



2(2) Feb 1953

DEPARTMENT OF PARKS AND WILDLIFE

MONTHLY SERVICE BULLETIN

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FISHERIES DEPARTMENT

10 OCT 1953

WESTERN AUSTRALIA

Vol. 2, No. 2.

February, 1953

STAFF NOTES

Inspector M. Goodlad, of Broome, who has been on sick leave since mid-December, expects to resume duty on February 2.

Messrs. Brownfield, Piesse, Connell, Coombes and McLaughlan have resumed duty after annual leave.

The crew of m.v. "Lancelin", which is at present operating off Fremantle but will shortly leave for the South-West to continue crayfishing, prawn trawling and ruff (sea herring) investigations, comprises Mr. H. C. W. Piesse, Assistant Inspector J. C. Thair and Cadet Inspector D. Wright.

Mr. L. G. Smith, Technical Officer, has been in the Denmark region in connection with the snapper investigation programme initiated by C.S.I.R.O. Division of Fisheries. During a week at Wilson's Inlet Mr. Smith, who was accompanied by Mr. A. Lee, of C.S.I.R.O., belly-tagged and released 150 snapper and preserved 50 others for raciation studies.

Mr. J. S. Simpson, Inspector, Pemberton, has been transferred to Perth with effect from January 27. Mr. Simpson's future role in the Department will be to investigate, after some tuition by C.S.I.R.O., the nature of inland dams and streams with a view to extension of trout acclimatisation activities.

In company with Inspector H. J. Murray, Mr. Simpson during December and January distributed to outlying centres approximately 112,000 fingerling rainbow trout.

During January the Superintendent visited Busselton and Cowaramup, and in company with Mr. E. C. Harris, President of the W.A. Professional Fishermen's League, inspected the waters of Cowaramup Bay, which had in August 1952 been closed against the use of fishing-nets. Later in the month the Superintendent visited Geraldton and the Murchison River. The Supervising Inspector and Inspector Bowler were with him.

Mr. J. Traynor, Fauna Warden, is continuing his duck banding operations at Yanchep. Mr. Traynor's health has now greatly improved, and he is fit for heavy duties again.

During the absence of Mr. Ian Bartholomew on national service training, Mr. Ian Cairns has been appointed to Head Office staff as temporary clerk. Mr. Bartholomew's permanent appointment was gazetted in January.

Inspector A. K. Melsom is acting as Metropolitan Inspector during Inspector Munro's absence in Broome.

#### C.S.I.R.O. PERSONNEL

Mrs. L. M. Willings, Technical Secretary of the Division of Fisheries, C.S.I.R.O., Cronulla, N.S.W., has returned to the East after a week's visit to Perth. During her stay Mrs. Willings had discussions with local officers of the Division and with the Superintendent. Arrangements were made for a visit to Rottnest Island and an inspection of Cockburn Sound in a.v. "Lancelin", and for an inspection of Fremantle, Rockingham, Safety Bay and Mandurah districts by car.

Mr. K. Godfrey was compelled as a result of illness to leave "Suda Bay" at Busselton about mid-January and to return to Perth for treatment. We are glad to say he is now well on the road to recovery and will join "Lancelin" early in February.

Mr. Athol Middleton, of the Hydrology Section of the Division of Fisheries, returned to Perth towards the end of January after having spent several weeks at Cronulla. A few days after he got back Mrs. Middleton gave birth to a son. Congratulations!

### W.A. FISHERIES

There is no compact record available in relation to any of our major fisheries, and it has consequently been decided to run a series of articles in this Bulletin dealing with the respective fisheries. These articles should prove of value to outstation officers when dealing with enquiries concerning such fisheries and they should, it is felt, provide a valuable record for each station's files.

This month we shall deal with the Australian Salmon fishery. Future articles will cover the crayfish, whaling, pearlshell, mullet, prawn, snapper and trout fisheries, as well as others. They will not necessarily appear in the order set out above.

### SICK LEAVE AND WORKERS' COMPENSATION

Absence from duty occasioned by sickness or injury must always be reported fully in writing, immediately if possible. Action will then be taken to see that the necessary form of application for sick leave is provided and that it is supported by a medical certificate.

Where workers' compensation is applicable the foregoing still applies and in addition a further medical certificate on the form prescribed under the Workers' Compensation Act must be secured. Shortly a set of all forms necessary under the Workers' Compensation Act will be forwarded to each district for use as occasion warrants, as well as a supply of sick leave forms required under the Public Service Act Regulations.

In regard to both types of absence through sickness it is stressed that the first essential is the written advice to Head Office. It is also emphasised that officers must not leave their district for private reasons without notifying Head Office in writing.

### THE CRAYFISH AT HOME

Mr. D. W. Klem, of Rivervale, a keen underwater spear-fisherman, recently speared, near Wanneroo Reef, a

crayfish about which were a number of peculiarities. He sent the crayfish to the Department for examination, and it appeared that its condition was due to some breakdown of its moulting mechanism. The shell was encrusted with coral growths, which indicated that it had remained with the cray for a much longer period than is normal.

In forwarding the crayfish Mr. Klem made several observations on the area during his underwater activities. As they may be of general interest his remarks are summarised below -

- (1) The Wanneroo area holds numerous crayfish of an average weight of just over 1 lb.
- (2) Batfish are always in evidence where crays are abundant.
- (3) Large crays (from 6 to 8 lb.) are more frequently met with in shallow water.
- (4) During easterly weather, when conditions are most suited to spear fishing, soft crays are usually found in small reef cavities facing west. Hard crays are generally found in crevices subject to strong currents and face north or south.
- (5) Dark and light colored crays live together and are not worried by a diver unless the latter approaches to within a couple of feet or touches them.
- (6) When a spear fisherman takes one cray from a cave or crevice it is usual for the remainder of his cohabitants to become very agitated. They frequently emerge and seek new living quarters.
- (7) Carpet Sharks have been seen in the same cave as crays on two occasions - in one case for an observed period of two weeks. One of these sharks tipped the scale at 26 lb.
- (8) Caves with some form of retreat are most favoured by crays. Shallow ledges 6 to 9 inches high and 4 to 5 feet deep are very popular.

ILLEGAL NETS - A LEGAL ADVISING

Some little time ago two inspectors on patrol in the Canning River came across a man in a boat on which was a net which was unlawful for use in the Canning inasmuch as the mesh (2" throughout) was smaller than that proclaimed as lawful (2-1/4"). Believing that section 21(3) was sufficient authority, the inspectors seized the net. The following are the words of section 21(3) -

"When any unlawful net shall be found by any inspector in any water or waters specified in the proclamation ..... without any person in actual possession thereof, or on a boat in such water or waters, the inspector may seize such net .....

