GOLD COAST COLONY

REPORT

ON THE

Prisons Department Fisheries Scheme

GOLD COAST:

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THE PRISONS DEPARTMENT FISHERIES SCHEME, GOLD COAST

INTRODUCTION

1. The purpose of this scheme and the progress it has made can best be seen when viewed against the background of the Colony's fishing industry as a whole. The first part of this report therefore contains a description of the Gold Coast Fishing Industry followed by an account of the Prisons Department Scheme and its results up to 30th September, 1941. Finally recommendations are made for the development of the scheme and of the industry. A map showing the principal fishing centres is included.

The literature of Gold Coast fisheries is scanty. Apart from a contribution to the International Fisheries Exhibition of 1883 by Sir C. A. Moloney (which has not been available) the only work appears to be a report by A. P. Brown of Achimota on a survey of the industry at Labadi and Teshie conducted by him in 1936. This report has proved most valuable in connexion with certain aspects of the Prisons Scheme. F. R. Irvine, also of Achimota, has published two booklets on "Salt Water Fish of the Gold Coast," which may soon be reprinted as a single enlarged volume.

Some other West African fisheries have received rather more attention, namely in a report by J. Hornell on "The Fishery Resources of Sierra Leone" (1928); A reference work by H. W. Fowler on "The Marine Fishes of West Africa" (published by the American Museum); numerous papers in French on the fisheries of the French Colonies, and in a few German papers.

I—THE GOLD COAST FISHING INDUSTRY

2. As there has been practically no European interest in this industry it has been maintained and expanded solely by the efforts of the Gold Coast fishing communities. The fishermen are of a strong robust type, with a physical development superior to that of most, if not all, other classes of the Colony's population. This superiority is probably due to the presence of fish as a regular item in their diet, giving them enough of the protein that is generally insufficient in other local diets. Their life also is healthy, spent from earliest childhood close to or in the sea, with plenty of hard physical work.

All their fishing is done from open dug-out canoes, seldom more than 25 feet in length, worked from open beaches through surf which is always strong, often thunderous. Their skill and determination in handling these craft is beyond praise: with all their skill it is no uncommon event for a canoe to capsize in the surf, perhaps when returning from a long day's fishing, and for its occupants to swim for half an hour or more while trying to right it and bring their gear ashore. They swim well and fatal accidents are rare, but damage to expensive gear or its less are frequent, and so are periods of dreary failure to make paying catches. They do not despair and are content to continue this hard work for a very small return, cheered by occasional good fortune when they may catch as much in one day as in the preceding month.

Few of them are literate, but they are by no means opposed to progress and have proved willing to adopt new methods and ideas when they have been given convincing demonstrations of their advantages. Some are Christian, but the majority are animists having an intense belief in numerous spirits and "medicines" of a tribal, family or personal nature. This faith pervades every phase of their lives, though its outward manifestations are seldom impressive, and it is expressed in many customs associated with their fishing, some of which will be mentioned subsequently.

3. When the catch has been landed and divided amongst the crew their interest in it ceases except for endeavours to get a true account for it from the women, who do all the curing and marketing. This point demands emphasis, as the success of any attempt to introduce improved methods of curing will depend on the interest and co-operation of the women to a far greater extent than on those of the men. The women sometimes travel by canoe with their men when the latter are going for the season to another district, but they do not go to sea for any other purpose and take no part in sea fishing except for an occasional pull at a seine net: nevertheless theirs is a vital share in the industry, and it must be given due recognition.

4. The following list shows some of the more important sea fishes found off the Gold Coast. (Their systematic names are according to Irvine):—

Herring (*sardinella camoronensis*)	Barracouta (*sphyraena guachancho*)
Herring (*sardinella aurita*)	Blue shark (*scoliodon sp.*)
Afafa (*caranx carangus*)	Hammer-head shark (*sphyrna zygaena*)
Tunny (*thunnus thynnus*)	Sail fish (*istiophorus sp.*)
Bonito (*sarda sarda*)	Drum (*otolithus macrognathus*)
Mackerel (*cybium tritor*)	Threadfin (*galeoides polydactylus*)
Mackerel (*scomber colias*)	Sole (*cynoglossus goreenesis*)
Sea bream (*dentex macrophalmus*)	Catfish (*arius latiscutatus*)
Sea bream (*pagellus erythrinus*)	Shad (*ethmalosa dorsalis*)
Sea bream (*pagus ehrembergi*)	Sting ray (*dasybatus margarita*)
Ribon fish (*trichiurus leptorus*)	Guitar fish (*rhinobatus sp.*)
Burro (*otoperce aurita*)	Long finned herring (*ilisha melanota*)

Many other edible fish are caught, and so are eels, turtles, crawfish, crabs and shrimps, but the catches of herrings and afafa fish far exceed in weight and value those of other species.

5. The sea fisheries of the Gold Coast are sharply divided into three types :—

(*a*) The ANLO type, found from the Eastern frontier to the east bank of the Volta, a coast of some 46 miles ;

(*b*) The FANTI-GA type, from the west bank of the Volta to the east bank of the Ancobra, a coast of some 230 miles ;

(*c*) The NZIMA type, from the west bank of the Ancobra to the western frontier, a coast of some 58 miles.

These three types will now be briefly described.

THE ANLO FISHERIES

6. These are centred around Keta : they are primarily seine fisheries, carried on with several types of seine according to the fish expected and the financial resources of the owner of the net. There is some drift net fishing for herring, and set nets are used to a small extent : line fishing is only practised by visiting fishermen from other districts. Nearly all the canoes are bought secondhand from Fanti, Ga or Ada men, and their description will therefore be included in that of the Fanti-Ga fisheries. Anlo men adapt these craft for seining by building up the gunwale with planks to increase the freeboard by about 10 inches at the bows and 5 inches elsewhere. The following seines are used :—

(i) *The afafa seine*

A very large seine, with wings some 600 yards in length and 16 yards deep, made of 12/48 twine with a mesh of 3 inches. (Throughout this report the mesh measurements given are those of the stretched diagonal : thus a " 2 inch mesh " has a 1 inch bar, or twelve knots to the foot). The afafa fish, a horse mackerel weighing up to twenty pounds, is caught by this net in large numbers from October to January, 8,000 being sometimes taken at a single haul. Such a catch would sell for several hundred pounds, quickly repaying the high cost of the net, which at present is about £360.

(ii) *The yevudor ga*

This seine has wings about 200 yards long and 10 yards deep, made of 40/6 twine with a mesh of about $1\frac{3}{4}$" : the bag is of 10/9 twine and $\frac{1}{2}$" mesh. It is floated with corks and weighted with lead. It is used throughout the year, catching herring, mackerel, bonito and many smaller fishes from January to August, though not always in large quantities, and during the afafa season is sometimes drawn behind the afafa net when the latter is nearing the beach. Ten men work the canoe which takes it out, one swimming back with one of the ropes when the canoe is through the surf. The net is shot about half a mile from the shore, and about thirty men draw it, the whole operation taking some two hours.

(iii) *The nekpeli*

This has wings 150 yards long and 9 yards deep, made of 40/6 twine with a mesh varying from $1\frac{3}{4}$" at the outer ends to 1" near the bag. Between the wings and the bag are quarters made of 10/6 twine with 1" mesh, and the bag is of 10/9 twine and $\frac{1}{2}$" mesh. Its working is the same as that of the yevudor ga, and it catches similar fish.

(iv) *The nekpeli vi*

This is like the *nekpeli*, but smaller.

All these seines are of cotton twine, and are not tanned. They are drawn with manilla rope of $1\frac{1}{2}$" to 2" circumference.

Much skill and experience are needed in working these nets, particularly when many are being drawn simultaneously in a strong current and are carried past each other. Anlo men have so specialised in this that they do most of the seining in the Central and Western province, and only in the Accra district is it done without them.

