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Reports on the Pearl Fishery of 1925.

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REPORTS ON THE PEARL FISHERY OF 1925

I.—REPORT OF THE MARINE BIOLOGIST AND INSPECTOR OF PEARL BANKS.

REPORT on the Operations of the Pearl Banks during the Pearl Fishery of 1925 by Joseph Pearson, D.Sc., Liverpool, D.Sc., Manchester, F.R.S., Edin., F.L.S., Marine Biologist and Inspector of Pearl Banks.

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I.—Review of the Scientific Investigations since 1902.

(1) INTRODUCTION.

IN presenting a review of the scientific operations on the pearl banks since the beginning of the present century, we have confined ourselves to those problems which are of strict economic importance and which are more directly concerned with the improvement of the pearl fisheries. For this reason we have omitted to refer to the work of Professor Herdman, Mr. Hornell and Mr. Southwell on the causes of pearl formation. It is not suggested that this work, which is of profound scientific interest is not capable of economic application, but it is not of pressing importance so far as the immediate economic problems of the Ceylon pearl fisheries are concerned. Neither have we discussed at length the interesting work on currents commenced by our predecessors and continued in a more systematic manner by ourselves. It is proposed to publish shortly the result of our hydrographical researches in the Gulf of Mannar, though it cannot be said that this will throw much light on the bionomic problems of the pearl banks.

Since the war we have been able to devote only about two months in the year to the pearl fisheries owing to limitations of staff and the demands of other official work. For this reason we have been careful to restrict the scope of our work, and as a pearl fishery (or, as we hoped, a series of fisheries) was imminent, we did not feel justified in indulging in irrelevant researches, however interesting, which would have diverted our attention from the more pressing surveys and inspections. We have had ample opportunity, however, for a full consideration of the situation, and in the present report an attempt is made to review and criticise the principal work of our predecessors. Much of the criticism may appear unappreciative. This is not so, as we are fully conscious of the great debt we owe to our predecessors, particularly to the late Sir William Herdman, who, until his lamented death, continued to take a keen and friendly interest in our work. In our position as Adviser to Government on pearl fishery matters we have always been careful to avoid the pitfall of undue optimism, and we have never taken the view that the application of scientific methods (disguised under the name of Marine Biology) to the pearl fisheries would produce miracles or would achieve much more than could be affected by the exercise of common sense.

Irregularity of the Fisheries.—The outstanding features of the Ceylon pearl fisheries are their irregularity and uncertainty. An examination of the records since the beginning of the nineteenth century, which are given in Appendix (1), makes this abundantly clear. For example, after the fishery of 1891 there was a barren interval of eleven years followed by the famous series of five fisheries in the years 1903–1907, and subsequent to the 1907 fishery there was an interval of seventeen unprofitable years terminated by the pearl fishery of 1925. So that in the period of thirty-four years since 1891 there have been only six fisheries. There can be no doubt that the pearl fisheries have loomed unduly large in the eyes of the public, and indeed of Government, and it comes as a mild shock to discover that there have been only thirty-nine fisheries since the beginning of the nineteenth century¹ and that the gross annual value of the pearl fisheries during that period has been only about Rs. 160,000.

¹ Omitting three small fisheries in 1815, 1816, and 1820 which were negligible.

Historical.—The history of the pearl fisheries has been presented by various writers, and more has been written on this subject during the last two decades than ever before. Perhaps the best general summary is that given by the late Sir William Herdman, F.R.S., in his well-known Report of the Ceylon Pearl Fisheries¹ written some twenty years ago. In the decade 1902–1912 much was written on the question, and unusual attention was drawn to it by the fact that the Ceylon Government leased the banks to a Company in 1906. During this period the scientific operations on the banks were the subject of considerable discussion, and many of the writers were severely critical and perhaps unduly acrimonious. In this connection reference should be made to the writings of Hornell^{2, 3}, Jameson^{4, 5}, Southwell^{2, 6, 7}, and Pearson⁸.

For information regarding the purely administrative side of the pearl fisheries reference should be made to the Sessional Papers and Administration Reports published by the Ceylon Government, and no study of the question would be complete without a perusal of Sir William Twynam's "Report on the Ceylon Pearl Fisheries" of 1899 published by the Ceylon Government in 1902.

(2) PROFESSOR HERDMAN'S RECOMMENDATIONS.

Professor Herdman's Mission.—It may be of interest to summarize the scientific work which has been carried out since Professor Herdman first visited Ceylon in 1902. He was appointed by the Colonial Office on the recommendation of the Royal Society to make a full inquiry into the bionomics, natural history, and economic problems connected with the Ceylon pearl oyster. In consequence he spent the early part of 1902 in Ceylon, and in company with his assistant Mr. Hornell made a thorough examination of the problems. In this he was greatly assisted by the ripe experience of Sir William Twynam, K.C.M.G., then on the retired list, who had been Superintendent of pearl fisheries from 1862 to 1896 and also by Captain Donnan, C.M.G., who was Master Attendant and Inspector of Pearl Banks from 1863 to 1902, and who was on the eve of retirement. Professor Herdman was indeed fortunate in having the unrivalled experience of these two gentlemen at his disposal, a circumstance of which he took the fullest advantage. On Professor Herdman's return to England Mr. Hornell was left in charge of the investigations under Professor Herdman's guidance and advice. Herdman and Hornell were closely associated with the work which was carried out in the three following years and the results of their investigations, together with numerous faunistic reports by specialists, are to be found in the five volumes published by the Royal Society to which reference has already been made.

Principal Causes of Mortality.—In the final volume Herdman summed up the position and concluded that the principal causes of mortality of the pearl oyster were—

- (1) Silting sand.
- (2) Predacious fish.
- (3) Overcrowding.
- (4) Overfishing.
- (5) Various other causes such as disease and attacks of invertebrates.

Herdman's Recommendations.—In order to counteract these various adverse influences and also as a means of increasing our knowledge of the bionomics of the pearl oyster, Professor Herdman made various recommendations of which the most important are given below :—

- (i.) The use of the dredge in inspection work.
- (ii.) Provision of a modern steam trawler.
- (iii.) The regular inspections of the paars by divers to be augmented by the use of the dredge over the whole pearl bank area.
- (iv.) The transplantation of young oysters from unfavourable grounds and from overcrowded beds.
- (v.) "Cultching" to be carried out on the sandy areas adjoining the paars.
- (vi.) Drift bottle experiments to be made in order to determine the direction of the surface drift of water.
- (vii.) The appointment of a Marine Biologist who should investigate the pearl oyster fisheries and the food fisheries of Ceylon.

Silting Sand : Importance of Silting Sand.—In enumerating the adverse influences at work on the pearl banks Professor Herdman placed the effects of silting sand at the head of the list and wrote as follows :—

"The most important agent in causing widespread death of pearl oysters—both young and old—in the Gulf of Mannar is the shifting sand due to the strong currents prevalent during the south-west monsoon and no doubt occasionally (but rarely) to exceptional storms".

¹ W. A. Herdman (1903–1906) : *Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Mannar*. Five Volumes. Published by the Royal Society.

² J. Hornell, T. Southwell, and J. C. Kerkham (1905–1911) : *Reports from the Marine Biological Laboratory, Parts I.–VI.* Published by the Ceylon Government.

³ J. Hornell (1914) : "An explanation of the irregularity, cyclic character of the Pearl Fisheries of the Gulf of Mannar" (*Madras Fisheries Bulletin*, No. 8).

⁴ H. L. Jameson (1912) : "An examination of the causes which have led to the failure of the biological work recently undertaken on the Ceylon pearl fisheries" (*Journal Economic Biology*, Vol. VII., p. 10).

⁵ H. L. Jameson (December, 1913) : "Some further remarks on the scientific work on the Ceylon pearl banks" (*Journal Economic Biology*, Vol. VIII., p. 241).

⁶ T. Southwell (February, 1913) : "A brief review of the scientific work done on the Ceylon pearl banks since the year 1902" (*Journal Economic Biology*, Vol. VIII., p. 22).

⁷ T. Southwell (October, 1913) : "Remarks on Dr. Pearson's review of the scientific work done on the Ceylon pearl banks from 1902–1902" (*Spolia Zeylanica*, Vol. IX., p. 124).

⁸ J. Pearson (January 1913) : "A review of the scientific work on the Ceylon pearl banks from 1902–1912" (*Spolia Zeylanica*, Vol. VIII., p. 205).

⁹ Report on the Pearl Oyster Fisheries of the Gulf of Mannar, Part V., p. 120.

Moreover, in discussing the pearl fishery of 1904, the same writer attributed to sand disturbances the great decrease in oysters in the previous two years. To quote his words—

"Sand disturbances did the greatest harm upon the South-West Cheval as this area has but few stretches of exposed rock surface, while "Cultch" is not sufficiently abundant. When first seen by Captain Donnan in 1900 the whole area was thickly spread with oysters on the sand as well as on the rock and on the cultch-strewn areas. With every recurrent period of stormy weather since that time these oysters have suffered thinning by encroachment and overwash of sand, till eventually they were cleared from off the sandy uncultched areas and only those were left that lay on rocky ground and on sufficiently cultch covered bottom¹."

It may be said at the outset that we agree with this opinion of the harmful effects of silting sand, but it is worthy of note that the older observers did not view the matter in this light. Steuart, for example, in his account of the "Pearl Fisheries of Ceylon" published in 1843 stated that—

"there appeared to be no reason to believe that the oysters were subject to be covered with drifting sand."

Moreover, in dealing with the enemies of the pearl oyster in his "Report on the Ceylon Pearl Fisheries" Sir William Twynam merely mentioned in passing the possibility of drifting sand being a source of danger.

This view received support in more recent years from Mr. Southwell who expressed the opinion that—

"the loss of beds of oysters in past years was probably never due to silting over by sand²."

Causes of Sand Movements.—Sand movements may be caused in various ways, of which the following merit special notice:—

(1) Sand in suspension being gradually deposited (silting)—

- (a) The sand in suspension being caused by water disturbances such as are experienced on the shallow pearl banks during the south-west monsoon.
- (b) The sand in suspension being caused by shoals of rays burrowing in the sand in search of food.

(2) Sand being bodily moved as the result of very strong currents.

It is difficult to say to what extent there is bodily movement of sand in large quantities due to strong currents. It has to be recognized that strong currents, if present, might do additional damage by tearing the oysters from their moorings and sweeping them away. We can hardly believe that such strong currents occur on the Ceylon pearl banks except under abnormal conditions. Sir William Twynam who believed that such currents existed wrote:—

"It is generally admitted that banks of oysters are often injuriously affected by currents which at times either carry away the oysters (old and young) or cover the banks with sand thus destroying them."

In their discussion on bottom currents, Messrs. Southwell and Kerkham apparently assumed that the chief danger of a bottom current to a bed of oysters was that the oysters would be swept away, and it would appear that they ignored the more probable explanation suggested by Herdman, that any movement of the bottom layers of water was dangerous in as much as silting might be caused.

Southwell and Kerkham on Currents.—Southwell and Kerkham³ wrote an interesting paper on currents on the pearl banks. They were of opinion that there were no bottom currents, and therefore no movements of sand due to such currents. In the course of the discussion they expressed the following opinion—

"It might be argued that on a shallow water plateau, such as the one under lease, any degree of surface current must of necessity produce a bottom current. This is most likely true, but as we have already pointed out no surface current exists on the banks."

But this reference to their previous statement is misleading. What was actually stated in their discussion on currents was—

"The only surface movements in this part of the plateau [the pearl banks] are entirely dependent on the wind. Except in very strong and prolonged south-west monsoon no real current exists."

It is clear that the "real current" referred to is the "oceanic current" which operates in the southern portion of the Gulf of Mannar, and which rarely, if ever, penetrates so far north as the pearl banks.

There is, however, a definite surface drift over the pearl banks area due to the wind, as Mr. Southwell himself has taken great pains to demonstrate, and this surface movement has been clearly established by our own experiments. It matters not for the purpose of the present argument whether the surface movement is "oceanic" or merely due to the action of the wind. The presence of a surface movement of any kind invalidates Southwell's contention that as there is no surface current there can be no bottom current.

Southwell and Kerkham contended that there was no longitudinal motion of the bottom layers of water, and based their conclusions upon three series of observations. Experiments were made with a piece of apparatus which was too faulty to be treated seriously, and they themselves admitted that the results of these experiments were "of too crude a nature to count for anything." Their second ground for adopting this view was based upon the scanty information obtained from the divers. But the main reason for their opinion was founded upon the observation made by Captain Kerkham himself on the numerous occasions when he descended in diving dress. It is significant, however, that none of these descents were made in the height of the south-west monsoon, when the banks are swept by strong

¹ *Ibid.* Part III., p. 25.

² Ceylon Marine Biological Reports, Part VI., p. 3.

³ Ceylon Marine Biological Reports. Report No. 20, p. 231.

winds and the water is in a continual state of disturbance¹. Whether even in the roughest weather the water six fathoms below the surface is affected in any considerable degree by the action of the wind is a doubtful point, but that some serious disturbance of the bottom layers does take place during the south-west monsoon was actually admitted by Southwell and Kerkham when they stated that—

“ At such a time [late in October, before the south-west monsoon has subsided] the bottom layer of water is turbid. The cause of this turbidity has been microscopically examined, and has been repeatedly proved to be due to the disintegrated remains of seaweed and caulerpas. The turbidity renders it almost impossible for divers to see, but it subsides as the north-east monsoon begins.”

They admitted, moreover, that the sandy bottom becomes ridged during the south-west monsoon. This ridging is caused, they asserted, by the action of surface agitation, which is transmitted as a vertical and not as a horizontal movement. This evidence may quite well be claimed by Herdman as support for his case. It seems clear that any movement, be it horizontal or vertical, which can produce well-defined ridges of sand may possibly be sufficient to cause silting. It is still more likely that movements of water, which are sufficient to disintegrate seaweed growing on the bottom to such an extent as to make it difficult for the divers to see are quite enough to disturb the sand and produce silting.

It is obvious, then, that Southwell's and Kerkham's opinion that there are no bottom currents, even if true, does not dispose of Herdman's suggestion that silting of sand takes place to such an extent as to be an important cause of mortality. So long as there is movement in the bottom layers of water, whether caused by a definite current or by the transmission of the surface waves, silting is a potential danger.

We have been more fortunate than Mr. Southwell in being able to test the movement of water on the pearl banks with Ekman current meters. Many tests have been made from an anchored ship on the pearl banks, all of which go to show the presence of a movement of water on the bottom. This is invariably less than the surface movement but even in the fine weather of March and April when our current observations were made, a bottom current with a velocity of 25 cm/s. has been recorded. There is no reason to doubt that in the height of the south-west monsoon the movement of the bottom layers may be as much as 50 cm/s. or even 100 cm/s. (50 cm/s.=1 nautical mile per hour).

During inspections, particularly in November, divers frequently complain of the difficulty of remaining on the bottom owing to the strong currents, and during the 1925 Fishery we had similar complaints from the divers during bad weather. Mr. Thomas, in his Report on the Pearl Banks and Fisheries of Tuticorin stated that—

“ The divers complain of the bottom being at times so clouded with sand for a depth of a fathom that they cannot see. They also complained of a to and fro wash that carries them to and fro past any shells they wish to reach.”

On the other hand Kelaart stated with regard to the Ceylon pearl banks that—

“ The divers report that there is scarcely any ground current on the banks.”

Our own experience of the pearl banks leads us to believe that on the whole the distribution of sand is more or less constant, though remarkable variations from the normal occur from time to time. It has been pointed out in another part of this report how the East Cheval Paar is covered with sand to an abnormal extent at the present time and the disastrous and amazing disappearance of twenty-five million large oysters on the South-West Cheval in the short space of six weeks during the 1925 Fishery was, in our opinion, due to sand.

We are in entire agreement with Professor Herdman's opinion of the importance of silting sand in relation to the pearl oyster, and disagree with Southwell's views on the subject, and also with the line of reasoning followed by him in arriving at his conclusions. We are not prepared to say, however, that silting sand is more detrimental to the welfare of the pearl oyster than predacious fishes, as there does not appear to be sufficient evidence to justify a definite expression of opinion on this point.

From observations recently made by the Assistant Marine Biologist, Mr. Malpas, and the Marine Superintendent, Commander Kerkham, it would appear that silting may be produced occasionally by the action of predacious fishes.

Sand Disturbances caused by Rays.—During the inspection of November, 1924, a large patch of water was observed to have a distinct muddy colour due to sand in suspension. At the same time a large shoal of rays was seen and there appeared to be no doubt that the discolouration of the water was due to the rays having disturbed the sandy bottom in search of food. It is obvious that only a very considerable disturbance of sand could have caused this discolouration of the surface waters at a place where the soundings recorded seven fathoms. It is easily understood that considerable silting would result when the suspended matter had again sunk to the bottom and any oysters in the vicinity would be completely covered. It should be pointed out that this phenomenon was witnessed a dozen miles from shore, and there could be no question of the discolouration having been caused by a river in flood, particularly as there was no heavy rain at the time.

It must be confessed that such a cause of sand disturbance on a large scale had never occurred to us or to any previous observers, and new light is thus shed upon the causes of silting. It should be stated, however, that no such phenomenon had been observed previously by any members of the marine staff of this Department many of whom have worked on the pearl banks for many years, and it may be questioned whether the occurrence is sufficiently common to rank as an important factor in silting.

Transplantation of Oysters.—Professor Herdman's remedy for the menace of silting sand was two-fold. He advocated the transplantation of oysters from sand to the rocky paars, and, further, he recommended that the sandy areas should be “cultched” so as to make them suitable for the healthy growth of pearl oysters.

Two-fold Value of Transplantation.—Transplantation was not only recommended for cases in which a spatfall took place on unsuitable ground but also when oysters on good ground were overcrowded. Hornell transplanted a batch of ten million oysters but no subsequent report indicated

¹ Dress diving is impossible during the south-west monsoon owing to bad weather, but this is the period of the year when silting will take place, if ever.

whether the experiment was a success or a failure, though we have reason to believe that it was a failure. Southwell also transplanted nine million oysters but they all died in the following year. We have transplanted oysters on various occasions, and so far as could be ascertained no permanent benefit resulted from these operations. It is true that in 1921 about one million young oysters were transplanted from the Periya Paar to the Alanturai Paar, which at the time was completely barren, and that in the following year an extensive spatfall occurred on the latter paar, but subsequently all the oysters disappeared.

Objections to Transplantation.—Theoretically the proposal regarding transplantation has much to commend it. This is particularly true of the Periya Paar where frequently there are enormous deposits of young oysters, which never reach a fishable age. Moreover, the pearl oyster seems hardy enough and apparently bears the ordeal of transplantation quite well. But the process would have to be carried out on a much more extensive scale than appears practicable in order to ensure definite beneficial results. Transplantation is generally effected by the use of the few divers engaged in inspection work, supplemented by the use of the dredge. Dredging for spat is quite successful when the spatfall is a heavy one over a considerable area, but in the case of half-grown oysters, which generally do not have a continuous distribution, the use of the dredge can hardly be said to be a success.

Mr. Hornell has changed his opinion of the value of the transplantation since he first advocated it over twenty years ago. Writing last year he expressed the following opinion:—

"It has also been suggested that when pearl oysters are overcrowded measures should be taken to reduce their numbers by dredging, trawling and other means. I have myself advocated such operations. With riper experience I have come to the conclusion that the heavy expenditure that these means necessitate are not justifiable from a financial standpoint. 'The game is not worth the candle' in view of the uncertainty of reaping any results. There would also be much practical difficulty in carrying out the operations in a way that would not cause as much or more damage than any benefit to accrue . . . so long as our local pearl oyster can never be counted on with reasonable certainty to live to fishable age or until fishing actually begins, the risk is too great to warrant heavy expenditure upon thinning out and transplanting.¹"

We are inclined to Mr. Hornell's view of the problem though we do not think that the present state of our knowledge of pearl fishery problems justifies our relinquishing this means of oyster culture without further trials.

Cultching: Object of Cultching.—The second remedy which has been proposed to counteract the menace of silting sand is that of "cultching." This term has been applied to the process of laying down an artificial deposit consisting of fragments of rock, dead coral, rubble, and other hard substances on the bottom of the sea so as to provide means of attachment for young oysters in places where the bottom is unsuitable owing to the presence of sand.

Herdman obtained this idea from Arcachon in France where the edible oyster is cultivated in shallow backwaters of the sea which are laid bare twice a day by the ebbing tide. Whitewashed tiles are laid down in these backwaters, and the young oysters attach themselves to the tiles and can be farmed and controlled as easily as a field of grain.

It will be readily seen that the conditions at Arcachon are very different from those obtaining on the Ceylon pearl banks where the oysters lie in five to ten fathoms of water several miles from the coast and where there are hundreds of square miles of potential paar ground. In view of the fundamental differences in the natural conditions it is strange that Herdman and Hornell should have attempted to apply these methods to the cultivation of the Ceylon pearl oysters. When the banks were leased to the Ceylon Company of Pearl Fishers in 1906, the Company was required by Government to lay down no less than 500 tons of cultch each year, as a definite outcome of Herdman's cultching recommendations, a stipulation which Government were induced to forego at a later period in the lease. It is regrettable that so much time, energy, and money were expended on an enterprise which, in our opinion, had no practical value.

Cultching impracticable in Ceylon.—We are of opinion that cultching on the Ceylon pearl banks is impracticable. As Southwell pointed out, the cost of cultching even one square mile of the banks would be colossal, and it would be unthinkable to attempt the process over the many square miles of sand on the pearl banks area.

This was undoubtedly the weakest portion of Professor Herdman's report, and it showed an amazing inability to appreciate the essential features of the problems connected with the bionomics of the pearl oyster.

Predacious Fishes: Rays are harmful to Oysters; Impossible to exterminate Rays.—Most investigators of the pearl oyster are agreed on the importance of the rôle played by predacious fishes in the natural economy of the oyster. Indeed it is doubtful whether this should not be regarded as the chief inimical factor. Many marine animals such as starfishes², boring sponges, boring molluscs, and filefishes attack the pearl oyster, but the principal enemies are, without doubt, the large rays which frequent the banks in "shoals" and which are harmful to spat and large oysters alike. We have frequently seen shoals of rays on the pearl banks, and on many occasions the divers have reported large patches of broken shells on the bottom, and, most convincing of all, the stomach contents of rays caught on the pearl banks frequently consist of fragments of pearl oysters. It is natural to suppose that the number of predatory fishes will increase with the number of oysters on the banks, but such a state of things is not easy to prove. In discussing the 1902-1907 period, Hornell stated that—

"The fish population on the banks increased annually in numbers and destructiveness till the end of 1907, they became so numerous that they were able to eat up the whole of the great beds of young oysters then present on the Periya Paar."

¹ Hornell: Madras Fisheries Bulletin, Vol. XVII., p. 206.

² In our opinion the common starfish of the pearl banks area, *Pentaceros lincki*, is not a serious enemy of the pearl oyster. The starfishes usually occur on sand while the pearl oysters natural habitat is on rock. Although we have dredged many thousands of starfishes we have never seen one attacking a pearl oyster, and Mr. Hornell's photograph given on page 107 of Herdman's Report (Vol. I.) depicting a starfish lying on a pearl oyster records what must be regarded as a very rare incident.

This agrees in the main with our own impressions but reliable evidence on this point could only be obtained by intensive trawling on the banks. This is impossible for two reasons. Trawling would damage the oyster beds, and, in the short period of the year when the weather is sufficiently reliable to permit of intensive work, most of our time has to be spent on inspection work by means of divers and dredges. But we have published from time to time the records of our trawling operations on the pearl banks area and have also recorded the kinds of fish captured and their stomach contents. It is hardly likely that Mr. Hornell had greater facilities in this respect than ourselves, as his investigations synchronized with the period of the five record fisheries when his time must have been fully occupied with more pressing duties. In none of his published work does he give detailed records of fish captures and examinations of their stomach contents. This statement of Mr. Hornell's may be regarded, therefore, as merely an expression of opinion which, as we have said, agrees with our general impression of things, though in our case we are not prepared to make a definite statement on the subject. Obviously in the interests of the pearl oyster these shoals of rays should be exterminated. But Herdman pointed out that the rays are a necessary link in the life history of the cestode which is supposed to form the nucleus of the Ceylon pearl and he invited our attention to the interesting theoretical problem involved. If we exterminate the rays we do away with the source from which spring the cestode larvae which form the nuclei of the pearls. On the other hand if we permit the rays to increase and flourish they will devour millions of oysters each of which is a potential pearl producer. No rays, no pearls; abundance of rays, no oysters; which is it to be? Fortunately, for the peace of mind of marine biologists, we are not called upon to make any momentous decision on this question as the problem does not arise in actual practice. The pearl bank area is so large that it would be impossible to exterminate, or even decimate, the rays without prodigious expense. Like most other problems of the pearl oyster we are forced to leave the issue to Nature. Some years ago Dr. Lyster Jameson charged Professor Herdman and his successors with having refrained from a campaign of extermination of predatory fishes because of their importance in the life cycle of the pearl inducing parasite. No such course has ever been followed and Dr. Jameson mistook the raising of a point of academic interest by Professor Herdman for a definite statement of policy. In brief, then, the rays and other fishes are a very serious menace to large beds of pearl oysters of all ages, but nothing of any permanent value can be done to frustrate their destructive course.

Overfishing.—Professor Herdman regarded overfishing as a possible danger though it is significant that in his final recommendations no provision was made against such a practice and no suggestions were offered by him. It would appear to be the general opinion of the public of Ceylon that the failure of the Ceylon Company of Pearl Fishers was mainly due to the drastic policy of overfishing pursued by them and the long barren period which followed the 1907 Fishery has been attributed to this policy.

Misconceptions regarding Overfishing.—So recently as January, 1925, this opinion was expressed in a speech in the Legislative Council as follows—

“The Company paid no attention whatever to the pearl banks. They tried to get as much as possible out of them and scraped the spat and subsequently sold out. I do not know whether the spat were scraped out by machinery, but the banks remained unfertile for several years¹.”

A similar ignorance of the true circumstances was shown in the thirties of last century when the newspapers of the Colony charged the administration of Sir Robert Wilmot Horton with having “caused the pearl banks to be overfished, scraped, and ruined.” Mr. James Steuart refuted this charge in very plain terms and showed that far from this having been the case—

“Many beds of oysters have died off in the course of nature, some from having been left too long in the hope of obtaining the greater quantity of pearl from them².”

It is clearly established from the records of the Ceylon Company of Pearl Fishers that overfishing did not take place nor did they “scrape the spat,” whatever that may mean. It is on record that a compact bed of mature oysters, numbering about four millions, was found on the Krusadi Paar six months after the Company's last fishery in 1907, and again, in March, 1908, a substantial bed of five-year old oysters was found near the Kondatchi Paar, unfortunately too late in the season to be fished. These two beds of oysters constituted breeding reserves of sufficient size to satisfy the most exacting critic, and from our knowledge of the banks we feel certain that other undiscovered stocks must have been present.

Overfishing Improbable.—Overfishing may refer to two distinct things. The term may be applied to operations conducted in an area containing only fishable oysters, with the object of collecting all available oysters without any regard to the advisability of leaving “breeding reserves.” On the other hand overfishing may have reference to the indiscriminate fishing of oysters of all ages. In our opinion it is impossible to overfish the pearl banks so as to leave no oyster reserve, and the recent fishery has served to strengthen this conviction which has been held for many years. The methods of fishing by skin divers render it very improbable that all oysters on a given area could be brought up. This is particularly true of the Tamil divers who generally refuse to dive after their catch has been reduced to less than seven oysters each dive. The truth of this was forced upon us times without number during the recent fishery. Frequently we had the experience of an Arab boat and a Tamil boat fishing within a few feet of each other. The Tamil divers would complain loudly and bitterly that there were no oysters and would move away to a new place, while, on the other hand, the Arabs would continue to dive in the same place though bringing up small numbers. As the majority of our divers were Tamils there could be no question of drastic overfishing, and there would appear to be no reason for establishing special breeding reserves so long as such conditions exist. The inadequacy of the present methods makes it practically certain that natural breeding reserves survive on all the banks which have been fished.

¹ Debates in the Legislative Council of Ceylon Session of 1925, No. 2, p. 47.

² James Steuart: “An account of the Pearl Fisheries of Ceylon, p. 25. 1843.”

On the question of overfishing Sir William Twynam expressed himself as follows :—

“ I do not concur in the least with those who cry out that the banks are or have been over-fished, and consequently that no oysters have been left to breed and replenish the banks. The divers do not and cannot clear away all the oysters on a bank at a fishery. There are many left scattered over a bank, and if oysters breed as the naturalist says they do there are enough left to replenish a bank.”

Moreover, the Ceylon pearl oyster is sexually mature at the age of twelve months and is extraordinarily prolific, and it may be stated definitely that so long as there are young oysters on the banks there can be no object in having breeding reserves of fishable oysters which are approaching old age.

As for the indiscriminate fishing of oysters of all ages, this, unfortunately, would appear to be inevitable in many cases. As a general rule an oyster paar contains oysters of various ages, and it is only in exceptional cases that one is fortunate enough to find a batch of oysters of one brood. Obviously the ideal plan would be to take only the fishable oysters, leaving the smaller ones for a subsequent occasion. In practice this is not feasible. The skin diver works under conditions which make it almost impossible for him to use his powers of discrimination even if he were desirous of doing so. Even on board ship it is not always easy to say at a casual glance whether a particular oyster is three or four years old. Experience has shown, too, that it is not wise to delay too long in fishing a paar. If a paar contained fifty million oysters in 1925, it is probable that under the most favourable conditions it would only contain half that number in the following year. But it may be argued that by leaving the oysters for another year the pearl yield would increase enormously. If the problem were so simple it would undoubtedly pay to postpone the fishing of the paar for one year. But there are many factors operating on the pearl banks by which the conditions of life under which the pearl oyster lives are rendered most precarious, and he would be a bold man who would decide to withhold the fishing of a bank solely on the grounds that the pearl yield in the following year would be much higher. All such considerations have to be borne in mind and carefully weighed in deciding when such a paar will reach its “ optimum ” condition¹.

The Establishment of a Department of Fisheries.—Reference has already been made to Professor Herdman's recommendations regarding transplantation and cultching. In addition he also recommended the appointment of a Marine Biologist, the provision of a modern steam trawler, and the regular inspection of the pearl banks. Effect has been given to all these recommendations.

Mr. Hornell the first Marine Biologist left the service of Government, and took employment with the newly formed Ceylon Company of Pearl Fishers, and in 1907, the Director, Colombo Museum, was appointed Marine Biologist in addition to the duties of his substantive post. When the present holder of the post was appointed in 1910, the two offices were combined under a single salary, and this arrangement has persisted to the present day. Doubtless there were good reasons for combining the two posts nearly twenty years ago. The two departments were small and their activities were restricted, and there may have been sound economical reasons for the amalgamation. In the last fifteen years, however, both departments have undergone considerable development, and the time has now come to consider whether the Colombo Museum and the Fisheries Department can profitably remain much longer under a single control. Until 1920 the fisheries section of the dual department could hardly be said to have functioned, as the Director of the Colombo Museum, with his multifarious duties, was the only trained scientist on the staff. Moreover, the activities of the fisheries side were severely restricted to the pearl fisheries at Marichchukaddi and Tamblegam. Since 1920 this section has been strengthened by the appointment of an Assistant Marine Biologist and more recently by the addition of a Second Assistant Marine Biologist, and the survey work has been placed in the hands of a trained navigator and a well equipped fisheries steamer has been provided. This equipment of material and personnel has made it possible to inaugurate a survey of the littoral waters of Ceylon, which, though still incomplete, has been signalized by results of far reaching importance. But it is significant that up to the present financial year no authority had been given, and no funds had been provided to embark upon a wide programme of fisheries research which would be in keeping with the importance and potential value of the food fisheries of the Island.

(3) THE CEYLON COMPANY OF PEARL FISHERS.

Terms of the Company's Lease.—The fisheries of 1903, 1904, and 1905 were administered by the Ceylon Government, but at the end of 1905 the Ceylon Company of Pearl Fishers obtained a lease of the pearl banks for twenty years. The fishery of 1906 was actually run by Government, but the net proceeds were handed over to the Company. The principal clauses in the agreement were as follows :—

- (a) Annual rent Rs. 310,000.
- (b) The Company to purchase Mr. Dixon's pearl-extracting apparatus for Rs. 120,000.
- (c) The Company to purchase the trawler “ Violet ” for Rs. 62,501.
- (d) The Company to spend each year not less than Rs. 50,000 or more than Rs. 150,000 on experimental and cultural work.
- (e) The Company to lay down not less than 500 tons of cultch each year.
- (f) No fishing to take place during the last three years of the lease except under specially arranged terms.

The Company commenced its career under the most happy auspices and was placed in an extremely sound financial position as the result of the lucrative fisheries of 1906 and 1907. After the latter year, however, the supply of oysters failed, and the company was obliged to terminate the lease early in 1912.

There is no published record of any scientific work done during the years 1906 and 1907. Doubtless the two fisheries which took place in these years occupied all the time of Mr. Hornell in his double rôle, but the Company were not wise in practising economy at the expense of the scientific investigations

¹ In view of what has been said it is interesting to note that at the first sale conducted during the recent fishery a European oyster merchant accused us with having fished “ immature oysters.” He had seen his first pearl oyster that day !

upon the results of which, as later events clearly showed, they believed so much to depend. The biological position was sufficiently difficult to demand the whole time and energy of Mr. Hornell without saddling him with navigating and surveying work which ought properly to have been assigned to a man of proved nautical experience, which Mr. Hornell admittedly was not. When he left the services of the Company in 1908, this defect was remedied by two appointments being made to Mr. Hornell's dual post. Mr. Southwell who had been Mr. Hornell's assistant was placed in charge of the biological work, and Captain Kerkham was made responsible for the navigation and surveying.

The results of the Southwell-Kerkham régime were naturally of a somewhat meagre nature, since those gentlemen were in the unfortunate position of holding office during a series of years when the pearl banks were barren. The most noteworthy results of this period were Southwell's work on the pearl-inducing worm, the current investigations prosecuted by Southwell and Kerkham by means of drift bottles, the compilation of a new chart of the pearl banks, and the inauguration of a new system of inspection to which Captain Kerkham refers in the present report.

The meteoric career of the Company undoubtedly attracted undue attention to the scientific application of marine biological methods to the problems of the pearl oyster, and Mr. Southwell was placed in an unenviable position. The shareholders took alarm at the "failure" of the Marine Biologist to produce a pearl fishery for their benefit, and, in their colossal ignorance of what could be achieved by the application of scientific methods to a commercial problem, the shareholders demanded something in the nature of a miracle.

Scientific Errors.—It would have been surprising if Mr. Southwell's judgment had stood the test of such trying conditions, and it was at this stage that he made two recommendations which marred his otherwise admirable work. He suggested the laying down of wire netting on the pearl banks in order to protect a spatfall from the attacks of predacious fishes, and for this purpose wire netting sufficient to cover one-sixth of a square mile was purchased for £3,500. It was obvious, as Mr. Southwell himself pointed out later, that the cost of such a means of protection, would be prohibitive, and the criticism which Mr. Southwell made against Herdman's cultching proposals may be offered with equal force regarding the wire-netting experiment.

Mr. Southwell also erected a concrete tank at Marichchukkaddi with the object of using it for breeding young oysters. To the lay mind nothing could sound more attractive than this. The pearl oyster is extraordinarily prolific: therefore, why not keep a few in captivity and later remove their numerous offspring to the pearl banks? We have too much respect for Mr. Southwell's intelligence to suggest that he put the problem before his directors in this form, but it is certain that the ingenuous shareholders in London and, if we are not mistaken, the Chairman of the Company himself had some such rosy vision of perennial supplies of young oysters from Mr. Southwell's tank at Marichchukkaddi.

There can be no doubt that the writings of Herdman, Hornell, and Southwell in the decade 1902-1912 left the impression that the problems of the Ceylon pearl fisheries, and particularly the question of establishing regular annual fisheries, could be solved by marine biological science. Herdman does not make a definite statement on the question but his reports are full of optimism and undoubtedly leave the impression of a bright future for the pearl fisheries of Ceylon. After Mr. Southwell's unfortunate experiences one might have expected him to regard the situation in a less favourable light, but it would appear that he was not sufficiently impressed by the magnitude of the task. Summing up the position at the conclusion of his labours in Ceylon he expressed the opinion that—

"Given a spatfall only thorough inspection, care and normal foresight in isolating breeding stocks, &c., are required to make the banks perennially productive."

This optimistic pronouncement was made at a time when the Ceylon Company of Pearl Fishers, to whom Mr. Southwell was Scientific Adviser, was about to become bankrupt! We prefer him in his less optimistic vein when he said in the same report—

"We thus come to agree with Steuart that in some respects the continuity of fisheries is dependent on natural events which are beyond the control of man."

In making these criticisms we do not forget the unenviable position in which Mr. Southwell found himself placed through circumstances entirely beyond his control, and the fact that these early scientific investigations coincided with the exploitation of the banks by a commercial syndicate did not lessen the difficulties of the situation.

Science and a Commercial Venture.—This statement may be liable to misconception. The Directors of the Ceylon Company of Pearl Fishers took a very liberal view of the scientific investigations, the prosecution of which they were bound to continue according to the terms of their agreement, and their attitude towards their scientific staff was distinctly sympathetic and deserving of the highest praise. The fault did not lie here, but in the fact that the shareholders, who apparently knew little or nothing of the problems at issue, put extraordinary faith in the scientific work and expected that science, with the wave of the magician's wand, would be able to produce a plentiful supply of oysters where hitherto there had been barrenness. The consequence was that when the affairs of the Company became critical, the misfortunes which were gathering fast were directly attributed to the failure of the scientific work.

The non-expert might be pardoned for taking this most amazing view of the situation when Dr. Lyster Jameson, himself a biologist and a competent authority on pearl fishing matters, discussed what he termed the "Failure of the Biological Work on Ceylon Pearl Fisheries¹." Both the title and the context of this paper showed that in Dr. Jameson's opinion the scientific work had proved a failure, although, unlike his fellow-shareholders, he did not believe that this "failure" was responsible for the misfortune which attended the Company's enterprises. In discussing the terms of agreement between Government and the Company, he said—

"The Company was pledged to pay in annual expenses on the minimum scale more than twice, and on the maximum scale about three times, the probable average return," and further on he continues—

"Applied biology had a colossal task placed before it to make up this difference, and in addition to pay dividends on a capital of £165,000."

¹ Journal of Economic Biology. Vol. VII. Part 1., February, 1912.

In concluding his paper, he wrote as follows—

“Let me say here that I do not think any scientific man who has seriously studied the pearl and mother-of-pearl fisheries question from an economic standpoint could dare to hope that a Company which started loaded with the heavy obligations which the Ceylon Company of Pearl Fishers accepted could within a few years have been made with a paying concern by biological science.”

The Company were perfectly aware of the risk they ran in taking the lease, and it is astonishing that men of acute business acumen should have taken such a sanguine view of scientific operations which had only been in progress four years as to convince themselves that the intermittent fisheries, which had characterized the banks for thousands of years, should give place so soon to yearly fisheries. If the Chairman of the Company had placed the blame for the unenviable outcome of their schemes at the doors of those business men who negotiated the lease and accepted such heavy responsibilities, instead of ascribing the failure to the scientific experts, whose greatest misfortune was that they had to conduct their operations in connection with a heavily burdened commercial enterprise, he would have placed the matter in a more reasonable light.

(4) RECENT HISTORY OF THE PEARL BANKS.

The pearl banks reverted to Government in 1912, and inspections were made by the Master Attendant and the Marine Biologist in 1913 and 1914 when the banks were found to be absolutely barren. During the war no inspections were held and the first post-war inspection was arranged for December, 1919. The trawler “Lilla” and the barque “Rangasamee Poravi” were engaged in this inspection, but no results were obtained as the “Rangasamee Poravi” was wrecked in a cyclonic storm on December 30, 1919. Commencing with the inspection of March, 1920, the trawlers “Lilla” and “Violet” were used and a promising deposit of spat was found in 1920, and this increased enormously in the following years. The subsequent history of these oysters is told in the Marine Biology Administration Reports for the years 1920–1924. The investigations carried on since the war have been restricted to the inspections, which have been supplemented by trawling and dredging operations, and to periodic hydrographical cruises in the Gulf of Mannar with the object of ascertaining the hydrographical conditions of the water in the vicinity of the pearl banks. A paper dealing with the hydrographical problems is now in course of preparation.

Dredging.—With regard to dredging operations it will be recalled that Professor Herdman recommended the use of the dredge, not only to supplement the work of the divers during the inspections but also during actual fisheries. During the 1905 fishery Mr. Hornell actually did so and he was so impressed by the results as to state that—

“Dredging is economically a more sound method of fishing than is diving.”

The late Mr. J. P. Lewis criticised this opinion in Sessional Paper XXXIII. of 1905, and in our opinion disposed of Mr. Hornell's claims. Our experience leads us to agree with Mr. Lewis, and we do not believe that dredging is either so economical or useful as the ordinary diving methods. Dredging is useful for lifting overcrowded spat for transplantation and as an accessory to the inspection work by the divers, but we cannot advocate its use during a fishery. The experience of the 1925 fishery showed that the trawlers were too busily engaged in other work to be able to take part in the actual fishing, and only on very rare occasions could dredging have been carried out for any length of time. It may be said that the “Nautilus” did a considerable amount of dredging during the fishery, but this was in the nature of necessary inspection work. By reason of the small area covered and also because of the inability of the dredge to operate on uneven ground we have generally found the dredge to be unsatisfactory and unreliable as a means of recording the presence of oysters, and we have only resorted to this method to supplement the investigations of the inspection divers. In this limited sense the dredge has proved most valuable but that is a very different matter from the excessive claims made by Mr. Hornell.

On more than one occasion it has been suggested that the present method of skin diving should give place to dress diving. We have gone into this matter very carefully, and Commander Kerkham has discussed the question in the present report. There appears to be no reason to believe that dress diving would be more efficient and more economical than the present system. It is true that dress divers are used in the mother-of-pearl oyster fisheries in various parts of the Indo-Pacific region, but only because the oysters are found in depths too great for the skin diver.

A Forecast.—It has even been suggested that some form of submarine vessel should be used for fishing the banks. In his “Report on the Ceylon Pearl Fisheries” already mentioned, Sir William Twynam wrote as follows in 1899—

“The day may perhaps come when the dreams of ‘Jules Verne’ in his 20,000 leagues under the sea may be realized, when the Superintendent and Inspector may be able to descend to the banks in a cigar-shaped vessel and walk over them with barrels of compressed air on their heads, accompanied by divers similarly equipped, who, instead of remaining down for at most a minute, may be able to remain down all day picking up oysters and loading them in the above cigar-shaped vessel to be taken to the kottus.”

Such a pronouncement may have been regarded as an extravagant flight of the imagination when it was written over twenty-five years ago, but it has proved to be an accurate conception of a method which may possibly be tried in the near future. It is doubtful, however, whether such methods will ever replace the practice of skin diving which has persisted unchanged for thousands of years.

Obsolete Methods: New Proposals.—When brought into intimate contact with the administration of a Ceylon pearl fishery one is immediately struck by the extraordinary simplicity of the methods in use, methods which apparently have changed but little since they were first conceived several thousands of years ago, and it is not unnatural to regard the present antiquated system as uneconomical, inefficient and unsatisfactory. Doubtless there have been many attempts to alter this condition of things, and

during the short tenure of the Ceylon Company of Pearl Fishers a few innovations, notably the bagging of oysters, were effected. But no serious attempt appears to have been made to initiate any fundamental changes in the conduct of the fishery. A proposal of such a nature was made to Government by the Marine Biologist in May, 1915, and again in September, 1919. Briefly, the proposal was to discontinue the sale of oysters at Marichchukkaddi and, instead, to retain the oysters, wash them and dispose of the pearls at the most favourable time in the Paris, London, and Bombay markets. Under such a scheme the diver's share would be bought by Government. The proposals were not favoured by Government in 1915, but on the second attempt the Colonial Treasurer, Mr. Bernard Senior, C.M.G., I.S.O., declared himself in favour of the scheme, and Government agreed to make a trial when a favourable opportunity next presented itself. Not the least important consideration in favour of such a scheme would be the reduction effected in the size of the camp as only those people would be allowed into the camp who would be actually engaged in the fishing and oyster-washing operations, together with their camp followers. Thus, the cost of policing and administering the camp would be considerably reduced. The proposal was chiefly based on the assumption that the merchants who purchase oysters at a fishery make a substantial profit on the transaction and a case from our own experience lends support to this view. A sample of pearls taken from 10,000 oysters of Twynam's Paar in February, 1925, was valued by professional pearl merchants at Rs. 375, and based upon the average price obtained at the 1925 Fishery, these oysters would have actually realized Rs. 440 if they had been sold by auction. Yet this sample of pearls was sold to a professional pearl merchant during the fishery for Rs. 1,000. Merchants are always willing to sell their pearls in the camp, and one has found by experience that pearls could be brought more cheaply in Marichchukkaddi than elsewhere, but at a price which obviously brought a profit to the merchant. We quote a case known to us. Pearls to the value of Rs. 3,300 were bought at the 1925 Fishery, and were valued by a leading expert in London at £600 three months later.

On the contrary, Mr. B. Horsburgh, C.M.G., formerly Controller of Revenue, who was strongly opposed to these proposals, maintained that Government made more money by selling the oysters than they could do by retaining the oysters and selling the pearls. Coming from one whose knowledge of the pearl fisheries is unequalled, this expression of opinion is entitled to considerable respect, but neither Mr. Horsburgh nor any one else can speak with certainty on this question as it is obviously impossible to ascertain what profit, if any, is made by the big buyers of pearl oysters at a fishery. Mr. Horsburgh's pronouncement may be regarded as an expression of opinion and nothing more.

Definite information on this question is desired, and it is precisely for this reason that the proposals of the Marine Biologist were formulated. Perhaps the most satisfactory experiment would be to allow half the oysters to be disposed of in the usual way, and the other half to be retained by Government and thus a fair comparison could be made. The recent fishery was not regarded as a favourable opportunity for such an experiment as none of the officers engaged had had previous experience of a fishery.

Mr. Horsburgh also criticised the proposal on the ground that it was a violation of an established principle for Government to engage in commercial enterprises, and that, moreover, such a departure was hardly consonant with the dignity of the Government. This objection can have little weight as Government already exploits the pearl banks entirely from a commercial point of view and is already in fact a purveyor of pearl oysters. To become a pearl merchant would not be any less "dignified."

It is true that there may be good reasons against a Government's launching into commercial activities of this kind, and in the case under discussion there would appear to be many difficulties. We do not know, for example, how far Government would be able to carry out successfully on a large scale the business of washing the oysters for pearls. In the matter of disposing of the pearls, Government could hardly depend upon advice from the Crown Agents who have no expert knowledge of the pearl market, though, doubtless, they would have no difficulty in finding an Agent. But this multiplicity of Agents, each of whom would exact his commission, would tend to defeat the object of the proposal which after all is simply to eliminate the middlemen. The venture may prove more troublesome and less profitable than adherence to the present system, but an experiment should be made and the proposal should be given a fair trial.

Main Object of the Scientific Investigations.—The main object of the scientific investigations of the last two decades has been to find a remedy for the intermittent and uncertain nature of the Ceylon pearl fisheries. This object has not been achieved and, unhappily, there appears to be no greater hope of success in the future. It may be stated definitely that we do not regard the situation as comparable to those instances in which marine cultivation has been practised with some measure of success, and consequently we are not surprised that the efforts of our predecessors to follow "cultural" methods were abortive and fruitless. From a general consideration of all circumstances we are forced to the conclusion that the pearl banks are, with its hundreds of square miles of deep water, with its lack of protection from the violence of the south-west monsoon, and with a complete lack of a suitable place in which to establish an oyster "nursery," cannot be brought under human control.

We may be charged with being wise after the event, which is true enough. It has been our lot and good fortune to follow a notable period of intensive work, and thus it has fallen to us to weigh the situation and to give a plain and unbiassed opinion of this work.

The Ceylon Pearl Fishery cannot be controlled.—Ever since we came into personal contact with the problems of the Ceylon pearl fisheries some fifteen years ago we have been sceptical of the undue optimism evinced by our predecessors. This feeling has increased with added experience, and we are of opinion that the conditions on the Ceylon pearl banks are such that culture work and all efforts to control the pearl oyster are doomed to failure. In particular, we do not believe that there is a solution to the unfortunate circumstances which characterize the Ceylon pearl fisheries and which render them so precarious and uncertain. Great advances in our knowledge of the biology of the coastal waters in general and of the pearl banks in particular have been made, and we should be ungenerous were we not to put on record our indebtedness to our predecessors in this respect. Their work, however, was disappointing in so far as it affected the main problem, not so much because they failed to achieve their end but because their writings, particularly those of Mr. Southwell, betrayed an optimism which was not justified by the circumstances.

(5) PEARL OYSTER CULTIVATION.

In referring to the possibility of controlling and cultivating the Ceylon pearl oyster, Messrs. Herdman, Hornell, and Southwell had in mind the methods practised in France and Holland with regard to the edible oyster. In discussing these methods Mr. Southwell said—

“It is quite reasonable to believe that scientific culture will be as successful here—if not more so—as at other places.”

and also—

“It is only *then* [when the ecology of the pearl oyster is understood] that a perfected system of culture can be adopted which will place the industry on a sound commercial basis. This has been done in other parts of the world, and I have no doubt that it will be done in Ceylon.”

Object of Oyster Culture.—The object of oyster cultivation is to remove young spat from the influence of their natural enemies until they have passed the most critical stage of their existence, and then to return them to their natural element in a healthy condition. Obviously the degree of efficiency of pearl oyster cultivation would be in direct proportion to the length of time during which the oysters could be afforded adequate protection.

Three things are essential in oyster cultivation :—

- (a) Provision of a suitable environment which allows the oysters to live healthily.
- (b) Adequate protection against the natural enemies of the oyster.
- (c) Accessibility so as to ensure constant supervision throughout the year.

Let us examine the proposal to cultivate pearl oysters in Ceylon in the light of our knowledge of the local conditions.

Objection and Difficulties.—The first requirement would be to find a suitable oyster “park” or “nursery.” This would have to be protected from the rough weather of the south-west monsoon and would need to be accessible at all times of the year. The only place fulfilling these conditions near the pearl banks is Portugal Bay, but the water is too shallow, and consequently too warm, and we cannot believe that the delicate oyster spat would survive these trying conditions, and still less can it be conceded that there would be the remotest chance of the oysters surviving to the end of their first year. If, for the sake of argument, it were admitted that oysters could be cultivated in Portugal Bay up to the end of their first year they would then have to be removed to the pearl banks for lack of any other suitable place. This would be attended by almost certain failure, as a twelve months’ old oyster would be a ready prey of *Balistes* and the numerous rays which abound. To be effective the cultivation of the spat would require to be followed by adequate protection of the half-grown oysters after transplantation, and we know of no means of ensuring such protection on a reasonably large scale. Further, we have found that at no stage in its life history does the pearl oyster achieve immunity to the attacks of fishes and the devastating effects of silting sand. Any scheme of cultivation, protection and supervision would have to provide for a period of four or five years until the oyster was “fishable.” There is no marine organism known to us which is so liable to extermination on a gigantic scale as the pearl oyster. Most animals enjoy a degree of immunity when they have achieved full growth, but not so the pearl oyster. In the literature of the subject there are many records of the extermination of full-grown fishable oysters by the million in the short space of a few weeks, and in the present report it is pointed out how a compact bed of twenty-seven million fishable oysters surveyed in February, 1925, was reduced to one-and-a-half millions in six weeks. The following table, compiled from our own observations, clearly shows the appalling mortality of pearl oysters :—

Table showing the Mortality of Pearl Oysters.