The Department had always read this Section to mean that it was not necessary, if an unlawful net was on a boat in closed waters, for the net to be unattended before it could lawfully be seized, and the Crown Law Department was instructed to prosecute. However, when the return day was approaching and the solicitor handling the case looked more deeply into the Act, he decided the defendant had no case to answer and the complaint was withdrawn.

As this case involves what is to Departmental officers a new concept of Section 21(3) the letter from the Crown Law Department on the matter is reproduced herewith for the information and future guidance of all concerned -

"Re Fisheries v .....

The above case came on for hearing in the Perth Police Court on the 24th September, and was withdrawn as examination of the facts and the Act disclosed that there was no case to answer.

The defendant was charged pursuant to Section 46 of the Act, which reads:-

- '(1) Any person who is found on any waters in a boat containing any net .... the use of which is prohibited by any proclamation made under sections nine or ten ..... is guilty of an offence .....

The proclamation in this instance was made pursuant to Section 19, and Section 46 therefore is of no effect.

The defendant should have been charged pursuant to Section 21, if the facts could sustain a conviction, but here, the nature of the offence is different, and involves the "use", for the purpose of catching fish."

There is no evidence that the net was being used, and any proceedings under Section 21 must fail.

Regarding the question of the net, there is power to confiscate only where it involves the commission of an offence. No offence was committed, and neither is it possible to utilise the provisions of Section 21(3) since this contemplates there being no person in the boat upon which the net was found.

The net in question was therefore taken without authority and must be returned to the defendant. I have informed him that if it is to be returned he will not be required to collect it, but it will be forwarded to him. I suggest that it be insured or registered for its full value since you are legally liable for its safe custody."

#### FAUNA PROTECTION ACT REGULATIONS

The new regulations under the Fauna Protection Act, a summary of which was published in the January issue of this Bulletin, have now been gazetted with effect from January 30.

#### ABROLHOS ISLANDS CRAYFISH SEASON

An alteration in the crayfish season at the Abrolhos has been approved by the Minister for Fisheries. For several years now the season has opened on April 1 and closed on August 31. This year the opening date will be March 15 and the closing date August 15.

THE AUSTRALIAN SALMON FISHERY OF WESTERN AUSTRALIA

By A. J. Fraser, Superintendent, Fisheries Department,  
W.A.

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INTRODUCTION

Distributed through many official files, but not readily available in convenient form, is much valuable information concerning the West Australian salmon fishery since its inception. It was for the purpose of putting together all that scattered information that the present paper was prepared. It is not the work of one person, but the facts and figures here presented have been culled from numerous sources. Mr. E. J. Brownfield, A.F.I.A., the clerk-in-charge of the W.A. Fisheries Department, collated the historical facts and got together the material dealing with administration and management. Mr. B. K. Bowen, B.Sc., the statistical officer of the Department, prepared the graph and statistical tables. Mr. W. B. Malcolm, B.Sc., a research officer of the Division of Fisheries, Commonwealth Scientific and Industrial Research Organization, provided the scientific data, wrote the appreciation of the salmon fishery and, assisted by Mr. L. G. Smith, the technical officer of the Department, compiled the table of releases and recoveries of tagged salmon. Their assistance has been invaluable and is gratefully acknowledged.

HISTORICAL

Before 1944 there was no organised fishery for Australian salmon in Western Australia, and the average annual production scarcely reached 50,000 lb. However, in 1939, with the onset of World War II and the added need for increased supplies of foodstuffs of all kinds, the Department set in train a fact-finding survey to assess the salmon resources and to determine the localities of greatest abundance. In 1940 J. A. Tubb, M.Sc., a research officer of the Fisheries Section of the Council for Scientific and Industrial Research, as it was then known, was sent to Western Australia to assist in the survey. In those days the roads along the south coast, where they did exist, were largely untrafficable, there was no cannery to process the salmon, and transport facilities were almost non-existent.

Although it was appreciated that salmon could undoubtedly be taken in sufficiently large quantities to make canning an economical proposition, Tubb's report was not such as to arouse any enthusiasm departmentally or among fishermen and investors.

In 1943 the demand for canned fish by the armed forces became more and more pressing, and arrangements were made for small parcels of salmon to be secured by the Department and handed to Vincent Gardiner, of the Ocean Canning Co., of Belmont, which had recently been established for the canning of Perth herring, for experimental canning. A pack acceptable to the Defence Foodstuffs Administration was soon achieved; the next step was to organise the catching of salmon for Ocean Canning Co.

In the same year a small salmon fishery was commenced independently at the 12-Mile, Hopetoun, by Mr. Edward Young. Working almost single-handed, Young under very great difficulties caught salmon and trucked it in ice to the metropolitan area, where the bulk of the catch was sold to a wholesale fishmonger. Very soon a syndicate known as Hopetoun Freezers, of which Young was a partner, was established at Hopetoun, and the new capital introduced was used to instal proper refrigeration facilities, fishing gear and transport vehicles.

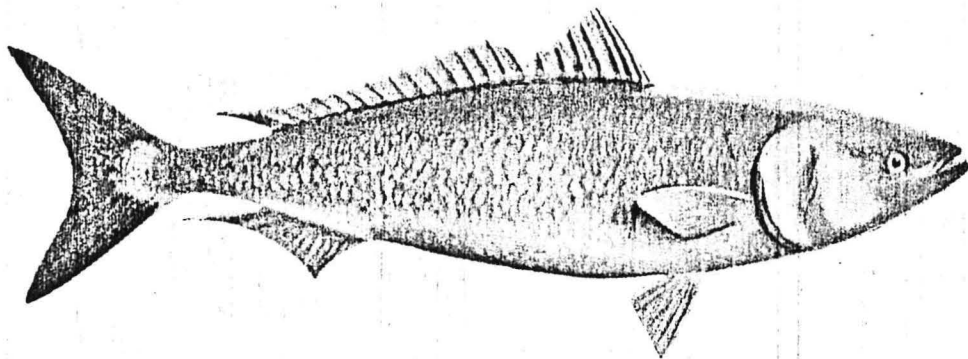
This then was the early history of one of Western Australia's more important fisheries. From these beginnings salmon fishing has spread over the whole of the south coast from Esperance to Windy Harbour, and on the south-west coast from the Leeuwin to Mandurah, and five canneries to deal with the catch have been erected at Perth, Hopetoun, Albany, Esperance, and Busselton.

#### THE FISH

The first point in relation to the Australian salmon (Arripis trutta) which must be cleared up is that the fish is not a true salmon at all. Structurally it is almost as far removed from the true salmon as any fish can be. Possibly some superficial resemblance to the English salmon induced the earliest colonists to give the fish the vernacular name of salmon - whatever the reason the name has stuck.

