912	107–162 (148·98)	157–287	401
1913	112–152 (132·50)	122–212 (162·80)	245
1914	92–132 (116·41)	57–142 (106·09)	146
1917	12–27 (19·07)	—	146

September, 1917.

1912	112–177 (149·33)	172–277	150
1913	112–157 (135·30)	137–227 (172·19)	102
1914	102–157 (127·32)	97–177 (132·61)	83
1915	87–132 (106·55)	62–112 (89·87)	21
1916	72–122 (95·87)	17–72 (38·36)	129
1917	57–117 (78·05)	7–42 (17·53)	171

January, 1918.

1912	112–162 (140·40)	227–272 (260·13)	43
1913	102–152 (128·44)	142–242 (192·96)	224
1914	102–152 (123·51)	112–172 (148·60)	59
1915	Abnormal	57–112 (86·67)	30
1916	67–122 (99·50)	42–87 (63·64)	50
1917	62–97 (79·22)	12–42 (26·64)	29

March, 1918.

1912	112–17 (162·50)	282 (282·51)	1
1913	117–167 (140·20)	187–257 (230·66)	69
1914	107–152 (128·84)	112–222 (168·14)	115
1915	92–122 (113·78)	56–122 (87·08)	35
1916	72–127 (101·35)	37–92 (62·11)	100
1917	72–97 (89·50)	27–57 (35·84)	30

September, 1918.

1913	132–167 (152·08)	197–257 (251·61)	46
1914	117–152 (132·87)	142–227 (181·64)	40
1915	102–152 (123·53)	102–172 (133·19)	68
1916	87–132 (115·02)	57–122 (93·75)	109
1917	92–117 (108·05)	57 (57·50)	9

February, 1919.

Year.	Short Diameter. mm.	Weight. Grms.	Number examined.
1912	152–172 (162·5)	327–362 (351·38)	9
1913	137–172 (151·10)	(282·50)	32
1914	122–172 (146·81)	157–242 (199·64)	65
1915	112–157 (132·09)	115–186 (145·70)	120
1916	102–147 (123·23)	62–127 (102·28)	137
1917	87–127 (104·93)	27–87 (60·20)	33

June-July, 1919.

1912	147 (147·50)	343 (343)	1
1914	137–162 (156·33)	187–272 (219·56)	34
1915	102–162 (132·18)	127–212 (160·71)	122
1916	97–147 (121·94)	87–157 (116·88)	132
1917	97–127 (110·06)	57–122 (87·95)	43

August, 1919.

1911	162 (162·50)	407 (407·00)	1
1913	152–157 (155·00)	287–322 (305·00)	2
1914	137–172 (150·95)	197–287 (233·01)	29
1915	112–157 (136·68)	142–212 (175·89)	109
1916	102–147 (123·46)	92–157 (131·31)	140
1917	92–127 (106·53)	72–112 (90·64)	41

January-February, 1920.

1914	137–182 (161·16)	242–312 (289·50)	26
1915	117–167 (144·74)	172–262 (217·16)	176
1916	112–152 (130·89)	122–197 (155·60)	272
1917	97–132 (118·02)	77–132 (115·66)	38

May, 1920.

1914	167–172 (170·00)	237–342 (291·00)	2
1915	122–167 (150·70)	197–272 (242·30)	25
1916	107–152 (130·94)	127–207 (162·27)	64
1917	97–137 (111·67)	77–112 (97·50)	12
1920	32–72 (51·78)	2–12 (3·92)	165

October, 1920.

1915	142–147 (145·00)	(247·50)	2
1916	112–152 (134·02)	157–247 (198·05)	46
1917	102–137 (118·25)	92–177 (135·41)	80
1919	72–117 (92·03)	27–77 (42·58)	115
1920	62–87 (74·62)	12–37 (22·50)	62

APPENDIX IV.

Short Diameter at each Inspection.

1909 Oysters.

January, 1915 :—

Mm. 140	..	3
,, 145	..	—
,, 150	..	4
,, 155	..	6
,, 160	..	—
,, 165	..	2
,, 170	..	1

Mean, mm. = 159·63

April, 1915 :—

Mm. 170	..	1

Mean, mm. = 171·50

1910 Oysters.

,, 160	..	2

Mean, mm. = 136·99

October, 1914 :—

Mm. 120	..	2
,, 125	..	2
,, 130	..	7
,, 135	..	7
,, 140	..	16
,, 145	..	8
,, 150	..	11
,, 155	..	3
,, 160	..	1

Mean mm. = 142·20

Bulletins of the Ceylon Fisheries, Vol. I., Bulletin No. 2.

ERRATA.

To face p. 27.

In Appendices IV. and V. (pp. 27–55) the mean measurements given should be increased by one unit. Thus, 131·85 should read 132·85, and so on.

In Appendix V. (pp. 39–55) for *mm.* read *grms.*

Note.—The footnote on p. 56 also applies to the groups of measurements given in Appendices IV. and V. (pp. 27–55).

February, 1919.

Year.	Short Diameter. mm.	Weight. Grms.	Number examined.
1912	152–172 (162·5)	327–362 (351·38)	9
1913	137–172 (151·10)	(282·50)	32
1914	122–172 (146·81)	157–242 (199·64)	65
1915	112–157 (132·09)	115–186 (145·70)	120
1916	102–147 (123·23)	62–127 (102·28)	137
1917	87–127 (104·93)	27–87 (60·20)	33
1914	167–172 (170·00)	237–342 (291·00)	2
1915	122–167 (150·70)	197–272 (242·30)	25
1916	107–152 (130·94)	127–207 (162·27)	64
1917	97–137 (111·67)	77–112 (97·50)	12
1920	32–72 (51·78)	2–12 (3·92)	165

October, 1920.

1915	142–147 (145·00)	(247·50)	2
1916	112–152 (134·02)	157–247 (198·05)	46
1917	102–137 (118·25)	92–177 (135·41)	80
1919	72–117 (92·03)	27–77 (42·58)	115
1920	62–87 (74·62)	12–37 (22·50)	62

APPENDIX IV.

Short Diameter at each Inspection.

1909 Oysters.

April, 1914 :—

Mm. 150	..	1
,, 155	..	1

Mean, mm. = 154·00

October, 1914 :—

Mm. 110	..	1
,, 115	..	—
,, 120	..	—
,, 125	..	—
,, 130	..	—
,, 135	..	—
,, 140	..	3
,, 145	..	2
,, 150	..	9
,, 155	..	6
,, 160	..	5
,, 165	..	4
,, 170	..	2
,, 175	..	—
,, 180	..	—
,, 185	..	—
,, 190	..	1

Mean, mm. = 156·02

January, 1915 :—

Mm. 140	..	3
,, 145	..	—
,, 150	..	4
,, 155	..	6
,, 160	..	—
,, 165	..	2
,, 170	..	1

Mean, mm. = 159·63

April, 1915 :—

Mm. 170	..	1

Mean, mm. = 171·50

1910 Oysters.

September, 1913 :—

Mm. 95	..	1
,, 100	..	1
,, 105	..	3
,, 110	..	3
,, 115	..	6
,, 120	..	10
,, 125	..	23
,, 130	..	29
,, 135	..	17
,, 140	..	19
,, 145	..	9
,, 150	..	6
,, 155	..	1

Mean, mm. = 131·85

April, 1914 :—

Mm. 115	..	2
,, 120	..	6
,, 125	..	18
,, 130	..	35
,, 135	..	23
,, 140	..	30
,, 145	..	18
,, 150	..	10
,, 155	..	1
,, 160	..	2

Mean, mm. = 136·99

October, 1914 :—

Mm. 120	..	2
,, 125	..	2
,, 130	..	7
,, 135	..	7
,, 140	..	16
,, 145	..	8
,, 150	..	11
,, 155	..	3
,, 160	..	1

Mean mm. = 142·20

January, 1915 :—

Mm. 125 ..	4
,, 130 ..	5
,, 135 ..	6
,, 140 ..	10
,, 145 ..	13
,, 150 ..	16
,, 155 ..	2
,, 160 ..	2
,, 165 ..	2

Mean, mm. = 144·92

April, 1915 :—

Mm. 130 ..	1
,, 135 ..	—
,, 140 ..	1
,, 145 ..	—
,, 150 ..	2
,, 155 ..	1

Mean, mm. = 146·50

July, 1915 :—

Mm. 135 ..	2
,, 140 ..	7
,, 145 ..	4
,, 150 ..	3
,, 155 ..	1
,, 160 ..	1

Mean, mm. = 145·67

August-September, 1916 :—

Mm. 175 ..	1

(Other months nil)
Mean, mm. = 176·5

1911 Oysters.

September, 1913 :—

Mm. 85 ..	1
,, 90 ..	—
,, 95 ..	2
,, 100 ..	5
,, 105 ..	5
,, 110 ..	10
,, 115 ..	4
,, 120 ..	9
,, 125 ..	10
,, 130 ..	7
,, 135 ..	3
,, 140 ..	2
,, 145 ..	1

Mean, mm. = 119·13

April, 1914 :—

Mm. 100 ..	2
,, 105 ..	2
,, 110 ..	2
,, 115 ..	2
,, 120 ..	4
,, 125 ..	2
,, 130 ..	—
,, 135 ..	2

Mean, mm. = 117·75

October, 1914 :—

Mm. 110 ..	2
,, 115 ..	5
,, 120 ..	15
,, 125 ..	12
,, 130 ..	12
,, 135 ..	17
,, 140 ..	16
,, 145 ..	2
,, 150 ..	2

Mean, mm. = 131·74

January, 1915 :—

Mm. 115 ..	2
,, 120 ..	9
,, 125 ..	15
,, 130 ..	27
,, 135 ..	22
,, 140 ..	22
,, 145 ..	9
,, 150 ..	11
,, 155 ..	1

Mean, mm. = 135·87

April, 1915 :—

Mm. 120 ..	3
,, 125 ..	2
,, 130 ..	7
,, 135 ..	3
,, 140 ..	8
,, 145 ..	1

Mean, mm. = 134·42

July, 1915 :—

Mm. 110 ..	1
,, 115 ..	—
,, 120 ..	1
,, 125 ..	—
,, 130 ..	2
,, 135 ..	4
,, 140 ..	3

Mean, mm. = 133·31

September, 1915 :—

Mm.	130	1
,,	135	5
,,	140	8
,,	145	8
,,	150	8
,,	155	2
,,	160	3
,,	165	1
,,	170	1

Mean, mm. = 147·71

December, 1915 :—

Mm.	135	1
,,	140	2
,,	145	—
,,	150	2
,,	155	1

Mean, mm. = 145·67

March, 1916 :—

Mm.	140	1
,,	145	3
,,	150	1
,,	155	6
,,	160	2
,,	165	2

Mean, mm. = 155·16

August-September, 1916 :—

Mm.	145	2
,,	150	2
,,	155	1
,,	160	5
,,	165	2

Mean, mm. = 157·83

January, 1917 :—

Mm.	140	1
,,	145	3
,,	150	4
,,	155	10
,,	160	7
,,	165	3
,,	170	1
,,	175	2

Mean, mm. = 157·95

1912 Oysters.

September, 1913 :—

Mm.	70	1
,,	75	2
,,	80	16
,,	85	43
,,	90	31
,,	95	15
,,	100	13

Mean, mm. = 89·68

January, 1914 :—

Mm.	85	2
,,	90	6
,,	95	4
,,	100	17
,,	105	5
,,	110	4
,,	115	1

Mean, mm. = 100·74

April, 1914 :—

Mm.	65	1
,,	70	1
,,	75	9
,,	80	24
,,	85	22
,,	90	88
,,	95	27
,,	100	74
,,	105	26
,,	110	20
,,	115	4
,,	120	1
,,	125	1

Mean, mm. = 95·97

October, 1914 :—

Mm.	80	2
,,	85	—
,,	90	2
,,	95	5
,,	100	13
,,	105	17
,,	110	37
,,	115	26
,,	120	25
,,	125	8
,,	130	8
,,	135	1

Mean, mm. = 113·54

January, 1915 :—

Mm.	90	2
,,	95	1
,,	100	6
,,	105	13
,,	110	25
,,	115	20
,,	120	26
,,	125	20
,,	130	11
,,	135	2
,,	140	1

Mean, mm. = 117·64

April, 1915 :—

Mm.	95	1
,,	100	—
,,	105	—
,,	110	1
,,	115	8
,,	120	12
,,	125	9
,,	130	3
,,	135	2

Mean, mm. = 122·33

July, 1915 :—

Mm.	110	1
,,	115	—
,,	120	1
,,	125	—
,,	130	—
,,	135	—
,,	140	1

Mean, mm. = 124·8

September, 1915 :—

Mm.	100	1
,,	105	2
,,	110	11
,,	115	20
,,	120	58
,,	125	68
,,	130	59
,,	135	36
,,	140	13
,,	145	3
,,	150	2

Mean, mm. = 127·92

December, 1915 :—

Mm.	110	6
,,	115	17
,,	120	38
,,	125	48
,,	130	67
,,	135	37
,,	140	30
,,	145	11
,,	150	3
,,	155	1

Mean, mm. = 130·5

March, 1916 :—

Mm.	115	4
,,	120	12
,,	125	13
,,	130	29
,,	135	28
,,	140	41
,,	145	15
,,	150	8
,,	155	3

Mean, mm. = 136·5

August-September, 1916 :—

Mm.	115	1
,,	120	6
,,	125	16
,,	130	25
,,	135	30
,,	140	43
,,	145	25
,,	150	21
,,	155	8

Mean, mm. = 139·61

January, 1917 :—

Mm.	105	1
,,	110	—
,,	115	3
,,	120	6
,,	125	11
,,	130	23
,,	135	25
,,	140	47
,,	145	41
,,	150	19
,,	155	7
,,	160	4

Mean, mm. = 140·59

May, 1917 :—

Mm.	110	2
,,	115	2
,,	120	2
,,	125	9
,,	130	24
,,	135	37
,,	140	78
,,	145	45
,,	150	85
,,	155	50
,,	160	44
,,	165	18
,,	170	4
,,	175	1

Mean, mm. = 147·98

September, 1917 :—

Mm.	110	1
,,	115	2
,,	120	2
,,	125	4
,,	130	13
,,	135	12
,,	140	26
,,	145	14
,,	150	29
,,	155	14
,,	160	15
,,	165	10
,,	170	6
,,	175	2

Mean, mm. = 148·33

January, 1918 :—

Mm.	110	1
,,	115	—
,,	120	3
,,	125	2
,,	130	8
,,	135	6
,,	140	11
,,	145	2
,,	150	7
,,	155	—
,,	160	3

Mean, mm. = 139·4

March, 1918 :—

Mm.	160	1

Mean, mm. = 161·5

February, 1919 :—

Mm.	150	1
,,	155	1
,,	160	2
,,	165	1
,,	170	1

Mean, mm. = 161·5

August, 1919 :—

Mm.	160	1

Mean, mm. = 161·5

1913 Oysters.

September, 1913 :—

Mm.	25	2
,,	30	1
,,	35	13
,,	40	29
,,	45	34
,,	50	136
,,	55	149
,,	60	164
,,	65	151
,,	70	157
,,	75	229
,,	80	158
,,	85	81
,,	90	21
,,	95	7

Mean, mm. = 67·21

January, 1914 :—

Mm.	50	14
,,	55	24
,,	60	38
,,	65	41
,,	70	34
,,	75	72
,,	80	50
,,	85	60
,,	90	38
,,	95	8
,,	100	11

Mean, mm. = 76·31

April, 1914 :—

Mm.	45	3
,,	50	18
,,	55	21
,,	60	30
,,	65	64
,,	70	82
,,	75	132
,,	80	78
,,	85	39
,,	90	93
,,	95	9
,,	100	6

Mean, mm. = 76·57

October, 1914 :—

Mm. 65 ..	2
,, 70 ..	25
,, 75 ..	19
,, 80 ..	49
,, 85 ..	27
,, 90 ..	63
,, 95 ..	35
,, 100 ..	47
,, 105 ..	18
,, 110 ..	27
,, 115 ..	6
,, 120 ..	2

Mean, mm. = 92·14

January, 1915 :—

Mm. 75 ..	1
,, 80 ..	—
,, 85 ..	1
,, 90 ..	9
,, 95 ..	10
,, 100 ..	23
,, 105 ..	16
,, 110 ..	15
,, 115 ..	2
,, 120 ..	1

Mean, mm. = 102·47

April, 1915 :—

Mm. 100 ..	2
,, 105 ..	2
,, 110 ..	1
,, 115 ..	—
,, 120 ..	1

Mean, mm. = 108·16

September, 1915 :—

Mm. 100 ..	2
,, 105 ..	7
,, 110 ..	19
,, 115 ..	8
,, 120 ..	9
,, 125 ..	2

Mean, mm. = 113·73

December, 1915 :—

Mm. 95 ..	1
,, 100 ..	—
,, 105 ..	4
,, 110 ..	8
,, 115 ..	17
,, 120 ..	17
,, 125 ..	11
,, 130 ..	6
,, 135 ..	3
,, 140 ..	—
,, 145 ..	—
,, 150 ..	1

Mean, mm. = 120·60

March, 1916 :—

Mm. 100 ..	6
,, 105 ..	4
,, 110 ..	17
,, 115 ..	17
,, 120 ..	32
,, 125 ..	36
,, 130 ..	18
,, 135 ..	9
,, 140 ..	5
,, 145 ..	1

Mean, mm. = 122·92

August-September, 1916 :—

Mm. 105 ..	1
,, 110 ..	3
,, 115 ..	13
,, 120 ..	22
,, 125 ..	63
,, 130 ..	72
,, 135 ..	41
,, 140 ..	24
,, 145 ..	7

Mean, mm. = 130·63

January, 1917 :—

Mm. 110 ..	2
,, 115 ..	7
,, 120 ..	15
,, 125 ..	22
,, 130 ..	14
,, 135 ..	14
,, 140 ..	6
,, 145 ..	4
,, 150 ..	1

Mean, mm. = 129·21

May, 1917 :—

Mm.	110	5
,,	115	18
,,	120	38
,,	125	42
,,	130	74
,,	135	38
,,	140	36
,,	145	16
,,	150	6
,,	155	1
,,	160	1

Mean, mm. = 131·5

September, 1917 :—

Mm.	110	2
,,	115	4
,,	120	8
,,	125	14
,,	130	21
,,	135	15
,,	140	27
,,	145	7
,,	150	3
,,	155	1

Mean, mm. = 134·3

January, 1918 :—

Mm.	100	1
,,	105	1
,,	110	15
,,	115	21
,,	120	34
,,	125	56
,,	130	54
,,	135	18
,,	140	17
,,	145	4
,,	150	3

Mean, mm. = 127·43

March, 1918 :—

Mm.	115	4
,,	120	1
,,	125	5
,,	130	12
,,	135	9
,,	140	10
,,	145	12
,,	150	8
,,	155	4
,,	160	2
,,	165	2

Mean, mm. = 140·20

September, 1918 :—

Mm.	130	1
,,	135	1
,,	140	9
,,	145	5
,,	150	16
,,	155	6
,,	160	4
,,	165	4

Mean, mm. = 151·08

February, 1919 :—

Mm.	135	3
,,	140	5
,,	145	5
,,	150	11
,,	155	5
,,	160	1
,,	165	—
,,	170	2

Mean, mm. = 150·1

June-July, 1919 :—

Mm.	145	1

Mean, mm. = 146·5

August, 1919 :—

Mm.	150	1
,,	155	1

Mean, mm. = 154·0

1914 Oysters.

April, 1914 :—

Mm.	10	1
,,	15	6
,,	20	5
,,	25	28
,,	30	16
,,	35	7
,,	40	2

Mean, mm. = 27·73

January, 1915 :—

Mm.	75	1
,,	80	1
,,	85	—
,,	90	1
,,	95	—
,,	100	1

Mean, mm. = 87·75

September, 1915 :—

Mm.	70	2
,,	75	1
,,	80	3
,,	85	3
,,	90	6
,,	95	16
,,	100	3
,,	105	2

Mean, mm. = 92·61

December, 1915 :—

Mm.	85	1
,,	90	2
,,	95	3
,,	100	6
,,	105	5
,,	110	2
,,	115	—
,,	120	—
,,	125	1
,,	130	2
,,	135	2
,,	140	1

Mean, mm. = 109·10

March, 1916 :—

Mm.	80	2
,,	85	6
,,	90	32
,,	95	38
,,	100	57
,,	105	39
,,	110	37
,,	115	33
,,	120	17
,,	125	4

Mean, mm. = 104·74

August-September, 1916 :—

Mm.	85	1
,,	90	4
,,	95	4
,,	100	22
,,	105	16
,,	110	22
,,	115	27
,,	120	31
,,	125	8
,,	130	4

Mean, mm. = 114·09

January, 1917 :—

Mm.	85	1
,,	90	1
,,	95	3
,,	100	3
,,	105	17
,,	110	15
,,	115	16
,,	120	13
,,	125	14
,,	130	3
,,	135	2
,,	140	1

Mean, mm. = 115·48

May, 1917 :—

Mm.	90	1
,,	95	3
,,	100	8
,,	105	11
,,	110	37
,,	115	35
,,	120	31
,,	125	12
,,	130	7

Mean, mm. = 115·41

September, 1917 :—

Mm.	100	1
,,	105	1
,,	110	13
,,	115	9
,,	120	12
,,	125	13
,,	130	13
,,	135	10
,,	140	5
,,	145	3
,,	150	2
,,	155	1

Mean, mm. = 126·32

January, 1918 :—

Mm.	100	3
,,	105	2
,,	110	7
,,	115	9
,,	120	10
,,	125	14
,,	130	9
,,	135	1
,,	140	3
,,	145	—
,,	150	1

Mean, mm. = 122·51

March, 1918 :—

Mm. 105	..	5
,, 110	..	5
,, 115	..	4
,, 120	..	28
,, 125	..	19
,, 130	..	24
,, 135	..	14
,, 140	..	13
,, 145	..	2
,, 150	..	1

Mean, mm. = 127·84

September, 1918 :—

Mm. 115	..	1
,, 120	..	5
,, 125	..	10
,, 130	..	10
,, 135	..	5
,, 140	..	7
,, 145	..	1
,, 150	..	1

Mean, mm. = 131·87

February, 1919 :—

Mm. 120	..	1
,, 125	..	1
,, 130	..	5
,, 135	..	8
,, 140	..	11
,, 145	..	12
,, 150	..	17
,, 155	..	7
,, 160	..	2
,, 165	..	—
,, 170		1

Mean, mm. = 145·81

June-July, 1919 :—

Mm. 135	..	1
,, 140	..	6
,, 145	..	5
,, 150	..	14
,, 155	..	4
,, 160	..	4

Mean, mm. = 155·33

August, 1919 :—

Mm. 135	..	1
,, 140	..	5
,, 145	..	8
,, 150	..	9
,, 155	..	2
,, 160	..	3
,, 165	..	—
,, 170		1

Mean, mm. = 149·95

January-February, 1920 :—

Mm. 135	..	1
,, 140	..	1
,, 145	..	2
,, 150	..	3
,, 155	..	2
,, 160	..	8
,, 165	..	4
,, 170	..	4
,, 175	..	—
,, 180	..	1

Mean, mm. = 160·16

May, 1920 :—

Mm. 165	..	1
,, 170	..	1

Mean, mm. = 169·00

1915 Oysters.

September, 1917: —

Mm. 85	..	1
,, 90	..	2
,, 95	..	3
,, 100	..	4
,, 105	..	4
,, 110	..	2
,, 115	..	3
,, 120	..	1
,, 125	..	—
,, 130		1

Mean, mm. = 105·55

January 1918 (abnormal) :—

Mm. 35	..	1
,, 40	..	8
,, 45	..	12
,, 50	..	9

Mean, mm. = 46·34

March, 1918 :—

Mm. 90	..	1
,, 95	..	2
,, 100	..	6
,, 105	..	3
,, 100	..	7
,, 115	..	4
,, 120	..	10
,, 125	..	—
,, 130	..	1
,, 135	..	—
,, 140	..	1

Mean, mm. = 112·78

September, 1918 :—

Mm. 100	1
,, 105	2
,, 110	10
,, 115	10
,, 120	17
,, 125	13
,, 130	9
,, 135	3
,, 140	2
,, 145	—
,, 150	1