	True Venkalai Paar (Millions).	Periya Paar Karai (Millions).	West Cheval Paar (Millions).	Twynam's Paar (Millions).
1922 (2nd year)	.. 4,600	.. 346	.. 6,900	} not examined
1923 (3rd year)	.. 5½	.. 21	.. 88	
1924 (3rd and 4th year)	.. —	.. 10	.. 109	
February, 1925 (3rd, 4th, and 5th year)	.. —	.. 1½	.. 70	13½
Pearl Fishery, 1925 (3rd, 4th, and 5th year)	.. —	.. 1½	.. 11½	2½

It will be seen that it is not only young oysters which suffer, and it should be emphasized that successful pearl oyster cultivation must take cognizance of these facts. Pearl oyster culture would be valueless if it were concerned only with rearing large quantities of spat and turning them into the sea at an early age.

An attempt has been made to show that mortality amongst pearl oysters is very high even when they reach a fishable age, and that any system of cultivation and protection must deal with half-grown and full-grown oysters if it is to be effective. It may be stated that such a programme of oyster culture is not practicable in Ceylon, first, because the local conditions are unfavourable, and also because the cost of such a scheme, even if feasible, would be prohibitive. Mr. Hornell who was formerly a keen advocate of pearl oyster culture is now of a different opinion, and only a year ago wrote as follows :—

“Cultural operations on the banks are so uncertain in their results and entail such heavy expenditure . . . that it pays better to restrict attention to inspection and to let nature have a free hand.”

(6) ENEMIES OF THE PEARL OYSTER.

The following enemies and inimical influences have been stated to affect the pearl oyster :—

- | | |
|----------------------------|-------------------------|
| (1) Predacious fishes. | (5) Sand. |
| (2) Various invertebrates. | (6) Strong currents. |
| (3) Sea snakes. | (7) Fresh water floods. |
| (4) Disease. | (8) Weed. |

Most of these have been discussed elsewhere in this report.

Sea Snakes.—In Sir William Twynam's Report we find the following reference to sea snakes :—

"Sea snakes, of which there are several species on the pearl banks, some of comparatively large size, are supposed by the divers and others to prey on the oysters ; but I have seen no positive evidence of this except that one of the European divers related a wonderful story of having seen the sea snakes darting their tongues into the oysters as he drifted over the bank, and on two occasions said he actually saw the snakes eating the oysters. He also said he saw the trigger fish making the round holes above referred to on the shell of the oyster. These and some other wonderful stories had to be swallowed with a very strong pinch of salt.

"The native idea is that snakes prey on the oysters. If the European diver is to be believed, he actually saw the snakes eating the oysters as reported by him on two occasions, and saw them darting their tongues into the oysters when lying with the valves open. There is no mention made of snakes in Mr. Thomas's report. There are several varieties on the Ceylon banks, and they are seen on the surface in numbers in March. Some of them are of large size and have powerful jaws and teeth. Some are very venomous¹."

We may dismiss this as being most unlikely. We do not believe that sea snakes attack oysters.

Fresh Water Floods.—Sir William Twynam was convinced that floods of fresh water discharged by rivers are a great danger to the oyster beds and stated that such was the opinion of the divers. He discussed this question at length in his report. Captain Donnan did not agree with him, and Mr. Thomas, who reported on the Tuticorin banks, did not think that floods exercised any influence on the oysters. Our personal opinion is strongly against that of Sir William Twynam. We do not consider that the pearl banks suffer from inundations of fresh water. From our observations on the influence of flood water in the sea at the mouth of the Kelani-ganga we do not believe that the effects of flood water could be felt on the pearl banks to any appreciable extent, particularly in the bottom layers at a depth of five to ten fathoms. Our observations off Colombo show that the lighter river water floats on the top and that the bottom layers are scarcely affected even at a distance of two miles from the coast. The eastern part of the East Cheval is three miles from the coast but the West Cheval is over five miles away. It should be remembered that the banks are separated from the shallow inshore water by a reef which would certainly protect the banks to some extent as is the case off Colombo. The fresh water emerging from Portugal Bay has to travel nearly five miles in a northerly direction before reaching the banks, and it is practically certain that no danger can come from that source.

Weed.—Previous observers have not mentioned sargassum weed as being harmful to the pearl oyster. We have found it a definite menace to the oysters and wherever the weed grows in abundance the oysters completely disappear. The reason for this is probably on account of the weed smothering the oysters, so to speak. That is to say, a luxuriant growth of weed causes stagnation of the water in the vicinity. As the oyster depends for its food upon the microscopic forms floating in the water, as well as other substances contained in the water, it follows that stagnation will reduce the supply of food. Whether the oysters die *in situ* or migrate is difficult to say from our limited observations. One thing is certain ; oysters cannot thrive in association with sargassum.

(7) THE IRREGULARITY OF THE PEARL FISHERIES—IS THERE A SOLUTION ?

Attention has already been drawn to the irregular cyclic character of the Ceylon pearl fisheries. This is made clear from the records given below and from a study of Appendix (1) :—

				Value of Revenue.
				Rs.
1801 to 1809—Six fisheries	..	..	..	2,611,465
Four blank years.				
1814—One fishery	..	..	..	1,051,876
Thirteen blank years ² .				
1828 to 1837—Nine fisheries	..	..	..	2,335,314
Seventeen blank years				
1855 to 1863—Six fisheries	..	..	..	1,913,206
Ten blank years.				
1874 to 1891—Eleven fisheries	..	..	..	4,178,385
Eleven blank years.				
1903 to 1907—Five fisheries	..	..	..	7,340,763
Seventeen blank years.				
1925—One fishery	..	..	..	526,355

During the long period of barrenness which followed the 1907 fishery public opinion in Ceylon viewed this complete disappearance of oysters as unprecedented, and as something of the nature of a judgment from Heaven on the Ceylon Government for having allowed a commercial company to exploit the pearl fisheries. The Ceylon Company of Pearl Fishers were blamed in the Press, and in the Legislative Council for having ruined the banks, but an examination of the above record clearly shows that fisheries have been the exception and not the rule in the past, and that only thirty-nine fisheries have been held in 125 years³. As already stated it was mainly with the object of discovering the reason for this irregularity (and if possible a cure) that Professor Herdman came to Ceylon in 1902.

¹ Sir William C. Twynam's Report on the Ceylon Pearl Fisheries, 1899, p. 6.

² Three very small fisheries in 1815, 1816, and 1820. Total value only Rs. 45,518.

³ And only 61 fisheries in the last 250 years.

There are two distinct problems connected with the bionomics of the pearl banks—

- (1) After a series of blank years how do the banks become repopulated ?
- (2) After the oysters have established themselves in large numbers what causes their complete disappearance ?

Importance of the Current.—In the Gulf of Mannar there are two series of pearl banks, those on the Indian side at Tuticorin and those on the Ceylon side. The two are separated by a distance of nearly one hundred miles and by a considerable depth of water. Mr. Southwell¹ has shown that during a very strong south-west monsoon the oceanic current which sweeps down the west coast of India turns eastward when it reaches Cape Comorin and hits the Ceylon coast between Talavillu Point and Colombo, and then turns south in the teeth of the monsoon. A portion of this oceanic current may be forced north as far as Tuticorin before it starts on its eastward course, and in such a case the current would pass over the Tuticorin pearl banks and later over the Ceylon banks. Southwell was of opinion that the breeding season of the pearl oyster is July and August and showed that under favourable conditions of monsoon and current the pelagic larvae liberated on the Tuticorin banks in those months would reach the Ceylon pearl banks before the completion of the pelagic stage and would be deposited as spat. In this way Mr. Southwell claimed that the repopulation of the Ceylon pearl banks takes place by exotic spat from the Tuticorin banks².

Pearl Oyster spawns twice a Year.—Incidentally Mr. Southwell explained the unprofitable character of the Tuticorin banks by concluding that they could receive no exotic spat as no oyster beds exist on the western coast of India. In arriving at this conclusion he ignored the possibility of there being two spawning maxima in the year, one in July–August and the other in December–January. Mr. Hornell believed that there were two spawning maxima and our own investigations have proved this beyond doubt. In another part of the present report the question of the spawning periods is discussed at greater length and it is pointed out that although there are two spawning maxima, probably controlled by conditions of salinity and temperature, abnormal conditions may produce spawning at any time of the year. If, then, the pearl oyster spawns in December–January the larvae liberated on the Ceylon banks may be carried to the Tuticorin banks under appropriate conditions during the north-east monsoon and thus the two series of banks may be inter-dependent. This point cannot be discussed at greater length in the present report, but it is necessary to correct the error into which Mr. Southwell's reasoning led him. There are two spawning maxima in the year, one at the height of each monsoon and thus it is possible, though by no means certain, that the Ceylon and Tuticorin pearl banks are mutually inter-dependent. This possibility was first pointed out by Pearson³ in 1913, and received support from Hornell⁴ in 1914.

Repopulation probably a Gradual Process.—It may be accepted that under suitable conditions the Indian and Ceylon banks may owe their rehabilitation to the causes set out above, but it is not unlikely that on occasion the banks become repopulated through other causes. In the Marine Biologist's Administration Report for 1914 it was suggested that the repopulation of the banks was a gradual process commencing in the first instance from a small number of oysters. The Marine Biologist wrote as follows :—

"In 1913 the observations of the divers and the operations of both trawl and dredge over an area of some hundreds of square miles showed that oysters were absent from all the principal paars. About a dozen oysters were actually recorded. In 1914 a similar condition of things was revealed, except that the oysters were more numerous. Young oysters were abundant at a station one mile south-west of the Bar Reef, and a few scattered oysters were recorded from the different paars. Undoubtedly the oyster population was greater in 1914 than in 1913, and circumstances pointed to the probability of the young oysters near the Bar Reef being the direct offspring of the few scattered oysters seen in 1913. *These observations unsatisfactory and incomplete though they were suggested to me the probability of the re-population of the pearl banks being effected by a few scattered oysters such as are to be found on the paars during even the most unfavourable periods. If this be so, the inter-dependence of the Ceylon pearl banks and the Tuticorin pearl banks may not be so important a factor as many writers on the subject have believed . . . and our present conception of the origin of a spat fall (by exotic larvae from Tuticorin) may have to be considerably modified.*"

Mr. Hornell's Opinions.—This opinion was expressed independently by Mr. Hornell in a paper which appeared at the same time⁴. He suggested that though the pelagic larvae from Tuticorin may form a spatfall on the Ceylon banks, the "motherland" of the pearl oyster is to be found in the shallows around the reefs at Arippe, Paumben, and Tuticorin. He further expressed the opinion that there are three distinct sources of spat supply :—

- "(a) That from adjacent beds in the same local area ;
- (b) That from beds off the opposite coast line of the Gulf ;
- (c) That from scattered oysters in shallow water around the reefs and islands at the head of the Gulf."

And he believed the third of these to be vitally important during the barren periods when the pearl bank region is devoid of any recognizable beds of oysters. With regard to the repopulation of the banks from these sources he named three factors upon which the repopulation depends :—

- "(a) The number of adult pearl oysters scattered about among the coral reefs and rough hard bottom close inshore adjacent to the banks, or upon the banks on the opposite coast of the Gulf ;
- (b) The occurrence of a favourable surface drift from the place where adult oysters are to the region of the pearl banks ;
- (c) The continued absence of fishes which prey upon oysters."

If we are to accept these views on the causes of the repopulation of the pearl banks, expressed independently by two separate observers, it will be necessary to attach less importance to the fascinating theory of the mutual inter-dependence of the Indian and Ceylon pearl banks.

¹ Ceylon Marine Biological Reports, Report No. 20, 1911.

² According to Sir William Twynam the natives believed that "the banks are replenished by spawn coming in on them from the Gulf."

³ Pearson : *Spolia Zeylanica*, Vol. VIII., p. 205, 1913.

⁴ Hornell : Madras Fisheries Bulletin No. 8, 1914.

Depletion of the Pearl Banks : An Advocate of Breeding Reserves.—Mr. Southwell considered that perpetual fisheries would be assured if breeding reserves were kept. To use his words—

“For the continuity of fisheries the isolation and protection of breeding stocks is essential¹.”

Later on in the same discussion after explaining why exotic spat might fail to reach the Ceylon banks he went on to say—

“These facts, however, do not explain why it is that when once the banks *have* oysters on them they should not be more or less independent of exotic spat, but maintain and develop their own. The reason is simple, and is to be found in the rapaciousness of man, whose avarice kills the goose that lays the golden egg by omitting to leave breeding stocks ; also to voracious fish, to whom a bed of oysters is a feeding ground, to be deserted for pastures new only when the supply is exhausted We thus come to agree with Stuart that in some respects the continuity of fisheries is dependent on natural events which are beyond the control of man. But, whilst this is so, we can almost escape this catastrophe, and in any case extensively mitigate it, by reserving breeding stocks of old oysters in the way indicated ; and although even thus one could not hope to emulate the luxuriant bounty of nature, such breeding stocks would at least make the enterprise a successful one commercially².”

Inadequacy of breeding Reserves.—In other words, Mr. Southwell believed that the long periods of barrenness were due to overfishing and the attacks of predatory fishes. As a remedy he proposed to establish breeding reserves and to protect beds of young oysters by wire-netting.

Elsewhere in this report we have discussed the question of establishing breeding reserves, and we have expressed our disbelief in such an expedient. Mr. Southwell's wire-netting proposals had for their object the protection of young oysters, but our experience of the 1925 fishery showed that oysters of all ages disappeared. If, as we believe, large numbers of oysters perished through the action of sand, it is clear that the wire-netting would not have prevented the catastrophe. Moreover, what can be the object of establishing breeding reserves when we cannot control the fate of the young pelagic larvae ? We have not had a spatfall since November, 1923, in spite of having ample breeding reserves. We cannot agree, therefore, with Mr. Southwell's pronouncement that—

“The Ceylon pearl banks do not require supplementing with exotic oysters. Given a spatfall only thorough inspection, care and normal foresight in isolating breeding stocks, &c., are required to make the banks perennially productive.”

Predacious Fishes.—Mr. Hornell, on the other hand, considered that predacious fishes are solely responsible for the intermittent character of the pearl fisheries of the Gulf of Mannar, and in 1914 he referred to this as the “key to the problem,” and he regarded fish enemies as the “dominant factor in the economy of the Indian and Ceylon pearl fisheries.” Writing on this subject he expressed his views as follows :—

“Synchronizing with this condition [abundance of oysters] is a gradual increase in the number of fishes, both of the kinds which eat immature oysters and those which prey upon the adults During the first years of the productive cycle, the oysters usually increase in numbers markedly, but at last a time comes when the balance turns in favour of the fishes, and the end then comes swiftly—swarms of hungry fishes give the beds of newly spawned oysters no chance of living more than a few months or even weeks³.”

It is natural to assume that the fish population would grow with the increase of oysters, and our own impression of local conditions during several years lends support to that assumption, at any rate so far as the large rays are concerned. But considerations of time and the lack of suitable opportunities have limited our trawling investigations on the pearl banks, just as they undoubtedly restricted those of our predecessors, and so far as the smaller fish are concerned, which confine their attention to spat and immature oysters (*Balistes*, *Lethrinus*, *Serranus*, and *Tetrodon*) we are convinced that sufficient reliable evidence on their relative abundance during the respective periods of prosperity and barrenness is not forthcoming. Consequently we must express surprise at the following statement, made so authoritatively by Hornell :—

“The important factor borne by fish in this irregularly cyclic phenomenon early arrested my attention, and along that line the investigation was pursued. The results have been to show that the alternating cycles are correlated primarily with the abundance or the scarcity of predatory fishes on the pearl banks.”

It is unfortunate that we are not in a position to test this statement as Mr. Hornell's “results” have never been published. Frankly, we cannot believe that he was in a position to reach such a conclusion from his trawling operations, which must have been greatly restricted owing to the more pressing demands of five pearl fisheries with which he was associated in his seven years' connection with Ceylon. It is to be regretted that Mr. Hornell should have given to a mere expression of opinion the semblance of authority which rightly could only have been claimed after a long series of laborious investigations.

We admit the reasonableness of the view that the fish population of the banks varies directly as the extent of the beds of living oysters, and we are prepared to agree that in specific cases the pairs may have been rendered barren by the depredations of shoals of fishes or by the catastrophic action of sand, or by any of the other inimical factors which are recognized to play a maleficent part in the life-history of the pearl oyster. But we cannot subscribe to the view that the “key to the problem,” as Mr. Hornell expressed it, is to be found in any of these agents, either individually or collectively, and we would even go so far as to say that if all predatory fishes were cleared from the banks and if sand troubles and the other harmful factors were eliminated we should still retain this unfortunate heritage. If the problem involved nothing more than the adjustment of

¹ Southwell : Ceylon Marine Biological Report, Part vi., Vol. I., p. 2.

² Southwell. loc. cit., p. iii.

³ Hornell : Madras Fisheries Bulletin No. 8, 1914, p. 21.

the "balance of Nature"—in this case primarily between the degree of predaciousness of the fishes on the one hand and the measure of fecundity of the pearl oyster on the other—as Mr. Hornell has suggested, we might expect to find the same state of precariousness and irregularity in the pearl fisheries elsewhere. But, so far as can be ascertained, this is not the case, and in the Persian Gulf, for instance, annual fisheries are the rule. Are we to believe, then, that in that region the ravages of the rays are less pronounced than in the Gulf of Mannar, and are we to understand, too, that the Persian Gulf oysters rejoice in an immunity to all the other inimical factors which have been discussed?

There are no valid grounds for believing that the Gulf of Mannar differs in this respect from other places where the pearl oyster is found and it is thus incumbent on us to seek another "explanation of the irregularly cyclic character of the pearl fisheries of the Gulf of Mannar" to quote the title of Mr. Hornell's paper—and we cannot attach to Mr. Southwell's remarks about overfishing and to Mr. Hornell's conclusions regarding predacious fishes the importance that those writers would desire.

Irregularity of the Fisheries due to Geographical Peculiarities.—We believe that the true explanation of the irregularity of our pearl fisheries is to be sought in the geographical peculiarities of the pearl banks. Both the Ceylon and Tuticorin pearl banks lie on a submerged shelf, limited in extent and varying from five to twelve fathoms in depth, which drops suddenly into one hundred fathoms. In the case of the Ceylon area no part of the pearl banks lies more than five miles from the "overfalls" to the west and a similar distance from the shallows to the east, narrow enough confines for an organism which spends the first few days of its life floating in the surface water. This is a significant state of affairs which, curiously enough, has been ignored by previous workers in their consideration of the problem. It is particularly strange that Mr. Southwell, who was interested in current investigations, should have missed this point. He discussed at length the probable source of new spatfalls and showed that under favourable conditions oyster larvae from the Tuticorin banks might find their way into Ceylon waters, and also the consequences under less fortunate conditions, as described in his own words—

"If the current is sluggish during the height of the monsoon, the pelagic larvae (when sufficiently developed) drop to the bottom in hundreds of fathoms and are lost."

If the rehabilitation of the banks depends upon the vagaries of the current why should not the reverse result, the denudation of the banks, be effected by the same agency? In discussing breeding reserves we have pointed out that though, in theory at least, such reserves do ensure the maintenance of compact beds of oysters there is no means of controlling the wanderings of the floating larvae which are produced by these oysters. This connection between the irregularity of the current and the prosperity of the banks was pointed out by us in 1912 when the following opinion was expressed—

"To establish breeding reserves will be futile, unless we know that spawning will be followed by a spatfall on the banks themselves. The only object of the breeding reserves is to maintain the productivity of the banks, hence this object fails if, owing to currents or surface drift, the pelagic larvae are carried off the banks."

Precarious Existence of the Oyster Larvae.—The state of affairs, then, is as follows:—Although there are two spawning periods in the year and though oysters are sexually mature at the age of twelve months, there is no guarantee that a bed of oysters, once established, will produce a spatfall on the banks. The floating larvae are at the mercy of the elements, and no one can say in a specific case what will happen. A lull in the monsoon, a slackening of the current, or any one of a hundred other factors, might be sufficient to prevent the oyster larvae from settling on favourable ground at the conclusion of the pelagic stage. They might be carried out into the deep water beyond the overfalls where, even if they did not perish, they would be beyond the reach of the divers, or, on the other hand, their course might be directed shoreward in which case they would come to grief in the shallow water to the east.

If our conclusions are sound it follows that the problem of establishing annual fisheries would involve much more than clutching, transplantation, and the protection of oysters which have established themselves on the banks. In our opinion these expedients would not only present insuperable difficulties but would prove too costly and, moreover, would not solve the problem. The provision of regular deposits of spats upon the pearl banks would be necessary in order to ensure annual fisheries, but as the fate of a spatfall rests upon the vagaries of the currents it would appear to be beyond the wit of man to devise a remedy.

The present condition of the pearl banks is illuminating in regard to this problem. In March, 1925, the banks contained six different batches of oysters representing spatfalls of December, 1920, July, 1921, December, 1921, July, 1922, December, 1922, and July, 1923. If it had been possible to provide these oysters with full protection from fishes and other harmful influences we should have been assured of annual fisheries up to 1927 or 1928; but beyond 1928 the continuity would have been broken as the spatfalls of December, 1923, July, 1924, and December 1924, were not deposited on the pearl banks. It is abundantly clear, therefore, that the establishment of annual fisheries, far from being the easy matter that Mr. Southwell so airily concluded, is entirely beyond human control.

Under ideal conditions the problem might be solved by the establishment of nurseries, but we have gone most carefully into this question, and have been driven to the conclusion that such an expedient offers no hope whatever of a successful issue. Within the last few weeks we have had an opportunity of discussing pearl oyster cultivation with Mr. Cyril Crossland who, for several years, has been closely associated with the successful cultivation of mother-of-pearl oysters in the Red Sea and, who, perhaps has a wider experience of such matters than anyone else. After examining the circumstances he agreed with our conclusions regarding the cultivation and control of the pearl oyster in Ceylon. He himself attempted to cultivate the pearl oyster but found that though there was no trouble in gathering spat he had no success whatever in rearing them. In his opinion pearl oyster spat are exceedingly delicate and their mortality is extraordinarily high. His work was carried out in a land-locked bay which was admirably suited to the purpose, but unfortunately we have no such place near the pearl banks where the general conditions are suitable for oyster cultivation.

¹ Pearson: *Spolia Zeylanica* Vol. VIII., p. 219.

Mr. James Steuart's Pronouncement.—The position cannot be summed up better than in the words of Mr. James Steuart, who as Master Attendant was connected with the pearl banks nearly a century ago. His opinion is entitled to some respect and consideration, and to our mind his pronouncement shows a sagacity and understanding remarkable in one who presumably had had no training in scientific methods. He expressed himself as follows :—

“The success of pearl fisheries in the Gulf of Mannar depends primarily upon natural events beyond the controul of man; nevertheless we may, by the most vigilant attention and good management, watch the progressive workings of nature, and not fish up the oysters before they have reached maturity; nor after they contain pearl, suffer them to die on the banks and the pearl to be lost. We may know the ages of every deposit of oysters upon the banks, and by letting the youngest remain undisturbed until the last, we may protract each successful period, and in corresponding proportions shorten the unsuccessful intervals. We may presume from past experience that unsuccessful intervals will continue to recur. We cannot promote or facilitate the production of pearl oysters. We cannot cause the spawn to settle down upon nourishing ground. These are events beyond the controul of man. The winds, the waves, and the uncertain currents of the ocean carry the embryo over unlimited space. It is only when, in the infinite wisdom of the Creator of all things, the oyster brood descends upon the banks suited to nourish and support it—that it comes within our limited power to watch its advancing age, and to fish up the respective deposits in succession as they approach the proper age; not letting them rest on the banks until they die off, and the pearl is lost; and carefully abstaining from disturbing those that are too young to contain it.”¹

II.—Notes on the 1925 Fishery.

(Plates IX. and X.)

Inspection of November-December, 1924.—A preliminary inspection of the banks was made late in 1924 under most unfavourable weather conditions. It was decided to fish about thirty millions in the following March, taken from the following banks :—

Twynam's Paar	..	..	..	5 millions
Periya Paar Karai	..	..	..	7 millions
West Cheval Paar (N.W.)	..	..	..	8 millions
West Cheval Paar (S.W.)	..	..	..	10 millions

and nearly 30,000 oysters were taken to Colombo for the valuation samples, taken from the following paars :—

Twynam's Paar	..	..	..	1,830
Periya Paar Karai	..	..	..	10,000
West Cheval Paar (N.W.)	..	..	..	8,000
West Cheval Paar (S.W.)	..	..	..	9,000

These oysters were rotted and washed in a specially prepared enclosure near Waters Meet at Mutwal. The valuation was not a very high one, but a low November valuation is apparently the rule, and we have shown in another part of this report that on the figures available since the fishery of 1880, a mean increase of 62 per cent. on the November price is to be expected at the fishery in the following March.

The average prices given by the valuers were as follows :—

Twynam's Paar	..	..	Rs. 17.10 per thousand
Periya Paar Karai	..	..	Rs. 22.46 „ „
West Cheval (N.W.)	..	..	Rs. 17.52 „ „
West Cheval (S.W.)	..	..	Rs. 16.92 „ „

Inspection of February 1925: Advance Preparations.—Prior to the fishery an inspection of the banks was made, the “Nautilus” and “Violet” being engaged upon the work. Both vessels left Colombo on February 4 and the “Violet” carried the Post Office and Telegraph Stores for Marichchukkaddi, Mr. Bryant of the Telegraph Department was accommodated on the “Nautilus.” His main object in going to Marichchukkaddi was to set up the wireless installation and he also tuned up the wireless set on the “Nautilus” but we were unable to send signals more than about 50 miles instead of 200 as anticipated. For the purposes of the pearl fishery this should be a sufficient range. The ships lay in Marichchukkaddi Bay on February 5 and 6 unloading stores, and the first inspection was commenced on the 7th on the south-west part of the West Cheval. The inspection of this area took three days and it was calculated that twenty-seven million oysters were present compared with twenty-six millions in November, 1924. This increase was probably due to the migration of oysters from the northern portion of the West Cheval. In my diary I noted that the oysters had spread over a larger area since the November inspection. Nevertheless, they were still very abundant and many of them were reported to be on sand. On February 10 the eastern area of the North-West Cheval was inspected, and twenty-three millions were found compared with forty-one millions in November, 1924. The central portion of the North-West Cheval was inspected on February 11 and 12, and nineteen million oysters of mixed ages were found. Two days were taken over the inspection of Periya Paar Karai, and only about three million oysters were discovered, a very disconcerting fact. Some difficulty was experienced in finding the oysters on Twynam's Paar on account of the distance of the paar from the shore. Fifteen million oysters were found in addition to spat and young oysters.

Valuation Sample.—A sample of 10,000 oysters was collected from the North-West Cheval and 9,900 from Twynam's. These were placed in gunny bags, sealed and labelled, and taken to Marichchukkaddi on February 19. It was arranged with Mr. Dyson the Kottu Superintendent to have the washing of oysters done in the Government kottu. The washing was very carefully supervised and the sample from Twynam's Paar was valued on February 26 at Rs. 37.50 per 1,000, and later the sample from the North-West Cheval was valued at only Rs. 17.50 per 1,000. While the inspection was in progress the

¹ James Steuart: “An account of the Pearl Fisheries of Ceylon, 1843, p. 25.”

"Nautilus" was obliged to return to Colombo in order to be slipped and cleaned as she was steaming very badly. She returned to the banks on February 19 with two small Colombo Port Commission tugs in tow. The B. I. ss. "Baroda" arrived at Marichchukkaddi on the morning of February 20 with all the Police and a large quantity of stores including furniture for the quarters and resthouse, and also 40,000 gunny bags. The unloading was facilitated by the use of twelve dhoneyes and the two Colombo Port Commission tugs towed the dhoneyes to and from the shore. Unloading commenced at 8 A.M. and was finished at 2 P.M.

Transport of Camp Officials.—With regard to the chartering of "Baroda" to bring the Police and stores, I believe that this might be dispensed with in future. In the first place there appears to be no reason to take up the complete Police force at one time. The camp grows gradually and I have no doubt that all requirements could be met if, say, one-half of the personnel were taken up by the "Nautilus" one week and the remainder the following week. This was actually done when the Police were returned to Colombo at the close of the fishery and the arrangement was satisfactory in every way.

The "Nautilus" and "Violet" went to Colombo on February 22 for coal, and returned on the 23rd with the "Lilla." Three sealing supervisors were accommodated on board the "Violet" and nine sealing officers on the "Lilla."

Sealing of the Oyster Bags.—The three sealing supervisors were as follows:—

Mr. R. G. Rolfe-Rogers.	Mr. Austin A. Dassanaiké.
Mr. M. C. Kelway Bamber.	

The following is a list of sealing officers:—

Mr. H. S. N. Koelmeyer, Senior Sealing Officer.	Mr. Walter W. de Silva.
Mr. C. de Sella.	Mr. O. Spearman White.
Mr. S. E. Ludekens.	Mr. C. L. van Heer.
Mr. W. Lawrence.	Mr. Allan de Silva.
	Mr. W. M. Weerappulle.

Duties of Sealing Officers.—As soon as the sealing officers arrived at Marichchukkaddi they were given instructions about their duties, which were twofold:—

- (1) To supervise the fishing fleet whilst the fishing was in progress;
- (2) To seal the oyster bags as soon as the fishing was concluded.

For this purpose eight rowing boats were provided, three ships dinghies for the three sealing supervisors, four inspection boats each containing two sealing officers, and a pilot boat containing Mr. Koelmeyer, the Senior Sealing Officer. The Senior Sealing Officer was responsible to Mr. Rolfe-Rogers, the Senior Supervisor, for the discipline of the sealing officers. In addition to these eight boats Mr. Malpas patrolled in one of the Colombo Port Commission launches and the Inspector of Pearl Banks in the motor launch "Lion."

The Object of bagging the Oysters.—As the result of the Pearl Fishery Conference held on May 15, 1924, it was decided to have the oysters placed in sealed bags, following a method introduced in 1907 by the Ceylon Company of Pearl Fishers. Previously the oysters had been allowed to lie unprotected and exposed until the fishing boats reached the shore. It was well known that under such conditions a considerable number of oysters were opened by divers and manducks on the way to the shore. Captain Legge estimated this to be as high as 23 per cent. and Mr. Hornell agreed with him though it is difficult to say how Captain Legge arrived at his estimate. Mr. Hornell assumed that each diver and manduck opened at least 100 oysters per hour so that 30 men would open 6,000 oysters in two hours during the run home. If there were 100 boats so employed 600,000 oysters would be opened on the way to the shore. During the recent fishery 100 boats very rarely obtained as many as 600,000 oysters in one day, and in our opinion Mr. Hornell's figures are unreliable, and we should say that Captain Legge's estimate was too high. It is impossible to make an estimate, but it is probable that 10 per cent. would be much nearer the mark. We agree with the late Mr. J. P. Lewis that Mr. Hornell's estimate was exaggerated, but we do not agree with Mr. Lewis' estimate that it would take half a dozen men four or five hours to open 1,000 oysters. He was assuming that the pilferers examined each oyster carefully for the smallest seed pearl. It is much more likely that all oysters opened on the homeward journey are examined very perfunctorily and only the biggest pearls are taken. A full discussion of the question appears in Sessional Papers XXXIII. of 1905 and LI. of 1906.

The Economy of bagging the Oysters.—But even if we allow only 10 per cent. we believe that the practice of sealing has been fully justified by results in spite of the adverse prognostication of Mr. Schrader of the Civil Service. Government's share was ten million oysters which fetched an average price of about Rs. 45 per 1,000. Ten per cent. of this would have meant a loss of Rs. 45,000 to Government. In addition boat guards would have been needed. Eighteen years ago boat guards received Re 1 per diem. Doubtless they would have received double that sum at the recent fishery. This would have cost Government something like Rs. 9,000.

The sealing involved the purchase of bags, lead seals, and sealing implements, and the employment of a number of sealing officers. But some of the sealing officers (say one-third) would have been needed for supervising work even had the sealing method not been adopted. We may say, therefore, that the additional cost of the sealing was as follows:—

	Rs.
15,000 bags at 48 cents each	7,200 ¹
Lead seals	2,120
Sealing implements	463
Pay of sealing officers (less one-third)	4,088
Total	13,871

¹ This was an excessive price to pay for bags. We could have got suitable ones for 32 cents which would have meant a further saving.

On the other hand if sealing had not been adopted the charge to Government would have been approximately as follows :—

			Rs.
One million oysters at Rs. 45 per 1,000	..	..	45,000
Boat guards	..	..	9,000
		Total ..	54,000

Thus an approximate sum of Rs. 40,000 was saved by the sealing operations in the small fishery of 1925.

The critics of the proposal to seal the oyster bags were of opinion that the divers would cut open the bags during the homeward journey, abstract oysters, and repair the bags. No such cases were brought to our notice. On the other hand, the divers always refused to use old bags containing holes as they feared that they would be charged with having made the holes. It was found that some of the divers secreted oysters in the bottom of their boats but a few heavy fines were sufficient to stop this practice, particularly as the sealing officers kept a sharp lookout. Each boat was visited by sealing officers about half a dozen times during the course of each morning's fishing, and the launches were in constant attendance on the fleet and we were satisfied that there was very little stealing.

Bagging Procedure.—The gunny bags were stored in the Government kottu and were issued to the divers each evening before they left for the banks. A stock of bags was also kept on the "Lilla." As a rule two divers worked alternately on one stone and they pooled their catch, but in some cases each diver kept his own catch separate. Each diving unit was supplied with three bags and the tindal of each boat also received three bags for his share, and the three bags were filled equally during the course of the morning. The manducks preferred to put all the oysters into one bag instead of dividing them up as they went on, and this caused delay at the end of the morning when sealing commenced as the sealing officers had to wait until the division into three lots had been made. We never succeeded in completely curing the manducks of this fault. Only on rare occasions were the three bags completely filled. More usually they were only half filled or even less. During the course of the morning the sealing officers provided the manducks with twine with which to fasten the mouth of the bags when fishing ceased. As soon as the signal "cease diving" had been given the bags were tied up after the manducks had seen that their catch had been equally divided amongst the three bags. Then the sealing officers boarded the boats and sealed the bags. The number of sealed bags in each boat was counted, and the tindal was given a chit signed by the sealing officer stating the number of sealed bags. The form of the chit was as follows :—

Number of boat :————

Number of sealed bags :————

Signature :————

As soon as each boat received its chit on the banks the anchor was weighed and sail was quickly set and the boat made for Marichchukkaddi. The boats' crews were always very eager to get their sealing done, and they assisted in every way possible, and it was surprising to find how readily the divers and manducks fell in with the new arrangement. I was prepared to find a certain amount of opposition, or at the best I did not expect the men to assist us as they did. By this new method the boats were sent off one by one, and there was no great rush in Marichchukkaddi, as the boats arrived in succession and in some cases there was as much as two hours difference between the arrival of the first and last boats. This made it much easier for the kottu officers to carry out their work. No finer sight can be imagined than the spectacle of over a hundred large dhoneyes in full sail stretching as far as the horizon. To those who had to assist in the sealing operations there was a decided sense of satisfaction in seeing the number of anchored boats gradually reduced as the sealing went on. Rarely was the sealing work completed before 2.30 P.M., and the officers concerned, who commenced work at 7 A.M., had a strenuous seven hours work in the hot sun and, more frequently than not, in rough seas.

In order that the fleet could sail back from the banks to Marichchukkaddi a favourable wind was of course essential. It is usual in February, March, and April to have a land breeze in the early morning, flat calm during the fishery operations, and a sea breeze springing up about midday. Unfortunately the weather was unseasonable during the fishery and frequently conditions did not permit the fleet to sail homewards. On such days the dhoneyes were tied up to the three trawlers and in this operation the two small harbour tugs proved to be most useful. From the sealing point of view it was much more difficult when the fleet had to be towed home as the crews of the diving boats were not so eager to help us in these circumstances, knowing that such help would bring them no individual advantage as the whole fleet was towed home together. Moreover, it was always difficult to know which dhoneyes had been visited by the sealing officers and which had not, and this always meant delay at the end, as the motor launch "Lion" had to go round the whole fleet to ensure that no boats remained with unsealed bags.

Each sealing officer was provided with a notebook in which he kept a record of the boats visited by him during the morning and also of the boats visited for sealing together with the number of bags sealed. These books were collected by the Inspector of Pearl Banks at the end of the morning's work, that is to say at about 2.30 P.M. On our busiest days we sealed no less than 4,500 bags, and after a little experience it was found that the sealing could be done with great rapidity. As a rule the sealing officer was assisted by one or two of his own boatmen in addition to the help always willingly offered by the divers and manducks. As the weather was frequently very rough the operation of boarding the dhoneyes from a small open boat required no little skill and was attended by a certain amount of risk, but happily no serious accidents occurred though there were many narrow escapes.

When each boat arrived at Marichchukkaddi the divers and manducks carried the bags into the kottu and placed them in the numbered enclosure allocated to their boat taking care to keep the individual catches separate, so that when all the bags were placed on the ground they were arranged in threes. The Kottu Superintendent or his representative, after receiving the tindal's chit and checking it, picked out one bag from each lot of three and this was removed by the diver to whom it belonged. The remaining two bags became the property of Government.

Proposals for the Future.—It has already been stated that twelve sealing officers in all were employed three of whom received a higher rate of pay than the others. This system was adopted after mature consideration, but in ignorance of the real conditions under which the sealing would be done. In future fisheries it is recommended that no senior sealing officers should be appointed. It so happened that both Mr. Malpas and the Inspector of Pearl Banks were with the fleet all morning and invariably assisted in the sealing operations. In such circumstances there was little or no need for the appointment of any sealing officers on a higher rate of pay than the others. This expression of opinion must not be interpreted as a reflection upon the work of the senior officers. All officers, both senior and junior, worked well under the most trying conditions, and the fact that the sealing operations were carried out so expeditiously and successfully was due to their efforts. It is suggested that if possible one Non-Commissioned Officer and the requisite number of Privates should be obtained from the Ceylon Light Infantry or some other military unit.

One objection to the bagging system was that the fleet was delayed on the banks after the actual fishing terminated. When the fleet was able to sail home this objection was not a serious one as some of the boats got away within a few minutes of the close of fishing, and, as we have already pointed out, the boats arrived at Marichchukkaddi at short intervals, instead of together, an arrangement which greatly facilitated the work of the shore staff. When, however, the wind was not favourable, as was the case on so many occasions this year, all the boats had to be towed by the trawlers and towing could not commence until all the boats had been visited by the sealing officers. This meant a delay of about two hours or more. The tinders of the boats were always anxious to tie up to the "Nautilus" as they soon found out that she was much more speedy than the other vessels and invariably reached Marichchukkaddi first. Very often the dhoneyes hoisted sail while being towed in order to relieve the tug of part of her heavy burden. This was always much appreciated by us and such "self-help" had its own reward in a speedier return to port. When the trawlers approached their anchorage at Marichchukkaddi all the dhoneyes were cast off on a given signal, and then a wild race for shore ensued, both sails and oars being used amidst a perfect babel of voices.

The system of providing three bags for each diving stone was very helpful to the staff in the Government kottu as it did away with the old method of dividing each diver's catch into three piles in the kottu. But the new system threw a great deal of work on the staff afloat and caused considerable delay on the banks. As an alternative it was suggested that the divers should fill one bag at a time. The result was—to quote a specific case—that instead of three bags, being each only one-third full, one full bag sufficed. This reduced the sealing operations considerably. Moreover, in cases where more than one bag was filled the sealing officers were able to seal the full bags before fishing stopped. To quote a case, instead of three bags being two-thirds full, two bags were completely filled and one of these was full half way through the morning and was sealed. This method was tried on March 3, but the Kottu Superintendent found that it increased his work considerably and so we reverted to the three-bag method. In former fisheries the oysters were always divided in the kottu and not on the banks.

Proposal to sell the Oysters by the Bag.—When the question of bagging was discussed at the Conference, it was decided to try the experiment of selling the oysters by the bag and not by the thousand. Consequently in his correspondence with the Colonial Storekeeper who called for tenders for gunny bags, the Inspector of Pearl Banks emphasized the importance of having the bags of one size. Unfortunately the bags provided were not of one size though the Colonial Storekeeper maintained that all were approximately of the same capacity. At the first auction the oysters were sold by the bag and a bag of oysters was produced and its contents counted. It was found, however, next morning that the bags were of different sizes and the merchants protested. This protest was repeated at the second auction and the Government Agent then decided to sell by the thousand. A large number of bags have since been examined and, though the linear measurements vary, the actual capacity of the bags is more or less constant as was pointed out by the Colonial Storekeeper. We are inclined to think that the merchants protested against buying by the bag as it was a departure from an old custom, and in consequence they seized eagerly upon this short difference in the size of the bags. It is a matter to be regretted that we have reverted to the old and cumbersome system of selling by the thousand, without giving the new method a fair trial, particularly as the old system necessitates the counting of the oysters in the Government kottu, in itself an antiquated method. It is readily understood that a considerable amount of additional work (and in my opinion unnecessary work) devolves upon the kottu staff. We are convinced that the protests made by the merchants would not have resulted in a boycott of the auctions and a further attempt to sell the oysters in bags should be made at the next fishery.

Estimation of Bags and Seals required.—As we had had no previous experience of bagging it was difficult to estimate how long a gunny bag would survive the rough usage of a pearl fishery. If we had had our full complement of divers about 5,000 bags would have been required daily. Each bag could be used for several days, and it was estimated that 30,000 bags would have been required for a fishery of thirty millions. At the last moment the Controller of Revenue, acting on the advice of the Colonial Storekeeper, decided to sell the bags at 50 cents each with the oysters. Our own opinion at the time was that this would be impracticable, as was subsequently proved, but a further 10,000 bags were ordered on this account making 40,000 in all. Very few bags were sold and we only fished half the estimated quantity. About 15,000 bags were disposed of, which agreed very closely with the estimate. No doubt many bags were taken by the divers though we always made a careful search of the dhoneyes during the sealing operations. It may be stated for future guidance that 1,000 bags would be required for every million oysters fished. 90,000 seals were used which works out at 6,000 seals for every million oysters fished.

Divers. Arab Divers; South Indian Divers; Fatality on the Pearl Banks.—A good deal has been written in the past about Arab divers. Sir William Twynam considered them a disturbing influence at the fishery and, though he admitted their unquestionable superiority over other divers, he recommended that their numbers should be rigorously restricted, and this opinion was endorsed by other pearl fishery authorities. In view of this we decided to limit the number of Arab divers to 500 out of a total of 2,000, and it was with some degree of trepidation that we witnessed their arrival at Marichchukkaddi. To our great surprise we found the Arabs extraordinarily well behaved and amenable to discipline. In

fact speaking with regard to the work afloat it may be said that they gave much less trouble than the others. The Arabs possessed one splendid quality which would appeal to any Inspector of Pearl Banks. When their boats took up their positions for the day's fishing they settled down to work quietly and systematically. They appeared to be quite content with even poor ground and very rarely moved. The result was that they invariably had the biggest catches. This conduct was in marked contrast to most of the non-Arab divers who seemed to think that the Inspector of Pearl Banks was responsible if they did not get abundant hauls. They were very rarely contented and it frequently happened that the approach of the Inspector's launch drew forth "Sippi illai" from the South Indian divers while Arab divers a few yards away were working contentedly and were, moreover, filling their bags. We have already referred to the difficulty experienced in inducing the Kilakarai divers to come to the fishery. When they did arrive we found them an unruly and undisciplined crowd though it must be admitted that they were good divers. On one occasion only was there any trouble with the Arab divers. This occurred on March 9, whilst fishing on the Mid-West Cheval when a fight broke out between the Arab divers and the Tamil manducks and tindal on one of the boats. Our attention was first attracted by the excited shouts of the men in the neighbouring boats. We went alongside in the launch and boarded the boat. By this time most of the Tamils had either thrown themselves into the sea or had been pushed there. So far as could be gathered the trouble arose through the tindal of the boat insisting on taking more than his fair share of oysters from an Arab diver. A free fight started at once between the Arabs and Tamils, but so far as we could gather no serious damage was done. Later in the morning when we visited the boat again one of the Arab divers was reported missing. It was difficult to ascertain what had actually happened, but there was every reason to believe that during the quarrel one Arab diver was at the bottom. His manduck left his post either to take part in the fight or to jump overboard. When the unfortunate diver, who probably had stayed down to the limit of his capacity, gave the signal to be pulled up, no response was made. The Arabs charged the Tamils with having killed the driver during the fight, but the version just given is probably the correct one. The boat was placed under arrest, and when the fleet returned to Marichchukkaddi the Camp Superintendent held an inquiry. The following day none of the Arab divers went out but ultimately the situation became normal once more. This was the only death at sea during the fishery.

During the fishery the Muslim fast of Ramdam took place. We were warned that the Arab divers would not work after March 20, but there was no difficulty in this connection, and the majority of them stayed until a few days before the close of the fishery and thirty-two Arabs went out on the last day of the fishery. We were told by a merchant who had been present at several of the previous fisheries that the Arabs were not such a fine lot of men as he had known at previous fisheries. They were very thin and emaciated which we attributed to their rigorous fasting.

Accidents on the Pearl Banks.—In addition to the fatal accident to which reference has already been made, two Tamil divers collapsed on the bottom and had to be brought up by their fellow divers. One was a case of a young boy from Kilakarai. He was diving on the same boat with his two uncles. When he did not come up they promptly went down and brought him up in a state of utter collapse. Their prompt action undoubtedly saved the boy's life. He was brought on board the "Nautilus" and made a complete recovery. Hardly a day passed without our having to administer first aid to divers on the "Nautilus," the commonest trouble being caused by poisoned spines of fishes and probably sea-urchins, which caused intense pain so that the victim was generally out of action for the rest of the day.

Methods of Diving.—There appeared to be no standardized method of diving. The Arabs had poles projecting over the side of the boat by means of which they hoisted themselves out of the water by an acrobatic movement which called a considerable amount of agility. The Arabs invariably used horn clips on the nose, and it was their custom to come up to the surface hanging on to the rope with the left hand, and they did not let go until they reached the surface. By this means they undoubtedly came up more quickly than the Tamil divers who always let go the rope in mid-water after they had received an initial pull sufficient to bring them to the surface. The disadvantage of this latter method was that the Tamils reached the surface some yards away from their boat. This was dangerous when the motor launch was moving about in the midst of the fleet.

Most of the Tamil boats had temporary outriggers fitted to the sides of their boat from which the divers' ropes were suspended, and the divers pulled themselves over the side of the boat when their spell of diving was finished and did not, like the Arabs, make use of the overhanging poles. The Tamils did not wear horn clips on the nose; instead the nose was held between thumb and forefinger during the rapid descent to the bottom. With rare exceptions both Arabs and Tamils went down feet first with the feet resting on the stone sinker. A few Tamils, however, were seen to hold the sinker near the chest and dive in head first. As a rule two divers worked alternately on the same stone, each one taking a spell of about an hour's duration. Sometimes there were two manducks for each stone, sometimes only one, and in some cases the spare diver assisted the manduck to haul up the ropes. After leaving the water for a rest the Arab divers invariably dried themselves with a towel, removed their bathing drawers, and put on a dry pair. The Arabs always had a fire burning in a chatty at the stern of the boat, around which the divers huddled protected from the wind by a blanket or cloth suspended across the stern of the ship from side to side. The Tamil divers rarely dried themselves or changed their scanty clothing and never used a fire. During typical fishery weather when there was no wind the divers were most comfortable, but they felt very keenly any wind there was when they got out of the water, and on several days when there was a high wind and little sun they appeared to feel the cold acutely. The divers' health would appear to depend almost entirely upon the condition of the weather. During the 1925 fishery many of the divers had severe attacks of fever, mainly caused by the strong wind and also by afternoon showers which were frequently encountered on the run back to Marichchukkadi.

Fishery Routine. Sailing.—It may be of interest to put on record the daily routine of the marine staff during the fishery. The divers were informed by the Beachmaster on the previous night as to our objective on the following day. In cases where the fleet was expected to sail out to the banks, one of the trawlers remained on the position overnight and displayed a powerful masthead light. In such cases the fleet commenced to sail out shortly after midnight and the trawlers followed later so as to reach the position at daybreak, the area to be fished having previously been buoyed. By the time the trawlers had taken up their position most of the dhoneyes were anchored. In many instances the fleet got scattered

either due to a failing wind or bad navigation. Commander Kerkham frequently expressed his surprise at the indifferent seamanship shown by the tindals in their efforts to reach the banks. In such cases the trawlers had to bring in the wanderers, a slow business at the best. Normally, however, the majority of the boats were in position at daybreak and fishing commenced shortly before 7 o'clock. We always regarded the earlier part of the morning as the least profitable, owing mainly to insufficient light.

Towing.—Frequently, because of unfavourable winds or the great distance of the fishing position from Marichchukkaddi the whole fleet had to be towed. In such cases instructions were given for the boats to be tied up to the trawlers before midnight, and the trawlers got under weigh between 2 A.M. and 4 A.M. according to the distance to be travelled (an average towing speed of about 5 knots was allowed for) the object being to get to the banks after daybreak as the exact position had been marked by flagged buoys, which are very difficult to see in the uncertain light of early morning. As soon as each trawler reached the position six blasts of the trawler's whistle were sounded as a signal for the boats in tow to cast off. This was done and the dhoneyes dropped anchor on the spot. It was not found necessary to give a signal to commence fishing. Conditions of light, &c., governed this and we found it more satisfactory to let the divers commence fishing as soon as they pleased after they took up their position. Usually no serious fishing took place before 7 o'clock. Our usual procedure in marking the position of oyster beds was as follows: During the February inspection flagged buoys were placed on the central spots of the various oyster beds to be fished, and during the fishery the fleet would be collected around one of these buoys, our object being to keep the dhoneyes as close together as possible. During the course of the morning the Assistant Marine Biologist went out in the "Thelma" with a diver in order to locate new patches of oysters which were buoyed. In this way we were able to determine whether to fish on the same position the following day or whether to move to one of the subsidiary buoys. Our chief difficulty was to prevent the fleet from scattering and this was best effected by forbidding the dhoneyes to hoist their sails during fishing hours, disobedience of this order being punished by a fine. On days when there was a strong wind it was a fatal policy to allow the dhoneyes to sail during fishery hours as they became scattered over a large area in a very short time with a consequent loss of efficient supervision. Whenever it was found necessary to move the dhoneyes from one part of the fishing ground to another we found it more satisfactory to tow them. In this connection the two harbour launches proved invaluable and were very useful in rounding up stragglers. In rough weather it was almost impossible to keep the fishing fleet in a small area as there was always a tendency to drift to leeward the moment the anchor was lifted.

Advantages of Fine Weather.—In fine weather conditions were in every way more satisfactory as the dhoneyes could be rowed from place to place and thus sailing and towing were unnecessary. Under these conditions the fleet was much more tightly packed and consequently the fishing was more intensive. A scattered fleet does incalculable harm to the banks and probably it is no exaggeration to say that in a given area fishing is at least 25 per cent. more productive when carried out under ideal weather conditions, not only because the divers are naturally more efficient in fine weather, but also because the fishing is more intensive and thorough. The supervision of a scattered fleet on a rough day is no light task. Many of the dhoneyes inevitably get off the oyster ground and the divers complain loudly and incessantly.

