TABLE IX

ELEVEN DIFFERENT LURES USED IN TROLLING EXPERIMENT ARRANGED IN DESCENDING ORDER OF RELATIVE EFFICIENCY RATING UNDER DIFFERENT CONDITIONS OF FISHING. THE RELIABILITY OF EACH EFFICIENCY RATING IS INDICATED BY THE NUMBER OF SETS IN WHICH IT WAS USED ALONG WITH THE GREEN RUBBER SQUID. THE GREEN SQUID WAS TAKEN AS THE STARDARD FOR REFERENCE AND HAS BEEN ASSIGNED AN EFFICIENCY RATING OF 100. " α " MEANS INFINITELY BETTER THAN GREEN SQUID.

Poor (Average)			*Fairly good*			*Good*			*Very Good*			*Ratings based on records for all fishing conditions combined*		
Lure	*Sets (no.)*	*Effic. rating*	*Lure*	*Sets (no.)*	*Effic rating*	*Lure*	*Sets (no.)*	*Effic rating*	*Lure*	*Sets (no.)*	*Effic. rating*	*Lure*	*Sets (no.)*	*Effic. rating*
Tandem baited hooks	22	246	Tandem baited hooks	21	α	—	—	—	—	—	—	Tandem baited hooks	43	429
$5\frac{1}{2}''$ Spoon	92	175	Ahatuwa bark	38	α	Japanese feather	22	α	$4\frac{1}{2}$ spoon	170	420	$4\frac{1}{2}$ spoon	333	350
$4\frac{1}{2}''$ spoon	58	157	$4\frac{1}{2}''$ spoon	63	513	$4\frac{1}{2}''$ spoon	42	900	Japanese feather	27	200	$5\frac{1}{2}''$ spoon	431	191
Green squid	—	100	$5\frac{1}{2}''$ spoon	77	300	$5\frac{1}{2}''$ spoon	63	210	$5\frac{1}{2}''$ spoon	199	162	Japanese feather	136	133
Yellow squid	100	100	Japanese feather	25	120	Hoochie koochie	21	207	Green squid	—	100	Green squid	—	100
Japanese feather	62	93	Green squid	—	100	Yellow squid	63	180	Yellow squid	127	69	Yellow squid	361	100
Hoochie koochie	58	91	Yellow squid	71	71	Green squid	—	100	Hoochie koochie	58	50	Hoochie koochie	145	86
Ahatuwa bark	44	88	Hoochie koochie	8	40	Ahatuwa bark	41	77	Brass spoon	27	36	Ahatuwa bark	178	79
Brass spoon	19	24	Brass spoon	9	0	Brass spoon	—	—	Ahatuwa bark	55	29	Brass spoon	55	22
White squid	23	0	—	—	—	—	—	—	—	—	—	White squid	23	0
Egg wobbler	7	0	—	—	—	—	—	—	—	—	—	Egg wobbler	7	0

The average fishing conditions (i.e. the conditions under which most trolling was done) were poor (Table VIII). And Table IX shows that under these conditions tandem baited hooks (efficiency rating 246) gave the best results bringing in more than twice as many fish or strikes as the green squid. The $5\frac{1}{2}$-and $4\frac{1}{2}$-inch chromium-plated spoons came next. The ahatuwa bark lure gave low catches and the white squid and egg wobbler were poorest of all. Data for the 7-inch, chromium-plated spoon are not listed. They were few and its catches were poor. The number of settings of the tandem hooks and of the last three lures listed in Table IX are too few to provide as reliable estimates of their efficiency ratings as seem desirable.

Under better fishing conditions there are departures (Table IX) from the order of rating worked out for average conditions. In most cases, however, these departures are not well supported by large numbers of data and there is some doubt of their validity. It will be noted that so far there has been no experimental fishing with baited tandem hooks under good or very good fishing conditions. This is desirable considering that this lure performed so well under average and fairly good conditions.

The order of efficiency ratings based on the combination of all records for all conditions of fishing is essentially the same as that for fishing under poor (average) conditions and it seems reasonable to use the former in dealing with most problems in selecting lures.

From discussions of these results with the skippers and from reviews of the original fishing records, it appears that deductions from the study should not be applied to all problems without reservation. Many species of fish were recorded in the catches and the order of efficiency worked out applies to catches of mixed species. There are indications that some species had different preferences. If trolling were done under special conditions where only one species is taken then the order of efficiency might be different. Furthermore, on the few occasions when fishing was particularly good, fish seemed to take any lure at all, i.e. the order of efficiency seemed to break down completely. This might be considered a weakness but not a serious weakness because our principal deductions apply to average or near-average conditions of fishing.

In discussing these results with local fishermen some were inclined to disregard them all together. They were more than happy to learn that their tandem hooks performed so well and they were willing to believe that differences in efficiency existed, which is a point that Wheeler and Ommanney (1953) apparently disregarded for all their trials were made with only one type of lure. However, the fishermen claimed that since all the experimental fishing was done from motor boats, the results would not apply to their operations from sailing craft. They were unshakeably of the opinion that motor noise frightened fish and that the order of efficiency worked out in the experiment had no meaning for them. Table VII shows that the catch per line-hour was approximately the same for sailing and motor craft. This discounts the idea that motor noise frightens fish seriously and that the established order of relative efficiency of lures would be different if the experiment had been conducted from sailing craft.

It must be admitted, however, that the experiment was out of balance in not comprehending observations made from orus using different kinds of lures as originally planned. How serious this weakness may be can be determined only by actual trials. It would appear to be small.

Acknowledgment. The writer wishes to thank his colleague, Mr. J. E. Paloheimo, Statistician of the Biological Station, Fisheries Research Board of Canada. St. Andrews, *N. B.*, for assistance in analyzing the result of the trolling experiment, and Mrs. E. I. Lord, Laboratory Technician, of the same institution, for her patient work in arranging the data of study.

Practical implications. Regardless of public opinion, results of the trolling experiment are pertinent to trolling problems and the Department's efforts to solve them. Several western-type lures, e.g. rubber squid, have been shown to have low efficiencies when fished in Ceylon waters and further trials of them seem pointless. Besides this it has been shown that fishermen are now using one type of lure (baited tandem hooks) that has a high efficiency rating under poor (average) and fairly good fishing conditions. It may be equally good under better fishing conditions but this has yet to be established. In some ways it would seem wise to encourage wider use of this gear but at the same time it would be unreasonable to expect revolutionary improvements in trolling catches to result from such a change. As pointed out earlier in this report trolling is a branch of the Ceylon fishing industry that seems to have limited possibilities.

Baited tandem hooks are manifestly good but they have one important handicap which was not fully considered in working out the efficiency rating—they require baiting. For fishermen who carry on trolling as a major operation, this is a real drawback but they have established ways of coping with this and use the gear extensively. They spend a considerable amount of time before each trip looking up bait (sometimes they have to buy it) or catching it on the way to the fishing grounds. Besides this they must often interrupt trolling operations to rebait their hooks In all these ways they suffer time losses that would not occur if they used 4½-or 5½-inch spoons that are only slightly less efficient. It is more than likely that they would be better off if they adopted spoons. These are always ready to go into the water. The only preparation required is to put them into the boat before sailing.

In campaigning for wider use of baited tandem hooks it would seem pointless to try to encourage their use by fishermen for whom trolling is an incidental operation. A number of handliners told us, for instance, that they seldom find it worth while to spend time and possibly money, looking up suitable bait for short trolling runs into their handlining grounds. However, some, and perhaps many, would fish spoons if they were available and this kind of trolling is something well worth encouraging. Even small catches would help these fishermen whose total landings are low. But again, general adoption of spoons should not be expected to bring about great changes in the country's total fish landings.

One disadvantage of spoons is often pointed out and grossly exaggerated by fishermen, by agents of the Department and by many others with whom our trolling experiment results have been discussed—spoons are expensive compared with the traditional gear. There is no denying that their initial cost is higher and that their lifetime is no longer. When lures have to be replaced it is usually because they have been lost—not because they are worn out. The wire leader breaks at a kink or the line parts under the strain of catching a heavy fish. The important point that these people overlook is that the initial cost of a spoon is its total cost—there is no operating cost. In contrast, baited tandem hooks have a low initial cost but a relatively high operating cost in terms of fishing time that is lost. It takes time to catch bait and time to bait the hook everytime it is set and reset. And bait sometimes has to be bought. It was hard to judge from what the fishermen told us but it appeared that in the normal lifetime of a set of tandem hooks, this operating cost far exceeded the difference between their initial cost and the cost of a spoon lure. In other words, the tandem hook is not an inexpensive fishing device. Even if spoons do cost more than tandem hooks the cost of either is trivial. It is less than the value of one good fish that either lure may catch. Thus, to suggest that cost is a serious objection to the use of spoons is hardly logical.

Spoons have been shown to be effective over a wide range of fishing conditions and their use offers advantages to fishermen even though trolling may seem worth while only as an incidental fishing operation. In 1955 spoons were available at only one or two tackle shops in Colombo and only a few fishermen, e.g. those at Nayaru, were acquainted with them through Mr. Glanville, the F. A. O. Fisheries Engineer, who worked there for some time. Presumably other groups would adopt spoons if properly acquainted with them.

Summary

1. Trolling is one of the major branches of Ceylon's indigenous fishing industry and has been little studied.
2. Catches are light but most of the fish taken are first grade and large and their per per pound value is high.
3. Boat crews are large in proportion to the number of lines towed and catch per man-hour is very low.
4. Indigenous baited lures are highly attractive to fish but using them involves much loss of potential fishing time and this detracts from their superiority.
5. Two of the spoon lures tested seem to be as good as or better than indigenous lures when all factors are considered.

6. In spite of motor noise, the catch per line per hour by motor boats was slightly higher than that for sailing craft but nevertheless low compared with that in the world's better known trolling fisheries. From this it would seem that, on the average, fish that take trolling lures are not abundant here.
7. The general conclusion is that catches by any craft (indigenous or mechanized) engaged full-time in trolling are too low to be economic. And it is expected that Ceylon's full-time troll fishery, as it is known today, will disappear. The fishermen will find more profitable ways of spending their time.
8. Fishermen engaged in trolling may suffer economic distress during the period of adjustment.
9. In contrast trolling catches made incidentally during other fishing operations can be worth while. For example, craft travelling to and from bottom longlining grounds can troll, with little expense and no loss of fishing time, and thereby add to their income.

Recommendations

On the basis of the results just summarized it is recommended that the Department of Fisheries should:

1. Turn down proposals for encouraging full-time industrial trolling operations unless they are supported by convincing new information.
2. Encourage mechanized craft to carry on trolling as an incidental operation while they are travelling to and from grounds where they pursue more lucrative types of fishing.
3. Make trolling spoons, of the type we found most effective, more readily available to fishermen by including them in fisheries stores and encouraging commercial dealers to stock them.
4. Carry out further studies of the indigenous troll fishery with emphasis on its economic aspects to see what can be done to ease the plight of fishermen who may be seriously affected by the expected decline in this fishery.

GILL NETTING

The gill net is an ancient fish-catching device (Radcliffe, 1921) but it is still widely and effectively used. Essentially it is an open-meshed curtain of twine which hangs vertically in the water. It snares fish, usually by their gill covers, when they try to poke their hands through the mesh. To make sure that the net presents a flat wall in the water it must be supported and almost all nets are supplied with floats along their upper edges for this purpose. Usually the floats are strung at intervals along a horizontal supporting headrope to which the upper edge of the curtain is bound.

If the floats are sufficiently numerous and buoyant they will stay at the surface and the net hangs below them by gravity. Such a net is termed a " surface net ".

If the floats are not sufficiently buoyant, the whole net sinks until its lower edge and sometimes a considerable amount of its lower part rests on the bottom. The submerged floats lift as much of the curtain off the bottom as will just counterbalance their buoyancy. The net may be carried downward by its weight alone in which case the number and size of the floats must be nicely adjusted so that the net will sink without too much of it lying folded on the bottom where it cannot fish. More often the lower edge is bound to a heavy footrope which helps sink the net. This rope may or may not be weighted with various devices. Compared

with nets that lack footropes, this arrangement requires less precise adjustment of buoyancy (no. of floats attached to headrope) to permit sinking of the net and still insure its fullest possible upward extension from the bottom. Both these types are referred to as " sunk nets ".

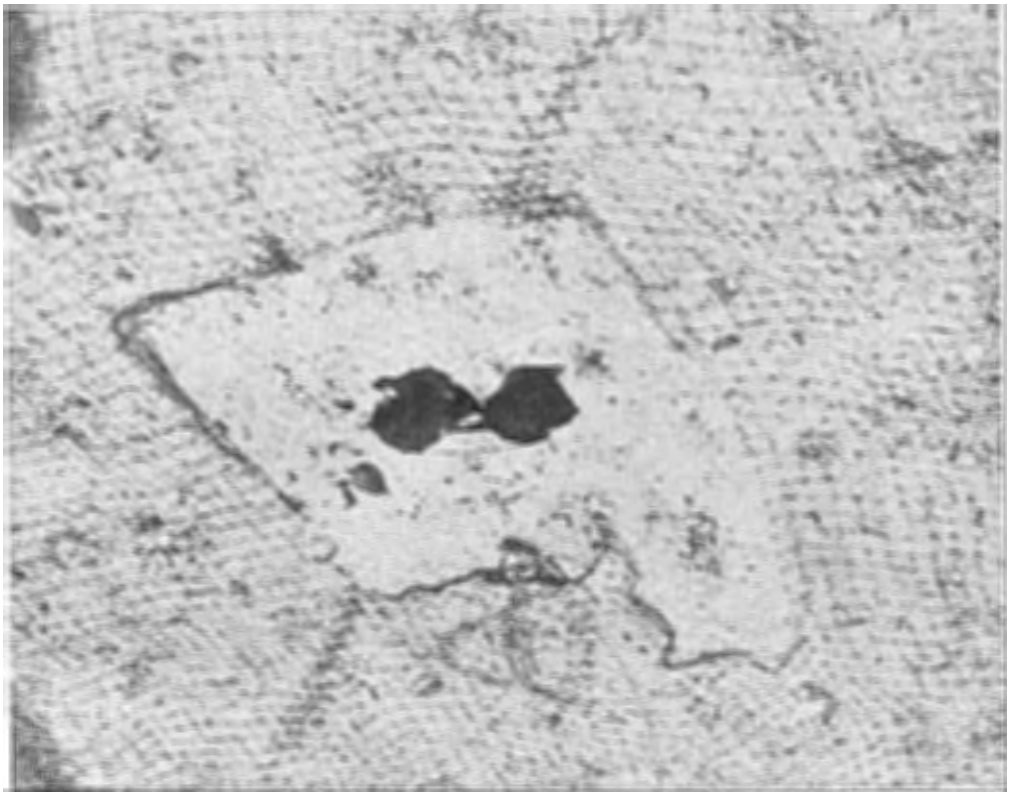

Fig. 6. Damage to Negombo fisherman's gill net caused by dolphins when they stole netted fish. The size of the rent may be judged from the sunglasses in the picture.

Gill nets may also be suspended in mid water by float lines of adjustable length attached to their headropes and passing upward to supporting surface buoys. These may be referred to as " mid-water nets ".

Most gill nets—surface, mid-water and sunk nets—have footropes (generally weighted) to spread the curtain to its fullest extent.

When nets are put in the water they are often made fast either individually or as a " fleet " (tied together end-to-end) to fixed supports such as stakes, anchors or buoys in which case they are termed " set nets ". Often they have no fixed support. Instead, single nets, or several in a fleet, are trailed out behind an unanchored boat. While the nets are exposed they and the boat may drift small or great distances depending on winds and currents. Used in this way they are usually referred to as " drift nets ".

Surface, mid-water and sunk nets may be used as set nets. And surface and mid-water nets are often used as drift nets but sunk nets are seldom used in this way. In the North Sea, however, sunk nets are sometimes used for drift netting over smooth bottom when herring concentrate low in the water. This same practice has been observed off the north coast of Ceylon where drift nets without footropes are employed.

A. Early Studies of Ceylon Gill Netting

Pearson's 1923 description of indigenous fishing gear indicates that gill netting is the most highly developed and diversified of Ceylon's major fisheries. Hickling (1951), Blegvad (1951) and John (1951) all examined the gill-net fishery and recommended searches for improvements, but this is no simple task. It requires comparison of performance of new kinds of nets with that of kinds that are now in use and a searcher cannot undertake this without a great deal of preliminary information. Considering the great variety of nets now in use in Ceylon and the bewildering number of new types that are constantly being invented all over the world, it will be appreciated that the planning, execution and interpretation of results of netting trials can be very involved. Nevertheless, following Hickling's, Blegvad's and John's recommendations the Department purchased a variety of nets and conducted fishing trials. Records of some of these are on file but they never have been properly examined and interpreted.