Mean, mm. = 122·53

February, 1919 :—

Mm. 110	5
,, 115	6
,, 120	13
,, 125	23
,, 130	33
,, 135	20
,, 140	9
,, 145	6
,, 150	4
,, 155	1

Mean, mm. = 131·09

June-July, 1919 :—

Mm. 100	1
,, 105	—
,, 110	10
,, 115	5
,, 120	18
,, 125	12
,, 130	25
,, 135	15
,, 140	27
,, 145	6
,, 150	2
,, 155	—
,, 160	1

Mean, mm. = 131·18

August, 1919 :—

Mm. 110	1
,, 115	2
,, 120	9
,, 125	10
,, 130	28
,, 135	16
,, 140	22
,, 145	17
,, 150	2
,, 155	2

Mean, mm. = 135·68

January-February, 1920 :—

Mm. 115	2
,, 120	2
,, 125	2
,, 130	19
,, 135	27
,, 140	44
,, 145	27
,, 150	30
,, 155	13
,, 160	8
,, 165	2

Mean, mm. = 143·74

May, 1920 :—

Mm. 120	1
,, 125	—
,, 130	1
,, 135	—
,, 145	2
,, 145	7
,, 150	5
,, 155	7
,, 160	1
,, 165	1

Mean, mm. = 149·70

October, 1920 :—

Mm. 140	1
,, 145	1

Mean, mm. = 144·00

1916 Oysters.

September, 1917 :—

Mm. 70	1
,, 75	4
,, 80	15
,, 85	24
,, 90	21
,, 95	13
,, 100	26
,, 105	10
,, 110	11
,, 115	2
,, 120	2

Mean, mm. = 94·87

January, 1918 :—

Mm.	65	1
,,	70	—
,,	75	—
,,	80	1
,,	85	1
,,	90	18
,,	95	9
,,	100	6
,,	105	5
,,	110	5
,,	115	2
,,	120	2

Mean, mm. = 98·50

March, 1918 :—

Mm.	70	1
,,	75	—
,,	80	5
,,	85	7
,,	90	13
,,	95	11
,,	100	30
,,	105	13
,,	110	15
,,	115	3
,,	120	1
,,	125	1

Mean, mm. = 106·35

September, 1918 :—

Mm.	85	1
,,	90	2
,,	95	1
,,	100	9
,,	105	13
,,	110	32
,,	115	21
,,	120	16
,,	125	7
,,	130	7

Mean, mm. = 114·02

February, 1919 :—

Mm.	100	3
,,	105	7
,,	110	16
,,	115	19
,,	120	35
,,	125	27
,,	130	16
,,	135	12
,,	140	1
,,	145	1

Mean, mm. = 122·23

June-July, 1919 :—

Mm.	95	1
,,	100	4
,,	105	5
,,	110	25
,,	115	14
,,	120	40
,,	125	15
,,	130	19
,,	135	5
,,	140	3
,,	145	1

Mean, mm. = 120·94

August, 1919 :—

Mm.	100	2
,,	105	2
,,	110	11
,,	115	30
,,	120	38
,,	125	32
,,	130	16
,,	135	8
,,	140	—
,,	145	1

Mean, mm. = 122·46

January-February, 1920 :—

Mm.	110	5
,,	115	14
,,	120	—
,,	125	58
,,	130	83
,,	135	43
,,	140	21
,,	145	5
,,	150	3

Mean, mm. = 129·89

May, 1920 :—

Mm.	105	1
,,	110	1
,,	115	4
,,	120	8
,,	125	17
,,	130	14
,,	135	8
,,	140	8
,,	145	2
,,	150	1

Mean, mm. = 129·94

October, 1920 :—

Mm.	110	3
,,	115	2
,,	120	2
,,	125	6
,,	130	11
,,	135	7
,,	140	11
,,	145	3
,,	150	1
,,	155	—
,,	160	—
,,	165	—
,,	170	—
,,	175	—
,,	180	1

Mean, mm. = 133·02

1917 Oysters.

May, 1917 :—

Mm.	10	15
,,	15	76
,,	20	49
,,	25	6

Mean, mm. = 18·07

September, 1917 :—

Mm.	55	2
,,	60	12
,,	65	26
,,	70	39
,,	75	25
,,	80	32
,,	85	12
,,	90	10
,,	95	7
,,	100	1
,,	105	2
,,	110	1
,,	115	2

Mean, mm. = 77·05

January, 1918 :—

Mm.	60	1
,,	65	2
,,	70	7
,,	75	8
,,	80	7
,,	85	1
,,	90	2
,,	95	1

Mean, mm. = 78·22

March, 1918 :—

Mm.	70	1
,,	75	3
,,	80	7
,,	85	10
,,	90	8
,,	95	1

Mean, mm. = 88·50

September, 1918 :—

Mm.	90	1
,,	95	2
,,	100	2
,,	105	—
,,	110	3
,,	115	1

Mean, mm. = 107·05

February, 1919 :—

Mm.	85	1
,,	90	6
,,	95	4
,,	100	5
,,	105	4
,,	110	10
,,	115	1
,,	120	2

Mean, mm. = 103·93

June-July, 1919 :—

Mm.	95	4
,,	100	13
,,	105	6
,,	110	7
,,	115	4
,,	120	8
,,	125	1

Mean, mm. = 109·06

August, 1919 :—

Mm.	90	1
,,	95	5
,,	100	15
,,	105	8
,,	110	8
,,	115	2
,,	120	—
,,	125	2

Mean, mm. = 105·53

January-February, 1920 :—

Mm.	95	1
,,	100	2
,,	105	4
,,	110	6
,,	115	9
,,	120	8
,,	125	4
,,	130	4

Mean, mm. = 117·02

May 1920 :—

Mm.	95	1
,,	100	1
,,	105	1
,,	110	5
,,	115	4
,,	120	—
,,	125	—
,,	130	—
,,	135	1

Mean, mm. = 110·67

October, 1920 :—

Mm.	100	2
,,	105	14
,,	110	15
,,	115	13
,,	120	16
,,	125	16
,,	130	3
,,	135	1

Mean, mm. = 117·25

1919 Oysters.

October, 1920 :—

Mm.	70	2
,,	75	6
,,	80	18
,,	85	23
,,	90	27
,,	95	18
,,	100	13
,,	105	3
,,	110	4
,,	115	1

Mean, mm. = 91·03

1920 Oysters.

May, 1920 :—

Mm.	30	1
,,	35	6
,,	40	26
,,	45	41
,,	50	34
,,	55	28
,,	60	25
,,	65	3
,,	70	1

Mean, mm. = 50·78

October, 1920 :—

Mm.	60	6
,,	65	8
,,	70	12
,,	75	24
,,	80	10
,,	85	2

Mean, mm. = 73·92

APPENDIX V.

Weights at each Inspection.

1909 Oysters.

April, 1914 :—

Mm.	220	2
,,	225	—
,,	230	—
,,	235	—
,,	240	—
,,	245	—
,,	250	—
,,	255	—
,,	260	1

Mean, mm. = 234·83

October, 1914 :—

Mm.	225	4
,,	230	—
,,	235	—
,,	240	1
,,	245	—
,,	250	—
,,	255	27

Mean, mm. = 252·30

January, 1915 :—

Mm.	225	1
,,	230	—
,,	235	—

Mm. 240 ..	1
,, 245 ..	—
,, 250 ..	—
,, 255 ..	4
,, 260 ..	6
,, 265 ..	—
,, 270 ..	—
,, 275 ..	—
,, 280 ..	—
,, 285 ..	1

Mean, mm. = 257·65

April, 1915 :—

Mm. 285 ..	1

Mean, mm. = 286·50

1910 Oysters.

September, 1913 :—

Mm. 110 ..	63
,, 115 ..	—
,, 120 ..	2
,, 125 ..	6
,, 130 ..	—
,, 135 ..	—
,, 140 ..	9
,, 145 ..	—
,, 150 ..	1
,, 155 ..	2
,, 160 ..	—
,, 165 ..	—
,, 170 ..	6

Mean, mm. = 121·28

April, 1914 :—

Mm. 120 ..	1
,, 125 ..	5
,, 130 ..	6
,, 135 ..	14
,, 140 ..	16
,, 145 ..	11
,, 150 ..	7
,, 155 ..	7
,, 160 ..	14
,, 165 ..	7
,, 170 ..	23
,, 175 ..	5
,, 180 ..	6
,, 185 ..	13
,, 190 ..	2
,, 195 ..	5
,, 200 ..	2
,, 205 ..	2
,, 210 ..	1
,, 215 ..	1

Mean, mm. = 161·23

October, 1914 :—

Mm. 145 ..	1
,, 150 ..	—
,, 155 ..	4
,, 160 ..	1
,, 165 ..	—
,, 170 ..	8
,, 175 ..	1
,, 180 ..	—
,, 185 ..	12
,, 190 ..	4
,, 195 ..	5
,, 200 ..	—
,, 205 ..	3
,, 210 ..	3
,, 215 ..	—
,, 220 ..	2
,, 225 ..	16

Mean, mm. = 196·5

January, 1915 :—

Mm. 155 ..	1
,, 160 ..	1
,, 165 ..	—
,, 170 ..	—
,, 175 ..	1
,, 180 ..	4
,, 185 ..	4
,, 190 ..	3
,, 195 ..	11
,, 200 ..	—
,, 205 ..	6
,, 210 ..	7
,, 215 ..	—
,, 220 ..	6
,, 225 ..	7
,, 230 ..	—
,, 235 ..	1
,, 240 ..	4
,, 245 ..	—
,, 250 ..	—
,, 255 ..	3
,, 260 ..	1

Mean, mm. = 209·5

April, 1915 :—

Mm. 195 ..	1
,, 200 ..	—
,, 205 ..	2
,, 210 ..	2

Mean, mm. = 206·5

August-September, 1916 :—

Mm. 295 ..	1

Mean, mm. = 296·5

1911 Oysters.

September, 1913 :—

Mm.	65	1
,,	70	1
,,	75	—
,,	80	—
,,	85	3
,,	90	1
,,	95	2
,,	100	3
,,	105	4
,,	110	54

Mean, mm. = 108·88

April, 1914 :—

Mm.	85	1
,,	90	2
,,	95	3
,,	100	—
,,	105	2
,,	110	5
,,	115	1
,,	120	1

Mean, mm. = 104·50

October, 1914 :—

Mm.	105	1
,,	110	11
,,	115	—
,,	120	8
,,	125	8
,,	130	1
,,	135	8
,,	140	26
,,	145	8
,,	150	—
,,	155	6
,,	160	—
,,	165	—
,,	170	6

Mean, mm. = 136·86

January, 1915 :—

Mm.	110	5
,,	115	—
,,	120	9
,,	125	9
,,	130	—
,,	135	10
,,	140	20
,,	145	17
,,	150	—
,,	155	11
,,	160	3
,,	165	—
,,	170	15
,,	175	12
,,	180	1
,,	185	7
,,	190	—
,,	195	4
,,	200	—
,,	205	3
,,	210	2
,,	215	—
,,	220	1

Mean, mm. = 149·33

April, 1915 :—

Mm.	135	5
,,	140	6
,,	145	2
,,	150	—
,,	155	3
,,	160	3
,,	165	—
,,	170	1
,,	175	1
,,	180	—
,,	185	1
,,	190	—
,,	195	1

Mean, mm. = 152·58

September, 1915 :—

Mm.	135	1
,,	140	1
,,	145	1
,,	150	—
,,	155	—
,,	160	1
,,	165	—
,,	170	2
,,	175	3
,,	180	1
,,	185	6
,,	190	8
,,	195	4
,,	200	—
,,	205	1
,,	210	—
,,	215	—
,,	220	1
,,	225	8

Mean, mm. = 192·55

December, 1915 :—

Mm.	185	1
,,	190	—
,,	195	2
,,	200	—
,,	205	—
,,	210	—
,,	215	—
,,	220	1
,,	225	—
,,	230	—
,,	235	1
,,	240	—
,,	245	—
,,	250	—
,,	255	1

Mean, mm. = 215·67

March, 1916 :—

Mm.	210	1
,,	215	—
,,	220	1
,,	225	2
,,	230	—
,,	235	2
,,	240	1
,,	245	1
,,	250	—
,,	255	4
,,	260	1
,,	265	—
,,	270	1
,,	275	—
,,	280	—
,,	285	1

Mean, mm. = 246·17

August-September, 1916 :—

Mm.	225	9
,,	230	—
,,	235	—
,,	240	—
,,	245	—
,,	250	—
,,	255	2
,,	260	1
,,	265	—
,,	270	1

Mean, mm. = 235·73

May, 1917 :—

Mm.	225	5
,,	230	—
,,	235	—
,,	240	4
Mm.	245	—
,,	250	1
,,	255	12
,,	260	2
,,	265	—
,,	270	5
,,	275	—
,,	280	—
,,	285	3
,,	290	—
,,	295	1

Mean, mm. = 256·65

1912 Oysters.

September, 1913 :—

Mm.	15	3
,,	20	6
,,	25	35
,,	30	17
,,	35	26
,,	40	23
,,	45	2
,,	50	1

Mean, mm. = 32·65

January, 1914 :—

Mm.	30	2
,,	35	18
,,	40	7
,,	45	6
,,	50	1
,,	55	4
,,	60	—
,,	65	1
,,	70	1

Mean, mm. = 42·62

April, 1914 :—

Mm.	20	2
,,	25	46
,,	30	22
,,	35	71
,,	40	17
,,	45	46
,,	50	30
,,	55	36
,,	60	18
,,	65	4
,,	70	10
,,	75	2
,,	80	—
,,	85	6

Mean, mm. = 46·13

October, 1914 :—

Mm.	45	4
,,	50	—
,,	55	13
,,	60	7
,,	65	1
,,	70	27
,,	75	9
,,	80	2
,,	85	50
,,	90	6
,,	95	5
,,	100	1
,,	105	1
,,	110	15
,,	115	1
,,	120	—
,,	125	1

Mean, mm. = 81·67

January, 1915 :—

Mm.	70	11
,,	75	13
,,	80	—
,,	85	19
,,	90	9
,,	95	22
,,	100	1
,,	105	11
,,	110	18
,,	115	1
,,	120	5
,,	125	3
,,	130	—
,,	135	1

Mean, mm. = 95·54

April, 1915 :—

Mm.	75	1
,,	80	—
,,	85	3
,,	90	6
,,	95	—
,,	100	3
,,	105	4
,,	110	19
,,	115	—
,,	120	6
,,	125	2
,,	130	—
,,	135	2
,,	140	1

Mean, mm. = 108·63

September, 1915 :—

Mm.	85	1
,,	90	—
,,	95	6
,,	100	—
,,	105	15
,,	110	41
,,	115	4
,,	120	39
,,	125	25
,,	130	3
,,	135	38
,,	140	31
,,	145	22
,,	150	1
,,	155	19
,,	160	9
,,	165	—
,,	170	17
,,	175	4
,,	180	—
,,	185	1
,,	190	2
,,	195	1

Mean, mm. = 132·38

December, 1915 :—

Mm.	85	1
,,	90	—
,,	95	—
,,	100	—
,,	105	4
,,	110	14
,,	115	1
,,	120	22
,,	125	38
,,	130	4
,,	135	24
,,	140	41
,,	145	11
,,	150	3
,,	155	17
,,	160	11
,,	165	3
,,	170	21
,,	175	6
,,	180	4
,,	185	6
,,	190	1
,,	195	3
,,	200	—
,,	205	—
,,	210	1
,,	215	—
,,	220	—
,,	225	1

Mean, mm. = 143·46

March, 1916 :–

Mm. 100	..	1
,, 105	..	1
,, 110	..	1
,, 115	..	—
,, 120	..	1
,, 125	..	7
,, 130	..	5
,, 135	..	13
,, 140	..	24
,, 145	..	15
,, 150	..	5
,, 155	..	16
,, 160	..	19
,, 165	..	3
,, 170	..	12
,, 175	..	6
,, 180	..	2
,, 185	..	12
,, 190	..	4
,, 195	..	3
,, 200	..	2
,, 205	..	—
,, 210	..	2

Mean, mm. = 156·37

August-September, 1916 :—

Mm. 130	..	1
,, 135	..	3
,, 140	..	12
,, 145	..	15
,, 150	..	2
,, 155	..	17
,, 160	..	10
,, 165	..	3
,, 170	..	37
,, 175	..	11
,, 180	..	1
,, 185	..	13
,, 190	..	11
,, 195	..	25
,, 200	..	—
,, 205	..	4
,, 210	..	3
,, 215	..	—
,, 220	..	1
,, 225	..	3
,, 230	..	—
,, 235	..	—
,, 240	..	1

Mean, mm. = 173·10

January, 1917 :–

Mm. 125	..	1
,, 130	..	—
,, 135	..	1
,, 140	..	1
Mm. 145	..	—
,, 150	..	—
,, 155	..	5
,, 160	..	6
,, 165	..	1
,, 170	..	25
,, 175	..	10
,, 180	..	2
,, 185	..	22
,, 190	..	10
,, 195	..	46
,, 200	..	3
,, 205	..	6
,, 210	..	13
,, 215	..	5
,, 220	..	4
,, 225	..	27
,, 230	..	1
,, 235	..	—
,, 240	..	3
,, 245	..	—
,, 250	..	1
,, 255	..	3
,, 260	..	—
,, 265	..	—
,, 270	..	1

Mean, mm. = 186·55

May, 1917 :—

Mm. 155	..	1
,, 160	..	—
,, 165	..	—
,, 170	..	5
,, 175	..	2
,, 180	..	—
,, 185	..	21
,, 190	..	13
,, 195	..	53
,, 200	..	1
,, 205	..	17
,, 210	..	37
,, 215	..	1
,, 220	..	18
,, 225	..	59
,, 230	..	—
,, 235	..	12
,, 240	..	26
,, 245	..	7
,, 250	..	—
,, 255	..	128
,, 260	..	—
,, 265	..	—
,, 270	..	—
,, 275	..	—
,, 280	..	—
,, 285	..	1

Mean, mm = 227·99

September, 1917 :—

Mm.	170	1
,,	175	—
,,	180	—
,,	185	—
,,	190	1
,,	195	6
,,	200	—
,,	205	3
,,	210	6
,,	215	1
,,	220	2
,,	225	28
,,	230	1
,,	235	5
,,	240	12
,,	245	7
,,	250	—
,,	255	65
,,	260	—
,,	265	—
,,	270	2
,,	275	2

Mean, mm. =241·76

January, 1918 :—

Mm.	225	2
,,	230	—
,,	235	1
,,	240	5
,,	245	1
,,	250	—
,,	255	26
,,	260	—
,,	265	1
,,	270	2

Mean, mm. = 259·13

March, 1918 :—

Mm.	280	1

Mean, mm. = 281·5

February, 1919 :—

Mm.	325	1
,,	330	1
,,	335	—
,,	340	2
,,	345	—
,,	350	—
,,	355	2
,,	360	—
,,	365	3

Mean, mm. = 350·38

1913 Oysters.

September, 1913 :—

Mm.	1	128
,,	5	330
,,	10	306
,,	15	241
,,	20	121
,,	25	70
,,	30	2
,,	35	1
,,	40	1

Mean, mm. = 12·02

January, 1914 :—

Mm.	1	60
,,	5	71
,,	10	113
,,	15	45
,,	20	36
,,	25	60
,,	30	2
,,	35	4

Mean, mm. = 13·21

April, 1914 :—

Mm.	1	9
,,	5	31
,,	10	112
,,	15	89
,,	20	151
,,	25	127
,,	30	19
,,	35	24
,,	40	5
,,	45	2

Mean, mm. = 19·97

October, 1914 : —

Mm.	10	1
,,	15	22
,,	20	48
,,	25	88
,,	30	4
,,	35	27
,,	40	59
,,	45	13
,,	50	—
,,	55	59

Mean, mm. = 35·00

January, 1915 :—

Mm.	35	1
,,	40	8
,,	45	9
,,	50	1
,,	55	24
,,	60	12
,,	65	—
,,	70	17

Mean, mm. = 57·61

April, 1915 :—

Mm.	65	1
,,	70	1
,,	75	2
,,	80	—
,,	85	2

Mean, mm. = 77·33

September, 1915 :—

Mm.	60	1
,,	65	—
,,	70	—
,,	75	1
,,	80	—
,,	85	12
,,	90	12
,,	95	8
,,	100	—
,,	105	2
,,	110	3
,,	115	1

Mean, mm. = 92·75

December, 1915 :—

Mm.	75	1
,,	80	1
,,	85	5
,,	90	5
,,	95	13
,,	100	—
,,	105	7
,,	110	32
,,	115	—
,,	120	7
,,	125	1

Mean, mm. = 105·45

March, 1916 :—

Mm.	70	2
,,	75	1
,,	80	1
Mm.	85	16
,,	90	10
,,	95	5
,,	100	20
,,	105	16
,,	110	41
,,	115	2
,,	120	12
,,	125	8
,,	130	3
,,	135	4
,,	140	1
,,	145	—
,,	150	—
,,	155	1
,,	160	1
,,	165	—
,,	170	2
,,	175	1

Mean, mm. = 106·86

August-September, 1916 :—

Mm.	90	1
,,	95	1
,,	100	8
,,	105	7
,,	110	55
,,	115	7
,,	120	28
,,	125	52
,,	130	6
,,	135	20
,,	140	37
,,	145	16

Mean, mm. = 125·10

January, 1917 :—

Mm.	110	3
,,	115	2
,,	120	4
,,	125	6
,,	130	1
,,	135	10
,,	140	20
,,	145	3
,,	150	1
,,	155	7
,,	160	7
,,	165	—
,,	170	13
,,	175	1
,,	180	—
,,	185	4
,,	190	1

Mean, mm. = 148·18

May, 1917 :—

Mm.	120	1
,,	125	12
,,	130	—
,,	135	13
,,	140	51
,,	145	25
,,	150	—
,,	155	23
,,	160	16
,,	165	1
,,	170	70
,,	175	14
,,	180	2
,,	185	23
,,	190	4
,,	195	18
,,	200	—
,,	205	1
,,	210	1

Mean, mm. = 161·80

September, 1917 : —

Mm.	135	3
,,	140	14
,,	145	5
,,	150	—
,,	155	9
,,	160	3
,,	165	2
,,	170	24
,,	175	5
,,	180	—
,,	185	10
,,	190	—
,,	195	14
,,	200	—
,,	205	2
,,	210	1
,,	215	—
,,	220	1
,,	225	2

Mean, mm. = 171·19

January, 1918 :—

Mm.	140	6
,,	145	1
,,	150	—
,,	155	8
,,	160	6
,,	165	5
,,	170	43
,,	175	8
,,	180	2
Mm.	185	18
,,	190	7
,,	195	55
,,	200	4
,,	205	1
,,	210	23
,,	215	2
,,	220	4
,,	225	28
,,	230	—
,,	235	1
,,	240	3

Mean, mm. = 191·96

March, 1918 :—

Mm.	185	2
,,	190	3
,,	195	6
,,	200	—
,,	205	1
,,	210	11
,,	215	—
,,	220	6
,,	225	9
,,	230	—
,,	235	—
,,	240	5
,,	245	3
,,	250	—
,,	255	22

Mean, mm. = 229·66

September, 1918 :—

Mm.	195	1
,,	200	1
,,	205	—
,,	210	—
,,	215	—
,,	220	—
,,	225	5
,,	230	—
,,	235	—
,,	240	—
,,	245	—
,,	250	—
,,	255	38

Mean, mm. = 250·61

February, 1919 :—

Mm.	225	1
,,	230	—
,,	235	—
,,	240	2

Mm. 245 ..	—
,, 250 ..	—
,, 255 ..	3
,, 260 ..	4
,, 265 ..	—
,, 270 ..	—
,, 275 ..	3
,, 280 ..	—
,, 285 ..	9
,, 290 ..	2
,, 295 ..	3
,, 300 ..	2
,, 305 ..	—
,, 310 ..	2
,, 315 ..	—
,, 320 ..	1

Mean, mm. = 281·50

August, 1919 :—

Mm. 285 ..	1
,, 290 ..	—
,, 295 ..	—
,, 300 ..	—
,, 305 ..	—
,, 310 ..	—
,, 315 ..	—
,, 320 ..	1