The Australian salmon has an exceedingly wide

# AUSTRALIAN SALMON



*(Arripis trutta)*

distribution, extending from New Zealand and along the whole of the southern coastline of Australia (including Tasmania) to Western Australia. The stock is divided into two main groups, each possibly deserving species ranking (Gilbert P. Whitley takes the view that the western group is entitled to sub-species status at least, and proposes the name Arripis trutta esper). The eastern group comprises the salmon of New Zealand (Maori "kahawai") and of Lord Howe and Norfolk Islands, and that of New South Wales and eastern Tasmania. The western group embraces the salmon of South Australia and Western Australia as well as that of western Tasmania.

In Western Australia two distinct phases of the fish are in evidence - the immature "salmon trout", which still bear the "parr marks" of adolescence and rarely exceed 15 or 16 inches in length yet are never very small, and the mature salmon, which attain a weight of 18 lb. or more. The "trout" usually inhabit the estuaries, whereas the mature fish are rarely, if ever, taken in estuarine waters.

The mature fish, while it seems reasonable to assume that a large offshore population exists - large schools have been seen many miles at sea - have an inshore schooling habit, and it is during the schooling period that the fishery operates. A further noteworthy feature is that salmon schools "lie up" at favoured resorts during parts of each year, especially in the non-spawning season, for several years on end. Then suddenly, and for no apparent reason, schools which have lain up in an area for a number of years will desert their old haunts and move to an entirely new section of the coast.

This habit of changing regular haunts is shown most strikingly in the Hopetoun area. Until 1948, when the salmon catch of Western Australia reached an all-time high, the 12-Mile fishery at Hopetoun produced half the total annual catch of the State. The fishery lasted for approximately six months of the year on the non-spawning stock. School after school of salmon moved in each year behind the 12-Mile reef, offering ideal fishing conditions, but in 1949 the number of schools entering tapered off and they have been virtually absent ever since. When the Hopetoun fishery was at its peak, numerous schools were present throughout the area from Hopetoun to east of Esperance, although in most cases, with the exception of the 12-Mile reef, they were largely

inaccessible to fishermen. It can be stated generally that from 1945 to 1948 the main inshore schooling area was the Hopetoun-Esperance region, but with the falling off in the number of schools in that region during 1949 more fish were seen in the Warriups area than previously. It now appears as if there has been a general shift of the inshore schooling area to the Warriups. Whereas Hopetoun provided ideal netting conditions the Warriups lying up area is practically inaccessible to netting.

A somewhat similar change occurred in the salmon fishery of Hamelin Bay and Boranup, in the south-westernmost corner of the State. There for several seasons there were regular visitations by large schools of salmon, and an important fishery was developed. However, during the past year or two practically no fish have come into these areas, but instead have concentrated in Geographe Bay, just around the corner from Cape Naturaliste.

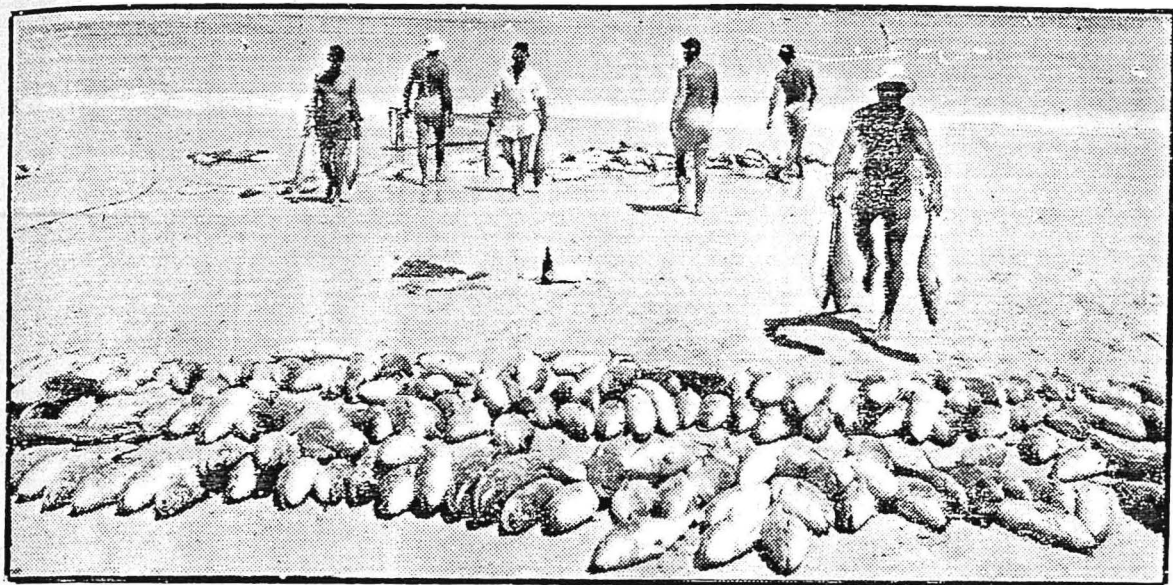
The failure of schools to show up at once-regular resorts has been attributed by many as due to net-shyness. It is not conceivable that a number of schools will shift to an entirely new area because of any such factor. Moreover, aerial survey data indicate that individual schools, or groups of schools, will move to a new locality even when they have not been harassed by net-fishing operations. It seems evident, that is generally speaking, that the changing of locality is one aspect of the behaviour pattern of the fish, although in some cases it could possibly be due to continual molestation by net-fishermen.

At odd times only are salmon met with in any abundance farther north than Fremantle, although in 1942 there were relatively large occurrences at Geraldton, and in November, 1952, an exceptionally large school was in the Cockburn Sound area for upwards of a fortnight. It later moved north and early in December was located from the air just south of the Moore River.

#### THE HOPETOUN FISHERY

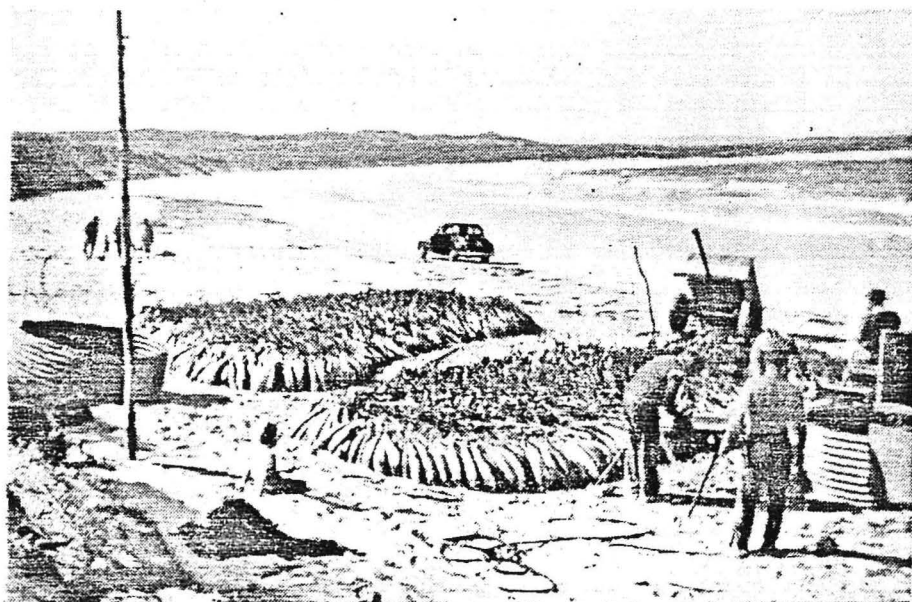
The most striking features of the 12-Mile fishery were the ease with which salmon were taken and the continuity of the supply. The scene of operations was 17 miles east of Hopetoun, or roughly 12 miles in