The Canadian team agreed to extend the Department's program with Mr. Babcock in charge and working from CANADIAN. He began with night drift-netting trials off the north and east coasts in August 1953 using the Department's 1,200 × 18-foot, 6½-inch mesh, tarred cotton nets He continued these trials in late October and early November out of Colombo.

Detailed records of his 13 sets are included in the writer's manuscript report to the Department (Medcof, 1955) and they are summarized here in Appendix 19. He worked both inshore and offshore where water depths varied from 4 to 200 fathoms and sometimes he drifted 10 miles or more during the night. The results were not rewarding.

From the beginning Mr. Babcock was not satisfied with his gear, so nylon webbing was requested from Canada as part of Colombo Plan Capital Aid. It arrived late in 1953 and he made it up into what he considered to be suitable nets for fishing trials. But he had no opportunity to test these nets before he completed his contract. We have records of only three of his 1954 sets (March 3-5) and they were all with the tarred cotton nets used as set, sunk nets off Colombo. These were fruitless (Appendix 19).

B. The 1954 Program

Early in 1954 the Steering Committee reviewed Mr. Babcock's program. The Committee appreciated the limitations under which he worked and the desirability of testing the nylon nets he had made up. It decided to continue gill netting studies as a low-priority project. Emphasis was to be shifted from merely carrying out fishing trials to developing better background information for planning trials and interpreting results. I was asked to review the Department's records of early experimental netting; Mr. Barry, who had many years of experience in gill netting on the Canadian Atlantic coast, was asked to conduct what experimental fishing he could along with his other work on CANADIAN and both of us were asked to assemble records of commercial gill netting operations by local craft.

The review of records was never completed but from July 1954 to March 1955, a great deal of potentially useful information on gill netting was assembled (Appendix 19) as well as general information on the gill net fishery.

General Observations

Our observations of the indigenous fishery indicated that although some new types of nets and methods of constructing them had been adopted, the general picture was much the same as in Pearson's day. Cotton and hemp were the commonest twines used. Some of the webbing was factory-made but most seemed to be hand knitted. Almost everywhere fishermen and women were to be seen occupied in some phase of net manufacture. The time so occupied seemed enormous.

Almost every type of net and method of operation mentioned in the introduction to this section of the fisheries survey report was encountered. Some were very ingenious and the quality of workmanship was generally high. Day and night fishing were both common and the

duration and frequency of sets and the amount of gear operated per man varied greatly. In some cases gill netting was carried on as a side line with other kinds of fishing; e.g. in taking bait for handlining. In other cases it was a major operation.

Standards for Comparative Studies

With this complexity of nets and special ways of using them it was hard to know how to organize the records we gathered. The available literature suggested no generally recognized international standard way of compiling, analyzing and reporting them. And there was no single type of net and method of operating it that was in island-wide use and therefore suitable as a standard. But we wanted to be able to compare efficiencies of different kinds of industrial netting among themselves and with experimental netting. We also wanted to compare the efficiency of netting (catch per man per hour) with the efficiency of other kinds of fishing like longlining. We therefore set up an arbitrary system based on a local fishery.

In the important drift net fishery in the northern end of the island the katumarams carry approximately 10,000 square feet of sun-hemp netting per crew member. This area of net was adopted as the standard unit of gear and 10,000 square feet of netting set for one hour was adopted as the standard unit of netting effort. To describe the amount of human effort that went into any netting operation, it was decided to use the number of crew multiplied by the number of hours the net was in the water and express it in man-hours.

We realized that this description of human effort associated with gill netting was unrealistic in certain instances. It seemed reasonable enough in most cases such as in day fishing of drift nets which are constantly tended but it was poor for describing the effort expended in tending fixed nets that were set close to shore and tended only a few brief times every 24 hours by men who paddled out for that purpose. Similarly it was poor for describing night fishing of drift nets where the crew usually manages to get some rest during the set. However, these inaccuracies and others like them were not considered too serious to discourage their use when the need for some description of effort was so great.

As a basis for comparing Ceylon operations with those of other countries Mr. Noel Tibbo of the Fisheries Research Board of Canada supplied information on the herring drift net fishery in the North Sea (Europe) and in the Gulf of St. Lawrence off the Canadian east coast. The former is one of the world's best known gill-net fisheries. A typical British herring drifter carries a crew of 14 men. In the evening it sets a fleet of about 100 mid-water drift nets, each 110 to 115 feet long and 50 feet deep, and hauls them in the morning. On the average it is 10 hours from the time the nets are set until they are back in the boat again and the catch per net averages about 100 pounds per net per night. This is equivalent to 17 pounds per unit area of net (10,000 square feet) per hour of set or 70 pounds per man per hour of fishing. Catches in the Gulf of St. Lawrence under the same conditions average 2 to $2\frac{1}{2}$ times as heavy. Data on other well known gill net fisheries for other species seemed desirable as standards for comparison but these were not available.

Organizing Records

All our 1954 observations were compiled on the regular fishing record form (Fig. 1) including mesh-size, length and depth of nets, method of fishing (surface, mid-water or sunk netting; drift or set netting) as well as the other standardized data the form calls for. The catch per unit of gear and of human effort was calculated as indicated above. Records of 1953 operations, already discussed, were similarly treated for listing in Appendix 19.

Fishing Trials 1954

Mr. Barry made 13 sets in 1954 and 43 in 1955 up to the third week of March—the end of the period covered by this report. These included two mesh-sizes of nylon and several mesh-sizes of tarred cotton nets. In most trials were used as surface drift nets. When they were used as set nets some were usually surface and some sunk.

Indigenous Gear Studies

Whenever possible, Mr. Barry recorded industrial catches by local fishermen in the areas where his experimental fishing was done. Other records of local-type net operations were assembled by the writer. These applied largely to the Colombo district and in their compilation he occasionally had assistance from Fisheries Inspectors and a laboratory attendant.

C. Discussion

1. Field observations confirmed the view of earlier investigators. Gill netting is probably the most highly developed and diversified of Ceylon's major fisheries. Because of this our work on gill netting turned out to be the most involved of all our fisheries survey projects. Because there had been so little previous work, much of our effort was consumed in establishing a basis for study. Some baseline information was assembled (Appendix 19) which shows great variability in catch per unit of effort. For this and for other reasons much more of this work is needed to provide the perspective necessary for sound comparisons and recommendations. But even from what has been learned to date we can delineate some of the main characteristics of the net fisheries.

2. Comparison with herring catches by the North Sea commercial drift net fishery (17 pounds per gear-unit-hour) shows that Ceylon gillnet catches, both commercial and experimental, are low most of the time (usually less than 5 lb.). Off the southwest coast, however, in the period September to March when sprat are running, catches are very good indeed—more than 100 pounds per gear-unit hour.

3. The amount of gear used by the Ceylon fishery is small, averaging less than one unit per man as compared with more than 4 units per man in the North Sea herring fishery. Ceylon landings could be greatly increased by increasing the numbers of nets used but, as Blegvad (1951) suggested, changes of this sort are limited by the low net-carrying capacity of local craft. The writer's impression is that over-crewing of some of the boats is another contributing cause. Until larger boats are available to carry more gear it is unreasonable to expect important improvements in total catches by gill netters.

4. As might be expected from (2) and (3), the catch per man per hour of commercial fishing effort is usually less than 5 pounds as compared with 70 for North Sea herring drifters. If the amount of gear set per man was raised to North Sea standards, the catch per man per hour might be increased four or five times but even then it would be low by comparison, most of the time.

5. A great deal of manual effort is expended in most fishing districts in net-making. Even if part of this work, e.g. the yarn twisting, were done machanically, fishermen could then make more gear, spend more time fishing and thus increase landings.

6. The catch per hour per unit area of gear used was about the same in experimental and commercial fishing. From this we deduce that nettable varieties of fish were either scarce or able to avoid the kinds of nets used. What evidence we have supports the latter deduction. Several times (Appendix 19) nets took nothing in places where there was an abundance of surfacing fish. If net-avoidance by fish is a sight reaction, nylon netting, being more transparent, should give better catches than cotton. Mr. Barry believed that this was the case but his records do not always separate catches by cotton and nylon nets to demonstrate this point as clearly as seems desirable. If net transparency is important then the new monofilament netting which is recently coming into use in some countries should give even better results than nylon in Ceylon because monofilament is highly transparent, durable and requires little maintenance.

7. The gillnet study is still in a preliminary stage. Our data do not show where, when and how the best catches can be made or what advantages new development like monofilament twines may have in tropical waters. Such information could be increasingly useful as mechanized boats that can handle large amounts of gear become more common. But it could also be useful

in present small-scale operations because setting a few gill nets can be and often is combined with other types of fishing like longlining. Improved methods of gill netting could be important in raising Ceylon's fish landings with little extra effort.

Recommendations

The study of the Ceylon gillnet fishery is in its infancy but it has already shown the importance of the industry and some ways in which it can be improved.

It is therefore recommended that the Department of Fisheries should—

1. Continue studies of the commercial gillnet fishery to discover its limitations and potentialities.
2. Continue experimental gillnet fishing trials including tests of newly developed materials and techniques of using them.

MISCELLANEOUS NETTING TRIALS

Trammel Netting

A trammel net is really a pair of nets, one fine-meshed and the other very coarse-meshed, hung face-to-face as a single net would be. Fish striking the fine-meshed net force a pocket of it through one of the meshes of the large-meshed net behind it and in struggling so entwine themselves that they cannot escape. Obviously trammel nets fish in only one direction, i.e. they catch only fish that approach them from the side on which the fine-meshed curtain is spread. Hickling (1951) believed they would work well in Ceylon.

Mr. Barry made several trial sets with a trammel net. These sets are described in Appendix 19 with the results of gill netting. The catches were low but good on the average compared with those of gill nets. Certainly they deserve further trials.

Lift Netting

Lift nets are fine-meshed curtains that are spread out on the bottom or deep in the water, and raised periodically by their corners or sides when fish swim over them. Often they are baited about the middle to improve catches. Lift nets are successfully used in shoal water in many parts of the world—often in rivers where it is possible to set up some system of hoisting levers on the bank which makes the use of a boat unnecessary. A modified form of lift net, used from boats in conjunction with ring seines, is now in use on the south coast of Ceylon for catching small fish for use as bait by hook-and-line fishermen.

Mr. Barry got the idea that a small form of lift net might be used in shallow waters and about wharves and in coves where cast-net fishermen and old men who angle, are often seen at work. He made several trials at the China Bay anchorage near Trincomalee. None of these was successful. The fish carefully avoided swimming over the net even when it was baited, as if they feared it. He believed that if he had had access to different types of webbing and could have dyed it the right colour, as the south-coast Ceylonese fishermen dye theirs, he might have had more success.

The idea has merit and might be used for fishing in freshwater irrigation reservoirs as well as in the sea. It would be worth pursuing this experiment as a side issue when occasion permits.

Lampara Seining

A lampara seine is a long, deep, fine-meshed wall of webbing with floats on the headrope and weights on the footrope. It can be set around a school of fish in shoal water and hauled back into the boat. It is most effective in taking slow-moving fish that " stand " in compact

groups without being too easily frightened by the netting operation. Lampara seining should be done quickly, otherwise the fish are likely to be frightened and escape.

A lampara seine was brought out from Canada as part of the equipment of CANADIAN and NORTH STAR but it was so heavily treated with net preservative that it was too stiff and clumsy to be properly handled. Mr. Pinchin made several sets with it. All were failures but they did show that several species of fish common in Ceylon waters will " stand " in the water while they are being surrounded by a net set from a motor boat. Hickling (1951) recommended trials with lampara seines and the skippers believed from what they saw that lampara seining with a proper net would be rewarding. The trials made by Mr. Pinchin should not be considered effective and their failure should not discourage further efforts.

Purse Seining and Ring Seining

In these operations a long, deep wall of fine or coarse-meshed netting (mesh-size depends on the size of fish taken) is set in a circle about a school of fish. After this, the bottom of the net is closed (pursed) by a draw string so the animals cannot escape. When they have once been closed in, in this fashion, they may be taken into the boat more or less leisurely. In many countries this is a highly productive method of fishing and sonic depth metres are regularly used to locate sizable schools of fish at convenient depths before sets are made. Several tons of fish are often taken at a single setting.

Both CANADIAN and NORTH STAR were equipped with sonic metres and it was thought that such fish as the highly prized pomfret, which schools off the northeast coast of Ceylon in July and August, might be taken in purse seines. A purse seine was accordingly included as part of the equipment of these two boats when they were sent to Ceylon. It was actually a little too large and too fine-meshed for conveninent handling from boats of this size class and it was so stiff from heavy treatment with net preservative that it could not be used. Eventually it and the lampara seine were torn down and built over into mid-water trawls for use in trawl fishing for the same species.

Mr. Barry was convinced from his general observations that some of the fish about Ceylon could be taken in purse seines. He found that schools of pomfret and queen fish would " stand " in the water while he ran around them with a motor boat but being acquainted with the history of the first purse seine he was hesitant to recommend purchase of such an expensive piece of equipment without some further evidence of its probable usefulness. He therefore joined two pieces of $6\frac{1}{4}$-inch mesh nylon netting, 90 by 4 fathoms, along their edges to produce a 90 by 8-fathom wall and equipped it with rings and a purse line along the lower edge and floats along the upper edge. He set this around part of a school of queen fish (Katta) in 5 fathoms of water over smooth sandy bottom off Karaitivu Island at 9.30 a.m., March 1, 1955. He caught 14 fish with an average weight of 10 pounds each. This operation was complete within an hour. Under " Remarks " on his record form he commented that a longer net would have made it possible to take many times this quantity of fish because turning in such a small circle (diameter less than 150 feet) frightened fish within it.

Further trials with this kind of net, especially, with pomfret, seem desirable. If they were at all successful it would seem wise to obtain a coarse-meshed purse seine for full-scale trials of this type of gear for taking such valuable types of fish.

Fishing with Night Lights

Fishermen on the Canadian east coast know that shoals of sardine herring will follow a night light on a small boat and can be led right into a weir from which then can be seined at some conveninent later time. Japanese fishermen take advantage of this behaviour of fish in another way. Schools of fish will come to a boat shining a strong light down into the water and they stay there while they are surrounded by a purse seine or ring seine set by another boat. When a school is thus surrounded and the net pursed, the boat with the light sails outside the

circle of net and the fish are drawn up conveniently. The same principle has been used elsewhere from a single boat with a generator and lead wires running to a powerful electric light supported on a buoy around which a purse seine can be set.

Mr. Pinchin discovered that several species of sprats common on the northwest coast of Ceylon react strongly to night lights even of relatively low intensity and urged night-light fishing trials. Accordingly a powerful buoyed lamp and generator were requested from Canada as part of Colombo Plan Capital Aid. The expectation was that it could be used with the fine-meshed lampara seine or the purse seine from CANADIAN or NORTH STAR.

For reasons explained earlier, it was never possible to make such trials during my term as Fisheries Biologist. The nets were not suitable and no trials were made with the light. Even if nets are not available it would be valuable to examine the night-light reactions of other fish common about Ceylon. Pomfret might be found to behave like sprat and might be taken in Mr. Barry's improvised ring seine. The Ceylonese fishermen do some night fishing with oil lamps and no doubt could supply a great deal of helpful information to anyone who undertook to study this subject. Exploratory trials would be well worth while and could be conveniently carried on from either NORTH STAR or CANADIAN.

Beach Seining Experiments

Mr. Barry was associated for a time with the F.A.O. Fisheries Engineer, Mr. E. Kvaran, in efforts to develop a mechanical hauler for beach seines. This work and the writer's participation in it in association with one of the Department's Research Officers are described elsewhere (Canagaratnam and Medcof, 1956).

DOLPHIN (PORPOISE) HUNTING

Vermin of the Sea

The dolphins referred to here are marine mammals of the family Delphinidae, not the fish *Coryphaena*. Dolphins are often confused with porpoises, which belong to the same family. But dolphins have long narrow jaws that project from the head like the beak of a bird (Norman and Fraser, 1938), whereas porpoises have blunt rounded snouts. This shows up nicely in Figure 1 of the Research Station's Bulletin on commercial utilization of dolphins (Lantz and Gunasekera, 1955). We found two species in Ceylon waters and they were identified by Dr. P. E. P. Deraniyagala, Director of National Museums, Ceylon, as the common dolphin (*Delphinus delphinis* L.), and the bottle-nosed dolphin (*Tursiops* sp.).