Mean, mm. = 304·00

1914 Oysters.

January, 1915 :—

Mm. 20 ..	3
,, 25 ..	2

Mean, mm. = 23·50

September, 1915 :—

Mm. 20 ..	3
,, 25 ..	8
,, 30 ..	—
,, 35 ..	4
,, 40 ..	4
,, 45 ..	—
,, 50 ..	—
,, 55 ..	1

Mean, mm. = 32·25

December, 1915 : —

Mm. 25 ..	2
,, 30 ..	—
,, 35 ..	1
,, 40 ..	2
,, 45 ..	3
,, 50 ..	1
Mm. 55 ..	6
,, 60 ..	—
,, 65 ..	—
,, 70 ..	3
,, 75 ..	—
,, 80 ..	—
,, 85 ..	—
,, 90 ..	—
,, 95 ..	—
,, 100 ..	—
,, 105 ..	—
,, 110 ..	—
,, 115 ..	—
,, 120 ..	2
,, 125 ..	—
,, 130 ..	—
,, 135 ..	—
,, 140 ..	3
,, 145 ..	1

Mean, mm. = 50·95

March, 1916 :—

Mm. 25 ..	3
,, 30 ..	1
,, 35 ..	11
,, 40 ..	13
,, 45 ..	8
,, 50 ..	28
,, 55 ..	60
,, 60 ..	47
,, 65 ..	12
,, 70 ..	44
,, 75 ..	16
,, 80 ..	4
,, 85 ..	15
,, 90 ..	1
,, 95 ..	—
,, 100 ..	1
,, 105 ..	1

Mean, mm. = 61·27

August-September, 1916 :—

Mm. 40 ..	3
,, 45 ..	—
,, 50 ..	2
,, 55 ..	4
,, 60 ..	12
,, 65 ..	2
,, 70 ..	13
,, 75 ..	7
,, 80 ..	7
,, 85 ..	35
,, 90 ..	24

Mm. 95	..	4
,, 100	..	29
,, 105	..	6
,, 110	..	5
,, 115	..	—
,, 120	..	—
,, 125	..	—
,, 130	..	—
,, 135	..	1

Mean, mm. = 85·68

January, 1917 :—

Mm. 55	..	1
,, 60	..	2
,, 65	..	—
,, 70	..	3
,, 75	..	2
,, 80	..	—
,, 85	..	9
,, 90	..	9
,, 95	..	1
,, 100	..	14
,, 105	..	5
,, 110	..	29
,, 115	..	5
,, 120	..	5
,, 125	..	4
,, 130	..	—
,, 135	..	—
,, 140	..	2

Mean, mm. = 103·42

May, 1917 :—

Mm. 55	..	2
,, 60	..	1
,, 65	..	—
,, 70	..	3
,, 75	..	3
,, 80	..	1
,, 85	..	22
,, 90	..	10
,, 95	..	—
,, 100	..	20
,, 105	..	13
,, 110	..	44
,, 115	..	1
,, 120	..	10
,, 125	..	12
,, 130	..	—
,, 135	..	4
,, 140	..	3

Mean, mm. = 105·09

September, 1917 :—

Mm. 95	..	1
,, 100	..	3
,, 105	..	1
,, 110	..	12
,, 115	..	—
,, 120	..	11
,, 125	..	10
,, 130	..	5
,, 135	..	11
,, 140	..	14
,, 145	..	7
,, 150	..	3
,, 155	..	3
,, 160	..	—
,, 165	..	—
,, 170	..	2
,, 175	..	1

Mean, mm. = 131·61

January, 1918 :—

Mm. 110	..	2
,, 115	..	1
,, 120	..	6
,, 125	..	3
,, 130	..	1
,, 135	..	3
,, 140	..	9
,, 145	..	6
,, 150	..	2
,, 155	..	2
,, 160	..	3
,, 165	..	4
,, 170	..	12

Mean, mm. = 147·68

March, 1918 :—

Mm. 110	..	1
,, 115	..	—
,, 120	..	2
,, 125	..	1
,, 130	..	1
,, 135	..	3
,, 140	..	15
,, 145	..	4
,, 150	..	2
,, 155	..	14
,, 160	..	7
,, 165	..	4
,, 170	..	29
,, 175	..	3
,, 180	..	4
,, 185	..	12
,, 190	..	1
,, 195	..	6
,, 200	..	1

Mm. 205 ..	1
,, 210 ..	3
,, 215 ..	2
,, 220 ..	1

Mean, mm. = 167·14

September, 1918 :—

Mm. 140 ..	2
,, 145 ..	—
,, 150 ..	—
,, 155 ..	7
,, 160 ..	1
,, 165 ..	—
,, 170 ..	12
,, 175 ..	1
,, 180 ..	—
,, 185 ..	4
,, 190 ..	1
,, 195 ..	8
,, 200 ..	—
,, 205 ..	—
,, 210 ..	—
,, 215 ..	1
,, 220 ..	—
,, 225 ..	4

Mean, mm. = 180·64

February, 1919 :—

Mm. 155 ..	1
,, 160 ..	5
,, 165 ..	—
,, 170 ..	8
,, 175 ..	2
,, 180 ..	—
,, 185 ..	4
,, 190 ..	5
,, 195 ..	12
,, 200 ..	—
,, 205 ..	3
,, 210 ..	6
,, 215 ..	—
,, 220 ..	6
,, 225 ..	7
,, 230 ..	—
,, 235 ..	1
,, 240 ..	3

Mean, mm. = 198·64

July, 1919 :—

Mm. 185 ..	1
,, 190 ..	3
,, 195 ..	5
,, 200 ..	—
,, 205 ..	2
,, 210 ..	5
,, 215 ..	—
,, 220 ..	2
Mm. 225 ..	9
,, 230 ..	—
,, 235 ..	—
,, 240 ..	5
,, 245 ..	—
,, 250 ..	—
,, 255 ..	1
,, 260 ..	—
,, 265 ..	—
,, 270 ..	1

Mean, mm. = 218·56

August, 1919 :—

Mm. 195 ..	5
,, 200 ..	—
,, 205 ..	1
,, 210 ..	2
,, 215 ..	—
,, 220 ..	2
,, 225 ..	6
,, 230 ..	—
,, 235 ..	4
,, 240 ..	4
,, 245 ..	—
,, 250 ..	—
,, 255 ..	1
,, 260 ..	—
,, 265 ..	—
,, 270 ..	—
,, 275 ..	—
,, 280 ..	—
,, 285 ..	4

Mean, mm. = 232·01

January-February, 1920 :—

Mm. 240 ..	1
,, 245 ..	—
,, 250 ..	—
,, 255 ..	—
,, 260 ..	—
,, 265 ..	—
,, 270 ..	2
,, 275 ..	6
,, 280 ..	—
,, 285 ..	7
,, 290 ..	4
,, 295 ..	—
,, 300 ..	—
,, 305 ..	2
,, 310 ..	1
,, 315 ..	—
,, 320 ..	—
,, 325 ..	—
,, 330 ..	—
,, 335 ..	—
,, 340 ..	2

Mean, mm. = 288·5

May, 1920 :—

Mm.	235	1
,,	240	—
,,	245	—
,,	250	—
,,	255	1
,,	260	—
,,	265	1
,,	270	—
,,	275	—
,,	280	1
,,	285	—
,,	290	1
,,	295	1
,,	300	1
,,	305	—
,,	310	1
,,	315	—
,,	320	—
,,	325	1
,,	330	1

Mean, mm. = 290·00

1915 Oysters.

September, 1917 :—

Mm.	60	1
,,	65	3
,,	70	1
,,	75	—
,,	80	1
,,	85	4
,,	90	5
,,	95	1
,,	100	—
,,	105	1
,,	110	4

Mean, mm. = 88·87

January, 1918 :—

Mm.	55	1
,,	60	1
,,	65	—
,,	70	4
,,	75	3
,,	80	2
,,	85	10
,,	90	2
,,	95	1
,,	100	4
,,	105	—
,,	110	2

Mean, mm. = 85·67

March, 1918 :—

Mm.	55	1
,,	60	1
,,	65	3
,,	70	7
,,	75	2
,,	80	—
,,	85	7
,,	90	5
,,	95	1
,,	100	5
,,	105	1
,,	110	1
,,	115	—
,,	120	2

Mean, mm. = 86·08

September, 1918 :—

Mm.	100	2
,,	105	—
,,	110	20
,,	115	—
,,	120	—
,,	125	8
,,	130	—
,,	135	—
,,	140	27
,,	145	1
,,	150	—
,,	155	4
,,	160	—
,,	165	—
,,	170	4

Mean, mm. = 132·19

April 1919 :—

Mm.	100	1
,,	105	—
,,	110	7
,,	115	—
,,	120	9
,,	125	19
,,	130	—
,,	135	11
,,	140	23
,,	145	12
,,	150	—
,,	155	11
,,	160	13
,,	165	1
,,	170	8
,,	175	2
,,	180	—
,,	185	2
,,	190	—
,,	195	1
,,	200	—

Mm. 205 ..	—
,, 210 ..	—
,, 215 ..	—
,, 220 ..	—
,, 225 ..	—
,, 230 ..	—
,, 235 ..	—
,, 240 ..	1

Mean, mm. = 143·12

June-July, 1919 :—

Mm. 125 ..	5
,, 130 ..	—
,, 135 ..	2
,, 140 ..	31
,, 145 ..	11
,, 150 ..	—
,, 155 ..	14
,, 160 ..	15
,, 165 ..	—
,, 170 ..	29
,, 175 ..	6
,, 180 ..	—
,, 185 ..	8
,, 190 ..	—
,, 195 ..	5
,, 200 ..	—
,, 205 ..	1
,, 210 ..	1

Mean, mm. = 159·71

August, 1919 :—

Mm. 140 ..	9
,, 145 ..	5
,, 150 ..	1
,, 155 ..	16
,, 160 ..	5
,, 165 ..	1
,, 170 ..	22
,, 175 ..	5
,, 180 ..	2
,, 185 ..	11
,, 190 ..	3
,, 195 ..	18
,, 200 ..	3
,, 205 ..	4
,, 210 ..	2
,, 215 ..	—
,, 220 ..	1

Mean, mm. = 174·89

January-February, 1920: —

Mm. 170 ..	4
,, 175 ..	6
,, 180 ..	—
,, 185 ..	15
,, 190 ..	12
,, 195 ..	23
,, 200 ..	—
Mm. 205 ..	9
,, 210 ..	12
,, 215 ..	—
,, 220 ..	14
,, 225 ..	40
,, 230 ..	—
,, 235 ..	13
,, 240 ..	8
,, 245 ..	2
,, 250 ..	1
,, 255 ..	14
,, 260 ..	3
,, 265 ..	—
,, 270 ..	—
,, 275 ..	—
,, 280 ..	—
,, 285 ..	2

Mean, mm. = 216·16

May, 1920 :—

Mm. 195 ..	1
,, 200 ..	—
,, 205 ..	1
,, 210 ..	1
,, 215 ..	1
,, 220 ..	—
,, 225 ..	6
,, 230 ..	1
,, 235 ..	—
,, 240 ..	1
,, 245 ..	2
,, 250 ..	1
,, 255 ..	5
,, 260 ..	2
,, 265 ..	—
,, 270 ..	2
,, 275 ..	1

Mean, mm. = 241·3

October 1920 :—

Mm. 245 ..	2

Mean, mm. = 246·5

1916 Oysters.

September, 1917 :—

Mm. 15 ..	1
,, 20 ..	4
,, 25 ..	46
,, 30 ..	5
,, 35 ..	23
,, 40 ..	17
,, 45 ..	13
,, 50 ..	2
,, 55 ..	16
,, 60 ..	1
,, 65 ..	—
,, 70 ..	2

Mean, mm. = 37·36

January, 1918:—

Mm.	25 ..	5
,,	30 ..	—
,,	35 ..	—
,,	40 ..	1
,,	45 ..	2
,,	50 ..	—
,,	55 ..	16
,,	60 ..	5
,,	65 ..	—
,,	70 ..	5
,,	75 ..	3
,,	80 ..	—
,,	85 ..	3

Mean. mm. = 62·64

March, 1918:—

Mm.	35 ..	2
,,	40 ..	6
,,	45 ..	5
,,	50 ..	5
,,	55 ..	25
,,	60 ..	26
,,	65 ..	8
,,	70 ..	17
,,	75 ..	3
,,	80 ..	1
,,	85 ..	3
,,	90 ..	1

Mean, mm. = 61·11

September, 1918:—

Mm.	55 ..	2
,,	60 ..	—
,,	65 ..	—
,,	70 ..	8
,,	75 ..	5
,,	80 ..	2
,,	85 ..	46
,,	90 ..	7
,,	95 ..	3
,,	100 ..	12
,,	105 ..	1
,,	110 ..	22
,,	115 ..	—
,,	120 ..	2

Mean, mm. = 92·75

February, 1919:—

Mm.	60 ..	1
,,	65 ..	—
,,	70 ..	4
,,	75 ..	2
,,	80 ..	—
,,	85 ..	23
	90 ..	21
Mm.	95 ..	1
,,	100 ..	29
,,	105 ..	13
,,	110 ..	25
,,	115 ..	—
,,	120 ..	15
,,	125 ..	5
,,	130 ..	—
,,	135 ..	—
,,	140 ..	—
,,	145 ..	2

Mean, mm. = 101·28

June-July, 1919:—

Mm.	85 ..	5
,,	90 ..	4
,,	95 ..	—
,,	100 ..	17
,,	105 ..	9
,,	110 ..	41
,,	115 ..	—
,,	120 ..	7
,,	125 ..	34
,,	130 ..	—
,,	135 ..	1
,,	140 ..	9
,,	145 ..	2
,,	150 ..	—
,,	155 ..	1

Mean, mm. = 115·88

August, 1919:—

Mm.	90 ..	2
,,	95 ..	—
,,	100 ..	3
,,	105 ..	—
,,	110 ..	21
,,	115 ..	—
,,	120 ..	14
,,	125 ..	40
,,	130 ..	—
,,	135 ..	9
,,	140 ..	30
,,	145 ..	8
,,	150 ..	—
,,	155 ..	12

Mean, mm. = 130·31

January-February, 1920:—

Mm.	120 ..	3
,,	125 ..	23
,,	130 ..	—
,,	135 ..	16
,,	140 ..	54
,,	145 ..	21
,,	150 ..	—

Mm. 155 ..	46
,, 160 ..	38
,, 165 ..	—
,, 170 ..	45
,, 175 ..	16
,, 180 ..	—
,, 185 ..	9
,, 190 ..	—
,, 195 ..	4

Mean, mm. = 154·60

May, 1920 :—

Mm. 125 ..	4
,, 130 ..	—
,, 135 ..	8
,, 140 ..	8
,, 145 ..	1
,, 150 ..	4
,, 155 ..	4
,, 160 ..	6
,, 165 ..	1
,, 170 ..	7
,, 175 ..	10
,, 180 ..	2
,, 185 ..	3
,, 190 ..	2
,, 195 ..	1
,, 200 ..	2
,, 205 ..	1

Mean, mm. = 161·27

October, 1920 :—

Mm. 155 ..	1
,, 160 ..	1
,, 165 ..	—
,, 170 ..	2
,, 175 ..	2
,, 180 ..	3
,, 185 ..	10
,, 190 ..	3
,, 195 ..	6
,, 200 ..	2
,, 205 ..	3
,, 210 ..	4
,, 215 ..	1
,, 220 ..	2
,, 225 ..	3
,, 230 ..	—
,, 235 ..	1
,, 240 ..	—
,, 245 ..	1
,, 250 ..	—
,, 255 ..	—
,, 260 ..	—
,, 265 ..	—
,, 270 ..	1

Mean, mm. = 197·05

1917 Oysters.

September, 1920 :—

Mm. 5 ..	4
,, 10 ..	75
,, 15 ..	29
,, 20 ..	38
,, 25 ..	14
,, 30 ..	—
,, 35 ..	2
,, 40 ..	2
,, 45 ..	—
,, 50 ..	—
,, 55 ..	2
,, 60 ..	2

Mean, mm. = 16·53

January, 1918 :—

Mm. 10 ..	3
,, 15 ..	—
,, 20 ..	1
,, 25 ..	23
,, 30 ..	—
,, 35 ..	1
,, 40 ..	1

Mean, mm. = 25·64

March, 1918 :—

Mm. 25 ..	10
,, 30 ..	4
,, 35 ..	7
,, 40 ..	6
,, 45 ..	2
,, 50 ..	—
,, 55 ..	1

Mean, mm. = 34·84

September, 1918 :—

Mm. 55 ..	8
,, 60 ..	—
,, 65 ..	—
,, 70 ..	—
,, 75 ..	1

Mean, mm. = 56·50

February, 1919 :—

Mm. 25 ..	4
,, 30 ..	—
,, 35 ..	1
,, 40 ..	1
,, 45 ..	4
,, 50 ..	—
,, 55 ..	5
,, 60 ..	4
,, 65 ..	—
,, 70 ..	7
,, 75 ..	2
,, 80 ..	—
,, 85 ..	2

Mean, mm. = 59·20

June-July, 1919 :—

Mm.	55	1
,,	60	2
,,	65	—
,,	70	9
,,	75	1
,,	80	—
,,	85	16
,,	90	3
,,	95	—
,,	100	8
,,	105	—
,,	110	3
,,	115	—
,,	120	1

Mean, mm. = 86·95

August, 1919 :—

Mm.	70	4
,,	75	2
,,	80	—
,,	85	26
,,	90	6
,,	95	—
,,	100	7
,,	105	2
,,	110	5

Mean, mm. = 89·64

January-February, 1920 :—

Mm.	75	1
,,	80	—
,,	85	—
,,	90	—
,,	95	—
,,	100	2
,,	105	1
,,	110	19
,,	115	—
,,	120	10
,,	125	4
,,	130	1

Mean, mm. = 114·66

May, 1920 :—

Mm.	75	1
,,	80	—
,,	85	2
,,	90	1
,,	95	4
,,	100	2
,,	105	2
,,	110	1

Mean, mm. = 96·50

October, 1920 :—

Mm.	90	1
,,	95	3
,,	100	1
,,	105	4
,,	110	8
,,	115	4
,,	120	6
,,	125	11
,,	130	3
,,	135	4
,,	140	6
,,	145	5
,,	150	1
,,	155	6
,,	160	8
,,	165	3
,,	170	1
,,	175	4

Mean, mm. = 134·41

1919 Oysters.

October, 1920 :—

Mm.	25	7
,,	30	23
,,	35	24
,,	40	29
,,	45	10
,,	50	6
,,	55	8
,,	60	3
,,	65	2
,,	70	3
,,	75	1

Mean, mm. = 41·58

1920 Oysters.

May, 1920 :—

Mm.	0	17
,,	5	13
,,	10	1

Mean, mm. = 3·92

October, 1920 :—

Mm.	10	13
,,	15	4
,,	20	18
,,	25	23
,,	30	2
,,	35	1

Mean, mm. = 21·50

APPENDIX VI.

Comparison of Weight and Short Diameter.

Comparison of Weights with Linear Measurements.*

0–10 grms.

Mm.	25 30 35 40 45 50 55 60 65 70 75 80 85 90 95	Mean = 57·5 mm.
Nos.	2 1 9 30 42 159 190 81 67 25 16 1 1 2 1	

10–21 grms.

Mm.	25 30 35 — — — 50 55 60 65 70 75 80 85 90 95 100 105	Mean = 74·6 mm.
Nos.	13 7 1 — — — 6 17 77 194 258 334 110 76 21 1 — 1	

20–30 grms.

Mm.	25 30 35 — — — 60 65 70 75 80 85 90 95 100 105	Mean = 85·2 mm.
Nos.	8 19 1 — — — 3 25 63 136 193 185 200 45 27 1	

30–40 grms.

Mm.	30 35 40 — — — 70 75 80 85 90 95 100 105 110 115	Mean = 92·9 mm.
Nos.	16 6 1 — — — 2 11 33 58 115 47 44 4 1 1	

40–50 grms.

Mm.	30 35 40 — — — 70 75 80 85 90 95 100 105 110 115	Mean = 98·0 mm.
Nos.	12 30 13 — — — 1 5 8 30 80 62 71 22 9 4	

50–60 grms.

Mm.	35 40 45 — — — 75 80 85 90 95 100 105 110 115 120	Mean = 103·1 mm.
Nos.	12 19 1 — — — 1 3 11 39 51 134 70 55 14 6	

* The groups 25, 30, 35 mm., and so on, should be indicated more correctly as 25–29 (inclusive), 30–34, 35—39, and so on, so that the middle measurement of each group is 27·5, 32·5, 37·5, and so on.

Similarly, 10–20 grms. is a group of 10 to 19 inclusive, so that the middle measurement of each group of weights is 5, 15, 25, 35 grms., and so on.

60–70 grms.

Mm.	40	—	—	—	90	95	100	105	110	115	—	—	—	130
Nos.	1	—	—	—	7	15	41	19	25	6	—	—	—	1

Mean = 105·0 mm.

70–80 grms.

Mm.	90	95	100	105	110	115	120	125	130
Nos.	6	12	61	61	97	37	14	2	3

Mean = 109·7 mm.

80–90 grms.

Mm.	90	95	100	105	110	115	120	125	130	135	140
Nos.	3	8	38	53	92	64	47	10	4	—	1

Mean = **113·20 mm.**

90–100 grms.

Mm.	95	100	105	110	115	120	125	130	135
Nos.	1	11	41	87	75	86	31	9	1

Mean = 117·10 mm.

100–110 grms.

Mm.	50	—	—	—	100	105	110	115	120	125	130	135
Nos.	1	—	—	—	2	8	25	37	48	30	8	2

Mean = **120·30 mm.**

110–120 grms.

Mm.	100	105	110	115	120	125	130	135	140
Nos.	7	16	55	97	146	118	73	15	2

Mean = 122·8 mm.

120–130 grms.

Mm.	100	105	110	115	120	125	130	135	140	145	
Nos.	2	5	34	65	133	157	112	59	11	3	Mean = 126·4 mm.

130–140 grms.

Mm.	105	110	115	120	125	130	135	140	145	
Nos.	5	4	18	33	57	90	33	11	2	Mean = 129·3 mm.

140–150 grms.

Mm.	100	105	110	115	120	125	130	135	140	145	150	155	
Nos.	1	6	31	43	116	158	200	121	69	6	2	1	Mean = 129·8 mm.

150–160 grms.

Mm.	100	105	110	115	120	125	130	135	140	145	150	155	
Nos.	1	3	5	16	40	48	84	61	43	8	1	—	Mean = 132·3 mm.

160–170 grms.

Mm.	115	120	125	130	135	140	145	150	155	
Nos.	2	27	36	52	31	35	18	3	—	Mean = 133·2 mm.

170–180 grms.

Mm.	100	105	110	115	120	125	130	135	140	145	150	155	—	—	—	—	—	170	
Nos.	3	—	—	11	10	39	72	117	115	146	51	26	3	—	—	—	—	1	Mean = 136·2 mm.

180–190 grms.

Mm.	110	115	120	125	130	135	140	145	150	155	
Nos.	4	7	12	17	42	42	74	36	20	2	Mean = 138·5 mm.

190–200 grms.

Mm.	110	115	120	125	130	135	140	145	150	155	—	—	—	170	Mean = 139·1 mm.
Nos.	6	7	13	27	63	75	106	61	48	14	—	—	—	1	

200–210 grms.

Mm.	115	120	125	130	135	140	145	15	155	Mean = 141·4 mm.
Nos.	1	—	2	8	9	28	10	12	6	

210–220 grms.

Mm.	110	115	120	125	130	135	140	145	150	155	160	—	—	—	180	Mean = 143·1 mm.
Nos.	5	7	4	8	21	19	25	40	44	13	6	—	—	—	2	

220–230 grms.

Mm.	90	—	—	—	115	120	125	130	135	140	145	150	155	160	165	170	175	Mean = 147·2 mm.
Nos.	1	—	—	—	1	6	10	31	14	53	40	73	28	24	6	1	1	

230–240 grms.

Mm.	120	125	130	135	140	145	150	155	160	165	170	Mean = 147·3 mm.
Nos.	1	2	2	6	4	6	9	8	1	—	1	

240–250 grms.