# SALMON FISHING IN W.A.



Part of a catch of nearly four tons of salmon made at Leighton Beach (about two miles north of Fremantle) by John Alver and crew on November 22, 1952

[Block courtesy "Daily News"]



A catch of 20 tons of salmon made at William Bay ("Parry's Inlet") by L. J. Smith and W. H. Pinniger and crew in late March, 1952

[Photo H. Properjohn]

a direct line, hence the name "12-Mile Beach", by which the locality is known. The 12-Mile, as it is usually called, consists of a half-mile stretch of ocean beach some 50 yards in width sloping upwards to a line of sand dunes from fifty to a hundred feet in height. Parallel to the beach runs a flat limestone reef protruding three feet or so at low tide and almost meeting the shore at each extremity where the beach curves seaward. The channel entrance occurs at the eastern extremity of the reef and leads into a large enclosed area of water. The natural pen formed by the reef is a mere 150 yards at its central and widest part while throughout the bottom is of clean sand and the average depth about 5 feet. Salmon entered this pen with each tide and slowly worked their way along its entire length. The dunes provided an excellent vantage point for fishermen from which to observe the fish and to enable them to decide when and where to shoot their nets.

The 12-Mile is the westerly continuation of two similar sheltered areas known as the 14-Mile and the 13-Mile. A gap in the reef occurs at the junction of the 12-Mile and the 13-Mile, and provides a point of entry for schools of salmon to each area. Many broken reef and sand shoal situations occur in both the 13-Mile and the 14-Mile making seine-netting very much more difficult than in the 12-Mile. Each of the three areas is of approximately the same length.

Anecdotal evidence shows that the 12-Mile had been a well-known reservoir of salmon since the turn of the century, and had been a favourite fishing spot of local residents, particularly during the heyday of mining in the Ravensthorpe and Kundip districts. Large quantities of salmon, it is said, were in earlier years obtained by miners by means of explosives.

#### OTHER SOUTH COAST FISHERIES

Today the most important salmon fishery is that at Cheyne Beach, which lies some 40 miles east of Albany. Here, as at Dillon Bay and Bremer Bay, farther east again, and at Torbay, William Bay (known locally as Parry's Inlet) and Foul Bay (referred to locally as Peaceful Bay), which lie to the west of Albany, the fish are caught in the surf zone, which is at times a somewhat hazardous proceeding. Here there is no sheltering reef or smooth water, and in rough weather, for which the south coast is noted, it

is quite common for the boats running the nets around the fish to be swamped and the occupants compelled to swim ashore.

On all the south coast beaches the fishermen look for two runs - the "down run" in late summer when the fish are on their westerly spawning migration, and the "back run", when they are returning east to their "lying up" haunts after spawning. Not always do the fish visit each beach on both the "down" and "back" runs - very often they miss beaches on one or both of the runs, and the fishermen are left lamenting.

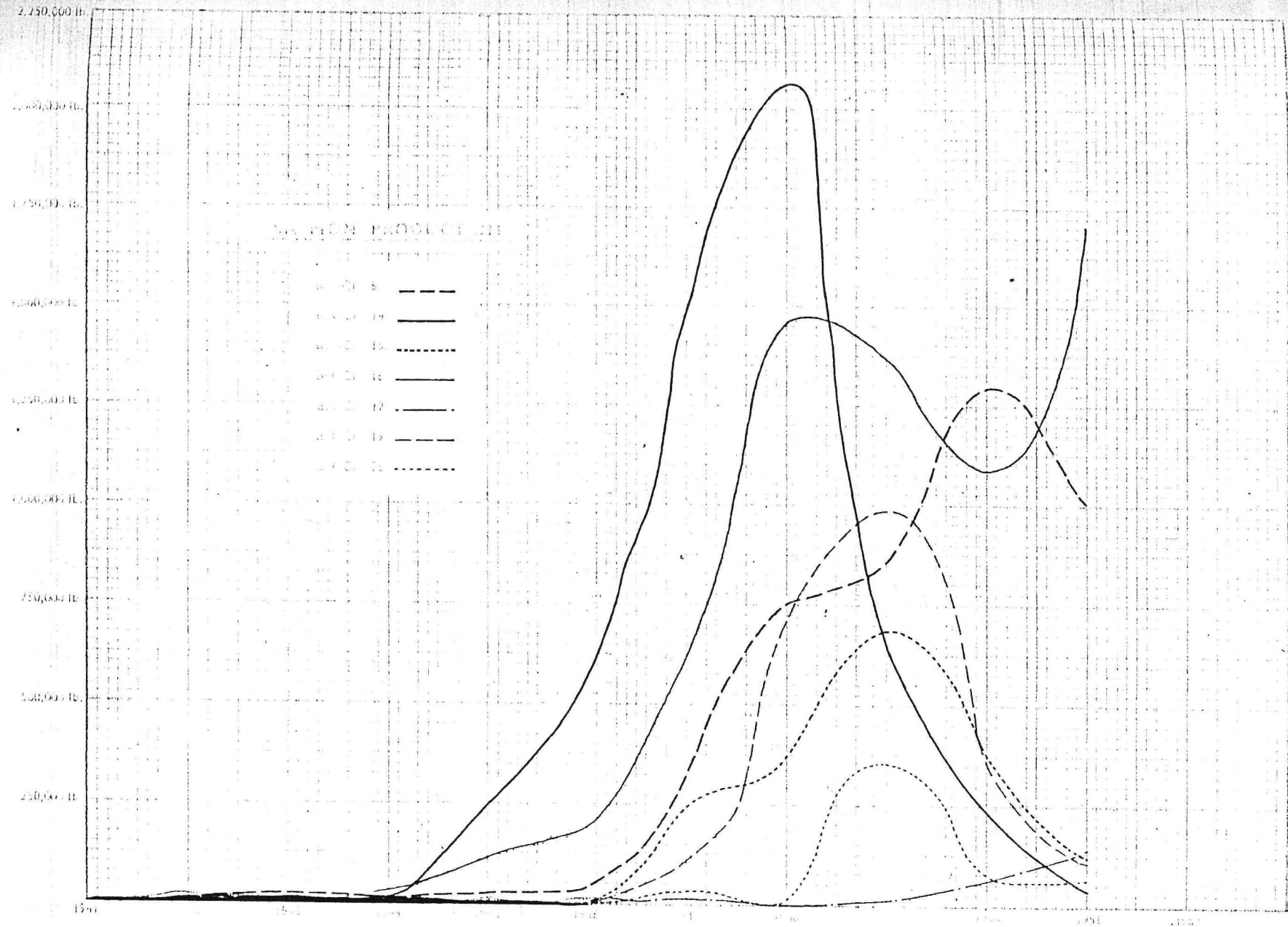
#### HAMELIN BAY, BORANUP AND THE SOUTH-WEST