7. Some Anlo men own "*ali*" herring drift nets and sailing canoes, but they go to Grand Popo, in Dahomey, to fish with them and seldom use them in their own waters. The name of these nets and probably their design and use have been borrowed from the Fanti-Ga fisheries, and they will therefore be described in the section dealing with the latter. Set nets known as "*toga*" are used, chiefly for sole and catfish : they are 4 feet deep, of varying length, of 40/6 twine, with a mesh of $3\frac{1}{2}$", and are set in the evening and hauled next morning. Set nets of large mesh and strong twine are used for shark near Cape St. Paul. Apart from the small amount of herring drifting, and lining by visiting crews, there is no off-shore fishing from the Anlo coast. This is surprising, as the in-shore waters worked by the seines are so exceptionally rich.

There is no close season for fishing, and apparently few customary restrictions. It is carried on each day of the week, except for some Christian fishermen who do not fish on Sunday.

8. Fish caught in the seines is divided amongst the crew and the owner of the net ; a usual arrangement being for the owner to take half if he supplies material for mending the net, one third if he does not. The catch is taken from the beach by the women, who then cure it. Most of it is smoked, but some is salted and sun-dried. It is distributed by lorry or by river transport up the Volta, mostly to centres such as Koforidua, Ho and Kpandu, though some travels much greater distances. Salt for curing is available cheaply and in large quantities at villages a few miles inland, where it is dug after the periodical partial drying of the Keta lagoon.

9. The District Commissioner, Keta, estimates the total number of canoes in this area to be 828. Some of these may be old and no longer in use, but those in service can hardly be less than 700, of which probably about half are used for seining. The quantity and value of the catch is extremely difficult to ascertain, as it varies greatly from year to year and there is no central marketing or system of records. The District Commissioner estimates that in 1940, a bad season, some 3,150 tons were sold in Keta market. Not all the catch goes through Keta, so the total may well have been 4,500 tons. At 2d. per pound, an average price, this would be worth £84,000.

THE FANTI–GA FISHERIES

10. These show considerable diversity in methods and gear, the most important being drift net fishing for herring. Drifting for other fish is practised to a lesser extent, and large quantities are caught with several types of set net. There is extensive deep sea lining, and seines are worked at most places where there is a suitable beach.

11. The canoes used in this area are of the following three main types :—

(i) *Off-shore canoes* (Ga—ali lɛlɛ : Fanti—adi ahima)

These are dug-out canoes cut usually from wawa (triplochiton scleroxylon). They have an overall length of about 25 feet and a maximum beam of 4 feet 9 inches, the hull being about 3 inches thick. They have graceful lines, are fast under sail, and are very buoyant, riding easily over surf that would swamp less well-designed craft. Thwarts consist of groups of narrow staves lashed to the gunwales with cane binding or with cord, except for that carrying the mast which is made of one flat piece. The mast, usually of danta, is stepped in another piece nailed to the bottom of the canoe. It carries a large rectangular sail of some 350 square feet spread by a bamboo sprit from the foot of the mast to the peak and another bamboo spar from amidships to the luff. Sheets are led aft from the peak and clew and the tack is lashed to the stem. It is steered by a man standing with a long sweep, and when going through surf or against the wind is paddled by its crew of five to seven.

Leeboards were introduced by A. P. Brown in 1936, and rapidly became popular throughout the coast, so that now few fishermen from Ada to Sekondi sail without one. This is an interesting example of their keenness to adopt a new idea when the latter is seen to be really sound. With a leeboard a canoe can sail within about eight points of the wind, but tacking is tedious as the mast is sloped to windward and has to be moved when going about. The men are quite happy with a following wind of 28 m.p.h., though this is rather too much for the smaller in-shore craft. Sailing is made easier by the regularity of the wind, which is westerly from midnight to about 10 a.m., and southerly from 10 a.m. to midnight. The only exceptions to this are during harmattan which may be only a few days each year, and sudden gusts when tornadoes are about, which the men have to watch carefully.

The hull is made in the bush at some point accessible to the sea where suitable trees are found, the fisherman often staying to watch the work and ensure that the shape is to his liking. It is then carried to the coast by rail or lorry or floated down a river, many canoes going down the Pra to Shama. At the beach it is charred, but not painted, the thwarts fitted, and the sides decorated with designs and mottoes to the owner's fancy. In the Eastern Province the hull costs about £10 in the bush, and the finished canoe about £18 : in the Central Province prices appear to be lower.

(ii) *In-shore canoes* (Ga—belesɛ lɛlɛ, fɑ́ lɛlɛ)

These resemble the off-shore canoes in structure and rig, but are 15 to 24 feet long with about 4 feet beam. They are paddled by two or three men, and their cost is about half that of the larger craft.

(iii) *Seine canoes* (Ga—ʧani lɛlɛ)

These are generally old off-shore canoes adapted for seining by building up the bows with a box-like structure about 18 inches high to give the extra freeboard necessary when plunging through the surf with a heavy net on board. The thwarts are replaced with nailed planks. Some new canoes are built specially for seining, and these do not receive the finish and decoration given to others.

12. The chief structural defect of these canoes is the frequent development of large cracks near the bows and stern where the hull is cut across the heartwood. Sometimes these are seen in new canoes, which have to be patched or caulked before they can be used, while others remain fairly free from this trouble for years. Because of these cracks and the heavy pounding the canoes continually receive in the surf and on the beach their life is short compared with that of European fishing boats : few remain sound after ten years, though they may still be used for seining.

13. The following drift nets are used in the Fanti–Ga fisheries :—

(i) *The herring net* (Ga—ali ; Fanti—adi)

This is of 40/6 twine with a mesh of 1¾ to 2 inches, up to 400 yards long and 800 meshes deep, equivalent to about 40 yards. It has a border about 12 meshes wide of net with 24/8 twine and is not set in, but stretched tight on the head and foot ropes. It is floated with cork and weighted with lead. The present cost of such a net is about £75. Along most of the coast in this area the herring season is from June to September, with a lesser season in December and January, but at Ada the more important season is from December to February or March. Canoes with a crew of six or seven generally leave soon after midnight and return during the following day, though they sometimes stay out for two days. They probably seldom go more than 20 miles out to sea.

(ii) *The mackerel net* (Ga—watʃa ; Fanti—esietʃom)

This is of 20/8 or 24/8 twine with 3 inch mesh, about 300 yards long and 340 meshes deep. It catches mackerel and other fish of similar size, often near the shore.

(iii) *The shad net* (Ga—kokolɛ ali)

This is of 40/6 twine with a mesh of about 3 inches. It is designed for catching the shad which is sometimes abundant, but it is not extensively used. All the drift nets are of cotton twine and are tanned, tanning being repeated at intervals with bark from local trees or with imported cutch.

14. The following bottom set nets are used :—

(i) " *Toga* " (Fanti—tenga)

This net is made of untanned 40/6 cotton twine with 1½ inch mesh. It is set in by the half and is about 88 yards long on the ropes and 5 feet deep. Each man in the canoe, of whom there are usually three, fishes two such nets and has the fish he catches. The canoe stays with the nets, and they are hauled after a few

hours. Threadfin is the fish mostly caught thus, and the net is used throughout the year. It suffers considerable damage from larger fish. Another net, " toga awalaŋ ", is similar to the toga, but has a mesh about twice as big.

(ii) " *Tengirafo* "

This is of thicker twine, often 20/8, with a mesh of 3 or 4 inches. It is only a few feet in depth, but may be several hundred yards long. Its name is derived from a supposed resemblance to a telegraph line ashore. It is shot in the evening, its position marked with a calabash buoy, and hauled the following morning. Its catch is chiefly catfish and sole. This net is extensively used in some towns, notably Shama, but is not popular in others.