Mm.	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	Mean = 148·2 mm.
Nos.	2	—	—	1	—	1	4	10	4	15	20	26	17	9	1	

250–260 grms.

Mm.	110	115	120	125	130	135	140	145	150	155	160	165	170	175	Mean = 153·1 mm.
Nos.	1	1	1	2	11	12	38	30	76	57	65	34	8	1	

APPENDIX VII.

Relation between Short Diameter and Long Diameter.

Comparison of Short Diameter = (s. d.) ; with Long Diameter (l. d.)

10–19 mm. (s. d.).

(*l. d.*) mm. $\frac{10\text{–}14\,..\,15\text{–}19\,..\,20\text{–}24}{5\ ..\ 69\ ..\ 11}$ Mean = 17·57 mm.

20–29 mm. (s. d.)

(*l. d.*) mm. $\frac{15\text{–}19\,..\,20\text{–}24\,..\,25\text{–}29\,..\,30\text{–}34\,..\,35\text{–}39}{3\ ..\ 40\ ..\ 45\ ..\ 32\ ..\ 4}$ Mean = 27·26 mm.

30–39 mm. (s. d.).

(*l. d.*) mm. $\frac{25\text{–}29\,..\,30\text{–}34\,..\,35\text{–}39\,..\,40\text{–}44\,..\,45\text{–}49\,..\,50\text{–}54\,..\,55\text{–}59\,..\,60\text{–}64\,..\,65\text{–}69}{1\ ..\ 63\ ..\ 95\ ..\ 97\ ..\ 11\ ..\ 27\ ..\ 3\ ..\ —\ ..\ 1}$ Mean = 40·07 mm.

40–49 mm. (s. d.).

(*l. d.*) mm. $\frac{30\text{–}34\,..\,35\text{–}39\,..\,40\text{–}44\,..\,45\text{–}49\,..\,50\text{–}54\,..\,55\text{–}59\,..\,60\text{–}64\,..\,65\text{–}69}{2\ ..\ 1\ ..\ 78\ ..\ 109\ ..\ 139\ ..\ 15\ ..\ 1\ ..\ 1}$ Mean = 48·81 mm.

50–59 mm. (s. d.).

(*l. d.*) mm. $\frac{50\text{–}54\,..\,55\text{–}59\,..\,60\text{–}64\,..\,65\text{–}69\,..\,70\text{–}74\,..\,75\text{–}79\,..\,80\text{–}84}{120\ ..\ 289\ ..\ 190\ ..\ 38\ ..\ 4\ ..\ 1\ ..\ 1}$ Mean = 58·80 mm.

60–69 mm. (s. d.).

(*l. d.*) mm. $\frac{20\text{–}24\,..\,45\text{–}49\,..\,50\text{–}54\,..\,55\text{–}59\,..\,60\text{–}64\,..\,65\text{–}69\,..\,70\text{–}74\,..\,75\text{–}79\,..\,80\text{–}84\,..\,85\text{–}89\,..\,90\text{–}94}{1\ ..\ 1\ ..\ 2\ ..\ 7\ ..\ 78\ ..\ 235\ ..\ 206\ ..\ 125\ ..\ 14\ ..\ 2\ ..\ 1}$ Mean = 70·5 mm.

70–79 mm. (*s. d.*).

(*l. d.*) mm.	60–64	65–69	70–74	75–79	80–84	85–89	90–94	95–99	100–104	110–114
	3	4	80	364	368	184	48	4	4	1

Mean = 81·4 mm.

80–89 mm. (*s. d.*).

(*l. d.*) mm.	15–19	60–64	70–74	75–79	80–84	85–89	90–94	95–99	100–104	105–109	110–114	115–119
	1	1	1	18	95	176	400	133	111	9	1	1

Mean = 92·3 mm.

90–94 mm. (*s. d.*).

(*l. d.*) mm.	75–79	85–89	90–94	95–99	100–104	105–109	110–114	115–119	120–124	125–129
	3	12	145	168	296	63	23	5	1	1

Mean = 99·88 mm.

95–99 mm. (*s. d.*).

(*l. d.*) mm.	75–79	85–89	90–94	95–99	100–104	105–109	110–114	115–119	120–124	125–129
	1	2	9	45	164	94	27	9	3	1

Mean = 104·16 mm.

100–101 mm. (*s. d.*).

(*l. d.*) mm.	95–99	100–104	105–109	110–114	115–119	120–124	125–129	130–134
	6	151	294	238	99	12	8	3

Mean = 109·70 mm.

105–109 mm. (*s. d.*).

(*l. d.*) mm.	85–89	95–99	100–104	105–109	110–114	115–119	120–124	125–129	130–134
	1	1	6	71	173	199	64	34	7

	145–149
	1

Mean = 115·85 mm.

110–114 mm. (*s. d.*).

(*l. d.*) mm.	95–99	100–104	105–109	110–114	115–119	120–124	125–129	130–134	135–139	140–144	145–149	150–154	155–159
	1	3	11	126	219	169	111	40	13	14	3		1

Mean = 121·03 mm.

115–119 mm. (*s. d.*).

(*l. d.*) mm.	100–104	105–109	110–114	115–119	120–124	125–129	130–134	135–139	140–144	145–149	150–154	160–164	175–179
	2	4	29	85	188	163	115	42	25	4	1		1

Mean = 126·26 mm.

120–124 mm. (*s. d.*).

(*l. d.*) mm.	100–104	105–109	110–114	115–119	120–124	125–129	130–134	135–139	140–144	145–149	150–154	155–159	165–169
	1	1	12	41	142	200	238	104	76	19	12	1	1

Mean = 130·78 mm.

125–129 mm. (*s. d.*).

(*l. d.*) mm.	100–104	105–109	110–114	115–119	120–124	125–129	130–134	135–139	140–144	145–149	150–154	155–159	160–164
	2	1	9	12	48	146	330	199	120	55	32	4	1

Mean = 134·72 mm.

130–134 mm. (*s. d.*).

(*l. d.*) mm.	110–114	115–119	120–124	125–129	130–134	135–139	140–144	145–149	150–154	155–159	160–164
	3	5	13	74	197	262	262	111	101	21	11

170–174
1

Mean = 139·92 mm.

135–139 mm. (*s. d.*).

(*l. d.*) mm.	120–124	125–129	130–134	135–139	140–144	145–149	150–154	155–159	160–164	165–169	170–174
	5	10	49	96	250	107	109	34	28	5	3

180–184
1

Mean = 144·76 mm.

140–144 mm. (*s. d.*).

(*l. d.*) mm.	110–114	120–124	125–129	130–134	135–139	140–144	145–149	150–154	155–159	160–164	165–169
	4	1	5	20	54	152	174	202	84	59	14

170–174 | 180–184
6 | 1

Mean = 149·18 mm.

145–149 mm. (*s. d.*).

(*l. d.*) mm.	125–129	130–134	135–139	140–144	145–149	150–154	155–159	160–164	165–169	170–174	175–179
	2	2	8	35	70	142	59	44	22	15	5

180–184
1

Mean = 154·0 mm.

150–154 mm. (*s. d.*).

(*l. d.*) mm.	130–134	135–139	140–144	145–149	150–154	155–159	160–164	165–169	170–174	175–179
	3	4	16	37	109	99	80	29	28	10

180–184
7

Mean = 158·28 mm.

155–159 mm. (*s. d.*).

(*l. d.*) mm.	140	144	145–149	150–154	155–159	160–164	165–169	170–174	175–179	180–184
1	5	16	39	64	30	24	8	3

Mean = 163·12 mm.

160–164 mm. (*s. d.*).

(*l. d.*) mm.	145–149	150–154	155–159	160–164	165–169	170–174	175–179	180–184	185–189
4	10	19	23	35	37	6	10	1

Mean = 167·27 mm.

165–169 mm. (*s. d.*).

(*l. d.*) mm.	150–154	155–159	160–164	165–169	170–174	175–179	180–184	185–189	190–194	195–199	200–204
1	1	—	14	16	15	10	5	—	—	—

Mean = 175·20 mm.

170–174 mm. (*s. d.*).

(*l. d.*) mm.	155–159	160–164	165–169	170–174	175–179	180–184	185–189
1	3	2	7	7	4	3

Mean = 174·78 mm.

175–179 mm. (*s. d.*).

(*l. d.*) mm.	145–149	155–159	170–174	175–179	180–184
1	1	1	3	1

Mean = 169·85 mm.

180–184 mm. (*s. d.*).

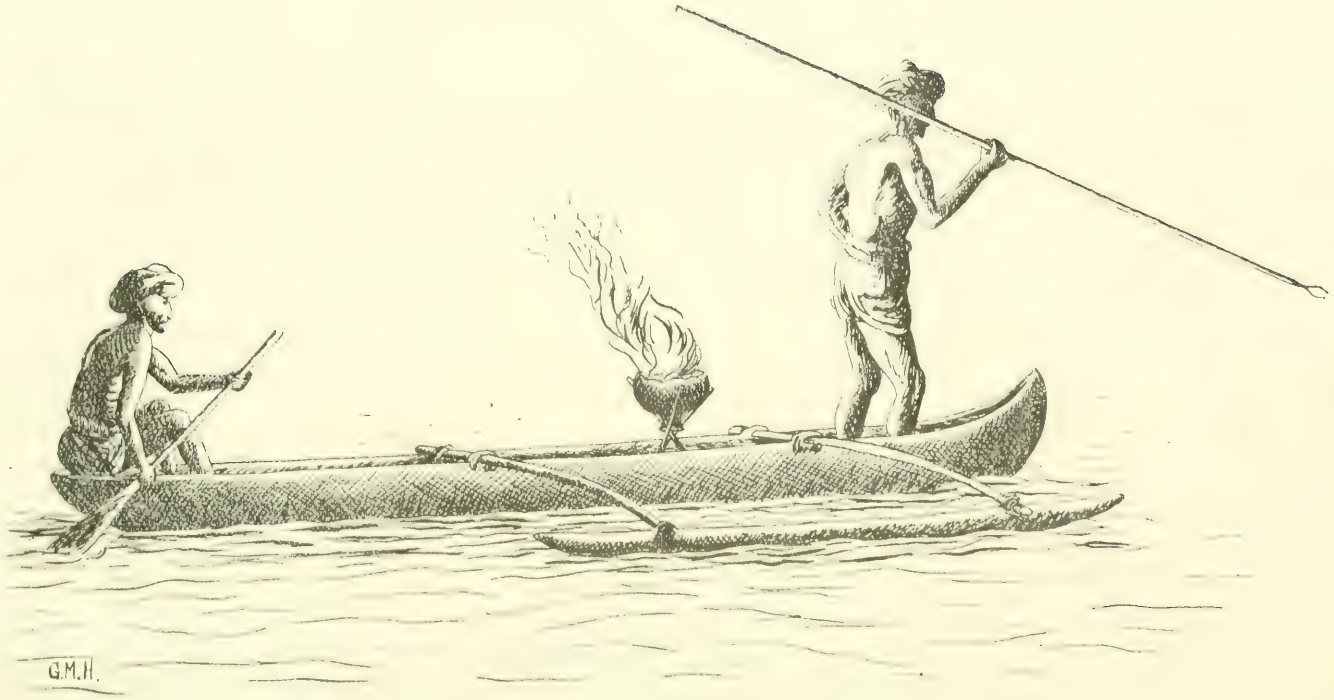
(*l. d.*) mm.	135–139	160–164	170–174	180–184
1	1	1	1

Mean = 163·25 mm.

185–189 mm. (*s. d.*).

190–194 mm. (*s. d.*).

(*l. d.*) mm.	180–184
1



Use of Manda by torchlight (see p. 126).

BULLETIN No. 3.

FISHING APPLIANCES OF CEYLON.

By Joseph Pearson, D.Sc., F.R.S.E., F.L.S.

THE following notes, which do not claim to be complete, have been brought together in the course of fishery investigations in Ceylon extending over a period of ten years. In all 150 different types of appliances have been examined, and, doubtless, a large number still remain to be described. In an investigation of this nature one is immediately struck by the multiplicity of names in different districts for what may be regarded as the same kind of net. But there is always some difference, however slight, between these differently named appliances. Occasionally, the difference lies in the nature or quality of the thread, sometimes an alteration in the size of mesh or in the dimensions of the net are considered sufficient grounds for the establishment of a new name. It has even been found that when the use of a certain named net is prohibited in a district the fishermen will make some slight modification of the net to justify a new appellation, and then will proceed to evade the law. There is little or nothing worthy of special note in the fishing implements of Ceylon. They are almost invariably primitive, and, with few exceptions, similar appliances are to be found throughout the world. Such things, for example, as the casting net, gill net, line and hook, fishing by torch light, and spearing are almost universal, and even such complicated and apparently highly specialized implements as the kraals or *jakottuwa*, so common in our backwaters and estuaries, have their exact counterpart in many countries.

The nets have been classified according to their method of use. A rigid classification is, however, impossible, as nets are frequently used in different ways on different occasions. A gill net, for example, may be used on one occasion as a fixed net and on another as a seine net.

The information given in this paper has been compiled from my personal notes, and it may be said that I have personally examined the majority of the nets dealt with. I have a large mass of undigested material regarding nets, which has been received through the Kachcheries from the headmen in response to a request for information regarding the nets and other fishing implements. This, with a few exceptions, has not been incorporated in the present paper.

It would be of interest to put on record the prohibitions and restrictions of fishing implements in Ceylon. This subject has not been fully dealt with in the present notes, but it is proposed to publish a further paper dealing with this aspect of the question.

1.—**Kalankaddi valai** (Tamil).

Locality : Jaffna, Mannar, and Kalpitiya.

Description : A fixed stake net. It consists of a portion known as the *mudi*, which is a trap. On each side is an enormous stretch of net several hundreds of yards long (see Fig. 1) supported by stakes.

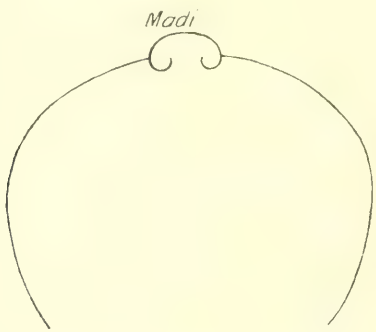


Fig. 1.—Kalankaddi valai.

Dimensions : height, 4 feet ; mesh, 1 inch.

Method of Use : Used in the shallow water. It is set in the mud, and during the flood tide the stakes are not fixed in the mud so that the net lies horizontally. As soon as the ebb

begins the net is raised so that many fish are stranded. It is kept three days in one place. In the Jaffna lagoon the area inside the wings is then dragged by means of a *Paddu valai*. This net appears to be as mischievous as the *Arakkuddi valai*. which is prohibited in certain portions of the Jaffna lagoon.

2.—**Arakkuddi valai** (Tamil).

Locality : Jaffna.

Description : A net of somewhat similar type to the *Kalankaddi valai*. It consists of a trap or *madi* of a vertical net supported by stakes, at each side of the *madi* is a vertical net and at the outer wings of the vertical net (*Pachchi valai*) are long lines carrying *olas* (see Fig. 2).

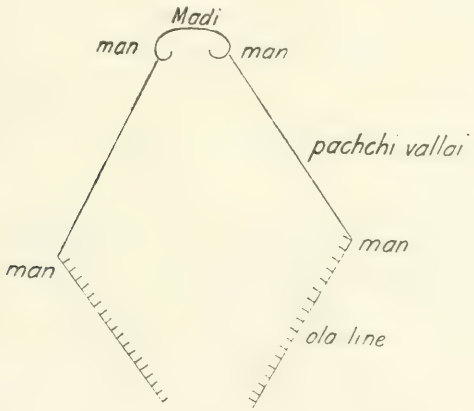


Fig. 2.—Arakuddi valai.

Dimensions : Length of each wing of vertical net, 35 fathoms ; length of each *ola* line, about 80 to 100 fathoms.

Method of Use : A fisherman stands at each end of the *Pachchi valai* and carries a pole to keep the net at the bottom. The *ola* lines are first kept far apart, but the fishermen in

charge of them gradually converge, and at the same time splash the water. In this way the fish are driven into the enclosure, and if they try to escape they get caught by the gills in the meshes of the *Pachchi valai*.

Not the same net as the *Arakkuddi valai* of Mannar.

This net is prohibited in certain portions of the Jaffna lagoon and of the sea between Jaffna and Mannar under the Proclamation of April 12, 1907. (See also *Government Gazette* of December 17, 1909.)

3.—**Seraku valai** (or **Kurukku valai**) (Tamil).

Locality : Jaffna lagoon.

Description : A stake net having a complicated arrangement (see Fig. 3)

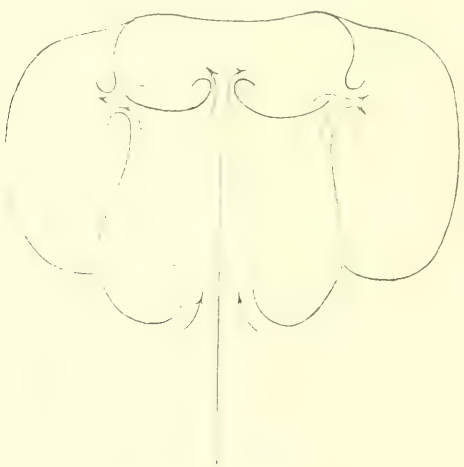


Fig. 3.—Kurukku valai.

Dimensions : The " maze " portion of the net varies in length ; length of central straight net, 75 fathoms. All the nets are 4 feet high ; mesh, $\frac{3}{4}$ inch.

Method of Use : This net is only used in shallow water, and is set in one place for three days. The system of nets acts as a trap, as the fish find their way in, but have some difficulty in getting out again.

4.—**Kandi** (Tamil).

Locality : Jaffna.

Description : A fish trap made up of zig-zag row of stakes ending in a *madi*. (See Fig. 4). These *Kandis* have been the

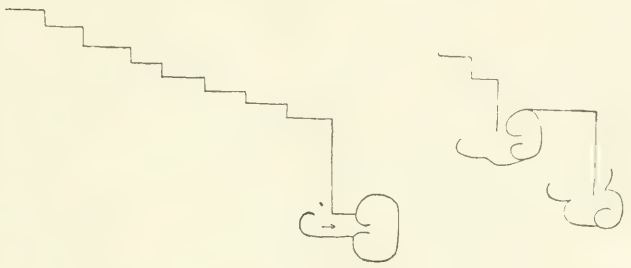


Fig. 4.—Kandi.

cause of many disputes in the Jaffna District, and at Patoor many have been removed and the erection of new ones has been prohibited. There appears to be a prescriptive right to *Kandis*, and they are handed down from generation to generation.

5.—**Kraals.**

Locality : Batticaloa.

Fish caught : Prawns and small fishes.

Description : At Batticaloa the channel into the lake is planted with kraals projecting from the banks. There is a double row of stakes (about 40 pairs) projecting in a line at right angles to the bank. Cadjans are fixed between the stakes so as to make a barrier. At the outer extremity three stakes A, B, C are placed at right angles to the line, and an ordinary casting net is placed on the stakes (see Fig. 5).

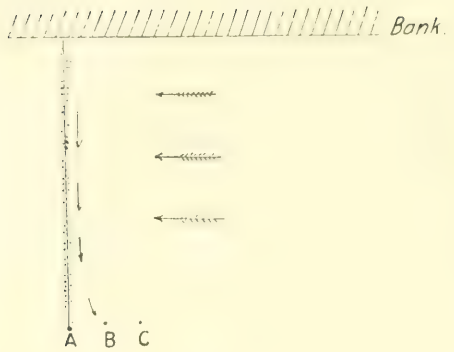


Fig. 5.—Kraal.

Method of Use : The fishermen approach the stakes in the shallow water splashing the water as they go. The fish and prawns are driven against the barrier where their course is diverted, and they all rush into the net.

Depth of water about 18 inches.

6.—**Akulwetiya** or **Jakottuwa** (Sinhalese).

Locality : Southern Province.

Description : This is the same as the jakottuwa, and is used under this name in rivers and estuaries of the Southern Province. Under Talpe pattu fishing rules (*Gazette* of September 13, 1912), the kraals must not be erected upon navigable rivers and canals within 50 yards of each other. Each jakottuwa consists of a vertical rattan barrier leading into a number of traps (see Fig. 6).

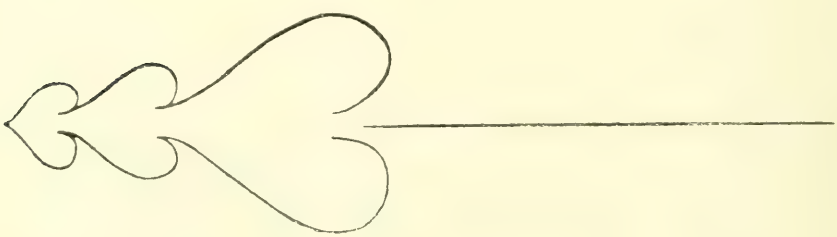


Fig. 6.—Jakottuwa.

Use of kraals prohibited in February, March, and April.

A clear space of not less than 16 yards shall be left for the waterway between the ends of kraals on either bank of the river.

The kraals can only be erected by permission of the Committee, who may order their removal.

7.—**Nittu valai** (Tamil).

Locality : Panichchenkeni.

Fish caught : Prawns and small fishes.

Description : This is a fixed net. It has a bag and two wings. Each wing is supported by three upright sticks. It entraps prawns and small fishes in its meshes.

Dimensions : Length, 5 fathoms (from extremity of wings) ; height, 4 feet ; mesh, 1 inch.

8.—**Sil valai** or **Sillu valai** (Tamil).

Locality : Panichchenkeni.

Description : A vertically fixed net. The dimensions of the net vary, but the mesh is $2\frac{1}{2}$ inches.

Method of Use : Generally used in the river and backwaters at Panichchenkeni. Each end of the net is supported by a vertical stake, which is fixed in the mud.

9.—**Bandu dela** (Sinhalese) ; **Kattu valai** (Tamil) ; **Kattu dela** (Sinhalese).

Locality : Chilaw.

Fish caught : Mostly prawns.

Description : A fixed net which is not used in the open sea, but only in the estuary and lake at Chilaw. The net consists of a bag and two wings. The mesh of the bag gradually decreases towards the apex. The net is made of fine string.

Dimensions : Length of wings, 7 fathoms ; height of wings, 1 fathom ; mesh of wings, 1 inch ; length of bag, 5 fathoms ; width of mouth of bag, 2 fathoms.

Method of Use : The wings are fixed in an upright position by four sticks placed vertically at either side. This net is generally placed in mid channel, and is left out only at night. Used mainly for catching prawns.

10.—**Kondaddi valai** (Tamil).

Locality : Jaffna lagoon.

Description : According to Father Deslandes, O.M.I., late of Jaffna, this net is so called because it is used by a section of the Jaffna fishermen known as the Kondaddi. It is a fixed net with a long bag. The footrope of the mouth is placed below the mud. Each side of the bag is kept open by a tall stake. Two short wings are also kept in position by a small stake at each extremity (see Fig. 7).

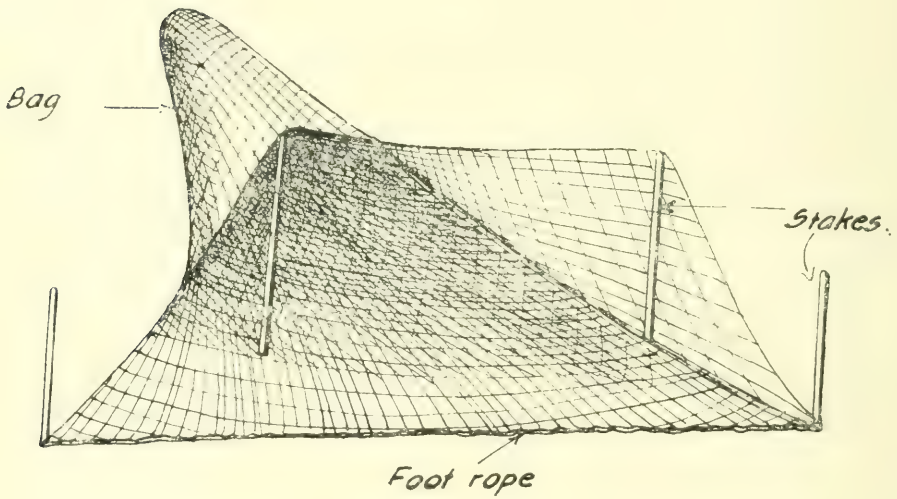


Fig. 7.—Kondaddi valai.