Fishing ceased at noon or 12.30 P.M. or in rare cases at 1 o'clock. The signal "cease fishing" was made by the "Nautilus." A red flag was hoisted and the whistle gave a long blast. All the other trawlers and tugs blew their whistles. After this signal divers were expected to leave the water. In a few cases it was found necessary to impose fines as divers were naturally reluctant to stop diving when they were on good ground. This was the busiest part of the day for the Inspector of Pearl Banks and his assistants. The dhoneyes were boarded in turn by the sealing officers and the oyster bags were sealed as already described. The run home depended upon whether the dhoneyes sailed or were towed. This has already been described.

Unfortunate Circumstances of 1925 Fishery.—The fishery was advertised to commence on February 26, but we decided to commence on February 27. For reasons which the Government Agent, Northern Province, will doubtless discuss in his report, the Kilakarai divers failed to put in an appearance. The fishery was started on February 27 with only 310 divers and 21 boats. The Kilakarai divers did not commence fishing until March 17, that is to say, half way through the fishery. As the Kilakarai divers refused to come to the fishery unless they were given free transport, the "Violet" made three trips to Kilakarai and transported about 1,000 people in all. In this connection it should be placed on record that Rao Bahadur Sundra Chalu, the Indian Labour Representative in the Fishery Camp, was very helpful. Mr. Sundra Chalu went to Kilakarai on two or three occasions in order to induce the Indian Government to relax their rules in favour of the divers and also to persuade the divers to come. There can be no shadow of doubt that had the Kilakarai divers refused to come the fishery would have been a failure, and would have entailed a heavy financial loss to Government. As it was, the late arrival of the divers proved very costly, as we were unable to fish the estimated number of oysters. As events proved the oysters were disappearing with great rapidity while the fishery was in progress, and it would have been a fortunate circumstance if we could have had 2,000 divers at the early stages of the fishery instead of an average number of only 500. The lack of divers resulted in the banks being fished inadequately and extravagantly for the first three weeks of the fishery. Intensive fishing is desirable and this cannot be achieved with a few hundred divers.

Another unfortunate factor was the abnormal weather experienced throughout the greater part of the fishery. Strong winds and high seas were the rule more often than not, and very rarely did we experience the delights of "fishery weather"—dead calm in the morning with a fresh sea breeze at noon. When we add to these unfortunate circumstances the fact that all the officials had had no previous experience of pearl fisheries, it may be well imagined that the fishery was not conducted under the most fortunate conditions.

In spite of the difficulties due to lack of divers, bad weather conditions, and the disappearance of oysters it may be said that the result of the fishery was gratifying. The administration ran smoothly and we found that the work afloat was facilitated in every possible way by the admirable arrangements ashore. So far as the adverse conditions permitted the operations at sea were satisfactory, a circumstance due in no small measure to the friendly co-operation of the Camp Superintendent and his shore staff.

Financial Results.—Excluding the cost of the “Nautilus” and the salaries of the permanent officials the fishery produced a nett profit of Rs. 167,017. The “Nautilus” was purchased in 1924, and its cost had to be met irrespective of the incident of a pearl fishery in 1925. The vessel was intended for trawling and surveying as well as for pearl fishery investigations, and as she may be expected to last for many years an erroneous idea of the value of the 1925 fishery would be given if it were debited with the total capital cost of the “Nautilus.” It would also be misleading to charge against the revenue of the fishery the salaries of the permanent officials. Fishery or no fishery, these salaries would have had to be paid.

Indirectly a pearl fishery brings many financial benefits to the poorer inhabitants of the Northern Province, and the Mannar district has been presented with an excellent road between South Bar and Mannar station out of the revenue of the fishery.

The administrative cost of the 1925 fishery was as follows :—

					Rs.	c.
Ashore	..	..	..	..	304,177	91
Afloat	..	..	..	..	109,541	48
				Total	413,719	35

The administration afloat showed a saving of Rs. 10,641·22, giving a nett cost of Rs. 98,900·26.

This sum was expended as follows :—

					Rs.	c.
Marine Biological Department	..	..	..	..	38,536	31
Cost of tugs, sealing operations, &c.	..	..	..	..	60,363	95

The cost of the tugs was justified for the following reasons :—

- Twynam's Paar, which is situated 24 miles from Marichchukkaddi, could not have been fished without tugs. Government's share of the oysters on this paar amounted to Rs. 73,000.
- The Kilakarai divers had to be brought to the fishery in the “Violet.” They refused to come otherwise. The Kilakarai boats brought a revenue of about Rs. 195,000 to Government.

III.—History of the Oysters fished in 1925.

(Plates I.—V.)

(1) GENERAL.

First Appearance of the Oysters.—Following the fishery of 1908 the banks were barren of oysters until 1919 and 1920, when they slowly began to reappear. The first post-war inspection was held in December, 1919, but had to be abandoned owing to bad weather and owing to the wreck of the barque “Rangaswamy Poravee” in a north-westerly gale. A later inspection in March, 1920, showed the presence of a thin scattering of young oysters over all the northern paars. These oysters occurred in small patches. In March, 1921, a heavy deposit of young oysters was found covering the sandy area between the West Cheval and the Periya Paar. A few occurred on the North-West Cheval and quantities were found on the Periya Paar. In November of the same year another heavy deposit of young oysters was discovered. These overlapped those found in March and extended east and south-east over a large area of the West Cheval, the Periya Paar Karai, and over the whole of the True Venkalai Paar. Later spatfalls discovered in March, 1922, and November, 1922, resulted in the complete population of the West Cheval, the Periya Paar Karai, and the True Venkalai Paar. In November, 1922, these oysters had an age-distribution approximately as represented in Plate II., which shows in a somewhat diagrammatic manner the limits of the spatfalls located from March, 1921, to November, 1923. The oldest oysters were those resulting from the spatfall of 1920, that is, those within the dotted blue line, the next oldest occurred within the continuous blue line denoting the limits of the summer spatfall of 1921. The youngest oysters occurred within the dotted and continuous red lines, which denote the limits of the 1922 spatfalls, as discovered in March and November, 1922. Those oysters within the dotted blue line were of ages ranging from 2–22 months, those within the continuous blue line ranged from 2–14 months, those within the dotted red line ranged from 2–10 months, and finally those within the continuous red line were from 2–4 months. Everywhere, except in the area between the dotted red line and the continuous red line, oysters of different ages were lying together, so that it was quite impossible to estimate the separate numbers of each age present. In March, 1922, it was estimated that the following numbers were present. These numbers do not include a few survivals of the oysters found in 1920 :—

West Cheval Paar	6,915,000,000, 2–27 months.
Periya Paar Karai	346,000,000, 2–27 months.
North Cheval Paar	90,000,000, 2–27 months.
True Venkalai	4,600,000,000, 2–27 months.

By March, 1923, these oysters were reinforced by millions of a new generation resulting from the two spatfalls of late 1922 and early 1923. The oldest oysters had by this time grown to such a size that it was a simple matter to differentiate between them and the younger oysters, and to record their numbers and their distribution. Plate I. shows the distribution of all oysters on the Northern Paars in March, 1923. The patches of blue indicate the positions of the old oysters discovered in March and November, 1921; the red patches represent the oysters discovered in March and November, 1922, and the green colouring represents spat discovered in March, 1923. We are only concerned here with the history of the 1921 and 1922 oysters. The later history of these oysters up to time of the fishery is best illustrated by Plate V. which shows their distribution in March, 1923, March, 1924, November, 1914, and February, 1925.

The numbers at each inspection were :—

Paar.	March, 1923.	March, 1924.	November, 1924.	February, 1925.
West Cheval	.. 87,890,000	.. 108,760,000	.. 77,910,000	.. 70,110,000
Periya Paar Karai	.. 21,000,000	.. 9,850,000	.. 4,470,000	.. 1,540,000
North Cheval	.. 7,630,000	.. 27,180,000	.. 14,450,000	.. 2,880,000
True Venkalai	.. 5,280,000	.. Nil	.. Nil	.. Nil

The great increase in numbers on the West Cheval and the North Cheval from March, 1923, to March, 1924, is explained by the fact that the numbers given for March, 1923, include only those oysters which survived from the spat falls discovered in March and November, 1921, that is spat falls of 1920 and 1921, while those given for 1924 include not only oysters resulting from these spat falls but also the survivals of the spatfalls of 1922. This entirely accounts for the great increase in numbers on these two paars in March, 1924. There are one or two points in the life history of the oysters fished that are best explained by a reference to the figures of Plate V.

West Cheval Paar.—The following table gives an estimate of the oysters found on the West Cheval Paar in 1924–25 together with the area covered by the oysters :—

	March, 1924.	November, 1924.	February, 1925.
<i>Oysters</i>	.. 108,760,000	.. 77,910,000	.. 70,110,000
<i>Area (sq. yds.)</i>	.. 10,560,000	.. 7,470,000	.. 8,370,000
<i>No. of Oysters per Dive</i>	32	30	22

In March, 1922, the northern half of the West Cheval was a continuous bed of 1920–1921 oysters. The southern half (see Plate II.) was covered with younger oysters. In March, 1923, dense masses of sargassum weed covered the mid-south area of this paar (shown as a blank space in Plate I.) In March, 1924, a further area on the north-central portion of this paar became choked with sargassum. This heavy growth of weed was particularly harmful and killed off large numbers of oysters. (Compare the conditions shown in March, 1923, and March, 1924, Plate V.) It forced others to migrate east, west, and south. This migration is illustrated rather clearly by the small patch of oysters on the South-West Cheval which first became evident in March, 1924. This patch contained a high percentage of 1920 and 1921 oysters which were not found in this locality the previous year. Their presence could only be explained therefore by a forced migration from their former anchorage consequent on the presence of sargassum weed. In November, 1924, there was a reduction on the north area of the West Cheval of 57 per cent. and a corresponding reduction in area. The South-West Cheval showed little diminution either in numbers or in area. In February, 1925, there was no marked diminution.

The Periya Paar Karai.—The following table gives the estimated number of oysters, and the area covered by them in 1923–25 :—

	March, 1923.	March, 1924.	November, 1924.	February, 1925.
<i>Oysters</i>	.. 21,000,000	.. 9,850,000	.. 4,470,000	.. 1,540,000
<i>Area (sq. yds.)</i>	.. 3,150,000	.. 1,320,000	.. 750,000	.. 480,000
<i>No. of Oysters per Dive</i>	20	22	16	9

Sargassum again was largely responsible for the steady decrease in numbers of oysters on this paar from 21,000,000 in 1923 to 1,540,000 in February, 1925. A mortality of 53 per cent. from March, 1923, to March, 1924, 55 per cent. from March, 1924, to November, 1924 (7 months) and 64 per cent. from November, 1924, to February, 1925 (2 months), which was almost entirely due to dense growths of sargassum weed.

The True Venkalai Paar proved a total failure, there being no oysters of any consequence after March, 1923, despite the fact that in April, 1922, there were 7,000 million oysters present on this paar. This disappearance is again largely consequent on the growth of sargassum weed, for since 1923 this area has been thickly covered by this weed, one of the greatest enemies of the oyster we know.

There are other contributing factors to the disappearance of oysters which are given below in their order of importance.

(1) *Movement of Sand.*—It has for some years been noticed that the contours of paar areas change materially from year to year and further, that rock which is one year bare, is the next year covered with sand and *vice versa*. This displacement of sand is directly proportional to the strength of the south-west and north-east monsoons. It is very doubtful if the sand is carried along bodily by strong bottom currents. It is much more likely that it is caused by the silting of sand carried in suspension. During this fishery we came across a case in point where living oysters were completely buried by sand. A diver whilst fishing the South-West Cheval reported numbers of living oysters entirely covered with sand. This is the first concrete example we have had. The phenomenon, however, must be exceedingly common.

(2) *Attacks of Predacious Fishes.*—When the banks are barren of oysters the fishermen report fish to be moderately scarce, but after oysters have been present for some time they say fishes become much more numerous. It is doubtful, however, whether the ordinary small fishes, such as *Lethrinus*, *Tetraodon*, &c., do much harm except to young oysters, but there can be no doubt of the ravages of oyster-eating rays. During the last two years we have noticed increasing swarms of these fishes on the banks. They are exclusively bottom feeders preferring to feed on sand, and on several occasions when we have been inspecting the banks we have noticed large patches of mud-coloured water which we have associated with the feeding habits of rays. Divers, who are more terrified of rays (probably on account of their poisonous candal spine) than of any other inhabitant of the banks, frequently report large numbers of rays feeding on the bottom. When these fishes are in such large swarms, it is not a difficult matter to imagine their completely stripping an oyster bed in a relatively short time. Rays undoubtedly do incalculable damage to the banks. We are, however, quite powerless to combat them. There are several other minor enemies of the oyster such as boring sponges, boring molluscs, &c. These may be ignored as the damage they do is very slight.

Twynam's Paar : Discovery of a New Paar.—In November, 1923, while dredging north-west of the True Venkalai Paar we unexpectedly came across old oysters lying on rock. A hurried survey by dredge showed these oysters to be covering a narrow strip of rock about one mile long by half a mile wide. In the following March a diver's inspection showed this area to be rather greater than we at first supposed, being at least two miles long and half a mile wide. There were then nearly fifteen million third-oysters present on this area, not including large numbers of younger oysters.

In November, 1924, we had some difficulty in locating this area. The weather was bad and there was much movement on the ship. Even at anchor she swung so much that it was quite impossible for Commander Kerkham to get his bearings sufficiently exact for him to be sure of his position. Our inspection of this area therefore was not reliable. In February, 1925, the weather conditions were good, and we made a much more accurate survey. We found this area to be even more extensive than we had thought in March, 1924, and in spite of making three inspections we found these to be insufficient to cover the whole of the rock area. The discovery of this paar area illustrates very strikingly how very little we know of the ground other than the established paar areas, and how important it is to survey from time to time different portions of the vast area of the Pearl Banks.

It has frequently been said that the whole ground of the pearl banks is potential oyster bearing ground and this statement received considerable support by the discovery of Twynam's Paar. The discovery of this paar gave us an opportunity of perpetuating the name of Sir William Twynam, K.C.M.G., who was associated with the pearl banks for over thirty years.

(2) INSPECTION OF NOVEMBER–DECEMBER, 1924.

In view of a possible fishery being held in March, 1925, a divers' inspection of those paar areas on which the oldest oysters were present was held from November–December. This inspection was delayed owing to the re-fitting of the "Nautilus," and the weather conditions were very unfavourable. We had to contend with a variable north-east wind, an overcast sky, broken sea, and a strong south-east current, a particularly bad combination of conditions. Not only were the inspection boats unable to keep their proper stations but the divers found the strong current exhausting to work against. The results obtained therefore are perhaps not too reliable. They are given below and are compared with those of March, 1924 :—

Summary of Oysters found.

Paar.	Number of Old Oysters, March, 1924.	Number of Old Oysters, December, 1924.	Age, December, 1924. Years.
<i>West Cheval—</i>			
N. W. area	.. 16,420,000	.. 7,400,000	.. $2\frac{3}{4}$ –4
Mid W. area	.. 36,200,000	.. 14,160,000	.. $2\frac{3}{4}$ –3 $\frac{1}{4}$
N. E. area	.. 25,940,000	.. 27,930,000	.. $2\frac{3}{4}$
S. W. area	.. 19,530,000	.. 22,970,000	.. $2\frac{3}{4}$
S. E. area	.. 10,670,000	.. 5,810,000	.. $2\frac{3}{4}$
<i>Periya Paar Karai</i>	.. 9,850,000	.. 4,470,000	.. $2\frac{3}{4}$ –4
<i>Twynam's Paar</i>	.. 15,600,000	.. 4,840,000	.. $2\frac{3}{4}$ –4
<i>North Cheval—</i>			
W. area	.. 6,580,000	.. 2,580,000	.. $2\frac{1}{4}$
Mid. area	.. 15,270,000	.. 9,290,000	.. $2\frac{1}{4}$
E. area	.. 5,300,000	.. 2,580,000	.. $2\frac{1}{4}$

Even allowing for the unsatisfactory weather conditions during this inspection, the oysters on north-west area of the West Cheval and on the Periya Paar Karai appeared to be dying off rapidly. It was imperative, therefore, that they be fished in March, 1925, together with the oysters on Twynam's Paar. With this object in view the following oysters were lifted for the purpose of pearl valuation :—

Twynam's Paar 1,830 (weather conditions too bad to collect a larger sample).
 Periya Paar Karai 10,000.
 North-West of West Cheval 8,000.
 South-West of West Cheval 9,000.

Valuation Samples.—These oysters were fished by Government divers from the inspection boats on December 9, 10, and 12. They were taken to the "Nautilus" immediately they were fished, and there counted, bagged, and sealed, and were brought to Colombo in December where they were washed in a specially prepared enclosure at Waters' Meet, Mutwal. The pearls were submitted to five merchants for valuation and the following results were obtained. The names of the merchants are not given, but are designated A, B, C, D, and E.

Valuation.

	Twynam's Paar.	Periya Paar Karai.	West Cheval (N.W.).	West Cheval (S.W.).
	Rs. c.	Rs. c.	Rs. c.	Rs. c.
A	.. 19 35	.. 22 0	.. 22 75	.. 20 55
B	.. 16 66	.. 22 50	.. 14 37	.. 18 0
C	.. 26 88	.. 36 92	.. 30 62	.. 19 30
D	.. 10 9	.. 15 5	.. 8 67	.. 7 9
E	.. 12 52	.. 15 82	.. 11 20	.. 9 65
<i>Average</i>	.. 17 10	.. 22 46	.. 17 52	.. 16 92

The figures given in the above table are rupees per 1,000 oysters.

It will be seen that there was a considerable divergence of opinion amongst the valuers, but I was informed by two of the merchants that the estimates should be regarded as very conservative. It is reasonable to suppose that such a valuation will be a low one as there is a likelihood of the valuers being prospective buyers at the fishery. A similar opinion was expressed by Mr. Hornell in his Report on the 1906 Fishery (Ceylon Sessional Paper LI. of 1906, p. 20).¹

It was necessary to ascertain from this valuation the probable price which the oysters would fetch three months later. For this purpose I collected the statistics available for the eleven fisheries ending with the 1906 fishery. A comparison was made between the November valuation, and the actual price realized at the fishery in the following March. This information is given in the following table, and with two exceptions it will be seen that there is a considerable increase, the mean increase for all fisheries since 1880 being 62 per cent.

Fishery Year.	Valuation per 1,000 Oysters at the November Inspection preceding the Fishery.		Price per 1,000 Oysters realized at the Fishery.	
	Rs. c.		Rs. c.	
1880	..	6 43	..	8 30
1881	..	21 37	..	33 30
1887	..	11 14	..	18 80
1888	..	14 20	..	57 40
1889	..	10 16	..	19 10
1890	..	20 0	..	14 20
1891	..	36 11	..	32 10
1903	..	16 20	..	29 72
1904	..	30 0	..	38 39
1905	..	16 60	..	48 89
1906	..	22 70	..	32 20
Average of eleven fisheries	..	18 62	..	30 21

Increase of 62 per cent.

The intention was to fish the following quantities :—

	Millions.
Twynam's Paar	5
Periya Paar Karai	7
West Cheval Paar (N.W.)	8
West Cheval Paar (S.W.)	10
Total	30

Taking a mean of the valuation of each paar the following would be the value of 30 millions :—

	Rs.
Twynam's Paar	85,000
Periya Paar Karai	157,220
West Cheval Paar (N.W.)	146,160
West Cheval Paar (S.W.)	169,200
	<u>557,580</u>

Allowing 62 per cent. increase on this valuation, the fishery of 1925 was thus estimated to produce Rs. 893,559 of which two-thirds would be the property of Government, namely, a sum of Rs. 595,706. The actual figures (for the sale of oysters only) were Rs. 461,887·17 for 10½ million oysters (Government share), or an average of Rs. 44 per thousand.

Valuation of Pearls.—With reference to the method used in valuing pearl samples Mr. F. R. Sandrasagra wrote as follows :—

Ten (10) sized baskets or sieves are used by the Ceylon and South Indian merchants (excluding the Madras City, Bombay, and Calcutta merchants) in the valuation of pearls. The Madras City, Bombay, and Calcutta merchants use thirty (30) baskets, instead of the 10. Each basket is round, about 6 to 8 inches in diameter, and 2 to 3 inches high with sized holes in the bottom. The size of the holes in each basket is different.

The pearls that do not pass through the holes of the Nos. 1, 2, 3, and 4 baskets come under the term "Chevo" (Ceylon). The pearls that do not pass through the holes in the Nos. 5, 6, and 7 baskets come under the term "Vadivu."

The pearls that do not pass through the holes in the Nos. 8, 9, and 10 come under the term "Thul."

¹ Our subsequent experience of a pearl fishery has strengthened this view, and we can quote a very striking instance of the difference between a valuer's estimate and the buyer's price. During the 1925 fishery a sample of pearls which was valued at Rs. 375 by a professional pearl merchant was bought for Rs. 1,000 by another pearl merchant. In practice a valuation is useful in so far as it conveys information to the professional buyers though the valuation figure would deceive the non-expert. Apart from this under-valuation it has to be borne in mind that the pearls would grow an appreciable amount between the November–December inspection and the fishery in the following March.

These baskets or sieves are called thus :

Chevo (Ceylon)	..	{	No. 1 basket is called	" 20 "
			No. 2	" 30 "
			No. 3	" 50 "
			No. 4	" 80 "
Vadivru	..	{	No. 5 basket is called	" 100 "
			No. 6	" 200 "
			No. 7	" 400 "
Thul	..	{	No. 8 basket is called	" 600 "
			No. 9	" 800 "
			No. 10	" 1,000 "
Masy	..	All the other small pearls are called by this name.		

The following are the technical names of the pearls in order of their value :—

- | | |
|--------------|--|
| (1) Annai. | (5) Kuruval (two pearls attached to each other). |
| (2) Adatari. | (6) Pisal. |
| (3) Valuhal. | (7) Kodai. |
| (4) Kalipu. | (8) Chenuir. |

(3) OYSTERS FISHED AT THE 1925 FISHERY.

Oysters available.—As a result of the February inspection it was estimated that the following fishable oysters were available :—

Name of Paar.	Oysters.	Rock Area. Sq. Yds.	Average per Dive.
Twynam's Paar, N.	4,000,000	600,000	20
Do. S.	9,760,000	1,290,000	22
Periya Paar Karai	1,540,000	480,000	9
North Cheval	2,880,000	570,000	14
West Cheval N.W.	5,380,000	780,000	19
Do. Mid.	13,668,000	2,760,000	14
Do. N.E.	23,440,000	2,790,000	25
Do. S.W.	27,340,000	2,640,000	31

These figures were then expected to be an under-estimate, and it was thought that the fishery would show considerably more oysters present than these figures indicated. We therefore ear-marked Twynam's Paar, the Periya Paar Karai, and the North-West Cheval as paars to be fished, expecting to make up any deficit from the south-west area of the West Cheval, holding the other areas in reserve for a fishery in 1926. As the fishery proceeded, however, we saw that our expectations would not be realized, and that it would be necessary to fish some of the oysters reserved for 1926 ; but even at that stage we were hopeful. It was only after the fishery had gone on for some time that we became fully aware of the discrepancy between our estimates and the actual numbers of oysters fished.

Description of the Fishery.—The fishery was advertised to start on or about February 26, but as there were then only 20 boats licensed and 310 divers available and the weather not too promising, it was decided to postpone the commencement until the next day. The fishing boats were instructed to tie up to the three trawlers and the two steam tugs "Thelma" and "No. 3" by 11 P.M. on the 26th, and the vessels would sail for Twynam's Paar at 2 A.M. the next day. We started from Marichchukkaddi at 2 A.M. towing 21 boats and arrived at the fishing ground, which was the north bed on Twynam's Paar, at 6 A.M. The divers had some trouble finding oysters at first, and did not get really going until about 10 A.M. by which time most of them were bringing up large catches. The Jaffna divers found the depth (9½ to 11 fathoms) rather exhausting. The Arab divers were not inconvenienced by the depth but felt the cold. The average catch per boat was 8,845. Next day, February 28, one additional boat fished, and the catch was even better, the average being 11,795. On March 1 and 2 thirty boats were fishing, but the catches dropped to an average of 9,042 and 7,103 per boat. The divers were by this time becoming rather tired of the deep water and for a reason we are not able to explain unless it was the usual cry that the oysters were immature, Twynam's Paar was becoming unpopular in the Camp, both divers and merchants were clamouring for us to fish the West Cheval. We therefore decided to start fishing the bed on the north-west area of this paar on the following day, March 3. The number of boats had now increased to 37 and the divers to 563. The new comers were from Pamben, Tuticorin, and the Persian Gulf. The first day's fishing on this area realized 269,920 oysters, or an average of 7,269 per boat. The second day on this area we had 53 boats out and 856 divers. The increase was mainly due to the arrival of 10 Tuticorin boats. The average catch per boat dropped to 5,555. This small patch of oysters covering only 570,000 square yards was expected to yield 5,000,000 oysters, but after two more fishing days spent on this area when a total of under 2,000,000 oysters were fished, divers complained of the scarcity of oysters (the fourth day the average dropped to 3,939 oysters per boat). It was then we first realized that the numbers of oysters fished would not be up to estimate, and that we should have to encroach on our reserves for 1926. We therefore changed the fishing ground to the Mid-West Cheval. The first fishing of this new area was on March 9 with 60 boats and 982 divers. This day's fishing yielded half a million oysters averaging 8,943 per boat. With one day's interval we fished this area for nine days getting fair average daily catches. The advent of the Kilakarai divers on March 17 raised the divers total to 1,805, 115 boats taking part. On March 21, 1,908 divers were fishing from 125 boats. This was the largest number of boats and divers we had during the fishery. On this day we had considerable trouble with the boats. One or two got restless during the early mornings and started sailing. This upset the remainder of the boats and soon a large number were sailing in all directions. It took us some time to get them to drop their sails and settle down again, by which time they had wasted much of the morning and the day's catch consequently suffered, being only an average of 3,852 per boat. The next day we moved to the South-West Cheval. Here we expected to find oysters in great abundance, but on the first day's fishing of this area we found

oysters not so plentiful as our inspection in February led us to think, but although half the morning was wasted before the boats got on to the good patches, the day's fishing yielded a good catch. As we were anxious to fish out the areas on which we had already started fishing, the next two days were spent on the north-west portion of the West Cheval and on Twynam's paar respectively. We then returned to the South-West Cheval and fished it for two days. On both of these days fishing was poor, the second day lamentably so, for except a small patch on the south-east side the area appeared to be barren. The failure of this area was a great blow. Six weeks earlier it had been inspected and showed about 27,000,000 oysters to be present in thick bunches, mainly on sand. Yet, after three day's fishing no oysters were left. We suffered another shock still later when fishing the south bed on Twynam's Paar. 9,760,000 oysters were estimated to be present on this area, yet when fished on March 31 no oysters could be found. The morning only yielded an average of 2,264 oysters per boat.

The Periya Paar Karai was fished for three consecutive days April 1 to 3, and we were agreeably surprised to find oysters on this small area occurring in thick patches. Fishing was brisk on the first and second day but very poor on the third day.

From April 4 to April 11 when the fishery ended we fished the north part of the Mid-West Cheval, getting very fair average catches until the last day April 11.

Quantity of Oysters fished.—The oysters actually fished and those estimated to be present are given in the following table:—

	February, 1925.	Fished.	Per Cent.
Twynam's Paar, N.	.. 4,000,000	.. 2,038,556	.. 50
Do S...	.. 9,760,000	.. 237,750	.. 2
Periya Paar Karai..	.. 1,540,000	.. 1,326,000	.. 86
North Cheval ..	.. 2,880,000	.. 512,625	..
West Cheval N.W...	.. 5,380,000	.. 1,183,522	.. 22
Do. Mid ..	.. 13,660,000	} 9,003,877	.. 43
Do. N.E. ..	.. 23,440,000		
Do. S.W. ..	.. 27,340,000		
Total ..	88,000,000	15,770,036	18

It is difficult to understand why only 18 per cent. of the total estimated number of oysters were fished when in other fisheries with the same method of estimation there was always a close approximation in the numbers fished and the estimated numbers.

Reasons for the Loss of Oysters.—There are only three possible explanations, namely:—

- The basis of estimation is radically wrong;
- The oysters were either destroyed or they were carried away by bottom currents during the interval between the inspection and the fishery; or
- The buoys marking the areas had drifted from their positions.

With regard to (a) our method of estimation is precisely that employed by Mr. Hornell and his predecessors in earlier fisheries though we have changed, and, as we think, improved on their method of inspection.

These two methods are described on page 37 of this report.

In estimating the numbers of oysters on a particular area we first calculate the average number obtained per dive, then allowing three square yards for one dive it is a simple matter to calculate the number of oysters covering a particular area. The assumption that a diver covers three square yards per dive has worked out very satisfactorily at previous fisheries. Where oysters are thick a diver fills his basket at one spot, but where oysters are scattered he probably covers twice this area in picking up oysters. The one case generally balances the other, and we get a fair working estimate.

Returning now to the present fishery it is inconceivable that the differences between the estimated numbers and the numbers fished could be entirely due to the wrong estimation. On Twynam's Paar (north bed) there was a difference of 50 per cent. This paar was fished at the commencement of the fishery when there were not more than 30 boats available. With such a small number of boats fishing it is impossible to pack them so tightly as with a big fleet, and when oysters are getting thin the boats have great freedom in changing their position, so that the ground is likely to be very imperfectly fished. Again, the depth was rather greater than normal and the weather was bad. Some allowance must be made, therefore, for these adverse conditions, in which case 50 per cent. of the estimate might be considered reasonable. On the other hand, the southern bed yielded only one day's very unsatisfactory fishing, only 2 per cent. of the estimated numbers being fished. Divers complained on this occasion that no oysters could be found and our own attempts with Government divers proved fruitless. This bed in February covered a quarter of a square mile and gave average dives of 22 oysters. The estimated number of oysters was 9,760,000. Yet only 237,750 oysters were fished. What then happened to the remainder? It is inconceivable that these oysters could have disappeared so completely within the short space of six weeks since this area is not likely to be sand washed. One can only suppose the buoys marking the spot to have drifted. A drift of even a quarter of a mile would put us out completely and would, moreover, be very difficult to detect since the available landmarks from which bearings can be obtained are very distant. The Periya Paar Karai, which we fully expected to be a failure since no oysters could be found when we attempted to take a valuation sample, gave very satisfactory results. 86 per cent. of the estimated number of oysters on this area were fished, and it is almost certain that we should have obtained the estimated number had we fished out the bed. This area, which was less than one-sixteenth of a square mile was fished under much more favourable conditions. We never had less than 100 boats fishing and as the area was so small they were packed very closely. Some difficulty was experienced on the first day in finding oysters, but when the boats did eventually get on to oysters fishing was very brisk. On the third day the bed appeared to be fished out and the catch was very poor. But after the signal to cease diving had been given and we had commenced sealing the bags, we found one or two boats who reported oysters in quantity on the spot they were fishing. It was too late then to take advantage of this find and we had no further opportunity of refishing this area. Had we done so I feel sure we should have fished the number estimated to be present. The North Cheval was only partly fished and does not call for discussion.

The North-West, and the Mid and North-East areas of the West Cheval realized only 22 per cent. and 43 per cent. I do not think any one of these areas was completely fished. The most astounding case of all the areas fished was that of the south-west of the West Cheval. Our records of the three inspections of March and November, 1924, and February, 1925, showed a surprising similarity both in estimated numbers and in the general contour of the bed.

The figures were :—

	March, 1924.	November, 1924	February, 1925.
<i>Oysters</i> ..	30,200,000 ..	28,780,000 ..	27,340,000.
<i>Area (sq. yds.)</i> ..	2,040,000	2,310,000	2,640,000
<i>No. of Oysters per Dive</i>	44 ..	39 ..	31

Loss Probably due to Sand.—During the February inspection I spent some time in the inspection boats and satisfied myself as to the accuracy of the coxswains' returns. Yet six weeks later we fished this bed for three days only, and had great trouble on the third day in finding oysters. The scarcity of oysters in this instance cannot be explained by the supposition that the buoys had drifted and that we were fishing on the wrong area, as this bed lies almost alongside a fixed mark, the shoal buoy beacon, which cannot be mistaken. Exhaustive efforts were made both by diver and dredge to locate these oysters with no success. We can only assume therefore that either they were covered by silting sand, or that a strong bottom current carried them away to some position which we could not locate.

A parallel case of the drift of oysters just prior to a fishery is furnished in the record fishery of 1905. As a result of the February inspection preceeding this fishery, it was expected to fish some 47,000,000 oysters from the South Cheval. Only half this quantity was fished from this paar, but 30,732,000 oysters were fished south-east of this area off clean sand, and it is assumed they were drift oysters from off the South Cheval.

The divers in the present fishery were very keen to fish over this sandy area misnamed the Kud-remalai Paar, but since we had dredged it extensively and had not found oysters thereon, we did not consider they had the remotest chance of finding oysters, particularly as shoal water lies between it and the South-West Cheval. Unless we succeed in finding these oysters during next November inspection this disappearance *en bloc* will provide yet another instance of the uncertainty of the pearl fisheries.

(4) AGE AND GROWTH RATE OF THE PEARL OYSTER.

(Plate VIII.)

Sir William Twynam's Views.—The question of age and growth rate of the pearl oyster, although a much discussed question amongst past administrators of the pearl banks, has received very little real attention from the point of view of ascertaining a relationship between age and size. All previous estimations appear to have depended on the experience of the particular person making the estimation. That is to say age has always been judged at sight. Sir William Twynam in a reference to this subject in his Report on the Ceylon Pearl Fisheries, gives it as his opinion that native ideas of age are not far wrong backed up as they are by the cumulative experience of centuries. He states that according to evidence collected by Steuart, the native opinion is that pearl oysters live seven to eight years ; form pearls when they are four years old ; are rich in pearls when they are five years old ; and should be fished before their sixth year. Twynam contends this statement to be singularly borne out by information gleaned from old records which Captain Donnan obtained for him in 1874. He gives the following in support :—

Fishery of 1855, age of oysters fished	4 years 4 months.
Do. 1857 age of oysters fished	doubtful, probably 4 years.
Do. 1858 age of oysters fished	doubtful, probably 5 years.
Do. 1859 (Cheval Paar) doubtful,	probably 6 years.
Do. 1859 (Modaragam) doubtful,	probably 4 years.
Do. 1860 (Modaragam)	4 and 5 years.
Do. 1863 (Modaragam)	under 5 years.

Of these seven fisheries, the age of oysters fished at four of them is admittedly doubtful, while the age of those fished at the other three, given as under five years, is an age at which pearl formation according to the above statement is not very far advanced. I have some difficulty in understanding, therefore, how these records corroborate the opinion expressed above.

The Views of Captain Steuart and Captain Donnan.—Again Captain Steuart and Captain Donnan who succeeded him were not in agreement regarding age. Captain Donnan definitely stated in a letter published as an Appendix to Twynam's Report, that he did not agree with Steuart's estimation of age as represented by drawings in the latter's manuscript book on the pearl oyster. Donnan stated that in his opinion—

Steuart's 12-14 months oysters	equalled his of 6 months.
Do. 2 years	do. 1 year.
Do. 4 years	do. 2 years.
Do. 5-6 years	do. 3 years.
Do. 6 year	do. 4 years.

There is thus a difference of some 50-100 per cent. between these two estimations made by men who had considerable opportunities for observing oysters under all conditions of age and growth. Unhappily we have no knowledge of Steuart's figures. Despite this difference of opinion of which Twynam was well aware, he stated that "for all practical purposes enough is known regarding the age of the pearl oysters and when they should be fished." The only practical contribution he offered to this question of age was that oysters of the size of a sixpence, a shilling, and a crown piece are six, twelve, and eighteen months, respectively. He gave no opinion regarding the ages of larger oysters. I shall presently show his six, twelve, and eighteen months, oysters to be two, three, and ten months, respectively, so that his ideas of the ages of larger oysters, which are still more difficult to determine from sight, are likely to have been even more incorrect. Hence the statement that enough is known regarding the age of pearl oysters is not supported by facts.

Measurements commenced in 1921.—The only reliable basis for an age determination is a known relation either of weight, or linear measurements, and in order to collect data which would give such a relationship, we have taken careful measurements and weights of oysters in all stages of growth found on the banks during successive inspections from November, 1921, to the present time.

The measurements taken are :—

- (a) Long axis, i.e., from the hinge to lip.
- (b) Short axis, i.e., from anterior to posterior edges of shell.
- (c) Greatest thickness.
- (d) Weight.

The linear measurements (in millimetres) have been measured with the utmost care by means of a millimetre gauge with sliding jaws. The weights have been measured by a spring balance in grammes.

We have now considerable numbers of these measurements of oysters from all the paar areas and although the data we have collected is not yet complete, we are able to give tentative results in regard to the oysters of the West Cheval. The oysters of the other paar areas differ slightly in their rate of growth, but for all practical purposes, the results obtained from the oysters of the West Cheval may be applied to all oysters of the pearl banks.

In an investigation such as this, it is extremely difficult to follow the growth of one generation of oysters from spatfall to the age of 3-4 years, owing to the fact that successive spatfalls are often deposited over the same area, and also because there is no hard and fast line of demarcation separating one generation from another. Different generations do as a matter of fact graduate into one another. This difficulty was especially apparent with the oysters of the West Cheval where the heavy spatfalls of 1920, 1921, 1922, and 1923 created much confusion. It was only after examining the measurements of a large number of oysters, that it became possible to pick out the various stages of growth of one generation. The following series gives the different stages in growth of the same generation of oysters from November, 1921, when they were first discovered, to March, 1925, when they were fished :—

Date.		Long Axis. mm.		Short Axis. mm.		Thickness. mm.		Weight. (grammes)
November, 1921	..	30.0	..	28.4	..	10.7	..	5.0
March, 1922	..	37.9	..	29.0	..	13.9	..	10.7
November, 1922	..	48.6	..	42.4	..	19.0	..	21.8
March, 1923	..	52.3	..	46.2	..	21.1	..	30.3
November, 1923	..	62.0	..	53.8	..	24.9	..	42.0
March 1924	..	65.6	..	58.3	..	27.0	..	52.3
November, 1924	..	72.9	..	63.4	..	30.4	..	71.7
March, 1925	..	74.6	..	66.6	..	32.2	..	81.0

It must be remembered that these are the average sizes of a large number of oysters, and that it is unlikely that a single oyster would agree in all four dimensions with the above. Linear measurements vary considerably as one would expect, but weight is generally a reliable indication of age.

Growth Curves.—When these results are plotted they give the interesting curves of Plate VIII. These curves represent the three linear dimensions (long axis, short axis, and thickness) and weight. The abscissa represents age in months, and the ordinate either millimetres when interpolating linear growth or grammes when interpolating weight. With the aid of this chart it is possible to obtain the approximate age of any oyster when the weight or linear dimensions are known.

There are three interesting points concerning the pearl oyster which arise from this chart.

- (a) The products of the three linear dimensions, long axis, short axis, and thickness of different oysters have the same ratio to each other as their weights. Thus taking, as examples, oysters weighing 20, 30, 40, and 80 grammes we obtain from weight curve Plate VIII. the following linear dimensions :—

Weight. Gramme.		Long Axis. mm.		Short Axis. mm.		Thickness. mm.		Product of Linear Measurement.
20	..	47.5	..	40	..	21	..	39,900 approximately.
30	..	53	..	48	..	32	..	58,080 = 1.5 by 39,900
40	..	60.7	..	53.6	..	24.5	..	79,956 = 2 by 39,900
80	..	76	..	66	..	32	..	160,512 = 4 by 39,900

that is, the ratios of the weights are approximately equal to the ratios of the products of the linear measurements. These results are what might be expected during active growth, but so far as I am aware this relationship has never before been demonstrated in connection with the growth of molluscs.

Further, the weight (in grammes)=approximately .0005 of the product of the three linear dimensions (in mm.).

- (b) It is possible to obtain from the weight curve an expression for the relationship between age and weight.

$$\begin{aligned} \text{Thus : if } x &= \text{age in months} \\ \text{and } y &= \text{weight in grammes} \\ \text{then } y &= \frac{x^2 - 18x - 117}{36} \end{aligned}$$

This expression gives very satisfactory results between the ages of 15 and 39 months. Outside these limits there is a larger error.

- (c) The curves of Plate VIII. have a further and ever greater interest in that it is possible to deduce from them the months of the year when the heaviest spatfalls occur.

From March, 1921–November, 1923, new spat regularly appeared on the banks, and was located during the March and November inspections during this period. The measurements of young oysters taken during these inspections are :—

Date.	Long Axis. mm.	Short Axis. mm.	Thickness. mm.	Weight. grammes
November, 1921	18.7	16.4	5.7	0.9
Do.	29.8	27.8	10.6	5.0
March, 1922	21.7	14.8	7.5	1.6
November, 1922	18.9	16.2	7.1	1.25
March, 1923	23.4	19.7	8.8	1.7
Do.	29.2	24.3	10.6	5.0

Only the dimensions of the most abundant oysters are here given although there were in November, 1921, March, 1923, and November, 1923, oysters of all intermediate sizes from very young spat to those weighing 5–6 grammes. There were, however comparatively few of these intermediate sizes present. The smallest oysters in November, 1921, weighed .9 of a gramme and according to the weight curve Plate VIII. they were two months old. They were thus produced during August and September. Those weighing 5 grammes were approximately seven months old and were produced during April–May. Taking now March, 1922, the young oysters given in brackets weighing 1.6 grammes were found in quantities to the west of the West Cheval but not on the pair itself. These oysters were approximately three months old and were therefore produced during December–January. Here again we had oysters weighing 5 grammes that is seven months old which were thus produced during April–May. In November, 1922, oysters of 1.25 grammes were abundant. These were approximately three months old and were thus produced during July–August. In March and November, 1923, there was a repetition of the same ages of oysters.

Spawning Periods.—We have therefore two spawning periods during the year reaching a maximum during July and August and December and January, that is during the height of the south-west and north-east monsoons. This confirms the conclusions arrived at by Mr. Hornell. Since, however, oysters of all intermediate sizes occur with those of the more pronounced sizes given above, these two spawning periods run into each other, and thus produce two overlaps, the one during April–May, which explains the presence of the 5 gramme oysters, and the other during September–October. These latter oysters are, however, so very small when found during the November inspections that their presence is not pronounced.

Oyster Larvae.—While on the pearl banks in November and March–April we take daily tow-nettings to ascertain among other things whether pelagic spat is present in the surface water, but we have never found more than a few larvae present except in 1923, at the end of March and the beginning of April, when large numbers of pelagic larvae were found in every tow-netting taken, even so far south as Colombo. In view of the above we should now expect to find pelagic larvae abundant during July–August and December–January.

Seasonal Stimulations to produce Spawning.—In temperate waters where abrupt temperature changes occur with the advent of the seasons, it has been found that as a general rule, the spawning of most marine animals occurs during the spring or early summer when temperature changes are abrupt, and this has led to the belief that a rise in temperature acts as a breeding stimulus.

In tropical waters there are no abrupt variations in temperature since there are no abrupt seasonal changes. One would therefore expect spawning in these waters to be more or less spasmodic throughout the whole year, or that very slight physical changes would produce the same effect as seasonal changes in temperate waters. It is as a matter of fact interesting to observe that the latter actually does happen in the case of *Placuna placenta*, the window-pane oyster living in the shallow almost land-locked water of Lake Tamblegam, Trincomalee. Here the spawning season follows the period of heavy rains in December and January, when the water of the lake (so called) receives a big supply of fresh water from the flood rivers entering it, with a result that both salinity and temperature are rapidly lowered. The breeding stimulus in this case is undoubtedly a physical one due to the change in salinity and temperature of the water in which the window-pane oyster lives.

In the Gulf of Mannar we have a more or less regular cyclic movement of water, which is controlled by the north-east and south-west monsoons. The south-west monsoon commences at the end of April, and increases in force until it reaches its height during July and August. Thereafter it gradually weakens until a lull is reached in November, when the north-east monsoon commences. This monsoon reaches its height during December–January, thereafter falling away to another lull during March and April, after which the south-west recurs. The effect of the south-west monsoon is to force oceanic water of high salinity and low temperature into the Gulf. The north-east monsoon has the converse effect, the surface water at any rate being replaced by low salinity water from the Palk Strait, which, at this time of the year, receives considerable quantities of flood water consequent on the torrential rains which fall over the north of Ceylon during this period. The maximum effect of these changes is reached when the monsoons are at their height, namely, July–August and December–January, thus coinciding with the periods of maximum spawning. It is therefore reasonable to suppose that these changes of temperature and salinity provide a breeding stimulus similar to that of the flood water of Lake Tamblegam on the window-pane oyster *Placuna placenta*.

The Size and Age of Oysters fished.—Referring now to the oysters fished during the recent fishery the following tables show the average dimensions, weights, approximate ages, and percentages, of samples of oysters taken from the three pairs fished. The measurements given of the valuation samples are of only 100 oysters in 10,000 taken at random. This probably explains why the January sample, in spite of its higher pearl valuation, is represented as being younger than the December sample.

The measurements given of the fishery sample, are of such oysters as were collected during prospective dives by a Government diver during the fishery, namely, about 100 per day. They represent, therefore, only a fractional proportion of the oysters fished, and are on this account, perhaps, hardly a representative sample of the fishery, they are, however, the only measurements available.

The West Cheval Paar.

	Long Axis. mm.	Short Axis. mm.	Thickness. mm.	Weight. grammes.	Approximate Age. Years.	Percentage.
Valuation sample—						
December, 1924	67.0	58.8	27.2	57.2	3	—
January, 1925	64.7	56.7	28.8	45.4	2½	—
Fishery sample	60.1	54.6	25.4	43	2½	34.3
	64.8	57.7	27.7	52	2½	32.5
	68.0	60.1	29.1	61.8	3½	23.7
	71.0	62.5	31.6	72.2	3½	6.2
	76.2	67.8	33.0	86.0	4	3.3
Average	64.64	57.83	27.64	53.60	3	—

Periya Paar Karai.

Valuation sample—						
December, 1924	70.9	61.6	29.1	61.7	3½	—
January, 1925 (not taken)						
Oysters fished	58.4	52.2	24.4	34.0	2½	6.1
	61.7	54.4	27.2	42.6	2½	28.3
	66.3	59.0	29.2	53.3	3	32.0
	70.0	58.9	30.3	62.8	3½	22.1
	73.4	65.0	32.3	74.0	3½	11.5
Average	66.15	58.03	28.92	53.56	3	—

Twynam's Paar.

Valuation sample—						
December, 1924	66.8	59.6	27.1	56.9	3	—
January, 1925	66	59	27	53	3	—
Oysters fished	57.3	57.1	24.2	33.6	2½	13.8
	61.5	55.5	26.9	43.2	2½	34.8
	65.4	59.2	28.0	52.4	2½	35.6
	69.0	62.2	29.6	62.6	3½	15.8
Average	63.5	57.2	27.3	48.2	2½	—

Reverting now to Twynam's statement that the age of oysters of the size of a sixpence, a shilling and a crown piece, are six, twelve, and eighteen months, respectively—the sizes of these coins are: six pence 20 cms., a shilling 23 cms., and a crown piece 38 cms. A glance at Plate VIII. will show that 20, 23, and 38 cms. measured along length curve give 2½, 3½, and 10½, respectively, as the ages of these oysters. A very different estimate to Twynam's six, twelve, and eighteen months.

Hornell's Measurements.—The first attempts at the actual measurement of the pearl oyster were made by Mr. Hornell during the fisheries of 1902–1907 and are published in Herdman's report. Unhappily Hornell's measurements were linear only. They would have proved more valuable had weights also been taken, but even so, they are the first attempts to attack this important question from a reasonable standpoint.

The figures quoted by Herdman for the West Cheval are:—

Age. (months)	Height (Long Axis). mm.	Length (Short Axis). mm.	Breadth. (Thickness) mm.
3–6	33.50	30.75	—
11–14	47.64	44.36	—
27–30	56.60	52.60	24.56

Taking into account only the height measurement or long axis, since my length measurements corresponding to height given above do not agree with Hornell's, my estimate of the age of the above oysters is 8, 17, and 27 months, respectively. This is in close agreement with the ages given by Hornell. My length (short axis) measurement of oysters having a height (long axis) measurement of 33.50, 47.64, and 56.60 are 27.50, 40.50, and 50.50, while my breadth (thickness) for the last example quoted would be 23 mms. instead of 24.56. I do not know how Hornell took his measurements; I can therefore give no explanation of these differences.

With regard to older oysters, Hornell states that the oysters fished in 1904 from the West Cheval were 4½–4¾ years old, and he gives the average sizes of these oysters as—

Height. mm.	Length. mm.	Width. mm.
73.79	66.98	31.86

From my curves the dimensions of oysters having a height (long axis) of 73.79 would be :

73.79, 65, 31 and the age 3¾ years, which I think is a more likely estimate.

This is the only record we have of the sizes of oysters fished. The reports of all other fisheries contain but a bare statement of the age or probable age and give no indication of the sizes. I feel, therefore, that as I disagree with Hornell's estimate of age in the particular instance quoted above, I have stronger reasons for doubting the accuracy of any age estimation of oysters fished at previous fisheries. I think in every case the oysters were very much younger than they were reported to have been.

V.—Nautical Notes.

(Plates VI. and VII.)

(1) THE FISHERY OF 1925.

Every preparation had been made afloat for the handling of a fleet of 120 divers' boats, and it was confidently expected that at least this number would be assembled at Marichchukkaddi on the date advertised for the commencement of the fishery. This number represented the number that could be towed, and with a view to disposing of two or three of the towing units after the fishing was well in hand it was decided to fish Twynam's Paar first. Unfortunately, only Arab and Jaffna divers, 14 Arab dhoneyys, and 7 Jaffna divers' dhoneyys had assembled on the opening date of the fishery, i.e., February 27, 1925. A start was made, however, with this inadequate number, and the consequence was that the boats being so few could not be induced to fish closely as they would have been forced to do had the required number of boats been present.

Towing.—Towing was made necessary in the case of Twynam's Paar by the distance of the paar from Marichchukkaddi, namely, 24 miles. Owing to the position of Twynam's the divers boats were unable to make the paar under sail in the day and return to Marichchukkaddi before dark. As it happened the unseasonable weather made it necessary to retain all the vessels engaged in towing throughout the fishery.

The tow units comprised the following :—

Trawler "Nautilus"	.. Fishery Department	Towing capacity at a speed	
		of 5 knots per hour	
		..	48 dhoneyys
Trawler "Violet"	.. Colombo Port Commission	..	30 "
Trawler "Lilla"	.. do.	..	24 "
Tug "Thelma"	.. Harbour Engineer's Department	..	10 "
No. 3 Pilot Launch	.. Master Attendant's Department	..	8 "
		Total	.. 120

The divers' boats (dhoneyys) range from 10 to 30 tons burden. On one occasion after the arrival of the Kilakarai boats, which are small and light, the "Nautilus" towed as many as 73 boats at a speed of 4 knots, the weather being fine and the sea calm. The towing speed should, however, be at the least 5 knots. With a favourable wind when the boats can lighten the tow by setting sail, a speed of 6 and $6\frac{1}{2}$ knots was made.