(*iii*) *Shark nets*

Numerous types of these are used with meshes varying from 8 inches to 2 feet, according to the size of shark for which they are intended. Sometimes they are of stout cotton cord, sometimes of hemp. They are usually shot in the afternoon and hauled next day.

Other set nets differing slightly in twine and mesh from those described above are used locally at the various fishing centres.

15. *Cast nets.*—Cast nets now have a limited use in this area, though they were of much greater importance before the introduction of the large drift nets. In the Eastern and Central provinces they are used from the beach to catch a small quantity of fish, and sometimes from canoes. In the Western province, in and near Sekondi, *ali* drift nets are less generally used and cast nets receive a correspondingly greater measure of attention.

16. *Line fishing.*—Off-shore line fishing in 50 to 100 fathoms is practised by Fanti and Ga fishermen, particularly the latter, the men of some villages such as Tema and Prampram using little other gear. The chief catches are tunny and a large sea bream, but shark, sail-fish, barracouta and many other species are also caught. Hooks of all sizes are used, from 5/0 for shark to No. 18 for small bream and mackerel, and the men are most particular to use what they consider the appropriate size of hemp or cotton cord for each hook. Snooding for the smaller hooks, of which 100 may be used on one long line, is often made by twisting several strands of machine thread.

Crews engaged in this work go farther out to sea than those drifting for herring, as the latter are burdened with a heavy net that would greatly increase their danger if they ran into heavy weather. Lining is carried on throughout the year, but the best season is that of the herring, from June to September. Long lines are also laid from the shore, boys swimming out with them through the surf, but this fishing is not important.

17. *Seine nets.*—Large catches are made throughout the Fanti–Ga area with seine nets (Ga—adra, tʃani; Fanti—tʃui). In the Ga district this work is done by local men, but in the Fanti coast most of it is done by immigrant Anlo men though the gear is often owned by Fantis.

A typical seine has wings of 24/8 twine with a mesh of $1\frac{3}{4}$ inch, each 80 yards long on the ropes and ten yards deep. The shoulders are of 10/9 twine with the same mesh, and the bunt of 10/9 twine with 1 inch mesh. It is floated with wood floats cut from an old canoe, and weighted with lead : the wings are tanned and the bunt tarred. Nine hundred yards of $1\frac{3}{4}$ inch manilla rope is provided for each wing, though the full length is not often used. Such a net at present costs about £90, and the heavy wear it has to face makes its upkeep costly ; but it is considered profitable by those who can afford to run it.

The 1 inch mesh in the bunt of seine nets is small, and catches many immature fish : there are no restrictions on the use of such meshes. The area worked by these seines is, however, only a very small proportion of the ground even close to the shore. The introduction of such restrictions would not effect an important saving of fish, and would certainly arouse much resentment amongst the fishermen.

Seines are most easily worked on open sandy beaches, but good catches are often made near rocks. In such places, such as the seining beaches at Teshie, Senya Beraku and Cape Coast, great skill is needed to prevent the net fouling the rock and being badly torn or lost. Where several men own seines on a narrow beach they fish in turn, pulling once or twice in the day : on open beaches four or five hauls are made if fish are plentiful.

18. In this area several systems are used for sharing catches between the fishermen and the owner of the gear, according to the method of fishing.

With drift nets the canoe has one share, the net two shares, and each member of the crew one share, so that if the owner of the net and canoe employs seven men he will take 30 per cent of each catch. He will supply materials for repairing the gear, and the crew will do the work.

In line fishing the canoe has one share, the lines one, and each of the crew one.

With the *toga* set net the owner of the net, if he does not fish it himself, takes half its catch.

In seine fishing a few shillings worth of the catch is first given to the six or seven men who take the net out to sea, as their dash, and the remainder divided equally between the owner and the whole crew of about twenty men. The owner again supplies materials for repair and the crew do the work : he often gives the crew chop money each day, whatever the catch.

19. In most fishing centres may be found canoes from other villages along the coast ; thus some Accra men go to Ada for the herring season from December to March ; crews from Prampram, Kpone and nearby towns go to Accra and the Winneba district for line fishing, and over a hundred Fanti crews come to the Accra district for the main herring season commencing in June. Other crews from Winneba, Appam and Elmina go to Shama, Sekondi and Axim, while Anlo men from the Keta district come to most of the Fanti towns for seining.

Some of this migration is in search of places where the fishing is temporarily better than that of the crew's home town, as in the case of the Accra men who visit Ada ; but often it appears to be due to the desire to escape from the family palavers that waste so much of the fisherman's money and time if he stays at home. Sometimes the men's wives accompany them, travelling by lorry or occasionally in the canoe, but generally the men arrange with a local woman to cure and sell their fish. These women may send a message to the men when the season is expected to begin and advance money for their travelling expenses, to be repaid when fish has been caught. Immigrant crews usually pay an annual fee of a few shillings or pounds to the chief fisherman of the town in which they wish to stay.

20. In most fishing towns there is a chief fishermen, who is responsible to the chief for all matters relating to fishing and the beach. He is advised by a group of elder fishermen. His authority varies in different towns : in some there is one chief fisherman with considerable power ; in others there are several having different sections to look after, and in some the chief of the town deals with fishing affairs himself.

21. The animist faith of the fishermen is often expressed in customs associated with their work. The most obvious of these is the prohibition of fishing on Tuesdays, which is rigidly enforced throughout the Fanti–Ga area in marked contrast to the Anlo fisheries. The only exceptions to this are the shooting of certain set sets, to be hauled next day, and the use of cast nets from the beach Tuesday is largely devoted to repairing gear and settling accounts with the women who cure and market the fish.

In Accra the spirit of the sea, Nai, is much respected and offerings are made by his priest when a new seine is to be brought into use. Loss of life at sea is believed to have a very ill-effect, and the heavy seas and lack of fish experienced this year is generally attributed to the many shipping disasters of the war, far away though these may be. Some months ago two Europeans were lost in a bathing tragedy near Accra : the surf at the time and for some weeks after was bad, and offerings were quietly performed one night on the Accra beach in an endeavour to placate the sea.

On most fishing beaches the shrines of other spirits may be found, often consisting of a small grass hut, a pot, a swish cone or platform, or a whale's vertebrae. These are believed to have a profound effect on the movements of fish. Canoes have a spiritual significance, and offerings are made when a new canoe is fitted out and at frequent, often weekly, intervals throughout its life. These may be seen in the remains of an egg broken on its stem, or a few feathers. Some men firmly believe that their canoes direct them by means of a whispering sound when fish is near.

In Accra seine nets are regarded with reverence and when a new one is made a sheep is sacrificed to it, in addition to the offering to the sea already mentioned. Seines may not be removed from the beach, though other nets are kept in the owner's house. There are a few local close seasons for fish ; for instance, in some towns near Accra the large sea bream may not be fished for some weeks in June and July, and in Accra all fishing ceases for one or two days in August.

22. The women prepare the following five main types of cured fish :—

(*i*) *Smoked.*—(Ga—lɔ̃ ni aʃa ni atʃukɔ ; Fanti—whoi).

Most of the herring catch is cured by this method. Without washing or gutting, the fish are dried in the sun for a few hours and then grilled for ten minutes on an iron grill over a charcoal fire : they are then placed in layers in an oven over a smoky fire of wood and coconut husk and remain there for several days or a week according to the time that they are required to be kept.

The ovens are cylindrical swish structures about 4 feet high and 4 feet wide, with an opening for fuel at the bottom and a rack for the fish half way up. Many women now use ovens made from iron drums instead of swish and these have advantages in that they are portable and easier to keep clean. The top of the oven is usually covered with a lid of corrugated iron. Small fish thoroughly dried by this method keep well for several months, probably because of sterilisation in the first grilling, but a less careful treatment gives a product that spoils in a few days or weeks. There is, however, little desire to keep it for long, as the women prefer a quick sale, even at a low price, to holding stocks of fish for a better market.