Dimensions : Width of footrope, 3 fathoms ; depth of bag from footrope, 5 fathoms ; height of mouth, about 6 feet ; mesh, $\frac{1}{2}$ inch.

Method of Use : One man stands at each side of the mouth near the long stake. The fish are driven into the net by means of a long *ola* rope, which is dragged through the water by two fishermen. This net is similar to the *Vidu valai* (No. 14), except that this latter is not supported by stakes

11.—**Kulu dela** (or **Ren dela** or **Ara dela**) (Sinhalese).

Locality : Lunawa lagoon, Balapitiya, Bentota.

Description : A net resembling the *Paddu valai* of Jaffna and Kayts in shape, but it is not used as a drag net. The mouth of the bag is supported by eight sticks at distances of one yard.

Dimensions : Width, $3\frac{1}{2}$ fathoms ; height of mouth, 3 feet ; depth of bag, 6 feet ; mesh, $\frac{1}{3}$ inch.

Method of Use : The net rests on the mud. A long rope (50 fathoms) weighted here and there with stones, and bearing *ola* leaves, is dragged through the water towards the mouth of the *Kulu del.* Thus many of the fish are driven into the net.

Prohibited in Panadure, Angulu Eliya, and Panadure lagoon, and also Bolgoda lake. (*Government Gazette* of December 17, 1909).

12.—**Unaddiya** (Sinhalese).

Locality : Matara.

Description : Same kind of net as *Kulu dela* of Lunawa.

Dimensions : Width, 17 fathoms ; height of mouth, 3 feet ; depth of bag, 6 to 9 feet ; mesh, $\frac{3}{4}$ inch.

Method of Use : Used both in river and sea, especially the latter.

13.—**Manni valai** (Tamil).

Locality :—Puttalam lake.

Fish caught : All kinds of fish.

Description : A net made of medium string consisting of a very long bag without any wings. Upper end and mouth furnished with floats.

Dimensions : Length, 12 fathoms ; height of mouth of bag, 5 feet ; depth of bag, 8 fathoms ; mesh, $1\frac{1}{2}$ inch.

Method of Use : Used in shallow water. One man holds each end of the mouth open by keeping the footrope on the ground with his feet and by lifting the upper with his arms.

Two nets are generally placed side by side. A rope 100 fathoms in length, to which are attached at intervals of 2 feet streamers made of dried palmyra leaves, is dragged through the water towards the mouths of the nets by two men (see Fig. 8). The streamers frighten the fish and drive them into the net. This net is used by Moormen only.

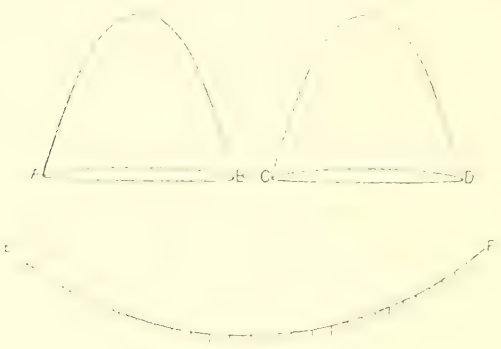


Fig. 8.—Manni valai.

14.—**Vidu valai** (or **Udu valai**) (Tamil).

Locality : Kalpitiya, Talaimannar, Kayts, and Jaffna.

Description : This net is a huge bag, 7½ fathoms wide and 3 fathoms deep. The mouth of the bag has a series of floats on the upper side. The lower side is provided with a light footrope. Mesh, 1 inch.

The same as *Vidu valai* of Pesali (sometimes known as *Manalai valai*). (See also *Manni valai* No. 13.)

Method of Use : Used in shallow water. One man supports either end and keeps the footrope in position by means of his feet. At the same time he holds the upper part of the mouth of the net with his hands, thus keeping the mouth open. The fish are driven towards the net by means of a long *ola* line dragged by two men. This is pulled from the shore outwards towards the net. When the fish enter the net the footrope is raised. This net is considered harmful by some of the fishermen.

15.—**Hondediya** (Sinhalese) ; **Ko dela** (Sinhalese).

Locality : Bentota (river).

Description : This net acts as a fixed net, as it is held by a man at each end. It has floats along the upper edge.

Dimensions : Length, 30 feet ; width, 20 feet ; mesh, 4 inches.

Method of Use : A man stands at each end holding the upper rope in one hand and the lower rope in the other, while the lower rope is kept on the bottom by means of the feet. Owing to the width of the net it forms a bag. Two other men draw a *rena, i.e.*, a line bearing coconut streamers towards the net (see Fig. 9). When the fish reach the net the men in charge of the net lift up the footrope, thus imprisoning the fish.

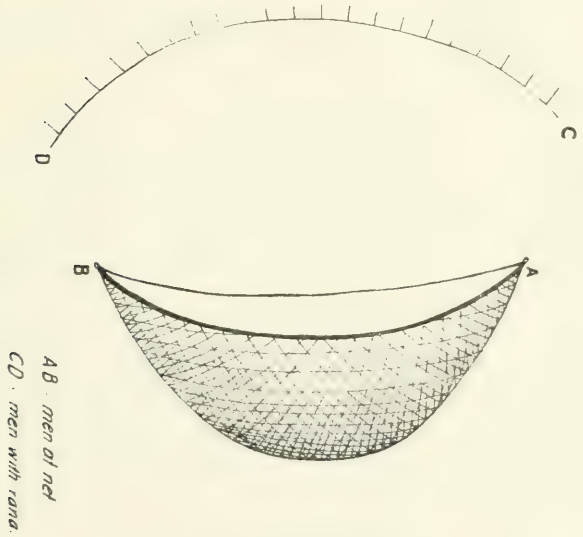


Fig. 9.—Hondediya.

16.—**Katumaran dela** (Sinhalese).

Locality : Chilaw.

Fish caught : Small fish, such as mondeli, anguluwa, pulunna, karalo, waula, as well as prawns.

Description : The net consists of a bag and two wings. The bag has a 1-inch mesh and the wings have a 2-inch mesh. There is a rope along the upper side of the net and a heavier footrope below (see Fig. 10).

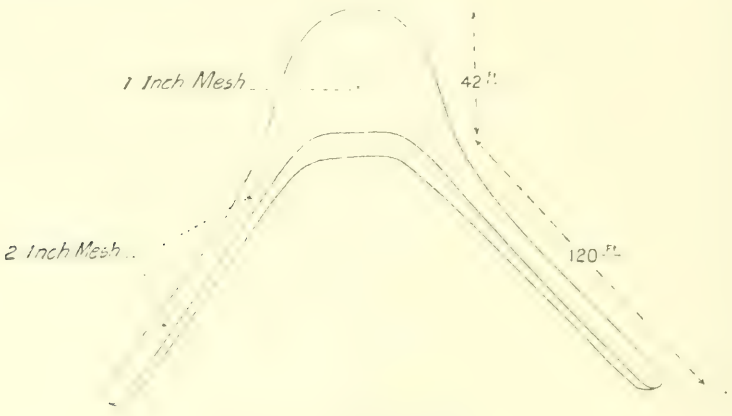


Fig. 10.—Katumaran dela.

Dimensions : Length of wing, 120 feet ; length of bag, 42 feet.

Method of Use : The net is taken out in a boat about $\frac{1}{4}$ mile from land. Then another boat comes alongside and takes one end of the wings, and the net is gradually paid out, each boat finally holding the extremities of the wings. Then both boats pull the net through the water. In this way small fish in the upper layers of the water are captured.

17.—**Maha dela** (Sinhalese) : **Kara valai** (Tamil).

Locality : All round the coast.

Fish caught : All kinds of fish.

Description : This is one of the largest and most efficient nets used by the fishermen in Ceylon. It is a drag net of great size. Essentially, the net consists of a large bag about 24 fathoms in length with two enormous wings. The wings vary in size, and each may be as long as 200 fathoms. The mesh in the wings is fairly open, but is smaller in the bag,

and the mesh gradually decreases in size towards the apex of the bag. To the extremities of the wings are attached long heavy ropes.

Method of Use : The net is taken out in boats some distance from the shore. Large numbers of men haul the two ropes from the shore and gradually the net is pulled in. Often small boats follow the net as it is being hauled in, and by splashing the water prevent the fish from escaping from the bags.

At Lunawa a smaller net of the same type is used inside the lagoon.

17B.—**Ola valai** (Tamil).

Locality : Kalpitiya.

Description : Similar to *Kara valai*, except that *ola* leaves are attached to the footrope.

18.—**Nethali valai** (Tamil).

Locality : Kalpitiya.

Description : Similar to *Kara valai*, but has a much smaller mesh. Similar to a sardine net used at Mullaittivu.

19.—**Kara valai** (Tamil).

Locality : Mullaittivu, Trincomalee, and Talaimannar.

Fish caught : All kinds of fish, including sardines.

Descriptions : The *Kara valai* of Mullaittivu is practically the same net as the Sinhalese *Maha del* (see No. 17). This net is different from the Jaffna net of the same name. At Jaffna the net is taken out to the open sea.

Method of Use : This net is used in the same way as the Sinhalese *Maha dela*, that is, from the shore.

This net is not used at Nilaveli.

At Talaimannar the *Kara valai* is sometimes called the *Kudduwa valai*. (Not the same as the *Koddura valai* of Puttalam). Bag, *Madi ;* wings, *Marukku*.

20.—**Tholi valai** (Tamil).

Locality : Mullaittivu and Pesalai.

Fish caught : Mostly sardines.

Description : This is a similar net to the Mullaittivu *Kara valai*. It is made of cotton, and is coloured a dark brown. It is smaller than the *Kara valai*.

Dimensions : Length, 50 fathoms ; mesh, $\frac{1}{2}$ inch in wings and $\frac{1}{4}$ inch in bag.

Method of Use : Used in the same way as the *Kara valai*.

21.—**Adassi valai** (or **Chanal valai**) (Tamil).

Locality : Mullaittivu, Trincomalee, Pesalai, and Batticaloa.

Description : The same type of net as the *Kara valai*, but smaller. The bag is made of chanal thread and the wings are made of hemp. It has a large mesh of about 4 inches, and in consequence most of the smaller fish escape. This net at Pesalai has a mesh of $4\frac{1}{2}$ inches in the wings, but smaller in the bag.

Method of Use : It is pulled to the shore by means of big ropes as in the *Maha dela*. It is not much used and only used at night.

22.—**Kuddu valai** (Tamil).

Locality : Puttalam lake.

Fish caught : Prawns and small fish.

Description : A kind of trawl net dragged through the shallow water by two men. It consists of a long shallow bag made of fine string, the mouth of which is kept open by about 22 to 26 stakes, each about 2 feet long.

Dimensions : Length, 14 fathoms ; depth of bag, 4 to 6 feet ; height of mouth of bag, 2 feet ; mesh, $\frac{1}{2}$ inch.

Method of Use : Two men work the net, one at each end. Sometimes the fish are driven into the net by means of long *ola* lines.

Used by both Tamils and Moormen. (The Mannar net of this name is only 5 fathoms long.) Not the same as the Jaffna net of the same name.

23.—**Arakkuddi valai** (Tamil).

Locality : Mannar.

Description : This appears to be the same net as the *Kuddu valai* of Puttalam, both in shape and in method of use. The mesh, however, is larger, being $1\frac{1}{2}$ inch. There is also a *Kuddu valai* used at Mannar, which only differs from the *Arakkuddi valai* in being smaller and is only used in very shallow water, and has a length of about 5 fathoms. Both the *Kuddu valai* of Puttalam and the *Arakkudi valai* of Mannar agree, in being about 14 fathoms long.

Method of Use : Same as the *Kuddu valai* of Puttalam.

24.—**Paddu valai** or **Kadipu valai** (Tamil).

(Not the same as the *Pattu valai* of Batticaloa.)

Locality : Jaffna lagoon and Kayts.

Description : A trawl net of the same type as the *Kuttu valai* of Puttalam and Mannar, but has different dimensions. The mouth is usually supported by stakes every three feet (see Fig. 11).

Fig. 11.—Paddu valai.

Dimensions : Length, 4 fathoms ; height of mouth of net, $3\frac{1}{2}$ feet ; depth of bag, 1 fathom ; mesh, 1 inch.

Method of Use : Same as that of *Kuddu valai* and similar nets, at Jaffna it is used in conjunction with the *Kalankaddi valai*.

25.—**Thumpai valai** (Tamil).

Locality : Certain parts of Jaffna lagoon.

Fish caught : Very small fish (Thumpai, Netthalai, &c.) and also immature fish.

Description : A net similar to *Paddu valai*, but differs from it principally in the size of the mesh, which is very small.

Dimensions : Length, 4 fathoms ; height of mouth, $2\frac{1}{2}$ feet ; depth of bag, 34 feet ; mesh, $\frac{3}{4}$ inch ; stakes, every 3 feet.

Method of Use : This net is used for catching very small fish (Thumpai, Netthalai, &c.). In my notes I have suggested that this is a harmful type of net, as it undoubtedly catches immature fish.

26.—**Raal valai** (Tamil).

Locality :—Kayts.

Fish caught : Prawns (*raal*).

Description : A drag net consisting of a bag with two pouches. The mouth of the bag is held open by five upright sticks, four feet apart (see Fig. 12). To each of the two ends

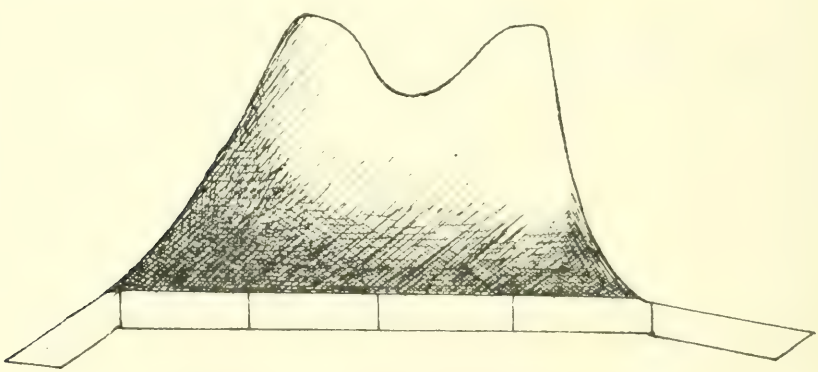


Fig. 12.—Raal valai.

of the net are attached two ropes, which, again, are attached to a pole held by a man (see Fig. 13). The lower side of the mouth of the net is kept down by a footrope.

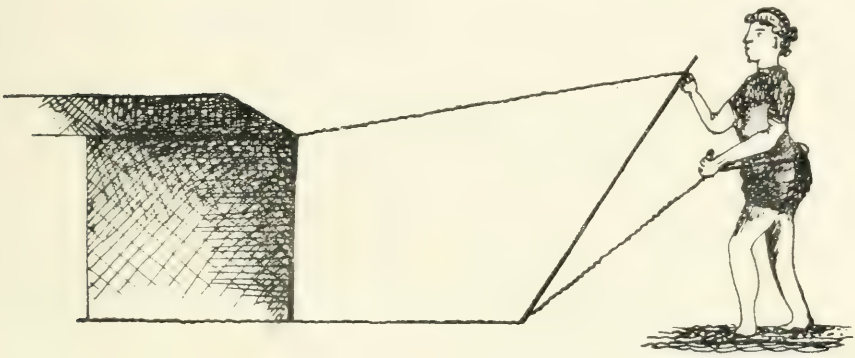


Fig. 13.—Raal valai with fisherman holding rope.

Dimensions : Width of mouth of net, $2\frac{1}{2}$ fathoms ; height of mouth, $4\frac{1}{2}$ feet ; length of bag, $2\frac{1}{2}$ fathoms.

Method of Use : A man stands at each side of the mouth of the net holding the long pole which is inclined at an angle, the lower end being nearer the net than the upper. The upper rope of the mouth of the net is tied to the upper end of the pole. The footrope is tied to the lower end, and is then tied around the waist of the man. In this way the net is dragged to the water.

27.—**Kulu dela** (Sinhalese).

Locality : Panadure.

Fish caught : Prawns and small fishes.

Description : Apparently this net is used in two different ways at Panadure.

(1) As a drag net (the mouth is supported by a stick every 3 feet).

Dimensions : Length, $6\frac{1}{2}$ fathoms ; height of mouth, 3 feet ; depth of bag, 1 fathom.

Method of Use : At each end of the net is a vertical stick attached to the net by ropes tied to the upper and lower ends of the stick. Each stick is held by a fisherman, and the two men drag the net through the water towards the land and catch prawns.

(2) As a fixed net (used similarly to net of same name at Lunawa). Prohibited at Panadure.

28.—**Kondaddi valai** (Tamil).

Locality : Kankesanturai and Batticaloa lake.

Fish caught : Small fish, Netthalai (Batticaloa).

Description : (Not the same as the Jaffna net of that name.)

This net is similar to the *Kuttu valai* used at Puttalam, except the dimensions are different. It is a trawl net, having the mouth kept open by seven vertical sticks.

Dimensions : Length of mouth, 2 fathoms ; height of opening, $2\frac{1}{2}$ feet ; depth of bag, $4\frac{1}{2}$ feet ; mesh, 1 inch.

Method of Use : Exactly as with the *Kuddu valai* at Puttalam. It is dragged through the water by small boys in shallow water and in this way small fish are caught.

29.—**Ranchu valai** (Tamil).

Locality : Kayts and Mullaittivu lagoon.

Fish caught : Prawns and small fish.

Description : A drag net used in the shallow water. It is made and used on the same principle as the *Kuttu valai* of Puttalam and the *Kondaddi valai* of Kankesanturai. The mouth is kept open by a dozen stakes.

Dimensions : Length of mouth, 5 fathoms ; height of mouth, 2 feet ; depth of bag, 5 feet ; mesh, $\frac{1}{2}$ inch.

Method of Use : The net is dragged through the shallow water.

30.—**Pala dela** (Sinhalese).

Locality : River at Bentota.

Description : A net used in conjunction with ropes carrying coconut leaves (*rena*).

Dimensions : Length, 15 feet ; breadth, 12 feet ; mesh 1 inch.

Method of Use : Each end of the net is supported by a pole 10 feet long. One man carries each pole and walks with it holding the pole in an oblique position, the lower end being in front. The lower edge of the net is about 3 feet below and the upper edge is about 3 feet above the water. To the lower end of each pole is attached a *rena* about 12 to 15 fathoms long, and held by a man at its free end. The two men holding the *rena* also walk keeping their distance in front of the net (see Fig. 14). When the fish are seen each *rena* is shaken, and in

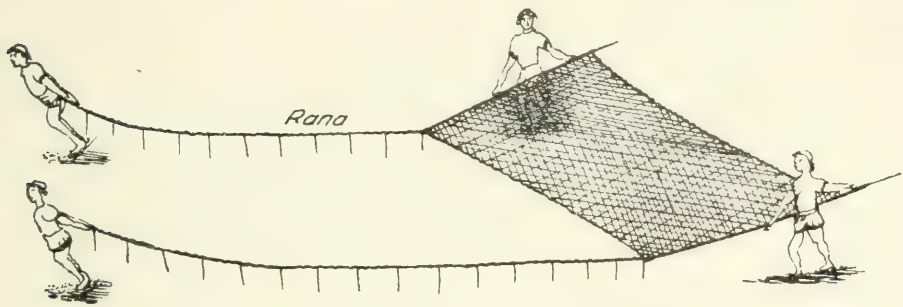


Fig. 14.—Pala dela.

that way the fish are driven towards the net. At the proper moment the lower edge of the net is raised above water.

(Not to be confused with the *Pala dela* of Chilaw.)

31.—**Vella valai** (Tamil).

Locality : Kankesanturai.

Description : This is different from the net of the same name at Point Pedro and other places. It is a vertical drift net, and has floats along the upper side.

Dimensions : Length, 50 fathoms ; height, 3 fathoms ; mesh, 2 inches.

Method of Use : The net is taken out to the high seas by two small boats. The net is paid out, the men in the two boats retaining the ends. In this way the net is allowed to drift.

32.—**Adasel valai** (Tamil).

Locality : Panichchenkeni.

Description : A vertical drift net made of hemp fibre. Pieces of stick are attached to the upper side of the net and act as floats.

Dimensions : Length, 7 fathoms ; height, 1 fathom ; mesh, 4½ inches.

Method of Use : Used both in the sea and lake at Panichchenkeni. The net is paid out from a boat and then allowed to drift. After a time it is hauled in.

33.—**Vali valai** (Tamil).

Locality : Point Pedro and Kankesanturai. Used by the Karavalai section of Karawas.

Fish caught : Large fish, such as seer and sharks.

Description : A vertical drift net floated along upper side.

Dimensions : Length, 18 fathoms ; height, 2½ fathoms ; mesh, 4 inches.

Method of Use : The net is taken out by a single catamaran and left to drift. If it is cast at 7 P.M. it will be examined at 12 P.M. and 6 A.M.

The use of this net is prohibited in the Jaffna lagoon and in parts of the sea between Jaffna and Mannar, either by itself or in conjunction with the *madi valai*, under Proclamation of April 12, 1907. (See also *Government Gazette* of December 17, 1909.)

At Kankesanturai this net is sometimes used with a 2-inch mesh.

Proclamation No. 6 of 1869 prohibited the use of this net within one league of the shore along the northern coast of the Jaffna peninsula.

34.—**Adasial valai** (or **Pol valai**) (Tamil).

Locality : Batticaloa lake.

Fish caught : Large fish, and even sharks.

Description : The same kind of net as the *Adasel valai* of Panichchenkeni, but the dimensions are different.

It is a drift net made of coarse hemp.

Dimensions : Length, 100 fathoms ; height, 2 fathoms ; mesh, 8 inches.

35.—**Vedi valai** (Tamil).

Locality : Kayts.

Fish caught : Large fish.

Description : A drift net, which lies vertically in the water having small floats 2 feet apart along the upper edge of the net.

Dimensions : Length, 9 fathoms ; height, 4 feet ; mesh, 3 inches.

Method of Use : The net is paid out from a boat. Then it is allowed to drift, and the boat stands by. It is used in fairly deep water. The fish get caught by the gills. Large kinds of fish are caught in this way.

36.—**Sura valai** (or **Chanal valai**) (Tamil).

Locality : Kalpitiya, both in lake and open sea.

Fish caught : Sura, koduwa, katta, seer, para, and other large fish.

Description : A vertical drift net made of coarse hemp and string. It is buoyed along the top by pieces of wood each 1 foot long and 2 inches in diameter. Floats $2\frac{1}{2}$ yards apart.

Dimensions : Length, five pieces of 30 fathoms each ; depth, 8 feet ; mesh, 7 inches.

Method of Use : The net is made of several pieces joined together, and is taken out in a canoe and paid out into the water where is is allowed to drift.

(Not the same as the *Chanal valai* of the north and eastern coasts.)

37.—**Sippi dela** (Sinhalese).

Locality : Talawa, North-Central Province, in the tanks.

Fish caught : Lula, petiya, kocasso, wallaya, koraliya, weligoya, kawaiya.

Description : A vertical drift net made of fine string with wooden floats along the top.

Dimensions : Length, 20 fathoms ; depth, 7 feet ; mesh. 3 inches.

Method of Use : The net dritts along, and about six men advance towards it driving the fish into the net.

(Not the same as the *Sippi valai* of Kalpitiya.)

38.—**Pullunu dela** (Sinhalese).

Locality : Chilaw.

Fish caught : Pulluna, angilawa, kattuwela, and similar fish to those caught by the *Mora del.*

Description : Similar to *Mora del* in its method of employment, but sometimes the net carries floats, in which case it acts as a vertical net. It is made of fine string.

Dimensions : Length, 75 fathoms ; depth, 3 fathoms ; mesh, 3 inches.

Method of Use : Similar to *Mora del.*

39.—**Kumbula dela** (Sinhalese).

Locality : Negombo lagoon and Chilaw.

Description : The net consists of two pieces attached together, each being 45 yards long and about 3 yards in depth. Supported by floats and weighted at the bottom.

Method of Use : Only one catamaran is used, and the net is placed partly across the channel in the Negombo lagoon. This was formerly used in the open sea by the Negombo fishermen. Now only used by the Sea street fishermen in the lagoon.