The use of the above vessels for towing undoubtedly saved many days when either the land or sea breeze failed. It is necessary to start diving operations as early as possible, that is, as soon as the sun is high enough for its rays to penetrate the depths; diving usually commences about half-past six or seven o'clock and ceases at noon. By stopping the diving at noon the divers' boats have ample time to make Marichchukkaddi before dark under seasonable conditions, that is with a fresh westerly wind. As previously remarked, owing to the unseasonable weather experienced and the long periods in which either the land or sea breeze failed, it was found necessary to tow the fleet either one way or the other, and sometime both out and in. There is no doubt that in the past such unfavourable weather conditions accounted for the number of days on which the banks could not be fished owing to the failure of the land or sea breeze. The failure of the land or sea breeze means the loss of a day; either the fleet gets out too late to fish and return, or returns too late for the boats to land their catch and sail again that night. Under such adverse conditions fishing can only be done on alternate days as would have been the case during this fishery on several occasions but for the use of the above vessels.

Number of Boats required.—At least 120 boats are necessary to ensure a good daily catch, and we found by experience that it was necessary to have the boats as closely packed as possible to ensure their remaining in position and to prevent their moving about and losing time; and also to fish the paar thoroughly and efficiently. As previously stated, few boats result in a restless endeavour to find better ground and a bed of oysters gets picked over. In this way much time is lost, and the paar is never thoroughly fished.

Dress divers.—In connection with the question of employing dress divers the vast numbers of oysters to be fished, the area they occupy, and the time limit imposed by the fine weather season must be borne in mind. It would appear impossible to employ enough dress divers with their equipment to deal with the number of oysters fished by skin divers in the period, say, 30,000,000 in 36 days. If we assume that one dress-diver can fish as many oysters as a crew of ten skin divers, at least 200 dress divers with their diving equipment and boats would be required for an average fishery. Even a quarter of that number would be out of the question. Dress divers, on the other hand, could be of great assistance in conjunction with skin divers at an inspection of the pearl banks, and, further, the ground on which oysters occur could be examined by dress divers before, during and after a fishery. In the case of a small compact bed of oysters which would not pay to fish in the usual manner, dress divers in connection with skin divers might be usefully employed, and the services of some eight dress divers could be obtained locally, two European and six natives.

Registration of Boats.—The success of a fishery depends on an adequate number of divers and boats being available at the commencement of fishing operations to ensure oyster beds being well fished, and to put sufficient oysters on the market to satisfy the buying public. To ensure this at least 120 divers' boats with their crews should be present at Marichchukkaddi on the opening day of the fishery. Kilakarai is the centre and port from which the most suitable divers' boats can be obtained in the numbers required, supplemented by others from Paumben and Jaffna. Kilakarai provides 75 per cent. of the boats available, and it is therefore most important that this port and district should be well beaten up, and reliable information should be obtained regarding the actual number of boats, their tonnage, and the number of divers to each boat. These particulars should be registered with a view to issuing the required licences, a list of the names made, and some assurance given to the enterprising owners that their boats would, in due course, be licensed.

The most suitable officer to undertake this duty is a seaman, who will carry more weight with a seafaring community as he understands their requirements, difficulties, prejudices, and traditions. He is likely to get into closer touch and learn the requirements of the situation, and bring a personal touch which goes so far towards creating a good understanding. To instance what is meant, the opening date of a fishery should always be fixed as far as possible on a date convenient and acceptable to the diving and boat-owning community. Kilakarai boats are the most suitable and popular with Arab, as well as Tamil divers, as they are light to tow and easy to handle.

Fishery Weather.—Fishing operations were commenced on February 27 in favourable weather, although not under what would be regarded as ideal conditions. The weather conditions found on the pearl banks during March are generally as follows:—A light south-easterly breeze after midnight, freshening slightly towards dawn and then declining to light air during the forenoon to calm at noon. After noon a light W. N. W. breeze sets in and increases to a fresh breeze which continues up to sunset when it falls light and veers through north to east. These conditions give a land breeze after midnight to take the pearl fishing boats off to the pearl banks and a sea breeze after midday to bring them back. The above conditions unfortunately were rarely experienced at the 1925 fishery, and the wind although east at dawn was generally very light and veered to north at about 10 A.M. freshening to brisk breeze, and again to N. W. and W. N. W. where it remained until sunset. Under the most favourable conditions Twynam's Paar could not have been fished every day without the aid of vessels to tow the fishing fleet out a distance of 24 miles and back again each day. This was accomplished with the aid of the following vessels:—Trawlers "Nautilus," "Violet," and "Lilla," also Steam Tug "Thelma" and No. 3 Pilot Launch. The trawlers were rigged with outrigger towing booms which allowed four boats to be towed abreast in each row, which made the tow more compact and more manageable in fine weather with a smooth sea. The average speed of the fleet when towing the above number was 5 knots, so the journey of 24 miles to Twynam's Paar occupied about five hours which entailed getting under way shortly after midnight to arrive at the banks at 6 A.M.

It was found in practice that a great deal more towing was required than was anticipated. When the West Cheval Paar was being fished the boat tindals in charge of the divers boats when called upon to sail out with the land breeze, as has always been the practice, in many cases failed to make the given course and two-thirds of the fishing fleet at dawn were found to be dispersed over a very wide area, in spite of the presence of a mark vessel showing two brilliant lights. It sometimes took as long as two hours to assemble the boats on the buoyed area, using all our towing fleet to expedite matters as the wind at dawn would rapidly fall. The tindals of the boats seemed to lose their sense of direction without the aid of a steady breeze.

Divers.—The preponderance of elderly and middle-aged divers was very noticeable and, apart from the Arab divers, the older men appeared to be the only experienced divers showing greater endurance than the younger men. This is not surprising as it is eighteen years since the last pearl fishery, and the only call for divers has been for chanks which occur in shallower water. The depth of Twynam's Paar certainly deterred a number of divers whose only experience was in shallower waters, but the experienced Tamil divers although many well up in years made no demur and were very successful in depths up to 11 fathoms. The Arab divers appeared from the start very satisfied and dived with great industry and endurance doing their work thoroughly and only shifting their position when they had practically cleared the ground of oysters. The Tamils on the other hand looked for great hauls and were always on the hunt for richer ground, consequently lost time and got much smaller catches in consequence. The minimum haul per dive which gave satisfaction was about seven old oysters, below that number even the Arab diver became dissatisfied. From seven to ten oysters per diver resulted in a total catch for two divers working together of about 500 oysters. That is, divers $\frac{1}{2}$ share, 166 oysters, which sold at 10 cents per oyster in the open market = Rs. 16'60, half share Rs. 8'30 to each diver for the day's takings; out of this he has to pay the tindal of the boat his proportionate share for the hire of the boat, &c.¹

Diving operations started at 7 A.M. and continued up to noon—five hours—sometimes later when a late start was made, but owing to the distance from Marichchikkaddi diving operations on Twynam's Paar had to cease at noon or shortly after to allow the fleet to make the shore at Marichchikkaddi before dark. The sea breeze usually set in after noon rapidly strengthening to a fresh breeze so that little towing was required. The sealing of the bags of oysters was usually completed in less than two hours, and the fleet usually made Marichchukkaddi between 5 and 6 P.M. The whole catch was landed in bags at Marichchukkaddi and placed in the Government kottu in the particular enclosure marked by the boat's number and the two-third share of Government retained. The divers then departed with their one-third share to sell them quickly to the eagerly waiting crowd of buyers outside the kottu. The divers usually landed between 5 and 6 P.M. and after obtaining their share of oysters (usually selling the same) had a bath and later a heavy meal. At 11 P.M. the divers' boats came off when they were being towed to the northern and most distant area of the pearl banks, or sailed with the land breeze which usually springs up after midnight. The oyster bed to be fished was buoyed and a mark or station ship anchored on the position. Two white lights were exhibited after dark to guide the fleet and pyrotechnic lights also shown at 2 and 4 A.M. as a further guide.

Value of Tugs, Launches, &c., at a Fishery.—The launches "Thelma" and No. 3 Pilot Launch were of very great assistance. In the first place they facilitated the landing of the camp stores, &c., the Police and their kit, Public Works Department material, all of which was landed from the "Baroda," some 250 tons, together with personnel, i.e., Police and others, about 250 all told, with their kit in the very short time of five hours. The "Baroda" touched at Marichchukkaddi on her way to Tuticorin where she was due the following morning, the Captain was therefore anxious to clear the shoals off Marichchukkaddi before dark. Twelve dhoneyes were engaged of from 20 to 40 tons capacity which together with the two launches "Thelma" and No. 3 Pilot Launch—ensured quick dispatch. These launches were used to tow dhoneyes throughout the fishery, also for dispatch work, and, on rare occasions, for carrying passengers. They could not get alongside the jetty at Marichchukkaddi but passengers could embark and disembark near the shore. In calm weather by mooring the water boat at the end of the jetty the launches could lie alongside the water boat and land passengers at the jetty. Two dingies were told

¹ But the better divers would earn twice or three times as much as this.

off for harbour duty at Marichchukkaddi, one spare ship's dingey and one from the Harbour Engineer's Department. The dingies were manned by boatmen from the shore, two men to each boat who, together with the crew of the water boat, *i.e.*, one tindal and four boatmen—formed a foreshore working party in connection with the landing of personnel and stores, &c.

Beachmaster.—The Beachmaster, Mr. A. S. Poobalarayan of Kilakarai, gave every satisfaction to this Department. He was always ready and attentive, had considerable authority with the divers and boatmen, and kept careful and accurate record of the licensed boats and their crews. The shore accommodation for our divers and manducks was excellent, and the shore arrangements worked smoothly and efficiently throughout the fishery in connection with this Department.

Storekeeper.—The establishment of a Storekeeper at Marichchukkaddi has been a great benefit and should be maintained between fisheries. It would mean we could use Marichchukkaddi as a depôt in connection with housing boats, storing petrol and oil, &c., for the petrol motor boat "Lion." The departure of the late Storekeeper, Mr. Sinniah, no doubt was inevitable with little or no prospect of a fishery next year, but he has local knowledge and authority, having been connected with the fisheries in the past and could get information should any poaching be attempted.

Weather Conditions.—The uncertainty of the future in connection with fishing oysters is unfortunate as so much might otherwise have been left intact, the wireless aerial masts for instance.

DAILY WEATHER CONDITIONS.

Feb. 27 to March 4	..	Light easterly air at dawn veering N. and N.E. afternoon and freshening, smooth sea to moderate sea, fine and clear.
March 5	..	Wind easterly blowing strong all day wind veered north and again N.E., high steep sea, cloudy sky, low temperature. Unfavourable weather for diving, bad light.
March 6 and 7	..	Blowing strong N.E. monsoon, high steep sea, cloudy sky, low temperature, most unfavourable weather for diving.
March 8 and 12	..	Light N.E. conditions, fine, detached clouds, smooth sea, land breeze before dawn and sea breeze after noon—regular fishing weather.
March 13	..	Fresh monsoon again, overcast sky, heavy rain clouds, showers overland, rough surface steep sea.
March 14	..	Strong N.W. breeze, wind and sea rose rapidly making diving operations impossible, heavy rain. The fishing fleet returned to Marichchukkaddi, wind veered to N.W. at 7 A.M. where it remained all day blowing a gale of wind.
March 15 and 16	..	Still blowing strong from N.W.
March 17 and 19	..	Weather moderate, fishing resumed, light N.E. breeze.
March 20 to 22	..	Light N.E. monsoon conditions, morning land and evening sea breeze, calm sea.
March 23	..	Conditions again unsettled, blowing S.W. afternoon.
March 24	..	Blowing strong from S.W. all day, steep sea, most unseasonable weather.
March 25 to 27	..	Light N.E. conditions, morning land, and afternoon sea breeze.
March 28 and 29	..	Unsettled conditions again, wind south-westerly, fresh breeze, high steep sea.
March 30	..	Light N.E. monsoon conditions.
April 1	..	Light south-easterly breeze from dawn to noon and S.W. after noon—light breeze all day.
April 2	..	Light S.S.E breeze at dawn veering S.W. at 8 A.M. and blowing strong all day. S.W. conditions, high steep sea, fishing operations difficult.
April 3 and 4	..	S.W. breeze all day light.
April 5	..	Light N.W. all day.
April 6, 7, 8, 9, and 10	..	Fresh S.W. all day, high steep sea, heavy swell.
April 11	..	Light S.S.E. up to noon, S. W. after and strengthening to fresh breeze after dark. Heavy S.W. swell.
April 12 and 13	..	Unsettled weather, light S.S. easterly and south breeze all day veering to S.W. at 4 P.M.
April 14, 15, and 16	..	S.E. at dawn, S.W. during forenoon and increasing to fresh breeze, blowing fresh until after dark.
April 17	..	Still blowing strong from the S.W., rain over land, low visibility, heavy S.W. swell, overcast sky. Most unseasonable weather.
April 18	..	S.W. conditions continues.
April 19	..	Unsettled weather conditions, heavy rain at dawn, light, South easterly land breeze veering N.W. during forenoon remaining in that quarter, all day.
April 20	..	Unsettled N.W. light breeze up to noon, falling calm at noon. Southerly air later, N.W. again after dark. 8 P.M., N.E. light breeze all night, overcast sky, and smooth sea—southerly swell.

It will be seen from the above that on the whole the weather during the fishery was unseasonable and unfavourable. The only really seasonable weather which can be described as fishery weather, *i.e.*, morning land breeze, forenoon calm, and afternoon sea breeze, only prevailed from March 8 to 12 and again March 20 and 22, and later 25 to 27, eleven days. After which the weather became very unsettled and south-west breeze set in bringing an ocean swell and high sea, cloudy sky, and heavy rain over land and sea.

The use and maintenance of the "Violet" for pearl fishery inspections is imperative. The "Nautilus" could not possibly accommodate the inspection crew of four coxwains, twenty-six boatmen, fourteen divers, and nine manducks, *i.e.*, fifty-three men; consequently a vessel would have to be hired as was done in the past. The retention of the services of this vessel would mean a great saving in time as a wider area could be covered in the time-limit imposed by the weather conditions, *i.e.*, six weeks. With her special boat fittings, the "Violet" can carry all four coxwain boats, two on the skids, and two in the davits, so she can steam full speed and save the boats wear and tear as well as valuable time as they would otherwise have to be towed at a slow speed to and from the pearl banks, a distance of 110 miles each way. Further, the "Violet" lays out and picks up inspection buoys as required during the course of inspection and then tows the boats to a second position. This leaves the "Nautilus" free to dredge over wide areas, and even at times to leave the banks for brief intervals to coal and get stores, &c., in Colombo, without delaying the inspection. The "Violet" has two cabins fitted, so can accommodate two or more officers when necessary in the absence of the "Nautilus." Her towing capacity is considerable. She towed as many as forty-eight dhoneys during the late fishery making a speed of $4\frac{1}{4}$ knots an hour. All things considered the services of this vessel should be retained as long as she is seaworthy.

(2) THE PRESENT SYSTEM OF INSPECTION OF THE PEARL BANKS.

Old Methods of Inspection.—The present rectangular method of inspection was inaugurated shortly after I took up duty as Superintendent of Fisheries under the Ceylon Company of Pearl Fishers, Limited, in 1908, as it was evident that the former circular method did not admit of continuity or accuracy. I quote Professor Herdman's description of this latter method given in his Pearl Oyster Report, Vol. III., pages 3 and 4:—

"The essential features are as follows:—Three flag-buoys are laid out by the attendant launch or tug boat in the direction of each cardinal point of the compass at distances apart of $\frac{1}{4}$ mile, the inmost buoys taking their distance from the inspection vessel, which is anchored to serve as a pivot mark in the centre of the circular area to be inspected.

"Four inspection boats (modified whaleboats) each manned by crew of six, together with three divers and two manducks under the charge of an experienced coxswain, take up equidistant positions between the ship and the first flag-buoy on the north radial line, and row slowly round the ship retaining with wonderful accuracy their relative positions the while. At regular intervals the crew rest on their oars to allow the divers opportunity to make descents and bring up oysters if any are present. The result of each dive is reported to the coxswain of the boat, who records the condition of bottom and oysters upon a diagram form with which he is provided. The oysters are retained in the boat for the Inspector to examine. The four boats, having each made a complete circuit, are next ranged in line abreast in the same manner as before, between the $\frac{1}{4}$ mile and the $\frac{1}{2}$ mile flag-buoys, and each then makes a second circuit. The day's work is completed by a third and last series or circles, in this case between the buoys distant respectively $\frac{1}{2}$ mile and $\frac{3}{4}$ mile from the ship. The four boats thus make a total of twelve concentric circuits, each boat making three. The results shown upon the coxswains' diagrams, each of which has three concentric circles drawn upon it representing the three circular paths covered are transferred by the Inspector to a final diagram or plan furnished with twelve concentric circles. When this has been done, the distribution of old and of young oysters is graphically shown for a circular area having a diameter of $1\frac{1}{2}$ miles."

As pointed out in Report from the Ceylon Marine Biological Laboratory, page 257, Method of Inspection by Divers:—

"The present method of inspection is an improvement on the circular method . . . which necessarily left intervening spaces between circles to obviate which the present rectangular method has been adopted. The circular method was convenient for prospecting, but for systematic survey and accuracy the rectangular method adopted has many advantages such as continuity, greater accuracy, and the avoidance of distortion, equalized labour, and a greater area covered daily, the courses are straight and full advantage can be taken of the prevailing wind."

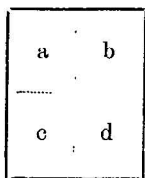
The rectangular inspection method enables us to cover a large area with daily inspections without overlap, and further enables us to be more certain of inspecting the same area from year to year. We are thus enabled to compare the same area at successive inspections, and to ascertain what changes both with regard to the numbers of oysters and the rock area have taken place within the interval. In practice we divided the chart of the pearl banks into a number of two-mile squares. (See Plate VI.) Each square is given a reference number and contains two inspections. The inspection charts are referred to this number. There is thus no possibility of our charts being confused.

As first devised the rectangular method provided for a number of square inspection areas each having a side of $1\frac{1}{2}$ miles. In 1920 slight modifications were made and the daily inspection area is now a rectangle having sides of 2 miles and 1 mile.

New Method of Inspection.—The area has thus been reduced from $2\frac{1}{4}$ square miles to 2 square miles which makes a better unit, and the number of dives has also been reduced from 336 descents to 288, i.e., 12 on each course. This allows more time for each dive which is necessary when oysters are present and the diver is required to collect as many oysters as he can to enable an estimate to be made of the number of oysters per 3 square yards, i.e., the area allowed per dive for calculation. This area per dive has been found to give a fair estimate, although the nature of the bottom has always to be taken into consideration. Oysters on sand are readily collected where they are attached to one another in bunches and a great number can be collected in the time which is from 50 to 70 or 80 seconds. Where the oysters are attached to rock and each oyster has to be detached it means much fewer oysters are collected in the time, and one cannot say that the area in question is cleared; only a dress diver could ensure the three square yards being cleared or that this area had been covered. The estimate, therefore, is always very approximate. At the same time no ground can be fished clean, that is skin divers find it does not pay to fish when the number obtained per dive does not exceed five or seven, and those must be old oysters of good pearl value. When estimating the numbers of oysters likely to be fished by skin divers, the fact that the area cannot be fished bare must be taken into consideration, and the proportion of say seven deducted from the number of oysters on each three square yards of the area on which the oysters occur. Any number under ten means dissatisfaction and a restless endeavour to find better ground, thereby loss of time and a poor catch. Arab divers proved more industrious and were content to fish out the ground rather than lose time recognizing that the best ground had been buoyed for fishing. Seven oysters per dive paid these men well at the late fishery.

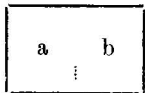
Procedure at Inspections.—The area as shown by the inspection chart (Plate VII.) represent two square miles on the north and south line or east and west as found convenient. The boats work across the prevailing north wind and buoys mark the area and guide the boats on their course. The centre line buoys ensure the boats making a good course and the correct spacing of the dives between the buoys. The coxswains of the boats (whalers, four in number) are provided with boats' compasses and coxswains' inspection charts, on which to record the finding of each dive, i.e., oysters, age, and number, character of bottom according to the conventional signs shown in Plate VII. Samples of oysters and also of the bottom being kept. If oysters are not present a sample of the bottom is brought up to ensure the diver going to the bottom whether oysters are present or not. The reports of the four coxswains are embodied in one chart. Plate VI. shows the pearl banks' area divided into squares, each

one having a side of two miles. It will be seen that the squares are lettered A, B, &c., from east to west, and numbered 1, 2, &c., from north to south. Each square can thus be given a reference number according to its position. Thus F. 6 represents the sixth square from the north and the sixth from the west. In practice these squares are further sub-divided into four equal parts each having an area of one square mile and lettered thus :—

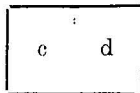


F. 6.

A daily inspection area measures 2 miles by 1 and is laid either east and west or north and south. In the former case the areas would be F. 6. a.b. and F. 6. c.d.



F. 6. a.b.



F. 6. c.d.

In the latter case the areas would be F. 6. a.c. and F. 6. b.d.



F. 6. a.c.



F. 6. b.d.

The inspection work commences at 6.30 A.M. when the sun has enough altitude to illuminate the depths. The boats work at right angles to the prevailing north wind steering east and west. The first and second coxswains take the windward and leeward line respectively, and maintain the east and west course with the aid of the buoys and compass. The buoys are clearly seen spaced as they are at half-mile intervals. Any divergence from the course is observable from the inspection vessel and the boats are repeatedly visited by an officer in the motor boat. The inspection of the two-mile area is usually completed by noon. Each of the four boats completes six lines, twelve descents being made on each line, and the time occupied on each line allowing for turning and getting into position, is one hour. So that the four boats make 288 diving descents in all. As each inspection area covers two nautical square miles (about 8,650,000 square yards) it follows that each diving descent represent an area of about 30,000 square yards. To cover the entire eighty-four square miles of paar ground, forty-two days' inspection is required. This vast area can only be done in March and April with certainty of good weather. When the weather is seasonable the work can be started in February and with good fortune might go on until the middle of May. A smooth surface and clear sky are essential to obtain the best and most reliable reports. A rough surface means heavy shadows on the bottom and every cloud is also reflected by dark shadows. A cloudy sky and rough surface makes it impossible to see below, and a strong breeze and high sea prevent the boats from making the course and maintaining their position, and the divers are unable to do more than make a hurried descent into darkness and return at once to the surface. Divers are nervous in dark waters and there is a lot of surface drift and sometimes divers report bottom current at such times so that the diver's report under such conditions is unreliable. But it should be noted that a dress diver would also experience the same difficulty.

The four inspection boats, six-oared whalers, start from the windward side of the area to be inspected and work across the wind east and west between the buoys which are laid down north, south, east, and west in rectangular form as shown by the Inspection Chart (Plate VII.). The inspection tender follows the boats to leeward and finally anchors at the extremity where the day's work ends. In the meantime she picks up and re-lays buoys as required. The inspection boats return at noon or a little later with the samples of oysters, &c., and each coxswain with his inspection chart. From these four charts the composite inspection chart for the area examined is drawn up showing the nature of the bottom, if oysters are present, their age and approximate number, the presence of rock, coral, weed, and sand, &c.

The crew of each boat comprises a coxswain, six boatmen, two skin divers, and one linesman. The coxswains require to be men of some standing, and it is an advantage to recruit them from Kila-karai and Paumben in South India where we get our divers. Two of the boats are manned by South Indian boatmen, the two remaining boats by men from Colombo, but there is little to choose between them, if anything the Colombo men are better.

(3) LANDMARKS IN THE VICINITY OF THE PEARL BANKS.

Absence of Landmarks.—The first thing that strikes one on visiting the pearl banks is the absence of landmarks and the distance of the Cheval Paars from the land. In the vicinity of these paars and to the north the coast is very low and featureless, Kudremalai Point is the only well-defined conspicuous landmark, but as it lies to the south of the Cheval Paar area, and as the land to the north is so low and featureless, artificial landmarks have had to be provided. The Kellar obelisk was the first to be erected, followed by the Doric obelisk which was erected in 1903, as the Doric ruin had become inconspicuous

owing to subsidence and overgrowth. To the north Arippeu Coconut Tope is a useful mark, but too distant from the northern banks and as Kudremalai Point and Hill are also too distant, the Venkalei and Arippeu reef beacons have had to be erected on these coral reefs which lie eight and four-and-a-half miles, respectively, from the mainland. These beacons are conspicuous and, together with the Talaimannar Lighthouse which is visible on Twynam's Paar, provide the necessary landmarks required to determine positions on the northern paars.

To the south we have the sunken beacon on the northern extremity of Karaitivu (or Cheval) shoal, where it was erected in 1903 in Mr. Hornell's time by the Harbour Engineer's Department. Unfortunately the beacon was run down at night by the old immigrant barque "Sultan Siccander" when she was returning to Paumben from Colombo (having being chartered by Government in connection with the inspection of the pearl banks). It appears that she left Colombo late and experienced the full force of the south-west monsoon, lost several sails, and commenced to leak badly, being an old vessel and badly found. In this condition she fouled the beacon in the night, and the impact of the barque in her half-waterlogged condition threw the beacon out of the perpendicular and it fell. The "Sultan Siccander," however, continued making for the land and foundered the next morning off Silavaturai in four fathoms of water. The crew, it appears, abandoned the old barque before she foundered and landed near Arippeu, no lives being lost. In March, 1910, I came across this vessel's foremast floating on the surface, and on examination I found it had the ship's cable still round the heel of the mast and the cable still rove through the hawse pipe. I descended in the diving dress and examined the wreck and found that the two sides of the hull had fallen apart and all the deck and fittings lay in the centre. I salvaged the cables and anchors, boat davits, and the foremast, which were all that remained of any value. The beacon still lies at the bottom on Karaitivu shoal where it is clearly visible in fine weather with a smooth sea and clear sky, a dark shadow on the white sandy bottom. This position, known as the Shoal-Buoy Position, is buoyed whenever the Cheval Paars are inspected as it is closely adjacent to the Cheval Paars and forms a useful central bearing. As the position is only important when inspection work is in progress it is not necessary to have a permanent beacon, although in November, when the surface of the sea is rough and the sky often cloudy, it is not always possible to see the beacon on the bottom. The position is located by bearings of Kudremalai beacon and Tower, Kellar obelisk (which is only visible after noon) and Karaitivu beacon.

Replacements, Repairs, and Upkeep of Beacons.—Karaitivu beacon is a most important landmark. The present beacon is being undermined by erosion and now stands on the waters edge with a cant seaward so may collapse at any moment. Another beacon requires to be erected in its place in November next on a position as far east of the threatened beacon as possible.

The Coconut Tope on Karaitivu Island, which has formed a useful landmark up to the present, is fast disappearing, and Karaitivu beacon will therefore become more important being the only landmark visible south from the Shoal Buoy position.

The Kudremalai beacon requires rebattening, scaling, and tarring.

The Bar Reef beacon also requires rebattening, scaling, and tarring.

Dutch Bay Beacon.—This beacon in spite of extensive erosion still stands upright, although standing in three feet of water. If it still stands at the end of the monsoon it will be examined, and it can then be decided if it is likely to continue to stand, and if so, should be scaled and tarred as it forms a useful landmark.

The maintenance of the steel beacons which require annual attention should, in my opinion, be in the hands of this Department, which alone can adequately undertake the work having all the facilities in the way of sea transport. All six beacons are accessible by sea and the crew of the trawler can do the work supplemented, if necessary, by hired labour. Any repairs would, of course, have to be done by the Public Works Department, transport of material, &c., being undertaken by this Department.

A sum of Rs. 500 would meet the annual expenditure of upkeep. Kudremalai, Karaitivu, Bar Reef, and Dutch Bay beacon, require scaling and painting during the next north-east monsoon, *i.e.*, 1926.

The mainland, foreshore landmarks, *i.e.*, Doric and Kellar obelisk, and also I understand the Marichchukkaddi obelisk, all masonry structures, come under the Government Agent, Northern Province. The trigonometrical stations marked by Kudremalai Tower and Arunakalu Tower come under the Survey Department. Both are useful for navigating purposes, being visible from the sea, and should be periodically cleared of forest growth and whitewashed.

List of Steel Beacons.

Erected.

Remarks.

Kudremalai beacon	..	February, 1913	..	Scraped and tarred, March 9, 1920.
Karaitivu beacon	..	do.	..	Scraped and tarred, March 8, 1920.
Dutch Bay beacon	..	do.	..	No record of when last scaled and tarred.
Bar Reef beacon	..	March, 1920	..	Tarred, March, 1922.
Venkalei Reef beacon	..	April, 1922	..	Tarred, April, 1924.
Arippeu Reef beacon	..	April, 1924	..	Tarred, April, 1924.

Description of Beacons.—The Pile beacon shown on Palk Strait, Chart 63A, at the northern extremity of the Cheval bank is not in existence having sunk shortly after its erection many years ago.

Bar Reef Beacon.—Marking the reef of that name off Dutch Bay is situated on the south-west extremity of the reef in Latitude 8°20' N. Longitude 79°43' E. It is a tripod, built of railway iron, three uprights carrying a square shape at the top; the beacon is black, height approximately 30 feet L.W.

Dutch Bay Beacon is situated on what is known as Dutch Bay Land, a sandy extension of Mutwal Island, which is subject to continuous erosion and segregation, the beacon now stands in 3 ft. of water and may collapse at any time. Position Latitude 8°20' 45" N., Longitude 79°45' 15" E., a tripod, built of railway iron with a diamond shape at the top, colour black, height approximately 40 ft. L.W.

Karaitivu Beacon situated at the north end of Karaitivu Island is threatened by erosion and may collapse at any time. Latitude 8°30' 30" N., Longitude 79°45' 40" E.; tripod, built of railway iron, colour black, and has a diamond shape at top, height approximately 40 ft. L.W.

Kudremalai Beacon on the extremity of Kudremalai Point position Latitude 8°32', Longitude 79°51' 30". Tripod, built of railway iron, colour black, and has a diamond shape at top. Height of beacon 40 ft.

Arippu Reef Beacon off Arrippu marks the northern extremity of the reef off Silavatorie Arippu, position approximately Latitude 8°48' 15" N., Longitude 79°50' 15" E., recently erected. Tripod, built of railway iron, surmounted with diamond shape, colour black. Height 52 ft. above L.W.

Venkalei Reef Beacon approximate position Latitude 8°53' N., Longitude 79°46' 30" E., Tripod, built of railway iron, surmounted by diamond shape, colour black, height 53' 9" above L.W.

The Doric shown on the Admiralty Chart (Palk Strait 63A) is marked by a white masonry obelisk about 30 ft. high. Conspicuous after noon.

Kellar.—(Named *Kelar* on the Admiralty Chart and described as a pillar) is also a masonry obelisk coloured white. Conspicuous afternoon.

Marichchukkaddi marked by a masonry obelisk 50 ft. high, is coloured white, has a considerable elevation, and is visible after noon fifteen miles to the west. Position Latitude 83°4' 30" N., Longitude 59°54' 36" E. The beacon bearing east forms a leading mark to Marichchukkaddi over the Cheval shoal which extends north of Karaitivu Island. The shoal should not be crossed by a vessel drawing over 15 ft. as the depth of water is decreasing, and considerable changes take place from one season to another. 3½, 3½, is now obtained where 4 fathom is shown on the Admiralty Chart.

Colombo, November 17, 1925.

JOSEPH PEARSON,
Marine Biologist and Inspector of Pearl Banks.

VI.—Appendices.

APPENDIX (1).

Pearl Fisheries held since the beginning of Nineteenth Century.

Year.	Total Number of Oysters fished.	Gross Government Proceeds.
		Rs.
1801	..	150,227
1803	..	163,154
1804	..	770,202
1806	..	412,842
1808	..	842,577
1809	..	272,463
1814	..	1,051,876
1815	..	5,842
1816	..	9,266
1820	..	30,410
1828	..	305,234
1829	..	382,737
1830	..	222,564
1831	..	293,366
1832	..	45,810
1833	..	320,896
1835	..	403,460
1836	..	254,935
1837	..	106,312
1855	..	109,220
1857	..	203,633
1858	..	241,200
1859	..	482,159
1860	..	366,816
1863	..	510,178
1874	..	101,199
1877	..	189,011
1879	..	95,694
1880	..	200,152
1881	..	599,533
1884	..	17,153
1887	..	396,094
1888	..	804,247
1889	..	498,377
1890	..	313,177
1891	..	963,748
1903	..	829,543
1904	..	1,065,751
1905	..	2,510,727
1906	..	1,449,192
1907	..	1,485,645
1925	..	526,355

APPENDIX (2).

Records of Sales at 1925 Fishery.

Date.	Paar.	Number fished.	Government's Share.	Proceeds of Government Sale.	Highest Price per 1,000.	Lowest Price per 1,000.	Average per 1,000.
1925.				Rs. c.	Rs.	Rs.	Rs. c.
Feb. 27	Twynam's	.. 185,760	.. 123,840	.. 6,988 0	.. 81	.. 30	.. 55 70
Feb. 28	Do.	.. 259,500	.. 173,000	.. 10,405 0	.. 77	.. 53	.. 60 14
Mar. 2	Do.	.. 271,267	.. 180,845	.. 7,302 53	.. 56	.. 35	.. 40 32
Mar. 3	Do.	.. 213,097	.. 142,065	.. 5,406 60	.. 43	.. 35	.. 38 5
Mar. 4	N.W. West Cheval	.. 268,920	.. 179,280	.. 7,714 44	.. 48	.. 44	.. 43 4
Mar. 5	Do.	.. 294,427	.. 196,285	.. 10,176 67	.. 60	.. 49	.. 52 84

REPORTS ON THE PEARL FISHERY OF 1925.

41

Records of Sales at 1925 Fishery (contd.).

Date.	Paar.	Number fished.	Government's Share.	Proceeds of Government Sale.	Highest Price per 1,000.	Lowest Price per 1,000.	Average per 1,000.
1925.				Rs. c.	Rs.	Rs.	Rs. c.
Mar. 6	N. W. West Cheval	387,750	258,500	11,911 50	48	45	46 8
Mar. 7	Do.	232,425	154,950	7,909 45	61	50	51 4
Mar. 9	Mid-West Cheval	536,602	357,735	15,230 60	55	38	42 57
Mar. 10	Do.	342,637	228,425	8,215 30	37	33	35 96
Mar. 11	Do.	280,000	186,800	7,000 60	45	37	37 47
Mar. 12	Do.	327,750	218,500	7,951 50	45	35	36 38
Mar. 13	Do.	339,067	226,045	8,029 12	36	35	35 52
Mar. 14	Do.	1,080	720	25 92	36	36	36 0
Mar. 17	North Cheval	512,625	341,750	12,240 25	39	35	35 81
Mar. 18	Mid-West Cheval	590,520	393,680	13,129 34	38	32	33 35
Mar. 19	Do.	825,195	550,130	19,511 81	37	35	35 46
Mar. 20	Do.	675,000	450,000	16,963 0	40	36	37 69
Mar. 21	Do.	481,500	321,000	17,441 0	62	49	54 33
Mar. 23	S. W. Cheval	700,585	467,057	22,827 18	56	45	48 87
Mar. 24	N.W. and Mid. W. Cheval	580,500	387,000	18,167 50	53	46	46 94
Mar. 25	Twynam's	747,750	498,500	22,399 0	59	41	44 93
Mar. 26	S. W. Cheval	425,971	283,981	16,734 42	62	46	58 92
Mar. 27	Do.	345,750	230,500	17,069 50	79	73	74 5
Mar. 28	Twynam's	361,182	240,788	13,685 98	64	52	56 83
Mar. 30	Mid. W. and N.W. Cheval	627,562	418,375	21,128 25	57	47	50 50
Mar. 31	Twynam's (S)	237,750	158,500	8,844 0	65	50	55 79
April 1	W. Cheval	467,580	311,720	14,856 0	60	45	47 65
April 2	Periya Paar Karai	466,029	310,686	18,494 85	63	55	59 52
April 3	Do.	710,100	473,400	23,218 20	56	47	49 4
April 4	Do.	150,271	100,185	6,754 66	76	63	67 42
April 6	West Cheval	785,250	523,500	21,667 50	44	41	41 38
April 7	Do.	661,102	440,735	14,944 50	36	32	33 90
April 8	Do.	590,362	393,575	11,510 75	31	27	29 24
April 9	Do.	336,562	224,375	6,108 88	41	26	27 22
April 10	Do.	344,550	229,700	5,053 40	22	22	22 0
April 11	Do.	210,858	140,572	3,208 59	26	22	22 82

APPENDIX (3).

Records of Divers and Boatmen. 1925 Fishery.

Date.		Boats.						Divers.						Oysters fished.	Paar.	Average per Boat.		
		Jaffna.	Paumben.	Tuticorin.	Colombo.	Arabs.	Kilakarai.	Total.	Jaffna.	Paumben.	Tuticorin.	Colombo.	Arabs.				Kilakarai.	Total.
1925.																		
February	27	7	—	—	—	14	—	21	110	—	—	—	200	—	310	185,760	Twynam's N. . .	8,845
Do.	28	7	—	—	—	14	1	22	107	—	—	—	195	10	312	259,500	do. . .	11,795
March	2	7	7	—	—	15	1	30	111	101	—	—	237	10	459	271,267	do. . .	9,042
Do.	3	7	7	—	—	15	1	30	112	88	—	—	225	10	435	213,097	do. . .	7,103
Do.	4	7	8	4	—	17	1	37	112	108	79	—	254	10	563	268,920	N.W. Cheval . .	7,269
Do.	5	7	12	14	1	18	1	53	115	141	318	16	258	8	856	294,427	do. . .	5,555
Do.	6	7	12	16	2	20	—	57	115	145	350	52	287	—	949	387,750	do. . .	6,802
Do.	7	7	12	17	2	20	1	59	112	133	356	52	295	12	958	232,425	do. . .	3,939
Do.	9	7	12	17	2	21	1	60	113	136	367	49	307	10	982	536,602	Mid.-W. Cheval	8,943
Do.	10	7	12	17	2	—	1	39	114	139	379	49	—	19	700	342,637	do. . .	8,836
Do.	11	1	10	14	2	20	—	47	14	112	254	30	247	—	657	280,200	do. . .	5,961
Do.	12	5	12	17	1	19	1	55	72	137	360	37	212	13	831	327,750	do. . .	5,959
Do.	13	6	12	15	1	16	1	51	79	138	315	34	177	11	754	339,067	—	6,648
Do.	14	—	—	—	—	—	—	2	—	—	—	—	—	—	—	1,080	—	—
Do.	17	7	12	17	2	19	58	115	102	137	365	50	297	845	1,805	512,625	N. Cheval . .	4,457
Do.	18	7	13	17	2	19	61	119	103	149	365	47	248	859	1,771	590,520	Mid.-W. Cheval	4,962
Do.	19	7	12	17	2	18	64	120	103	145	344	52	214	915	1,773	825,195	do. . .	6,875
Do.	20	5	11	17	1	14	59	107	63	141	359	16	172	851	1,601	675,000	do. . .	6,308
Do.	21	7	13	17	2	18	68	125	105	159	363	52	236	993	1,908	481,500	—	3,852
Do.	23	7	10	17	2	18	68	122	106	125	357	52	258	1006	1,904	700,585	S.W. Cheval . .	5,742
Do.	24	7	9	17	2	18	67	121	105	114	357	52	245	999	1,872	580,500	N.W. & Mid. . .	4,632
Do.	25	6	9	17	2	18	68	120	95	109	352	52	235	996	1,839	747,750	Twynam's . .	6,225
Do.	26	6	5	15	2	13	62	103	86	71	297	52	139	887	1,532	425,971	S.W. Cheval . .	4,136
Do.	27	6	10	17	2	17	68	120	92	112	343	52	205	993	1,797	345,750	S. W. Cheval . .	2,881
Do.	28	6	8	16	2	17	66	115	93	92	333	52	203	973	1,746	361,182	Twynam's . .	3,141
Do.	30	6	7	17	2	16	68	116	89	86	328	52	184	1001	1,740	627,562	Mid. & N. W. Cheval . .	4,510
Do.	31	6	3	15	2	17	62	105	80	25	315	50	201	907	1,578	237,750	Twynam's (S) . .	2,264
April	1	5	6	15	2	16	68	112	75	70	300	50	189	985	1,659	467,580	W. Cheval . .	4,175
Do.	2	2	7	13	2	16	65	105	31	82	271	50	185	933	1,552	466,029	P. P. K. . .	4,439
Do.	3	2	4	13	1	15	67	102	30	56	257	16	175	962	1,496	710,100	do. . .	6,961
Do.	4	2	6	12	2	17	68	107	28	78	240	50	194	969	1,559	150,271	do. . .	1,404
Do.	6	2	6	12	2	14	68	104	27	78	219	50	159	978	1,512	785,250	W. Cheval . .	7,550
Do.	7*	2	5	12	2	13	64	98	27	66	218	50	155	920	1,436*	661,102	do. . .	7,428
Do.	8	1	4	11	2	9	59	86	10	54	197	50	99	854	1,264	590,362	do. . .	6,864
Do.	9	—	2	7	1	6	52	68	—	32	137	34	63	711	977	336,562	do. . .	4,949
Do.	10	—	2	—	2	2	52	58	—	32	—	50	18	761	861	444,550	do. . .	5,940
Do.	11	2	1	7	—	3	52	65	28	12	130	—	32	743	945	210,858	do. . .	3,243

* Nine boats returned without reaching banks, therefore only eighty-nine boats actually fished.

VII.—Explanation of Plates.

Plate I.—Distribution of oysters over the northern paars compiled from the inspections of March and November, 1923. *Blue*: denotes oysters first discovered in March and November, 1921, *red*: oysters discovered in March and November, 1922 (also occurring in the blue areas), *dark green*: spatfall discovered in March, 1923 (also occurring over red and blue areas), and *light green*, shading denotes spatfall discovered during November, 1923. These oysters overlap all other oysters. The clear patches denote patches of sargassum weed.

Plate II.—Diagrammatic representation of the limits of the successive spatfalls from 1921–1923 discovered during the inspections of March and November during these years, after which spatfalls almost entirely ceased. The plate shows the gradual increase in the area covered by spat at successive inspections.

Plate III.—Distribution of oysters in March, 1924, showing oyster areas to be much reduced and broken up as compared with Plate I. In this plate no differentiation has been made between 1921 and 1922 oysters. They are represented as *blue* patches. *Red* patches are oysters resulting from the 1923 spatfalls, and the *green* patches denotes spat discovered in March, 1924. The position of the new Twynam's Paar is here shown.

Plate IV.—Distribution of oysters in November, 1924. A partial inspection only of the West Cheval, North Cheval, Periya Paar Karai, and Twynam's Paar. The oyster areas are still further reduced and broken up.

Plate V.—A comparison of the distribution of oysters on the West Cheval and the Periya Paar from March, 1923, to February, 1925. They illustrate the reduction in area (and consequently the numbers of oysters) that has occurred from March, 1923, to February, 1925.

Plate VI.—A chart of the pearl banks showing method of division into two-mile squares, each having a reference letter and number. Thus the seventh square from the west and north is G 7. The chart is further explained in the text.

Plate VII.—A typical example of an inspection chart showing the method of recording the divers' reports by signs and numbers.

Plate VIII.—Curves showing the growth-rate (weight and linear) of the pearl oyster.

Plate IX.—Fig. 1—Divers at work.

Fig. 2—Arrival of the fleet at Marichchukkaddi.
Divers carrying the oyster bags ashore.

Plate X.—Six figures illustrating the diving operations on the banks.

Plate XI.—Fig. 1—The fleet at work on the banks. Note the sealing officer's boat in the foreground.

Fig. 2—The fleet at work on the banks.

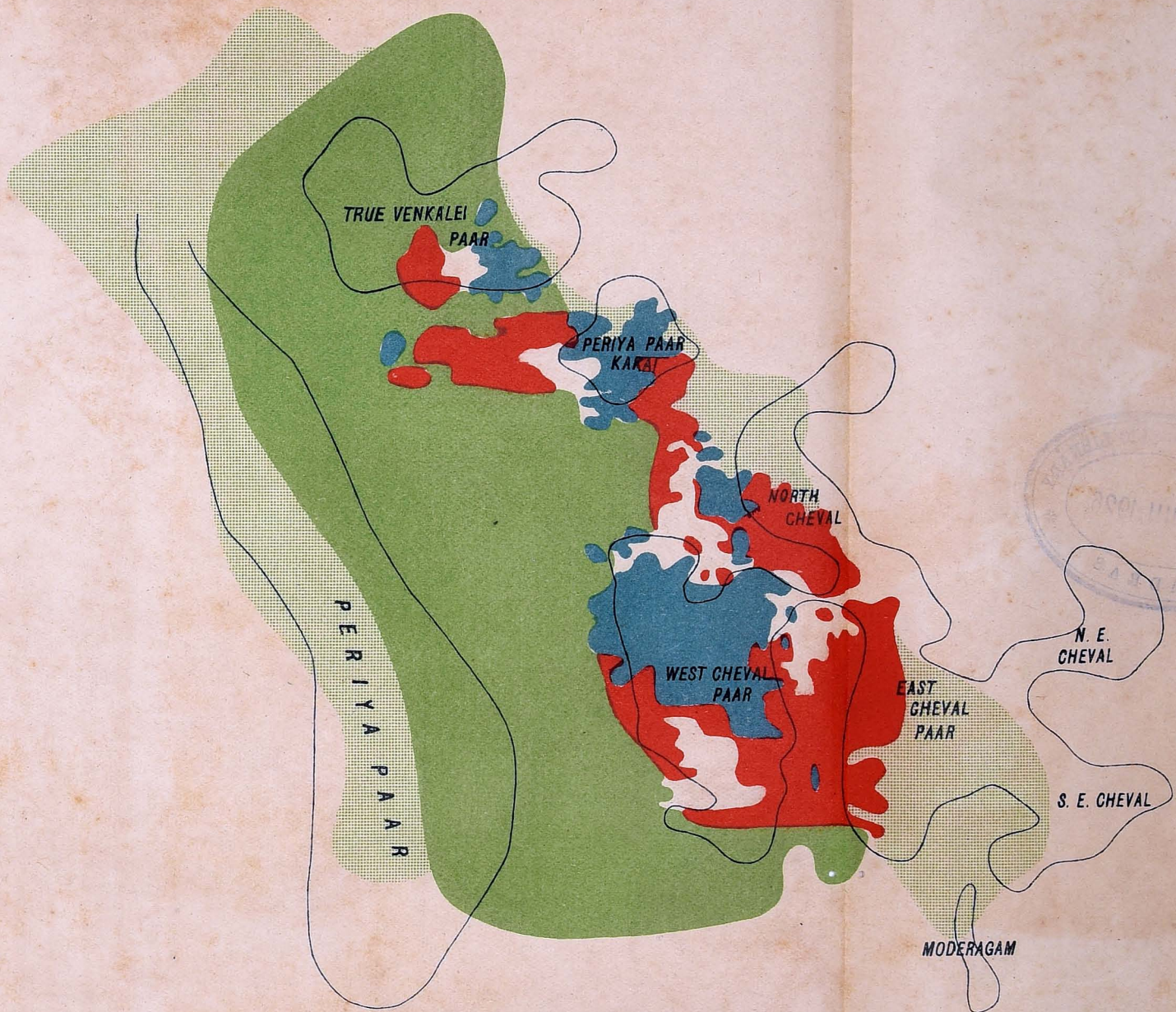
Fig. 3—The fleet being towed home.

Fig. 4—Fleet being towed home with sails set.

Fig. 5—Fishing boats sailing home.

Fig. 6—Divers depositing their catch in the Government kottu.

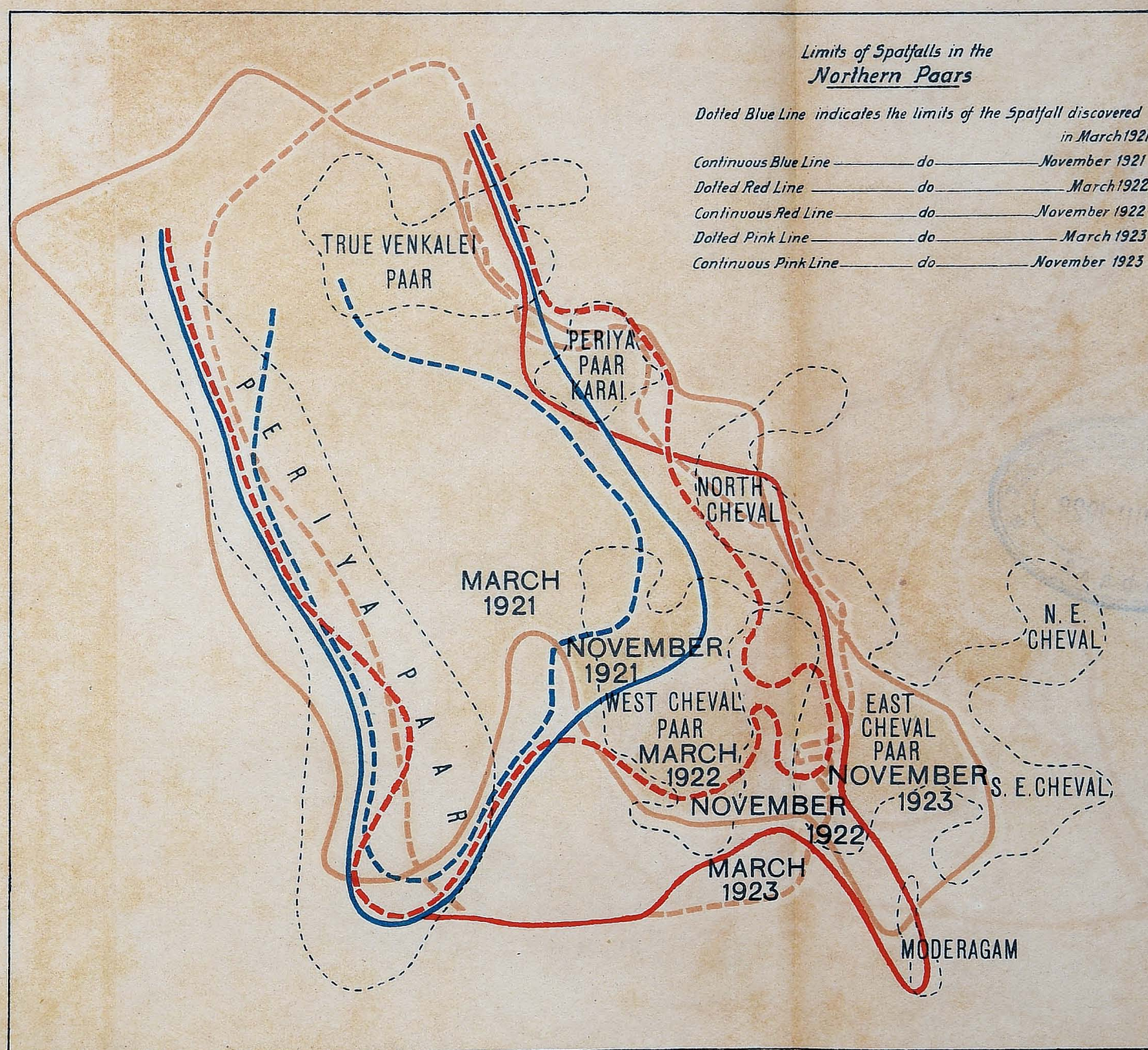
CHART 1



NORTHERN PAARS

DISTRIBUTION OF OYSTERS 1923

- Light Green..... Spatfall first discovered in November 1923.
(These oysters are also found on the Dark Green, Red and Blue Areas)
- Dark Green..... Spatfall first discovered in March 1923.
(These oysters are also found on the Red and Blue Areas.)
- Red..... Oysters first discovered in March and November 1922.
(Also found on the Blue Area)
- Blue..... Oysters first discovered in March and November 1921.