To fishermen, both species are vermin of the sea. Early in his stay in Ceylon Captain Wm. Mitchell carried on a good deal of fish inspection and experimental fishing for the Department from HALPHA. In the manuscript report he filed with the Department of Fisheries in 1950, he described how some kinds of hook-and-line fishing suddenly come to an end when groups of dolphins appear on the scene. They frighten and drive off the schools of fish.

Dolphins are generally seen in the deep water along the edge of the continental shelf chasing schools of the small fish they feed on. However, when the fish schools move inshore, dolphins sometimes follow and get caught in beach seines along with the fish in quite shoal water. In 1953 I collected the skulls of several bottle-nosed dolphins taken in this way on the central west coast about Karaitivu Island and discussed my finding with the Steering Committee. Dolphins will attack netted fish and I often saw Negombo fishermen repairing gill nets torn by dolphins (Fig. 6). Captains Homer and Babcock reported damage to their drift nets set at night off the east coast in August 1953. At first they believed this was caused by sharks but later attributed it to dolphins which abounded there then. They reported sighting schools of hundreds of these animals in places where " feed " patches (presumably small fish) showed up on the recording tape of their sonic depth meter.

Dolphin and Porpoise Hunting in other Countries

According to Dr. H. D. Fisher, of the Arctic Unit of the Fisheries Research Board of Canada, dolphins and their close relatives, the porpoises, are hunted commercially in several countries. Norway has a sporadic fishery for the striped dolphin, *Lagenorhynchus* sp., and there are established fisheries for two species off the Canadian east coast—for the black fish, *Globicephala melaena* (Traill), and the beluga, *Delphinapterus leucas* (Pallas). These are used as food and in preparing oil and "fish" meal. On the Canadian Pacific coast, efforts have been made to popularize the flesh of another species which has been marketed under the trade name, "porp". However, Japan prosecutes by far the greatest of all such fisheries. It depends largely on a combination of shot-gun shooting and harpooning of three species by 20-30 ton motor craft with crews of about 10 (Wilke *et al*, 1953). The annual movements of these animals have been studied and there are well recognized winter and summer fishing grounds. These authors list no records of catch per unit of effort that would be helpful in judging what might be expected from similar operations conducted about Ceylon. But, their description is that of a vigorous industry.

Use of Dolphins in Ceylon

When I collected the skulls I learned that dolphin flesh is eaten in fishing communities on the central west coast of Ceylon where these animals are occasionally taken in beach seines. It is not regarded as high-quality meat but it is considered wholesome and acceptable by the many who use it in either the fresh or dried state. Captain Homer was intrigued with the idea of developing a fishery and believed that considerable quantities of the meat might be marketed regularly if it were properly handled and processed.

From all this, the Steering Committee decided to carry out a preliminary survey of possibilities of exploiting Ceylon's dolphin stocks and methods of processing. The work was shared by several but it was Captain Homer's interest and enthusiasm, vigorously supported by Mr. Lantz, which were largely responsible for whatever success was achieved.

Fishing Trials

Captain Homer's first trials were in October 1953. He rigged standard-type, east-coast, North American swordfish harpoons and built a forward-projecting "pulpit" into the bow of CANADIAN for the harpooner to stand on while thrusting or casting his harpoon. This was necessary because dolphins seldom come alongside a boat (They usually swim just ahead of it.) and because it is awkward to handle the long-shafted harpoon from the boat proper. The mast, stays and other boat rigging are in the way. This gear and method of fishing are described by Lantz and Gunasekera (1955).

The October 1953 operations described by Lantz and Gunasekera were encouraging and Captain Homer rigged more harpoons and put them aboard two other Department boats—NORTH STAR and SEER. Besides this, several harpoons were distributed in the Negombo district to oru fishermen who had become interested during demonstration cruises on CANADIAN.

Most of this harpooning was combined with other types of fishing. In some cases (e.g. when netting) it was impossible to break away for dolphin hunting for long periods but when a school was sighted the boat gave chase for an hour or two. In other cases (e.g. when trolling) it was possible to search steadily for long periods ready at all times to haul the gear and go dolphin hunting for as long as this proved rewarding. As a result our records (Appendix 20) provide rather inconsistent ideas of catch per unit of effort that might be expected for a boat engaged in dolphin hunting only. Partly to offset this, a good many of the skipper's log book comments have been entered in the appendix.

The 1953 records were encouraging so the Steering Committee decided that the work should be continued on this same basis in 1954.

For some time the skippers did not realize that both species of dolphins were common about Ceylon because only the common dolphin was taken in the early trials. However, several bottle-nosed dolphins were captured in January 1954. They are large animals. Many weighed more than 200 pounds and some were judged to weigh more than 400 pounds. The more handsome, black-and-white, common dolphins were much smaller with average weights of about 80 pound. This is a low weight for the species (Norman and Fraser, 1938) and we wondered whether our animals were immature or a small variety of the species.

Although many of the weights reported in Appendix 20 are estimates only, it is nevertheless possible to make shrewd guesses as to which species was taken on the various hunting trips. The highest number captured in one day's operation was 28. These were taken off Colombo on December 2, 1953. The heaviest day's catch (3,260 lb.) included only 20 animals but comprised a higher proportion of the larger bottle-nosed dolphins. This catch was taken January 14, 1954, between Colombo and Barberyn.

The oru fishermen to whom harpoons were given had no success but their efforts were not very determined. They reported that their sailing craft were not sufficiently manoeuverable for effective harpooning. And it must be admitted that dolphin hunting demands nice control of boat movements.

Scaring Dolphins from Fishing Areas

After he had been harpooning for several days out of Colombo in December 1953 Captain Homer reported that the schools of dolphins were harder to approach than at first. He believed that the animals had learned to fear the boat. This, he argued, made harpooning less rewarding because the animals could swim faster than CANADIAN could travel even at full throttle, and because the most successful hunting is done at slower, quieter cruising speeds.

Although this was discouraging to Captain Homer whose interest was in harpooning, his observation was encouraging from another point of view. It suggested that dolphins can be frightened away from a fishing area and thus relieve harassed gillnetters and other fishermen. Insufficient work was done to encourage serious hopes that this can be an effective remedy for the " vermin of the sea " problem. But this idea deserves closer examination. It may be that the animals naturally travel faster and are harder to approach at some seasons than at others. They may not have been frightened by the boat and the harpooning.

Prospects for Industrial Development

The records show that once dolphins had been sighted and the hunt had begun, the poundage catch per hour of boat operation (105 lb.) and per man-hour of fishing effort (26 lb.) was higher than that in several other fisheries in which trials were carried out. Besides this, general observations showed that during the normal fishing seasons off the east, central-west, south-west and south coasts, large numbers of these animals are regularly encountered. Schools of 500 or more were sighted on numerous occasions. This means that dolphin hunting might be possible the year round as it is in Japan.

The fishing done so far does not permit a proper assessment of the possibilities. It is only an encouraging beginning. Before abandoning the idea that harpooning may be done from orus an experienced harpooner should make several trips on these boats and carry out determined and exhaustive trials. Beginners in any fishery often fail even under the very best fishing conditions. Besides this, it should be remembered that in Ceylon there has so far been no test of using guns as well as harpoons to increase the catch. Dolphin hunting deserves further attention. It may be that Ceylon's heavy imports of fish could be cut down by developing this resource. If dolphin hunting is practicable here it seems likely, from what has been done, that it should be combined with some other fishing operation like gill netting to be economic.

If the potentialities are great it would be worth while to make a sustained effort to develop a market. Consumer acceptance of a new product is not easily generated and much depends on how the product is processed and presented. It might be best to make marketing trials on the central-west coast where dolphin flesh is already used to some extent.

Recommendation

In view of the encouraging results of preliminary trials it is recommended that the Department continue this survey of possibilities of a dolphin fishery.

" MOTHERSHIP " OPERATIONS

The term " mothership fishing " implies different operations in different places. In Ceylon the term was apparently devised by Dr. John in the late 1940's when he held office in the Department of Fisheries, and later used by Kesteven (1951). Both referred to the use of motorized craft, usually of small size, for towing sailing and oared boats to fishing grounds that are otherwise accessible only to mechanized craft.

Early Trials

Mothership operations in this sense have been extensively tested by the Department using its own motor craft such as HALPHA and SEER and even the trawler, RAGLAN CASTLE. The fishermen involved have usually been handliners but sometimes bottom long-liners. In some cases they were employees of the person who engaged the mechanized boats and in other cases, members of co-operative societies that rented them. Occasionally catches have been good or very good (Appendices 12 and 13) but on the average the catches per unit of total effort have not been phenomenal if the long slow hauls to and from the fishing grounds are taken into account. This discouraging feature of the operations is not represented by the appendix entries which describe only on-the-grounds results or by the glowing public accounts in support of mothership fishing (Anon, 1953).

1953 Trials

In October 1953 the Steering Committee decided to conduct mothership trials off Negombo and Captain Homer undertook the work with CANADIAN. His report on the operation, which involved 2-man teppams, reads very much like those filed with the Department by Captain Mitchell and others who carried out similar earlier assignments towing various kinds of local craft—vallams, katumarams and teppams. An excerpt from Captain Homer's report describes what is actually involved—

" At 0100 hours, October 9, five teppams put out from the beach and came alongside us. We made them fast to our towline and got under way at 0130 hours and proceeded in a WSW direction. We experienced considerable difficulty and delays with broken lines by which the teppams had attached themselves to our towline.

" At 0415 hours we stopped in a position approximately 8 miles W × S of Negombo, the depth being 13½ fathoms. The teppams then put out their drift nets for the purpose of catching bait. At daylight they hauled their nets and started handlining operations. At 0700 hours one teppam caught two sailfish, weighing approximately 20 pounds each, the other boats getting little or nothing. At 0730 hours the five teppams requested to be moved two or three miles to the westward, which was accomplished by 0820 hours. We noticed a few schools of porpoise in the vicinity and rigged a hand harpoon and took 2 of them.

" At 1040 hours the five teppams wished to return to Negombo and we arrived there at 1330 hours and anchored and the teppams went ashore. The catch was—1 teppam (2 sailfish) 40 pounds; 4 teppams, average catch, 10 pounds each; total weight—80 pounds.

" That night the weather conditions were still good, but the ground swell had increased considerably. At 0200 hours, October 10, we were approached by 11 teppams and at 0240 hours left Negombo with them in tow and proceeded at slow speed (2 or 3 knots) in a WSW direction, experiencing much difficulty with breaking lines, due to the heavy swell. Shortly after leaving, 4 teppams gave up the struggle and dropped astern.

" At 0635 hours we arrived at a position about 5½ miles WSW of Negombo and the 7 teppams threw out their nets as before and started handlining operations at daylight. CANADIAN started trolling with surface jigs, with no success. At 0740 hours we moved 4 of the teppams a few miles to the north, and at 11.30 hours picked up the 7 teppams and started towing them towards Negombo, again experiencing considerable difficulty with the heavy ground swell, two fishermen being thrown entirely clear of their teppams and swimming back to them when we stopped. By 1400 hours we were within 1 mile of Negombo and the sea breeze having freshened we cast off the teppams which proceeded to the beach under sail. The catch, as on the previous day, was very small, possibly averaging 10 or 15 pounds per boat.

" Comments and recommendations. Captain Babcock and I would like to point out that in our opinion even if the amount of fish caught warranted the services of a comparatively large and powerful vessel, it is very doubtful if the amount of boats necessary to the success of such an operation could be towed under average open-ocean conditions. It would appear that the only feasible operation would entail the rigging out of a large vessel (65' or more) with standard-type, one or two-man dories. The vessel, with the dories nested on deck, would then be able to proceed to more distant and possibly more lucrative grounds than the shore-based or " day " fishermen are now able to reach."

Critique of Mothership Operations

The Steering Committee asked for the critique of mothership operations which follows.

Economics. Analysis of Captain Homer's report shows that only about 30% of the time at sea was spent in actual fishing (handlining). The catch per hour of actual handlining was approximately 2 pounds per line. If the catch is expressed as pounds per man per hour at sea, it amounts to slightly more or slightly less than a half pound depending on whether or not the time of the crew of the " mothership " is included in estimating the effort involved. These rates are low but many handliners operating independently fish at about this rate as Appendix 12 shows.

The obvious conclusion from this and similar operations in Ceylon is that oridinarily mothership operations have not paid. This would seem to account for industry's lack of interest in private ownership of motherships. The trouble seems to be that fish were not abundant on the grounds visited and that towing speeds are too low to permit visits to better-stocked areas which are still further from shore. Mothership operations do not provide the solution to the difficulty. Captain Homer's suggestion that dory fishing be adopted to increase the range of operations is in effect a recommendation that mothership operations be dropped. If a fishing ground were extra-ordinarily rich and close to shore it might be economic to carry on with the present scheme but it has not been clearly shown that such areas exist. This picture may alter if present trials of surface and bottom longlining are fruitful.

Even under ideal fishing conditions the scheme will not work unless there is good co-ordination of efforts by operators of motherships and crews of fishing craft. This was achieved at the fishing village of Negombo during the two trips made by Captain Homer but in some of the operations described in earlier reports filed with the Department, fishermen have had to assemble from wider areas and co-ordination was difficult. This sometimes resulted in long and irritating delays both in port and on the fishing grounds that cancelled out the advantages of motorization and the higher catch-rates realized on the distant grounds.

It is pointless to say that this should not discourage development of the scheme. It does. Fishermen the world over are instrinsically independent. They are unlikely to be co-operative with motherships operated by other people and if they own a motor boat or if they are paying rent for one they will want to sail in it—not be towed by it

Industrial leaders have shown little interest in buying mothercraft of their own although many of them are financially able to do so. The long continuation of these trials by the Department is regarded in some quarters as foolish or patronizing to fishermen, or both. There is justification for these views because the cost to the Department of operating the mothercraft has generally exceeded the rental fee levied on the fishermen and because some of the fishermen have stated that it would not pay them to engage Departmental mothercraft if the service fee were increased.

Another and important reason for questioning the wisdom of continuing these trials is that many fishermen are likely to own motorized craft of their own before many years. When this comes about they will no longer be interested in motherships. When there are so many useful tasks that could be undertaken it would be better for the Department to try to produce results of more lasting economic value than mothership operations seem likely to provide.

Hazards. A feature of the whole operation to which the Department has not given just weight, is the safety factor. Whether fishermen and Departmental officers are conscious of it or not, a fisherman assumes, when he makes fast to the mothership tow line, that the Department is accepting responsibility for his safe passage to and from the fishing area. This assumption persists regardless of the terms of any contract under which the operation may be conducted. Fortunately there have been no fatalities so far but there have been several accidents such as that reported by Mr. Homer. In one case (March 1950) a boatload of fish was lost and the boat and crew almost lost. How easy it would be for a fisherman or several fishermen to be washed overboard and drowned in the dark of night on a rough sea with the mothership motor creating such a noise that cries for help could not be heard! Legally and morally, the Department of Fisheries could scarcely evade responsibility for such happenings. And by carrying on regular mothership operations it is constantly exposing itself to possible incrimination for loss of life through sea accidents that keep recurring. One fatal accident could so damage public relations as to jeopardize not only mothership schemes but many other departmental programs as well.

Realizing, this, fishermen have sometimes been taken aboard the mothership during the trip to and from the fishing grounds. But there is not always room to accommodate them.

Psychology. Another weakness of this operation and certain others that the Department has undertaken, is its tendency to destroy the sturdy independence which is a necessary characteristic of any successful fisherman. Some are inclined to scoff when this is suggested as a serious consideration but in the long run it is not trivial. Cultivation of a healthy psychological attitude among fishermen is as important as keeping them supplied with up-to-date information about fishing methods. Keeping them standing about on beaches waiting for tows to fishing grounds that may not be of their own choosing is not the way to encourage the spirit of enterprise that is necessary to the full development of Ceylon's fishery resources.

Summary

1. The Department of Fisheries has engaged in mothership operations since the late 1940's.

2. Maximum towing speeds of most indigenous fising craft are low, and co-ordinating operations of several craft is difficult. These two factors involve such great time losses that the really good off-shore fishing grounds are often inaccessible to the fishermen involved in the operations.