40.—**Kattu valai** (Tamil).

Locality : Nachchikuda, Jaffna.

Description : A vertical net floated at the top with wooden buoys and at the bottom with stones. About 30 nets are joined together.

Dimensions : Length, 12 fathoms ; height, 33 feet ; mesh, 2 inches.

Method of Use : I am not clear as to how this net is used. My notes merely say " about 30 nets are joined together." The fish are driven into the net by two or three boats from which men make a noise with sticks. Whether the net is straight or horse-shoe shaped I cannot say.

(Not to be confused with net of same name at Chilaw.)

41.—**Heen dela** (Sinhalese).

Locality : Hikkaduwa.

Fish caught : Catilla.

Description : A vertical gill net stretched across the river. Floats along the top. Weighted at bottom.

Method of Use : Men walk in the water towards the net making a splash, thus driving the fish into the net, where they are caught by the gills.

(Not the same as net of same name at Chilaw.)

42.—**Elana dela** (Sinhalese).

Locality : Lunawa.

Fish caught : Same kind of fish as in the jakottuwa of the Lunawa lagoon.

Description : A vertical net buoyed along the upper side. It has a depth of 2 feet, and does not reach to the bottom of the water. Mesh, 1 inch.

Method of Use : This net is stretched across the lagoon at Lunawa. A similar net is used at Panadure, 1 fathom deep and having a mesh of $1\frac{1}{2}$ inch. Only used at night.

Not the same as the *Elana dela* of Weligama and Tangalla.

(See *Kud dela* of Ahangama.)

43.—**Wak elana dela** (Sinhalese).

Locality : Ambalangoda.

Description : The same kind of net as the *Elana del* of Lunawa, but of larger dimensions and made of stronger string.

44.—**Kud dela** (Sinhalese).

Locality : Ahangama, Talpe, Tangalla.

Description : Same kind as *Elana del.* Mesh, $2\frac{1}{2}$ inches.

Method of Use : Used in the same way as *Elana del.*

45.—**Pachchi valai** (Tamil).

Locality : Mullaittivu, and also at Jaffna, as the wings of the *Arakkuddi valai.*

Description : A drift net.

Dimensions : Length, 50 fathoms ; height, 2 fathoms : mesh, 3 inches.

Method of Use : This net is cast during the night. Anchored at one end.

46.—**Kanni dela** (Sinhalese) ; **Kanni valai** (Tamil).

Locality : Chilaw and Kalpitiya.

Fish caught : Sharks.

Description : A vertical net made of coarse rope, and has a mesh of 15 inches. The upper edge of the net is supported by a series of floats. The net is usually about 26 fathoms in length and about 3 fathoms in depth.

Method of Use : The net is taken out to the open sea in about 8 fathoms. One end is anchored by means of a heavy stone. The net is generally left out seven or eight days, but is examined every day.

47.—**Katta dela** (Sinhalese).

Locality : Chilaw.

Fish caught : Katta, small sharks, pulunna, anguluwa, skate (maduwa), crabs (kakuluwa), and pannawa, &c.

Description : Similar in principle to the *Kanni del.* It is a vertical net made of medium string. Mesh, about $4\frac{1}{2}$ inches ; length, 45 fathoms ; depth, 3 fathoms.

Method of Use : This net is supported in the water by floats arranged along the upper edge. One end of the net is anchored by means of a heavy stone. Used $\frac{1}{4}$ mile from shore.

48.—**Pala dela** (Sinhalese).

Locality : Chilaw.

Fish caught : Big godaya, weku, koi.

Description : A vertical net with floats along the upper side. Made of fine string.

Dimensions : Length, 20 fathoms ; height, 5 feet ; mesh, 2 inches.

Method of Use : Used in the open sea.

(Not the same net as the *Pala del* of Bentota.)

49.—**Kaddu valai** (Tamil).

Locality : Talaimannar.

Description : A vertical net with floats along upper side.

Dimensions : Length, 150 to 200 fathoms ; height, 4 fathoms ; mesh, 3 inches.

Method of Use : It is laid about $\frac{1}{4}$ or $\frac{1}{2}$ mile from the shore and anchored. The fishermen visit it from time to time. The fish are caught by the gills.

50.—**Suramal valai** (Tamil).

Locality : Nachchikuda, Jaffna.

Fish caught : Sharks and other big fish.

Description : A drift net with floats along the upper side and is laid straight across the channel. It is made from the fibre of the Ceylon plant *erikallam.*

Dimensions : Length, 12 fathoms ; height, $3\frac{1}{2}$ fathoms ; mesh, 5 inches.

Method of Use : Laid straight across the channel with floats along the upper side.

51.—**Tirrikka valai** (Tamil).

(*a*) Jaffna District—

Locality : Nachchikuda, Jaffna.

Fish caught : Rays, small turtles, and sharks.

Description : Similar net to the *Suramal valai,* but has a 12-inch mesh. Made from the *erikallam.*

(*b*) Kalpitiya—

Locality : Kalpitiya.

Fish caught : Skate (*tirrikka*) and shark.

Description : The same in principle as the *Tirrikka valai* of Jaffna. It is a vertical net made of cotton thread as thick as strong twine. There are wooden floats along the upper side.

Dimensions : Length, 30 fathoms ; depth, 10 feet ; mesh, 8 inches.

Method of Use : The net is suspended vertically in the water, and is anchored to a heavy stone at one end. The other end is attached to a float (see Fig. 15) made of two coconut midribs (A and B).

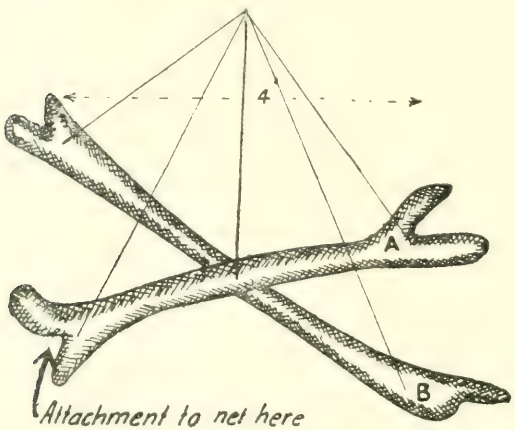


Fig. 15.—Float attached to *Tirrikka valai* (A and B are made of coconut midribs).

52.—**Elana dela** (Sinhalese).

Locality : Tangalla.

Description : A vertical gill net similar to the one of the same name used in the Lunawa district. It is buoyed at the top with cylindrical pieces of wood every 4 feet. The bottom rope is weighted with lead.

Dimensions of each piece : Length, 20 fathoms ; depth, 33 fathoms ; mesh, 2½ inches.

Method of Use : Several pieces are joined together, and put out in the sea and anchored at each end by means of stones. It is left out all night.

53.—**Kodduwa valai** (Tamil).

Locality : Puttalam.

Fish caught.—Kodduwa and other big fish.

Description : A fixed net made of medium string. Along the top edge are a series of elongated wooden floats each 18 inches long. No weights at the bottom, merely a light foot-rope.

Dimensions : Length, 14 fathoms ; height, 6 feet ; mesh, $3\frac{1}{2}$ inches.

Method of Use : The net is worked by two men in shallow water. It is supported at each end by a pole about 6 feet long, so that the net hangs vertically in the water, the lower side being on the bottom. The fish find that the net acts as a barrier to their progress. After a time the men drop the poles and go along the net bringing the upper and lower borders of the net together, thus trapping the fish. This net is used in the Puttalam lake by Moormen only.

A net of this name is used at Mantai, Northern Province, near Mannar.

(Not the same as the net of the same name at Negombo and Panichchenkeni.)

54.—**Nachchi valai** (Tamil).

Locality ; Puttalam lake.

Fish caught : Mannalai, palai, &c.

Description : A vertical net made of very fine string. There are small floats along the upper edge.

Dimensions : Length, 50 fathoms ; height, 3 feet ; mesh 2 inches.

Method of Use : Worked by one man in shallow water. He gradually pays out the net, but retains one end. The net hangs vertically, and the fish are caught by the gills.

Used in the shallow waters of the Puttalam lake by Moormen only.

55.—**Wala valai** (Tamil).

Locality : Puttalam lake.

Fish caught : Larger fish than mannalai, palai, &c., caught by *Nachchi valai*.

Description : Exactly same kind of net as *Nachchi valai*, but dimensions are different. Made of very fine string.

Dimensions : Length, 50 fathoms ; height, 6 feet ; mesh, 3 inches.

Method of Use : This net is used in deeper water than the *Nachchi valai*, and it catches larger fish.

Used in the Puttalam lake by Moormen only.

56.—**Heen dela** (Sinhalese).

Locality : Chilaw.

Fish caught : Godaya, koraliya, karaluwa, kalanda, selava, anguluwa, ilathiya.

Description : A vertical net with floats along the top. The net is made of fine string.

Dimensions : Length, 20 fathoms ; height, $3\frac{1}{2}$ fathoms ; mesh, 1 inch.

Method of Use : Used in the lake at Chilaw close to the shore. Two men go into the water each holding one end. They make a big sweep and then gradually come together.

57.—**Vella valai** (Tamil).

Locality : Point Pedro.

Fish caught : All kinds of fish of all sizes, including sardines.

Description : Essentially this is a vertical net with floats on top side. About eight nets are used tied together.

Dimensions of each net : Length, 12 fathoms ; height, 3 fathoms ; mesh, 2 inches.

Method of Use : When a shoal of fish is seen, each boat goes out with a net, and all surround the shoal. Each net hangs vertically in the water, and the separate nets are joined up and

surround the fish. When the fish have got entangled in the meshes, the fishermen catch the top and bottom of the net and haul in. Some of the fishermen have protested against the use of this net, as it is said to frighten this fish away.

(See *Kuddu valai* of Mantai, page 96.)

58.—**Amai valai** (Tamil).

Locality : Mannar, Point Pedro, and Jaffna.

Fish caught : Turtles, sometimes dugongs, sharks, purpoises, &c.

Description : A vertical net buoyed along the upper side. It is made of very strong twine.

Dimensions : Length, 100 to 150 fathoms ; height, 3 to 4 fathoms ; mesh, 1 foot square.

Method of Use : The net hangs vertically in the water and is anchored at one end. When the turtles come to breed, the fishermen surround their breeding places with four or five of these nets. At Point Pedro the mesh of this net is about 9 inches square. At Jaffna the pariahs use a mesh of $1\frac{1}{2}$ feet square.

59.—**Thoddandi valai** (Tamil).

Locality : Kankesanturai.

Fish caught : Same fishes as are caught by the *Amai valai*.

Description : This net is practically the same as *Amai valai*.

Dimensions : Length, 25 fathoms or more ; height, 3 fathoms ; mesh, 8 inches square.

Method of Use : Used in the same manner as the *Amai valai*.

60.—**Ora valai** (Tamil).

Locality : Kayts.

Fish caught : Ora.

Description : A vertical net with wooden floats 1 foot apart along the upper side. The lower side is weighted with stones.

Dimensions : Length, $3\frac{1}{2}$ fathoms ; height, 3 feet ; mesh, $2\frac{1}{2}$ inches.

Method of Use : This net is used by three men. First a small circle of stones is made so as to provide good shelter for fishes. The net is then placed around the circle by the three men, and the bottom of the net is weighted by some of the stones so that the top of the net does not reach the surface. It is used in about one fathom of water in the channel on the west side of Kayts.

61.—**Suraya valai** (Tamil).

Locality : Puttalam.

Fish caught : Suraya, kodduwa, parai, seri, &c.

Description : Made on same plan as the *Nachchi valai*, but is used differently, and is made of coarse string. It has floats along the upper side.

Dimensions : Length, 50 fathoms ; height, 8 feet ; mesh, 4 inches.

Method of Use : Each end is taken by a man in a boat. In the first position the net is held more or less taut between the two boats (position A) and hangs vertically. Then the two boats approach each other and ultimately meet, thus enclosing a number of fish (position B). (See Fig. 16.)

Used in the Puttalam lake by Moormen only.

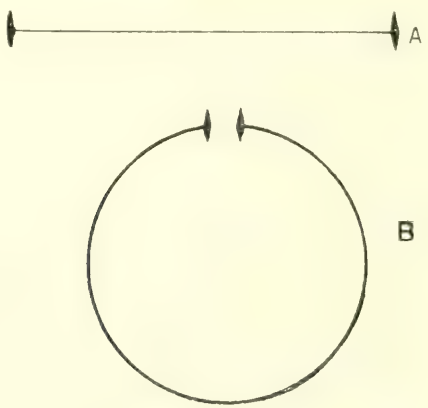


Fig. 16.—Suraya valai.

62.—**Kumbula valai** (Tamil).

Locality : Puttalam.

Fish caught : All kinds of fish.

Description : The same type of net as the *Suraya valai*. It bears floats along its upper edge and is made of medium string.

Dimensions : Length, 12 fathoms ; height, 5 feet ; mesh, $1\frac{3}{4}$ inch.

Method of Use : It is worked from two boats, each boat having an end. The net is first stretched out to its extreme length and then the two boats move towards each other, thus enclosing a number of fish.

This net is used in the Puttalam lake by Moormen only.

(Not the same as the *Kumbula dela* of Chilaw.)

63.—**Siri dela** (Sinhalese) or **Siri valai** (Tamil).

Locality : Negombo and Chilaw.

Fish caught : Prawns and immature fish.

Description : A vertical net used in the shallow waters of the Negombo lagoon.

Dimensions : Length, four pieces, each 9 yards long ; depth, 5 feet ; mesh, $\frac{3}{4}$ inch.

Method of Use : This net is manipulated by two men, one at each end of the net. The net is first drawn out straight, the lower edge being kept in position close to the bottom by means of the men's feet. The net is drawn towards the shore, and the men gradually approach each other, thus entrapping the fish. At Chilaw the net is used at night and the fish are driven towards the net by men with torches. This net is used by the Sea street fishermen, and the Munnakarai people have not raised any objection to its use.

Under the bye-laws published in the *Government Gazette* of December 5, 1913, this net in its present form is prohibited, as its mesh is less than 2 inches. This net is similar to the *Siru valai* of Batticaloa, except that the latter is worked from boats, and has different dimensions.

64.—**Kuddu valai** (Tamil).

Locality : Jaffna, Mantai, and Erukkalampiddi, and used by the Kondaddi section of Karawas.

Description : A compound net consisting of a drift net called *Vali valai* (A B) which in its final stage assumes the shape of a $\frac{3}{4}$ circle. The *Vali valai* may be composed of two or three pieces joined together (see Fig. 17). The net C D is

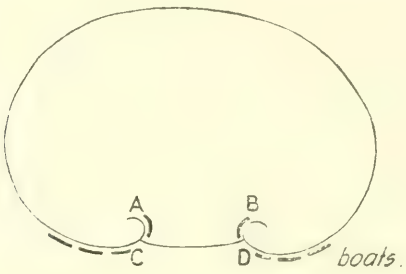


Fig. 17.—Kuddu valai.

used to close up the entrance. Both nets have buoys along their upper side and are made of Chanal. Frequently, the two ends of the *Vali valai* have bags (or *Madi valai*) into which many of the fish ultimately find their way. In this respect the *Kuddu valai* differs from the *Vella valai*.

Dimensions : Length of *Vali valai*, 200 to 300 fathoms ; length of other net (C D) 20 fathoms ; height of both nets, about $3\frac{1}{2}$ fathoms ; mesh (at Jaffna), $2\frac{1}{2}$ inches ; mesh (at Mantai and Erukkalampiddi), $4\frac{1}{2}$ inches.

Method of Use : This net is used in much the same way as the *Vella valai* of Point Pedro. As soon as a shoal of fish is seen the *Vali valai* (A B) is spread out in a straight line on the seaward side of the fishes. Boats at either end of the net pull it along after the fish. As soon as shallow water is reached each end of the net is brought gradually inwards by the boats until the net assumes the appearance shown in the sketch. The net C D is then placed in position across the entrance.

The boats take up their position as shown in the diagram. Small nets are raised in each boat so that if the fish try to jump over the encircling net they strike the small nets and fall into the boats. Many of the fish imprisoned in the area find their way into the *Madi valai*.

Proclamation in the *Government Gazette* of April 5, 1907, prohibits the use of this net in the Jaffna lagoon.

This net is prohibited in parts of the Jaffna lagoon, and in parts of the sea between Jaffna and Mannar by the Proclamation of April 12, 1907. (See also *Government Gazette* of December 17, 1909.)

65.—**Suda dela** (Sinhalese) ; **Sudai valai** (Tamil).

Locality : Negombo.

Description : A vertical net of four pieces each 10 yards long. There are floats along the upper side and weights along the bottom.

Dimensions : Length, four pieces, each 10 yards long ; depth, 3 yards ; mesh, 1 inch.

Method of Use : Used in the open channel, and is worked from two catamarans. It first lies in a straight line and then each catamaran describes a quarter circle and eventually they meet, and the net encloses a number of fish.

Used in the Negombo lagoon. Not the same as the *Suda del* of Chilaw.

Under the by-laws published in the *Government Gazette* of December 5, 1913, this net in its present form is prohibited, as no net with a mesh of less than 2 inches is permitted. This net was used by the Sea street fishermen, and was objected to by the Munnakarai people, on the grounds that owing to its small mesh it caught immature fish. The Marine Biologist upheld the objection.

66.—**Aiya valai** (Tamil) ; **Aiya del** (Sinhalese) or **Kodduwa valai** (Tamil) ; **Kodduwa del** (Sinhalese).

Locality : Negombo.

Fish caught : Large fish.

Description : A vertical net which carries wooden floats along the upper edge and is weighted below. Made of strong string.

Dimensions : Length, 2 pieces, each 13 fathoms long ; depth, 3 yards ; mesh, 7 inches.

Method of Use : Worked from two catamarans in the lagoon at Negombo. First the net stretches straight across from boat to boat. Then each boat moves towards the other, and so the net entraps large fish. Used only by the Sea street fishermen.

Not the same as the nets of the *Kodduwa valai* of Puttalam and Panichchenkeni.

67.—**Katta dela** (Sinhalese) ; **Kattala valai** (Tamil).

Locality : Negombo.

Description : Not very different from the *Katta del* of Chilaw, but used in a different manner. A vertical net having wooden floats along the upper edge and being weighted at the bottom by a rope.

Dimensions : Length, four pieces, each 4 fathoms long ; depth, 3 yards ; mesh, 4½ inches.

Method of Use : The net is taken out by two catamarans, and used exactly in the same manner as the *Sudai valai* and *Aiya valai.* Used only by the Sea street fishermen in the Negombo lagoon. Sometimes a third boat is used at night and the occupant is provided with a torch, and thus the fish are attracted by the light and are entrapped by the net. This latter method is injurious.

68.—**Vali valai** (Tamil).

Locality : Negombo.

Description : This net is prohibited under the regulations published in the *Government Gazette* of December 17, 1909, on the sea coast between the mouth of the Maha-oya and

Kepungoda, and in the lagoon at Negombo. It is similar to the net of the same name used in the Northern Province, but the method of use is rather different.

Dimensions : Length, 70 fathoms ; depth, 2 fathoms ; mesh, $2\frac{1}{2}$ inches.

Method of Use : Two boats take the net out and stretch it straight between them. A third boat goes about 50 yards away, and the man makes a noise with his paddle, thus driving the fish into the net. At the same time the two other boats move towards each other, thus enclosing the fish. This net is probably harmful in the lagoon, but I cannot see any objection to its use in the open sea.

69.—**Sippi valai** (or **Chippi valai**) (Tamil).

Locality Kalpitiya, North-Western Province.

Fish caught : Manalai, palai, suriya, velameen.

Description : A vertical net made of fine white string. It is floated along the top edge with wooden sticks 1 foot long and $\frac{1}{2}$ inch in diameter. One float every 3 feet. The net is so called because sometimes the wooden floats are made somewhat in the shape of an oyster shell (*sippi* = oyster).

Dimensions : Length, four pieces of 40 fathoms each ; depth, $4\frac{1}{2}$ feet ; mesh, 2 inches.

Method of Use : Used in shallow water. When a shoal of fish is seen one end of the net is tied to a stake fixed in the mud. The remainder of the net is taken in a canoe, and is gradually paid out as the boat travels in semicircle. When the semicircle is complete the boat makes its way back to the stake, thus completing the circle and enclosing the fish. This method is very similar to that practised by the *Nachchi valai* at Puttalam.

The *Suriya valai* is similar to the *Sippi valai*, except that in the former the net is not tied to a stake, but each end is retained by a boat.

(Not the same net as the *Sippi dela* of Talawa.)

70.—**Chanal valai** (Tamil).

Locality : Batticaloa.

Description : A vertical drift net made of thick string and has floats along the top.

Dimensions : Length, 100 fathoms or more ; depth, 4 feet ; mesh. 4 inches ; floats. 5 inches by 4 inches.

Method of Use : The net is gradually paid out by two canoes, and finally assumes the shape of a flattened horse-shoe. Then about three boats approach the concave side of the net, and the fishermen make a noise with their paddles on the side of the boat, thus driving the fish towards the net in the meshes of which they become entangled. The net is then taken in by two boats.

Used in the lagoon at Batticaloa.

This net differs from the nets of the same name used in other parts of the coast.

71.—**Chillu valai** (Tamil).

Locality : Batticaloa.

Description : The name given to a gill net, of which three types are used, the *Pattu valai*, the *Arutha valai*, and the *Siru valai*.

72.—**Pattu valai** (Tamil).

Locality : Batticaloa.

Fish caught : Seelah, palai, koduwa, manalai, para.

Description : A vertical net manipulated by a boat at each end. The net is first straight, but by the movement of the boats it gradually assumes a horseshoe shape. Made of medium hemp.

Dimensions : Length, 200 fathoms ; height, 5 feet ; mesh, $3\frac{1}{2}$ inches.

Method of Use : As the net changes to the horseshoe position several boats approach the narrowing entrance, and the fishermen drive the fish towards the net by beating their paddles on the sides of their boats. The fish get caught by the gills.

73.—**Arutha valai** (Tamil).

Locality : Batticaloa.

Fish caught : Smaller kinds of fish, such as killaken, oti, thirali, &c.

Description : A net made of fine hemp.

Dimensions : Length, 200 fathoms ; height, $4\frac{1}{2}$ feet ; mesh, $2\frac{1}{4}$ inches.

Method of Use : Used exactly in same way as the *Pattu valai.*

74.—**Siru valai** (Tamil).

Locality : Batticaloa.

Description : A net made of fine white string.

Dimensions : Length, 50 to 100 fathoms ; height, 3 feet ; mesh, 1 inch.

Method of Use : Used in same manner as the two previous nets, but instead of the fishermen making a noise with their paddles they throw mud into the water.

Compare *Siri valai* of Negombo (p. 95).

75.—**Suda dela** (Sinhalese).

Locality : Chilaw, Nachchikuda, and Jaffna.

Fish caught : Suda, laga, prawns, small fish.

Description : A vertical net.

Dimensions : Length, 30 fathoms ; height, 4 fathoms ; mesh, 1 inch.

Method of Use : Taken out by two boats, and is used in conjunction with the *Maha dela.* As the *Maha dela* is being drawn to the shore, this net is dragged by the two boats behind the bag of the *Maha dela*, thus catching the small fish that escape from the *Maha dela.*

(At Jaffna this net is used apparently only by the Sinhalese, and probably without the *Maha dela.*)

See *Suda dela* of Negombo (No. 65), which is used in a different manner.

76.—**Mora dela** (Sinhalese).

Locality : Chilaw.

Fish caught : Small sharks, seer, skate, anguluwa, kattawa.

Description : A simple net made of medium string. There are no floats or weights.

Dimensions : Length, about 40 fathoms ; depth, 3 fathoms ; mesh, 6 inches.

Method of Use : The net is taken out to sea in a small boat and gradually paid out, one end being attached to the boat. The net sinks to the bottom, and is left there for three or four hours.

77.—**Kumbula dela** (Sinhalese).

Locality : Chilaw.

Fish caught : Kumbulawa and prawns.

Description : A similar net to the *Mora dela*, but made of very fine string.

Dimensions : Length, 75 fathoms ; depth, 4 fathoms ; mesh, 2 inches.