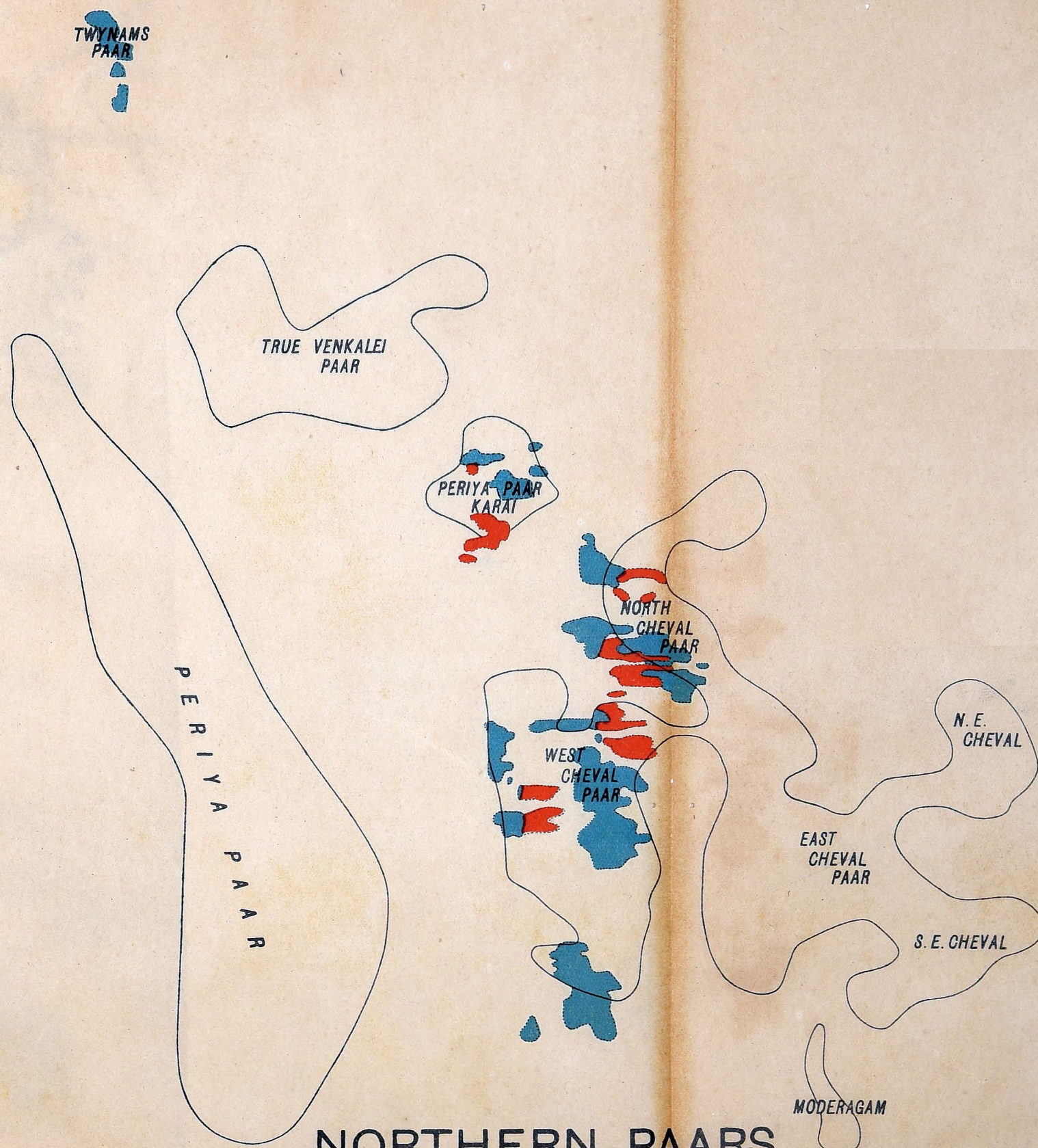
NORTHERN PAARS

DISTRIBUTION OF OYSTERS MARCH 1924

Green.....Spatfall discovered in March 1924.

Red.....Oysters discovered in March & November 1923.

Blue.....Oysters discovered in March & November 1921 and March & November 1922.



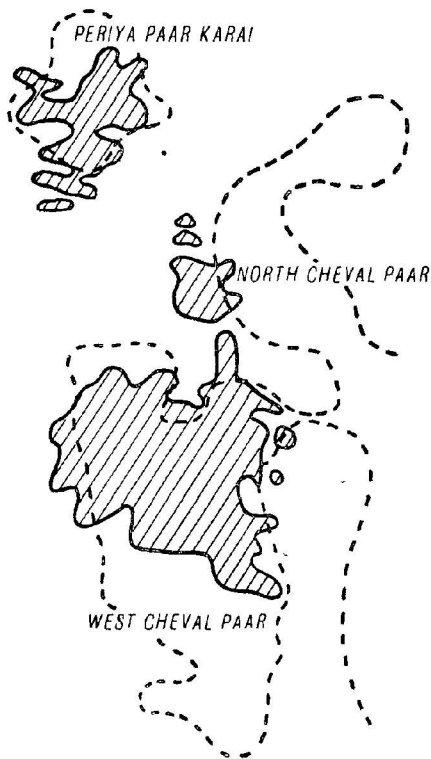
NORTHERN PAARS

DISTRIBUTION OF OYSTERS NOVEMBER 1924

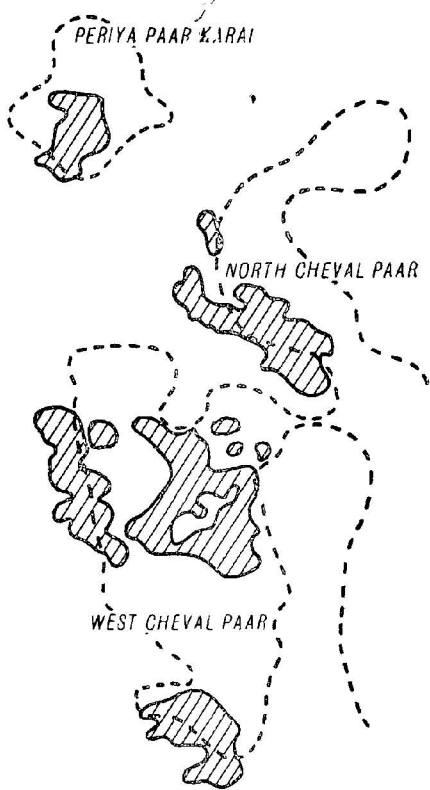
Red....Oysters discovered in March & November 1923 and March 1924.

Blue....Oysters discovered in March & November 1921 and March & November 1922.

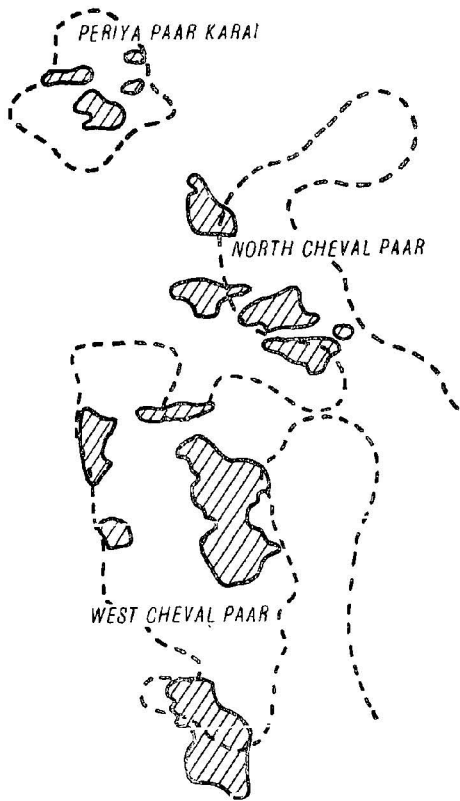
(East Cheval and Twynam's Paars not inspected.)



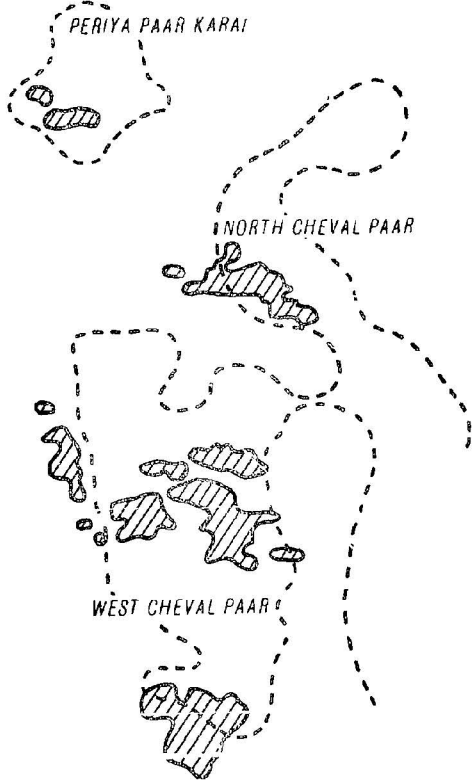
MARCH 1923



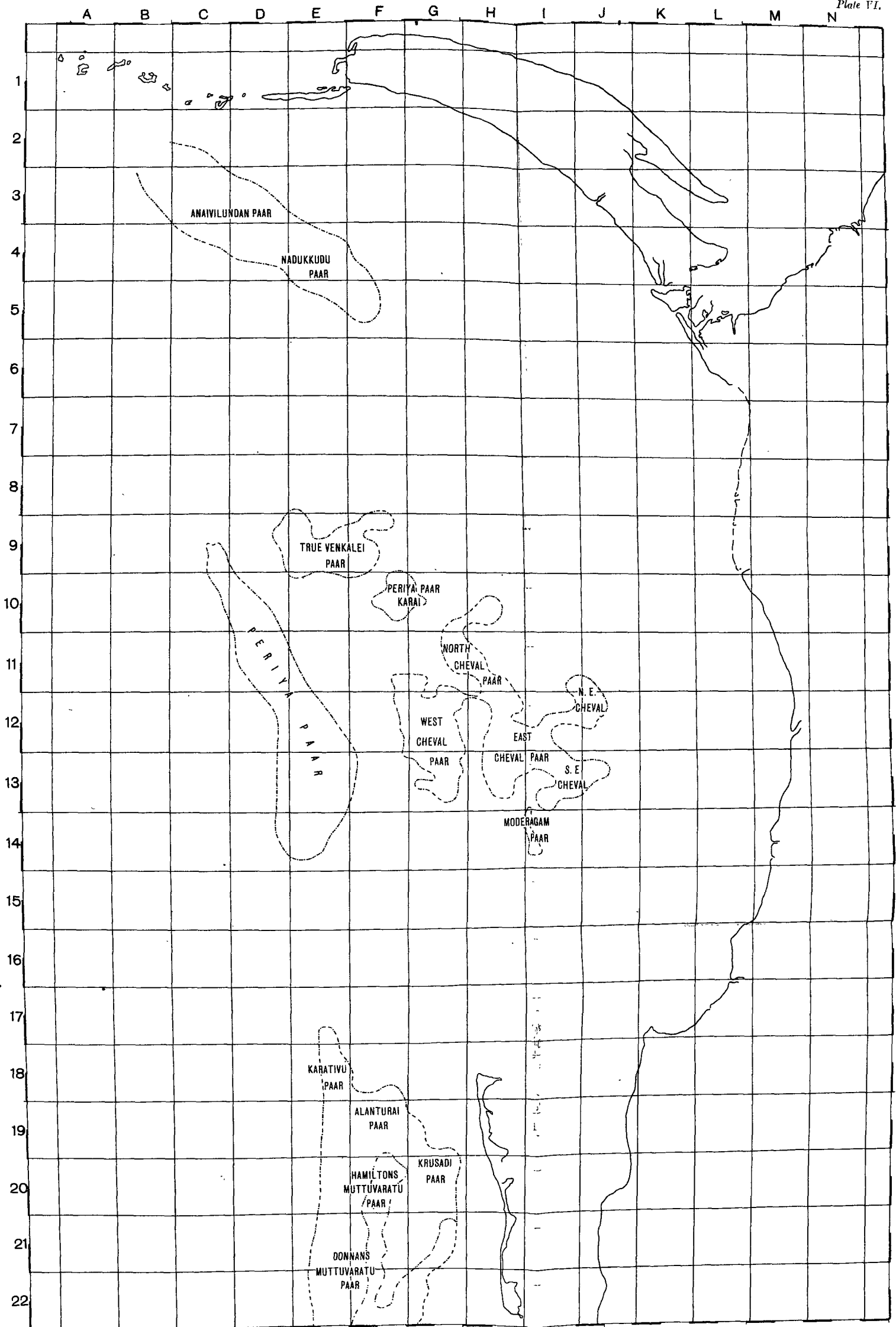
MARCH 1924



NOVEMBER 1924

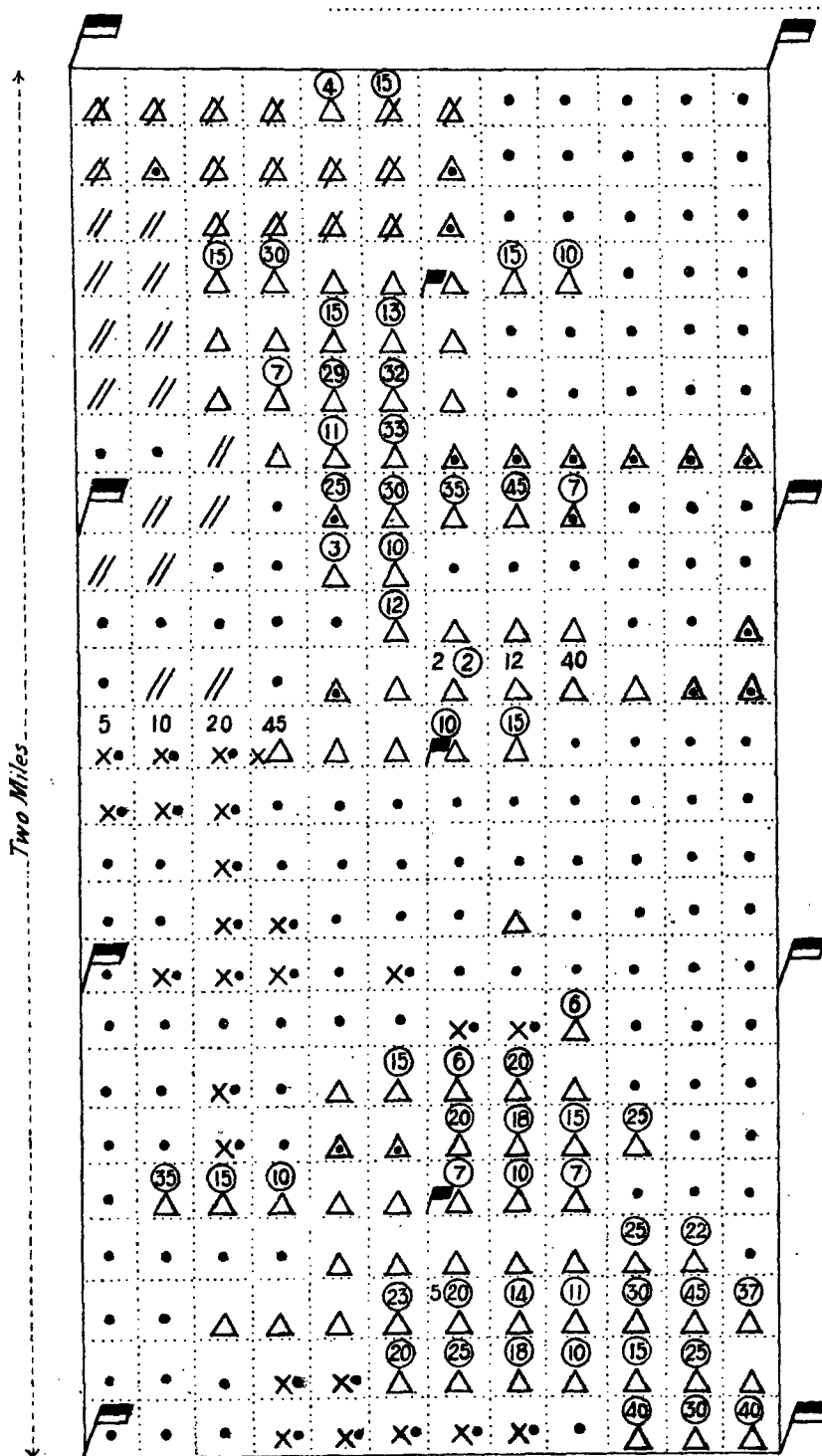


FEBRUARY 1925



Date 15th February 1925
Chart Reference G.13.ac.

Plate VII.



Total Area 2 Sq. Miles or
Say 8,650,000 Sq. Yards.

Area $\frac{1}{2}$ of a Mile square
Say 30,000 Sq. Yds.

Numbers in circles indicate Old Oysters.

Plain Numbers Young.

X Sign {Spat or Very
too numerous to count.

△ Indicates Flat Rock.

// Living Coral.

. Sand.

△ Sand on Rock.

/ Weed.

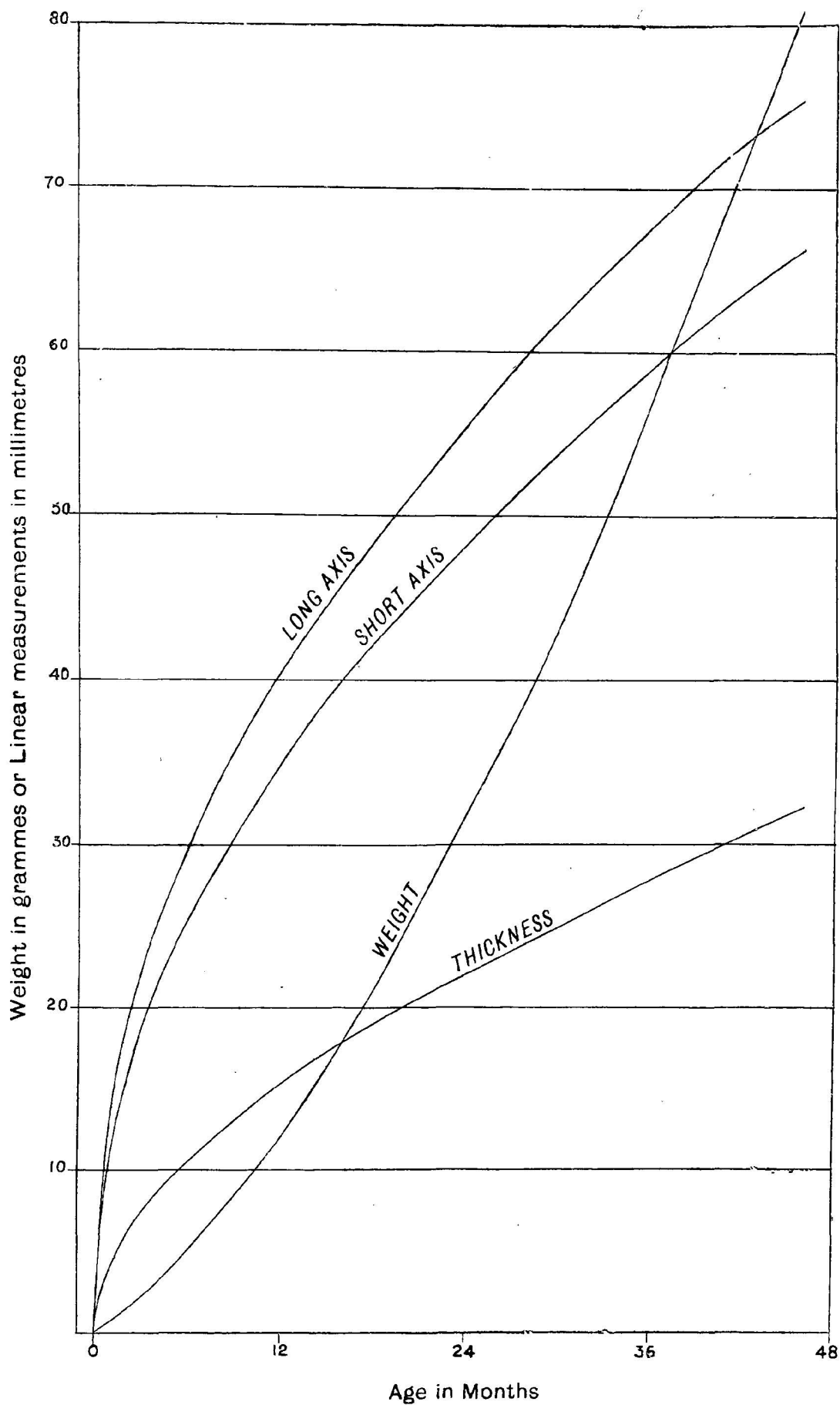
Average number of Oysters per dive:- 20

Area covered by Oysters:- 1560,000 Square yards

Total number of Oysters:- 10,400,000
(allowing 3 Sq. Yds. per dive)

Note.—In the calculations given in the margin, the young oysters are ignored.
It should be further noted that this particular chart does not
represent an actual inspection.

One Mile
EXAMPLE OF DIVERS' INSPECTION CHART.



CURVES SHOWING GROWTH-RATE OF PEARL OYSTER.

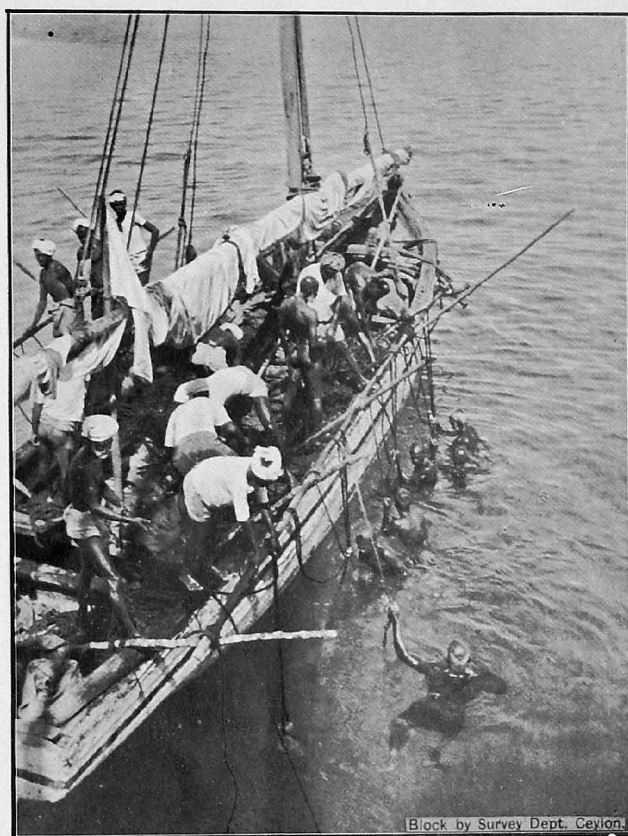
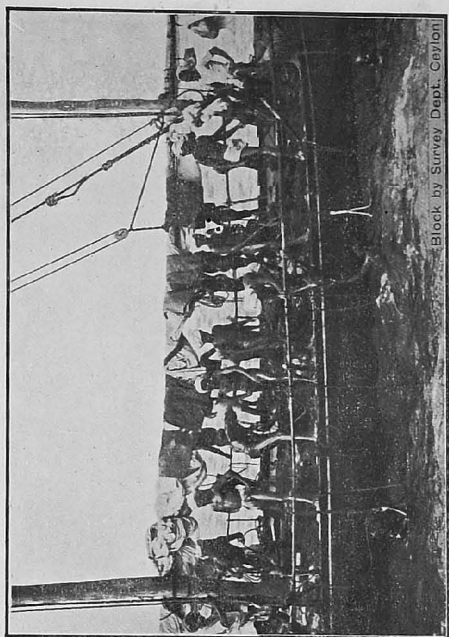


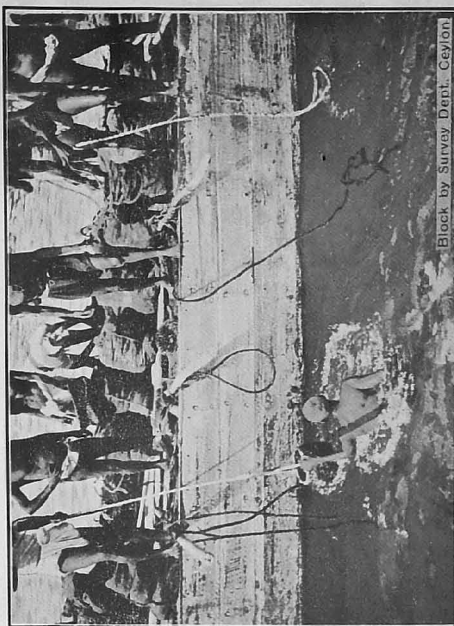
FIG. 1.—DIVERS AT WORK.



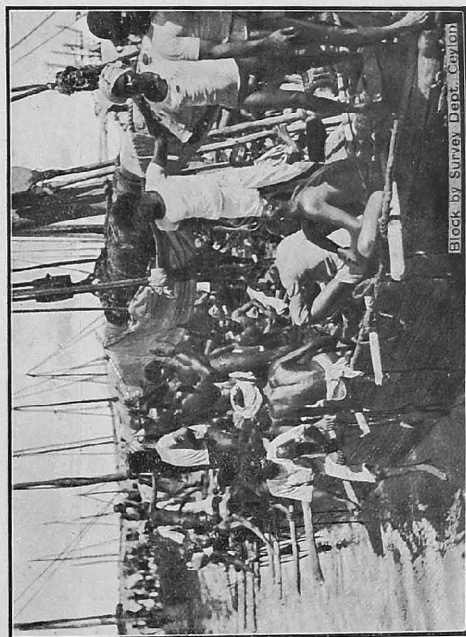
FIG. 2.—ARRIVAL OF THE FLEET AT MARICHCHUKKADDI.



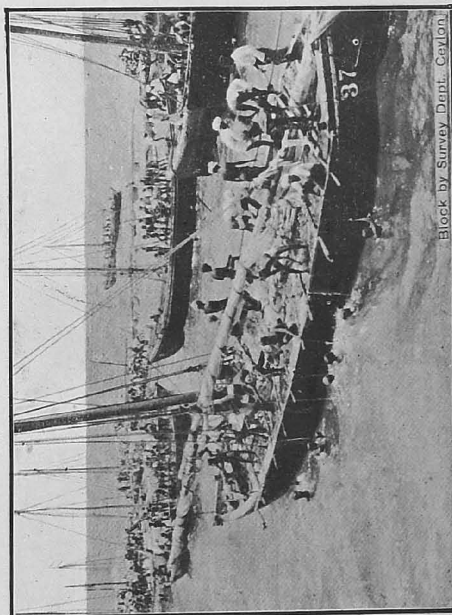
Block by Survey Dept. Ceylon



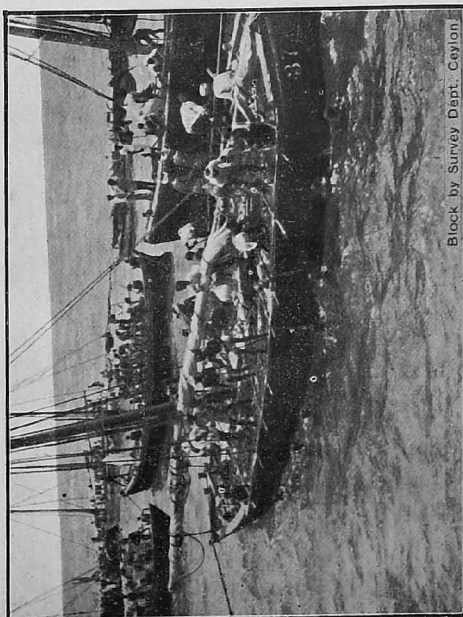
Block by Survey Dept. Ceylon



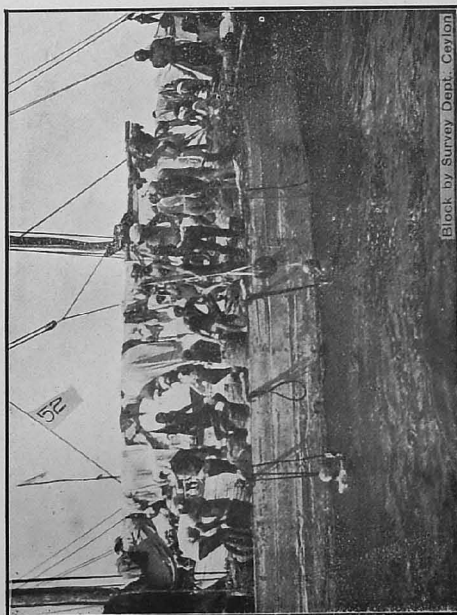
Block by Survey Dept. Ceylon



Block by Survey Dept. Ceylon

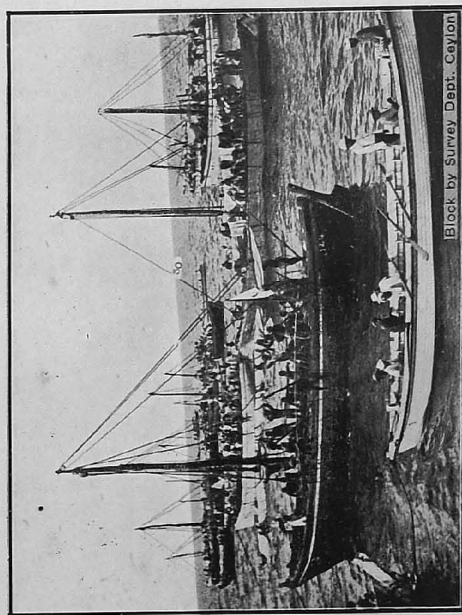


Block by Survey Dept. Ceylon



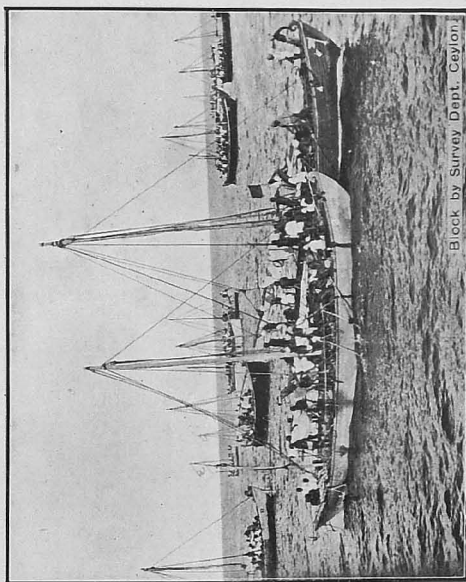
Block by Survey Dept. Ceylon

DIVING OPERATIONS ON THE CEYLON PEARL BANKS.



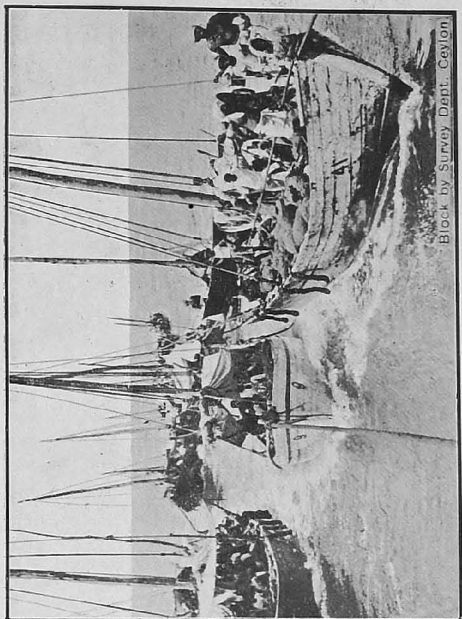
Block by Survey Dept. Ceylon

ON THE PEARL BANKS.



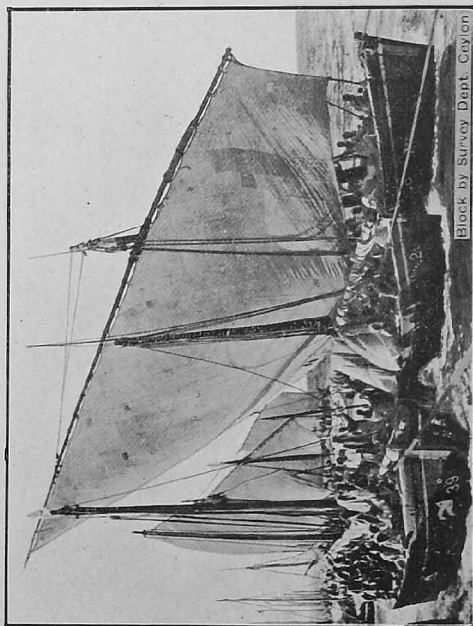
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ON THE PEARL BANKS.



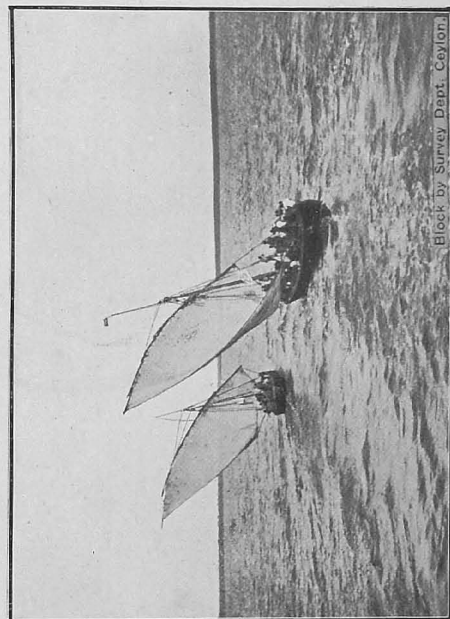
Block by Survey Dept. Ceylon

THE FISHING FLEET IN TOW.



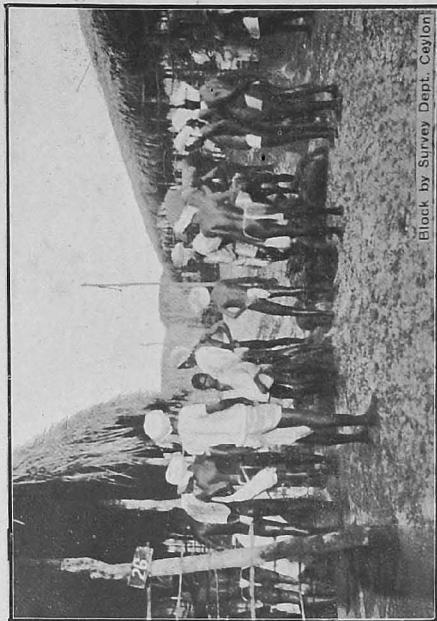
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FISHING FLEET IN TOW WITH SAILS SET.



Block by Survey Dept. Ceylon

FISHING BOATS SAILING HOME.



Block by Survey Dept. Ceylon

IN THE GOVERNMENT KOTTU.

II.—REPORT OF THE SUPERINTENDENT.

REPORT of the Superintendent of the Pearl Fishery of 1925.

THE surveys of the Pearl Banks made by the Marine Biologist in 1921, 1922, and 1923 indicated that, unless something unforeseen occurred, a profitable series of Pearl Fisheries might be expected to commence in 1925, and in August, 1923, it was decided that preparations for a Fishery in 1925 should be put in hand.

2. No Fishery having taken place since 1907, the site of the camp at Marichchukkaddi had become covered with jungle, and the requirements of a camp in the way of clearings, water supply, roads, permanent and temporary buildings, &c., had to be carefully investigated.

3. The Government instructed the Controller of Revenue to exercise a general supervision over the preparations, while the Government Agent, Northern Province, was notified that he would act as Superintendent of the camp at the Fishery; and be generally responsible for seeing that the arrangements decided upon were carried out in due time.

4. A preliminary visit to Marichchukkaddi was made by the Controller of Revenue, the Government Agent, Northern Province, and the Assistant Government Agent, Mannar, on September 24 and 25, 1923, and the principal requirements which demanded early commencement, in view of the difficulties attending engineering work in that locality, were decided upon.

5. Detailed estimates for these works were framed by Mr. W. J. Price, District Engineer, in December, 1923, and works proposed at a cost of Rs. 40,000 were sanctioned by Government in January, 1924, viz. :—

- (a) Jungle clearing.
- (b) Roads, drains, and temporary culverts.
- (c) A pipe line for water supply from Pukulam tank.
- (d) Repairs to Adappankulam spill and cistern.
- (e) A new spill and bridge for Palaiyadiakulam.
- (f) A hand pump and delivery pipe for Karadikuli well.
- (g) Repairs to the Uralite bungalow.
- (h) A permanent Treasury.
- (i) A powder magazine.
- (j) Store accommodation.
- (k) Improvements to the jetty.
- (l) Erection of a masonry tower on the site of Dixon's skeleton landmark.
- (m) Drainage of Adikarkulam tank.

6. For the discussion of other details in connection with the Fishery, a Conference, to which the Heads of all Departments likely to be concerned were invited by the Controller of Revenue, was held in Colombo on May 15, 1924, and the following decisions were arrived at :—

- (a) That in 1925 two banks should be fished, viz., the Twynam's Paar and the West Cheval Paar expected to yield thirty million oysters, the Government share of which, at an average of Rs. 30 per thousand, would sell for Rs. 600,000.
- (b) The distance of Twynam's Paar (24 miles) would make towing, which should be provided without charge, necessary; and the number of boats and consequently of divers to be admitted to the Fishery should be restricted. This could be done without prejudice to the 1925 Fishery which was proposed to be a small one preliminary to larger fisheries of more mature oysters in succeeding years. It was agreed that the number of divers should be restricted to 2,000 (including 500 Arabs from the Persian Gulf), that 100 to 125 boats should be sufficient for these, and that a fee of Rs. 5 per ton should be payable by each boat licensed for fishing.
- (c) That divers should receive one-third of the oysters obtained by them, and that their catches should be bagged and secured by seals by Government officers visiting the boats on the banks before the boats were allowed to set sail for the shore; and that in the koddu the bags should be opened and the oysters divided into three heaps for distribution.
- (d) That in addition to the fleet of three trawlers, one motor boat, and one water boat, the Marine Biologist should have one steam tug to help in towing and two launches to supervise the fishing boats and assist in the sealing of bags afloat.
- (e) Questions of steamer arrangements, quarantine, hospital accommodation, sanitary arrangements, framing of estimates, accounting, interpreterships, licences for the sale of country and foreign liquor, advertisement of the fishing, &c., were also discussed.

7. A second Conference was held on September 5, 1924, at which the desirability of amending the Pearl Fishery Ordinance, No. 17 of 1906, to give the Camp Superintendent special powers to deal with undesirables attending the camp, and to prohibit the import of artificial pearls into the camp, and also to allow of the framing of rules for the general good order and sanitation of the camp, was discussed; and it was decided that an amending Ordinance and rules thereunder should be drafted. It was also decided that an amendment of the Ordinance No. 18 of 1843, which prohibits the use of certain fishing nets in the Gulf of Mannar, should be recommended.

8. Other matters discussed were the filming of the Fishery, letters of credit, details of the shore, staff required, the provision of sailing vessels for transport, the police, sanitary, lighting, and water arrangements at South Bar, and the valuation of sample oysters.

9. A third Conference was held on December 13, 1924, at which the draft of the proposed new regulations was discussed, and the draft of the public notice regarding the Fishery was passed. The question of recruitment of sanitary coolies was also dealt with, as also the transport of the police and stores to Marichchukkaddi.

10. An amending Ordinance No. 2 of 1925 to consolidate the law relating to the Pearl Fisheries of Ceylon was passed by the Legislative Council in February, 1925, and rules dated February 12, 1925, were made thereunder by His Excellency the Governor in Executive Council.

11. On December 19, 1924, public notice of the forthcoming Fishery was given in the *Government Gazette* in the following form, and copies of it in English and Tamil were widely distributed, both in India and Ceylon :—

[Extract from the "Ceylon Government Gazette" No. 7,436 of December 19, 1924.]

CEYLON PEARL FISHERY, 1925.

It is estimated that 30,000,000 mature oysters will be available for fishing on the following banks :—

Twynam's Paar, Periya Paar Karai, and a portion of the West Cheval.

2. A Pearl Fishery Camp will be established at Marichchukkaddi on the West Coast, about 25 miles south of Mannar. Sites will be allocated for the erection of pearl merchants' boutiques and of shops, and the right of occupation of these sites during the period of the Fishery in 1925 will be put up to auction by the Government Agent on Monday, February 23, 1925, at 9 A.M. Sites for "toddlies" for the same period for keeping and washing oysters will also be put up to auction by the Government Agent later on the same date.

3. The camp will be open to visitors on and after Tuesday, February 24, 1925. Sites for temporary houses will be allotted by the Government Agent, Northern Province, who will be the Camp Superintendent. Visitors can purchase the necessary timber and cadjans from local contractors.

4. A temporary resthouse of about ten rooms is also being erected for the accommodation of well-to-do visitors. Persons requiring rooms should give long notice beforehand to the Government Agent. (They must bring their own camp beds, sheets, and blankets.)

5. The actual fishing for the oysters will commence on or about Thursday, February 26. No person will be allowed to take boats to or to dive for oysters on the pearl banks without a special licence for such purpose. Licences will be issued in advance by the Government Agent or his Deputy at various Indian and Ceylon Ports. The number of licences issued for boats will not exceed 125, and the number of licensed divers will be limited to 1,500, exclusive of 500 Arab divers from the Persian Gulf. All the licensed boats and divers should arrive at Marichchukkaddi by Tuesday, February 24.

6. For the convenience of purchasers deposits of Rs. 250 or over in cash or notes will be received at the Colonial Treasury or any other Government Treasury in Ceylon, against which the cost of oysters purchased may be charged. Persons desirous of dealing in oysters on a large scale are advised either to deposit funds with the Colonial Treasurer in Colombo, or to produce letters of credit from a well recognized Bank made out in favour of the Colonial Treasurer and endorsed by one of the Colombo Banks. Persons making such deposits or tendering such letters of credit in favour of the Colonial Treasurer will be required to furnish to the Government Agent at Marichchukkaddi proofs of identity when purchasing oysters against their deposits or letters of credit.

7. Adequate medical and police arrangements and an improved water service are being provided.

8. Persons desirous of opening eating-houses, tea and coffee boutiques, bakeries, and aerated water manufactories will be required to take out licences from the Government Agent. These licences will be issued without payment. All food exposed for sale in such shops must be protected from contamination by flies and dust, either by glass cases or by frames covered with mosquito netting.

9. Visitors can proceed to Marichchukkaddi, either—

(a) Direct by sea from Paumben in the Madras Presidency ; or

(b) By rail to Mannar in Ceylon, thence by road 1 mile to South Bar, and from there by sea to Marichchukkaddi ; or

(c) By sea from Colombo about 115 miles, if and when a steamer is available.

Inquiries with respect to sailings from Paumben to Marichchukkaddi and from South Bar to Marichchukkaddi may be addressed to Messrs. The Madura Company, Limited, and to Mr. P. M. S. Mohamed Meera Saibo and Mr. P. R. M. K. Mohamed Abdul Raiman Maraikayar of Paumben among others.

10. A further notification will be published with regard to the quarantine and emigration arrangements which will be made for visitors coming over from India.

11. All communications regarding the Fishery should be addressed to the Government Agent, Northern Province, Jaffna, Ceylon.

By His Excellency's command,

Colonial Secretary's Office,
Colombo, December 15, 1924.

CECIL CLEMENTI,
Colonial Secretary.

P.S.—The Fishery will be conducted on Government account. One-third share of the oysters will be given to the divers as their share ; the remaining two-thirds will be put up to auction daily by the Government Agent in such lots as may be expedient.

Merchants desirous of purchasing the rents of sites for boutiques and "toddlies" are specially requested to note that the sales will be held on February 23 and that they or their representatives should arrive at the camp on February 22, 1925.

SITE OF THE FISHERY CAMP.

12. It was decided that the Fishery Camp should be established at Marichchukkaddi as at the 1903-07 fisheries.

13. On December 18, 1923, tenders for clearing the camp site (estimated to comprise about 100 acres of heavy clearing, 70 acres medium, and 50 light scrub) were called for, and eighteen tenders were received. The lowest that of Mr. G. C. Abraham for Rs. 6,900 was accepted. The contract required the work, including extraction of stumps, to be completed by May 15, 1924, but, owing to ill-health among the coolies engaged, the period was extended ultimately until August 31, 1924. By that date the whole area originally intended to be cleared had not been cleared, but it was arranged with the contractor to pay him Rs. 5,900 for the work completed, and to have such as still appeared necessary to be done attended to departmentally.

14. The annual rains, as expected, caused the undergrowth to spring up again, and a fresh clearing was taken in hand early in 1925 by the District Adigar at a cost of Rs. 200; the sanitary coolies who arrived early were also put on to the work of clearing up compounds.

15. A survey of the camp, as in being in April, 1925, was undertaken by Mr. J. de Niese, retired surveyor of the District Road Committee, Jaffna, and a plan thereof supplied.

CAMP BUILDINGS.

16. The question of what temporary buildings would be required as Government offices, hospitals, quarters, and lines, and what their respective dimensions, &c., should be, having been carefully considered, an estimate of the quantity of timber of various classes required for them was prepared in April, 1924, in order that the Forest Department might have ample time to arrange for its supply, as well as for the timber likely to be required for buildings to be privately erected.

17. A contract was entered into by the Forest Department for the felling and delivery of the timber required at Marichchukkaddi by September 16, 1924, and the following were taken over by the District Adigar on September 20 :—

- 384 periya kappus (length 15 ft. to 18 ft.; girth 18 in. to 24 in.).
- 2,014 sinna kappus (length 12 ft. to 15 ft.; girth 12 in. to 17 in.).
- 6,868 vallais (length 12 ft. to 15 ft.; girth 8 in. to 11 in.).
- 39,000 puddus (length 12 ft. to 15 ft.; girth 4 in. to 8 in.).
- 38,000 varichchus (girth 4 in.).

and on December 4 a further 1,513 periya and 1,049 sinna kappus and 29,000 varichchus were supplied.

18. A total sum of Rs. 24,471·26 was paid to the Forest Department for the timber required for camp construction.

19. In October, 1924, tenders were invited for the construction of the necessary camp buildings, on the understanding that the timber therefor would be supplied to the successful tenderer free, and that the buildings to specification given would be completed by February 10, 1925. Five tenders were received, varying between Rs. 38,247 and Rs. 65,600, but these were rejected as excessive, and it was decided that the buildings should be put up under the supervision of the Musali District Adigar, who estimated the work could be performed for Rs. 16,000.

20. The buildings, as well as certain additional buildings, were put up in good time, the total cost (including that of fifty boutiques in Tank street which it was thought advisable to have in readiness for salesmen of foodstuffs as soon as the public were admitted to the camp) being Rs. 20,485·80, exclusive of cost of timber.

21. The buildings were satisfactory as temporary fair weather ones, but unfortunately some very heavy rain occurred in the middle of March which the roofs generally were unable to withstand, and the floors not having been made up and the sites not having been trenched, many of them became flooded. Unfortunately, the hospital wards and the police lines suffered considerably in this respect. At the next Fishery the pitch of the roofs should be improved, the cadjan roofing be made double, the floors be raised, and a good drain be cut round each building. Several suggestions by occupants for the improvement of their quarters or offices have been noted for consideration.

22. At the close of the Fishery the buildings were partially dismantled, the cadjan walls being removed, and the cadjans collected and stacked for preservation for the next Fishery; the cadjan roofing was allowed to remain as some protection to the skeleton frameworks which it was considered would be too expensive to dismantle.

STREETS AND SITES FOR PEARL MERCHANTS' AND TRADERS' SHOPS.

23. Prior to the opening of the camp, lines for broad straight streets were marked out, *e.g.*, Main street was 100 feet wide, Divers street 50 feet, and other streets 25 to 30 feet wide; and sites for the erection, along their frontage, of boutiques were pegged out. As a general rule, a frontage of 12 feet was allowed for each site, and between every block of four of such contiguous sites a reserve of 20 feet was retained, principally as a precaution against the spread of fire.

24. Certain streets were reserved for particular classes, *e.g.*, Main street for pearl merchants, Tank street for (uncooked) rice and sundry goods merchants, Divers street for eating-house and sherbet boutique keepers, Field street for butchers, Dixon's Tower street for fruit and vegetable sellers.

25. The right to occupy sites was put up to public auction commencing on February 23, and smaller sales continued daily for some weeks.

26. For private dwellings approved sites were rented for nominal amounts, while the poorer classes were allowed to put up huts to the north of the eastern end of Main street without charge.

27. The total sum realized by the sale of boutique sites was Rs. 26,461·50. Unfortunately, at the time of the first auction, the prospects of the Fishery were doubtful owing to a threatened boycott by the Kilakarai divers, and the consequent absence of competition after the best lots had been disposed of prejudiced the prices fetched. The highest price realized for a pearl merchant's boutique site was Rs. 450 (site No. 32), while the lowest was Rs. 20 (site No. 80). Altogether eighty sites in Main street were sold.

28. In Tank street the conditions of sale were that the sum bid was to be exclusive of Rs. 75 to be paid as the actual cost of the boutique erected by the Government; thirty-three of the boutiques found purchasers. The highest bid was Rs. 220, and the lowest Rs. 25.

29. In Divers street fifty-one sites were sold for eating-houses, &c., at sums ranging from Rs. 20 to Rs. 85. In Twynam street twenty-four sites were sold at from Rs. 10 to Rs. 50 each. In Field street eight sites were sold for butchers, &c., at from Rs. 16 to Rs. 46 each. Sites for aerated water boutiques, fruit and vegetable stalls were sold, where unobjectionable, at prices ranging from Rs. 3·50 to Rs. 10 each in Tank street, Rs. 2 to Rs. 10 at Main street junction, and Rs. 2·50 to Rs. 3·50 in Chetty street. Eleven sites for barbers were sold at Re. 1 each.

OYSTER-WASHING TODDIES.

30. As regards the oyster-washing toddies, the seashore, north of Dixon's Tower, was laid out into lines of blocks, each block consisting of six pairs of a toddies each 18 feet along the coast $\times$ 12 inland, and each block being separated from the next by a 10-foot reservation along the coast and a 6-foot path parallel with the coast. At Dixon's Tower end where the beach is broadest, there were five blocks lettered A-E.

31. There was very little demand for toddies at the first auction, only 124 being sold. The highest price realized was Rs. 265 per unit (for A 3-12) and the lowest Rs. 30 (C 34); on subsequent days a few more were sold, and finally only Rs. 10 could be obtained for sites such as A 70, B 78, D 27. Eventually 305 sites were disposed of, the total realized being Rs. 16,000.

DIVERS.

32. As previously stated it was considered desirable to limit the number of licensed divers to 2,000, of whom 500 should be Arab divers from the Persian Gulf. Messrs. Mackinnon, Mackenzie & Co. offered to assist Government in obtaining the latter through their agencies at the Persian Gulf.