3. In most cases, costs to the Department of mothership operations have exceeded the service charges it has levied and industry feels that it cannot afford to pay the full operation costs. Furthermore, industry has shown little interest in purchasing motherships of its own.

4. There is not always room for all the fishermen to go aboard the mothership and towing operations are hazardous to the lives of fishermen who travel on the boats being towed.

5. Mothership operations are patronizing to fishermen and not likely to stimulate the enterprise and resourcefulness which is needed for vigorous development of this nation's fisheries.

6. Mothership trials have been carried on long enough to show their severe limitations and it seems pointless for the Department to continue using its boats in this way unless better reasons can be found for continuing the effort.

Recommendation

From results of 1953 and earlier trials and from points raised in this critique, it is recommended that the Department engage in no further mothership operations.

GENERAL DISCUSSION

A New View

This fisheries survey has provided a semi-quantitative description of some of Ceylon's fisheries. It is not a complete description and it cannot be completed without several more years' work. Nevertheless it does permit sound comparisons between our operations and well-known fisheries of other countries. The comparisons provide much needed perspective for critical thinking about the potentialities of Ceylon's fisheries and this may prove to be the most useful result of the survey. Without such a background it is impossible to weigh the possible importance of undertakings that are proposed or to judge the worth of results of projects that have been completed.

From this background we can now see the positive value of much advice given by earlier visitors. Hickling (1951) and Kesteven (1951) suggested that analysis of Wadge Bank trawling records would discover ways of improving and developing the trawl fishery. This was a most useful suggestion as the section, " Critique of the Wadge Bank trawl fishery ", clearly shows. It also shows that some earlier advice was not so useful; e.g. advice favouring mothership operations and advice against bottom longlining (John, 1951). From the fishery survey results the Steering Committee decided on opposite courses.

Recommendations

Besides providing orderly descriptions of the industry, comparisons with other fisheries and assessments of earlier advice, the survey has brought forth new recommendations on how some fisheries may be improved and on why efforts to improve others do not seem worth while. These recommendations, which are presented at the close of each section of the report, are better founded than many of those Ceylon has received previously. This is because, from the very beginning, the Canadian team had as a guide the information and advice proffered by former visitors to the Island, advice from the Steering Committee and constant help in experimental fishing from well-informed fisheries officers, research officers, departmental boatmen and F. A. O. workers. The Canadian team had another important advantage. It was able to work and think for a much longer period in Ceylon than most earlier advisers. This gave them access to more information about the industry and opportunity to test and mature opinions before advancing them as recommendations. It is hoped that these recommendations will be useful.

Generalizations

In the course of the survey the Canadian team arrived at certain general conclusions about Ceylon's fishing and fisheries. These deserve a place in this report because they may be useful in dealing with problems of the industry and the Department, especially where expansion is being considered.

Fish abundance. The first conclusion is that Ceylon's inshore waters are not everywhere " teaming with fish " that await all fishermen who acquire mechanized boats. This is supported not only by the generally low catches per unit of fishing effort but also by other indicators of

fish scarcity frequently remarked on by the skippers. One was the scarcity of fish-eating birds on Ceylon's marine fishing grounds. In northern areas fishermen, especially net men, watch the behaviour of flocks of birds like gulls and terns, to determine where to fish. The theory behind their thinking is " no birds, no fish ". The skippers believed that this theory applies not only to Canadian waters but to Ceylonese as well. And in Ceylon, birds are scarce. They believed the scarcity of birds indicated a general scarcity of fish about the Island except perhaps in lagoons.

Another subject of comment was the remarkable clarity of the water at most times. This generally accompanies a scarcity of small mid-water plant and animal organisms (plankton) which serve as fish food. Where these are scarce, heavy fish production is usually not realized.

From these considerations it appears that Ceylon's shoal-water fishing grounds are not only limited in extent as John (1951) has stressed, but that they are also scant producers of fish. Accordingly, those responsible for guiding fisheries development must not expect too much from the inshore marine areas in arranging programs for expanded production. We believe, although John (1951) did not, that they should direct a considerable part of their attention to waters beyond the continental shelf and possibly to the inland fresh waters.

Fishery regulations. Another conclusion of importance to administrators is that at this stage it would be unwise to introduce legislation such as specification of minimum mesh-size of fishing nets, with the object of conserving breeding stocks of marine species. This is especially true for migrant species taken by beach seines because only a small percentage of their stocks is vulnerable to attack by Ceylon fishermen. Contrary to a belief (Roughley, 1951. see p. 147.) that is popular here, there is usually nothing wrong, either theoretically or practically, with catching juvenile fish (fish that have not spawned) if they are not wasted. In Ceylon even the smallest fish in the catches are normally carefully collected and used as food. So far there is insufficient information to justify regulations restricting their use. Experience in other countries has shown that when regulations are introduced without proper study, they usually do more harm than good.

Essential work of the Department. Many people, including fisheries officers, expressed the opinion that the Department has involved itself too much in the fishing business. It buys and sells fish and fishing equipment, salt, rice and a number of other commodities and engages extensively in actual fishing, e.g. in trawling and pearl fishing. Much of the Department's thinking is occupied with these matters thus reducing its opportunities to cope with the essential problems of fisheries management and development. Much is being done but more is needed. The simplest way to increase usefulness without increasing staff is to curtail non-essential programs.

To decide where energy should be directed it is important to discover what it is that fishermen need most to become better fishermen. In other words, it is as important to study fishermen as it is to study fish because the fisheries depend on both. A development program should be as clearly related to fishermen's practices, needs and philosophies as it is to fish migration cycles and gear efficiency problems.

Modernizing Thinking. The Department's staff needs fuller opportunity for self education in the theory and practice of management and for the vital work of liaison with industry if it is to be effective in fostering development. Modernized ways of thinking are needed just as much as modernized ways of fishing. Ideas can aid development but they can also impede it if they are not challenged. Most people think, for instance, that when the south-west monsoon is blowing fishing is automatically poor on the coasts exposed to it and that it is not worth while fishing on the north-east coast when the north-east monsoon is blowing. This idea seems to hold for the beach seine fishery and for fisheries conducted by indigenous craft. But the fisheries are changing rapidly with mechanization and it would be wrong not to change our thinking to keep pace. Traditional thinking on all aspects of fishing

should be challenged. Many of the generally accepted ideas will prove to be well grounded. But others, like that about monsoons, will be found weak. Trawling records demonstrated that during the north-east monsoon it is possible to make good catches on the Pedro Bank off the north-east coast and that catches on the Wadge Bank are best during the south-west monsoon It is quite possible that other types of fishing like bottom longlining from mechanized craft could be equally successful in many areas during what are now considered to be the " off " seasons.

A further example of how traditional thinking limits vigorous development is the tendency of many fishermen to consider themselves specialists. They participate in one or a few branches of the fisheries and disregard opportunities for increasing earnings by diversifying their activities. Whole communities consider themselves teppam men. They use handlines and certain types of gill nets but they will not venture to do other types of fishing. Other communities are weir fishermen and feel they can do nothing else. They can learn to diversify their activities so as to make full use of every resource available to them. Indeed with popular education they are diversifying and the Department can and is hastening this process by its publications and training programs so that fishermen may achieve their greatest usefulness in national life. It might be hastened still more if government were to abandon the kind of patronizing assistance that keeps old fishing and marketing methods alive long after they have outlived their usefulness. This might seem cruel, but clear thinking tells that in the long run it would be kind.

Appraisal of Survey Results

The survey has accomplished much considering that it extended over only two years. These were two years of persistent work often in the face of difficulties—lack of experience and information, inability to converse with fishermen in their own language, delays in obtaining needed equipment and, in some projects, lack of sympathy (understanding). The survey has been criticized in some quarters, as over-empirical and in others, as over-studious. Some critics argued, for instance, that the program should have included much more demonstration to and instruction of fishermen. It must be pointed out, however, that any survey must go on for some time before the potential industrial usefulness of any new method or device can be sufficiently established to justify its demonstration to industry. This stage is just being reached in bottom longlining and it is hoped that demonstrations and instruction will be properly executed in this and other kinds of fishing in due time. In the meantime, investigations must continue. The approach we took to our work not only made good sense to us but it was what was called for in our contracts—a broad approach to the fisheries problems including a mixture of trial fishing and research that would lead to useful recommendations for development.

Some persons with whom I have discussed the survey results were inclined to belittle them as " more advice from visiting experts that are putting in time ". From lack of serious thought they expected to see a full-blown, modern fishing industry in Ceylon after our two years' work.

Science has been able to create dramatic changes in fields like radio and television communication through the activities of small numbers of highly trained people. We take important advantage of these changes but they are mysterious to most of us and science is often regarded as a modern-day witchcraft capable of working similar changes in any field including the fisheries. Science will bring about great changes in the fisheries of Ceylon but there will be nothing mysterious about them when they come and they will be slow coming. The reason is that the changes must be comprehensible, at every stage, to unschooled fishermen. And the pace of science in leading the developments must be regulated by the rate at which the every-day habits of thousands of people can be changed by hard work on the part of those who undertake to change them. Bertram (1948) has nicely expressed this in his sober but optimistic advice to South-East Arabia, that " .....very slow returns in genuine development, result from extensive, and expensive, years of demonstration and urging of new and improved methods of fishing and cultivation, but under wise guidance, the changes do come in the end "

Fortunately, many who are guiding Ceylon's fisheries development appreciate Bertram's point of view. They must see to it that it is more generally appreciated and address themselves to the task ahead.

The Task Ahead

It must appear from preceding sections of this report that many of Ceylon's fishermen are not " pulling their own weight " as citizens of the country. Blegvad (1951) commented on their very low catches. According to his estimate the catch per man per day in a 365-day year averages between 4 and 5 pounds. If correct, this is a very low value even when compared with catches in poor fishing areas like the western Arabian Sea (Bertram, 1948). The records assembled during the fisheries survey suggest that Blegvad was not far wrong.

It appears that a man on a trawler on the Bear Island fishing grounds of northern Europe catches more fish in one day than the average Ceylonese fisherman catches in a whole year. The Ceylonese fisherman is not to be blamed. He is in a dilemma not of his own creation. But no reasoning person would suggest that this meagre service to the nation by 50,000 fishermen is a reasonable exchange for costly and elaborate public services the Ceylon fisherman expects and gets—good roads, cheap public transportation, police protection and schooling and health services for his children. No country can afford such a waste of man power as that which is going on now in Ceylon's fishing industry. Fishermen must become independent, not dependent.

Administrators must be awake to the enormity of this problem and vigorously attack it. Their first task is to clarify their own thinking. They must have a clearly recognized aim. Again, Bertram (1948) has probably described what this aim should be, better than anyone else, when he said the " important objective in any fishery development is the emergence of the fisherman, as an individual and as a class, as an active, contented and independent member of the community. So, ultimately, will his efforts help in the attainment of higher standards for all ".

Administrators will not attain this goal quickly or easily. Importing a few boat engines will not take them far towards it. Real progress requires the severest criticism and modification of present policies and programs and redirection of effort. Continuing with the present set-up, patching it up here and there to keep it in operation, will never do. There must be straight-line thinking, drastic decisions and drastic action, sometimes with disregard for present comforts of fishermen in the interest of their long-term betterment.

Many people, including some administrators, are guilty of thinking in circles. They praise mechanization of fishing craft and in the same breath say that every step must be taken to avoid throwing fishermen out of work. If progress is worth striving for, all must be willing to suffer the pains of progress. If administrators practise straight-line thinking they must come to the conclusion that no more people should engage in the fishing industry than can earn a good living at it so that each man's contribution is significant and that fishermen should not continue to be wards of the state as some maintain they are today. Ceylon probably has at least twice as many fishermen as it should have even under the present condition of the fisheries. After mechanization of fishing craft gets under way and fishing becomes a more competitive business, many fishermen will find it impossible to maintain their present positions in their profession. Unless large numbers of them find new niches in undeveloped sections of the fisheries, like fishing in tanks (irrigation reservoirs) they will be thrown out of work. They will have to leave fishing all together as, indeed, many are leaving right now—a healthful sign. As this goes on, administrators must cease to think of these people as " poor fishermen " requiring patronage which would maintain them indefinitely in an impoverished state. Instead, administrators should think of them as potentially important contributors to the development of other industries.

If this clear view is adopted, attention can then be intelligently directed to the proper development of the fishing industry. Partial answers to how this can be achieved (sufficient to serve as a working basis) are given in earlier sections of this report. There is no need for recapitulation here.

Implementation of this advice would be relatively easy under the ideal system postulated by Hickling (1954) where people—all people—earnestly desire the change which in the overall picture seems necessary. The change in Ceylon's particular case is the industrial revolution of the fishing industry and the conditions under which it must take place are not of the ideal sort Hickling referred to. There are indications that parts of Ceylon's fishing industry will offer short-sighted opposition to innovations. They may like motors but they will not like to handle more gear and many who do not get motors will not take kindly to entering other industries when they find they cannot compete with those fishermen who do mechanize their operations.

Opposition may also come from some "middle-men"—net and boat owners and fish dealers—who may fear that they will be forced out of their business which now requires an abundance of low-paid labour. Middlemen are quite indispensible to a vigorous fishing industry and the competent ones should be able to adjust their methods and maintain their positions and interests. The Department will be wise to cultivate the closest liaison with middle-men and win their sympathy so as to have their support, step by step, in bringing about the needed changes. At the same time administration must create an atmosphere that will encourage that ambition among fishermen by which they will improve their performance as fishermen or find other employment that will provide them a better livelihood.

Guiding the fishing industry through this trying transition period will not be an easy task. The difficulties are not decreasing. They are increasing year-by-year because Ceylon's rapid population growth creates that vicious circle of problems such as De Castro (1952) and others have described as common to large sections of the world today. Even maintenance of present standards will require a supreme effort and betterment will demand the most careful co-ordination of every ounce of energy that can be brought to bear on the problems of development and developmental research.

Some outside assistance may be counted on but it is easy to over-estimate its value. In the long haul, progress will be proportionate to the extent to which the Department's own staff devote themselves to that task of constantly acquiring and applying new knowledge, skill and self-reliant working philosophies. The work of fisheries development will never end.

Judging from the physical results of this fisheries survey, the outlook for Ceylon's fisheries development need not be dismal. But under almost any conditions it will be dismal unless the open-minded, far-sighted, honest and unselfish members of the Department and industry co-operate vigorously.

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APPENDIX 1

SUMMARY OF 1953 TRAWLING OPERATIONS BY MAPLE LEAF (BOSTON ATTACKER) ON WADGE BANK OFF SOUTH COAST OF INDIA

Year and Trip No.	Dates: Sailing	Dates: Landing	Days in Port (no.)	Days at sea (no.)	Days fished (no.)	Days fished/ Days at sea %	Hours trawl was towed	Catch/ Trip (lbs.)	Catch/ Day at sea (lbs.)	Catch/ Man/Day at sea (lbs.) (1)	Catch/Hr. fished (lbs.)	Catch/Hr. towed (lbs.)
1953												
1	June 10	June 22	8	12	11	92	202	131,177	10,931	390	497	649
2	June 30	July 10	4	11	10	91	148	99,911	9,083	324	416	675
3	July 14	July 24	5	10	9	90	158	87,020	8,702	311	403	551
4	July 29	Aug. 10	9	12	11	92	146	169,496	14,125	504	642	1,061
5	Aug. 19	Aug. 28	20	9	8	89	120	72,555	8,062	288	378	605
6	Sept. 17	Sept. 29	6	12	11	92	205	96,717	8,060	288	366	472
7	Oct. 5	Oct. 16	5	11	10	91	177	102,039	9,276	331	425	577
8	Oct. 21	Oct. 30	8	9	8	89	148	47,977	5,331	190	250	324
9	Nov. 7	Nov. 17	4	10	9	90	158	55,968	5,597	200	259	354
10	Nov. 21	Dec. 2	6	11	10	91	161	121,406	11,037	394	506	754
11	Dec. 8	Dec. 21	10	13	12	92	220	77,503	5,962	213	269	352
	Total (6·7 months)		85	120	109	—	1,843	1,061,769	—	—	—	—
	Average/month		12·8	17·8	16·2	—	275	158,473	—	—	—	—
	Average/trip (from pooled data)		7·7	10·9	9·9	91%	168	96,524	8,849	316	405	576

(1) Total crew of MAPLE LEAF (Officers and men) 28.