(*ii*) *Smoked.*—(Ga—lɔ̃ ni ahɔ̃ ; Fanti—whoi).

Fish are put straight into the smoke oven without preliminary grilling. The product is inferior to that of the longer process and does not keep as well. This method is mostly used when the quantities of fish to be dealt with are so large that the women do not have time to do them properly. No salt is used in either of these methods.

(iii) *Salted and sun-dried ; " stink fish "* (Ga—lɔ̃ŋʃra ; Fanti—momoi)

Fish are gutted, washed, rubbed with salt, left for several days, washed and dried in the sun. Salting is sometimes delayed for one day, and it is always inadequate, for the stench of the drying fish is appalling. The product is popular as it goes a long way in flavouring stews, but its preparation is restricted by the Sanitary authorities in the larger towns.

(iv) *Salted* (Ga—ŋɔ̃ lɔ̃, " salfish ")

Fish are gutted, washed, and packed in salt. As they are thoroughly salted they keep well, but this method does not seem to be extensively used.

(v) *Sun-dried* (Ga—lɔ̃ŋʃra)

Small fish, generally caught in seines, is simply laid on the ground to dry in the sun. Like the other " stink fish " it deserves its Ga name, which means " rotten fish."

23. When curing is complete the women sell the fish in the local market or send it by lorry, rail or river boat to agents in distributing centres such as Koforidua or Kumasi. When it is sold and the woman has the money she will give it to the fisherman, who then pays her the customary commission of one or two shillings in the pound. In some towns the fisherman's wife or wives have the right to sell and market his fish ; in others he is free to dispose of it as he likes. Fish caught in seines may generally be given to any woman who wishes to market it. In Accra and the few other towns, where there is an important market for fresh fish, the women who sell it receive a similar commission from the men.

24. In the Fanti—Ga area salt for curing is obtained from several sources, some coming from the large quantities available at Keta and Ada. some from local lagoons such as that between Labadi and Teshie, and some is imported salt bought in the stores.

25. Information supplied by District Commissioners indicates a total of 7,694 canoes in this area. Subtraction of 10 per cent, to allow for old ones no longer in use, leaves 7,000, of which about 400 are used for seining. It is at present impossible to estimate the average catch of these canoes with any accuracy: it varies greatly from season to season, few fishermen keep accounts, and the experience gained through the working of the Prisons scheme is still very limited. In view of this experience I suggest that £40 be taken as the average annual catch of an off-shore or in-shore canoe in a poor season, and £150 as that of a seine. These can hardly be excessive, as they correspond to an annual income of about £4 to £6 per man: they are often greatly exceeded, as even in a bad season *ali* drift nets may land catches worth £15 in a single day; seines catches of £20, and *foga* set nets catches of £5.

The value of the total annual catch in this area would thus be about £324,000. At an average price of 2d. per pound this would be equivalent to 17,350 tons.

A. P. Brown (loc. cit.) suggests that the annual catch of the 240 canoes at Teshie is worth £50,000 to £100,000: Dr. F. M. Purcell, in his report on the Nutrition Field Survey, gives the income of fishermen in Dzelukope (Keta district) and Nungua (Accra district) as forty to several hundred pounds: but I hesitate to accept these estimates, which are greatly in excess of those given above.

The Nzima Fisheries

26. There are two obvious differences between these fisheries and those of the Fanti—Ga area: the Nzimas do not observe the prohibition of Tuesday fishing, but fish each day of the week, and they use an entirely different type of canoe. It is a dug-out, prepared usually from the silk-cotten tree, and, instead of the graceful lines of the Fanti craft, it has wall sides and a square cross-section throughout its length of about 25 feet. It is used for both seining and drift net fishing, but is never sailed, so that its range for the latter work must be very limited. Poles are used to push it through shallow water, and then it is paddled. Seines in this district are smaller than those of other areas. I have had no opportunity to see the local drift nets.

27. The total number of sea canoes in this area has been estimated at 327, of which 67 are used for seining. Assuming an average annual catch of £20 for each drifting canoe and £150 for each seine, the total catch for this area would have a value of £15,200. At 2d. per pound this is equivalent to 814 tons.

Estimate of Total Catch

28. The figures given in paragraphs 9, 25 and 27 above indicate that in the sea fisheries of the Colony there are some 8,000 canoes, worked by about 50,000 men: their catch in a poor year is estimated at about 23,000 tons, worth £420,000. This estimate makes no claim to accuracy, but is intended to give a minimal value: it seems not unlikely that in a fair season the value may exceed £1,000,000. The industry would thus appear to be one of major importance.

River Fisheries

29. Fish are caught in all of the many rivers of the Colony, generally with cast nets or wicker traps, but the largest river fisheries are those of the Volta. This is fished throughout its length in the Colony, much of the work being done by Ada men, some of whom have made permanent camps near Lawra and Wa.

No survey has been made of the Volta fisheries, and no information is available as to their value, but it must be considerable. The upper Niger in French territory yields a large quantity of fish, some of which used to come regularly to Kumasi: the Volta is a much smaller river, but it probably makes a valuable contribution that may be capable of extension. The Rivers (Fishing) Regulations, 1938, prohibit the use of nets other than cast nets of not more than 15 yards circumference in the principal rivers of the Colony.

Lagoon Fisheries

30. Cast nets and sometimes other gear are used in many of the lagoons in the coastal districts, but probably the most important of these fisheries is that of the Juen lagoon, on the Western frontier. Here large quantities of fish are caught from January to June, partly by local men and partly by immigrant fishermen from other areas. The catch is carefully cured and most of it sent to the mines, a considerable industry having been thus established. Much of this lagoon is in French territory.

Lake Bosumtwi

31. Fish from this lake are sold in the neighbouring districts of Ashanti. Fishing is greatly restricted by the religious associations of the lake, the only permitted methods being by means of several types of trap made with reed mats.

II.—THE PRISONS DEPARTMENT FISHERIES SCHEME

(A) Curing

32. Before the outbreak of war protein in the prisoners' diet was largely derived from dried salt cod and red herrings imported from England at costs of about 33s. and 28s. per cwt. c.i.f. When the supplies of these became irregular and more expensive, Colonel Cavenaugh, then Director of Prisons, decided to purchase locally caught fish and cure it by European methods in ovens to be built and worked by the Department. It was hoped that this would not only ensure adequate supplies of fish for rations, but that it would also provide a basis for development of the fishing industry by the introduction of better methods for utilising the catch.

At Keta a swish oven was built, and started production in December, 1939. It was used until October 1940, when Captain Miller, District Commissioner, built a new oven of a design seen by him in South Africa. This was built with cement blocks, with a length of 6 feet, a width of 8 feet, and a height of 12

feet. Wooden frames inside support mats on which the fish are laid. Its height makes it efficient and economical for the hot smoking necessary in this climate, and ovens built by the Department in future will have similar dimensions. Cement baths for washing and salting the fish were built with it.

At Ada production was also started in December, 1939, using an experimental oven that had been previously built by the Political Administration. This was subsequently replaced by two new ovens more conveniently situated. These were of swish, with thatched roofs, and were heated from hearths stoked from outside. They were fitted with racks and wires for holding the fish, of which each oven could contain several hundredweight.

At Accra an oven built of cement blocks was completed in July, 1940 near the fishermen's compounds of the West Korle Gonno housing estate. This has two smoke rooms heated by separate flues and a large store to which smoke can be admitted, the smoke rooms being fitted with racks to hold about 7,000 herring. Cement baths were provided for washing the fish.

At Winneba a swish oven was built, and started production in April, 1940. Its site is not satisfactory, and it is proposed to build a new oven, of the Keta type but of sun-dried brick, in a more suitable position on the Prison farm.

At Elmina a swish oven to hold about 3,000 herring was completed in October, 1940.