Method of Use : Used about $\frac{1}{4}$ mile from the shore.

78.—**Parawa valai** (Tamil).

Locality : Point Pedro.

Fish caught : Mural and flying fish (parawa).

Description : A net made of very fine string, and is buoyed every 15 inches by small floats. The lower part of the net is not weighted.

Dimensions : Length, 50 fathoms ; height, 2 feet ; mesh, 1 inch.

Method of Use : The net is paid out from a catamaran in 3 or 4 fathoms of water and it floats on the surface.

79.—**Pachchu valai** (Tamil).

Locality : Jaffna lagoon.

Fish caught : Small fish only.

Description : A horizontal net, with a long pole attached at each end.

Dimensions : Length, 5 fathoms ; width, 7 feet ; mesh, $\frac{1}{2}$ inch.

Method of Use : The net lies horizontally in the water. A man holds each end by the long pole. So that while the central part lies on the bottom the two extremities are about 3 feet high (see Fig. 18).

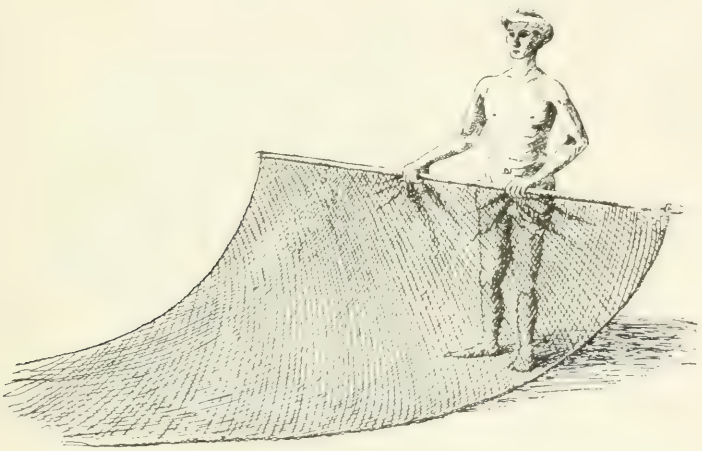


Fig. 18.—Pachchu valai.

Then two other fishermen drag a long ola line towards the net. Some of the fish jump into the net, which is then lifted above the surface of the water.

80.—**Atoli dela** (Sinhalese).

Locality : Western and Southern Provinces. Panadure and Balapitiya, &c.

Description : In many of the backwaters and rivers of the Western and Southern Provinces the jakottuwa stretch from bank to bank, with the exception of a narrow gap of about

4 or 5 yards in the middle to allow boats to go through. Frequently, this gap is closed under water, so that fish are not able to move up or down stream unless they come very near to the surface at the gap and jump over the submerged barrier.

Method of Use : In order to catch such fish a net is fixed just outside the gap. At one end the two corners of the net are attached to long poles, and are suspended well above the water. Each of the other two corners is held by a man standing on a platform at the other side of the gap (see Fig. 19). The net lies just below water in the middle of the gap. When the fish come the two men raise the net above the water, thus capturing the fish. This net is known as an *Atoli dela*.

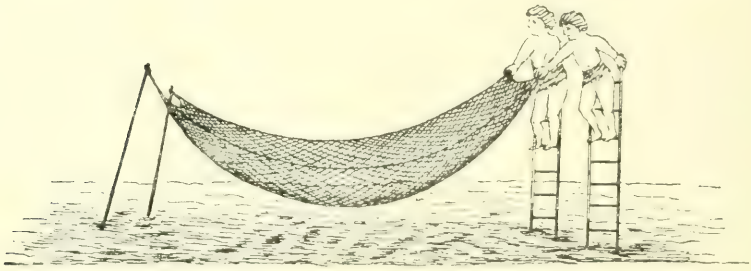


Fig. 19.—Atoli dela.

81.—**Koraliya dela** (Sinhalese).

Locality : Ambalangoda.

Description : A net similar in structure to the *Pala dela* of Bentota, but is not dragged through the water.

Method of Use : When the fish come to the net the man at each end lifts the net horizontally out of the water by means of the pole, and thus the fish are captured.

82.—**Wesi dela** (Sinhalese) ; **Vechchu valai** (Tamil).

This is the generic name given to the casting net, which is the commonest kind of net found in Ceylon (see Fig. 20). It is used universally in the rivers, lakes, and backwaters, as

well as in the shallow parts of the sea. It is given different names in different localities. Below are given descriptions of twenty-two different kinds of casting nets. In addition, there are certain large nets, such as the *Suda valai* of the northern coast and the *Elana dela* of the southern coast, which have the structure of a casting net, but are too big to throw.

Fig. 20.—Wesi dela.

83.—**Ahalawuru dela** (Sinhalese).

Locality : Tangalla.

Description : A kind of casting net called after a fish of that name. Mesh, $\frac{3}{4}$ inch.

84.—**Thi dela** (Sinhalese).

Locality : Tangalla.

Fish caught : Prawns.

Description : A casting net for catching prawns. Mesh, $1\frac{1}{4}$ inch.

85.—**Karala dela** (Sinhalese).

Locality : Hambantota and Tangalla.

Fish caught : Karala.

Description : A large casting net used for catching *Karala*. Radius, 30 feet ; mesh, 1 to $1\frac{1}{2}$ inch.

Method of Use : This net is used from a boat at sea.

86.—**Wetta dela** (Sinhalese).

Locality : South coast.

Description : A casting net 2 fathoms in diameter. Mesh, $1\frac{1}{4}$ inch.

87.—**Wara dela** (Sinhalese).

Locality : Talpe pattuwa.

Description : A kind of casting net used in Talpe pattu.

88.—**Ehelemburu dela** (Sinhalese).

Locality : Talpe pattu.

Description : A kind of casting net used in Talpe pattu.

89.—**Baru dela** (Sinhalese).

Locality : South-western coast, Kolonnawa, and also Kalmunai in Eastern Province.

Description : A particular kind of *Wesi dela* used around the south-western coast. The only net allowed in Kolonnawa canal. (See *Gazette* of November 8, 1912.)

Also used by Sinhalese fishermen at Kalmunai, Eastern Province.

90.—**Wek dela** (Sinhalese).

Locality : South coast.

Description : A large casting net with 4-inch mesh. Made of strong string.

91.—**Ath dela** (Sinhalese).

Locality : Galle.

Description : A kind of *Wesi dela* used at Galle. Very small size. (*Ath* = hand.)

92.—**Korumburuwa dela** (Sinhalese).

Locality : Ahangama, Talpe pattu, Hambantota.

Fish caught : Korumburuwa.

Description : A kind of *Wesi dela* used for catching Korumburuwa.

93.—**Raal valai** (Tamil).

Locality : Nilaveli.

Fish caught : Prawns.

Description : A kind of casting net made of cotton twist.

Dimensions : Length, 12 feet ; diameter, 17 feet ; mesh, $\frac{1}{2}$ inch (for prawns).

94.—**Meen valai** (Tamil).

Locality : Kilweddi.

Fish caught : Medium sized fish.

Description : A casting net. Mesh, $1\frac{1}{4}$ inch.

95.—**Suda valai** (Tamil).

Locality : Trincomalee.

Fish caught : Sardines.

Description : A casting net used for catching sardines. Mesh, $\frac{3}{4}$ to 1 inch.

Method of Use : The fisherman goes out into the water up to his neck and then throws the net. (*Cf. Suda valai*, No. 105.)

96.—**Kuttuwa valai** (Tamil).

Locality : Panichchenkeni.

Fish caught : Fish weighing from 10 to 30 lb.

Description : A casting net made of hemp fibre grown locally.

Dimensions : Length, 13½ feet ; diameter, 20 feet ; mesh, 4 inches.

Used at Batticaloa, where mesh is 6 inches.
(Not same as net of same name at Puttalam.)

97.—**Moovilan chanel valai** (Tamil).

Locality : Panichchenkeni.

Fish caught : Fish weighing from ½ lb. to 5 lb.

Description : A casting net made of hemp fibre grown locally.

Dimensions : Length, 16 feet ; diameter, 21 feet ; mesh 2 inches.

98.—**Eerilai chomel valai** (Tamil).

Locality : Panichchenkeni.

Fish caught : Fish weighing from ½ lb. to 5 lb.

Descrption : A casting net made of hemp fibre.

Dimensions : Length. 17 feet ; diameter, 24 feet ; mesh, 1½ inches.

99.—**Koi valai** (Tamil).

Locality : Panichchenkeni. (Also used at Kayts.)

Fish caught : Small fish.

Description : A casting net made of cotton twist of European make.

Dimensions : Length. 20 feet ; diameter, 28 feet ; mesh 2 inches.

100.—**Muttukkam valai** (Tamil).

Locality : Panichchenkeni.

Fish caught : Small fish.

Description : A casting net made of cotton twist.

Dimensions : Length, 21 feet ; diameter, 30 feet ; mesh, $1\frac{1}{2}$ inch.

101.—**Kurukkattu valai** (Tamil).

Locality : Panichchenkeni. (Used also at Batticaloa.)

Fish caught : Sardines.

Description : A casting net made of cotton twist.

Dimensions : Length, 15 feet ; diameter, 20 feet ; mesh, $1\frac{1}{4}$ inch.

102.—**Arippu valai** (Tamil).

Locality : Panichchenkeni.

Fish caught : Sardines.

Description : A casting net with $\frac{1}{2}$-inch mesh, Used at Kalkudah for catching small sardines.

103.—**Panthagam valai** (Tamil).

Locality : Batticaloa.

Fish caught : Thiralai, koi, &c.

Description : A casting net made of very fine string and 2-inch mesh.

104.—**Palameen valai** (Tamil).

Locality : Batticaloa.

Fish caught : Pala, suraya, &c.

Description : A casting net of coarse string with $3\frac{1}{2}$-inch mesh.

105.—**Suda valai** (or **Chala valai**) (Tamil).

Locality : Point Pedro, Kankesanturai, &c.

Description : This net is exactly like the *Vechchu valai* except it is not thrown. It is weighted all round the edge.

Dimensions : Diameter, 6 fathoms ; mesh, $\frac{3}{4}$ inch.

Method of Use : The net is taken out in a catamaran and gradually spread, and then the fisherman lets go. In this way all the fish in the area covered by it are captured.

Also known as *Kavi valai* at Kankesanturai.

(See *Elana del*, Weligama.)

106.—**Elana dela** (Sinhalese).

Locality : Weligama district.

Description : A large net made exactly as a *Wesi dela*, but much too large to be classified as a "casting net." It has a radius of 45 feet when expanded. Mesh, 1½ inch. Made of fine white thread.

Method of Use : The net is taken out in a boat. Bit by bit the weighted edge is dropped overboard and the boat meantime describes a circle. Thus the ultimate position of the net in the water is the same as that of an ordinary *Wesi dela*.

Not the same as the *Elana dela* of Lunawa.

The same as the *Ahurana dela* of Tangalla.

(See *Suda valai* Kankesanturai, No. 105.)

107.—**Ahurana dela** (Sinhalese).

Locality : Tangalla and Hambantota.

Description : This is apparently the same as the *Elana dela* of Weligama.

108.—**Parakuda** (Tamil).

Locality : Point Pedro.

Description : A fish basket with four entrances. (See Fig. 21.) Same as *Ooddikuda* at Kankesanturai.

There is also another kind of trap with one entrance (see No. 113, *Ora Kuda*.)

At Kayts the fish basket of this name has only a single entrance like the *Ora kuda* of Batticaloa.

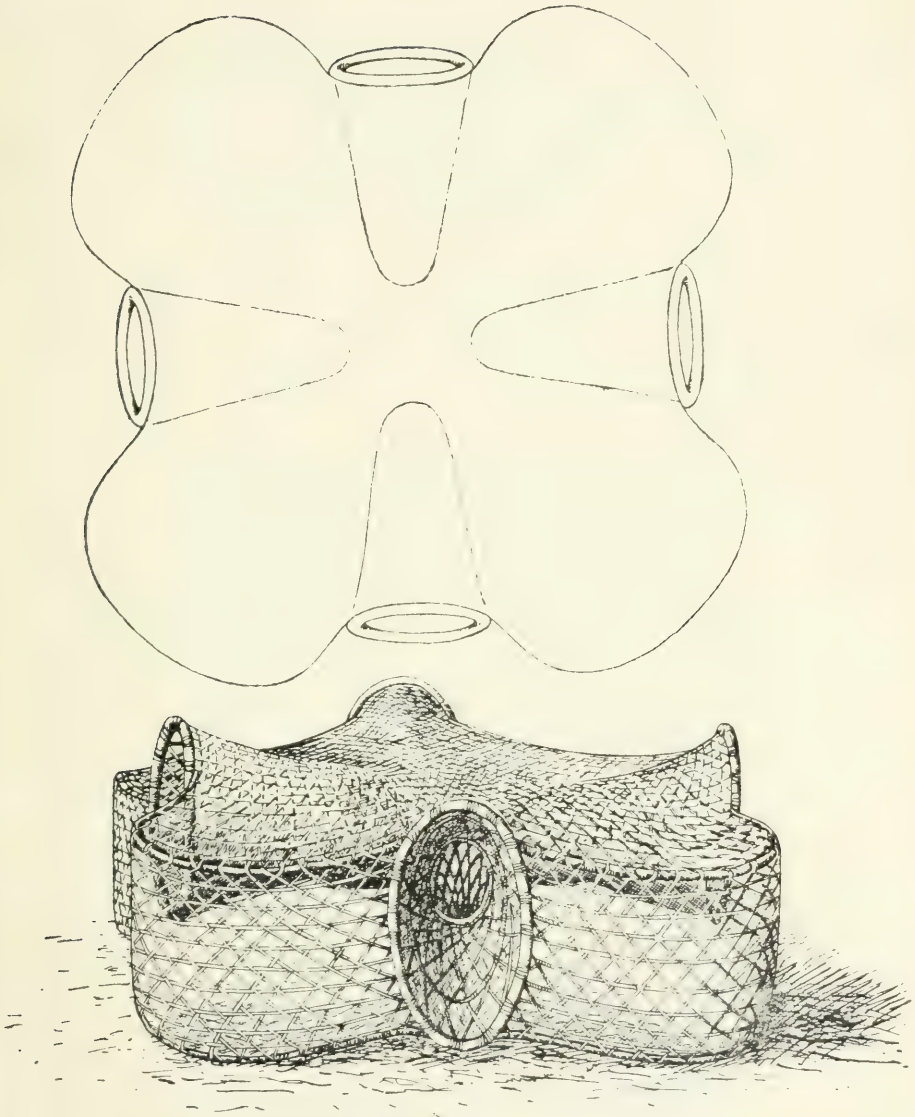


Fig. 21.—Para Kuda. Upper figure—plan view ; lower figure—side view.

109.—**Kemina** (Sinhalese).

Locality : Western and Southern Provinces.

Description : A rattan fish trap (Figs. 22 and 23) used in the backwaters of the Western and Southern Provinces. (See Dr. Willey's Administration Report, Marine Biology, 1908, description.)

The same device is called a *Karaka* in the tank district of the North-Central Province.

Method of Use : One method used in the tanks is as follows :— A number of men each with a *Karaka* arrange themselves in a circle, and then advance towards the centre of the circle, thus entrapping quantities of fish.

See *Karappu* of Kalpitiya, Eastern Province (No. 115), which is the same thing.

Fig. 22.—Man holding a "kemina" at Hanwella. The narrow end is covered by a coconut cup.

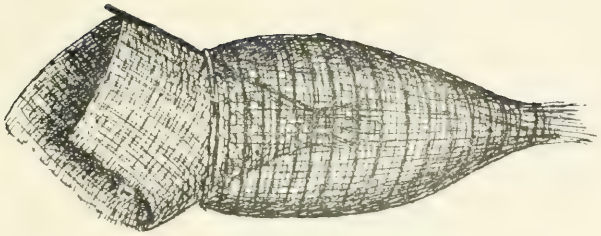


Fig. 23.—Kemina.

110.—**Koraliya paha** (Sinhalese).

Locality : Various.

Fish caught : Koraliya.

Description : A fish basket similar to the one used at Batticaloa and elsewhere.

111.—**Kakula watte** or **Kakula dela** (Sinhalese).

Locality : Universal.

Fish caught : Crabs.

Description : A crab trap used all around the coast. Local variations exist (see Figs. 24 and 25).

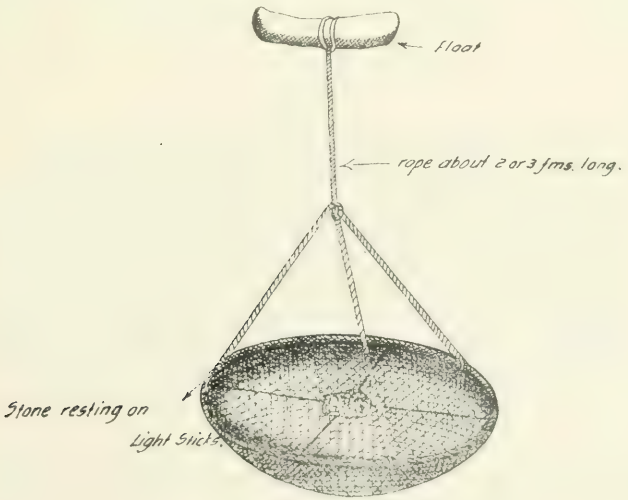


Fig. 24.—Kakula watte.

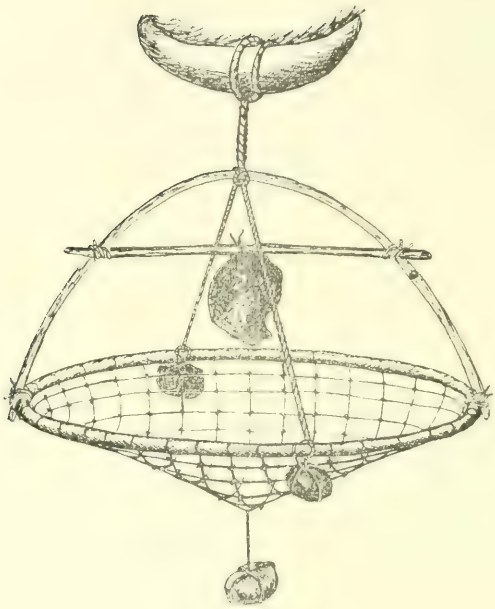


Fig. 25.—Kakula watte.

112.—**Karuppu** (Tamil) ; **Karaka** (Sinhalese).

Locality : Kalkudah, Kilveddi, and Kalpitiya.

Fish caught : Prawns and small fish.

Description : A basket somewhat like the *Kemina* for catching prawns and small fish, but not having the internal trap.

Method of Use : It is used with a light at night, and it is also used in the day time. Mostly used in estuaries and back-waters (see Fig. 26).

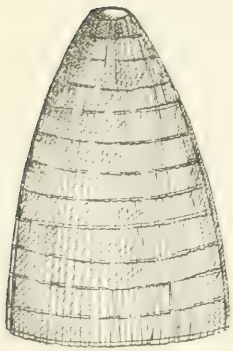


Fig. 26.—Karappu.

113.—**Ora kuda** (Tamil).

Locality : Batticaloa.

Description : A fish trap used at Batticaloa having a single entrance. At Kayts this fish trap is called *Para kuda* (differs from the *Para kuda* of Point Pedro). See Fig. 27.

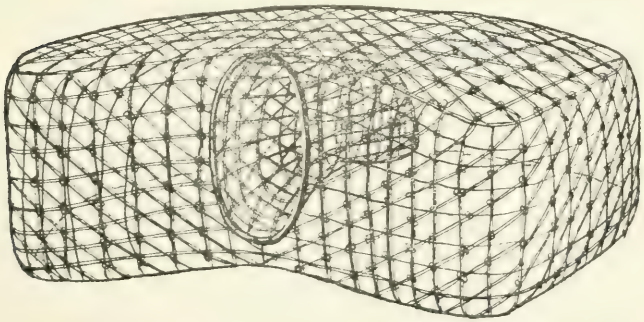


Fig. 27.—Ora kuda.

114.—**Ooddi kuda** (Tamil).

Locality : Kankesanturai.

Description : A fish basket of four entrances. Same as *Para kuda* of Point Pedro.

115.—**Tundi valai** (Tamil).

Locality : Puttalam.

Description : A line only used by the Tamils at Puttalam. (The Puttalam Moormen do not use lines.) Each line is 50 fathoms long, and has a hook every fathom.

Method of Use : The fishermen use this line from a boat. About 10 lines are used from each boat.

116.—**Kallawallu yotha** (Sinhalese).

Locality : Weligama and Matara Districts.

Fish caught : Sharks, kallawallu, and other big fishes.

Description : A line used at Weligama and Matara Districts for catching sharks, kallawallu, and other big fishes.

Dimensions : Length, 275 to 300 fathoms ; thickness, $\frac{1}{3}$ inch diameter.

Method of Use : An iron barbed hook, 6 inches long, is attached to the line by means of a 3-ply plaited brass wire. Small fish are used as bait.

117.—**Parawa yotha** (Sinhalese).

Locality : Weligama and Matara Districts.

Fish caught : Parawa, thalapotha, thora, &c.

Description : A line used at Weligama and Matara Districts for catching parawa, thalapotha, thora, &c.

The hook is three inches long, and is attached to the line by means of a single brass wire.

Dimensions : 200 fathoms long and $\frac{1}{6}$ inch in diameter.

118.—**Yothgahana yotha** (Sinhalese).

Locality : Weligama and Matara Districts.

Description : A line used at Weligama and Matara Districts.

Dimensions : Length, 200 fathoms thickness, the line is of three different diameters, increasing from 1/16 inch near the hook to 1/10 inch at the other end ; hook, English-make $1\frac{1}{2}$ inch in length.

The hook is attached to the line by English wire supplied by Cave & Co.

119.—**Thundal valai** (Tamil).

Locality : Kalpitiya.

Description : A long line with a hook attached every three feet. Altogether about 100 hooks. A float is placed between each pair of hooks, and the line is anchored at one end by means of a stone.

(See *Thundal* of Kankesanturai and *Thundal kiru* of Batticaloa). *Thundal* = hook.

120.—**Mudulanuwa** (Sinhalese).

Locality : Weligama.

Fish caught : Panna, bolas, theliya, paratiya, and other small fish.

Description : A line used at Weligama. Gut is used for the attachment of the hook, and there is a leaden weight between the line and gut. There is also a small weight attached to the gut.

Dimensions : Line, 20 fathoms long, 1/15 inch diameter ; gut, 2 feet long ; brass hook, $1\frac{3}{4}$ inch long.

121.—**Bili hada** (Sinhalese).

Locality : Weligama and Matara Districts.

Fish caught : Bait (small fish).

Description : A small line used for catching bait. The line is made of ordinary coarse white string. At intervals of 2 feet, hooks are attached on short lines 6 inches in length. Seven or eight such hooks are used.

Dimensions : Line, 18 feet long, $\frac{1}{8}$ inch diameter ; hook, $1\frac{1}{2}$ inch long.

Method of Use : One end of the line is weighted with a stone and the other end is attached to the line of a *Parawa yotha* and sunk into deep water. The boat drifts while the lines are out. Small pieces of fish are used as bait.

122.—**Pahaya biliya** (Sinhalese).

Locality : Weligama and Matara Districts.

Fish caught : Balaya.

Description : A line 4 fathoms in length attached to a rod. There is a single hook $2\frac{3}{4}$ inches long made of German silver. Attached to the hook are about a dozen coconut fibres $1\frac{1}{2}$ inch long. No bait is used (see Fig. 28).

123.—**Kopiyawa** (Sinhalese).

Locality : Weligama and Matara Districts.

Fish caught : Balaya.

Description : A line used for catching balaya. The hook is made of German silver and is $1\frac{1}{4}$ inch long (see Fig. 29).

Method of Use : Inguruwa is used as bait.

124.—**Puduwa** (Sinhalese).

Locality : Weligama and Matara Districts.

Fish caught : Parawa, thora, &c.

Description : A single strand of brass wire bearing a barbed hook $2\frac{3}{4}$ inches long.

On the wire near the attachment to the hook (see Fig. 30) is a piece of frayed rope 3 inches long (A). Half way down the hook is another piece $1\frac{1}{4}$ inch in length (B). At the bend of the hook a piece of white tape is tied (C).