Hamelin Bay Beach and Boranup both form part of the foreshore of Hamelin Bay, just north of Cape Leeuwin. The Hamelin Bay fishery is not an easy one, as the surf area contains numerous rocks and gutters, and usually in winter, when the fishery was at its peak, exceptionally heavy seas roll in rendering fishing most difficult. But if Hamelin Bay is difficult, Boranup is positively dangerous in bad weather, and several "close shaves" have been experienced.

The only other worthwhile fisheries in the south-west are in Geographe Bay at places like Bunker's Bay and Eagle Bay. There, in waters sheltered by a shallow sand bar, fishing is relatively comfortable.

#### FISHING, HANDLING AND TRANSPORTING

The netting method employed in the salmon fisheries is common to all areas, but slight variations do occur. There are differences too in the method of handling the catch and of other aspects of the whole operation of catching and transporting. Before fish can be caught they must approach to within a relatively short distance of the shore, usually in or adjacent to the surf zone. The approach of a school is noted by an observer or "spotter", following which the team assembles at the most suitable point on the beach. The boat with net aboard has already been prepared for the expected operation. Usually two men man the boat and row rapidly in a semi-circle and surround the fish with the net, which is allowed to run freely from the stern as they progress. Hauling lines attached to one end of the net have been retained on the beach at the point



of the dinghy's departure, and similar lines at the opposite end of the net are brought ashore when the dinghy is beached some distance from the point of departure. All hands then haul on the two sets of lines and the net with the fish encircled is slowly hauled inshore.

The observer or spotter (there may be more than one) has his vantage point high on a close-by sand dune and on observing the approach of salmon, and at the appropriate moment, signals to the team. Fires are sometimes used as signals, while at "Parry's Inlet" an electric bell system is employed. The observer system releases all but one or two men from duty, thus allowing proper rest and regular meals to be taken by the remainder.

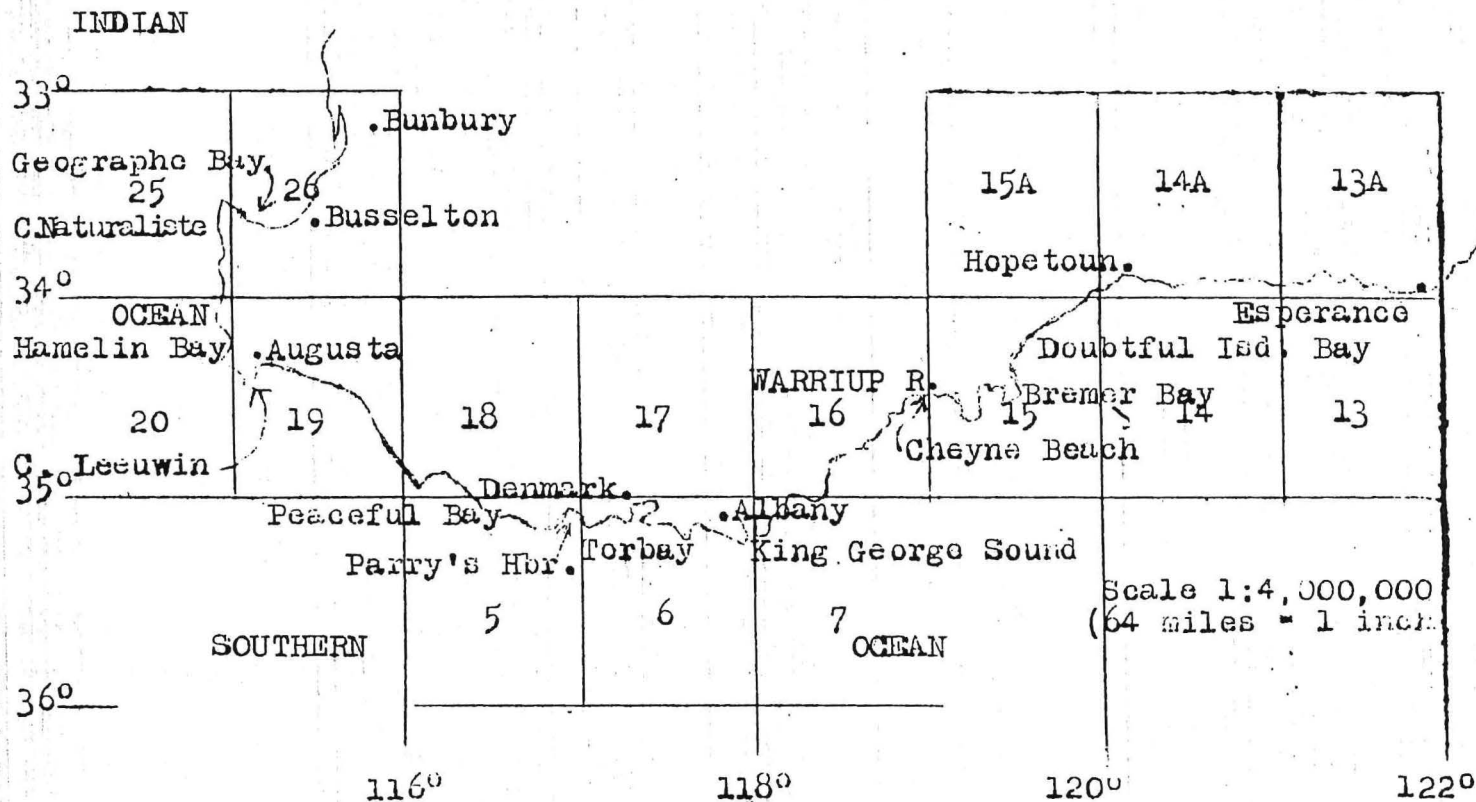
A modern touch in the observation of salmon was employed by D. S. Hunt in 1948 by the use of a Gypsy Moth plane in the Esperance region. Here, a mobile team in radio communication with the plane, on being informed of salmon occurring at any point on the nearby coast, sped across country in an ex-army tank. This vehicle conveyed boat, net and men to the beach and returned to base with the catch in addition to the original load.