At Sekondi an oven was built with sun-dried bricks, roofed with corrugated iron. It started production in December, 1940, but was only used for two months as the price of fresh fish then rose to a level that made working uneconomical. The site of this oven is unsatisfactory and a new one will be built if a better site can be obtained.

The cost of materials for constructing the swish ovens was usually £5 to £10 : a cement block oven of the type built at Keta would cost about £60.

33. The following table shows the total weight and cost of the cured fish produced in these ovens from the time of their first production to 30th September, 1941. Values are based on the price paid to the fishermen for the fresh fish : some of the fish was caught with gear owned by the Department, particulars of which will be given in a subsequent paragraph, and the value of this is based on the current beach price. Costs include salt and fuel, much of which is collected by prisoners.

	Weight	*Cost*	*Cost per cwt.*
	lbs.	£ *s.* *d.*	£ *s.* *d.*
Keta	21,256	360 10 3	1 18 0
Ada	8,282	155 6 9	2 2 0
Accra	16,280	385 1 1	2 13 0
Winneba	1,512	40 8 7	3 0 0
Elmina	3,269	70 9 1	2 8 3
Sekondi	1,772	79 8 2	5 0 3
Total	52,371 = 23·4 tons	£1,091 3 11	£2 6 6

34. All this fish has been cured by salting with subsequent smoking. Several methods varying in detail have been used in an endeavour to produce fish that will keep well in the very difficult climatic conditions prevailing in the Colony. Spoilage of cured fish is generally due to one or more of the following factors :—

(i) Putrefactive bacteria
(ii) A red halophilic bacterial growth, probably micrococcus rubriviscosus (Martel and Germain)
(iii) Moulds
(iv) The formation of a grey powder, probably " smut " fungi, giving an offensive musty odour
(v) Insects, particularly acaridae.

Of these, putrefaction can easily be prevented by salting and smoking, but the other factors are more difficult to control. The best keeping qualities have been found with fish of which the flesh contained nine per cent salt and twenty-five per cent moisture. Herrings with this composition may be prepared by the following process :—

(*a*) Split, gut, wash thoroughly, but do not scale.
(*b*) Leave for about 12 hours in a 16 per cent by weight salt solution.
(*c*) Rinse quickly in fresh or sea water and sun-dry for three days.
(*d*) Smoke for one day.

At Keta salting is done with dry powdered salt, which is rubbed on the split fish. This has given good results, but is likely to introduce an excessive quantity of salt, causing deliquescence during subsequent storage.

Large fish, such as shark, tunny and afafa, should be cut into small pieces and salted with saturated brine or dry salt.

35. Fish cured by these methods keeps in fairly good condition for two or three months, sometimes longer. It is of course essential that containers should be kept clean and free from all trace of contaminated fish. This period is sufficient for fish to be sent from the coast to inland stations and stored for a short time if not immediately required. But it does not provide for a supply throughout the year, as the catch from February to May is often so small that such a supply could only be maintained by keeping fish from the latter part of the main season, perhaps October, for six or eight months.

36. Laboratory experiments indicate that fish can be kept for such a period if it is layered with salt and covered with saturated brine. Split herrings treated thus have been found to be in perfectly good condition after eight months, and a piece of afafa fish after seven months ; the experiment is still proceeding.

As the fish is totally immersed in brine it is protected from air-borne fungal spores and from insects : the red organism appears to be aerobic, growing on the surface of the brine but not below.

This method requires a considerable amount of salt, in fact nearly as great a weight of salt as of fish. Local salt is cheap, however, a 150 lb. bag costing about 9d. at the Songaw lagoon near Ada. As it is derived from the spontaneous evaporation of lagoon water without any sort of refining it would not be considered of satisfactory quality by curers in Europe, but it preserves fish effectively by the above method. When a sufficient quantity of herring becomes available an experimental lot will be stored thus in cement tanks at the Accra curing station.

Some of the eight months old herring mentioned above were soaked in water for one night to remove excess salt, sundried for three days and smoked for one. The product was quite free from any taint, having a taste like that of a kipper. Fish may thus be kept for many months immersed in salt and saturated brine, and then converted by smoking into a product suitable for transport and short storage.

37. The Department's ovens and methods of curing have been demonstrated to many fishermen and women, and samples of the products distributed. Interest has been shown, but there has been little apparent desire to imitate. At the present stage of the scheme this is not surprising, as the cost of the ovens and equipment is more than that of native ovens, and the salted smoked fish is new to the native palate though it was immediately popular amongst prisoners.

Native curers cannot be expected to change their methods, which they consider to be satisfactory, until they see convincing evidence that the new methods are better and more profitable. Such evidence would be given if the Department could produce stocks of well preserved fish at a time out of the season when prices were high but the women had no fish to sell. It has not yet been possible to do this as in the 1940 season the ovens had only been working for a short time, and the present season has been so exceptionally poor that prices have been too high for fish to be purchased, and that caught with the Department's gear has been insufficient for the daily needs of the prisons. This year there have thus been no opportunities for working the ovens to capacity or for storing the cured fish.

Moreover, as has been indicated above, the methods of curing are still in an experimental stage, though promising results have been obtained ; it is not desirable to encourage native curers to adopt these methods until they have been proved completely satisfactory. It seems probable that the fishing community will eventually derive great benefit from them, but a rapid change in such a large and well-established industry is hardly to be expected.

38. Some five years ago an oven of American design was built at Teshie under the guidance of members of the Achimota staff and of the Political Administration. It was to have been run on co-operative lines, but these did not succeed and the oven remained unused. Early in 1941 the Military authorities were requiring large quantities of cured fish, which the Prison ovens were unable to supply, and arrangements were made with the acting chief and the elders of Teshie, whereby the oven was freely lent to the Military for the duration of the war. The latter provided other equipment necessary for curing, to be given to the people of Teshie when the oven was returned to them after the war. Soldiers of the W.A.A.S.C. were taught the method of curing at the Prisons Department's Accra station. Owing to the scarcity and high price of fresh fish only small quantities have so far been cured in this oven, but if the season improves a valuable contribution should be made by it.

39. Relations have been friendly between the Prisons Department and the fishermen from whom has been purchased the fresh fish for the Department's ovens, but there have been some complaints from the women who would otherwise have disposed of the fish. These complaints have not been serious except at Keta, where eventually the men declined to sell to the Prison. The difficulty was overcome by the Department buying and working its own net, as part of the later development of the scheme.

(B) Fishing

40. In a memorandum to His Excellency the Governor, dated 8th November, 1940, the Director of Prisons suggested that the department should purchase canoes and nets to be worked by local fishermen on the customary share basis (as described in paragraph 18 herein). It was hoped that a regular supply of fresh fish would thus be assured, that the cost of obtaining and running the gear would be less than that of continued purchases of local or imported fish, and that a further contribution could be made to the development of the fishing industry. The sum of £650 was made available for the purchase of gear, and in April, 1941, a further £271 was granted for its maintenance.

By February, 1941, canoes and nets were working at Keta, Ada and Accra. This season has, however, been quite exceptionally poor and catches much smaller than had been anticipated. This has been the case in almost every coastal district : only near Appam and Winneba have fair quantities of herring been caught. In other centres much distress has been caused amongst the fishing communities, as the men have had to face not only a scarcity or absence of fish, but also greatly increased prices for nets and the materials needed for their repair. In both these difficulties the department has had to share, and it has thus gained experience that may prove to be not without value.

41. The following paragraphs give particulars of the gear used, the cost of its purchase and maintenance, and the fish it has caught up to 30th September, 1941. In estimating the expense incurred it has been necessary to consider the depreciation of the gear. This is difficult to assess from the limited experience now available, but I suggest that the annual depreciation of canoes kept in repair be taken as 20 per cent ; of drift nets, seine nets and shark nets as 30 per cent ; of *toga* set nets as 100 per cent, and of lines as 50 per cent. The catches are valued at the local beach price current at the time they were made.