APPENDIX 2

SUMMARY OF 1954 TRAWLING OPERATIONS BY MAPLE LEAF (BOSTON ATTACKER) ON WADGE BANK

Year and Trip No.	Dates: Sailing	Dates: Landing	Days in Port (no.)	Days at sea (no.)	Days fished (no.)	Days fished/Days at sea %	Hours trawl was towed	Catch/Trip (lbs.)	Catch/Day at sea (lbs.)	Catch/Man/Day at sea (lbs.)	Catch/Hr. fished (lbs.)	Catch/Hr. towed (lbs.)
1954			14									
1	Jan. 15	Jan. 27	6	12	11	92	206	70,237	5,853	209	266	341
2	Feb. 2	Feb. 12	27	10	9	90	174	91,072	9,107	325	422	523
3	Mar. 11	Mar. 22	7	11	10	91	187	61,170	5,561	199	255	327
4	Mar. 29	Apr. 5	10	7	6	86	114	37,796	5,399	193	262	332
5	Apr. 15	Apr. 26	7	11	10	91	184	98,236	8,931	319	409	534
6	May 3	May 12	26	9	8	89	147	74,869	8,319	297	390	509
7	June 7	June 12	4	5	4	80	64	50,006	10,001	357	521	781
8	June 16	June 28	4	12	11	92	204	127,752	10,646	380	484	626
9	July 2	July 10	5	8	7	88	122	88,995	11,124	397	530	729
10	July 15	July 26	7	11	10	91	188	121,475	11,043	394	506	646
11	Aug. 2	Aug. 13	7	11	10	91	182	158,106	14,373	513	659	869
12	Aug. 20	Aug. 31	10	11	10	91	165	141,385	12,853	459	589	857
13	Sep. 10	Sep. 22	33	12	11	92	194	132,655	11,055	394	502	684
14	Oct. 25	Nov. 5	5	11	10	91	175	47,144	4,286	153	196	269
15	Nov. 10	Nov. 22	4	12	11	92	179	43,485	3,624	129	165	243
16	Nov. 26	Dec. 6	5	10	9	90	162	36,839	3,684	132	171	227
17	Dec. 11	Dec. 23	9	12	11	92	210	87,410	7,284	260	331	416
	Total (12 months)		190	175	158	—	2,857	1,468,632	—	—	—	—
	Average/month		15·8	14·6	13·2	—	238	122,386	—	—	—	—
	Average/trip (from pooled data)		11·2	10·0	9·3	90%	169	86,390	8,392	300	387	514

APPENDIX 3

SUMMARY OF 1951 TRAWLING OPERATIONS BY (BOSTON ATTACKER) MAPLE LEAF OFF THE WEST COAST OF SCOTLAND

Year and Trip No.	Dates: Sailing	Dates: Landing	Days in port (no.)	Days at sea (no.)	Days fished (no.) (1)	Days fished/ days at sea %	Catch/trip (lbs.)	Catch/ day at sea (lbs.)	Catch/ Man/day at sea (lbs.) (2)	Catch/hour fished (lbs.)
1951										
1	June 1	June 13	18	12	8	75	35,980	2,998	200	188
2	July 1	July 16	2	15	11	73	137,620	9,175	612	521
3	July 18	July 23	2	5	1	20	119,700	23,940	1,800	4,988
4	July 25	August 1	2	7	3	43	104,160	14,880	992	1,450
5	Aug. 3	Aug. 13	3	10	6	60	97,440	9,744	650	676
6	Aug. 16	Aug. 27	3	11	7	64	52,640	4,785	319	313
7	Aug. 30	Sept. 15	3	16	12	75	62,160	3,885	259	216
8	Sept. 18	Oct. 2	29	14	10	71	68,880	4,920	328	286
9	Nov. 1	Nov. 14	3	14	10	71	76,860	5,490	366	318
10	Nov. 17	Nov. 29	2	12	8	75	72,940	6,078	405	379
11	Dec. 1	Dec. 15	3	14	10	71	55,300	3,950	263	231
12	Dec. 18	Dec. 31		13	9	69	44,100	3,397	226	204
	Total (7 months)		70	143	95	—	927,780	—	—	—
	Average/month		10·0	20·4	13·6	—	132,540	—	—	—
	Average/trip (from pooled data)		5·8	11·9	7·9	67%	77,315	6,488	433	407

(1) Actually these are days on the fishing grounds but they are treated here as identical with days fished.

(2) Total crew of " Boston Attacker " (officers and men) 15.

APPENDIX 4

SUMMARY OF 1952 TRAWLING OPERATIONS BY BOSTON ATTACHED (MAPLE LEAF) OFF THE WEST COAST OF SCOTLAND

Year and Trip No.	Dates: Sailing	Dates: Landing	Days in port (no.)	Days at sea (no.)	Days fished (no.)	Days fished/days at sea %	Catch/trip (lbs.)	Catch/day at sea (lbs.)	Catch/Man/day at sea (lbs.)	Catch/hour fished
1952										
1	Jan. 5	Jan. 21	5	16	12	75	31,640	1,880	125	110
2	Jan. 24	Feb. 6	3	13	9	69	133,840	10,290	686	619
3	Feb. 9	Feb. 23	3	14	10	72	141,820	10,130	675	591
4	Feb. 28	March 15	5	16	12	75	128,380	8,025	535	446
5	March 25	April 7	10	13	9	69	82,880	6,360	425	383
6	April 9	April 23	2	14	10	72	67,620	4,830	322	282
7	April 27	May 10	4	13	9	69	93,660	7,205	480	433
8	May 13	May 28	3	15	11	73	92,540	6,170	411	351
9	May 31	June 14	3	14	10	72	105,420	7,530	502	438
10	June 19	July 3	5	14	10	72	60,480	4,320	288	252
11	July 6	July 19	3	13	9	69	62,020	4,771	318	287
12	July 22	Aug. 4	3	13	9	69	55,300	4,254	284	256
13	Aug. 7	Aug. 20	3	13	9	69	78,540	6,042	403	364
14	Aug. 22	Sept. 6	2	15	11	73	58,800	3,920	261	223
15	Sept. 10	Sept. 24	4	14	10	72	79,940	5,720	380	332
16	Sept. 28	Oct. 8	4	10	6	60	81,200	8,120	541	562
17	Oct. 10	Oct. 25	2	15	11	73	104,440	6,963	464	396
	Total (9·8 months)		64	235	167	—	1,458,520	—	—	—
	Average/month		6·5	24·0	17·0	—	148,829	—	—	—
	Average/trip (from pooled data)		3·8	13·8	9·8	71%	85,795	6,206	414	364

APPENDIX 5

GROUNDFISH LANDINGS OF OTTER TRAWLERS OPERATING OFF THE CANADIAN ATLANTIC COAST, JANUARY 1 TO DECEMBER 31, 1953, ACCORDING TO VESSEL-SIZE AND AREA FISHED. DATA COMPILED AND MADE AVAILABLE BY THE FISHERIES RESEARCH BOARD OF CANADA

Area fished and size of trawler (gross tons)	*Effort*								*Landings (thousands of pounds)*								*Catch/ Trip (lbs.)*	*Catch/ Days at sea (lbs.)*	*Catch/ Hour trawl was towed (lbs.)*
	No. of craft	*No. of trips*	*Days absent from port*	*Days on grounds*	*Days fishing*	*Hours trawled*	*Length of trip (days)*	*Days on grounds/ Days out of port*	*Cod*	*Haddock*	*Pollock*	*Halibut*	*Redfish*	*Flounders*	*All other species combined*	*Total*			
Central Nova Scotia (ICNAF Sub-Division 4 W)																			
Over 500	1	1·45	12·5	10	10	81	8·6	80%	30	72	2	1	—	13	16	134	94,800	10,700	1,654
151—500	23	184·1	1,337·5	1,108	1,084	14,338	7·3	83%	4,676	9,089	674	142	149	2,013	1,013	17,756	93,000	13,300	1,239
51—150	6	48·2	323·3	282	269	2,910	6·7	87%	528	1,742	158	13	73	172	163	2,849	59,300	8,830	979·5
26— 50	13	56	—	—	—	1,350	—	—	100	651	2	—	17	95	17	882	15,700	—	653·3
Up to 25	—	—	—	—	—	—	—	—	47	253	—	—	3	252	52	607	—	—	—
Western Nova Scotia (ICNAF Sub-Division 4 X)																			
151—500	1	4·1	16·7	14	14	113·1	4·1	84%	6	98	—	—	—	4	14	122	29,800	7,300	1,041
51—150	3	44·4	154·7	138	138	693	3·5	89%	95	388	239	—	14	35	17	788	17,800	5,080	1,132
26—50	6	84	—	—	—	—	—	—	157	390	445	—	5	20	51	1,068	12,700	—	—
Up to 25	54	772 Weeks	—	—	—	—	—	—	48	1,525	62	—	13	1,089	260	2,997	—	—	—

APPENDIX 6

SUMMARY OF RECORDS OF LANDING (POUNDS) BY SMALL OTTER TRAWLERS (AVERAGE LENGTH 50 FEET) FISHING OUT OF BRITISH COLUMBIA PORTS (CANADIAN PACIFIC COAST) IN THE YEAR BEGINNING NOVEMBER 1, 1948
(DATA COMPILED AND MADE AVAILABLE BY FISHERIES RESEARCH BOARD OF CANADA)

	Month	*Hours Fished*	*Misc. Soles*	*Lemon Sole*	*Rock Sole*	*Brill*	*Flounders*	*Grey Cod*	*Lingcod Cod.*	*Rockfish (Sebastodes)*	*Skate*	*Perch*	*Dogfish Liver*	*Total Catch ((Excluding Liver)*	*Catch /Hour fished (excluding Liver)*
1948															
	November ..	549..	2,800..	34,338..	900..	208,450..	7,000..	59,598..	9,953.. L 284	15,165..	1,033..	534..	29,058..	339,771..	619
	December ..	494..	240..	52,519..	70..	61,833..	315..	21,054.. L 53..	17,434.. L 616	4,122..	2,866..	275..	10,771..	160,728..	325
1949															
	January ..	983..	17,761..	109,897..	16,985..	3,710..	13,174..	201,639.. L 3,090..	21,412.. L 4,405	11,283..	7,089.. L 49..	560..	3,710..	403,510..	410
	February ..	764½	6,575..	60,015..	12,968..	1,000..	55,648..	76,974.. L 20..	3,845.. L 19	4,064..	1,856..	350..	1,711..	223,295..	292
	March ..	1,637..	23,756..	396,430..	9,808..	35,910..	34,499..	103,083.. L 610..	53,159.. L 688..	5,911.. ..	5,179.. L 63	789..	3,081..	668,524..	408
	April ..	1,282..	4,384..	179,955..	8,001..	44,888..	5,332..	123,889.. L 289..	30,483.. L 312..	4,871.. ..	4,872.. L 878	40..	65,601..	406,715..	317
	May ..	1,729½	1,319..	66,207..	53,640..	176,355..	5,579..	188,367..	133,968.. L 1,357½	2,149.. ..	8,560.. L 89	123..	155,170..	636,267..	368
	June ..	1,444..	2,608..	17,228..	367,824..	457,394..	11,657..	42,189..	206,936.. L 1,597	6,881..	4,701..	—..	110,941..	1,117,418..	774
	July ..	2,028½	18,574..	28,485..	480,035..	599,794..	562..	59,759..	444,184.. L 7,677	3,964..	1,788..	—..	38,961..	1,637,145..	807
	August ..	1,383..	67,612..	24,537..	276,624..	413,342..	1,149..	33,821..	388,060.. L 4,155	825..	4,825..	—..	41,095..	1,210,795..	815
	September ..	392½	118,455..	28,430..	35,243..	318,635..	1,799..	66,560..	231,051.. L 3,153	8,402..	2,530..	20..	39,381..	811,125..	206
	October ..	1,116½	33,946..	75,501..	11,382..	105,309..	12,480..	163,328..	29,516.. L 311..	18,155.. L 182	2,104..	178..	31,993..	451,899..	405
	Total ..	13,803	298,030	1,073,542	1,273,480	2,426,620	149,194	1,140,261 L 4,062	1,570,001 L 20,214	85,792 L 182	47,403 L 1,219	2,869	531,473	8,067,192	Av. 639

Misc. Soles :—Sole 10,175, Sand 10,080, Rex 94,756, Dover 121,810, Butter 17,634, C-O Sole 460, Longjaw flounder 43,007, Flathead 100.

Misc. Fish :—Crab 65,952½, Black cod 27,353, Hake 7,000, Turbot 3,000, Ratfish 4,600, Bass 3,119, Herring 1,000, Pompano 125, Shad 106, Sturgeon 78, Eels 40 Devilfish 5,855, Squid 13½, Scrap liver 2,369, Rat liver 649, Turbot liver 378, Black cod liver 245, Mink feed 16,142, Squpfin liver 8, Mixed viscera 193, Lingcod viscera 203, Dogfish carcasses 13,000.

L. = Liver

APPENDIX 7

GROUND FISH LANDINGS, JANUARY 1 TO DECEMBER 31, 1954, BY SMALL OTTER TRAWLERS OF LESS THAN 26 GROSS TONS OPERATING IN WESTERN NOVA SCOTIA (ICNAF SUB-DIVISION 4X, CANADIAN ATLANTIC COAST). DATA COMPILED AND MADE AVAILABLE BY THE FISHERIES RESEARCH BOARD OF CANADA.

Month	*Effort*				*Landings (lbs.)*										*Catch/ Day out of port (= day fished)*	*Catch/ Hour trawled (lbs.)*
	Boats (No.)	*Trips (No.)*	*Days fished*	*Hours trawled*	*Cod*	*Haddock*	*Halibut*	*Pollock*	*Hake*	*Cat fish*	*Winter Flounders*	*Silver Hake*	*Scales*	*Total*		
January	2	15	16	161	300	8,927	—	—	—	300	16,975	—	—	26,502	1,659	164
February	3	26	26	298	3,440	8,500	—	—	—	—	28,605	—	—	40,545	1,560	136
March	2	22	22	308	800	—	—	—	—	300	42,400	—	—	43,500	1,977	141
April	14	86	95	1,099	3,460	2,900	40	1,290	—	44,528	108,623	—	—	160,841	1,693	146
May	27	232	267	2,232	8,675	63,685	115	190	—	68,078	219,045	—	—	359,788	1,348	161
June	33	361	372	3,260	9,874	171,035	40	5,465	330	44,195	291,666	—	—	522,605	1,410	160
July	30	285	285	2,092	835	72,072	—	1,400	2,205	7,318	229,074	3,000	—	315,904	1,110	151
August	29	246	246	1,731	684	71,808	322	—	14,823	1,260	185,863	9,999	—	284,759	1,157	164
September	25	193	193	2,023	16,446	72,141	—	100	9,608	—	146,718	29,239	16,239	290,252	1,509	143
October	17	101	102	1,122	2,139	51,362	—	—	853	—	32,812	16,474	26,600	130,240	1,277	116
November	13	68	76	577	6,142	142,594	—	—	3,370	—	3,585	11,755	23,800	191,246	2,520	332
December	7	40	44	431	7,361	37,189	—	100	255	—	6,500	9,345	33,600	93,410	2,123	217
Totals	45	1,675	1,744	15,314	60,156	702,213	517	8,545	31,444	165,979	1,311,926	79,812	100,000	2,459,592	Av. 1,416	Av. 161

APPENDIX 8

SUMMARY OF EARLY PEDRO BANK FISHING OPERATIONS BY OTTER TRAWLERS

Fishing Vessels	*Year and trip dates*	*Days out of Port (No.)*	*Position (Approximate) N.Lat. : E.Long.*	*Depths (fathoms)*	*Total catch (lbs.)*	*Catch/Day out of port (lbs.)*	*Catch/Hour trawl was towed (lbs.)*	*Quality of catch*
	1920							
LILLA	Aug. 14–Aug. 29	—	9–15 : 81–58	6—35	1,256	—	129	2
	1921							
	Aug. 9–Aug. 10	—	9–15 : 81–58	13—22	482	—	241	2
	1928							
BULBUL	June 15–June 30	15	—	—	39,750	2,650	—	2
Do.	July 5–July 19	14	—	—	49,287	3,521	—	2
Do.	July 24–Aug. 8	15	—	—	78,251	5,217	—	2
Do.	Aug. 19–Sept. 2	14	—	—	35,813	2,558	—	2
Do.	Oct. 1–Oct. 14	13	—	—	42,715	3,286	—	2
Do.	Oct. 18–Nov. 1	14	—	—	21,570	1,541	—	2
	1929							
BULBUL	Feb. 15–Feb. 25	10	—	—	31,242	3,124	—	2
TONGKOL	Feb. 27–March 9	10	—	—	24,870	2,487	—	2
BULBUL	March 1–March 14	13	—	—	40,580	3,122	—	2
TONGKOL	March 12–March 23	11	—	—	28,750	2,432	—	2
BULBUL	March 18–March 31	13	—	—	31,310	2,408	—	2
Do.	April 25–May 11	16	—	—	29,820	1,864	—	2
TONGKOL	May 14–May 27	13	—	—	24,640	1,895	—	2
Do.	Aug. 21–Sept. 3	13	—	—	29,184	2,245	—	2
BULBUL	Aug. 28–Sept. 14	17	—	—	45,850	2,697	255	2
Do.	Sept. 17–Oct. 2	15	—	—	38,097	2,540	241	2
Do.	Oct. 9–Oct. 19	10	—	—	27,483	2,748	259	2
	1930							
BULBUL	March 6–March 18	12	—	—	37,546	3,129	—	2
Do.	April 7–April 22	15	—	—	42,609	2,841	—	2
Do.	April 25–May 8	13	—	—	23,166	1,782	—	2
Do.	July 23–Aug. 8	16	—	—	42,530	2,658	—	2
Do.	Oct. 21–Nov. 5	15	—	—	32,123	2,142	—	2
	1932							
BULBUL	Aug. 11–Aug. 26	15	—	—	53,896	3,593	—	2
	1935							
BULBUL	March 30–April 18	19	—	—	42,020	2,212	—	2
	1949							
HALPHA	Aug. 15– —	—	9–36 : 80–31	8	0	0	0	—
RAGLAN CASTLE	April 6–April 16	10	9–36 : 80–45	19–20	14,500	1,450	392	2
	1950							
RAGLAN CASTLE	June 15–June 21	6	9–37 : 80–45	18–21	33,383	5,564	423	2
Do.	June 30–July 7*	7	9–48 : 80–38	20–26	25,425	3,632	446	2

LILLA records ex Malpas (1926); BULBUL and TONGKOL records courtesy, Ceylon Fisheries Ltd.; RAGLAN CASTLE and HALPHA records ex files of Department of Fisheries, Ceylon.