Provisional arrangements were made for their shipment all together to Colombo, and special armlets and identification passes, to serve in the place of passports, were handed to the Company to be sent to the Persian Gulf to be given to those recruited there, and the Company's agents were authorized to recover Rs. 10 per head from each diver as remuneration for their services, and also Rs. 15, as a deposit for good behaviour during the Fishery on behalf of the Ceylon Government.

33. After prolonged correspondence on the subject from August, 1923, onward, however, on December 23, 1924, the Company announced that they had decided to cancel all the provisional arrangements. Their Head Office, apparently, was unable to guarantee a direct steamer from the Persian Gulf to Colombo at the date required; and in view of a forthcoming Fishery in the Persian Gulf, it was doubtful whether 500 Arabs would be prepared to incur the expense of coming to Ceylon for what was expected to be a small Fishery. Their agents, however, did assist in facilitating the passage of those Arab divers who decided to make their own way to the Fishery, and eventually 264 Arabs from the Gulf, who arrived with armlets, took out divers' licences at the camp. These arrived *via* Mandapam, and as they were detained there for eleven days, until the opening of the Fishery Camp, Government agreed to pay the cost of their rice meals there, amounting to Re. 1 per head per diem. Government further paid to the British Indian Steamship Agents a sum of Rs. 970 for their services in connection with these divers.

34. For the licensing of South Indian divers, it was considered advisable that the Koddu Superintendent (Mr. E. T. Dyson, C.C.S.) should proceed to the South Indian Ports, and he, with the concurrence of the Madras Government, in January, 1925 selected and licensed divers at the following ports:—

Kilakarai	..	..	..	..	1,078
Paumben	..	..	..	..	154
Tuticorin	..	..	..	..	301

it being made a condition that no diver would be licensed without a written statement giving the number, port of registration, and owner of the boat from which he proposed to dive.

35. Others were subsequently licensed at the camp, and the final numbers were 2,187, viz., Arabs 315, Kilakarai men 1,153, Tuticorin 380, Paumben 166, Jaffna 121, and Colombo 52. No divers from Erukkalampiddi in Mannar accepted the offer of licences as they did not approve of the new conditions proposed, especially that of bagging oysters, to prevent theft during return to shore.

36. The licences to divers were issued free of cost. Each was supplied with a numbered armlet—the armlets were of different colours for the various classes of divers—which they were required to wear when in their boats or the Government koddus.

37. The success of the Fishery was greatly prejudiced by the failure of the Kilakarai divers (who constituted about half the total number licensed) and boatmen to attend the Fishery at the proper time. They had petitioned at the end of January for the privilege of direct clearance from Kilakarai to Marichchuk-kaddi, but the Board of Immigration had refused to grant this. Their request was repeated in a petition received on February 13, in which, too, they complained that the numbers allowed to clear in their diving boats were unnecessarily restricted, the usual passenger vessel rules being applied to them, although, when they proceeded in such boats for chank fishing, no such restrictions were imposed. The petition was forwarded by the Ceylon Government to the Madras Government for favourable consideration on February 19—and on the 20th, on my arrival at camp, I was informed that the Kilakarai men had bound themselves under penalty of Rs. 2,000 each not to proceed to the Fishery unless the concessions demanded by them were granted. The Indian Government refused to allow more than one man per registered ton of a boat to proceed in addition to the crew, "as the safety of passengers and crew must be the first consideration"; and a deadlock consequently ensued for several days. The Indian Government agent at the Fishery—Rao Bahadur S. K. Sundaracharlu—who realized the loss to Indian merchants, which would ensue if the Fishery was a failure, left on February 26 for India to interview the Indian authorities on the subject, but without result. The Ceylon Government on March 3 appointed a Medical Officer to give clearance direct from Kilakarai, and I suggested that it was advisable to offer free transport by Government vessels or train to the divers, &c., waiting at that port in excess of the numbers who would be allowed to come over in the diving boats. The Indian agent went to Kilakarai and had a long discussion with the disaffected men on March 5, and finally a minority decided to take advantage of passages offered in the Government trawlers on Sunday, March 8, when 126 divers and manducks embarked on the "Violet." The Kilakarai boats then started to come with the authorized complements, and the "Violet" made trips again on March 13 and March 16, bringing nearly 300 on each occasion. In the fishing of March 13, only 754 divers participated, but in the next fishing, that of March 17, 1805 participated and for the next nineteen days, numbers were well maintained.

OYSTER FISHING BOATS.

38. In view of the small number of boats which it was anticipated would be sufficient for the 1925 Fishery, it was decided that those licensed to attend should pay a fee of Rs. 5 per ton, with a maximum of Rs. 125 for the privilege. As a matter of fact, there was by no means an over supply of suitable boats—so many years had elapsed since the last Fishery that most of the old Fishery boats had fallen into disrepair; and there were many grumbles at the levy, though a similar one had been made by the Company of Pearl Fishers at their last Fishery. The boatowner had also to deposit a sum of Rs. 100 by way of security for good behaviour.

Mr. Dyson proceeded to South India on notified dates for the purpose of boat licensing.

39. As the banks proposed to be fished were at such a distance from the shore that towing was likely to be necessary, the licensing was confined, as far as possible, to boats of under twenty-five tons burden.

40. As boatowners preferred to make the necessary deposits on arrival at Marichchukkaddi, they were not actually licensed by Mr. Dyson at the time of his visits, but were selected by him and granted provisional certificates in the following terms:—

“ ————— divers’ licences have been issued to divers who are going to Marichchukkaddi in —————’s boat No. ——— registered at ———. On payment of a fee of Rs. ——— (being Rs. 5 per registered ton) and of a deposit of Rs. 100 on his arrival at Marichchukkaddi, a boat licence will be issued to ———.”

and formal licences in terms of the Pearl Fishery Ordinance were granted at Marichchukkaddi on due payment. One hundred and twenty-eight boats in all were licensed.

CONDUCT OF DIVERS AND BOATMEN.

41. Generally speaking, the behaviour of the divers and boatmen was satisfactory. The system of supervision adopted on the banks during the fishing and the immediate sealing of the bags after fishing ceased and before the boats left for the shore undoubtedly minimized thefts. The bags, as a rule, arrived intact with seals undamaged, though, occasionally, the sealing was inefficient and enabled the lead seals to be drawn back, so that it would be possible to insert a hand and withdraw oysters, and subsequently redraw the seal into position. The boats were searched by the shore police on arrival, and at times a few oysters were found concealed, but the total so discovered was very small. On one occasion, however, towards the close of the Fishery, the officer afloat found a considerable quantity of oysters withheld from bagging and concealed in the sand ballast at the bottom of boats. Special attention was thereafter paid to this.

42. There were occasional quarrels afloat between boatmen on the banks owing to collisions during heavy winds, &c., and on one occasion a row arose between the Arab divers in a boat and the Tamil boatmen, consequent upon a dispute over the tindals’ share; in the *melee* several men were knocked overboard, including the manduck of a diver who was still diving, though the signal to cease diving had been given; when this manduck regained the boat and pulled up the life line, the diver did not come up and was never seen again—he was probably too tired at the end of the day’s diving to regain the surface from such a depth as 8½ fathoms unaided, and was therefore drowned. The Arabs alleged he had been murdered by a blow, but, though all those in the boat were examined, none gave evidence as having himself witnessed any such assault. Dr. Pearson and Mr. Malpas, who had proceeded to the boat when they saw the row going on, felt no doubt that the Arabs were the dominant parties in the row, but when the news reached the shore, the Arabs generally took up the cry that one of their numbers had been murdered, and they were afraid to entrust themselves afloat without adequate protection. They boycotted the fishing the next day, and held a mass meeting, but the leaders met me in the afternoon and agreed to resume, on the understanding that I would make every endeavour to bring the guilty to justice and protect the Arabs. They said, *inter alia*, that they had been warned by the British Agent at the Persian Gulf to be of good behaviour and not earn the Arabs a bad name at the Fishery, and that they were not even to hit back if bullied by the Tamils.

43. On the whole, the Arabs were exceedingly well behaved, and gave no trouble in camp, though a few were dealt with for koddu offences.

44. Other disputes occurred between the boatmen and the divers over the terms of their agreements, which were generally very loosely worded, and before licences are issued for the next Fishery, it will be well to warn both sides as to the points which they should make perfectly clear.

45. Separate lots were marked out for occupation by the divers from various ports between Main street and the jungle, a reservation of 100 yards width being maintained north of Main street. The Arabs were allotted the high ground on the western side, but, at the close of the Fishery, asked that they might be given a lot to the east at future fisheries, as they found the smell from the toddies injurious to their health.

THE FISHING AND SALE OF OYSTERS.

46. The actual fishing was advertised to begin on or about Thursday, February 26, but on the 25th evening Dr. Pearson considered the sea too rough to send out boats to the banks that night. On the 26th evening it was arranged that the available boats should tie up to the tugs between 8 and 11 P.M., and twenty-one boats with 310 divers proceeded to the Twynam’s Paar. The fishing thereafter continued on thirty-seven days, *i.e.*, till April 11, excluding Sundays; Saturday, March 14, and Monday, March 16, when stormy weather precluded the boats from reaching the banks.

47. The following table shows the number of boats and divers engaged on fishing on each date, the estimated number of oysters obtained daily, and the bank fished :—

The Pearl Fishery, 1925.

Date.	Number of Boats engaged in Fishing.	Number of Divers.	Reference to Paar fished.*	Total Number of Oysters fished.
February 27	21	310	A	193,500
28	22	312	A	261,000
March 2	30	459	A	271,268
3	30	435	A	213,097
4	37	563	B 1	268,920
5	53	856	B 1	295,927
6	57	949	B 1	392,250
7	59	958	B 1	224,925
9	60	982	B 2	536,602
10	39	700	B 2	342,638
11	47	657	B 2	280,200
12	55	831	B 2	327,750
13	51	754	B 2	339,068
14	51	781	B 2	1,080
17	115	1,805	C	512,625
18	119	1,771	B-2	590,520
19	120	1,773	B 2	825,195
20	107	1,601	B 2	675,660
21	125	1,908	B 2	481,500
23	122	1,904	B 3	700,584
24	121	1,883	B 1 and B 2	583,500
25	120	1,839	A	747,750
26	103	1,532	B 3	425,971
27	120	1,797	B 3	345,750
28	115	1,746	A	361,182
30	116	1,740	B 1 and B 2	627,561
31	105	1,578	A	237,750
April 1	112	1,669	B 1 and B 2	467,580
2	105	1,552	D	466,029
3	102	1,496	D	710,100
4	107	1,559	D	150,282
6	104	1,512	B	785,250
7	98	1,436	B	661,102
8	86	1,264	B	590,363
9	68	977	B	336,562
10	58	861	B	344,550
11	65	945	B	210,858
Total				15,786,449

Reference to Paar fished.

A.—Twynam Paar.	B 3.—West Cheval (South-west).
B.—West Cheval.	C.—North Cheval.
B 1.—West Cheval (North-west).	D.—Periya Paar Karai.
B 2.—West Cheval (Central).	

48. It will be seen that the highest catch on any day was 825,195 on March 19 from the West Cheval (Central) Paar, when 120 boats with 1,773 divers participated in the fishing. The next highest was 785,250 from the West Cheval Paar on April 6, when 104 boats with 1,512 divers took part. The lowest catch, when any real attempt was made at fishing, was 150,282 on April 4, when 107 boats with 1,559 divers took part on the Periya Paar Karai, where after two days' good fishing very few oysters were traceable. One boat brought in a total of 49 oysters.

49. The average numbers of oysters per diver fished depended upon several factors, viz., the weather prevailing, the distance of the bank fished, the depth of water on the bank fished, variations in the richness of the oyster beds, and the capacity and industry of the divers. The Arab divers were the best divers, the Kilakarai second best, while the Jaffna divers were lazy and incapable under any but the most favourable conditions.

50. Generally speaking, the weather throughout the Fishery was not good for fishing, strong winds frequently causing a good deal of interference; and there was also unusual rain from March 10 to 20, over 7½ inches being registered in camp.

51. It was originally intended that oysters should be sold per bag in bags estimated to contain about 1,000 oysters each, as this method would mean an economy in staff and also reduce the actual handling of oysters—with loopholes for theft of pearls—to a minimum. At the first auction, however, I had two average bags taken to the auction room, and on count they were found to contain just on 750 oysters each. At the second sale some purchasers complained that the contents of their bags had varied widely from that figure (750), and the bags then counted were found to contain 585 and 712, respectively. A subsequent examination of the bags showed that they were of several varieties and not of uniform size, as intended, and I had no option but to yield to the demand that the oysters should be sold as at previous fisheries, at so much per 1,000. In actual practice the work of counting distributed among the staff of koddu counters or coolies did not take long, and the staff could not have been appreciably reduced, had the counting been dispensed with.

52. The oysters were usually sold at the auction bungalow at 9 P.M. on the day on which they had been fished—or next morning in the few cases of late arrivals. The system followed was that bids were called for—per bag at the beginning and subsequently per 1,000—and the highest bidder was allowed to take as many as he desired, within reason, at this price, whereafter the bidding was resumed, or offers at the rate of the last bid invited at my discretion until the whole stock was disposed of. As a rule, prices gradually fell until about three-fourths were disposed of, when there was a tendency to rise.

53. At the night sales, purchasers who had not made deposits were required to deposit Rs. 5 per 1,000 and to pay the balance when obtaining delivery order next morning.

54. The following table shows the number of oysters sold each day and the amount realized therefrom, and also the highest and lowest bid each day and the average :—

The Pearl Fishery, 1925.

Date of Fishery.	Government Share of Oysters.	Amount realized.	Average Price per 1,000.	Highest Bid.	Lowest Bid.
1925.		Rs. c.	Rs. c.	Rs. c.	Rs. c.
February 27 ..	129,000 ..	6,988 0 ..	54 17 ..	108 0 ..	40 0 ..
28 ..	174,000 ..	10,456 0 ..	60 9 ..	80 0 ..	53 0 ..
March 2 ..	180,845 ..	7,302 53 ..	40 38 ..	56 0 ..	36 0 ..
3 ..	142,065 ..	5,406 60 ..	38 6 ..	45 0 ..	36 0 ..
4 ..	179,280 ..	7,714 44 ..	43 3 ..	48 0 ..	40 0 ..
5 ..	197,285 ..	10,228 67 ..	51 85 ..	60 0 ..	49 0 ..
6 ..	261,500 ..	12,056 50 ..	46 10 ..	51 0 ..	45 0 ..
7 ..	149,950 ..	7,661 45 ..	51 9 ..	61 0 ..	50 0 ..
9 ..	357,735 ..	15,230 60 ..	42 57 ..	55 0 ..	38 0 ..
10 ..	228,425 ..	8,215 30 ..	35 96 ..	37 0 ..	33 0 ..
11 ..	186,800 ..	7,000 60 ..	37 48 ..	45 0 ..	37 0 ..
12 ..	218,500 ..	7,951 50 ..	36 39 ..	45 0 ..	35 0 ..
13 ..	226,045 ..	8,029 12 ..	35 52 ..	36 0 ..	35 0 ..
14 ..	720 ..	25 92 ..	36 0 ..	36 0 ..	36 0 ..
17 ..	341,750 ..	12,240 25 ..	35 85 ..	39 0 ..	35 0 ..
18 ..	393,680 ..	13,129 34 ..	33 35 ..	38 0 ..	32 0 ..
19 ..	550,130 ..	19,511 81 ..	35 47 ..	37 0 ..	35 0 ..
20 ..	450,440 ..	16,979 28 ..	37 69 ..	40 0 ..	36 0 ..
21 ..	321,000 ..	17,441 0 ..	54 33 ..	62 0 ..	49 0 ..
23 ..	467,057 ..	22,827 18 ..	48 87 ..	56 0 ..	45 0 ..
24 ..	389,000 ..	18,261 50 ..	46 95 ..	53 0 ..	46 0 ..
25 ..	498,500 ..	22,399 0 ..	44 93 ..	59 0 ..	41 0 ..
26 ..	283,981 ..	16,734 42 ..	58 93 ..	62 0 ..	46 0 ..
27 ..	230,500 ..	17,069 50 ..	74 5 ..	79 0 ..	73 0 ..
28 ..	240,788 ..	13,685 98 ..	56 84 ..	64 0 ..	52 0 ..
30 ..	418,375 ..	21,128 25 ..	50 51 ..	57 0 ..	47 0 ..
31 ..	158,500 ..	8,844 0 ..	55 80 ..	65 0 ..	50 0 ..
April 1 ..	311,720 ..	14,856 0 ..	47 67 ..	60 0 ..	45 0 ..
2 ..	310,686 ..	18,494 85 ..	59 53 ..	63 0 ..	55 0 ..
3 ..	473,400 ..	23,218 20 ..	49 4 ..	56 0 ..	47 0 ..
4 ..	100,185 ..	6,754 66 ..	67 41 ..	76 0 ..	63 0 ..
6 ..	523,500 ..	21,667 50 ..	41 38 ..	44 0 ..	41 0 ..
7 ..	440,735 ..	14,944 50 ..	33 91 ..	36 0 ..	32 0 ..
8 ..	393,575 ..	11,510 75 ..	29 21 ..	31 0 ..	27 0 ..
9 ..	224,375 ..	6,108 88 ..	27 22 ..	41 0 ..	26 0 ..
10 ..	229,700 ..	5,053 40 ..	22 0 ..	22 0 ..	22 0 ..
11 ..	140,572 ..	3,208 59 ..	22 83 ..	26 0 ..	22 0 ..
Total ..	10,524,299	460,336 7	43 74		

55. From this table it will be seen that the highest individual bid at the auction sales was Rs. 108 per 1,000 on the first day, when there was only a small supply of oysters from Twynam's Paar available, and the gambling spirit was strong. The next highest was Rs. 79 on March 27, on which date also the highest average price, viz., Rs. 74·05, was obtained. These oysters were of the third days' fishing on West Cheval South-west Paar, which was not subsequently fished. Oysters from the same paar had fetched an average of Rs. 48·87 on March 23 and Rs. 58·93 on March 26.

56. The lowest bid accepted was Rs. 22 on the last day of the Fishery.

57. The Periya Paar was fished on April 2, 3, and 4, when the average prices obtained were Rs. 59·13, Rs. 49·04, and Rs. 67·41, respectively. On the last date the supply was only just over 100,000, whereas on the previous day it had been over 473,000.

58. The Twynam Paar, on which the deepest diving was required, was fished on February 27, 28, March 2, 3, 25, 28, and 31, and the average prices fetched on those dates were Rs. 54·17, Rs. 60·09, Rs. 40·38, Rs. 38·06, Rs. 44·93, Rs. 56·84, and Rs. 55·80, respectively.

59. The north-west portion of the West Cheval Paar was fished on March 4, 5, 6, 7, 24, 30, and 31, and the average prices obtained varied between Rs. 35·85 and Rs. 55·80.

60. The central portion of the West Cheval Paar was fished from March 9 to 21 (except on the 17th) and on 24, 30, and April 1. The average prices obtained varied between Rs. 33·35 and Rs. 54·33.

61. The North Cheval Paar was only fished on March 17, and the average price obtained was Rs. 35·85.

62. Oysters from parts of the West Cheval Paar fished during the last six days of the Fishery fetched from Rs. 22 to Rs. 41·38 on the average.

63. The prices realized bore, I think, little relation to the intrinsic value of the oysters. A large proportion, especially of the smaller catches, was removed from Marichchukaddi to serve the retail markets in Colombo and elsewhere, where a good deal of gambling occurred; and those engaged in this business could well afford to outbid those who intended to wash their oysters at the camp and deal in the pearls obtained therefrom. This competition was eliminated towards the close of the Fishery owing to the state of the sea rendering transport to Colombo difficult, but the low prices then obtained, for the comparatively small catches made, rendered it not worth while continuing the Fishery, especially as the weather was becoming bad and the divers getting tired.

64. The average valuation of four valuers of the pearls obtained at the November-December inspections of the banks was as follows per 1,000 oysters :—

	Rs. c.		Rs. c.
Twynam Paar ..	17 10	North-west of West Cheval Paar ..	17 52
Periya Paar ..	22 46	South-west of West Cheval Paar ..	16 92

In February further samples were taken from Twynam's Paar, and the valuation of these was Rs. 37·50 per 1,000. In March further samples from the West Cheval Paar were valued at Rs. 17·94 per 1,000—yet oysters were sold the same evening at an average of Rs. 43·09. The valuations made are always believed to be very conservative, and the usual experience in past fisheries has been that the prices actually realized have greatly exceeded them. The lots of sample pearls were sold for Rs. 1,000 and Rs. 833.

65. As usual, at this Fishery there were constant complaints from divers of there being no oysters where they were diving—the catches of certain boats on several days certainly supported this, though the officers afloat said the divers were incompetent, or the boatmen too slack to move their boats themselves to better spots—and from purchasers of oysters that they were immature or contained no pearls. Most merchants stated they had lost this year as business was slack owing to the catches being much less than anticipated and the pearls found poor—yet they had every intention of coming next year, when a large Fishery of well-grown oysters was anticipated, to recoup their losses. It is difficult to know what weight to attach to such complaints, but few pearls of any outstanding size or quality appeared to be on offer, and private experience showed that one could open a large number of promising-looking oysters without finding much beyond an occasional seed pearl, though one at times heard of lucky finds.

THE GOVERNMENT KODDU.

66. The design of the koddu was similar to that adopted at previous fisheries. There was a stout outside palisade, 342 feet by 218 feet, with five doors on the sea and three on the land side. Within this, and allowing for a 9-ft. path all round, was an inner palisade, the rectangular space enclosed by which was divided into nine compartments, each 200 feet long and 36 feet wide, with a door at each end. Each of these inner compartments had an open passage, 21 feet broad throughout its length, the remaining 15 feet being protected by cadjan roofing, and divided into twenty rooms, each 10 feet by 15 feet, with low partition walls of varichchus. Ramps leading from the shore to the entrances of the koddu, which was several feet above sea level, were constructed of old sleepers to render the task of carrying bags of oysters into the koddu easier.

67. On the arrival of a boat at the flagged part of the beach opposite the koddu and after the necessary examination by the police, the divers and boatmen wearing their badges had to proceed with their catches to the room in the koddu assigned to them, and indicated by a number plate bearing the number of their boat. The same room was not always assigned to the same boat as, to prevent congestion, it was found desirable to distribute the number of boats which actually went out as equally as possible between the distributing staff available—two koddu clerks generally worked in each compartment—and on the occasions when the catches had to be divided by oysters instead of by bags, the work could be expedited and supervision over it improved if two contiguous rooms, instead of one, could be made available for a boat.

68. Generally speaking, each diver's catch was brought into the koddu in three sealed gunny bags, he having divided the oysters, as equally as possible, into three shares prior to the sealing; two of each three were selected by the koddu clerk and retained as Government share, and the diver was given the third and also two empty gunny bags for the next day's fishing. The tindal of each boat brought a chit from the sealing officer, showing the number of sealed bags he had to account for; and after the distribution a pass was issued to him for the removal of the number of bags assigned to the divers in his boat.

69. The system, on the whole, worked very smoothly. Occasionally, the number of bags produced did not correspond with that on the sealer's chit, but generally in such cases an error on the latter's part was admitted after inquiry. There were also a few complaints that, in the press of work which occurred when a large number of boats for the same compartment came in together, divers seized opportunities for exchanging the bags allotted to them for others of greater capacity among the Government share. Such cases were dealt with on their merits, and, apart from confiscations, the services of a few koddu coolies were dispensed with. After a suggestion of connivance in such malpractice by pre-arrangement with the divers on the part of certain koddu clerks—the evidence failed to establish any such—it was arranged that the compartments to which the koddu clerks were posted should be altered daily and be fixed just before the arrival of the boats.

70. To avoid delay on the banks sometimes the sealing officers did not await the division by the divers of their catches into three equal bags, and on such occasions all the bags had to be turned out in the koddu and the oysters divided into heaps for distribution. This process required a good deal more time than dividing sealed bags, and on the busiest days of the Fishery, when a large number of boats came in about the same time under tow, considerable congestion and noise ensued in the compartments; and safeguarding the oysters was a matter of difficulty especially after dark.

71. On the departure of the divers from the koddu, the bags of the Government share were opened, and the oysters counted and put into bags of 500 for delivery.

72. The boats usually began arriving at the koddu by about 5 P.M., and on such occasions the divers were generally disposed of by 6.30 P.M. and counting completed by 8 P.M.; on a few occasions, however, the boats were delayed owing to calm, and the koddu could not be closed till after midnight.

73. The six Wells' incandescent lamps obtained for the koddu, even when supplemented by hand-oil lanterns, proved insufficient when the divers were in the koddu after dark, as the cadjan roofing and the partitions obscured their rays. A supply of petrol-fed hand lanterns was accordingly obtained, and these portable lamps proved very useful.

74. At night the Wells' lamps at the corners of the stockade gave sufficient light for the police guard which patrolled the paths between the locked inner and outer palisades.

REVENUE AND EXPENDITURE.

75. It was decided by Government that the revenue and expenditure of the 1925 Pearl Fishery including expenditure incurred in 1924) should be credited and debited respectively to a separate Pearl Fishery Fund, and that no free inter-departmental services should be allowed in connection with the Fishery.

76. The expenditure to be charged to the fund cannot at present be definitely stated, but will probably be some Rs. 588,000, while the total receipts to be credited to the fund from the current Fishery will be about Rs. 528,000. The former sum includes the cost of several valuable assets, such as the trawler "Nautilus" and stores in hand; and also the cost of buildings and of the new road from Mannar Station to South Bar.

77. The revenue already brought to account is made up as follows :—

	Rs.	c.
(1) Sale of oysters and sample pearls	462,891	57
(2) Sale of confiscated pearls and oysters	3	0
(3) Sale of boutique and dwelling sites	27,101	50
(4) Sale of toddi sites	16,000	0
(5) Licences for boats	7,180	0
(6) Kottu fines, &c.	669	87
(7) Refunds	433	51
(8) Miscellaneous	3,228	48
	517,507	93

Item (7) will be increased by audit surcharges.

78. No credit is given to the fund for the receipts to be ascribed to the opening of the camp obtained by the Forest Department at the Timber Dépôt, by the Post Office, and by the Customs (Rs. 2,946·69), nor for the proceeds of the sale of arrack within the camp (Rs. 15,946·28). The fund was debited with Rs. 10,604·98 paid to the Ceylon Government Railway for transport services.

QUARANTINE ARRANGEMENTS AND THE PUBLIC HEALTH OF THE CAMP.

79. The Board of Immigration and Quarantine at a meeting on December 8, 1924, came to the following decisions :—

- (1) That direct passenger traffic from India to Marichchukkaddi (Pukulam) should only be allowed from Paumben, where the sole restriction should be examination by the Quarantine Medical Officer, and that the usual regulations regarding pratique should be applied to boats arriving at Marichchukkaddi.
- (2) That the ordinary quarantine regulations should be applied to passengers coming by the Dhanushkodi-Talaimannar or the Tuticorin-Colombo routes.

80. Subsequently, as a concession to the Kilakarai divers, a Ceylon Medical Officer was stationed at that port and direct transit, thence to Marichchukkaddi was allowed from March 3 onwards.

81. The quarantine arrangements at Pukulam—the port for Marichchukkaddi—were in charge of Dr. J. B. Flamer Caldera, M.R.C.S., Eng., L.R.C.P., Lond., who assumed duties on February 19 and performed his arduous functions very efficiently. He inspected all passengers arriving by sea, and, in the case of vessels from India, only granted pratique after all on board had been inspected, counted, and their names checked with those in the health passes. All were found healthy, except a Moorman from Kalpitiya who had mumps and an Indian passenger who had chickenpox. He inspected altogether 605 incoming boats with 16,511 passengers; on March 15 alone he had to inspect 49 boats arriving with divers, &c., from Kilakarai.

82. As regards the reporting of passengers who had arrived from Mandapam and Paumben with the usual printed health passes, the Quarantine Medical Officer reports—

The Medical Officer of Health and I made what arrangements we could for passengers to report. During the first few days a sanitary inspector attended to the clerical work. By the end of the first week, the work of reporting was carried out in a fairly systematic and orderly manner, when the services of the vaccinator, who had previous experience in reporting work, were available. I was very pleased with the efficient work done by this officer. Towards the latter part of the Fishery, merchants and respectable visitors were requested to attend the office of the Medical Officer of Health, where the reporting was done on the day after their arrival, register their names and addresses, and asked to report only in case of illness. Coolies and traders were not allowed this concession for obvious reasons. Everything considered, I think the percentage of those who reported themselves was quite satisfactory. It was not feasible to take action against defaulters as is ordinarily done. Sanitary inspectors were asked, whenever possible, to visit the houses of those who had given their addresses, but had not reported.

and suggests that for future fisheries—

(1) Coolies and petty traders should not be allowed to cross over before undergoing the full period of detention at Mandapam. No health passes should be issued to people of these classes at Paumben or Kilakarai to travel by the direct sea route.

(2) Respectable visitors and merchants should be asked to sign a bond and deposit a small sum of money—say Rs. 25—undertaking to register their own and their servants' names and addresses at the office on the day after their arrival, and report any case of illness occurring during the period of quarantine. As a further safeguard, a sanitary inspector might be detailed to visit them at the addresses given twice a week or so.

(3) No special arrangements need be made in the case of divers. The sammati and tindal of each boat should be instructed to report any case of illness occurring amongst the divers or crews to the Medical Officer of Health.

83. After the occurrence of cholera in the camp, the Quarantine Medical Officer examined all passengers leaving Pukulam by coastwise vessels.

84. The camp hospital which consisted of four ordinary wards (three male and one female) and three infectious diseases wards—for cholera, smallpox, and segregation, respectively—was in charge of Dr.C. Somasundaram, the Medical Officer of Point Pedro, who arrived at the camp on February 23.

85. Thanks in large measure to the efficiency of the sanitary staff, the health of the camp was generally good until after the week of heavy rains beginning on March 10, when malaria broke out, although very few mosquitoes were to be seen. The total number of patients treated in the hospital—mostly people of the cooly class—was 285, and fifteen deaths occurred therein. The cases were—

Malaria	..	..	206	Insanity	..	..	1
Dysentery and diarrhoea	..	..	32	Ulcer of cornea	..	..	1
Pneumonia	..	..	12	Asthma	..	..	1
Wounds	..	..	12	Piles	..	..	1
Syphilis	..	..	1	Colic	..	..	2
General debility	..	..	5	Skin diseases	..	..	7
Rheumatism	..	..	2	Leprosy	..	..	1
Hæmoplægia	..	..	1				

and the deaths were due to malaria 3, dysentery and diarrhoea 3, pneumonia 7, and debility and old age 2. As usual, the patients were generally brought in to hospital when very ill.

86. At the Government dispensary 2,435 cases, principally of malaria and bowel complaints, were treated. Quinine tabloids were supplied daily to Government officers of all ranks during the period of the Fishery, and the general health of these was remarkably good while the camp lasted, but most of them suffered on return to their station from malaria and bowel complaints.

All officers appointed for Pearl Fishery duty had in accordance with the instructions of Government to undergo anti-enteric inoculations before proceeding to camp and no cases of enteric fever occurred among them.

87. At the Infectious Diseases Hospital, two cases of cholera were treated and both proved fatal, and one case each of chickenpox and mumps.

88. The first case of cholera occurred on February 28, a Muslim, aged about 35, from the Tanjore District, which he had left on the 21st, being found in a collapsed condition in a shed erected for the use of the police guard outside the Government koddu at 3.30 p.m. on that date. He was removed to the hospital, where he died on March 3. The contacts traced were segregated, and the buildings which he had contaminated were burnt down. Bacteriological examination gave a positive result.

89. A second case of cholera occurred in the camp near Mullikulam village on March 7, the patient—a Sinhalese—being found lying outside an eating-house in the night. He had been in the district for a month and had gone about doing cooly work, so was probably a contact of the first patient. The patient rallied for some time, but ultimately died.

90. A third case of suspected cholera was reported on March 9 from a boutique at the corner of Tank street, but the Medical Officer was finally of opinion that it was chronic dysentery.

91. Meanwhile on March 4 a case occurred at Murungan of suspected cholera. The patient, a Muslim, who died the same morning, had come from Marichchukkaddi, where he had been a hawker; and five fatal cases subsequently occurred there, doubtless due to infection from him.

92. On March 5 arrangements were made to post an apothecary at Talawila to inspect all travellers leaving the camp by the road route to Murungan; and the Superintendent of Mandapam Camp shortly afterwards was requested to insist on full quarantine at Mandapam of all persons of the cooly class proceeding to the camp. The camp thereafter fortunately remained free from infectious disease.

93. The sanitation of the camp was in charge of Dr. S. F. Chellappa as Medical Officer of Health working with five sanitary inspectors, 10 overseers, and 160 coolies. Those who arrived early were immediately put to work in clearing up the low brushwood in the camp, burning refuse, &c., and from the time the camp opened, the separate staffs of scavenging and conservancy coolies (the latter obtained from India) were kept busy under strict supervision, and performed very efficient service. The general good health of the camp and noticeable absence of mosquitoes and flies in any considerable numbers must be largely ascribed to the excellent work of Dr. Chellappa and his staff.

94. Six sets of permanent latrines had been erected in various parts of the camp; and the contents of the buckets from these, as well as from the dry-earth commodes supplied for the Government servants' bungalows, were at first incinerated, but, when this method proved unsatisfactory, were buried, the incinerator being used for the disposal of rubbish. Coir dust for use in latrines was obtained from the Chilaw District and shipped from Negombo by dhoney. Apart from the permanent latrines, open places in the jungle to the north of the camp to which flagged paths were cut were made available for use under supervision.

95. Four scavenging carts were obtained on loan from the Colombo Municipality, and these and twelve conservancy carts, each to hold six buckets, were regularly employed.

96. The sanitary staff also attended to the chlorinating of the water supplied, and supervised the eating-houses, food boutiques, butchers' shops, slaughter-houses, &c. Some useful leaflets, in English and Tamil, were prepared by the Sanitary Commissioner for distribution. The sanitary staff also took prompt and efficient measures when the cases of cholera occurred.

WATER SUPPLY.

97. The principal source of supply of drinking water for the camp was the Adappankulam tank. Prior to the opening of the camp, this tank was protected by a barbed wire fence, 1½ mile long, and was later, as other sources of drinking water were, regularly patrolled by tank patrols; it was also emptied in August, 1924, in order to enable the bed to be cleansed and purified by exposure to the sun, but unfortunately unseasonable rain occurred shortly after it had been emptied and reduced the sun exposure to a very short period. The tank had become well filled again by the time the camp opened, and the heavy rains which fell in the middle of March dispelled any fear of water shortage if the water could be retained, the only anxieties being lest the bund might breach or the water become polluted by reason of the water level rising above the protected contour.

98. The concrete spill of this tank was thoroughly repaired and withstood the heavy floods in March when the water was racing probably two feet over it; and a new cistern was constructed for service purposes fed by a sluice and pipe through the bund.

99. The road to the service tank was metalled to facilitate cart traffic, but the metal was not sufficiently consolidated, and on the wet days carts sank nearly to their axles in places. Further metalling and consolidation will be required before the next Fishery.

100. As regards the quality of the water in this tank, the analytical tests were not quite satisfactory, and it was decided that the water should be chlorinated before issue, and this was regularly done at the service cistern by the sanitary authorities. At the cistern water was issued by departmental coolies using only the buckets supplied to them for the purpose.

101. The Government officials' drinking water was issued by means of water carts from the well at Karadikuli, which, however, analysis showed to be not of very good quality. The delivery of water to Government officials was regulated by the Musali Adigar, and a satisfactory supply was maintained.

102. Another principal source of supply of water to the camp was from the private tank, Pukulam, in the Puttalam District, from which the water was led in pipes over the Modaragam-aru to the jetty, the main pipe being tapped at several points *en route* to supply cement bathing, &c., tanks constructed by the tank owner, Gabriel Appulami. For this tank the pipes were supplied by Government, on condition that it would be allowed free use of the water—a flexible pipe extension was carried along the jetty for direct supply to the water boats attached to the Government fleet—and that Gabriel would pay Rs. 500 per annum for the use of the connections—he being allowed to charge the general public for water supplied and for baths, &c.

103. For bathing purposes the Palayadikulam tank in the middle of the camp was reserved for divers. At the close of the fishery, the tank was becoming very foul, although it had received a good replenishing during the heavy storms in the middle of March.

ACCESS TO THE FISHERY.

104. 3,785 persons (including divers) arrived at Pukulam by the direct sea routes from Paumben and Kilakarai; and some 12,613 arrived in boats from Ceylon coastwise ports.

105. No boat services were subsidized for the conveyance of visitors to Marichchukkaddi, but such transport was, as in previous years, left to private competition; and no attempt was made to regulate boat charges.

106. Negotiations with the Agents of the British Indian Steam Navigation Company and the Ceylon Steamship Company for a steamer service between Colombo, Marichchukkaddi, and Paumben fell through, as the Companies did not consider such a service likely to pay, in view of the competition of the railway route, and Government was unwilling to give the guarantees demanded. The South Indian Railway also refused to allow their spare steamer to run to Marichchukkaddi owing to the shoal waters in the neighbourhood. Special arrangements, however, were made for the British Indian Steamship "Baroda" to take on her way to Tuticorin the police force and stores from Colombo to Marichchukkaddi just prior to the opening of the camp.

107. As it seemed probable that the majority of passengers to the Fishery would take the rail route to Mannar and travel by sea from South Bar to Marichchukkaddi, a good serviceable road was constructed between Mannar Station—the platform of which was temporarily extended—and South Bar; and a temporary port was formed at South Bar with shelters for passengers, a water supply, latrines, and lamps under the supervision of Customs, police, and sanitary officers.

108. It was anticipated that several motor launches would ply from South Bar, but ultimately only three launches ran at various periods, and, as their fare was Rs. 5 while the dhoney fare was Re. 1, most passengers availed themselves of the dhoney services. The number visiting the Fishery Camp by the South Bar route was less than anticipated, and there was practically no congestion at any time at South Bar, where the maximum number embarking on any day was about 750. Towards the close of the Fishery, passengers returning by this route experienced considerable discomfort in landing from the launches and dhonies through the rough sea and the surf—and many preferred the tedious overland journey to Murungan or Mannar. Under orders from Government, estimates for a properly gravelled or metalled road between Murungan and Marichchukkaddi were framed by the Public Works Department, and, if such a road is constructed, the discomfort to visitors will be greatly reduced.

109. Owing to the somewhat abrupt closing of the Fishery, a Government tug taking passengers at Rs. 5 per head was put on the run between Pukulam and South Bar, and full advantage of the facility was taken by passengers desirous of leaving the camp. On one day the "Nautilus" also accepted passengers for South Bar and Paumben.

POLICE.

110. In anticipation of large numbers attending the camp, a strong police force was detailed for duty at Marichchukkaddi and rendered excellent service in the maintenance of order, in the prevention of crime, and in preventing the spread of such fires as broke out. The Superintendent, Mr. G. H. Ferguson, was very tactful and indefatigable in going round the camp and getting into friendly touch with all classes of the mixed population, and thoroughly justified his selection for a post of such responsibility. I refrain from details of the work performed by the police, as I understand the Inspector-General of Police will submit a report upon the police work performed at the Fishery Camp.

CUSTOMS.

111. The Customs were in charge of Mr. B. Soosapillai from Point Pedro as Sub-Collector, with one head tidewaiter and two tidewaiters.

112. The Port (Pukulam) was open from February 21 until April 18, and 173 vessels with a total tonnage of 4,139 tons reported from beyond the seas and 538 vessels with a tonnage of 4,298 from Ceylon coastwise ports.

113. The revenue collected was as follows :—

	Rs.	c.		Rs.	c.
Grain	1,063	66	Double rent	1	20
Sugar	36	4	Fines	26	0
Other goods	391	47			
Port dues	775	76			
Single rent	652	56			
					2,946 69

THE POSTAL SERVICE.

114. A Post and Telegraph Office was opened at Marichchukkaddi for the period of the camp, and did a good business requiring the services of a postmaster and six assistants. Telegraph and money order work was especially heavy.

115. There being no regular launch services between South Bar and Pukulam, the mails were generally carried by runners from Mannar and were due at nightfall, but owing to the bad road, wild animals, &c., were frequently late and not delivered until the next morning. There were no casualties or losses.

116. For valuable articles, &c., use was made of the Government trawlers and launches when they proceeded to Colombo or South Bar.

117. A wireless set was installed at the Post Office for communication with the Government trawler and worked satisfactorily.

118. The estimated receipts of the Camp Post Office were as follows :—

	Rs.	c.
Telegraph receipts	4,044	22
Sale of stamps	1,812	99
Money order commission	801	56
Miscellaneous	25	76
Total	6,684	53

THE FOREST DEPARTMENT.

119. The Forest Department punctually met the demands made upon it for timber for the Government temporary buildings and had sufficient stocks in hand at its depôt (which was suitably safeguarded by an excellent sleeper and barbed wire fence) to meet the requirements of private parties.

RESTHOUSE.

120. A temporary resthouse with ten rooms was erected at Government expense and equipped in the first instance by the Provincial Road Committee, who put the resthouse-keeper, Murungan, in charge.

121. The number of visitors to the resthouse was, owing to the doubtful prospect of the Fishery at first and later to the weather and the cholera scare, disappointingly small.

122. Government has since acceded to the request of the Provincial Road Committee that the resthouse should be considered as having been run on Government account and has taken over the equipment at its cost price.

SALE OF LIQUOR.

123. The only retail "on" licence for the sale of foreign liquor was that issued to the resthouse-keeper.

124. It was decided that only one shop for the off sale by bottle of foreign liquor should be allowed on a license fee of Rs. 50, and applicants for this privilege were required to state what brands of spirits and wines they proposed to keep and what maximum selling prices they were prepared to fix. The Point Pedro foreign liquor shop licensee, whose quoted prices were low, was selected. He complained, and apparently with reason, that business was very poor.

125. It was decided that six (or, if found necessary for adequately supplying the camp, eight) arrack taverns should be allowed, and tenders were invited for the exclusive privilege of sale at these—the supply of arrack to be drawn from the Mannar godown.

The successful tenderer undertook to pay Government Rs. 3 per gallon as rent. The amount paid to revenue in respect of the arrack consumed at the camp was Rs. 15,946.28.

126. One arrack tavern was allowed on the beach near Gabriel's Tope, one in Divers street, one in Main street, and three in the divers' quarters area. Six taverns were found sufficient, but, in view of the special circumstances, the original closing hour was extended from 7 p.m. to 8 p.m. in the case of three, and to 9 p.m. in the case of the other three patronized principally by divers. There were no toddy taverns in or near the camp.

127. An Inspector of Excise and peon were stationed at the camp to supervise the licensed shops, prevent short measure, overcharging, &c. There was practically no drunkenness within the camp.

MISCELLANEOUS.

128. Eight deposit accounts, to which sums due to Government for oysters purchased, &c., could be debited instead of being paid in cash, were opened at the Camp Kachcheri, and twelve at the General and other Treasuries.

129. Indian Government notes were accepted at the Kachcheri at their face value, and such notes to the value of Rs. 136,150 were received. At the close of the Fishery, merchants returning to India were glad to exchange their Ceylon notes for Indian. There were no cases of presentation of counterfeit notes.

130. The only prohibition imposed as regards lighting was that of the use of bottle lamps within the camp. None of the few fires which did occur was due to the use of oil lamps. The small fire at the wireless station was due apparently to a neglected candle. No damage was caused by fires.

131. The main streets were lighted by kerosine oil lamps of the ordinary Municipal type fixed on poles. In the Main street for the pearl bazaar and at the Government koddu, powerful Wells' incandescent lamps were used, and proved satisfactory.

132. As the indiscriminate opening of oysters purchased from the divers within the camp was becoming a nuisance, an order was issued prohibiting such openings except within areas marked by flags. The sanitary authorities daily cleaned up these areas, and the right of collecting abandoned oyster shells within them was sold by public auction.

133. The camp, on the whole, was wonderfully free from offensive smells, except in the neighbourhood of the toddies, though occasionally dead seaweed on the beach emitted a bad odour. The Sanitary Department improved matters by collecting and burning this.

134. The food supply maintained within the camp was ample, and there was no occasion to exercise the power of regulating prices granted by the new Ordinance. A special contract for the supply of raw rice, Muttusamba No. 2, required by the police force and the coolies of the Sanitary Department, was entered into at Rs. 9.15 per bushel prior to the Fishery, and the contractor gave satisfaction.

135. The power of requiring reconvicted criminals found in the camp to give security had to be exercised in very few cases, but the deterrent effect appears to have been good. One criminal was sent back to India as he failed to give security, and six Ceylon criminals were similarly sent back to their homes. Altogether sixteen reconvicted criminals of Ceylon and eleven of India were detected by the police and kept under surveillance, but none of them committed any serious crime in the camp.

136. There were only two prosecutions for possession of artificial pearls, and convictions were obtained in both. Three other complaints of attempted sale of artificial pearls were made, but the evidence was insufficient to justify prosecution.

137. A few licences were taken out for bringing genuine pearls into the camp.

138. In view of the difficulties which it was felt might possibly arise under the Indian Emigration Act, No. VII. of 1922, in the attendance of Indian merchants' servants, divers, coolies, &c., at the Fishery, the Government of Madras was addressed on the subject by the Ceylon Government in July, 1924, and the Indian Government agreed that the restrictions imposed by the Act might be suitably relaxed when the Fishery was held, and that divers, crews, and general merchants would not come under the definition of "Emigrants," and that assistants and personal retainers accompanying merchants might well be passed as "skilled emigrants" to which the Act would not apply.

139. The Hon. Mr. W. E. Wait, Controller of Indian Immigrant Labour, when in Madras in January, also discussed the matter with the Indian Labour Commissioner, who informed him that the Madras Government had no wish to throw any difficulties in the way of Indians attending the Fishery, and that the protectors of emigrants at Mandapam and Tuticorin would be instructed not to interfere under the Act with those *bona fide* crossing to attend the Fishery.

140. The Madras Government also promised assistance to the Ceylon officers proceeding to India to issue divers' and boat licences.

141. Applications were received for the exclusive right to film the Fishery operations, but Government eventually decided to grant no monopoly. In the event, none of the applicants took advantage of free permission to take any films they wished. Agents of Messrs. Plate, Ltd., and the Times of Ceylon Co., Ltd., took a large number of photographs of the various subjects of interest in the camp and on the Pearl Banks.

VISITORS.

142. Visitors to the camp included His Excellency Admiral Richmond and family and Mrs. Clementi, who arrived off Marichchukkaddi in the Flagship H.M.S. "Chatham."

143. The following Members of the Legislative Council—the Hon. Messrs. E. B. Alexander, Elphinstone, Southern, Kindersley, Colonel Wright, C. E. V. Corea, Duraiswamy, Colonel Hayward, C. W. Kannangara, Madawala, and Wikremanayake—also visited the camp and the Pearl Banks.

144. The Director of Indian Fisheries arrived in the "Lady Nicholson," and paid a three days visit to the Fishery and watched operations.

145. Rao Bahadur S. K. Sundracharlu, M.A., was appointed by the Indian Government to watch the interests of the Indians attending the Fishery, and he remained throughout except for a short period when he went to India to try to secure the early arrival of the Kilakarai divers. Our relations were very cordial and, while safeguarding the interests he had to protect, he was always anxious to be of assistance to the Ceylon Government, and was specially useful in settling disputes between boatmen, in helping in koddu supervision, and so forth. Unfortunately he contracted malaria during his stay.

THE SUPERINTENDENT'S STAFF.

146. Mr. E. T. Dyson, C.C.S., was appointed Assistant Government Agent, Northern Province, in December, 1924, and was of much assistance in recruiting the subordinate staff and obtaining minor stores. He made two journeys to South India to arrange for the licensing of divers and boats at the ports there, and also made arrangements for the recruitment of the conservancy coolies required at the camp from India. At the Fishery he acted as Koddu Superintendent. The work of the koddu was efficiently organized and supervised by him till a late hour practically every evening. He was indefatigable in his efforts, and maintained his health during the Fishery; but, like so many other officers, had a bad attack of fever immediately after the close of the camp.

147. The Assistant Government Agent, Mannar, Mr. C. L. Wickremasinghe, C.C.S. (with his Kachcheri Mudaliyar, Mr. Ponniah Hubert), rendered excellent service in the preliminary preparations for the camp; and during the Fishery was in charge of the Camp Kachcheri and the judicial work in the courts, where he displayed his customary efficiency. Unfortunately, he suffered from attacks of

fever on several occasions. During his absence from Mannar, Mr. R. S. V. Poulier did excellent work in organizing and supervising the arrangements at South Bar and in dealing with the cholera outbreak at Murungan.

148. Mr. J. R. Toussaint was appointed to assist in the Camp Kachcheri and koddu work from March 10 to April 4, when he was relieved owing to ill-health and returned to Colombo. He too did good work in spite of occasional ill-health.

149. Gate Mudaliyar M. S. Ramalingam was very helpful as Interpreter, generally in the camp and in the auction room in controlling the excited crowds there collected.

150. The officers at the Camp Kachcheri had a strenuous time, the Kachcheri being opened before 8 A.M.—Sundays included—for the acceptance of cash for oysters purchased the previous evening and the issue of removal permits. Ordinary Kachcheri work generally continued thereafter till after 5 P.M. At 9 P.M. they had to attend the auction sale and record the names of purchasers and accept their deposits; thereafter check the cash received, and they were rarely free before 10.30 P.M., and sometimes considerably later. The head clerk, Mr. Chintamani of Mannar; the second clerk, Mr. J. P. Kanthyah of Jaffna; and the shroff, Mr. Velupillai, deserve a special word of commendation.

157. Other officers deserving of special mention were Mr. Arulappa, District Adigar, Musali, who was responsible for the construction of the temporary buildings, and organized and supervised the water supply to the Government buildings, besides being generally useful in camp; Mr. A. S. Popalayaran, Beach Master, who performed his difficult duties in dealing with boatmen and divers very efficiently; and Messrs. N. Thampipillai and Naganathan who rendered Mr. Dyson special assistance in the Government koddu.

Jaffna, July 31, 1925.

F. J. SMITH,
Superintendent of the Pearl Fishery Camp.

III.—REPORT OF THE DIVISIONAL FOREST OFFICER, NORTHERN DIVISION, JAFFNA.

REPORT of the Divisional Forest Officer, Northern Division, Jaffna, on the supply of Timber and Firewood for the Pearl Fishery.

UNLIKE previous Fisheries, the entire timber supplies were carried out well in advance by the Forest Department. These supplies were classified under three distinct heads:—

- (a) Timber required for permanent Government works.
- (b) Timber required for temporary Government works.
- (c) Timber required by private purchasers.

2. Timber for permanent works came from various sources, and was supplied through the Director of Public Works. Timber for the temporary buildings and camp was supplied on indent from the Government Agent, whilst material required by merchants and other private purchasers was concentrated at the Forest Department Dépôt.

3. All timber, supplied on indent for Government use, was charged for at cost price, the Department merely taking credit for the royalty value. This transaction was, in the first place, treated as an inter-departmental service on the "Advance Account," which was subsequently credited by Treasury Transfer (from the Pearl Fishery Vote) to the extent of the actual expenditure incurred thereunder.

The Forest Department Dépôt, which supplied the needs of merchants and other private purchasers was run as an entirely independent transaction—having nothing to do with the Pearl Fishery Vote.