Keta

42. A second-hand *nekpeni seine net* and canoe were purchased in February, 1941, and have been used continuously since then. The proposed system of employing local fishermen to work the gear on a share basis was not adopted here, and the work is done by prisoners. This is made possible by the facts that a

seine canoe has only to go a short distance out to sea, and that many of the prisoners and warders at Keta are fishermen who are skilled in this work and very keen on it. It is in no way resented by other fishermen, who often lend a hand in pulling or mending the net. The results of working the net are the following :—

	£ s. d.	£ s. d.
Cost of canoe		7 17 6
Cost of net and ropes		73 12 8
Depreciation of canoe for eight months at 20 per cent per annum	1 1 0	
Depreciation of net for eight months at 30 per cent per annum	14 14 5	
Net sent from Accra for repairs	26 0 0	
Total Expenses		41 15 5
Value of catch		116 14 0
Weight of catch		19,887 lbs.
Average value of catch per lb.		1·4d.
This shows a profit to Government of	£74 18 7	

In September, 1941, a sum of £358 was granted for the purchase of a new *afafa net* for use at Keta. This was first used on 3rd October and its working therefore does not come within the period under review ; but it may be of interest to note that its first haul was 1,200 lbs. and on 8th October a single haul of 20,000 lbs. was obtained. These would together be worth about £80.

ADA

43. In July, 1940, before the inception of the present fishing scheme, a second-hand canoe was purchased for use in the river and estuary, where the prisoners fish with lines, cast-nets and traps. The expenses incurred have been very small, only hooks and lines costing 8*s.* 5*d.* having been provided from the vote for gear. The catch since February, 1941, including some fish caught at sea with these hooks from the ali canoe, has been worth £18 3*s.* 10*d.* weighing 2,520 lbs., with an average value of 1·7d. per lb.

44. An *ali drift net* was assembled in February, 1941, and a second-hand ali canoe purchased. This gear has been worked by local men on the share basis, a crew of seven men taking seven-tenths of the catch and the department three-tenths. It was not completed until almost the end of the main Ada herring season, and was only used in February and March. Its depreciation has therefore been taken as that expected in three months. The results of working this net are the following :—

	£ s. d.	£ s. d.
Cost of canoe		21 15 0
Cost of net		74 3 9
Depreciation of canoe for eight months at 20 per cent per annum	2 18 0	
Depreciation of net for three months at 30 per cent per annum	5 11 2	
Maintenance	Nil	
Total Expenses		8 9 2
Value of prison share of catch		10 7 0
Value of total catch		21 9 6
Weight of prison share		1,501 lbs.
Weight of total catch		3,124 lbs.
Average value of catch per lb.		1·7d.
This show a profit to Government of	£1 17 10	

45. A *shark net* was made of hemp twine in July, 1941 and has been used when large shark were believed to be about. The results of its working are the following :—

	£ s. d.	£ s. d.
Cost of net		7 8 0
Depreciation of net for two months at 30 per cent per annum	0 7 5	
Maintenance	Nil	
Total Expenses		0 7 5
Value of prison share of catch		1 7 0
Value of total catch		1 7 0
Weight of prison share		369 lbs.
Weight of total catch		369 lbs.
Average value of catch per lb.		0·9d.
This shows a profit to Government of	0 19 7	

ACCRA

46. The Ga Mantse has taken great interest in the development of the scheme in Accra. Particularly valuable help has been given by Mr. J. A. Quaye, a linguist in the Ga State, who is now attached to the department for this work.

47. A *tjani seine net* was assembled in January, 1941, and a second-hand canoe purchased. Since then it has been used continuously, except when the surf has been too heavy. It is worked by a regular crew of about twenty, who take half the catch: in addition 3s. per day is given to them for chop money. The results of its working are the following:—

	£ s. d.	£ s. d.
Cost of canoe		12 10 0
Cost of net		113 11 6
Depreciation of canoe for eight months at 20 per cent per annum	1 13 4	
Depreciation of net for eight months at 30 per cent per annum	24 14 0	
Maintenance	49 17 7	
Chop money for crew	32 10 0	
Total Expenses		106 14 11
Value of prison share of catch		61 18 2
Value of total catch		123 16 4
Weight of prison share		4,545 lbs.
Weight of total catch		9,090 lbs.
Average value of catch per lb.		3·3d.
This shows a loss to Government of	44 16 9	

The very heavy maintenance cost was due to inferior net having been used in its construction. At the time it was assembled net was difficult to obtain, and the only net available was purchased. This proved so unsatisfactory that much of it had to be replaced after a few months by good net which could then be obtained. Over £40 of the maintenance cost was incurred during the first four months working.

48. An *ali drift net* was assembled in February, 1941, and a second-hand canoe purchased. Unfortunately this canoe was destroyed in May by a fall of rock from the cliff under which it was lying, and another had to be bought. The crew of seven takes seven-tenths of the catch, and the Department three-tenths. The results of working this net are the following:—

	£ s. d.	£ s. d.
Cost of canoe		18 8 6
Cost of net		80 13 7
Depreciation of canoe for five months at 20 per cent per annum	1 10 0	
Depreciation of net for seven months at 30 per cent per annum	14 2 5	
Maintenance	19 3 8	
Value of lost canoe	11 8 0	
Total Expenses		46 4 1
Value of prison share of catch		19 11 9
Value of total catch		64 19 4
Weight of prison share		1,171 lbs.
Weight of total catch		3,880 lbs.
Average value of catch per lb.		4·0d.
This shows a loss to Government of	26 12 4	

49. A *toga set net* was assembled in March, 1941, and a second-hand canoe purchased. This net is usually worked by three men, who together take half the catch. The results of its working are the following:—

	£ s. d.	£ s. d.
Cost of canoe		7 7 6
Cost of net		26 14 2
Depreciation of canoe for six months at 20 per cent per annum	0 14 10	
Depreciation of net for six months at 100 per cent per annum	13 7 1	
Maintenance	2 4 0	
Total Expenses		16 5 11
Value of prison share of catch		29 3 10
Value of total catch		58 7 8
Weight of prison share		1,218 lbs.
Weight of total catch		2,436 lbs.
Average value of catch per lb.		5·7d.
This shows a profit to Government of	12 17 11	

This type of net has an exceptionally high depreciation, seldom lasting more than a year if used continuously, but it catches regularly and is popular amongst the fishermen.

50. The crews of the *ali* and *toga* nets have been equipped with *lines*, which they use for off-shore fishing when they consider that conditions are more favourable for this than their nets. Each member of

the crew of three to five takes one share of the catch, and the department two shares. Lines from the shore have also been used to a small extent. The results of *line fishing* are the following :—

	£ s. d.	£ s. d.
Cost of lines and hooks		7 3 6
Depreciation for four months at 50 per cent per annum	1 3 10	
Maintenance	Nil	
Total Expenses		1 3 10
Value of prison share of catch		4 17 6
Value of total catch		10 14 6
Weight of prison share		173 lbs.
Weight of total catch		357 lbs.
Average value of catch per lb.		7·2d.
This shows a profit to Government of	3 13 8	

SUMMARY OF FISHING RESULTS

51. The results given in the preceding paragraphs show that since the inception of the scheme 41,663 lbs. (18·6 tons) of fish valued at £415 12s. 2d. has been caught : of this Department's share has been 31,384 lbs. valued at £262 3s. 1*d*.

The expenses incurred and met from the vote provided for this purpose are estimated at £221 9s. 2d. based on the assumed depreciation of gear. There has thus been a profit to Government of £40 13s. 11*d*. This is disappointing as a much more substantial profit had been expected and would probably have been realised had the season not proved so poor.