* Sailing and landing time estimated from log record of fishing time.

APPENDIX 9

SUMMARY OF EARLY OTTER TRAWLING IN SOUTH EASTERN PALK STRAIT AND OFF SOUTHWEST COAST (GALLE TO CHILAW).

Area and Fishing Vessel	*Year and fishing dates*	*Position (approximate) N. Lat. : E. Long.* °_1 : °_1	*Depth (fathoms)*	*Total catch*	*Catch/Hour trawl was towed (lbs.)*	*Quality of catch*	*Source of Records*
Palk Strait							
LILLA	1920—July–Sept.	9–35 : 79–50	4–7	717	80	3	Malpas (1926) (page 26)
	Do.	9–18 : 79–50	6–8	2,737	456	3	do.
	Do.	9–50 : 79–30	5–7	1,669	238	3	do.
HALPHA	1952—May 2	9–09 : 79–44	3–4	1,470	490	2—3	Glanville's report May 2–26,1952
	May 3	9–08 : 79–43	3–4	4,110	822	2—3	Department of Fisheries files (data incomplete)
	May 7	Talaimannar	—	1,200	300	2—3	do.
	May 13	do.	—	950	238	2—3	do.
	May 14	do.	—	435	145	2—3	do.
	May 19	do.	—	1,020	510	2—3	do.
	May 20	do.	—	2,850	570	3	do.
	May 21	9–20 : 79–56	4	490	245	3	do.
	May 26	9–44 : 79–49	3–5	140	140	2	do.
Southwest Coast							
LILLA	1920—May 6–7	7–50 : 79–38	7–8	113	28	—	Malpas (1926)
	1921—Dec. 22–27 1923—April 5–12	7–20 : 79–38	6–14	539	90	—	do.
	1921—Dec. 22–27	6–58 : 79–38	8–25	317	26	—	do.
	1923—April 5–12	6–41 : 79–39	24–32	457	76	—	do.
	1920—Dec. 20 1923—April 5–12	6–29 : 79–40	27–31	57	11	—	do.
HALPHA	1952—March 10	Mutwal	6–8	1,000	100	2— 3	Dept. Fish. files

APPENDIX 10

SUMMARY OF 1953 RECORDS OF SMALL-BOAT OTTER TRAWLING BY NORTH STAR.

Base	*Date*	*Position* N. Lat. °_1 : E. Long °_1	*Depth (fathoms)*	*Description of trawl*	*Length of haul (hours)*	*Catch (lbs.)*	*Grade of catch*	*Catch/ Hour towed (lbs.)*	*Catch/ Man/ Hour (lbs.)**	*References and Remarks*
	1953									
Colombo ..	22·5..	6–49 : 79–46..	22–26..	ground fish trawl 80′ footrope : towed on bottom	0·75..	440..	3..	588..	196·0..	
	16·6..	6–47 : 79–41	26–27..	do. ..	3·0..	100..	3..	33..	11·0..	4 three-quarter-hour tows combined.
	19·6..	6–54 : 79–50..	10..	do. ..	1·0..	1000..	3..	1000..	250·0..	
		6–54 : 79–50..	10..	do. ..	1·0..	0..	—..	0..	0..	Tore net.
	22·6..	6–55 : 79–49..	10–12	do. ..	3·0..	75..	3..	25..	6·3..	3 one-hour tows combined
		6–52 : 79–45..	26							
		6–49 : 79–44..	29							
	23·6..	6–46 : 79–41..	11–31	do. ..	1·0..	0..	—..	0..	0..	2 half-hour tows combined
		6–45 : 79–41..	12–33							
	24·6..	6–39 : 79–51	18 ..	do. ..	2·0..	0..	—..	0..	0..	2 one-hour tows combined : poor bottom
Talaimannar ..	17·7..	9–11 : 79–39..	7 ..	do. ..	1·0..	200..	3..	200..	50·0..	2 half-hour tows combined : bottom soft : doors burying
	18·7..	9–11 : 79–39..	7 ..	do. ..	0·5..	35..	—..	70..	17·5..	
	do...	9–21 : 79–33..	6 ..	do. ..	1·0..	400..	3..	400..	100·0..	
Mullaitivu ..	2·8..	9–31 : 80–50..	20	do. ..	3·0..	600..	3..	200..	50·0..	3 one-hour tows combined
		9–31 : 80–49..	18							
		9–31 : 80–49..	16							
	7·8..	9–30 : 80–46..	8 ..	do. ..	1·0..	50..	3..	50..	12·5..	
	8·8..	9–35 : 80–39..	8–9 ..	do. ..	6·0..	1600..	3..	266..	66·5..	3 two-hour tows combined
	8·8..	9–35 : 80–39..	8–9 ..	do. ..	1·0..	0..	—..	0..	0..	Net fouled with weed.
	9·8..	9–35 : 80–39..	6–7 ..	do. ..	4·0..	60..	3..	15..	3·8..	2 two-hour tows.
	10·8..	9–11 : 80–53..	8–9 ..	do. ..	2·0..	120..	—..	60..	20·0..	

APPENDIX 10—*contd.*

SUMMARY OF 1953 RECORDS OF SMALL-BOAT OTTER TRAWLING BY NORTH STAR—*contd.*

Base	*Date*	*Position* N. Lat. °_1	*Position* E. Long °_1	*Depth (fathoms)*	*Description of trawl*	*Length of haul (hours)*	*Catch (lbs.)*	*Grade of catch*	*Catch/ Hour towed (lbs.)*	*Catch/ Man/ Hour (lbs.)**	*References and Remarks*
	1953										
Trincomalee ..	19·8 to 22·8 ..	8–32 :	81–18..	10	80 ft. otter trawl : towed at different depths on short cable along 40 fathom contour	1·0..	5†	3..	5..	1·2..	Many jelly fish
	,, ..			20		1·0..	5†	3..	5..	1·2..	do.
	,, ..			30		1·0..	0..	—..	0..	0..	do.
	,, ..	8–37 :	81–15..	10 ..	do. ..	1·0..	few ..	3..	0..	0..	do.
	,,			20 ..	do. ..	1·0..	,, ..	3..	0..	0..	do.
	,, ..			30 ..	do. ..	1·0..	few ..	3..	0..	0..	do.
Point Pedro ..	30·8 ..	10–07 :	80–16..	22 ..	80′ foot-rope : on bottom	2..	250..	3..	125..	31·3..	Sea fans and ray fish
	,, ..	10–07 :	80–16..	18–19..	do. ..	2..	20..	3..	10..	2·5..	Rough
	,, ..	9–58 :	80–29..	21 ..	do. ..	2..	0..	—..	0..	0..	Tore net
	31·8 ..	9–56 :	80–23..	7–9 ..	do. ..	66..	100..	3..	150..	35·7..	Rough
	,, ..	9–56 :	80–23..	7–9 ..	do. ..	2..	200..	3..	100..	25·0..	2 one-hour tows ; ray fish
Mullaitivu ..	1–9 ..	9–20 :	80–53..	12	do. ..	6..	890..	3..	148..	37·1..	3 two-hour tows ; smooth bottom
		9–20 :	80–54..	15							
		9–20 :	80–55..	18							
	2–9 ..	9–20 :	80–53..	11–12..	do. ..	6..	90.	3..	15..	3·7..	Sharks and rays
	,, ..	:	..	— ..	do. ..	4..	180.	2&3..	45..	11·2..	2 two-hour tows cat-fish and small paraw
do. ..	16·9 ..	9–34 :	80–48..	22 ..	80 foot net on bottom	2 ..	0	—..	0..	0..	Rough
	,, ..	9–27 :	80–51..	12 ..	do. ..	2 ..	230..	3 ..	115..	28·8..	Ray fish
	,, ..	9–20 :	80–53..	11 ..	do. ,,	2 ..	180..	3 ..	90..	22·5..	Small fish
	17·9 ..	9–16 :	80–57..	22 ..	do. ,,	2 ..	110..	3 ..	55..	13·8..	Ray fish
	,, ..	9–21 :	80–55..	21 ..	do. ,,	2 ..	80..	3 ..	40..	10·0..	
	,, ..	9–25 :	80–53..	21 ..	do. ,,	0·2..	0..	—..	0..	0 ..	
	,, ..	9–29 :	80–52..	22 ..	do. ,,	1·5..	0..	—..	0..	0 ..	

APPENDIX 10—*contd.*

SUMMARY OF 1953 RECORDS OF SMALL-BOAT OTTER TRAWLING BY NORTH STAR—*contd.*

Base	*Date*	*Position* N. Lat. °_1 : E. Long °_1	*Depth (fathoms)*	*Description of trawl*	*Length of haul (hours)*	*Catch (lbs.)*	*Grade of catch*	*Catch/ Hour towed (lbs.)*	*Catch/ Man/ Hour (lbs.)**	*References and Remarks*
Mullaitivu	18·9..	9–14 : 80–53..	11 ..	80 foot net on bottom ..	2·0..	240..	3 ..	120 ..	30·0..	Small fish
	,, ..	9–17 : 80–53..	11 ..		3·0..	360..	3 ..	120 ..	30·0..	Heavy rain
	19·9..	9–11 : 80–54..	9–10–11	do. ..	3·0..	1,260..	3 ..	420 ..	105·0..	2 very large sharks
	20·9..	9–13 : 80–53..	10 ..	do. ..	1·5..	390..	1·5 ..	260 ..	65·0..	
	1·10..	9–35 : 80–48..	25 ..	55′ footrope ..	3·0..	360..	3 ..	120 ..	30·0..	Equal quantities small and large fish
	,, ..	9–35 : 80–48..	25 ..	do. ..	2·0..	290..	3 ..	145 ..	36·3..	—
	2·10 ..	9–35 : 80–52..	30 ..	do. ..	3·0..	345..	3 ..	115 ..	28·7..	
	,, ..	9–35 : 80–52..	33 ..	do. ..	3·0..	540..	3 ..	180 ..	45·0..	
	3·10 ..	9–35 : 80–52..	33 ..	do. ..	3·0..	120 ..	2 ..	40 ..	10·0..	Sea anemones
	,, ..	9–39 : 80–49..	30 ..	do. ..	3·0..	0..	..	0 ..	0 ..	—
	4·10 ..	9–35 : 80–51..	31 ..	do. ..	3·0..	110..	3 ..	37 ..	9·2..	
	5·10 ..	9–35 : 80–46..	18 ..	do. ..	2·0..	12..	1 ..	6 ..	1·3..	Shells and mud
	,, ..	9–13 : 80–53..	11 ..	do. ..	2·5..	60..	3 ..	24 ..	6·0..	1 large sea snake
	6·10 ..	9–18 : 80–59..	33 ..	do. ..	1·3..	30..	2 ..	20·3..	5·8..	Dead coral in net ; stuck in mud
	,, ..	9–19 : 80–59..	42 ..	do. ..	1·5..	90..	2 ..	60 ..	15·0..	loose coral; dirty bottom

* The catch/man/hour is calculated on the basis of a 4-man crew. Actually more men were aboard but only 4 were required to operate the gear.

† Estimated.

APPENDIX II

SUMMARY OF 1954 RECORDS OF SMALL-BOAT TRAWLING (MOSTLY BY CANADIAN)

Base	*Year and Date 1954*	*Position (Approximate)* N. Lat. °_1	E. Long. °_1	*Depth (fathoms)*	*Description of trawl*	*Length of haul (hours)*	*Catch (lbs.)*	*Grade of Catch*	*Catch/ hour towed (lbs.)*	*Catch/ man/ hour towed (lbs.)**	*References and Remarks*
Trincomalee	13·7	8–33 :	81–49	13	80' footrope	0·5	60	2	120	30·0	Many jellyfish; tore net badly
Do.	13·7	8–33 :	81–48	17	do.	0·7	0	—	0	0	
Do.	16·7	80–36 :	81–45	12–14	do.	2·0	8	2	4·0	1·0	—
Do.	16·7	80–33 :	81–49	—	do.	1·5	0	—	0	0	Tore net
Mullaitivu	21·7	9–42 :	80–48	30	30' footrope FAO	1·0	0	—	0	0	Bottom good, Star fish, sponges and shells
Do.	21·7	9–41 :	80–46	28–22	do.	1·0	0	—	0	0	Good bottom
Do.	21·7	9–39 :	80–44	22–14	do.	1·0	0	—	0	0	do.
Do.	21·7	9–37 :	80–41	14–11	do.	0·8	4	3	5.0	1·2	1 Shark
Alampil	22·7	9–11 :	80–54	7–12	do.	1·0	0	—	0	0	Good bottom
Do.	22·7	9–11 :	80–55	12–15	80' footrope	1·0	25	2	25·0	6·3	—
Do.	22·7	9–11 :	80–56	15	do.	1·0	25	2	25·0	6·3	—
Do.	22·7	9–11 :	80–57	20–14	do.	2·0	0	—	0	0	Tore net
Chundikulam	23·7	9–36 :	80–44	15	do.	1·5	75	2	50·0	12·5	—
Do.	23·7	9–39 :	80–46	20	do.	1·0	45	2	45·0	11·2	Net badly torn. Catch must have been very good for fish to remain in net
Do.	23·7	9–38 :	80–42	14	do.	1·6	0	—	0	0	—
Alampil	24·7	9–11 :	80–54	11	do.	1·5	75	2	50·0	12·5	—
Do.	24·7	9–11 :	80–57	15	do.	2·0	120	2	60·0	15·0	—
Do.	24·7	9–11 :	80–56	13	do.	2·0	45	2	22·5	5·7	—
Do.	24·7	9–11 :	80–55	12	do.	2·1	40	2	20·0	4·8	—
Do.	24·7	9–11 :	80–57	15	do.	2·0	60	2	30·0	7·5	—
Do.	26·7	9–13 :	80–58	18–25	do.	2·0	25	2	12·5	3·2	Net Torn
Mullaitivu	26·7	9–16 :	80–58	25	do.	0	—	—	—	—	Net torn. Door damaged

APPENDIX 11—*contd.*

SUMMARY OF 1954 RECORDS OF SMALL-BOAT TRAWLING (MOSTLY BY CANADIAN)