4. The following is a statement of timber supplied and actually disposed of under the three heads:—

(a) Government Permanent Buildings.

No.	Description.	Cubical Contents.	Royalty.		Cost.		Total.
			Rs.	c.	Rs.	c.	Rs. c.
15	.. Kumbuk logs	504	252	0	—	—	—
16	.. Milla logs	416	416	0	—	—	—
8	.. Palu logs	213	159	75	—	—	—
4	.. Hulanhik logs	147	147	0	—	—	—
4	.. Satinwood logs	107	214	0	—	—	—
4	.. Ranai logs	123	92	25	—	—	—
22	.. Satin top pieces	115	230	0	4,259	52	5,770 24
30	.. Bamboos	—	1	80	3	65	5 55
48	.. Halmilla logs	451	676	50	635	43	1,311 43
50	.. Trestles	—	2	50	19	24	21 97
4	.. Palu scantlings	5	3	75	10	96	14 71
1,025	.. Halmilla planks	29	45	0	92	45	137 45
100	.. Hora planks	233	116	50	339	92	456 42
29	.. Milla planks	13	13	0	33	41	46 41
			2,370	5	5,394	58	7,764 63

(b) Government Temporary Buildings, &c.

No.	Description.	Dimensions.		Rate per 1,000.	Cost.	Royalty.	Total.
		Length. Ft.	Girth. In.				
50 ..	Beams ..	18-25	Over 25-30 ..	750 ..	37 50 ..	35 0 ..	72 50
1,211 ..	Periya kappus ..	15-18	Over 18-25 ..	480 ..	609 40 ..	242 20 ..	851 60
2,179 ..	Sinna kappus ..	12-15	Over 12-18 ..	400 ..	871 60 ..	108 95 ..	980 55
99 ..	do. ..	12-15	Over 12-18 ..	400 ..	— ..	4 95 ..	4 95
2,911 ..	Vallais ..	12-15	Over 8-12 ..	380 ..	1,106 18 ..	145 55 ..	1,251 73
39,000 ..	Puddus ..	12-15	Over 4-8 ..	135 ..	5,265 0 ..	1,950 0 ..	7,215 0
38,000 ..	Variechus ..	12-15	Over 2-4 ..	30 ..	1,140 0 ..	190 0 ..	1,330 0
9,000 ..	do. ..	12-15	Over 2-4 ..	35 ..	315 0 ..	45 0 ..	360 0
20,000 ..	do. ..	12-15	Over 2-4 ..	45 ..	900 0 ..	100 0 ..	1,000 0
					10,244 68	2,821 65	13,066 33

(c) Merchants and Private Buildings.

No.	Description.	Dimensions.		Rate per 1,000.	Cost.	Sale Rate.		Amount realized by Sale.
		Length. Ft.	Girth. In.			Retail. Rs. c.	Auction. Rs. c.	
111 ..	Periya kappus ..	10-12	Over 16-20 ..	500 ..	55 50 ..	1 50 ..	1 25 ..	164 0
1,764 ..	Sinna kappus ..	10-12	Over 12-16 ..	370 ..	652 68 ..	1 25 1 0	0 80 ..	1,815 50
32 ..	Barge poles ..	—	— ..	350 ..	11 20 ..	1 50 ..	— ..	48 0
1,529 ..	Vallais ..	10-12	Over 8-12 ..	300 ..	458 70 ..	0 75 ..	0 60 ..	1,098 5
12,535 ..	Puddus ..	10-12	Over 4-8 ..	110 ..	1,378 85 ..	0 25 ..	0 20 ..	2,994 90
121,099 ..	Varichchus ..	10-12	Over 2-4 ..	35 ..	4,238 46 ..	0 7 ..	0 6 ..	7,467 68
245 ..	Cubic yards fire-wood ..			— ..	455 40 ..	4 0 ..	— ..	776 0
					7,250 79			14,364 13

Issued to Government Departments from Dépôt :—

	20 ..	Puddus	..	..	—	..	—	..	—	..	5 0
10,700	..	Varichchus	..	..	—	..	—	..	—	..	749 0
	51 ..	Cubic yards firewood	..	..	—	..	—	..	—	..	204 0
					<u>7,250</u>	<u>79</u>					<u>15,322 13</u>

5. In the case of (b) and (c) timber in excess of requirements was brought in. This excess was due to the fact that timber was extracted on estimates of anticipated requirements. Had the Fishery attracted the usual crowds, the camp would have been larger, and all material extracted would have been fully utilized. This excess material, with the exception of varichchus, will be disposed of at cost price, which will cover cost incurred in felling and transport.

6. The actual balance remaining over at the conclusion of the Fishery was as follows :—

(b) Government Temporary Works.

Depôt Stock.

No.	Description.	Royalty. Rs. c.	Cost. Rs. c.	No.	Description.	Cost. Rs. c.
686	.. Periya kappus ..	137 20	329 28	43	.. Barge poles ..	15 5
735	.. Sinna kappus ..	36 75	294 0	3,801	.. Vallais ..	1,140 30
3,957	.. Vallais ..	197 85	1,503 66	17,465	.. Puddus ..	1,921 15
				42,901	.. Varichehus ..	1,501 54
				320	.. Cubic yards firewood ..	604 80
		371 80	2,126 94			5,182 84

Financial Results.

7. The financial results are summarized below :—

Depôt Transactions.		Rs.	c.	Rs.	c.
By cash recoveries at Depôt	..	14,364	13		
By cash value of material issued from Depôt to Government departments	..	1,028	49		
Realizable value of balance stock at cost	..	3,681	30		
				19,073	92
Total cost of all timber supplies to Depôt	..	13,515	95		
Total cost of all buildings and permanent Depôt	..	1,032	23		
To pay of Depôt coolies, watcher, &c.	..	369	7		
By payment of double batta for staff	..	1,414	0		
Miscellaneous	..	65	55		
				16,396	80

Balance in favour of Dépôt ..	2,677 12
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8. In addition to the above, the Department is to receive in cash from the Pearl Fishery Vote the royalty value of all timber supplied on Government account for temporary and permanent works in connection with the Pearl Fishery.

This royalty is as follows :—

	Rs.	c.
(a) Royalty on timber supplied for permanent works	..	2,370 5
(b) Royalty on timber supplied for temporary works..	..	3,193 45
		<u>5,563 50</u>

The Forest Revenue has, therefore, benefited by the Pearl Fishery to the extent of Rs. 8,240·62.

General.

9. Forest operations commenced in July, 1924, with the result that all timber required for the temporary Government buildings was cut, transported, and delivered by September 30—well in advance of building operations. This plan of bringing in material in advance and supplying it before the commencement of the building contracts should always be adopted. It saves confusion, keeps down rates, prevents illicit removal, and at the same time enables the Advance Account to be adjusted before the close of the financial year.

10. Owing to rain and the low-lying nature of the locality, no forest transport is possible between October and January, so that only about six weeks is available in which to concentrate Depôt supplies. Contracts for this service should, therefore, be signed during the early part of December, in order to enable cutting to be done in advance. During the year under report, the contract was entrusted to one Gabrielpillai of Marichchukaddi who did well in completing the entire work within the time allowed. It might be noted that during the last week he had no less than fifty carts engaged in transport.

11. The supervision of felling, transport, and the preliminary arrangements in connection with the supply of timber for Government temporary buildings and the sale Depôt was carried out by Mr. G. Sankarapillai (Forest Ranger, Murunkan), with the assistance of the Forest Guard of Silavaturai. These officers deserve to be commended for the spade work done under trying conditions.

12. On February 1 a special staff consisting of Mr. A. Hensman (Assistant Conservator of Forests) and Mr. S. C. Ramalingam, Forest Ranger, was appointed to run the Depôt and supervise operations during the period of the Fishery, enabling Range and Beat Officers to attend to their ordinary protective duties.

13. Gaining by the experience of past Fisheries, every endeavour was made to cope with the rush of purchasers during the first ten days. A substantial fence was erected round the premises, within which all timber was classified and sold on a system of coloured tickets. Certain small material was also sold periodically in lots by auction, in order to encourage the opening of small retail stores from which material could be purchased for erecting small temporary shelters. Both systems worked well.

14. During the first week the Depôt was besieged by thousands of purchasers, all speaking diverse languages, and the sales amounted to over a thousand rupees per diem, but these sales rapidly diminished, as disappointed speculators left the camp.

15. Mr. S. C. Ramalingam, Forest Ranger, who performed the duties of Depôt-keeper, proved hardworking and efficient, and made an excellent Depôt-keeper.

16. In view of the fact that there has been no Fishery for fifteen years, and that all timber brought in was based on rough estimates of possible requirements, the results obtained must be considered satisfactory.

Forest Office,
Jaffna, September 18, 1925.

A. B. LUSHINGTON,
Divisional Forest Officer, Northern Division.

IV.—REPORT OF THE POSTMASTER-GENERAL AND DIRECTOR OF TELEGRAPHS.

REPORT of the Postmaster-General and Director of Telegraphs on the Postal and Telegraph Facilities at Marichchukaddi.

The POSTMASTER-GENERAL AND DIRECTOR OF TELEGRAPHS to the Hon. the COLONIAL SECRETARY.
No. 347/64688/23. Office of the Postmaster-General and Director of Telegraphs,
General Post Office, Colombo, September 7, 1925.

SIR,—I HAVE the honour to forward the following report on the activities of the Postal Department in connection with the Pearl Fishery :—

1. A Post and Telegraph Office was opened at Marichchukaddi on February 16, 1925, and closed on April 17, 1925. Full postal and telegraph facilities were provided.

2. Direct communication with Colombo and Jaffna was established by telegraph by deviation of the Colombo-Kayts telegraph circuit which runs along the western sea coast *via* Puttalam and Mannar. It was found that direct communication was necessary between the Camp Post Office, Mannar, and Jaffna, as the Fishery arrangements were in the hands of officials of the Northern Province, and a large portion of the anticipated traffic was expected to and from stations in the Jaffna Peninsula. A quadruplex set was installed at Marichchukaddi Post Office, which permitted direct exchange of traffic

by means of repeater arrangements between Colombo, Marichchukkaddi, Mannar, and Jaffna. It was also anticipated that the visit to the camp of tradesmen from India and the presence of large gangs of divers would cause considerable increase in the Indo-Ceylon traffic. Arrangements were, therefore, made to quarter special staff at Mannar for the exchange of Fishery traffic direct with India without having to pass through Colombo for disposal. With the collaboration of the Indian telegraph authorities, a camp station was opened at Rameswaram on the Indian side, and vibrator communication was found workable on the second cable which had been interrupted since January last and on which telegraph working by other means was not possible. The Indian traffic dealt with during the period was 6,329 telegrams. Although the traffic was less than anticipated, this temporary arrangement was found very useful in minimizing delays on the Indo-Ceylon traffic generally through the interruption of the second cable.

3. In addition, a temporary wireless installation was installed between Marichchukkaddi Post Office on shore and the trawler "Nautilus," which was equipped with wireless transmitting and receiving apparatus. The equipment on the "Nautilus" was installed in a permanent manner so as to be available for future occasions.

4. The Post Office staff comprised—

Postmaster-in-charge, 6 assistants, 3 telegraph messengers, 2 postmen, and 1 peon.

The business was disposed of expeditiously and without complaint.

5. The accommodation provided for the Post Office and for the quarters was not sufficient, and this defect should be remedied in the next Fishery.

6. It was not possible to provide a regular mail service between Mannar and Colombo by sea, and advantage was taken of the weekly trip to and from Colombo by the Government trawler "Nautilus" to dispatch whatever mails were on hand. This service relieved the runners of carrying heavy parcels and some valuable insured packets, and these articles were detained a day or two, if necessary, for this more convenient and safer means of transport. Nor was it practicable to run a regular contract mail service by boats between Marichchukkaddi and Mannar. Contractors did not wish to enter into a contract and undertake the usual risks incurred in connection with the loss of mails. Considering the large number of ordinary and insured parcels exchanged between Marichchukkaddi, Mannar, and Colombo, it was undesirable to enter into an agreement without proper safeguards.

7. The runner mail service between Marichchukkaddi and Mannar (thirty miles) was unsatisfactory and unsafe owing to the absence of roads suitable for motor traffic, or even a hand cart, and the runners having to carry the mails as head-loads with much inconvenience. The presence of wild animals also interfered with the prompt arrival of mails. The runners were often late by six or seven hours, and delivery could not always be effected on the day of arrival of mails at Marichchukkaddi. The weight of mails increased gradually until the Fishery was in full operation. It would be a great improvement and convenience to this department if a road could be built over the entire mail route so as to expedite the dispatch and receipt of mails between Marichchukkaddi and Mannar.

8. A delivery of letters by postmen was arranged. At first one postman was sufficient, and as the operations expanded, the number of postmen was increased to two.

9. The money order and postal order business transacted was heavy, and the public took full advantage of the telegraph money order system. Although ordinary money order business closed at 4 P.M., one assistant was engaged solely on telegraph money order work until 6 P.M. and frequently 7 P.M. The figures are as follows:—

Money Orders and Postal Orders issued.

Month.	Money Orders.		Postal Orders.		Total Value.	
					Rs.	c.
February ..	..	98	..	9	3,688	38
March ..	..	1,071	..	126	48,891	20
April ..	..	419	..	29	20,302	44
		1,588		164	72,882	2

Money Orders and Postal Orders paid.

Month.	Money Orders.		Postal Orders.		Total Amount paid.	
					Rs.	c.
February ..	..	48	..	5	6,691	81
March ..	..	619	..	26	76,227	94
April ..	..	392	..	13	38,943	74
		1,059		44	121,863	49

10. It will be seen that the money order and postal order payments exceeded the issues, roughly, by Rs. 50,000, which was remitted to the Postmaster in sums as required.

11. Considerable Savings Bank business was transacted, as will be seen from the following figures:—

Month.	Deposits.				Withdrawals.			
	No.	Amount.			No.	Amount.		
			Rs.	c.			Rs.	c.
February ..	4	..	46	25	..	—	..	—
March ..	71	..	1,578	75	..	18	..	292 56
April ..	23	..	1,212	0	..	11	..	154 0
	98		2,837	0	29		446	56

12. The telegraph traffic was not as heavy as was anticipated. The number of telegrams received and dispatched was as follows :—

Telegrams Received and Dispatched.

Month.		Received.		Dispatched.		Total.
February	..	372	..	794	..	1,166
March	..	2,889	..	4,001	..	6,890
April	..	1,231	..	1,677	..	2,908
		<u>4,492</u>		<u>6,472</u>		<u>10,964</u>

13. The traffic exchanged by wireless between ship and shore, except for a few private telegrams, consisted of State messages.

14. Registration and insurance were not heavy. One hundred and sixty-nine articles were insured.

15. The estimated revenue and expenditure shown below shows a loss on the working of the Post Office of Rs. 4,131·08.

Revenue and Expenditure.

REVENUE.	Rs.	c.	EXPENDITURE.	Rs.	c.
Telegraph revenue estimated	..	4,044	22	Salaries and wages of staff	.. 2,860 36
Postage revenue estimated	..	1,812	99	Other expenditure	.. 7,955 25
Money order commission	..	801	56		
Miscellaneous receipts	..	25	76		
		<u>6,684</u>	<u>53</u>		<u>10,815 61</u>

16. A fire broke out in the Wireless Power Room on March 26, at 10 P.M., and was extinguished in about thirty minutes. The prompt action of the police prevented the fire from extending to the neighbouring buildings. There were no casualties, and little damage was sustained.

17. On the whole, the staff maintained good health, a few cases of fever occurring towards the end of the Fishery.

M. S. SRESHTA,
Postmaster-General.

V.—REPORT OF THE MEDICAL OFFICER OF HEALTH.

REPORT of the Medical Officer of Health, Pearl Fishery Camp, Marichchukkaddi.

WATER SUPPLY.

The drinking water of the camp was obtained from two tanks and a well, viz., Addappankulam, Pukulam, and Palakully well.

Addappankulam is the usual type of village tank constructed for irrigation purposes and replenished by the rainfall. It is situated on the northern boundary of the camp near Mullikulam village.

The water area was enclosed within a well-constructed barbed wire fence, but at two spots portions of the water were outside the fence, and guards were employed for watching to prevent pollution of them. The drainage area of the tank is open to pollution.

The quantity of water in the tank was quite sufficient for the needs of the camp.

This tank had been used at previous fisheries for drinking purposes, and the system then in vogue was that adopted this year, with the additional precaution of chlorination, which was necessitated by the result of the analysis of the water.

It supplied the water for all the camp, with the exception of that portion by the Customs and Pukulam village, which were supplied by Pukulam tank.

The water from the tank was led through a pipe under the bund to a cement cistern of the following dimensions : 30 ft. by 30 ft. by 2 ft. 8 in. and a capacity of 15,000 gallons. The water in the cistern was chlorinated before it was permitted to be removed for consumption. The precaution was taken of employing eleven men and two overseers for drawing water and filling the vessels that were brought, no private vessel being allowed to be dipped in the water. Six men worked from 5.30 A.M. to 12 noon, and the other five from 12 noon to 6 P.M. In addition to the above personnel and the two guards mentioned earlier, a watcher was employed at the entrance to regulate traffic.

The water contained a good deal of sediment, which necessitated the cleaning out of the cistern once in two days.

The wheel tracks of the approach to the tank were roughly metalled, but after the rains the whole road became very muddy, and the bulls found it very difficult to draw the carts.

Water was removed from the cistern in barrels mounted on carts, in pots, and in kerosine tins. There were ten water carts with barrels of 100 gallons capacity employed by Government for providing its officers with water, and twenty-two private carts for selling water to the public. A kerosine tin of water (4 gallons) in the bazaar was sold at 10 cents. Twice a week all the water barrels were cleaned out under the supervision of the Sanitary Inspector in charge of the water supply.

The following two statements show the amount of water chlorinated, quantities of the chemicals used, and the amount of water consumed each month :—

(1) Table showing Gallons of Water chlorinated, Amounts of each Chemical used, and Gallons of Water consumed each Month.

(1) Month.	(2) Gallons of Water ehlorinated.	(3) Amount of E. C. Solution used in oz.	(4) Amount of Milton used in oz.	(5) Amount of Bleaching Powder used in lb.	(6) Gallons of Water consumed.
February, 21-28 ..	88,713 ..	1,440 ..	525 ..	2½ ..	87,778
March, 1-31 ..	687,040 ..	12,480 ..	592 ..	173½ ..	687,040
April, 1-10 ..	227,390 ..	11,030 ..	— ..	— ..	227,390
Total, 50 days ..	1,003,143	25,950	1,117	176	1,002,208

(2) Table showing Gallons of Water chlorinated with the different Chemicals used each Month.

(1) Month.	(2) With E. C. Solution.	(3) With Milton.	(4) With Bleach- ing Powder.	(5) Total chlorinated.
February ..	26,166 ..	28,880 ..	33,667 ..	88,713
March ..	233,694 ..	52,823 ..	400,523 ..	687,040
April ..	227,390 ..	— ..	— ..	227,390
Total ..	487,250	81,703	434,190	1,003,143

Pukulam is situated in the District of Puttalam, on the Puttalam side of Moderagam-arū, about 300 yards from the seashore. It is also a tank depending on the rain for its source of water. There are no habitations in the gathering area, the only dwellings nearby being five dryfish kottus by the seashore and the dwelling of the Police Headman of Pukulam village. The tank is provided with a thorn fence on the seashore side, but in the other directions it is not fenced but is surrounded by jungle. The water from here is piped to the camp over the Moderagam-arū, and flows by gravity owing to the higher situation of the tank. The carriage of water from the tank is a private concern of Gabriel Appu, the owner of Pukulam village.

There are four cement cisterns along the seabeach, which are served by this supply.

Cistern No. 1 located in Pukulam village is 22 ft. by 10 ft. 10 in. by 2 ft. 2 in. and a capacity of 3,228 gallons. The water after flowing into it is led into smaller cisterns built on the four sides, each 2 ft. 5 in. by 2 ft. 5 in. by 2 ft. and a capacity of 74 gallons. These small secondary cisterns are used for bathing purposes. Close by and at one angle is a conical-shaped cistern 2 ft. 9 in. by 3 ft. 7 in. by 2 ft. 5 in. and a capacity of 130 gallons. During the period of the camp this conical cistern and four of the other secondary cisterns on the seashore side were reserved for holding water for drinking purposes. This water was chlorinated, and a man was employed for filling vessels that were brought to take away water, a charge being made by Gabriel Appu at the rate of 5 cents for 4 gallons.

Cistern No. 2 located near the Customs building is 3 ft. by 3 ft. by 2 ft. 3 in. and a capacity of 126 gallons. The water in this was also chlorinated and sold, but was supplied free to the Government officers living in quarters by the seashore.

Cistern No. 3 located close to the jetty is 13 ft. 6 in. by 18 ft. by 2 ft. 6 in. and a capacity of 3,784 gallons. It was used from April 7. The water in this also was chlorinated and sold.

Cistern No. 4 located by the side of the jetty is 30 ft. by 10 ft. by 4 ft. 10 in. and has a capacity of 9,345 gallons. The water in this was not chlorinated as it was used for boilers in the ships.

Pukulam supplied the population along the seashore, which consisted of the inhabitants of Pukulam village, the Customs officials, and the numerous boatmen.

The following two statements show the amount of water chlorinated, quantities of the chemicals used, and the amount of water consumed by months :—

(1) Statement showing Gallons of Water chlorinated, and the Amount of the various Chemicals used by Months.

(1) Months.	(2) Gallons of Water chlorinated.	(3) Amount of E. C. Solution used in oz.	(4) Amount of Milton used in oz.	(5) Amount of Bleaching Powder used in lb.	(6) Gallons of Water consumed.
February, 21-28 ..	3,734 ..	— ..	105 ..	½ ..	3,734
March, 1-31 ..	34,148 ..	1,135 ..	160 ..	4½ ..	34,148
April, 1-10 ..	10,258 ..	959 ..	— ..	— ..	7,662
Total, 50 days ..	48,140	2,094	265	5	45,544

(2) Statement showing Gallons of Water chlorinated with the different Chemicals used by Months.

(1) Month.	(2) With E. C. Solution.	(3) With Milton.	(4) With Bleach- ing Powder.	(5) Total chlorinated.
February		2,630	1,104	3,734
March	11,396	2,760	19,992	34,148
April	10,258	—	—	10,258
Total	21,654	5,390	21,096	48,140

Palakully Well is a shallow well situated by some paddy fields in Marichchukkaddi village, about $2\frac{1}{2}$ miles from the camp, newly constructed in accordance with the Government type plan. A hand-pump was installed, but it never worked. The water of this well, which was supplied to Government servants for drinking purposes, was chlorinated and removed to the camp in water carts.

In addition to the above well, there is another situated at Karadikully at the edge of a tank. This well is a deep one and yielded sufficient water; but the approach to it was difficult, and the chemical analysis proved unsatisfactory. The water from it, after boiling, was used for manufacturing aerated waters.

The Government Agent, for drinking purposes, had rain water taken off the roof of his bungalow and stored in an iron cistern.

For bathing purposes the numerous tanks in and around the camp were made use of. The one by Tank street was reserved for the use of the divers, while the other people used Allesakulam and two tanks towards Thanakamkulam village.

A fraud was being committed by some people by removing water from tanks used for bathing purposes, and selling it in the bazaar area as if it were water from Addappankulam.

Analysis of the Water Supply.—On January 14, four samples of water from (1) Palakully well, (2) Karadikully well, (3) Addappankulam, and (4) Pukulam were submitted for chemical analysis.

The following is the report of the Analyst:—

	(1)	(2)	(3)	(4)
Free ammonia ..	0.006 ..	0.024 ..	0.011 ..	0.016 parts per 100,000
Alb. ammonia ..	0.010 ..	0.025 ..	0.058 ..	0.074
Chlorine ..	2.2 ..	3.3 ..	1.0 ..	1.0
Total solids ..	47.6 ..	40.6 ..	17.0 ..	21.6
Elec. conductivity	590 ..	550 ..	42 ..	105 units
Nitrites ..	present ..	present (heavy)	present ..	present
Nitrates ..	— ..	— ..	— ..	—
Reaction to Lit- mus ..	Alkaline ..	Alkaline ..	Acid ..	Acid

Co-fusion.—(1) The presence of nitrites indicates recent contamination, therefore this water is not satisfactory for drinking purposes in its present state. Otherwise the water is reasonable from the chemical standpoint. (2), (3), and (4) unsatisfactory drinking water. They are contaminated.

As a result of this analysis chlorination of the water supply of the camp was undertaken.

During the fishery, on February 23 and March 27 Addappankulam water was chemically analysed, and on March 2 water from Palakully well. The following are the reports of the Analyst:—

	(1) Addappankulam. February 23, 1925.	(2) Addappankulam. March 27, 1925.	(3) Palakully Well. March 2, 1925.
Free ammonia ..	0.009 ..	0.018 ..	0.004
Alb. ammonia ..	0.059 ..	0.054 ..	0.014
Chlorine ..	1.2 ..	1.4 ..	2.30
Total solids ..	15.4 ..	12.2 ..	43.2
Elec. conductivity	60 units ..	48 ..	510
Nitrites ..	— ..	— ..	trace
Nitrates ..	— ..	— ..	—
Reaction to litmus ..	Neutral ..	Acid ..	Alkaline

Conclusions.—(1) Unsatisfactory drinking water. The alb. ammonia is excessive. Otherwise passable. (2) Unsatisfactory drinking water. The ammonia is excessive and the water is acid. (3) The presence of nitrites indicates recent contamination and the alb. ammonia is high, otherwise water is satisfactory for drinking purposes.

One sample of Addappankulam water was submitted on February 28 for bacteriological examination. The following is the report:—

- (a) Average number of micro-organisms per cc at 37°C, 4,387;
(b) Lactose fermenters were present in 0.001 cc. conductivity, 50.

The water at the time of collection was unfit for human consumption. The large number of lactose fermenting organisms present in the sample indicates that faecal pollution has taken place.

Chlorination.—Owing to existence of pollution as revealed by analysis of the water, chlorination was necessitated.

The substances used were:—Milton, electrolytic chlorine, and bleaching powder.

Table showing the Quantity of Water chlorinated at each Tank and the Amount of the Chemicals used.

Tank:	Gallons of Water chlorinated.	E. C. Solution used in oz.	Milton used in oz.	Bleaching Powder used in lb.
Addappankulam ..	1,003,143 ..	25,950 ..	1,117 ..	176 ..
Pukulam ..	48,140 ..	2,094 ..	265 ..	5 ..
Total ..	1,051,283	28,044	1,382	181

Table showing Gallons of Water of each Tank chlorinated with the Different Chemicals.

Tank.	Gallons of Water with E. C.	With Milton	With Bleaching Powder.
Addappankulam ..	487,250 ..	81,703 ..	434,190 ..
Pukulam ..	21,654 ..	5,390 ..	21,096 ..
Total ..	508,904	87,093	455,286

From the above it will be seen that 1 oz. of E. C. solution was needed to sterilize 18 gallons of water; 1 oz. of milton was required for 63 gallons of water; 1 lb. of bleaching powder was needed for 2,515 gallons of water.

The bleaching powder used was found on analysis to hold 28.1 per cent. of available chlorine.

The test used for the presence of excess chlorine in water was that of smell and taste. The excess chlorine as revealed by this test indicated that more than enough of the chemical was being added. Although this renders the water safe, it also makes it objectionable to drink. For a more delicate test the reagent orthotolidin was not available. With it a quantitative determination could have been done, thus lessening the taste imparted to the water, and the quantity of the substance used.

Recommendations.

(1) The chief source of the drinking water of the camp is Addappankulam. Owing to the heavy sediment in this water the writer would suggest that, if a series of fisheries were contemplated, steps be taken for getting rid of it by the use of alum and sedimentation. With the removal of the suspended material the amount of the chlorinating substance will be reduced, and a more acceptable water provided. All that would be needed would be a couple of sedimentation tanks.

(2) Chlorination of the water will be needed, and the objectionable taste should be reduced by the use of the electrolytic chlorine solution a little more scientifically. The proper quantity needed for chlorination could be known and that amount added only. By quantitative estimation of the excess chlorine by the use of orthotolidin and comparison with standard colours this amount could be maintained.

(3) For the storage of water in Government bungalows it would be desirable to provide them with large sized bins similar to those supplied for storing refuse. As a matter of fact many used the refuse bins for storing water.

DISPOSAL OF HUMAN EXCRETA.

The methods of disposal adopted at the camp were as follows:—

- (1) The Government officers were provided with dry-earth latrines—commodes, buckets, coir fibre dust, and deodorant powder being supplied. There were in all forty-six latrines for Government bungalows including the resthouse.
- (2) A certain number of private people who provided their own commodes and buckets had them conserved free of charge. The number of latrines so dealt with was eight.
- (3) Government had provided six public latrines consisting of fifty-three seats in all, distributed as follows:—

One set of sixteen seats reserved for the Police.

One set of eight seats located behind the Court-house for the use of the people who frequented that building and of the servants of Government bungalows.

One set of eight seats at the junction of Chetty street with New Moor street for the use of the Chetties.

One set of eight seats behind Tank street near its junction with Main street.

One set of eight seats at the Kottu end of Divers' street on the Athigarkulam side.

One set of five seats, meant for females, along Main street near its junction with the road to Karadikully.

- (4) For the people occupying the divers' area, three sets of open areas in the jungle were provided at the top of Twynam, Tank, and Divers' streets, respectively, for easing themselves. Each set consisted of a number of open areas connected by paths. The people defaecated on the ground, and coolies stationed for the purpose picked up the filth which was removed to the trenching ground for burial. These open air latrines have been termed Twynam latrines.

In spite of all these official arrangements, the people defaecated promiscuously out in the open.

The area around the divers' quarters where they (divers) had their women and children were always faecally polluted, and so was the area behind the cotties. The open areas in the centre of the camp were also found polluted, but not to the same extent as the other places.

The latrines of Government servants consisted of cadjan rooms with commodes placed inside them.

The public latrines had the bucket compartment, with the squatting plate of reinforced concrete supported on brick walls plastered in cement, the walls being erected on a concrete platform 4-in. thick. The buckets were of such a size as to fit the compartments, and when wooden covers were placed over the squatting plate openings they were rendered fly-proof. The cement work had a cadjan fence in front and one behind, with entrances at the two ends, and cadjan partitions. These latrines were very effective and were very much used.

The area between the cadjan fence and the bucket compartments was not cemented, and as ablution took place there it became muddy. The writer would recommend that this area be cemented and sloped into a drain opening into a catch pit of a size to receive a bucket.

A cooly was placed in permanent charge of each latrine, and liquid disinfectant was used to keep flies out.

These public latrines which, the writer is informed, cost at the rate of Rs. 35 per seat proved so successful, that the construction of another six at least is recommended at the following places :—

Two latrines for Pukulam village and the area between it and the jetty. This locality was wholly unprovided with latrine accommodation. Of these two latrines one should be for Pukulam village to be constructed by Gabriel Appu who owns the village. For the location of the other one to be constructed by Government, is suggested the piece of land below the bungalow occupied by the Public Works Department.

One latrine on the Dixon Tower side of Divers' street.

One latrine at the junction of Tank and Main streets on the opposite side to where the present latrine is.

One on the divers' area side of Main street.

One behind the Government dispensary at Mullikulam. In addition to the above, one latrine could, with advantage, be constructed for the area between Twynam and New Moor streets.

If these are provided, then there will be no excuse for faecal pollution to occur within the camp area. In constructing them, cement aprons front and back leading to a drain and catch pit should be provided. The catch pit should not be too large but should be just enough to receive a standard size bucket.

Collection.—The excreta from the Government officers' bungalows, public latrines, and private latrines were removed by our coolies. The private buckets were attended to once a day in the morning, and the public latrines twice daily, the Divers' street latrine being conserved sometimes thrice daily.

Sanitary type of handcarts, as used by the Colombo Municipality, with good airtight collecting buckets were employed. These carts were never offensive, and twelve such handcarts were in use.

For the faecal pollution that occurred within camp limits the area was divided up, and coolies were detailed with covered buckets, and mammoties for collecting up the excreta lying about.

Eight coolies were detailed for the collection of the filth at the open air or Twynam latrines.

It is desirable to provide every public latrine with a set of collecting buckets in addition to those already in the handcarts. Owing to the latrines being well used, sometimes removal has to take place twice and even thrice daily. Much time is lost in a cart coming and waiting till its buckets are filled. If a separate set were provided, all that need be done would be to displace the empty buckets in the carts by the already filled ones, which could then be taken away to the trenching ground.

Disposal.—The disposal of the excreta was at first by incineration and later by trenching.

For incineration of night soil a well constructed incinerator was provided in accordance with the type plan of the Sanitary Branch of the Medical Department. It consisted of the incinerator, a mixing platform, and a catch pit. Incineration of night soil was commenced on February 21 and was continued till the 28th, when the incinerator failed to deal with all the material collected. After February 25 all the night soil could not be incinerated the same day with the result that some of it was stored near the incinerator for the following day. This was unsatisfactory. This went on till the 28th when half the collection had to be trenched.

For two days the collection of faecal material dropped about the area was incinerated, but owing to the presence of sand, the fire was choked and it had to be trenched subsequently.

As it entailed more work without any adequate advantage, and as all the faecal material collected in a day could not be disposed of by this method, incineration was stopped, and all the faecal material was trenched from March 1.

Trenching of night soil was commenced on March 1, and was carried out satisfactorily without causing any nuisance. The trenching ground was situated at the edge of the jungle clearing, north of Main street between Karadikully road and Twynam street.

From the work done at the incinerator it was found that—

One bag of coir dust was needed to mix up with $5\frac{1}{2}$ buckets of faecal material as collected.

One yard of firewood would deal with $33\frac{1}{2}$ buckets of night soil.

It should be added that the incinerator was found capable of dealing with only thirty buckets of collected material daily, the bucket being the one that goes with the sanitary handcart.

After incineration or trenching the buckets were washed in the Moderagam-arū beyond the incinerator where water is brackish, and were subsequently disinfected. The writer's opinion is that where land is available trenching is more satisfactory, especially when one is dealing with a large population.

COLLECTION AND DISPOSAL OF REFUSE.

Storage.—In the case of Government bungalows and institutions, sanitary covered dust bins were provided for the storage of refuse.

In the case of all others, refuse was deposited indiscriminately on the ground. Some of the owners of licensed trade premises were persuaded to store their refuse in receptacles.

Collection and Disposal.—For the work of collection and disposal one hundred and two coolies with nine overseers and four scavenging carts of approved pattern belonging to the Colombo Municipality were employed.

Refuse was collected twice daily and disposed of by incineration and burial.

The work took a few days to get into routine. The area was divided into three districts with an Inspector placed in charge of each. Each district was divided into sections, and one overseer and a number of coolies were detailed for work in each.

The collected refuse was at first burnt in the incinerator, but subsequently it was buried. Owing to the construction of the incinerator for dealing with night-soil, all the refuse collected could not be disposed of by the incinerator. On March 14 two of the scavenging bulls were seized by the Police, a quite unnecessary action, since it was hindering the very necessary work of another Government Department, and in consequence all the refuse could not be transported. At this period rain set in and it became difficult to burn it either. Then it was that burial was resorted to. After March 14 the incinerator was not used except for the dust bin collections until March 20 when the use of it was given up altogether. When the accumulated refuse had been disposed of by burial, and as only three scavenging carts were available for transport, pits were dug at different points and the refuse of each locality was tipped into them and burnt. What was able to be removed by the three carts, specially the street refuse, was transported to the trenching ground where it was burnt, anything remaining being buried.

During this period 798 cart loads of refuse were collected and removed. Of this 471 were incinerated and the balance of 327 buried. This does not include the material dealt with on the spot by burning and by burial.

The collection of kitchen waste from private dwellings particularly those occupied by the cooly class and the divers and their retinue was a difficult matter. Organic waste consisting of fish waste, vegetable refuse, boiled rice, &c., was found thrown on the ground around the dwellings. This attracted flies and in places maggots were seen among them. This was particularly so in the divers' area where the dwellings were constructed in a very disorderly manner, as a result of which scavenging of this area was rendered difficult. Where the houses were arranged in an orderly manner, as along the various streets, scavenging was done satisfactorily with the minimum of staff, but in the divers' area a larger staff was employed, but the work was not done so satisfactorily. The only solution to this would be the orderly construction of buildings in this area. This matter is referred to under the head of housing.

There is a good deal of preliminary work to be done by the sanitary staff, and from this year's experience the writer desires to emphasize that it is necessary for the full personnel to get to the camp at least one week before it commences.

The question of dealing with oyster shells is dealt with separately.

FOOD SANITATION.

The following trade premises were required to be licensed:—Eating-houses, tea boutiques, bakeries, meat stalls, and aerated water manufactories.

Licences were issued free of charge by the Camp Superintendent on the recommendation of the Medical Officer of Health.

The following is a statement of the number of the licensed trade premises:—

Nature of Trade.				Number licensed.
Eating-houses	..	..	..	32
Tea boutiques	..	..	..	32
Bakeries	..	..	..	2
Mutton stalls	..	..	..	4
Beef stalls	..	..	..	3
Aerated water factories	..	..	..	3

Twenty-two of the tea boutiques were eating-houses as well.

Meat.—For the slaughter of goats and cattle two sheds to serve as slaughter-houses were provided outside the flagged area along the Karadikully road on the northern boundary of the camp. The sheds were a little too far away.

Of the three butchers slaughtering cattle only one man slaughtered with any regularity. The other two did it spasmodically. There did not appear to be much demand for beef.

There were five men licensed to slaughter goats. Of these one gave it up on March 12, another on March 20, and the third on March 30. Two carried on to the end of the fishery.

Cattle and goat exposing pens were set apart for exposing the animals before slaughter.

An attempt was also made to confine the butchers' goats and cattle intended for slaughter to one place.

By 12 noon the butchers were expected to hand in vouchers of cattle to be slaughtered, and the statement of the number of goats to be similarly dealt with. At 4 P.M. on the Medical Officer of Health's evening round they were passed or rejected.

The following statements show the cattle and goats slaughtered:—

Return of Cattle slaughtered.

Name of Butcher,		From Feb. 26.	In March.	Up to April 13.	Total by each Butcher.
P. M. Ibrahim	..	2	24	1	27
James Fernando	..	1	8	1	10
M. R. Croos	..	—	10	5	15
Total	..	3	42	7	52

The number of cattle rejected for the whole period was five, due to old age.

Return of Goats slaughtered.

Name of Butcher.	From Feb. 26.	In March.	Up to April 13.	Total by each Butcher.
P. M. Ibrahim	8	115	31	154
M. Panchan	6	92	58	156
Pulavar Rawther	—	62	—	62
P. Mohammado Ismail	—	5	—	5
E. Mohideen Pitche	—	17	—	17
Total	14	301	89	395

Total number of goats rejected for the period was four.

A separate cooly was placed in charge of the slaughter-houses during the time of slaughter under the supervision of a Sanitary Inspector who passed the meat after slaughter. After the slaughter of each animal, the floor was cleaned up and fresh sand strewn, the collected material being immediately buried. The slaughter-houses were found at all times maintained clean.

There were four mutton and three beef stalls located along Field street. This street was selected because it had been the site at previous fisheries. The writer considers it desirable to shift the site to a more central location, *e.g.*, towards New Moor street.

Sufficient by-laws were in force for the proper conduct of the business. In spite of numerous warnings, prosecutions had to be entered.

After a month of fishing, flies began to make their appearance. At first a few were seen in the stalls, then more, finally the joints hung up became covered with them. By persuasion the butchers were got to place their meat inside cages made of mosquito netting. This proved fairly satisfactory, and besides keeping the flies out the arrangement made the meat look attractive. The writer experimented with a fly trap after the army pattern to catch bluebottles, but without success. Perhaps with a little improvement the trap might be made to work better. The use of the Japanese clock-work fly-trap proved extremely efficacious.

It is, therefore, recommended that at future fisheries the right to slaughter and sell meat be given only to those who will in addition to complying with the by-laws:—

- (1) Provide a meat safe. This is nothing very elaborate; all that would be needed will be the taking of fly-proof wire mesh which could be wrapped round a frame of jungle timber, and having doors provided at the two ends.
- (2) Provide a Japanese clock-work fly-trap for each stall. This costs about Rs. 12, and certainly does destroy a very large number of flies daily.

The writer believes that by these two, and the co-operation of the butchers the fly nuisance in the meat stalls could be minimized. There was no occasion to seize or deal with bad meat exposed for sale.

It is necessary that a rubber stamp be provided with the word "PASSED" which could be used for stamping live goats inside the ear when passed for slaughter, and meat passed for consumption, as otherwise there is no mark to show that a goat passed is the same as the one that is led the following morning for slaughter.

Fish.—A fish market consisting of an open shed was provided free of charge along the foreshore below Dixon's Tower and between the Government kottus and private cotties.

Only on one occasion was bad fish seized and dealt with. Owing to the sand, and the habit of the people of throwing away waste and bad fish into it, constant supervision was required to keep the building and the surroundings in a clean condition.

Vegetables.—There was a fair abundance of the common vegetables which were sold in ordinary boutiques at the top of Main street, and which were chiefly brought over from Puttalam. Trouble arose with flies when vendors exposed cut pieces of coconut, pumpkin, and similar articles.

Bakeries.—Contrary to what was expected, the Assistant Government Agent, Mannar, was able to get constructed a bakery conforming to sanitary requirements. In addition to the bakery within camp limits, there was one outside in Thanakankulam which was also made to conform to sanitary requirements.

The writer would desire to stress the fact, that it was possible at the fishery camp to get the people to conform to all sanitary requirements, provided notice was given in time.

Aerated Water Factories.—There were three licensed, but one was unsatisfactory owing to defective machinery, and licence had to be withdrawn. An undesirable type of apparatus was brought from India, but licence was not granted. The water was obtained from Karadikully well and was boiled and filtered before it was used.

A recommendation that the writer would make is, that each factory be provided with a Japanese clock-work fly-trap.

Tea Boutiques and Eating-houses.—There were thirty-two eating-houses, ten tea boutiques, and twenty-two combined eating-houses and tea boutiques. The chief point with regard to them was the keeping of food stuffs exposed to flies. Frames covered with mosquito netting did not prove very satisfactory. The netting was not put on effectively to keep the fly out, and it got dirty very quickly. Quite a number brought with them fly-proof glass cases.

The keeping of food stuffs covered is very necessary especially in a camp, and if people were notified in time efficient fly-proof cases would be provided.

HOUSING.

Temporary cadjan buildings were used for all purposes. The only buildings of a permanent nature were the Government Agent's residence, the Treasury vault, and the store.

For Government servants three types of buildings were provided—

For the higher paid officers A-type bungalows were provided, each consisting of three rooms, one storeroom, and back and front verandahs with detached kitchen, bath, and latrine. Of this type there were thirteen bungalows.

For the lesser paid officers B-type bungalows were provided, each consisting of two rooms and front verandah with separate kitchen, bath, and latrine; the latter two being under one roof. There were six of these.

The officers of the Kachcheri, kottu clerks, and Sanitary Inspectors were housed in single rooms 13 ft. by 12 ft. built in lines and provided with a front verandah. There was a set of kitchens and latrines provided for each set of rooms. For bathing purposes cadjan enclosures were provided.

For the floor of the quarters occupied by the Government officers palmyra mats were provided.

The visitors to the camp housed themselves in cadjan structures of varying types according to what each person desired and could afford. Quite a number were found sheltering under trees.

Housing of the Sanitary Staff.—The Medical Officer of Health was provided with an A-type bungalow situated on the elevated land on the right overlooking the sea.

The Sanitary Inspectors were housed in single rooms forming part of the kottu clerks' quarters in a line with the Medical Officer of Health's bungalow.

The sanitary coolies were housed in two sets of lines far apart from each other. The scavenging coolies occupied quarters behind the Medical Officer of Health's Office, while the conservancy coolies were put in lines north of Main street towards Addappankulam.

DRAWBACKS.

(1) The floor of the quarters were not hardened, and in spite of the mats provided fleas made themselves very evident and proved to be a great nuisance. Life was more comfortable for those who had their floors hardened at their own expense.

(2) The glare of the sun is disturbing, and should be obviated by the construction of porches to the quarters.

(3) The roofs of the buildings did not have the slope that cadjan buildings should have; hence leaks occurred when the rains set in.

(4) The quarters of the Sanitary Inspectors were not as comfortable as they could have been.

(5) The dwellings of the divers in the area set apart for them were constructed without control, and in whatever position it suited them. There was no system as to the location of the buildings with the result that it was more or less impossible to adequately scavenge the area. Where buildings were constructed with some system, as along the various named streets, scavenging was easy and was performed with the minimum of staff.

Recommendations.

(1) The floor of all the Government quarters should be levelled and hardened with clay.

(2) The roofs should be of proper slope as required for cadjan buildings.

(3) The glare of the sun should be kept out by the construction of porches.

(4) For the Sanitary Staff:—

(a) The Medical Officer of Health could be located as during this year's fishery.

(b) The Supervising Sanitary Inspector should be provided with a B-type bungalow similar to the Inspector and Sub-Inspector of Police. He is an officer of such standing as to be entitled to this type of building. Location should be in the vicinity of the Medical Officer of Health's Office and bungalow.

(c) For five Sanitary Inspectors a line of six rooms, separate from all other buildings, should be provided. Five rooms will be used for sleeping purposes, and the sixth as a dining room. In addition to the verandah a porch in the middle will, in addition to keeping the glare out, serve as a place for sitting out in. Two latrines, two kitchens, and a bathing enclosure also should be provided.

(d) For the coolies: the conservancy coolies were housed too far away. Their line should be located near the scavenging coolies' line but separate from them, and near the office. Latrine accommodation for these coolies should also be provided.

Room overcrowding should be prevented. Three or at the most four persons should be assigned to each room 10 ft. by 12 ft.

(5) The area set apart for the divers should be pegged out into lanes about 12 to 15 ft. wide at right angles to the sea, and the construction of dwellings along these lanes enforced. A space of 15 ft. could be left between the backs of buildings. This arrangement will introduce system into the construction of the dwellings, and would facilitate the work of the scavenging staff and the inspection by the Inspectors.

OFFICE OF THE MEDICAL OFFICER OF HEALTH.

Although a set of three rooms was requested as office, store, and orderly's room and the site was suggested, none was constructed; as the Government Agent pointed out that he had a set of three lines for which he could not find any use. He suggested that if a portion of these lines proved suitable, the writer could have it; otherwise he would have a separate building constructed. Three rooms were taken over from one of the lines, and were separated off from the remainder by a fence. A small porch was constructed to keep the glare of the sun out.

There is a good deal of business conducted at the Medical Officer of Health's Office by the public, and it was found that the location of the office was unsuitable for the purpose.

It is recommended that the Office of the Medical Officer of Health at the next fishery be situated between his bungalow and the Court-house facing Mullikulam road. The office building should consist of four rooms: one as Medical Officer of Health's Office, one as Sanitary Inspectors' and clerks' office for reporting and issual of health passes, and the other two as store and orderlies' room.

OYSTERS, LOOKING FOR PEARLS, AND THE RESULTING NUISANCES.

The pearl oysters after being fished and conveyed from the banks are stored in the Government kottus. Here the divers are given their one-third share of the catch, and are passed out into the waiting crowd at the rear of the kottus. The divers sell their share to the people, who buy them in small quantities, open them on the spot, and throw the shells away.

In the evening at 9 P.M. the Camp Superintendent auctions in the Court-house the oysters in the kottus. It is here that the oysters are brought in large quantities. After payment of money at the Kachcheri and armed with an issue order, the merchant takes charge of his oysters the following day, and removes them to the private totties, where the following process of searching for pearls takes place :—

The private tottie consists as a rule of two parts : the inner spread with mats receives the oysters, the outer has one portion reserved for washing, and another for sifting the dried sand, &c., containing the pearls, and for cooking and sleeping.

The oysters in bags or loose are first placed in the inner compartment where bluebottles lay their eggs, which hatch out into larvae, which eat up the flesh of the oyster. After three or four days when myriads of maggots could be seen covering the oysters and spilling over the floor of the inner room the oysters are washed. The washing takes place in a vessel the size of which depends on the number of oysters to be dealt with. In the case of a small number of oysters zinc baths are used, while in the case of very large quantities boats are employed. Sea water is used for the washing. Men seated on one side with the owner watching, pick the shells from the water, wash them completely, and deposit them on a side. The maggots float on the surface of the water and slip over the side of the vessel on to the ground. After the washing is completed the water is tipped on to the ground carrying the maggots with it. The debris at the bottom contains the pearls. This is collected, sun dried, and then sieved when the pearls are picked out. The shells are collected and eventually sold, if a buyer could be found.

The nuisances caused consist: (1) of the smell which is nauseating, and (2) of the breeding of myriads of bluebottles.

The smell is localized and occasionally, depending on the direction of the wind, gets wafted towards the habitations. Otherwise it created no nuisance to those who lived away from the private totties.

The bluebottle is essential for the business of washing oysters, and cannot be eliminated altogether. The myriads of maggots prove a nuisance by crawling about all over the place, and by the bluebottles they hatch into. One portion of the private tottie is used for cooking, eating, and sleeping. These maggots creep on to this area as well, and become an annoyance. Bluebottles could be seen at the totties attached to the fence sticks like berries on a tree.

Nothing could be done with regard to the smell, but it appeared that something could be done to diminish the nuisance caused by the maggots by collecting and disposing of them by burial.

Work on this was commenced on March 8 with five coolies and one overseer. Each cooly was supplied with a bucket containing disinfectant and a strainer of galvanized iron. These men went into the totties and strained off the maggots that floated on the surface of the water while washing was in progress, and deposited them in the bucket of disinfectant; more of the washing of oysters took place in the morning. After a few days the people liked the work, and the number of coolies on March 18 was increased to eleven. Besides collecting the maggots from the vessel in which the washing took place, those deposited in catch pits by the emptying of the used water and those crawling about the sand were also collected. They were disposed of first by incineration and latter by burial in deep pits.

It was not possible to gauge the results obtained by this piece of work. The bluebottles in spite of the attack made on the maggots appeared to be in abundance. The people of the totties, who had been to previous fisheries appreciated the work very much, and when it came to be understood there was quite a demand on the coolies. They stated that at former fisheries the maggots used to creep on to their cooking and sleeping places, but that this year there was no such nuisance. The only method of judging the beneficial result of the work was the appreciation on the people concerned.

This year the totties were constructed in lines parallel with the sea. This impeded the flow of the waste water. It would be desirable, to facilitate drainage, to construct them in pairs at right angles to the sea. This would enable each tottie to empty the waste liquid by its side without obstruction to the sea.

One object to be aimed at is to get the liquid to drain away into the sea. A system of drainage has been suggested. The drains will not deal with all the maggots because it has to be remembered that they are overflowing from the inner compartment, where the oysters are stored and they are already crawling about the floor. Further for drains to be a success, a watertight platform has to be constructed for the boat or other vessel in which washing takes place to be placed on.

The man who buys small quantities of oysters does not go through the process that the big merchant goes through. He opens the oyster, looks inside it, and finding no pearl throws the shell and flesh away. The flesh when it decomposes emits an offensive smell, and attracts bluebottles. This attraction of bluebottles was demonstrated when certain people were permitted to open oysters by the thousand in the Public Works Department bungalow. One was able to see the bluebottles flying in the direction of the bungalow in swarms.