The fishermen have had as their share 10,279 lbs. valued at £153 9s. 1d.

The weights given above do not include small quantities of fish given according to custom to certain fishermen, such as those who take the seine net to sea ; these are deducted before the catch is divided.

52. The total expenditure on purchasing, maintaining and working the above gear was £592 17s. 4d. A lorry for transporting fish from the beach to the Accra curing station and the prison was bought for £100. The department also owns a canoe fitted with a balance lug sail and a rudder. This was designed by His Excellency the Governor, and it was hoped that the improved rig would be adopted by the fishermen. They at once appreciated its sailing qualities, but they did not consider it to be suitable for fishing, mainly because of the obstruction to working the net caused by the yard and boom. It may later prove possible to develop a rig combining the good qualities of native and European sails.

53. The average value per lb. of the whole catch was 2·4d. but it varied widely in different districts and for different gear : in the case of the larger catches from 1·4d. for the Keta *nekpeni* seine to 5·7d. for the Accra *toga*. The latter catch is mainly threadfin of uniform size and good quality, but its value seems disproportionately high. These prices may be compared with those of fish in Great Britain during 1938, which ranged from 0·7d. for herring to 5·5d. for plaice, with an average of 1·7d.

III—CONCLUSIONS AND RECOMMENDATIONS

54. The most serious difficulty encountered by Gold Coast fishermen is the strongly seasonal nature of their trade. In a normal year herring are abundant along most of the coast from June to October, and the great afafa catch is made in the Anlo area from October to January. In December and January fairly large quantities of herring are caught at Ada, but from February to May fish is scarce throughout the Coast and large catches cannot be expected anywhere. During the season prices fall sharply, herring and afafa fish sometimes fetching less than 0·5d per lb. (and sometimes even being thrown away when the quantities are too great for the women to cure), but when fish is scarce the price of herring may rise to 8d per lb.

The result of these fluctuations is that for six months in the year the fishermen are forced to a low standard of living, with hardly enough money for food and clothing, and little for recurrent expenses such as house rents and their children's school fees. When the season comes they have an opportunity to renew their gear, but they are naturally tempted to spend an undue proportion of their takings in celebration, and little money is saved.

If their catch could be sold evenly throughout the year at a fairly steady price their standard of living would probably rise, even if their total annual incomes did not at first increase. This would induce more men to take up fishing as their trade, causing a general expansion of the industry.

55. Progress towards the attainment of such a steady supply of fish to local markets might be made in two ways :—

(i) The extensive use of improved methods of curing, whereby much of the catch could be stored for several months and then sold when fresh fish had become scarce :

(ii) The use of improved gear and boats, capable of catching fish at times when the present equipment is unable to do so.

Substantial progress will probably be made only by a combination of these two methods.

56. A question of fundamental importance is whether locally cured fish can compete in price with imported fish under peace-time conditions. During 1938 3,387 tons of tinned fish at an average cost of 42s. 6d per cwt. c.i.f., and 1,812 tons of dried fish at an average cost of 34s. were imported. This quantity is much less than the local catch, but it would increase if conditions were favourable. The retail price of these would hardly be less than 54s. and 44s. respectively. The average cost of fish cured in the prison ovens has been 46s. 6d. per cwt., but it has been produced for 25s. at Keta when fish has been abundant. There is little doubt that the fishermen could get an adequate return by selling at 30s. or 35s., particularly if catches are increased.

57. In the development of the industry three distinct phases may be anticipated. The first of these will be largely concerned with methods of curing and storing. The method described in paragraph 36, whereby fish is kept immersed in salt and saturated brine and then smoked shortly before distribution and consumption, seems likely to form the basis for such development. A cylindrical tank 4 feet in diameter and 4 feet high would hold at least a ton of fish in salt : built of cement blocks it would cost several pounds. An oven of the type built at Keta could be built of sun-dried bricks for about £10. Many of the fishermen and women could afford this expenditure, which would be small compared to that incurred for their nets.

Large numbers of tanks of the above dimensions would be needed to store a significant proportion of the catch, but if those first built proved profitable others would soon follow. Many women want a quick cash return and would not wish to hold much of their stock. If they found that a small portion so held gave a good return they would probably try to increase the amount in the following season.

58. While progress towards the better utilisation of the catch is thus being made, some improvements can probably be effected in the fishing gear used by the men. Of these the most valuable would be the introduction of efficient methods of net preservation. Expenditure on the repair and replacement of damaged net is very heavy and often strains a fisherman's resources to their limit. Some of the damage is caused by rocks and large fish, but most of it is due to a decrease in the tensile strength of the twine, which commences within a short time of the net being brought into use.

59. The second phase in the development of the industry will be the introduction of boats capable of remaining at sea for longer periods and in rougher weather than can the canoes. Line fishermen often see herring far out to sea when there are none in the waters nearer the shore where the drift nets are worked : canoes laden with these heavy nets cannot venture as far out as can the lightly laden line canoes. Of the two chief catches, herring are only caught when they come within about 15 miles of the land, and afafa fish when they come within one mile.

It seems probable that the catch both in and out of the main season could be greatly increased by the use of craft capable of following the fish and remaining at sea for several days or a week. Salt would be carried for preserving the catch. Craft similar to ships' lifeboats or the whaleboats used off the Liberian coast might prove suitable for this work. Carvel built boats of this type, but smaller, have long been used for line fishing off Sierra Leone.

Auxiliary motors would be useful, but sails should be the chief means of propulsion. The men would quickly learn to handle any sail, but they are not mechanics and would soon be in trouble if they relied on a motor to get them home.

Such boats could not be worked from the open beaches that form almost the whole coast line, as they would have difficulty in getting out through the surf and would be too heavy to be drawn up on the sand. On these beaches the present canoes are probably more efficient than any other type of craft. The larger sailing boats could, however, work from Sekondi harbour, where there is a long breakwater and two large jetties ; some could also work from Accra harbour, and possibly from the estuaries of the Ancobra, the Pra, and the Volta.

Such boats should not cost more than £200, and would be within the means of some of the wealthier fishermen and net owners. The increased catches obtained would necessitate further development of curing, storing and marketing systems.

60. The third phase anticipated in the industry's development is the introduction of motor or steam driven vessels from which a large fleet of drift nets could be worked, and a trawl or Danish seine should the bottom prove suitable for these. Little is known as to the prospects of trawling off the Gold Coast. Demersal fish are untouched by present methods of fishing, except for those caught close to the shore by seines and set nets and off-shore by lines.

The 100 fathom line lies at a distance from the shore varying from 58 miles off Sekondi to 10 miles off Keta. The 50 and 200 fathom lines are generally within a few miles of it, as the continental slope seems to start at about 50 fathoms and is steep : off Ada the depth increases from 20 to 200 fathoms in less than a mile. Within the 100 fathom line there is an area of about 8,000 square miles, most of which is in less than 50 fathoms. There are no banks outside this area except the small Mesange bank, an area of about three square miles in 10 fathoms, rising from 500 fathoms 20 miles south of Ada.

61. Decked motor boats of about 35 feet, similar to those used off the west coast of Scotland, might prove suitable for working drift nets and Danish seines : for trawling larger vessels would be needed. They could operate from Takoradi and Sekondi, and possibly from the Ancobra, Pra and Volta estuaries. Their catches would be large, and adequate curing stations would be essential : without these the venture would fail utterly.

Such an undertaking would probably be beyond the means of the fishing community and would need European capital and direction. The time for it has not yet come, but without it the fisheries of the Colony will not be fully developed.

62. The first phase of development, described in paragraph 57 above, may be considered to have already commenced with the Prisons Department curing and fishing scheme. Though the results of the fishing have so far been disappointing, I suggest that they justify the continuance and extension of the work. Provision has been made in the 1942–43 estimates for the purchase of *ali* drift nets, *watfa* drift nets, *toga* nets, lines and canoes for use at Winneba, Elmina and Sekondi, and for additional nets at Accra. This gear should do much to maintain a supply of fish for the Prison curing stations, and every effort will be made to increase the efficiency of these stations and to arouse local interest in them.