Base	*Year and Date 1954*	*Position (Approximate)* N. Lat. °_1	E. Long °_1	*Depth (fathoms)*	*Description of trawl*	*Length of haul (hours)*	*Catch (lbs.)*	*Grade of catch*	*Catch/ Hour towed (lbs.)*	*Catch/ Man/ Hour towed (lbs.)**	*References and Remarks*
Trincomalee	11·8..	8–46 :	81–12..	23	35' footrope	2·0..	22	2	11·0..	2·8..	This in the 80' trawl cut down
Do.	11·8..	8–48 :	81–13..	30	do.	2·5..	0	—	0	0 ..	—
Do.	5·10..	8–44 :	81–15..	35	¾ of No. 35 (50' footrope) small doors	1·8..	5	2	2·8..	0·7..	Caught on bottom; Net and doors fouled
Do.	5·10..	8–42 :	81–14..	12	do.	2·0..	8	3	4·0..	1·0..	—
Do.	5·10..	8–42 :	81–12..	10	¾ of No. 35 large doors	1·5..	0	—	0	0 ..	Sounder not working
Do.	7·10..	8–45 :	81–13..	30	do.	2·0..	27	2	13·5..	3·4..	Net badly torn
Do.	7·10..	8–46 :	81–12..	20	do.	2·0..	4	—	2·0..	1·0..	—
Do.	8·10..	8–46 :	81–13..	35	do.	5·0..	5	2	1·0..	0·3	Net and doors caught : NORTH STAR helped to haul
Kayts	18·10..	9–47 :	79–44..	5	¾ of No. 35 small doors	1·0..	0	—	0	0 ..	—
Do.	18·10..	9–47 :	79–44..	5	do.	1·0..	24	2	24·0..	6·0..	—
Do.	18·10..	9–44 :	79–48..	4	do.	1·0..	0	—	0	0 ..	—
Do.	19·10..	9–44 :	79–25..	8	do.	2·0..	14	3	7·0..	1·7..	—
Do.	19·10..	9–44 :	79–37..	7	do.	2·0..	6	1&3	3·0..	0·8..	—
Do.	19·10..	9–44 :	79–39..	7–6	do.	2·0..	9	2	4·5..	1·1..	—
Do.	19·10..	9–44 :	79–43..	5–4	do.	1·5..	0	—	0	0 ..	Net full of weeds
Do.	29·10..	9–44 :	79–45..	7	Large doors ¾ of No. 35	1·0..	20	2	20·0..	5·0..	CANADIAN alone towing at 1,500 R. P. M.
Do.	29·10..	9–40..	79–37..	7	do.	1·5..	80	2	53·0..	13·4..	CANADIAN & NORTH STAR tandem towing 1,400 R. P. M.
Do.	29·10..	9–37 :	79–31..	4–5	do.	1·3..	55	2	41·3..	10·3..	do.
Do.	29·10..	9–38 :	79–33..	7	do.	1·5..	150	2	100·0..	25·0..	do.
Do.	1·11..	9–50 :	79–55..	6	do.	1·8..	20	3	11·1..	2·8..	CANADIAN alone
Do.	1·11..	9–38 :	79–55..	4	do.	1·8..	20	3	11·1..	2·8..	Bottom very soft
Do.	1·11..	9–47 :	79–46..	3–4	do.	1·8..	60	3	33·4..	8·3..	Towed at 1,400 R. P. M.

SUMMARY OF 1954 RECORDS OF SMALL-BOAT TRAWLING (MOSTLY BY CANADIAN)

Base	*Year and Date 1954*	*Position (Approximate)* N. Lat. °_1	E. Long °_1	*Depth (fathoms)*	*Description of trawl*	*Length of haul (hours)*	*Catch (lbs.)*	*Grade of catch*	*Catch/ Hour towed (lbs.)*	*Catch/ Man/ Hour towed (lbs.)**	*References and Remarks*
Kayts	2·11	9–36	79–37	7–8	Large doors ¾ of No. 35	1·5	26	3	17·4	4·3	—
Do.	2·11	9–45	79–42	2–3	do.	1·0	50	2	50·0	12·5	—
Do.	2·11	9–44	79–44	3–4	do.	1·0	49	2	49·0	12·2	—
Do.	8·11	9–36	79–36	8	Old net cut down 35' footrope	1·8	10	3	5·6	1·4	—
Do.	8·11	9–28	79–34	9	do.	1·8	22	3	12·2	3·1	—
Do.	8·11	9–28	79–34	9	do.	1·0	5	3	5·0	1·3	—
Do.	8·11	9–39	79–41	6	do.	1·5	34	1 & 3	22·3	5·7	—
Colombo	8·9	7–0	79–51	—	Katumaran dela 25' footrope	5·0	55	2	11·0	2·2	—
Do.	2·11	—	—	—	do.	5·0	25	3	5·0	1·0	—
	1955										
Do.	25·1	—	—	—	do.	6·0	40	3	6·8	1·3	—
Do.	25·1	—	—	—	do.	6·0	60	3	10·0	2·0	—
Do.	25·1	—	—	—	do.	6·3	90	3	14·3	2·9	—
Do.	26·1	—	—	—	do.	5·5	130	2 & 3	23·6	4·7	—
Do.	26·1	—	—	—	do.	5·5	90	3	16·4	3·3	—
Do.	26·1	—	—	—	do.	6·0	150	3	25·0	5·0	—
Do.	11·3	—	—	—	do.	7·0	80	2 & 3	11·4	2·3	—
Do.	11·3	—	—	—	do.	7·3	40	3	5.5	1·1	—
Do.	11·3	—	—	—	do.	7·2	50	3	7·0	1·4	—
Do.	11·3	—	—	—	do.	5·5	115	2 & 3	21·0	4·2	—

* The catch/man/hour is calculated on the basis of a 4–man crew. Actually more men were aboard but only four were required to operate the gear.

APPENDIX 12

SUMMARY OF 171 FISHING RECORDS OF GROUNDFISH HANDLINING FISHING TRIPS. THE DETAILED RECORDS APPEAR IN A MANUSCRIPT REPORT (MEDCOF, 1955) FILED WITH THE FISHERIES RESEARCH STATION, CEYLON.

Fishing area	*Month(s)*	*Depth (fath.)*	*Boats (No.)*	*Catch (lb.)*	*Catch/ line/ hr. fished (1) (lb.)*	*Remarks and references*
1948						
Gulf of Oman	January	—	40	4,000	—	Catch/man/hr. was 8·3 lb. (Bertram, 1948)
1949						
Wadge Bank	Feb. and March	40–65	1	19,312	33·2	3- and 4-hook lines; research boat (Chidambaram, 1951)
Karativu	August	13–22	1	600*	20·0	*Estimate from HALPHA log
1950						
Karativu	March and April	15–23	19	13,714	21·5	1- and 5-hook lines; in vallams; 2/3 of crew fished (2); HALPA mothership
Karativu	Oct.-Dec.	13–20	15	13,844	32·8	5-hook lines (2); HALPA mothership
1951						
Mullaitivu	June	13–40	98	42,477	13·5	5-hook lines (2); HALPHA mothership
Mullaitivu	July	5–10	120	58,798	13·8	5-hook lines (2); HALPHA mothership
Mullaitivu	August	—	79	20,288	8·4	5-hook lines (2); HALPHA mothership
Mullaitivu	September	—	63	9,825	6·5	5-hook lines (2); HALPHA mothership
1952						
Mullaitivu	August	—	123	16,360	6·0	1-hook lines; HALPHA mothership
Mullaitivu	September	—	84	10,530	4·9	1-hook lines; HALPHA mothership
1954						
Batticaloa	May	—	2	77	—	1-hook lines; unassisted orus
Mankeni	June	15–30	66	2,384	10·3	1-hook lines; teppams; ADE MARE mothership
Valaichchenai	August	—	1	50	7·2	Vallam with outboard motor; 2 lines
Trincomalee	September	42–45	1	0	0	Oru; 5 lines
Colombo	September	—	15	1,073	2·6	1-hook lines; orus; 5 lines each
Chilaw	September	18	1	38	1·3	1-hook lines; oru; 4 lines
Thalaiyadi	September	3–10	2	19	0·6	Kattumarams
Pt. Pedro	September	4–7	3	42	0·3	Kattumarams
Mylliddy	September	—	1	6	3·0	
Colombo	September	18	1	6	1·2	Motor boat SEER
Colombo	Nov. and Dec.	—	13	458	1·0	Orus unassisted
Negombo	December	14	2	30	0·8	1-hook lines; orus; 3 lines each
Colombo	December	8–40	9	77	0·4	2-hook lines; orus; 6 lines each
1955						
Colombo	January	10–20	20	683	1·2	1-hook lines

(1) This is the average of the values for the various trips.

(2) Four men in each vallam rowed the boat to maintain position on the fishing ground and could not fish.

APPENDIX 13

SUMMARY OF RECORDS OF BOTTOM LONGLINING IN THE MAURITIUS-SEYCHELLES IN 1948, AND ABOUT CEYLON 1949—1954 (DETAILS ON INDIVIDUAL SETS REPORTED IN APPENDIX 13 BY MEDCOF (MS 1955).* MEANS WEIGHTS ESTIMATED. CATCH PER MAN PER HOUR ON THE FISHING GROUND FOR NS IS BASED ON A 3-MAN CREW. NS MEANS NORTH STAR)

Year and base	*Date*	*Boat(s)*	*Sets (No.)*	*Hooks per set (No.)*	*Catch/ 100 hooks lb.*	*Catch/ man/hr. on grounds lb.*	*References and remarks by skipper*
1948							
Mauritius-Seychelles	Feb.-June	MFRV No. 1	12	16— 150	112*	—	Wheeler (1953)
1949 (Ceylon)							
Colombo	3.3	HALPHA	1	500	0	—	Blegvad (1951)
Chilaw ..	7.3	HALPHA	1	200	10.0*	—	
Galle ..	22.3	HALPHA	1	500	20.0*	—	
Wadge Bank	29.3	RAGLAN CASTLE	1	1,000	8.0	—	
Karativu	8.4	HALPHA		1,000 (500)	55.0*	—	Lost 500 hooks
1951							
Velvedditurai	30.3–27.4	KATTUMARAMS	8	700—1,100	38.9	—	HALPHA and SEER served as mother-ships
1954							
Trincomalee	13.7–16-7	NS ..	4	700—900	21.8	10.6	
Chundikulam	21.7	NS ..	1	1,200	1.6	1.5	
Alampil	22.7	NS ..	1	1,000	15.2	13.0	
Chundikulam	23.7	NS ..	1	900	24.3	18.3	Squid bait took best catches
Mullaitivu	27.7	NS ..	1	900	44·4	33·4	
Trincomalee	29.7–16.9	NS ..	23	350—900	29.1	15.1	
Mankeni	18.9	NS ..	1	840	37.5	30.1	Good fishing
Trincomalee	22.9–24.9	NS ..	4	560—840	15.0	12.5	
Mylliddy	27.9–28.9	KATTUMARAM	2	200—250	42.9	5.4	
Trincomalee	27.9–12.10	NS ..	5	490—840	16.9	10.9	Gear badly worn; lost some
Kayts ..	29.10–8.11	NS ..	5	210—840	2.9	1.9	Poor bait and bottom; local boats caught little
Colombo	3.12–31.12	NS ..	13	1,120—1,400	13.4	12.5	Some conditions poor
1955							
Colombo	17.1–20.1	NS ..	4	560—1,400	16.3	12.4	Poor weather
Negombo	20.1	DORY	2	175—185	6.9	3.8	Poor bait and windy
	22.1	DORY	1	280	1.8	1.5	Lost part of gear; heavy weather
Karativu	4.2	DORY	1	280	3.6	5.0	Most bait untouched
Colombo	21.1	NS ..	1	840	4.8	4.3	
Colombo	24.1–29.1	NS ..	3	980—1,400	4.9	4.7	
Karaitivu	5,2–15.2	NS ..	3	840—1,120	13.8	9.9	
Colombo	22.2	NS ..	1	1,400	15.6	14.6	
Karaitivu	25,2–2,3	NS ..	3	1,120—1,400	14.6	9.3	

APPENDIX 14

SUMMARY OF FISHING RECORDS OF YEAR-ROUND, BOTTOM LONGLINING OUT OF TWO NOVA SCOTIAN PORTS (CANADIAN ATLANTIC COAST) IN 1952 AND 1953. COMPILED BY THE FISHERIES RESEARCH BOARD OF CANADA. EXCEPT FOR THE LAST COLUMN ALL WEIGHINGS ARE OF FRESH, GUTTED FISH. GUTTED WEIGHT IS APPROXIMATELY 87% OF UNGUTTED ('ROUND') WEIGHT FOR THESE SPECIES

Port and year	*Hooks set (No.)*	*Trips (No.)*	*Hooks set/ Trip (No.)*	*Man-hours expended (1)*	*Total catch (lbs.) (2)*	*Catch/Trip (lbs.)*	*Catch/Man Hour out of port (3) (lbs.)*	*Catch/100 hooks/set (lbs.)*	
								Gutted	*Ungutted equivalent*
Liverpool									
1952	2,353,815	398	5,912	—	1,459,817	3,668	—	62.0	71.4
1953	1,542,420	256	6,029	8,240	850,060	3,321	103.2	55.0	63.3
Lockeport									
1952	4,920,850	1,402	3,510	—	3,669,313	2,617	—	74.6	85.8
1953	4,740,450	1,228	3,860	—	3,391,669	2,762	—	71.6	82.5

(1) Man-hours=Time absent from port × number of fishermen involved.

(2) 35—50% cod ; 18—27% haddock ; rest is a mixture of several species of bottom fish. The catches reported here constitute approximately 50% of the total landings in these ports from longliners.

(3) For a crude conversion of this to catch per man per hour on the fishing ground multiply by 2.0.

APPENDIX 15

1954 RECORDS OF DRIFTLINE FISHING AT 15 FATHOMS OUT OF COLOMBO, CEYLON, BY 3-MAN ORUS FISHING 6 HOOKS WITH SQUID FOR BAIT ON 25-FATHOM LINES (ACTUALLY 50-FATHOM LINES WITH A HOOK ON EACH END) AND BY NORTH STAR AT 100-FATHOMS, OUT OF TRINCOMALEE ; 3 MEN WITH 4 HOOKS AND KELAWALLA FOR BAIT.

Date	*Hours fished*	*Catch (lb.)*	*Catch/hook/ hour (lb.)*	*Catch/man/ hour (lb.)*
ORUS :				
September 9	6·5	72	1·8	3·7
11	7·0	130	3·1	6·2
13	6·0	45	1·3	2·5
13	6·0	0	0	0
15	7·0	90	2·2	4·3
15	8·0	180	3·8	7·5
Average ..	—	—	2·0	4·0
NORTH STAR :				
August 26	5·9	0	0	0

APPENDIX 16

SURFACE LONGLINING IN CEYLON 1949-1955. SUMMARY OF DATA FROM MEDCOF (MS REPT. 1955)

Craft and base	*Date*	*Depth of water (fm.)*	*Hooks (No.)*	*Hooks taking fish (%)*	*Catch (lb.)*	*Catch/100 hooks set (lb.)*	*Catch/man/hr. on grounds† (lb.)*	*Remarks and references*
1949								
HALPHA (gear improvised)								
Colombo	3·3	18	50	0	0	0	0	Gear improvised (Blegvad, 1951)
	4·3	23	200	3	25*	12·5	4·2	*estimated
1954								
CANADIAN (gear improvised ; effective crew, 4)								
Colombo	25—26·1	500—700	240	0	0	0	0	Gear improvised
Mt. Lavinia	26—27·1	17	120	0	0	0	0	
Bentota	27—28·1	16	144	0·7	20	14·0	0·8	8 hooks gone
Galle	2·2	100	240	1·3	51	21·3	2·0	Bait untouched
Galle	2—3·2	31	240	0·4	20	8·3	0·4	Bait all gone
Barberyn	3—4·2	20	120	1·7	40	33·3	0·7	Bait all gone
Tangalle	16·2	1,100	240	0	0	0	0	
Do.	16—17·2	1,200	240	—	—	—	—	Lines parted ; lost all gear ; shark ?
SMALL JAPANESE BOAT (Japanese gear)								
Colombo & Negombo	27·9–16·10	—	35	12*	4,000	760	—	*from incomplete report ; 15 sets
SEER (Japanese gear)								
Colombo	29·10	18	103	4·9	186	180	13·3	
	30·10	18	40	0	0	0	0	
	30·10	20	40	7·5	68	170	21·3	Bait hurulla
	4·11	18	93	4·3	116	125	11·6	Bait hurulla
(U. K. shark lines)								
	18·11	200	75	1·3	92	123	8·7	
	18·11	75	75	0	0	0	0	
1955								
NORTH STAR (gear improvised)								
Colombo	19·1	22	50	2·0	62	124	5·7	Bait cuttlefish
	2—3·3	100	50	2·0	35	70	2·9	Bait kumbala

† calculations based on a 4-man crew.