Method of Use : The wire is attached to a *Parawa yotha*, and is dragged after the boat in full sail. No bait is used.

125.—**Kahaw biliya** (Sinhalese).

Locality : Weligama and Matara Districts.

Fish caught : Koramuruwa.

Description : The hook is $3\frac{1}{2}$ inches long, and is weighted with lead.

Method of Use : Used with rod and line. No bait is used. Sometimes three or four hooks are used on the same line (see Fig. 32).

126.—**Eyem biliya** (Sinhalese).

Locality : Weligama and Matara Districts.

Description : A hook made of brass wire. The hook is weighted with lead and is $1\frac{1}{4}$ inch in length.

Method of Use : Used on rod and line without bait.

127.—**Heen yotha** (Sinhalese).

Locality : Hambantota.

Fish caught : All kinds of fish.

Description : A small hand line, with a thick hook baited with prawns.

Dimensions : Line, 50 fathoms long, $\frac{1}{8}$ inch diameter ; hook, $2\frac{1}{4}$ inches long.

128.—**Kahawa** (Sinhalese).

Locality : Panadure.

Description : A multi-barbed hook used without bait (see Fig. 31).

Method of Use : The line is attached to a rod and is dragged through the water.

129.—**Yotha saha biliya** (Sinhalese). (Literally "line and hook.")

Locality : Dodanduwa.

Description : Name given to the ordinary deep-sea line. Bait used.

130.—**Thundal** (Tamil).

Locality : Kankesanturai.

Description : A fishing line used at Kankesanturai where line fishing is much practised. Each line is five fathoms long and bears two hooks. (See *Thundal kiru* of Batticaloa and *Thundal valai* of Kalpitiya.)

131.—**Shark hook.**

Locality : Panichchenkeni.

Fish caught : Sharks.

Description : A single barbed hook attached to a pole 9 feet long. Very similar to one of the prongs of a Manda. As in the Manda it is attached to a pole by a long piece of thin rope (see Fig. 33).

132.—**Velirai kiru** (Tamil).

Locality : Panichchenkeni.

Description : A fishing line 350 feet long to which a hook is attached. Used at Panichchenkeni for catching fish about 30 lb. in weight.

133.—**Sura kiru** (Tamil).

Locality : Batticaloa.

Fish caught : Sharks.

Description : A line and hook used for catching sharks. The line is $\frac{1}{2}$ inch in diameter. The hook is 8 inches long.

Fig. 28.

Fig. 29.

Fig. 32.

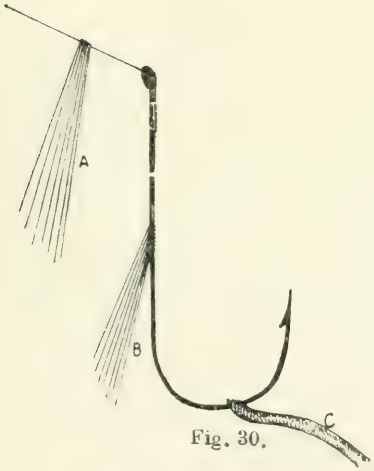


Fig. 30.

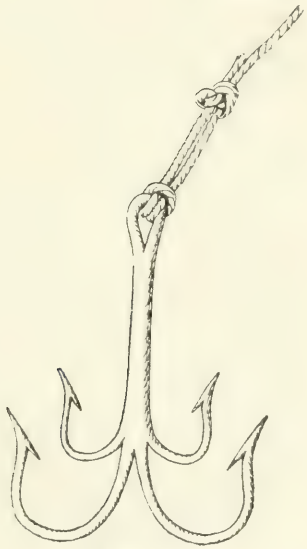


Fig. 31.

Fig. 33.

Figs. 28–33.—Fishing hooks (See pp. 118–120).

134.—**Thundal kiru** (Tamil).

Locality : Batticaloa.

Fish caught : Para, koduwa, kala, &c.

Description : A small line and hook. Hook 3 inches long.

(See *Thundal* of Kankesanturai and also *Thundal valai* of Kalpitiya).

135.—**Kaddai** (or **Katte**) (Sinhalese).

Locality : Negombo.

Description : This consists of a group of three or four trunks of coconut trees fixed in the mud and projecting a foot or so above the water. They are confined to the eastern side of the Mankuliya channel in the Negombo lagoon. Around the stakes dead branches are placed, thus affording an attractive shelter for fishes.

The kaddais have been a source of trouble between the Munnakarai fishermen and the Sea street fishermen. The latter fish in the open sea when the weather is favourable, at other times they practise net fishing in the lagoon. The Munnakarai fishermen, on the other hand, are lagoon fishermen, and they have regarded the kaddais as their special property. The dispute is a long standing one, and as far back as 1878 the Assistant Government Agent, Mr. Green, caused all the kaddais to be removed, and for twenty years after that few stakes were erected.

The objections of the Sea street fishermen to the use of the kaddais are as follows :—

(1) The fish are attracted by the kaddais, and the main channel in which the Sea street people fish is thus deprived of its normal fish population.

(2) They entrap immature fish.

(3) They interfere with navigation, and also prevent the Sea street people from using their nets to full advantage.

(5) Whenever the Sea street people catch good sized fish they are charged by the Munnakarai people with having obtained them from the kaddai.

In 1912 the dispute became serious, and at the end of that year the Marine Biologist was instructed by Government to make an inquiry and report upon the situation. This was done, and it was found that, generally speaking, the charges brought by the Sea street fishermen had no foundation. So long as the fish which take shelter in the kaddais are not entrapped by nets the kaddais cannot be regarded as mischievous. As a result of the Marine Biologist's report new bye-laws were made (see *Government Gazette* of December 5, 1913) which made the kaddais free to every one for fishing purposes, and which made it an offence to use any kind of net within the kaddai area.

136.—**Kottu** (Sinhalese).

Locality : Backwaters of Pitapana and Duwa in the Negombo lagoon.

Fish caught : Young fish and prawns, also immature fish.

Description : These kottus were constructed of dead twigs and branches in water sufficiently shallow to enable a man to wade out to them.

Method of Use : These kottus were left unvisited for about a week, and in that time attracted young fish and prawns. Then the kottu was surrounded by a stake net of $\frac{3}{4}$-inch mesh. Two men then entered the enclosure, and after removing the branches proceeded to entrap all the fish.

The Marine Biologist reported early in 1913 that these kottus were responsible for the destruction of large numbers of immature fish, and their use was prohibited in consequence. (See *Government Gazette* of December 5, 1913.)

137.—**Mandal** (Tamil).

Locality : Kalpitiya.

Fish caught : Large fish.

Description : A weapon consisting of a wooden handle about 9 feet long, with an iron head carrying nine barbed prongs (see Fig. 34).

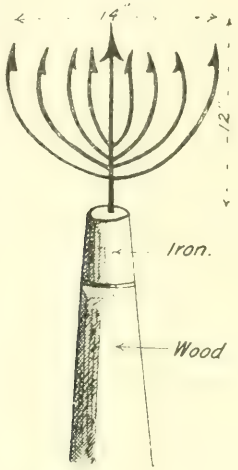


Fig. 34. —Mandal.

Method of Use : This is used for spearing fish at night. Three men go out in a canoe. The one in the prow holds the *Mandal*, the middle man holds a torch made of coconut leaves, and the man in the stern paddles. Only used in the shallow waters of the lake, and large fish are caught in this way.

138.—**Malu kottanakaduwa** (Sinhalese).

Locality : Kalutara.

Description : A weapon used for killing fish when fishing at night. The weapon consists of a slightly bent piece of iron 3 feet long. For a distance of 15 inches from the end there are

twenty barbed hooks set close to each other (see Fig. 35). The other end of the iron is fixed in a short wooden handle 7 inches long. To the handle is tied a double rope about 4 feet long, which the fisherman ties securely around his waist. Another man accompanies him with a hand net (*Pandan-athangowa*) for catching the smaller fish (see p. 128).

Fig. 35.—Malu kottanakaduwa.

Method of Use : The fishermen carries a torch in the left hand and the *Kottanakaduwa* in the right. The fish attracted by the light, come to the surface. Then the fisherman strikes.

139.—**Aulun biliya** (Sinhalese).

Locality : Ambalangoda, and also at Kalmunai (Eastern Province) by Sinhalese fishermen.

Description : A hook 8 inches long on the end of a short pole 3 feet long (see Fig. 36). Used for pulling large fish into the boat after being caught on a line.

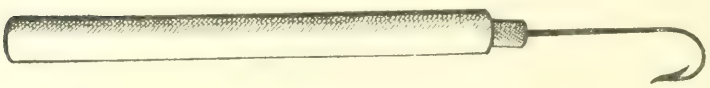


Fig. 36.—Aulun biliya.

140.—**Manda** or **Mantha** (Tamil).

Locality : East coast, and also all around the coast.

Description : A pole 9 feet long bearing at its end a releasable 2-pronged fork (see Fig. 39). Each prong bears a single barb (Fig. 38). The prongs are about 9 inches long.

Method of Use : The *Manda* is used at night for spearing fish from a canoe. On the canoe a small platform is constructed, and this carries a broken upturned chattyfull of burning wood. The fish are attracted by the bright light. Generally, two men are in the boat. One with a paddle sits in the stern, the other stands in the bow holding the *Manda* in readiness to strike (see frontispiece). When a fish is stabbed the two-pronged head is carried away, but is prevented from being lost by being attached to the pole by a length of thin rope.

In the Jaffna lagoon a *Mantha* is used for spearing Bêche-de-mer. This differs from the one figured above in not having barbs on the prongs. There are many other variations of this implement. In Palk Strait a single pronged *Manda* is used for spearing chanks (see Figs. 40 and 41).

Fig. 37.

Fig. 40.

Fig. 41.

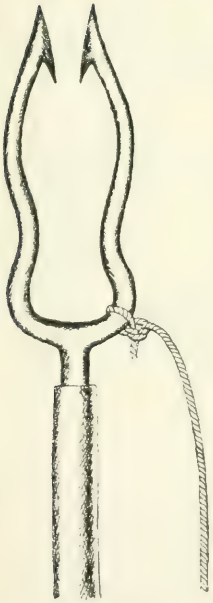


Fig. 38.

Fig. 39.

Fig. 37–41.—Manda.

141.—**Pandan athangowa** (Sinhalese).

Locality : Kalutara.

Description : The name given to a hand net having a 1-inch mesh (Fig. 42). The one used at Dodanduwa and Galle is attached to a long pole (Fig. 43).

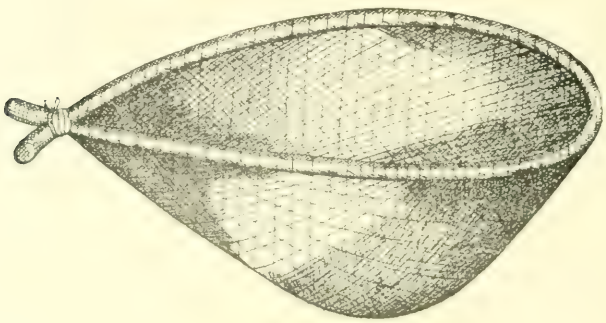


Fig. 42.—Pandan athangowa.

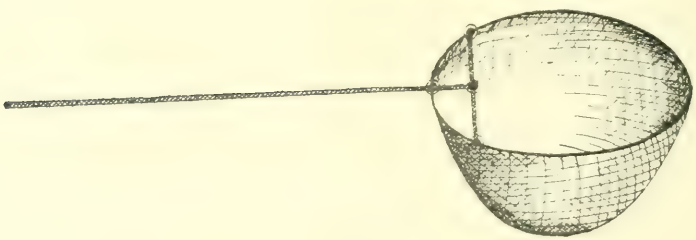


Fig. 43.—Athangowa.

142.—**Athangowa** (Sinhalese).

Locality : Dodanduwa and Galle.

Description : This Athangowa is attached to a long pole 6 feet long.

Length of Net : 2 feet 3 inches ; breadth, 9 inches.

The Athangowa used at Kalmunai has a mesh of $\frac{3}{4}$ inch.

143.—Dallo athangowa (Sinhalese).

Locality : Galle.

Fish caught : Squids (*Dallo* = squid).

Description : Same as *Pandan athangowa* of Dodanduwa. Squids are caught by this net and then used as bait for larger fish.

144.—Kakula athangowa (Sinhalese).

Locality : Ahangama.

Fish caught : Crabs.

Description : Same as *Pandan athangowa of* Kalutara.

145.—Issan boat (Sinhalese).

Locality : Panadure.

Description : An interesting sort of appliance used by Panadure fishermen for transferring prawns from the river to the sea for bait. It takes the form of a boat-shaped box, about 6 feet long, having wooden bottom and sides, and open at the top. In the middle of each side the wood is interrupted, and its place is taken by a series of tats, similar to those used in the *jakottua*. These tats allow fresh water to enter the box, and thus the prawns are kept alive (see Fig. 44).

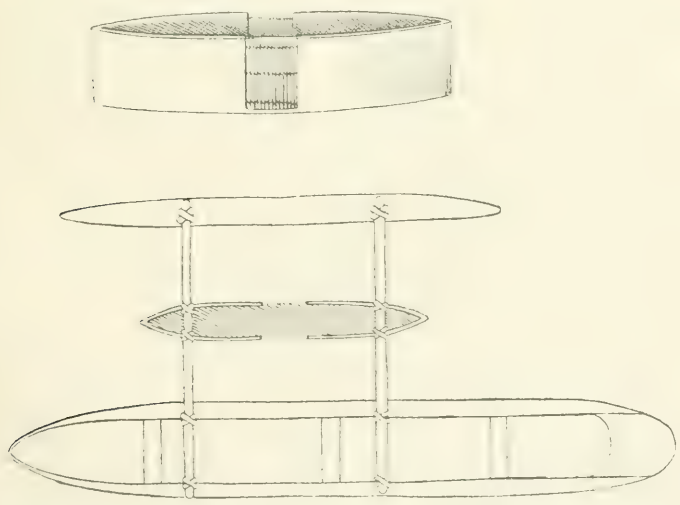


Fig. 44.—Upper figure—Issan boat : lower figure—Issan boat attached to outriggers.

Method of Use : The box is placed beneath the two supports of the outrigger of a canoe and in that way can be transported.

146.—**Rena** (Sinhalese).

Locality : Western and Southern Provinces.

Description : The name given to a long rope with coconut leaves attached.

Method of Use : Used for driving fish into a net.

147.—**Lamp.**

Locality : Galle District.

Description : A metal lamp used in Galle District for night fishing, kerosine oil being used (Fig. 45).

Fig. 45.—Lamp.

148.—**Paha** (Sinhalese).

Locality : Weligama.

Description : A basket in which *bili larga* for bait are taken out to sea alive. Tied to the side of the canoe and used in

much the same way. It is a strong wicker work basket oval in shape.

Dimensions : Length, $5\frac{1}{2}$ feet ; breadth, $3\frac{1}{2}$ feet ; depth. 3 feet.

Method of Use : This basket is tied to the side of the canoe, and is used in much the same way as the *issan boat* at Panadure.

149.—**Kodaicheelai** (Tamil).

Locality : East coast.

Description : A rude imitation of a fish made in cloth. The cloth is stiffened by three sticks and a weight is attached to one end. At the same end the *Kodaicheelai* is attached to a line (Fig. 46).

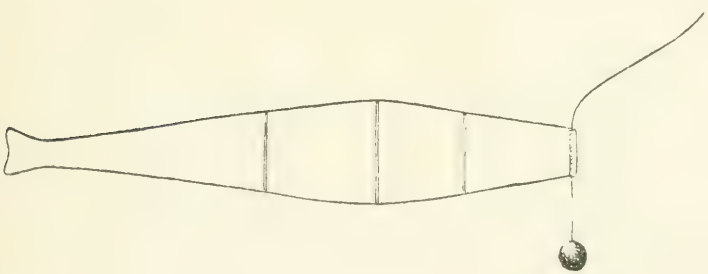


Fig. 46.—Kodaicheelai.

Dimensions : Length, 6 feet ; greatest breadth, 1 foot.

Method of Use : Each boat carries two of these, and they are attached by a line one on each side of the prow. These spread out as the canoe is paddled and roughly simulate the movements of the fish. The fish are attracted, and the fishermen harpoons them. The type of harpoon used is the *Manda*, common all along the east coast.

150.—Float.

Locality : Panichchenkeni.

Fish caught : Murel.

Description : A float made of two pieces of stick which are used in fishing with a hook. The smaller float is $3\frac{1}{2}$ inches long and the larger one is 2 feet in length (Fig. 47).

When the fish is caught the smaller float becomes submerged, but the larger float shows the position.

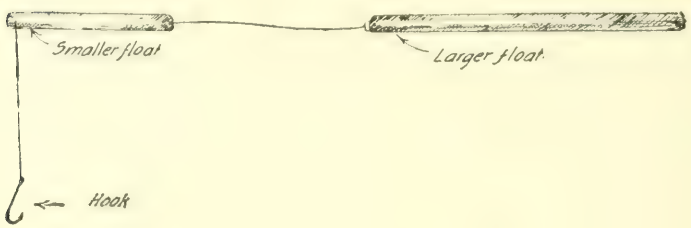


Fig 47.—Float.

The following is a classified list of appliances described in the present paper :—

Fixed Stake Nets.

1. Kalankaddi valai (Tamil).
2. Arakkuddi valai(Tamil); Jaffna.
3. Kurukku valai (Tamil) ; Jaffna.
4. Kandi (Tamil).
5. Kraals (Jakottuwa) Sinhalese.
6. Akulwetiya (Sinhalese).
7. Nittu valai (Tamil).
8. Sil valai (Tamil).
9. Kattu dela with wings and bag (Sinhalese).
10. Kondaddi valai with wings (Tamil).
11. Kulu dela (Sinhalese).
12. Unaddiya (Sinhalese).

Fixed Net with Bag.

13. Manni valai (Tamil).
14. Vidu valai (Tamil).
15. Hondediya (Sinhalese).

Seine Net with Wings and Bag ;

16. Katumaran dela (Sinhalese).
17. Maha dela (Sinhalese).

17A Ola valai (Tamil).

18. Nethali valai (Tamil).
19. Kara valai (Tamil).
20. Tholi valai (Tamil).
21. Adassi valai (Tamil).

Drag Net.

22. Kuddu valai (Tamil).
23. Arakkuddi valai(Tamil); Mannar.
24. Paddu valai (Tamil).
25. Thumpai valai (Tamil).
26. Raal valai (Tamil).
27. Kulu dela (Sinhalese).
28. Kondaddi valai (Tamil).
29. Ranchu valai (Tamil).
30. Pala dela (Sinhalese).

Vertical Gill Net, floats at top and weights at bottom.

(a) Drift in straight line.

31. Vella valai (Tamil).
32. Adasel valai (Tamil).
33. Vali valai (Tamil).
34. Adasial valai (Tamil).
35. Vedi valai (Tamil).
36. Sura valai (Tamil).
37. Sippi dela (Sinhalese).
38. Palluna dela (Sinhalese).
39. Kumbala dela (Sinhalese); Negombo.

(b) Anchored at one end or both ends. Fish driven into net.

40. Kattu valai (Tamil).
41. Heen dela (Sinhalese).

Fish not driven into net.

42. Elana dela (Sinhalese). Lunawa.
43. Wak elana dela (Sinhalese).
44. Kud dela (Sinhalese).
45. Pachchi valai (Tamil).
46. Kanni dela (Sinhalese).
47. Katta dela (Sinhalese).
48. Pala dela (Sinhalese); Chilaw.
49. Kaddu valai (Tamil).
50. Suramal valai (Tamil).
51. Tirrikka valai (Tamil).
52. Elana dela (Sinhalese); Tangalla.

(c) Held by men at one or both ends.

53. Kodduwa valai (Tamil).
54. Nachchi valai (Tamil).
55. Wala valai (Tamil).
56. Heen dela (Sinhalese).

(d) One or more nets placed around shoal.

57. Vella valai (Tamil).
58. Amai valai (Tamil).
59. Thoddandal valai (Tamil)
60. Ora valai (Tamil).

(e) At each end of net the boats converge, and the net encircles shoal.

61. Suraya valai (Tamil).
62. Kumbula valai (Tamil).
63. Siri dela (Sinhalese).
64. Kuddu valai (Tamil).
65. Suda dela (Sinhalese).
66. Koduwa valai (Tamil).
67. Katta dela (Sinhalese).
68. Vali valai (Tamil).

(f) Stake at one end, boat at other. Boat moves in a circle and net surrounds shoal.

69. Sippi valai (Tamil).

(g) Boat at each end. Net forms horseshoe, and then other boats drive fish into net.

70. Chanal valai (Tamil).
71. Chillu valai (Tamil).
72. Pattu valai (Tamil).
73. Arutha valai (Tamil).
74. Siru valai (Tamil).

(h) Boat at each end. The boats pull the net in a straight line or crescent.

75. Suda dela (Sinhalese).

Gill Net (without floats or weights.)

76. Mora dela (Sinhalese).
77. Kumbula dela (Sinhalese); Chilaw.

Gill Net (floating), not vertical.

78. Parawa valai (Tamil).

Horizontal Net.

79. Pachchu valai (Tamil).
80. Atoli dela (Sinhalese).
81. Koralia dela (Sinhalese).

Casting Nets.

82. Wesi dela (Sinhalese); Vechchuvalai (Tamil).
83. Ahalawuru dela (Sinhalese).
84. Thi dela (Sinhalese).
85. Karala dela (Sinhalese).
86. Wetta dela (Sinhalese).
87. Wara dela (Sinhalese).
88. Ehelemburu dela (Sinhalese).

89. Baru dela (Sinhalese).
90. Wek dela (Sinhalese).
91. Ath dela (Sinhalese).
92. Korumburuwa dela (Sinhalese).
93. Raal valai (Tamil).
94. Meen valai (Tamil).
95. Suda valai (Tamil).
96. Kuttuwa valai (Tamil).
97. Chanal valai (Tamil).
98. Eerilai chomel valai (Tamil).
99. Koi valai (Tamil).
100. Muttukkam valai (Tamil).
101. Kurukkattu valai (Tamil).
102. Arippu valai (Tamil).
103. Panthagam valai (Tamil).
104. Palameen valai (Tamil).

Circular Gill Net.

105. Suda valai (Tamil).
106. Elana dela (Sinhalese).
107. Ahurana dela (Sinhalese).

Fish and Crab Traps.

108. Parakuda (Tamil): Point Pedro.
109. Kemina (Sinhalese).
110. Koraliya paha (Sinhalese).
111. Kakula watte or Kakula dela (Sinhalese).
112. Karuppu (Tamil); Karakagediya (Sinhalese).
113. Ora kuda (Tamil): Kayts.
114. Ooddi kuda (Tamil).

Line and Hook.

115. Tundi valai (Tamil).
116. Kallawallu yotha (Sinhalese).
117. Parawa yotha (Sinhalese).
118. Yothgahana yotha (Sinhalese).
119. Thundal valai (Tamil).
120. Mudulanuwa (Sinhalese).
121. Beli hada (Sinhalese).
122. Pahaya biliya (Sinhalese).
123. Kopiyawa (Sinhalese).
124. Puduwa (Sinhalese).
125. Kahaw biliya (Sinhalese).
126. Eyem biliya (Sinhalese).
137. Heen yotha (Sinhalese).
128. Kahawa (Sinhalese).
129. Yotha saha biliya (Sinhalese).
130. Thundal (Tamil).
131. Shark hook.
132. Velirai kiru (Tamil).
133. Sura kiru (Tamil).
134. Thundal kiru (Tamil).

Kottus.

135. Kaddai (Sinhalese).
136. Kottu (Sinhalese).

Spears.

137. Mandal (Tamil).
138. Malu kottanakaduwa (Sinhalese).
139. Aulum biliya (Sinhalese).
140. Manda (Tamil).

Landing Nets.

141. Pandan athangowa (Sinhalese).
142. Athangowa (Sinhalese).
143. Dallo athangowa (Sinhalese).
144. Kakula athangowa (Sinhalese).

Sundry Devices.

145. Issan boat (Sinhalese).
146. Rena (Sinhalese).
147. Lamp (Sinhalese).
148. Paha (Sinhalese).
149. Kodaicheelai (Tamil).
150. Float.

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