The dinghies used are usually about sixteen feet in length. A typical salmon net measures some four hundred yards in length and is of very strong construction. Early in the history of the fishery war-caused shortages necessitated the use of flax camouflage netting to a large extent, the only sort readily available. Nowadays the meshes of about 4" are comprised of hemp. According to the conditions normally met with on a given beach, the net will contain either a pocket or a balloon bunt of 3" mesh. The latter is in use at Cheyne Beach where calm water and very big catches are not uncommon. The former is used at "Parry's Inlet" and at other beaches where heavy surf is experienced. The depth of a net at the pocket or bunt is usually about thirty feet, thus enabling a large quantity of fish to be taken at each haul, although usually the water depth does not exceed two fathoms where the net is run. With these types of net single hauls of up to 30 tons have been made.

Teams may consist of any number of men but probably ten is the average number. Twenty-four men

MAP OF PART OF SOUTH-WEST AND SOUTH COASTS OF WESTERN AUSTRALIA  
 showing principal fisheries for Australian salmon

(Note: The numbered squares correspond with the "blocks" used in the  
 W.A. Fisheries Department's statistical system)



in one team operated at the 12-Mile under Chipperfield and Andre at one time, but this was exceptional. Members of a team are employed in hauling the net, and in the subsequent handling of the fish. These are stunned with billets of wood as they thrash around in the net at the water's edge and are then thrown on to the beach. The fish next have their throats cut causing them to bleed freely, following which they are stacked head down. Heading and gutting then proceeds and may take many hours according to the size of the catch. This operation has precedence and continues without stopping until the last fish is done. By this means the risk of deterioration is reduced to a minimum. Even though darkness may descend, this operation proceeds under artificial light from pressure lamps, searchlights, or what other form of illumination is available. Washing of the fish next follows. Nature has at one or two places provided almost ideal facilities for this purpose, as at Peaceful Bay where a spring provides a freshwater pool on the beach at a spot convenient to the usual hauling ground. The washed carcasses are then transported by motor vehicle to the cannery.

Easy access to most salmon beaches has been provided either naturally or by man-made roads and tracks but this was not possible at the 12-Mile and 13-Mile at Hopetoun. Here the dunes rise steeply from the beach to heights between fifty and one hundred feet. Laborious and back-breaking work was entailed in carrying cleaned salmon from the beach to the motor trucks waiting behind the dunes. In 1945 it was decided to fillet the fish on the beach and thus lighten this arduous task. A pack-pony was used and this animal, its saddle bags loaded with fillets (and helped from behind by the men), took the burden from the shoulders of the team. This method was found to be slow and finally the problem was overcome by installing at the dune top a motor truck with a winch which hauled on a steel cable a box-like trolley running on iron rails. In contrast to this access by motor truck to and along the beach itself is possible at Bremer Bay, Cheyne Beach and William Bay, thus saving much labour in the packing and transport of the fish.

The final operation is to clean, dry and make the net ready for another haul. This may proceed concurrently with other jobs, such as heading and gutting, or packing for transport, depending on the number of hands available. Net drying racks have been

- erected at some places, e.g., Cheyne Beach. Perhaps a convenient outcrop of smooth rounded granite may provide a suitable place to lay out a net. Such does occur at William Bay and Green's Pool. Another feature, employed at William Bay, is a huge barrel-framed windlass about 8 feet in diameter mounted between uprights. On this arrangement the net is wound and can be as conveniently unwound and folded ready for use.

The techniques and gear described have been evolved for beach fisheries, and are quite adequate, but there will be modifications and refinements as time goes on. If however the salmon depart from their normal observed habit of remaining in shallower situations and instead move out to deeper water, the present methods will be useless, and fresh means of taking the fish at sea will need to be developed. So far any departure from normal behaviour by the fish has been hopefully considered of a temporary nature, but perhaps it may pay to be wise before and not after the event.

#### PRODUCTION AND UTILISATION

Salmon from the 12-Mile found a ready sale in the wartime-depleted shops in Perth during 1944/45. Smoked fillets of salmon from Hopetoun were also on sale at this time. Catch figures for 1944 totalled 3,503 fish averaging  $7\frac{1}{2}$  lb. headed and gutted and represented 9 months' actual fishing.

The canning of salmon was first commenced at Belmont by the Ocean Canning Co. in February, 1945, and its supplies were drawn largely from the syndicate "Hopetoun Freezers" operating at the 12-Mile. The success of the fishery attracted others and in November of the same year D. S. Hunt established a team in the area. Smoking operations did not last long, and nowadays the whole of the catch is canned.

The following table shows the quantity of canned salmon produced in Western Australia since 1944. Fish have been canned under different forms and cans of varying sizes have been used, but for a clearer understanding of the situation the production figures given here have been reduced to terms of 1-lb. cans -

<u>Year</u>	<u>Dozen Cans</u>
1944	120
1945	24,998
1946	52,288
1947	143,776
1948	218,979
1949	212,623
1950	145,482
1951	155,326
1952	154,012
Total:	<u>1,107,604</u>

The production table on the next page shows the total quantity of salmon caught in this State since 1945. The block numbers in column 1 correspond with those shown on the map at page 36. The catch during each year from 1941 to 1944, which has not been dissected, was as follows -

<u>Year</u>	<u>lb.</u>
1941	54,888
1942	45,350
1943	43,851
1944	105,401
Total:	<u>249,490</u>

A clearer picture of production may perhaps be obtained from a study of the graph facing page 34.