APPENDIX 17

Trolling.—RECORDS OF 1949 TROLLING BY THE VANCOUVER, B.C., FLEET OF "ICE BOATS" SHOWING HOW THEIR 1,000,000-POUND ("ROUND" WEIGHT) SALMON CATCH, COHO AND SPRINGS COMBINED, WAS DISTRIBUTED SEASONALLY AND ACCORDING TO EFFORT. COMPILED BY THE FISHERIES RESEARCH BOARD OF CANADA FROM TRIP REPORTS.

Month 1949	*Fishing effort*		*Catch/Boat*		*Catch/Line/ Hour*	*Catch/Man/ Hour*
	Total boat-days fished	*Hours/ boat/day (Av.)*	*Day (lb.)*	*Hour (lb.)*	*(lb.)*	*(lb.)*
February	10	6·8	106	15·5	2·6	9·1
March	12	4·7	148	31·3	5·2	18·4
April	22	12·0	241	40·1	3·4	11·8
May	188	11·7	279	23·9	4·0	14·0
June	264	14·2	380	26·8	4·5	15·8
July	475	15·4	570	37·0	6·2	21·8
August	677	13·9	580	41·8	7·0	24·6
September	473	13·4	383	28·6	4·8	16·8
October	28	11·6	181	15·6	2·6	9·4
Total	2,149	29,596 Hrs. Fished				
Averages for year's data pooled	239 Days/Month	13·8 Hrs./Day	465*	34·2	5·7*	20·1*

APPENDIX 18

SUMMARY OF CEYLON TROLLING RECORDS, 1953–55, REPORTED IN DETAIL BY MEDCOF (MS, 1955) CATCH/MAN/HOUR CALCULATED FOR 4-MAN CREWS FOR CANADIAN (C), NOTRH STAR (NS) AND SEER

Year and Base	*Dates (day, month)*	*Craft*	*Trips (No.)*	*Lures per trip*		*Catch per hour of trolling*	
				No. (total)	*Kinds*	*Lure/hr. (lb.)*	*Man/hr. (lb.)*
1953							
Colombo	4.5—30.6	C	9	10	rubber squid and plugs	0·2	0·6
Galle	1.7	C	1	10	rubber squid	0·4	1·0
Colombo	2.7—2.8	C	4		do.	0	0
Pamban	2.8	C	1		do.	0·4	0·9
Trincomalee	3—20.8	C	8		do.	2·5	3·7
Do.	28.8	C	1	10	Japanese feathered	0·4	1·1
Do.	29—31.8	C	3	10	rubber squid	2·5	6·4
Do.	1—11.9	C	6		do.	1·5	3·6
Colombo	25.9—13.12	C	11		do.	0·3	0·7
1954							
Colombo	4.1—22.3	C	10	10	rubber squid	0·3	0·6
Do.	22—25.3	NS	4	6	spoons $5\frac{1}{2}''$	12·5	18·8
Do.	23.3	C	1	10	spoons $7\frac{1}{2}''$	0	0
Palk Strait	24.3	C	2	10	rubber squid	0·6	1·7
Colombo	26.3	C	1		do.	0·9	2·3
Gulf of Manaar	27.3	C	1		do.	4·7	11·7
Colombo	21.6	NS	1	4	rubber squid	0	0
Colombo	21—22.6	C	2		do.	0·3	0·3
Pamban	22.6	NS	1		do.	0	0
Mullaitivu	24.6	C	1		do.	0	0
Trincomalee	9—14.7	NS	3		do.	0·7	0·7
Mullaitivu	21—29.7	NS	6	1—5	rubber squid	0·5	0·4
Trincomalee	3—5.8	NS	3	2—6	various	0·3	0·5
Trincomalee	4—5.8	C	2	4—8	various	0·2	0·2
Nai Aru	6.8	orus (12)	12	3	ahatuwa bark; baited	0·6	0·6

APPENDIX 18—*contd.*

SUMMARY OF CEYLON TROLLING RECORDS, 1953–55 REPORTED IN DETAIL BY MEDCOF (MS, 1955) CATCH/MAN/HOUR CALCULATED FOR 4-MAN CREWS FOR CANADIAN (C), NORTH STAR (NS) AND SEER—*contd.*

Year and Base	*Dates (day, month)*	*Craft*	*Trips (No.)*	*Lures per trip*		*Catch per hour of trolling*	
				No. (total)	*Kinds*	*Lure/hr. (lb.)*	*Man/hr. (lb.)*
Mullaitivu	6—7.8	C	2	7	various	0·3	0·7
Mullaitivu	6—7.8	NS	2	5—6	various	0·1	0·1
Trincomalee	9—19.8	C	4	4—7	various	0	0
Trincomalee	10—19.8	NS	3	3—6	various	1·5	1·2
Negombo	11.8	Orus (3)	3	18	tandem hooks; baited	0·2	0·3
Negombo	12.8	Orus (2)	2	6	tandem hooks; baited	2·1	2·3
Trincomalee	20—23.8	C & NS	6	2—5	various	0·3	0·3
Negombo	24—27.8	Orus	7	3—6	tandem hooks; baited	0·7	1·4
Kal Kuda	25.8	C	1	6	various	1·5	2·3
Trincomalee	27.8—6.9	C & NS	7	3—5	various	0·1	0·1
Colombo	9—11.9	Orus	6	2—4	tandem hooks	1·7	1·5
Colombo	13—15.9	Orus	6	3—4	tandem hooks	0·9	0·9
Trincomalee	10—22.9	NS	5	3—6	various	0·8	0.7
Nai Aru	23.9	Orus (6)	6	3	ahatuwa bark; baited	0·1	0·1
Trincomalee	23.9—7.10	C & NS	7	3—4	various	0·1	0·1
Batticaloa	24.9	C	1	4	do.	0	0
Colombo	28—29.9	SEER	2	8	do.	0·3	0·6
Negombo	30.9	SEER	1	8	do.	0·2	0·4
Trincomalee	8—16.10	C & NS	6	4—8	do.	0·4	0·4
Kayts	16—29.10	C & NS	9	3—6	do.	0·1	0·1
Colombo	29—30.10	SEER	2	3—6	tandem hooks; baited	0·6	0·7
Kayts	1—8.11	C & NS	7	4—6	various	2·1	2·9
Pamban	10.11	C & NS	2	4	do.	1·0	1·0
Colombo	11.11—15.12	C & NS	11	3—8	do.	0·5	0·7
Negombo	22.12	Orus	1	3	tandem hooks; baited	0·8	1·2
1955							
Colombo	1—2.2	C & NS	3	2—8	various	0·6	0·9
Karaitivu	2—9.2	C	5	2—3	do.	2·4	1·5
Karaitivu	3—16.2	NS	9	6—8	do.	1·6	3·5
Colombo	13—24.2	C & NS	5	5—8	do.	0·5	0·8
Karaitivu	25—28.2	C & NS	5	5—8	do.	2·9	4·0
Karaitivu	1.3	C	1	5	do.	32·8	41·0
Karaitivu	1—16.3	C & NS	8	4—6	do.	2·1	2·7
Kachchtivu	16—19.3	C & NS	4	5—6	do.	3·7	4·9
Trincomalee	17.3	Dory	1	3	do.	0	0
Kayts	19—24·3	C & NS	4	5—6	do.	1·4	2·3

APPENDIX 19

SUMMARY OF CEYLON GILL NETTING OPERATIONS, 1953-55, REPORTED IN DETAIL BY MEDCOF (MS, 1955). CATCH/MAN/HOUR FOR CANADIAN (C), AND NORTH STAR (NS) CALCULATED FOR 4-MAN CREW. DR.=DRIFT NET; SET=SET NET; SUR.=SURFACE NET; SUN.=SUNK NET; TAR.=TARRED; COT.=COTTON; NYL.=NYLON; MESH MEASUREMENT INSIDE. STRETCHED (INCHES)

Year and Base	*Dates (day, month)*	*Craft*	*Sets (No.)*	*Type of net*	*Catch per hour of set*	
					Per unit area of net (lb.)	*Per man (lb.)*
1953						
Point Pedro	..2—3·8 (night set)	C	1	Dr; Sur; Tar; Cot; 6½	2·3	0·1
Trincomalee	..3—31·8	C	6	Dr; Sur; Tar; Cot; 6½	0·5	0·3
Colombo	..15·10—10·11	C	6	Dr; Sur; Tar; Cot; 6½	3·3	1·8
1954						
Colombo	..2—5·3	C	3	Set; Sun; Cot; 6½	0	0
Kathiraveli	..6·7	Teppam	1	Set; Sur; Cot; 2	0	0
Kathiraveli	..7·7	Teppam	1	Set; Sur; Cot; 3½ and 4	5·3	9·0
Kathiraveli	..7·7	Teppam	2	Set; Sun; Hemp; 3½	1·9	0·6
Trincomalee	..18—20·8	C	2	Dr; Sur; Nyl; 5¼	0	0
Negombo	..23·8	Teppams	2	Dr; Sur; Cot; 2	1·8	1·6
Batticaloa Light	..24·8	C	1	Dr; Sur; Nyl; 5¼ and Cot; 1½	0	0
Kal Kuda	..24·8	C	1	Dr; Sur; Nyl; 5¼ and Cot; 1½	11·0	7·7
Trincomalee	..26·8	C	1	Dr; Sur; Nyl; 5¼	6·3	3·4
Vandeloos Bay	..25—26·8	C	1	Set; Sun; Tar Cot; 8 (shark net)	0	0
Colombo	..8·9	Orus	8	Dr; Sur; Cot; ½ (sprat nets)	73·0	6·5
Colombo	..9—15·9	Orus	8	Dr; Sur; Cot; ½ (sprat nets)	100·9	12·6
Point Pedro	..24—25·9	Katumarams	4	Dr; Sun; Hemp; 5½ and 6	2·8	2·2
Mylliddy	..26—27·9	Katumarams	7	Dr; Sun; Hemp; 5½ and 6	4·7	5·6
Colombo	..28—30·9	SEER	2	Dr; Sur; Cot; 2½, 3½, 4 and 5	4·5	—
Colombo	..14—15·12	C	1	Dr; Sur; Nyl; 5¼	2·6	1·7
Colombo	..21·12	Orus	4	Dr; Sur; Cot; ?	7·0	2·8
Colombo	..21—22·12	Katumarams	4	Dr; Sur; Cot; ?	8·0	2·8
Colombo	..21—22·12	C	1	Set; Sun; Tar Cot; 8 (shark net)	0	0
Colombo	..22.12	Orus	8	Dr; Sur; Cot; ?	4·5	1·8
Colombo	..22—27·12	Katumarams	8	Dr; Sur; Cot; ?	6·7	1·8
Colombo	..24·12	Orus	2	Dr; Sur; Cot; ?	0·7	2·6
Colombo	..28—31·12	C	3	Set; Sun; Tar Cot; 8	0·2	0·1
Colombo	..28—31·12	C	2	Dr; Sur; Nyl; 5¼	0·3	0·2
1955						
Colombo	..18—25·1	C	1	Dr; Sur; Nyl; 5¼ and Dr; Cot; 3 and 18 (trammel); nets torn; shark ?	2·8	0·8
Colombo	..24—25·1	C	1	do.	16·2	2·6
Colombo	..25—28·1	C	3	do.	1·9	0·9
Colombo	..20—21·1	C	1	Set; Sur; Nyl; 5¼	4·0	0·4
Colombo	..21—22·1	C	1	Set; Sun; Nyl; 5¼ and 6¼	4·8	0·5
Colombo	..20—22·1	C	2	Dr; Sur; Cot; 3 and 18 (trammel)	0	0
Colombo	..20—25·1	C	3	Dr; Sun; Nyl; 5¼ and 6¼	7·0	4·4
Colombo	..25—29·1	Orus	10	—	6·7	3·4
Mampuri	..1—2·2	C	1	Set; Sun; Cot; 3 and 18 (trammel)	4·6	0·1
Karaitivu	..2—26·2	C	4	Set; Sun ; Cot; 3 and 18 (trammel)	15·8	0·9
Karaitivu	..4—5·2	Dory	1	Dr; Sur; Nyl; 5¼	7·6	4·1
Karaitivu	..2·2–2·3	C	6	Set; Sur; Nyl; 5¼	3·7	1·6
Karaitivu	..8·2—2·3	C	5	Set; Sun; Nyl; 5¼	8·7	1·1
Karaitivu	..2—24·2	C	4	Set; Sur; Cot; 3 and 5	0·8	0·2
Karaitivu	..25—26·2	C	1	Set; Sun; Cot; 3 and 5	1·0	0·1
Colombo	..8·3	Orus	3	Dr; Sur; Cot; mesh ?	4·4	1·7
Colombo	..9·3	Orus	2	Dr; Sur; Cot; mesh ?	0·5	0·2
Colombo	..10·3	Orus	5	Dr; Sur; Cot; mesh ?	2·5	1·0
Colombo	..11·3	Orus	4	Dr; Sur; Cot; mesh ?	0·9	0·4
Colombo	..12·3	Orus	4	Dr; Sur; Cot; mesh ?	24·6	9·6
Kachchtivu	..17—19·3	C	2	Set; Sun; Cot; 5	0	0
Kachchtivu	..17—19·3	C	2	Set; Sun; Nyl; 5¼	6·2	1·0
Kachchtivu	..17—19·3	C	2	Set; Sur; Nyl; 5¼	1·6	0·9
Kayts	..21—26·3	C	5	Set; Sur; Nyl; 5¼	1·4	0·4
Kayts	..22—26·3	C	4	Set; Sun; Nyl; 5¼	0·7	0·1
Kayts	..22—24·3	C	2	Set; Sun; Cot; 3 and 5	0	0

APPENDIX 20

HARPOONINGS OF SMALL (C) MOSTLY COMMON, AND LARGE (BN) MOSTLY BOTTLE-NOSED DOLPHINS IN CEYLON WATERS BY CANADIAN 1953–54. (WEIGHTS SOMETIMES ESTIMATED. CATCH-MAN-HOUR IS BASED ON A 4-MAN CREW.)

Base	*Date*	*Hours hunted (No.)*	*Catch*				*Remarks by skippers*
			No. and kind	*Total weight (lb.)*	*/hour fished (lb.)*	*/man /hour (lb.)*	
	1953						
Trincomalee	28.8	—					Large schools sighted
Colombo	1.10	12·0	1C	80	7	2	Trolling most of time
Negombo	9.10	1·0	2C	179	179	45	Working as " mothership " ; schools common
Colombo	15.10	5·3	3C	240	45	11	Stopped trolling to harpoon
,,	16.10	3·0	10C	800	267	67	Trolling most of time
,,	17.10	1·5	3C	240	160	40	,,
,,	18.10	8·0	5C	400	50	13	,,
,,	29.10	1·0	1C	80	80	20	Combined with trolling and netting ; nets damaged
,,	6.11	1·5	5C	400	267	67	Demonstration cruise
,,	7.11	1·8	3C	240	133	33	,,
,,	11.11	5·0	1C	80	16	4	Combined with netting
,,	2.12	10·0	28C	2,240	224	56	Mackerel schools around
,,	3.12	7·0	10C	800	112	29	Combined with trolling
Marawila	12.12	7·0	6C	480	68	17	Demonstration cruise
,,	14.12	11·0	23C	1,840	176	41	Large schools swimming north ; wild, frightened (?)
	1954						
Colombo	5.1	6·5	2C	160	25	6	Combined with trolling ; schools wild, heading south
,,	12.1	8·0	14C	1,120	142	35	Combined with trolling ; all schools wild
,,	13.1	12·0	0	0	0	0	Trolling ; no dolphins seen
,,	14.1	12·5	13BN, 7C	3,260	260	65	Combined with trolling
,,	21.1	7·0	3C	240	34	9	Demonstration cruise ; also harpooned large shark—escaped
,,	19.3	7·8	3C	240	31	8	Combined with trolling ; chased 3 wild schools
Trincomalee	9.8	8·5	2BN	400	48	12	Combined with trolling
Colombo	18.11	6·5	2BN	200	31	8	Chased school of 100
,,	20.11	5·0	1BN	244	49	12	
				Average	105	26	