The oyster shells thrown away after complete removal of the flesh are unsightly, but do not attract or breed flies. Many seed pearls are found in oysters thus thrown away (with the flesh), and Tuticorin women go about scooping the flesh out of such oysters. They thus assist sanitary work in keeping a nuisance down, and are to be encouraged. The scooped up flesh is boiled down or mixed with sand, squeezed, then washed, dried, and winnowed for the pearls, of which quite a number are found.

This promiscuous opening of oysters created a great nuisance, and it was confined by proclamation of the Camp Superintendent to Aithigarkulum and to the sloping area below Dixon's Tower to the north of Government kottus. Large quantities were also opened in the area behind the diver's quarters between them and the jungle.

At first the oyster shells were collected and buried, but when the work became too much and as no harm resulted from empty shells lying about, coolies were put on merely to heap them up in different places. At the end of the fishery the right of collecting the shells lying on Crown lands was sold by the Camp Superintendent to a private party.

Recommendations.

(1) That a special gang of coolies be employed for maggot collection work, which is appreciated, and diminishes a nuisance.

(2) The private totties be constructed in pairs at right angles to the sea with an interval which could be used as a drain between pairs.

(3) That special areas be proclaimed besides the private totties where oysters in small quantities could be opened. These could be, Athigarkulam, the area between Dixon's Tower and the Government kottus, and an area behind the divers' quarters. Special men could be detailed to keep them clear, if it is known where the opening will occur.

(4) For the collection of oyster shells, rakes and wheelbarrows should be provided.

CONTROL OF ANIMALS AND INSECTS.

Cattle.—To prevent cattle being tied all over the camp area and add to the breeding of flies, a place was set apart where all cattle were to be tied. This, which was near Addappankulam, enabled the concentration of all the dung to one locality and the dealing with it there. Cart bulls and buffaloes are brought into the camp for transporting goods and for carting water. It took a few days before the place could be prepared and the cattle got into it. In spite of our efforts a number were tied elsewhere and several prosecutions were entered.

Fleas.—Fleas became abundant in the temporary quarters. A few were caught and were identified by Mr. Carter as *Pulex Irritans*.

Fleas are a real nuisance to which many were subjected. They are kept away by hardening the floor with clay and applying cow dung to it. Those who took the precaution of having this done at their own expense escaped, but those who did not had to put up with their bites.

It is recommended that all Government quarters have the floors hardened with clay.

Bluebottles.—Bluebottles chiefly made for decaying organic matter, and did not so much invade the living quarters.

House Flies.—At the start for a month or so they were few, but later towards the middle period of the fishing they made their presence felt. At the end when the bazaar area was being evacuated, those officers like the writer who had the misfortune to stay to the last were plagued with them. The writer is informed that although flies were evident, they were not to the same extent as at previous fisheries.

Every effort was made to keep them down, particular attention being paid to the cleanliness of the camp and the confining of cattle to one locality. Knowing that the fly cannot be eliminated, and that the people are indifferent, it was necessary to have all food exposed for sale fly-proofed. The fly-proofing for sweet meats was successful in a few instances, but where mosquito netting was used it was not satisfactory. The netting was not properly put on, and it soon got soiled with oil and dust necessitating frequent washing.

A Japanese clock-work fly-trap was used in the writer's bungalow and in a meat stall; it was found efficient for catching flies. It is recommended that all meat stalls and aerated water factories be insisted on to have them. In the case of others they may be recommended. In fact each Government bungalow should be provided with one.

THE HEALTH ORGANIZATION.

For the health work of the camp the organization was as follows:—

Port Work.	Medical Work.	Sanitary Work.
Quarantine Medical Officers at Marichchukkaddi, Paumben, Kilakiri, and Mandapam.	Medical Officer and two Apothecaries.	Medical Officer of Health, Supervising Sanitary Inspector, five Inspectors, one Vaccinator, Orderlies, Overseers, Coolies.

The personnel of the Sanitary Staff consisted of the following:—

Medical Officer of Health	..	..	Dr. S. F. Chellappah
Supervising Sanitary Inspector	..	..	Mr. D. A. Fonseka
Sanitary Inspectors	..	..	Mr. Allen Perera
			Mr. E. G. Canagasabey
			Mr. K. Visvalingam
			Mr. M. C. Ernest
			Mr. A. E. Dharmakirti
			Mr. D. Wambeck
Vaccinator	..	..	Mr. K. Sinnatamby
Orderlies	..	..	Paulis Perera
			Thomis Appu
			C. D. Simon.

The original staff consisted of the Medical Officer of Health, the Supervising Sanitary Inspector the first four Inspectors, and one orderly. Subsequently another orderly was obtained. With the incidence of cholera two more Inspectors and one orderly were obtained.

Of the two Inspectors who arrived on March 10, Mr. Wambeck along with Orderly Simon was sent back on March 25, 1925. Mr. Dharmakirti was retained till the end, as the other Inspectors periodically fell ill.

Of the original staff, Mr. Allen Perera took ill with Malaria on April 2, and had to be sent back to Colombo with Orderly Thomis on April 7, Mr. Ernest accompanying him as far as Mannar to see to his comfort. The remainder of the original staff worked right through the period.

The staff of coolies consisted of—

One hundred and two scavenging coolies with ten overseers.

Fifty-six conservancy coolies with four overseers.

The scavenging coolies and overseers were obtained from Jaffna, while the conservancy coolies, with the exception of five working at the incinerator, were recruited in India. For maggot collection work authority was obtained to secure five coolies, but as they could not cope with the work the number had to be increased to eleven, and an overseer was placed in charge.

As coolies started leaving, others were engaged, and the maximum strength was—

One hundred and nineteen coolies and overseers on one day.

One hundred and eighteen coolies and overseers on two days.

At other times it did not exceed one hundred and seventeen. The conservancy coolies were the same right through. The scavenging coolies started leaving from about March 18 by ones and twos, and for a time they were replaced by engaging men locally, but after March 26 no new coolies were engaged as the work was decreasing. Of the conservancy coolies one was sent away owing to illness on March 11, but he had not worked from February 27. Fourteen others left between April 4 and April 9 owing to domestic troubles. One incinerator cooly, who took ill with pneumonia on March 4, had to be sent away after he had recovered.

At the termination of the fishery there were—

Forty-three conservancy coolies including three overseers.

Fifty-eight scavenging coolies including five overseers.

Pay of the Coolies.—During February they were paid—

Re. 1 per cooly per day; and

Re. 1.25 per overseer.

The coolies were paid their passage to the camp, and those who left after a reasonable period of service were also paid their passage back plus batta for the days of travelling.

The work of the conservancy coolies was very satisfactory, but that of the scavenging coolies could have been better. Scavenging overseers were a sorry lot. They appeared to have no control over the work of the coolies. Often when the Sanitary Inspector's back was turned the coolies and the overseers took a rest. More and satisfactory work would be got done if all the coolies were recruited from India. The conservancy coolies worked right through, including Sundays, when they were paid one and half day's wage, while the scavenging coolies worked only half a day on Sundays and received a whole day's wage.

Hours of Work.—6 A.M. to 11 A.M.; 2 P.M. to 5 P.M.

At 5 P.M. the quinine parade took place. It is not desirable to work them longer than these hours.

Quarters.—The coolies were supplied with lines, the scavenging being near the office and the conservancy along Main street to the East of Karadikully road. Six coolies were allotted to each room 10 ft. by 12 ft., whereas there should have been only three per room. Water buckets and water were supplied. Rice was issued daily for those who wanted it at 23 cents per measure.

Apportioning of the Work.—The area of the camp was divided into three, and placed in charge of three Inspectors.

The area between Moderagam-arū and the ravine running by the side of the Medical Officer of Health's Office was under Mr. Allen Perera. It extended from the sea up to the Government Dispensary junction. At the next fishery, Chetty street could with advantage be made the northern limit of this area.

The area lying between the northern limit of No. 1 area and Main street formed the second area and was in charge of Mr. Visvalingam.

The area lying between Main street and the northern boundary of the camp formed the third subdivision and was in charge of Mr. Canagasabay. This area proved to be the most difficult to deal with, and as work increased another Inspector was detailed to assist.

The chlorination of water was in charge of Mr. Ernest.

The fifth Inspector assisted in area No. 3 and also attended to the outskirts.

Recommendations.

(1) The staff that would be needed for efficient work is: One Medical Officer of Health, one Supervising Sanitary Inspector, five Sanitary Inspectors, two orderlies, one vaccinator, one clerk or Sanitary Inspector for issuing and checking passports, hundred scavenging coolies and nine overseers, sixty conservancy coolies and four overseers, ten coolies for maggot collection and one overseer, ten coolies for oyster shell collection and one overseer.

(2) The overseers from Jaffna proved extremely unsatisfactory and the coolies were equally so. If coolies could be recruited from India for scavenging work without much extra expense, it would be desirable to do so. A better lot of overseers should be recruited.

(3) Two additional scavenging carts making six in all, and three reserve bulls should be provided. The writer is informed that the number of coolies employed this year was the same as at previous fisheries. The only difference this year in the staff was the presence of the trained Sanitary Inspectors. The work was better organized and supervised. Whereas at former fisheries the coolies once detailed for work did what they pleased and earned extra money by working for the people in the bazaar; this year owing to better supervision it could not be done to any extent. A trick that coolies often resorted to was to take off their identifying armlets and work for the bazaar people.

The writer would desire to place on record the excellent work done by the Sanitary Inspectors who were extremely hard worked. But for their zeal and earnestness what was achieved could not have been. The work required their personal attention from morning till evening.

On Mr. D. A. Fonseka, the Supervising Sanitary Inspector, fell a good share of the work. It is the writer's privilege to acknowledge the creditable manner in which he carried out his duties.

A point was made of the health organization being as useful as possible to the public. All sick persons who came to our knowledge were assisted either as in-patients of the hospital or as outdoor patients; the well-to-do classes were put in the way of obtaining visits at their quarters from the Medical Officer. The Arabs did not favour the hospital. Some had an idea that they would be poisoned by the doctors, others stated that their language would not be understood. All facilities were offered but were not accepted. A number of patients were picked up ill under trees and cared for at the hospital.

MEDICAL FACILITIES.

There was a well equipped temporary hospital and an outdoor dispensary provided by Government with Dr. C. Somasunderam in charge, assisted by two apothecaries. In addition to this temporary outdoor dispensary, there was also another permanent dispensary at Mullikulam close by.

For the treatment of infectious diseases separate wards with quarters for contacts and for an apothecary were provided.

The hospital was located east of Mullikulam road by Mullikulam tank. It consisted of four large open wards and a number of rooms used as doctor's office, apothecary's quarters, and store. Of the open wards two were used for male patients, one for female and one as dispensary. Four of the buildings were arranged in the form of a square. The site of a portion of the hospital proved to be somewhat low, with the result that water found its way into the wards when the rain set in.

The outdoor dispensary was located behind Chetty street. Both these institutions were very well patronized.

The Infectious Diseases Hospital consisted of three large wards built parallel and close to each other, and was surrounded by a thorn fence. It was placed a good distance east of the hospital buildings. Between the two were constructed, the apothecary's quarters (close to the Infectious Diseases Hospital) and the contacts' shed nearer the hospital.

The burials from the hospital and the Infectious Diseases Hospital took place in the open area by the side of the fence of the latter to the south.

Recommendations.

Temporary Hospital.—It is desirable to have it shifted to a more elevated site to the south of this year's location.

Infectious Diseases Hospital.—The location of it is satisfactory, but the wards were placed too close to each other, and could with advantage be separated to the three corners of the space allotted for the buildings. No kitchens need be constructed within the thorn enclosure, but only latrines, one for each ward. The apothecary's quarters were unnecessary and need not be constructed. The accommodation provided for the contacts proved inadequate and unsuitable. It would be desirable to construct about ten rooms in a line with a verandah, and a set of kitchens and latrines.

MORBIDITY.

The following is a tabulated statement by weeks of the incidence of disease at the camp, as demonstrated by attendance at the Government outdoor dispensary and the hospital:—

(1) Disease.	(2) February 22 to March 2.	(3) March 3-9.	(4) March 10-16.	(5) March 17-23.	(6) March 24-31.	(7) April 1-7.	(8) April 8-14.
Infectious Diseases—							
Mumps	1	—	—	—	—	—	—
Malarial fever	38	66	149	197	479	455	268
Malarial cachexia	4	2	2	5	2	4	1
Dysentery	1	5	6	5	19	72	34
Tonsillitis	—	—	—	1	—	—	1
Cholera	1	1	—	—	—	—	—
Syphilis	—	—	—	1	—	—	—
Gonorrhœa	—	—	1	1	—	—	—
Leprosy	—	—	—	—	—	1	—
General Diseases—							
Rheumatism	1	6	6	4	6	4	—
Spleen	1	—	—	—	—	—	—
Nervous System—							
Hemiplegia	2	—	—	2	2	—	—
Nervous system	—	—	—	—	—	5	2
Neuralgia	—	1	3	1	—	—	—
Diseases of Eye—							
Ulcer of cornea	—	—	1	1	—	—	—
Conjunctivitis	1	—	2	5	2	—	—
Diseases of Ear—							
Otorrhœa	3	16	9	11	7	12	4
Otitis	—	—	—	—	—	—	—
Rupture of ear drum	—	4	—	—	—	—	—
Circulatory System							
	—	—	—	—	—	—	—

(1) Disease	(2) February 22 to March 2.	(3) March 3-9.	(4) March 10-16.	(5) March 17-23.	(6) March 24-31.	(7) April 1-7.	(8) April 8-14.
Respiratory System—							
Pneumonia	.. 1 ..	2 ..	3 ..	1 ..	1 ..	2 ..	2
Asthma	.. — ..	1 ..	— ..	— ..	— ..	— ..	—
Bronchitis	.. 1 ..	1 ..	8 ..	11 ..	9 ..	11 ..	4
Digestive System—							
Toothache	.. 2 ..	4 ..	1 ..	1 ..	5 ..	— ..	—
Stomatitis	.. — ..	— ..	— ..	— ..	1 ..	— ..	—
Cancerum oris	.. — ..	— ..	— ..	— ..	— ..	1 ..	—
Worms	.. — ..	— ..	1 ..	— ..	— ..	— ..	—
Anchylostomiasis	.. — ..	1 ..	— ..	— ..	— ..	— ..	—
Constipation	.. 9 ..	4 ..	19 ..	12 ..	17 ..	— ..	—
Diarrhoea	.. 1 ..	2 ..	1 ..	1 ..	6 ..	1 ..	4
Hepatitis	.. — ..	— ..	— ..	— ..	— ..	1 ..	1
Digestive system	.. — ..	— ..	— ..	— ..	— ..	26 ..	13
Indigestion	} .. 1 ..	1 ..	4 ..	2 ..	5 ..	— ..	—
Dyspepsia							
Gastritis	.. — ..	— ..	— ..	1 ..	— ..	— ..	—
Piles	.. 1 ..	— ..	— ..	— ..	1 ..	1 ..	—
Colic	.. 1 ..	— ..	— ..	— ..	— ..	— ..	—
Puerperal State—							
Partus	.. — ..	— ..	— ..	— ..	— ..	1 ..	—
Diseases of the Skin and Cellular Tissue—							
Eczema	.. — ..	1 ..	3 ..	2 ..	1 ..	1 ..	—
Ringworm	.. — ..	— ..	2 ..	— ..	2 ..	1 ..	—
Ulcer	.. 3 ..	6 ..	10 ..	15 ..	8 ..	10 ..	4
Scabies	.. 1 ..	2 ..	3 ..	1 ..	1 ..	3 ..	—
Abscess	.. 3 ..	3 ..	3 ..	3 ..	2 ..	— ..	—
Cellulitis	.. — ..	1 ..	4 ..	— ..	— ..	3 ..	—
External Causes—							
Incised wound	.. 2 ..	— ..	3 ..	6 ..	5 ..	— ..	—
Contused wound	.. 11 ..	3 ..	5 ..	7 ..	7 ..	4 ..	—
Lacerated wound	.. 3 ..	4 ..	7 ..	2 ..	2 ..	2 ..	—
Punctured wound	.. 1 ..	— ..	2 ..	— ..	1 ..	— ..	—
Sprain	.. 1 ..	— ..	— ..	2 ..	— ..	2 ..	7
Burns	.. — ..	2 ..	— ..	— ..	— ..	— ..	—
Bones and Joints—							
Synovitis	.. — ..	— ..	1 ..	1 ..	— ..	— ..	—
Periostitis	.. — ..	— ..	— ..	1 ..	— ..	— ..	—
Old Age—							
Debility	.. — ..	— ..	— ..	— ..	2 ..	3 ..	2
Old age	.. — ..	— ..	— ..	— ..	— ..	2 ..	—
Others—							
Orchitis	.. — ..	1 ..	1 ..	1 ..	— ..	— ..	—
Chest pain	.. — ..	— ..	— ..	— ..	1 ..	— ..	—
Enlarged gland	.. — ..	— ..	— ..	— ..	1 ..	— ..	—

It will be seen that Malaria of all diseases contributes the largest number of cases. There is a steady increase from the first, but in the fifth week the increase is sudden, which happened to be directly after the rains. The decrease in the seventh week is due to the people leaving the camp. It is not believed that all these cases acquired their infection in the camp; in quite a number the disease would have been a relapse. Further, as the figures refer to attendance at the outdoor dispensary, some of the cases may have been counted more than once.

The next disease that has contributed largely towards morbidity is Dysentery. The figures show an increase as the weeks went by. It was stated, that at previous fisheries one saw blood about the camp, and that very few escaped the disease. The writer believes that the incidence of the disease has been less this year, which is, no doubt, due to the better scavenging and conservancy systems that were in force.

Under diseases of the ear figure two conditions, viz., rupture of the ear drum and otorrhoea, which happened to be in divers who had their ear drums burst, owing to the great pressure they were subjected to under water.

Communicable Diseases.—There were two cases of cholera, one case of mumps, and one case of chickenpox.

Cholera.—There were two cases of cholera in the camp, both of which proved fatal. The particulars of the first case are as follows:—

Marakan Cader Rawather, married, male, Indian Muslim of the cooly type, aged about 55 years, was found on February 28, in the Police guard shed to the south of the Government kottus, by Supervising Sanitary Inspector Fonseka about 3.30 p.m. He was a man from Muddukur near Muthu

Peradi in Tanjore District, South India. He left home on February 21, spent the 22nd at Trichinopoly, the 23rd and 24th at Madura, the 25th at Mandapam and arrived here on 26th. He reported himself at the Office of the Medical Officer of Health on the 27th, and the following day he was taken ill. He acquired his infection in India. During the week that the patient was at Madura and Trichinopoly, both localities were cholera infected, and there is no doubt that he acquired his infection at one of these places. A faecal specimen was sent for bacteriological examination, and before the result arrived the patient expired on March 2, when a post mortem was performed to verify diagnosis. A specimen of the intestinal contents was also dispatched for bacteriological examination. The report on the ante-mortem specimen was negative for cholera, but the post mortem one was returned positive. His death was intimated to the deceased's village authorities by the Camp Superintendent.

The second case occurred on March 7. On information given by the Police at 4.30 A.M. to the effect that a man was ill at the Government dispensary junction, it was found that one Jayawickramage Marthelis Fernando, aged about 50 years, male, Sinhalese, from Anuradhapura, had taken ill on the 6th evening with signs of cholera at a bakery at Thankankulam, a village near the camp. From there he was brought over to the Government dispensary junction, and left by a man working in the bakery. The patient found his way into an eating-house near by conducted by some people from Anuradhapura. He died at the Infectious Diseases Hospital on March 8, 1925. An ante-mortem specimen of his faeces sent for bacteriological examination was returned positive for cholera.

As to the source of infection, the writer is not certain. There was only one case known, and that was our first case. If the patient came in contact with him, it is quite possible that he contracted it from him. The date of onset given by the patient was March 5, 1925. The only point in common was that both were of the cooly class.

On the morning of March 9 a patient named Combutheram Ramasamy, aged about 30 years, unmarried, Indian Tamil, from Anuradhapura, was taken ill at his tea boutique along Chetty street at the junction of it with Tank street with symptoms simulating cholera. When seen at his boutique the picture was typical of cholera; he went so far as to tie his calves with coir rope. After the patient had been removed to the hospital his motion was found to contain blood. A specimen of it was sent for bacteriological examination, and was returned positive for cholera. The patient was given emetine and recovered. Although returned bacteriologically positive for cholera it was not reckoned clinically as such. The patient subsequently gave a history of two previous attacks of dysentery at Marichchukkaddi, one on February 8 and the other on 15th, the patient having been here sometime. This was an acute exacerbation of chronic dysentery.

The number of contacts of the first case was 7; of the second 33; and of the third 12; making 52 persons in all.

Chickenpox.—On March 5, Menachi Kanakapulle, aged 34, Indian Tamil, was taken off a boat from Paumben with chickenpox, and was isolated at the Infectious Diseases Hospital. There was no further cases.

Mumps.—On February 23, 1925, Mohideen, a Ceylon Muslim, aged 30, was taken off a boat from Kalpitiya with mumps. He was isolated at the Infectious Diseases Hospital, and no further cases occurred.

On March 23, 1925, about 11 P.M., a patient named Noor Mohammadu was removed, with the assistance of a sergeant of the Criminal Investigation Department, in a boat to Paumben. Two constables on duty were requested by the Criminal Investigation Department man not to interfere. When information was given at 11 P.M. by a Police Constable, Sanitary Inspectors Dharmakirti and Visvalingam were sent to investigate. When they arrived, the patient had already sailed away. As a matter of fact information was given after the patient had left. Mr. Dharmakirti, with commendable promptitude, investigated and found out all the contacts. Next morning the boutique from where the patient went could not be determined, but in the afternoon the Criminal Investigation Department sergeant pointed it out, and a confession was obtained from the chief occupant. The story was that the man was suffering from smallpox, and the boutique in Main street was therefore disinfected, and twenty-nine people who were alleged to have come in contact with this case were vaccinated. Telegrams were dispatched and a reply was received three days later to the effect that it was a case of malaria. There is some doubt as to the case diagnosed as malaria being the one that left the camp. Dr. Kuruwila, who was at Kilakarai, is stated to have seen a case of smallpox landed there. It is believed that this patient was dropped at Kilakarai, and a healthy man was picked up and taken to Paumben where malaria was diagnosed.

Of the twenty-nine vaccinated all were secondary. Of these one was a Tamil, and twenty-eight were Indian Muslims. The results are as follows:—Nine successful, five unsuccessful, fifteen results not known.

Cholera at Murunkan.—On March 4 a case of cholera was detected at Murunkan in the person of one Noogoo Lebbe, aged 40, Muslim, from Katugastota. This man left Marichchukkaddi at 3 P.M. the previous day, and as a result of this case there occurred five others, making six in all.

MORTALITY.

There were twenty-eight deaths in the camp analysed as follows:—

	Hospital.	Outside.	Total.
(1) Locality	17	11	28
(2) Age distribution—			
0-4	—	1	1
5-9	—	—	—
10-14	1	1	2
15-24	—	—	—
25-34	1	2	3
35-44	3	3	6
45-54	1	3	4
55-64	5	1	6
65-74	6	—	6

		Hospital.		Outside.		Total.
* (3) Sex distribution—						
Males	..	15	..	11	..	26
Females	...	2	---	---	..	2
(4) Nationality—						
Indian Muslim	..	8	..	2	..	10
Ceylon Muslim	..	1	..	---	..	1
Indian Tamil	..	4	..	5	..	9
Ceylon Tamil	..	1	..	1	..	2
Sinhalese	..	2	..	---	..	2
Bengalee	..	1	..	---	..	1
Arab	..	---	..	3	..	3
(5) By months—						
March	..	7	..	6	..	13
April	..	10	..	5	..	15
(6) By causes of death—						
Cholera	..	2	..	---	..	2
Pneumonia	..	7	..	4	..	11
Dysentery	..	3	..	---	..	3
Diarrhoea and old age	..	1	..	---	..	1
Malarial Cachexia	..	3	..	---	..	3
Old age	..	1	..	---	..	1
Septicaemia	..	---	..	1	..	1
Malaria	..	---	..	1	..	1
Fever	..	---	..	3	..	3
Cause unknown	..	---	..	2	..	2

It will be seen that Pneumonia is responsible for eleven out of the twenty-eight deaths, *i.e.*, for 39·2 per cent. of the total deaths. This is due to the fact that all types of people came to the fishery, and that quite a number were provided with inadequate shelter. This exposure is believed to have contributed to the deaths from Pneumonia.

Six post mortems were performed; two proved to be Cholera and four Pneumonia.

PORT WORK AND SURVEILLANCE OF VISITORS FROM INDIA.

The inspection of incoming and outgoing boats was done by Dr. Caldera.

Passengers from India visiting the fishery camp were permitted to come over from Paumben, Kilakarai (for divers only) and Mandapam without quarantine on the Indian side, after being inspected and passed by a member of the Ceylon Medical Department. On arrival at Marichchukkaddi such visitors were expected to report themselves at the Office of the Medical Officer of Health. This information was given them on landing. As this was a piece of work for which we were not prepared, Vaccinator Mr. Sinnatamby was placed in charge of attending to those reporting.

The rush was great, and in consequence delay occurred, and some of the people had to wait an hour or two before they could get attended. It is believed, that the general desire of the people was to be allowed to go free on this side of the water. Merchants and other traders did not desire to waste their time at the Office of the Medical Officer of Health. Further it was an impossibility to get people to come and report when they did not choose to.

The following is a statement regarding the reporting:—From February 23 to April 13 the number of passports issued from—

Paumben	..	..	..	4,122
Kilakarai	..	..	..	1,839
Mandapam	..	..	..	4,643
				10,604

Of this total of 10,604—

The number which reported the full period was 2,272 or 21·4 per cent.

The number which reported part of the period was 2,639 or 24·8 per cent.

The number which did not report at all was 5,693 or 53·6 per cent.

It will be seen, therefore, that with a very small proportion, *viz.*, 21·4 per cent. reporting for the proper period, the surveillance on this side could not be considered a success.

The period of reporting was for twelve days except in the case of those who had been recently vaccinated or had had smallpox; in the latter, the period was six days. People reported every other day with the exception of Sundays.

On the question of keeping divers under surveillance on this side, the following endorsement was addressed to the Camp Superintendent:—

Camp Superintendent,—

THE Arab divers, with the exception of five, I believe, passed their quarantine at Mandapam. The five who were instructed to report at this end failed to do so.

The Tuticorin and Kilakarai divers came over without quarantine with the idea of being kept under surveillance here.

I do not think that it is possible to keep the divers under surveillance on this side. The system that was adopted was to warn the "samarti" to report any case of illness among his men. This has no legal binding, and the "samarties" frequently have no control over the divers, who often leave one "samarti" for another, or to go away altogether.

The only place at which the divers could report themselves is the Government kottus at the end of the day's work. If a large number of divers has to report there will be delay, which will not find favour with the divers, who will want to get out quickly to sell their share of oysters. The only time the divers could report at the Office of the Medical Officer of Health will be on Sundays, and there is no way of getting them there if they do not choose to come.

It will, therefore, be seen that complete reporting on this side is not feasible without interfering with the fishing. If effective precautions are to be taken to prevent the introduction of diseases like Cholera, Smallpox, and Plague, the divers should be quarantined on the Indian side. If they come to Marichchukkaddi, as was done this year, the only way possible is to request the "samarti" to report in case of illness which is practically useless.

A suggestion that I could make is to engage the divers ahead, have them vaccinated, and then it will be a matter of reporting for six days. If they leave India seven days before the fishing commences, two days may be taken up in travelling and the four days on this side, while reporting, could be utilized in building their huts and making themselves comfortable. On the seventh day they will be ready for fishing. This will enable us to get their huts in some order to facilitate our sanitary work. This year the men came with a rush, and put up their buildings in an irregular manner, with the result that it was difficult to keep the surroundings clean.

S. F. CHELLAPPAH,
Medical Officer of Health.

Recommendations.

With regard to the divers the above endorsement to the Camp Superintendent deals with the matter.

With regard to other visitors from India the writer would recommend the following :—

The well-to-do people and merchants who would occupy quarters in the camp, and their servants should be permitted to come over without quarantine to be under surveillance on this side.

All other people of the cooly class type should undergo quarantine at Mandapam before being permitted to cross over. A person of this type who came over without quarantine developed cholera at Marichchukkaddi.

QUININE PROPHYLAXIS.

The writer is indebted to Dr. Das Gupta, Medical Officer of Health, for the statement appended below on the administration of quinine as a prophylactic.

The following is a tabulated statement of Dr. Gupta's findings :—

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Customs.	Port Surgeon.	Subordinate Kachecheri Staff.	Kottu Clerks.	Kottu Gate-keepers.	Kottu Coolies.	Police Department.	Sanitary Department.
Total number in the department	6	1	17	12	12	102	90	190
Number with positive previous history	5	—	11	5	10	32	56	10 ?
How many took quinine	2	1	10	7	10	102	90	190
How much quinine	gr. 3 every other day.	gr. 5 daily	gr. 1½ to 2½ daily	gr. 1 to 6 regularly	gr. 6 daily	gr. 6 daily.	gr. 5 daily	gr. 9 daily.
How many suffered from malaria	2	—	6	5	4	17	84	5*
Percentage of morbidity	34	—	35.3	41	34	16	90.1	2.6

They all gave a positive previous history.

The following is from Dr. Gupta's statement :—

"The annexure will give exact details regarding the effect of prophylactic quinine on people belonging to different departments. It will be seen that in certain departments there was not a sufficient number of people for a definite conclusion to be arrived at. The kottu staff and menials, the Police and the Sanitary Departments provided a comparatively wider scope for arriving at some definite conclusion. Of these three departments the Police had the greatest share of sickness. There is reason to believe that a large percentage of the attacks were relapses in men who had come from malarial localities from being exposed while on duty to the rains that set in. The dose administered to the Police staff was grains 5 per day.

"The kottu clerks contributed more to the number of the sick among the kottu staff than the menials, and this was solely due to their indifference in not taking quinine regularly. The dose administered to the kottu staff was grains 6 per day.

"The Sanitary Department held a regular quinine parade, and administered quinine to the coolies in the presence of a responsible officer. The result was that the percentage of sickness from malaria was very low. Not only was the morbidity low, but it was also observed that most of the menials, who, when they arrived at the camp appeared but ancient victims of malaria, appreciably improved in health and looked better after this regular administration of quinine. Not only had they no relapse of the old malady, but they were found to have gained by the curative effect of the drug, and in spite of the hard work and exposure they kept themselves remarkably fit. The superior sanitary staff also used to take quinine regularly with a few exceptions who paid dearly for their folly in having had more than one attack during their stay in camp. The dose administered to the sanitary staff was grains 9 per day.

"Judging from the above it will be seen that those who had limited their dose to a very small quantity, i.e., anything below 6 grains per day had suffered considerably. Irregular administration of quinine was another cause of the drug not having produced the desired effect. It will be noted that the Sanitary Department had the lowest percentage of morbidity from malaria, and then came the kottu department menials. The dosage in the former was grains 9 per day, while in the latter it was grains 6. All other departments especially those that had no regular system of administration suffered considerably."

The present writer agrees with Dr. Gupta's conclusions. With regard to the Police, it has to be stated that no regular quinine parades were held. The quinine was given to the sergeants who were expected to see that the constables under them took their regular dose. It is doubted if it was done with any regularity. The high morbidity rate among the Police would not have occurred if the quinine was given, and it was seen that the men took it regularly. Not only would the morbidity rate have been less, but a dose of 10 grains daily would have had a marked curative effect on those already subject to the disease, as was demonstrated in the case of the sanitary coolies.

For the sanitary coolies the administration of quinine was in the evening at the end of the day's work. The checkroll for the afternoon's work was not marked till the quinine parade; and as those who absented themselves lost a half day's pay, every one made it a point to be present. After a time the coolies appreciated the administration of quinine. The writer who saw the coolies from the very start was able to note a decided improvement in their general condition as the weeks went by. Of the six Sanitary Inspectors three who did not take regular doses due to not being included in the parade, came down with the disease while the other three who did escaped it.

It has been noticed, that those who escaped malaria while at Marichchukkaddi by taking quinine, stopped taking it on leaving the camp, with the result that on returning to their stations they came down with the disease. This is explained by the fact that the quinine while at the camp kept the organisms in check, but when the drug was stopped they increased and multiplied with resulting paroxysms of the fever. It would be desirable to continue the quinine for at least a fortnight after leaving camp.

PROSECUTIONS.

The following is a tabulated statement of the prosecutions entered for breach of sanitary regulations. This statement refers only to those entered by the Sanitary Inspectors. A number of prosecutions of a sanitary nature was also entered by the Police for such offences as easing and urinating in public places:—

(1) Nature of Offence.	(2) Number of Prosecutions.	(3) Number of Convictions.	(4) Number discharged.	(5) Total Fines. Rs. c.
Unlicensed and insanitary tea boutiques	.. 4	.. 4	.. —	27 0
Unlicensed tea boutiques	.. 2	.. 2	.. —	7 0
Insanitary tea boutiques	.. 7	.. 7	.. —	30 0
Insanitary meat stalls	.. 2	.. 2	.. —	7 0
Exposing food to flies	.. 18	.. 18	.. —	31 50
Keeping cattle outside gala	.. 12	.. 12	.. —	27 0
Easing in public places	.. 4	.. 4	.. —	6 0
Urinating in public places	.. 3	.. 3	.. —	2 0
Total	.. 52	.. 52	.. —	137 50

SUMMARY OF RECOMMENDATIONS.

LOCATION AND DESCRIPTION OF THE CAMP.

If further fisheries are contemplated, steps should be taken to plant the sides of streets with shade trees of a kind that will grow without much attention at Marichchukkaddi.

WATER SUPPLY.

(1) The chief source of the drinking water of the camp is Addappankulam. Owing to the heavy sediment in this water, the writer would suggest that, if a series of fisheries were contemplated, steps be taken for getting rid of it by the use of alum and sedimentation. With the removal of the suspended material, the amount of the chlorinating substance will be reduced and a more acceptable water provided. All that would be needed would be a couple of sedimentation tanks.

(2) Chlorination of the water will be needed, and the objectionable taste should be reduced by the use of electrolytic chlorine solution a little more scientifically. The proper quantity needed for chlorination could be known and that amount added only. By quantitative estimation of the excess chlorine by the use of orthotolidin and comparison with standard colours this amount could be maintained.

(3) For the storage of water in Government bungalows, it would be desirable to provide them with large-sized bins similar to those supplied for storing refuse. As a matter of fact, many used the refuse bins for storing water.

DISPOSAL OF HUMAN EXCRETA.

(1) The public latrines, which the writer is informed, cost Rs. 35 per seat, proved so successful that the construction of at least another six is recommended.

(2) The area between the cadjan fence and the bucket compartment of the public latrine was not cemented, and as ablution took place there it became muddy. The writer would recommend that this area be cemented and sloped into a drain opening into a catch pit of a size to receive a bucket.

(3) It is desirable to provide every public latrine with a set of collecting buckets in addition to those already in the hand carts. Owing to the latrines being well used, removal sometimes has to take place twice and even thrice daily. Much time is lost in a cart coming and waiting till its buckets are filled. If a separate set were provided, all that need be done would be to replace the empty buckets in the carts by the already filled ones, which could be taken away to the trenching ground.

COLLECTION AND DISPOSAL OF REFUSE.

- (1) The writer desires to emphasize that it is necessary for the full sanitary staff to get to the camp at least one week ahead.
- (2) The orderly construction of dwellings in the diver's area is necessary for the efficient scavenging of it.

FOOD SANITATION.

- (1) It is recommended that at future fisheries the right to slaughter and sell meat be given only to those who will in addition to complying with the by-laws—
 - (a) Provide a meat safe. This is nothing very elaborate ; all that would be needed will be the taking of fly-proof wire mesh which could be wrapped round a frame of jungle timber, and have doors provided at the two ends.
 - (b) Provide a Japanese clock-work fly-trap for each stall.
- (2) It is necessary that a rubber stamp be provided with the word " PASSED " which could be used for stamping live goats inside the ear when passed for slaughter, and meat passed for consumption, as otherwise there is no mark to show that a goat passed is the same as the one that is led the following morning for slaughter.
- (3) The writer would desire to stress the fact that it is possible at the fishery camp to get the people to conform to all sanitary requirements, provided notice is given in time.
- (4) *Aerated Water Manufactory*.—A recommendation that the writer would make is that each manufactory be provided with a Japanese clock-work fly-trap.
- (5) *Tea Boutiques and Eating-houses*.—The keeping of food stuffs under cover is very necessary, especially in a camp, and if people were notified in time efficient fly-proof cases would be provided.

HOUSING.

- (1) The floors of all the Government quarters should be levelled and hardened with clay.
- (2) The roofs should be of proper slope as required for cadjan buildings.
- (3) The glare of the sun should be kept out by the construction of porches.
- (4) For the Sanitary Staff :—
 - (a) The Medical Officer of Health could be located as during this year's fishery.
 - (b) The Supervising Sanitary Inspector should be provided with a B-type bungalow, similar to that of the Inspector and Sub-Inspector of Police. He is an officer of such standing as to be entitled to this type of building. Location should be in the vicinity of the Medical Officer of Health's Office and bungalow.
 - (c) For five Sanitary Inspectors a line of six rooms separate from all other buildings should be provided. Five rooms will be used for sleeping purposes and the sixth as a dining room. In addition to the verandah, a porch in the middle will, in addition to keeping the glare out, serve as a place for sitting out in. Two latrines, two kitchens, and a bathing enclosure also should be provided.
 - (d) For the coolies : the conservancy coolies are housed too far away. Their line should be located near the scavenging coolies' line but separate from them, and near the office. Latrine accommodation for these coolies should also be provided.

Room overcrowding should be prevented. Three or at the most four persons should be assigned to each room 10 ft. by 12 ft.

(5) The area set apart for the divers should be pegged out into lanes about 12 to 15 feet wide at right angles to the sea, and the construction of dwellings along these lanes enforced. A space of 15 ft. could be left between the backs of buildings. This arrangement will introduce system into the construction of the dwellings and would facilitate the work of the scavenging staff and the inspection by the Inspectors.

(6) *Office of the Medical Officer of Health*.—It is recommended that the Office of the Medical Officer of Health at the next fishery be situated between his bungalow and the Court-house facing Mullikulam road. The office building should consist of four rooms, one as the Medical Officer of Health's Office, one as the Sanitary Inspector's and the clerk's office for reporting and issual of health passes, and the other two as store and orderlies' room.

OYSTERS, LOOKING FOR PEARLS, AND THE RESULTING NUISANCES.

- (1) That a special gang of coolies be employed for maggot collection work. This work is appreciated and diminishes a nuisance.
- (2) That the private totties be constructed in pairs at right angles to the sea with an interval, which could be used as a drain between pairs.
- (3) That special areas be proclaimed besides the private totties where oysters in small quantities could be opened. These could be, Athigarkulam, the area between Dixon's Tower and the Government kottus, and an area behind the divers' quarters. Special men could be detailed to keep them clean if it is known where the opening will occur.
- (4) For the collection of oyster shells, rakes and wheelbarrows should be provided.

CONTROL OF ANIMALS AND INSECTS.

- (1) *Fleas*.—It is recommended that all Government quarters have the floors hardened with clay.
- (2) *House Flies*.—It is recommended that all meat stalls and aerated water manufactories be insisted on to use Japanese clock-work fly-traps. Tea kiosks and eating-houses could as well be included with the above.

HEALTH ORGANIZATION.

(1) The staff that would be needed for efficient work is :—One Medical Officer of Health, one Supervising Sanitary Inspector, five Sanitary Inspectors, two orderlies, one vaccinator, one clerk or Sanitary Inspector for issuing and checking passports, one hundred scavenging coolies and nine overseers, sixty conservancy coolies and four overseers, ten coolies for oyster shell collection and one overseer, ten coolies for maggot collection and one overseer.

(2) The overseers from Jaffna proved extremely unsatisfactory, and the coolies were equally so. If coolies could be recruited from India for scavenging work without much extra expense it would be desirable to do so. A better lot of overseers should be recruited.

(3) Two additional scavenging carts making six in all, and three reserve bulls should be provided.

MEDICAL FACILITIES.

(1) *Temporary Hospital*.—It is desirable to have it shifted to a more elevated site to the south of this year's location.

(2) *Infectious Diseases Hospital*.—

- (a) The location of it is satisfactory, but the wards were placed too close to each other. The three wards should be separated to the three corners of the space allotted for the buildings. No kitchens need be constructed within the enclosure, only latrines should be provided for each ward.
- (b) The Apothecary's quarters were unnecessary and need not be constructed. The hospital was close enough for the Doctor and Apothecary to look after the patients.
- (c) The accommodation provided for contacts proved inadequate and unsuitable; it would be desirable to construct about ten rooms in a line with a verandah and a set of kitchens and latrines.

PORT WORK AND SURVEILLANCE OF VISITORS FROM INDIA.

(1) With regard to the divers the endorsement to the Camp Superintendent (page 74) deals with the matter.

(2) With regard to other visitors from India the writer would recommend the following :—

- (a) The well-to-do people and merchants who would occupy quarters in the camp, and their servants should be permitted to come over without quarantine to be under surveillance on this side.
- (b) All other people of the cooly class type should undergo quarantine at Mandapam before being permitted to cross over. A person of this type who came over without quarantine developed cholera at Marichchukkaddi.

QUININE PROPHYLAXIS.

That 10 grains of quinine is the most effective dose for prophylaxis at Marichchukkaddi, and that it must be given regularly under the supervision of a responsible officer to obtain results. Further that it should be continued for a fortnight after leaving camp.

October 5, 1925.

S. F. CHELLAPPAH,
Medical Officer of Health.

VI.—REPORT OF THE INSPECTOR-GENERAL OF POLICE.

REPORT of the Inspector-General of Police on the Force on Special Duty at Marichchukkaddi and South Bar, Mannar.

The INSPECTOR-GENERAL OF POLICE to the Hon. the COLONIAL SECRETARY.

No. 424.

Office of the Inspector-General of Police,
Colombo, May 15/18, 1925.

Pearl Fishery, 1925.

SIR,—I HAVE the honour to submit for your information and for record the following reports on the work of the Ceylon and Indian police at the Pearl Fishery, 1925 :—

- (a) Letter from the Government Agent, Northern Province, to the Inspector-General of Police, dated April 22, 1925.*
- (b) Report of the Superintendent of Police who was on special duty in charge of the Police Force at Marichchukkaddi (Mr. G. H. Ferguson).
- (c) Report by the Assistant Superintendent of Police, Northern Province (Captain S. G. Notley, M.C.), on the work of the Special Force at South Bar, Mannar, during the Pearl Fishery.

2. It will be seen from the Government Agent's letter and from Mr. Ferguson's report that good order was maintained and there was practically no preventable crime. The Police turned out promptly to the fire alarms and prevented fire spreading, so essential in a camp where all the buildings are of adian and highly inflammable.

* Not reproduced.

3. The binding over of re-convicted criminals had good effect in the prevention of crime in the Fishery Camp. It will be seen from Mr. Ferguson's report, paragraph 6, that several re-convicted criminals left the Camp as soon as they heard that proceedings had been started to have them bound over, while on hearing that re-convicted criminals were being sent out of the Camp others from India who had come as far as Mandapam returned to their homes. Sixteen re-convicted criminals of Ceylon were detected in the Camp and 11 re-convicted criminals or bad characters from Southern India were detected by the Indian police.

H. L. DOWBIGGIN,
Inspector-General of Police.

Report of the Superintendent of Police who was on Special Duty in Charge of the
Force at Marichchukkaddi.

Police Office, Sabaragamuwa,
Ratnapura, April 24, 1925.

Police Force at Pearl Fishery, Marichchukkaddi, 1925.

FORCE consisted of 1 Superintendent, 1 Inspector, 1 Sub-Inspector, 16 Sergeants, 194 Police Constables, as well as 1 Sub-Inspector and 6 Constables of the Indian police.

2. The whole Force with equipment left Colombo in the ss. "Baroda" on February 19, 1925, and arrived at Marichchukkaddi on February 20, 1925.

3. Merchants and others arrived during the next few days to buy boutique and totti sites. The police station was opened on February 24, 1925, and fishing started on February 27, 1925.

4. The conduct of the Force was, on the whole, very good. Only two Constables were punished for being drunk. There were no complaints of extortion or other offences of a serious nature.

5. (a) There were seven true complaints of grave crime. All seven cases were for theft from dwellings. Convictions were obtained in three cases. In all cases the accused was either a servant or other person actually living in the house.

The biggest case was a theft of £220 in gold sovereigns and Rs. 10,000 worth of pearls by a servant from an Arab pearl merchant. The accused was traced after six days and 201 sovereigns and a few of the pearls were traced. It is doubtful, however, if the pearls stolen were anything like Rs. 10,000 in value. Inspector P. R. Krisnaratne deserves great credit for the successful way in which he handled the case.

(b) 203 minor offences were taken up, convictions being obtained in all cases. Most of the offences were for nuisance.

(c) Five cases were instituted for the illegal possession of opium. In one case over $\frac{1}{4}$ lb. of opium was seized.

(d) There were two prosecutions for possessing artificial pearls, convictions being obtained in both cases. Three other complaints were received from merchants that persons had attempted to sell them artificial pearls, but as none of the leading pearl merchants in the Camp could agree as to whether the pearls were artificial or not no prosecutions were entered.

6. There can be no doubt whatever that the binding over of re-convicted criminals had a very good effect in the prevention of crime in the Camp. The first man to be bound over was a re-convicted criminal of South India who had five previous convictions. He arrived at the Camp on February 23, and was spotted the next day by the Indian Police Sub-Inspector. He failed to give security and was sent back to India.

Action was only taken against those re-convicted criminals who, in addition to having more than one conviction, were known to be dangerous men. Several re-convicted criminals left the Camp as soon as they heard that proceedings had been started to have them bound over. Sixteen re-convicted criminals of Ceylon were detected in the Camp. Action was taken against six of these men, and as they failed to give security they were sent back to their homes. Three others returned home of their own free will before their cases were heard in Court. Eleven re-convicted criminals or bad characters from Southern India were detected by the Indian police, one man was bound over and as he failed to give security was sent back to India. Intimation was received that other re-convicted criminals from India were coming but they returned to their homes after having come only as far as Mandapam. No doubt they heard of the fate of their friend and changed their minds.

7. *Stray Cattle.*—There are large herds of stray cattle in the Camp and, owing to the fact that they are not used to being tied up, there was great difficulty not only in seizing them but in holding them when once they had been seized. In all eight head of cattle were seized.

8. *Fires.*—Three alarms of fire were given, but all were put out before any serious damage was done, on one occasion the room adjoining the wireless power house caught fire. In addition to these alarms there were several small fires which were put out almost immediately they started. Several fires took place after the closing of the actual fishing and were started either by smouldering cinders left behind by people in their vacated huts or else by cadjan pulled down from huts—catching fire on the ground, owing to fires being lit near by. It is essential that as soon as a hut is vacated it should be pulled down and the cadjans burnt immediately under supervision.

9. *Indian Police.*—The Indian police detachment was in charge of Sub-Inspector V. Sundaram Ayer of Tinnevely District, who was assisted by three Constables from the same district, one Constable from Madura District, and two Constables from Ramnad District. As has already been stated eleven criminals from India were spotted by the Indian police. In addition, which the Sub-Inspector did particularly good work in tracing the identity of a mutilated corpse brought in a fishing net. Had it not been for the presence of the Indian police it is very doubtful if any eleven criminals referred to would have been detected; with the result that many more criminals have come to the Camp and would undoubtedly have given trouble.

10. *Police Arabic Interpreter* was very useful both as an interpreter in cases of inquiries and as an interpreter to enable me to converse with the Arabs and find out what was going on in their lines.

11. *Health*.—In spite of the prophylactic treatment of 5 grains of quinine each day and the supply of mosquito nets there was a great deal of malarial fever. It is interesting to note that the first outbreak of malaria started nine days after the starting of the Main street and Kottu guards. The off duty men at these guard rooms had no cots or mosquito nets.

Up to April 11, 1925, on which date half the Police Force returned to Colombo, there was an average of five men sick each day. The first case of malaria in the police occurred thirteen days after our arrival at the Camp. The Kottu and Main street guard rooms should be of larger size and should be fitted with cots and mosquito nets. The necessity for a separate police ward at the hospital was badly felt. The majority of the policemen who were sick had to remain in barracks owing to lack of accommodation in the hospital. I would suggest that a separate police ward for 12 beds be attached to the hospital. Built on the same scale as the police barracks such a ward should be 70 feet long by 20 feet broad, sides 8½ feet high, centre pole 18½ feet high. Twelve extra cots and mosquito nets would also be required for this ward.

12. A statement of duties performed by the police is attached.

13. (a) Four Sergeants and 65 Constables returned to Colombo in the Government trawler "Violet" on April 11, 1925.

One Sergeant and 34 Constables returned the same day in the ss. "Nautilus." The remainder left by ss. "Nautilus" on April 18, 1925, direct for Colombo.

(b) South Bar police station was closed on April 18, 1925, the detachment proceeding direct to Jaffna by rail.

14. Inspector Krisnaratne, in addition to doing particularly good work in the big theft case of goods valued about Rs. 14,000, did very good work indeed at the Camp. He never waited to be told what to do, but used his own initiative and obtained a very good control over all the men under him, by no means an easy task when it is realized that the men were drawn from stations all over the Island.

G. H. FERGUSON,
Superintendent of Police, Pearl Fishery.

Report of the Assistant Superintendent of Police, Northern Province.

May 9, 1925.

Special Police Force at South Bar, Mannar, during Pearl Fishery, 1925.

THE Force consisted of 2 Sergeants and 6 Constables. This Force left Jaffna with equipment on February 18, 1925, arriving Mannar, February 19, 1925. Sergeant 2120 Khan was in charge of the Force.

2. The first passengers passed through South Bar *en route* for Marichchukkaddi on February 21, 1925. The total number of passengers who passed through South Bar for the Pearl Fishery from February 21, 1925, to April 16, 1925, was 7,665. The number who returned from the Fishery along the same route was 5,782.

3. The station at South Bar was opened on February 19, 1925, and was closed on April 18, 1925.

4. The conduct of the Force there was good, only one Constable was punished for being drunk. There were no complaints of a serious nature.

5. There were no cases of grave crime and only thirteen minor offences. Convictions obtained in every case.

6. Sergeant 2120 Khan noticed a re-convicted criminal from Jaffna passing through to Marichchukkaddi and the police at Marichchukkaddi were informed.

7. *Fire*.—There was a big fire at Mannar, and the South Bar police did excellent work for which they have been rewarded.

8. *Health*.—Very good. No sickness during the whole period.

9. *Buildings*.—Good, but I suggest that a proper quarter for Sergeants be erected in future. This year Sergeants made use of the kitchen for their quarters and had their meals in a boutique.

The singlemen's barracks was very small. The cots were touching each other.

Lock-ups.—Very good type.

10. *Furniture*.—I suggest that in future the South Bar furniture be kept at Mannar and not sent to Colombo. If the Assistant Government Agent, Mannar, was approached he would probably be able to store it.

11. Sergeant 2120 Khan who was in charge of this detachment did very good work indeed. He used his initiative and had good control over the men.

Sergeant Khan, who can speak Hindustani, gave great assistance to the Indian passengers.

The success of the South Bar detachment was entirely due to Sergeant Khan.

S. G. NOTLEY,
Assistant Superintendent of Police, Northern Province.