The problem of net preservation is also receiving attention. Part of the Accra toga net was treated with copper oleate, and this portion is still strong though the rest of the net is in need of renewal. Further experiments will be made with this preservative when supplies of it become available.

Literature courteously supplied by the United States Bureau of Fisheries indicates that the most serious cause of net deterioration is the action of direct sunlight on dry nets, cotton exposed to rain and sun for six months on the Atlantic coast having lost 72 per cent of its tensile strength, while cotton exposed to rain but dried in the shade increased in strength by 3 per cent. If these results are applicable to the Gold Coast they suggest that much of the spoilage of nets is due to the local practice of drying nets in the sun and leaving them in the sun for hours after they are dry.

Areas of shade of sufficient extent for drying large nets are difficult to find, but men working the Department's nets are instructed to remove them from the sun as soon as they are dry. If this is found to prolong the life of the nets a valuable result will have been attained.

63. The Prisons Department will continue to contribute in these ways to the progress of the industry, but its ability to do so is limited by the fact that it has prisons in only seven of the many fishing centres along the coast. It has neither facilities nor staff to extend the scheme to other towns and its present fisheries work is run by a staff already fully occupied in their normal prison duties. There would thus appear to be little prospect of a general development of fisheries throughout the coast, on the lines indicated in paragraphs 57 to 61, unless a small specialist staff be appointed to give its whole time to this work. I suggest that the extent and value of the industry are such as to justify the establishment of such a staff.

64. This Staff should include members with a knowledge of marine biology and practical experience of modern methods of commercial fishing. They must have a sympathetic approach to the illiterate fishing community, for it cannot be over-emphasized that there can be no progress without the goodwill and co-operation of the fishermen and women.

Its first duty would be the introduction of the improved methods of curing and storing in centres where there are no prison ovens. Fishing co-operative societies, which do not at present exist, might prove valuable in the construction of curing stations and in many other ways, but such societies would be difficult to run and initial progress could be more readily made by encouraging private enterprise amongst the wealthier fishermen and women. While this work was in progress the staff would collect information about every aspect of the industry, including the movements and habits of fish.

A survey of lagoon and river fisheries should also be made. The Volta may have a considerable influence on the movements of fish off the Eastern Province : Anlo fishermen say that the afafa fish goes far up this river to spawn. If this is true, its protection there is most important. On the other hand it is possible that the larger rivers and lagoons could contribute greatly increased quantities of fish without becoming destocked, a contribution of special value in that it could be made in the dry season when the sea fisheries are at their lowest.

65. When better curing had become established, and the second phase of development could be commenced, the staff would assist the fishermen in finding the type of sailing craft suitable for their needs, and in dealing with the increased catches that should be obtained.

If equipped with a small research vessel the staff would carry out the marine surveys that must precede the third phase, that of intensive fishing by modern methods.

66. The nutritional significance of an expansion of the fisheries would be great. The present catch, estimated in paragraph 28 to be 23,000 tons, is equivalent to an annual consumption of about 16 lbs. per person of the total population of the Colony. If this could be increased fourfold a notable contribution would be made towards a solution of the problem of an adequate protein supply, the lack of which causes so much malnutrition. Such an increase should be well within the capacity of the industry.

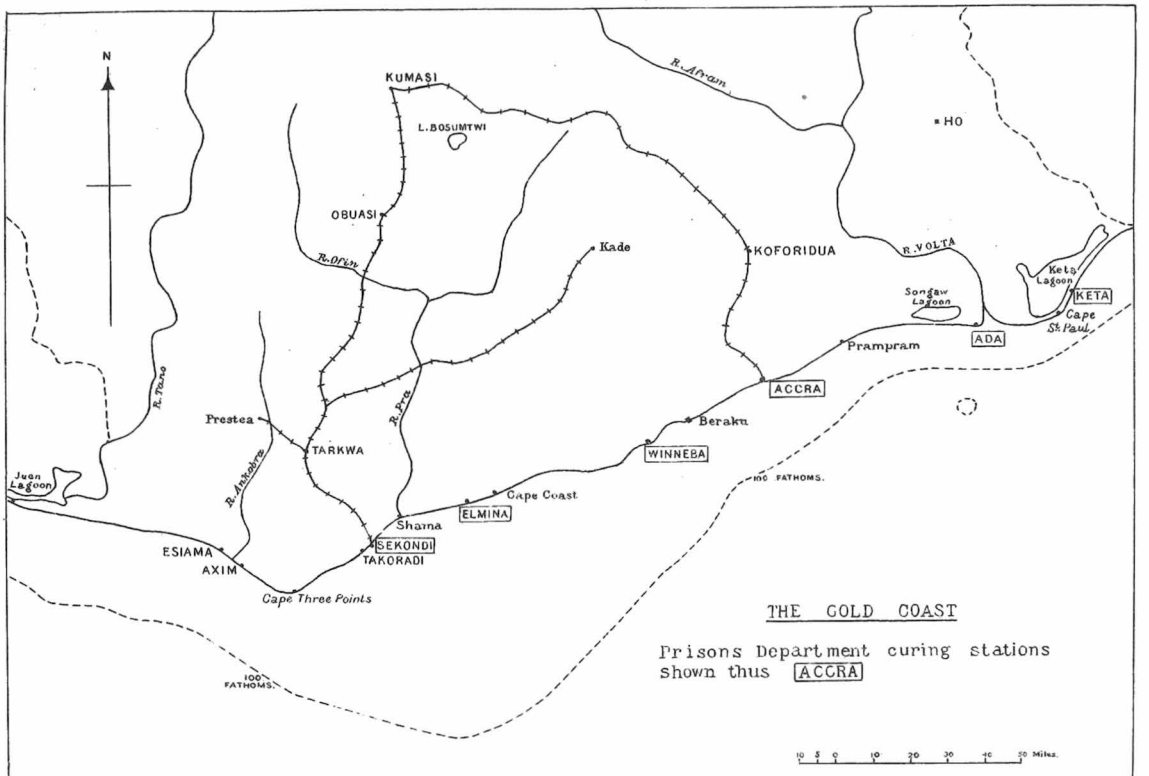
The importance of this aspect of fisheries development is stressed in paragraphs 180 to 182 of the 1939 Report on Nutrition in the Colonial Empire, Part I. Fresh fish is also a valuable item in the diet of many Europeans in coastal towns. Improved facilities for transport and cold storage will make it increasingly available to those stationed inland, to whom it would be particularly welcome and beneficial. Amongst species most suitable for European consumption are sole, drum, threadfin and the sea breams.

67. Little attention has hitherto been given to the production of fishery by-products, such as fish-meal, liver oils and shark skin. The Prison Department has had to concentrate its efforts on the more important problem of food supply, though some small and broken fish have been made successfully into meal for both human and animal consumption. With the development of the industry the utilisation of such by-products may become valuable.

68. In conclusion I would suggest that there is an urgent need for legislation to protect the fishing industry from exploitation. Hitherto it has belonged to the fishermen themselves and to some more wealthy Africans living in coast towns, who find the ownership of a few canoes and nets a good investment : but there are probably very few with more than £1,000 invested in it. As the industry progresses it may well attract capital from other sources, and though this will probably be necessary for its full development there should be means whereby Government can prevent exploitation by firms or individuals against the interests of the fishing community and of the large section of the population for whose nutrition cheap local fish is essential. A draft of legislation designed to provide for this was submitted by the Acting Dirctor of Prisons with his letter No. 762/25/40 of 9th July, 1941.

F. R. JOHNSON,
Government Chemist.

ACCRA,
18th October, 1941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