TABLE SHOWING PRODUCTION OF AUSTRALIAN SALMON IN WESTERN AUSTRALIA, 1945-1952

Where caught	1945	1946	1947	1948	1949	1950	1951	1952*	Totals
Block No.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
5	224	272	..	115,173	158,421	199,218	183,472	..	656,780
6	29,714	37,338	297,796	765,347	818,154	1,282,624	1,035,576	614,785	4,881,334
7	..	1,806	..	..	..	..	2,023	..	3,829
12	..	..	..	4,642	330	..	..	..	4,972
13	..	..	110	518	..	..	..	..	628
14	258,605	580,524	1,507,560	2,134,701	680,626	272,054	38,893	21,303	5,487,266
15	..	9,648	258,813	356,913	702,653	416,929	123,218	538,212	2,406,386
16	107,961	171,445	638,358	1,438,389	1,326,056	1,086,209	1,711,625	1,446,916	7,926,959
17	7,708	1,045	298	316	370	261	130,983	34,156	175,137
18	40	..	1,940	4,300	..	..	..	..	6,280
19	11,641	318	115,802	731,563	944,167	244,099	123,571	204,801	2,375,962
25	..	..	4,180	100	115	..	..	..	4,395
26	789	13,834	34,298	7,279	314,874	61,468	58,607	..	491,149
27	1,348	148	12	..	..	..	..	..	1,508
28	..	42	..	..	..	..	..	..	42
29	246	24,148	696	41	..	..	..	..	25,131
36	..	7,977	..	..	..	..	3,360	..	11,337
39	124	..	..	..	..	..	..	..	124
<b>TOTALS</b>	<b>418,400</b>	<b>848,545</b>	<b>2,859,863</b>	<b>5,559,282</b>	<b>4,945,766</b>	<b>3,562,862</b>	<b>3,404,328</b>	<b>2,860,173</b>	<b>24,459,219</b>

\*The 1952 figures are subject to final check. One or two returns are still outstanding, and in respect of the area concerned the catch has been estimated. There will be no great variation between the actual figures and those given here.

ADMINISTRATION AND MANAGEMENT

After D. S. Hunt established a team at Hopetoun, certain difficulties arose in relation to the rights of the respective teams to fish the area, the determination of priority in netting, and other factors. It soon became evident that the 12-Mile could not carry more than one team, and the two teams joined forces. At the same time the combination was not a really happy one, and the rapprochement was more in the nature of an armed truce.

However, the unique nature of the fishery and its vulnerability to unorderly fishing, as well as continued argument and strife between fishing teams, necessitated a conference of all interested parties being held. That same month Mr. E. Young, having broken away from the Hopetoun Freezers Syndicate, commenced canning salmon in a rather primitive way on the Jerdacuttup River between Hopetoun and the 12-Mile, and wanted fish. This gave rise to a dispute on the question of disposal of the catch, which was then in the hands of the Hopetoun Freezers Syndicate, which to all intents and purposes controlled the fishing team. Indicative of the degree to which the demand for fish had grown were the following stated requirements of the various interests -

Young's Cannery ...	50 tons per annum.
Fish smokers ...	78 " " "
Perth Cannery ...	600 " " "

The conference took place with the approval of the Minister at the Fisheries Department, Perth, on August 14, 1946, and was attended by all interested parties, fishermen, processors, freezer-operators, in addition to departmental officers. The questions submitted at the Conference as requiring immediate answers were -

- (1) What are the weekly requirements of salmon?
- (2) What is the productive capacity of the 12-Mile?
- (3) What is the best method of controlling the catching operations and distribution of the catch?

Although the view was held by some that a beach controller appointed by the Government was desirable, it was finally decided by the parties themselves what catching methods should be adopted, what prices were to be paid and the method of disposal of the catch during the season then current. In the light of subsequent events and the later development of the salmon fishery, this conference was most significant. The shape of things to come began to show itself in that the management problems confronting the Department today were then faintly evident.

An important amendment to Section 17 of the Fisheries Act which was effected in 1946, gave power to the Department to endorse fishermen's licenses with conditions designed to assist in the management and control of any fishery. Thus by endorsement of licenses the numbers of fishermen operating at the 12-Mile could be and were in fact kept down to a figure considered to be sufficient to work the fishery efficiently and economically.

The year 1947 opened with considerable planning for the future development of the industry. An additional canning factory was under construction at Albany for D.S. Hunt, steps were being taken to organise the Hopetoun fishermen as a Co-operative Society, the Jerdacuttup cannery was to be removed to Hopetoun and, more important still, the whole of the south coast from Hopetoun to west of Denmark was becoming alive to the possibilities of the industry. Governmental approval was secured for the appointment of a full-time fisheries inspector to be stationed at Hopetoun. The first step taken was the holding of a conference at the Fisheries Department, Perth, on January 31, 1947, at which the policy of the Government concerning the 12-Mile fishery was announced. This comprised -

- (1) Exclusive salmon fishing rights for the proposed Fishermen's Co-operative in the 12-Mile and 13-Mile;
- (2) Disposal of fish in certain fixed proportions between Hopetoun and Perth canneries;
- (3) The appointment of an inspector to supervise fishing operations and catch disposal.

Protests against items (1) and (2) were lodged by the principals of the Hopetoun and Albany canneries and the matter referred to the Government. The Solicitor-General ruled that Section 17(3)(e) of the Fisheries Act as amended in 1946 did not include power to impose conditions to control the disposal of fishermen's catches. Several conferences were held by both the Fisheries Department and the Department of Industrial Development in an endeavour to secure agreement between the canners. This was finally achieved in June, 1947, on the basis that of the total Hopetoun catch two-fifths were to be allocated to Ocean Canning Co. (Perth) and the balance divided between Hopetoun and Albany canneries in the proportions determined by themselves. Although the Fishermen's Co-operative was registered, it did not function as such and catching arrangements were placed in the hands of one team with George Andre as Manager. Throughout the discussions and conferences it had been recognised by all parties, including departmental officers, that one team only could satisfactorily handle fishing operations, and that impairment of the fishery might, and loss of production certainly would occur if fishing in the 12-Mile became competitive.

Departmental supervision of the fishery and of catching operations was established by the appointment of Inspector H. J. Murray to the Hopetoun district on July 2, 1947. Mr. Murray also watched and reported on allocations of supplies to canneries, and while minor complaints were heard from time to time, fishing operations ran reasonably smoothly thenceforward.

The 12-Mile has always been considered the most important fishing area at Hopetoun and negotiations, arguments, conferences and decisions have all centred on that fishery. Thus the final agreement reached in 1947, and the exclusion of fishermen other than those in the 12-Mile team, was in respect of the 12-Mile only. Fishing was carried on in the 13-Mile by another party, but in practice it was found that each team at times needed the help of the other. This co-operation was in course of time established on a mutually satisfactory basis.

Great expansion in the salmon industry occurred in 1947 as a result of increased demand for fish occasioned by the establishment of additional canneries

and the awareness of the public concerning a new fish product. Places such as Bremer Bay, Cape Riche, Cheyne Beach and Torbay produced many tons of salmon, and fish were taken also in King George Sound. In 1948 further beaches were opened up for salmon and a harvest of 5½ million pounds of salmon rewarded the fishermen's efforts that year. From Doubtful Island Bay to Boat Harbour west of Denmark almost every fishable beach was occupied, while at Hopetoun the 12-Mile and 13-Mile contributed a total of over 2 million pounds, and in order to prevent fishing operations interfering with the free ingress of salmon into the 12-Mile and 13-Mile, a proclamation was issued prohibiting net-fishing at "The Gap" (the local name for the break in the reef) between the hours of noon of each day and 3 a.m. of the next day following. This had effect from December, 1948.

Competition for supplies had by 1948 become exceedingly keen between the canneries. Various tactics were employed by all parties and included price rises and bonuses for the fishermen, whose desires were predominant with the canneries. Another cannery was established at Esperance by D. S. Hunt. On the south-west coast, salmon fishing had begun in 1947 at Hamelin Bay, all catches being transported by road to Ocean Canning Co. at Perth. Considerable success resulted from fishing during the 1947 and 1948 seasons in that area, and a new cannery was erected at Busselton by V. Gardiner, of the Ocean Canning Co.

The Hamelin Bay area provided also a problem similar to that which arose at Hopetoun - too many fishermen in too small an area. This problem was to become that of most moment on practically all salmon beaches as time went on and remains a problem today. This is however a problem to which, if the fishermen desire it solved, they will have to find a solution themselves. This new departmental attitude is the result of an expression of Government policy given in a Cabinet decision of June, 1950. An application had been made by K. V. Smith, a professional fisherman, to fish in the 12-Mile and 13-Mile at Hopetoun. The Minister placed two alternatives before Cabinet -

- (1) To permit any licensed fisherman to fish wheresoever he pleases;
- (2) To permit only specified licensed fishermen to fish in a defined area.

The Government decided in favour of the first alternative, and the endorsement of salmon fishermen's licenses ceased.

The introduction of a team into the 12-Mile by Smith led to immediate conflict between the newcomers and the established fishermen, and culminated in a Supreme Court claim and counter-claim. The Chief Justice, who heard the claims, gave a verdict against Smith who was ordered to pay damages and costs to Chipperfield and Andre, the leaders of the resident team. Smith left the area in August, 1950.

At other beaches too there have been problems - clashes of personality, recrimination, spoiling tactics, and many methods of overcoming the problems have been tried. Some have suggested control of beaches by Fishermen's Associations, but these bodies are not powerful enough to discipline their own members even, let alone non-members. Some have suggested the allocation of beaches by ballot - others the rotation of hauls. All have been considered - some tried and failed. Regulation 13 under the Fisheries Act has of course some bearing on the matter, determining as it does the rights of priority between net-fishermen working in the same locality. This regulation has stood for a number of years without being invoked, but it is now found that in its application to present conditions it has many shortcomings, particularly as far as salmon fishing is concerned. It has accordingly been re-drafted and is now under consideration by the Crown Law Department.

#### INVESTIGATIONAL WORK

Originally, as already indicated, salmon investigations in Western Australia were in the hands of J. A. Tubb. Later the work was taken over by the late W. S. Fairbridge, M.Sc. It is now being carried out by W. B. Malcolm, B.Sc. The Fisheries Department, through its technical officer (L. G. Smith) and departmental inspectors, performs much ancillary field work.

During the past two years salmon investigations have been concentrated on the western group. The life history of the fish has not yet been worked out, although it is reasonable to assume that the salmon of South Australia, are the same as those of Western Australia, and that these are not two distinct populations. Detailed examination of the structure of both have failed to show any difference between the fish of both areas, and the

assumption is even more reasonable as South Australian waters contain the younger age-groups, which are absent from Western Australian waters. A fair working hypothesis is that a considerable quantity of the large Western Australian salmon spend their early life in South Australian waters. This assumption admits a complication in that two distinct populations could exist without showing any visible structural variations. One test is to show, by tagging, whether the younger South Australian salmon do migrate into Western Australian waters.

During 1952 considerable field work was undertaken in South Australia and Tasmania towards this end. Approximately 3,000 salmon were internally tagged and released. If a single population of salmon exists it is to be expected that some of these tags will be recovered from Western Australian waters during the next few years.

The tables at pages 47 and 48 provide details of tagging operations and recoveries in Western Australia in recent years.

#### CONCLUSIONS

Considering the spawning migration of the salmon there has been little variation in the catch taken on this "run" since 1948, when the development of the fishery more or less reached its peak. Taking any individual beach fished during the run, large fluctuations have often occurred in the catch from year to year. But if we consider that the salmon moving along the beaches only represent portion of the fish moving out to sea, then although the normal spawning migration takes place, the number of schools breaking off and moving inshore at each beach could not be expected to be constant year after year.

Summing up it may be said that catch taken on normal spawning migration has been constant since 1948 and that the fall in the Western Australian catch can be attributed to the failure of the Hopetoun fishery brought about by a shift of the inshore schooling area from the Hopetoun-Esperance area to the Warriups-Cheyne Beach area during the non-spawning season.

There certainly does not appear to be any evidence of over-fishing in the generally accepted sense of the term. It is true that fluctuations in the ready availability of fish occur from year to year, but this is true also of the eastern States, and in the same way as the fishery is still carried on there on violently fluctuating stocks, so can it reasonably be expected that the Western Australian fishery will continue indefinitely, with good and bad seasons.

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SUMMARY OF WESTERN AUSTRALIAN SALMON TAGGING EXPERIMENTS,  
1945-1952

Year	Place of Release	Tag Type	No. Re-based	No. Re-covered	Recovery Remarks
1945	Hopetoun	Operculum	47	8	Local recoveries
1946	Hopetoun	"	250	56	Local recoveries
	Cheyne Beach	"	15	-	
1947	Pasley Island	"	1	-	
	Bremer Bay	"	11	-	
	Ceduna (S.A.)	"	1	-	
	Hopetoun	"	52	1	Local recovery
1948	Cheyne Beach	"	62	19	Local recoveries
	Hopetoun	"	212	69	One good movement - Bremer Bay
1949	Cheyne Beach	"	52	5	Two good movements - Hopetoun & Esperance
	Parry's Inlet	"	75	9	Two good movements - Dillon Bay & Albany
	Hamelin Bay	"	122	4	Two good movements - Chatham Island and Hopetoun
	Boat Harbour	"	74	1	Cheyne Beach
	Esperance	"	108	1	Local recovery
	"	Petersen	10	-	
1950	Cape Riche	Operculum	64	9	All good movements - Peaceful Bay (2), Cheyne Beach (7)
	"	Petersen	1	-	
	Parry's Inlet	Operculum	132	19	Two good movements - Hopetoun, Albany
	"	Petersen	206	15	One good movement - Albany
	Nannerup	Internal	50	3	Two good movements - Cheyne Beach & Dunsbrough
	Cheyne Beach	"	171	82	Six good movements - Hamelin Bay, Torbay (2) Nannerup, Peace- ful Bay (2)
	"	Operculum	142	62	Five good movements - Hamelin Bay, Torbay, Peaceful Bay, Cape Riche
	Hamelin Bay	Internal	18	-	
	"	Operculum	1	-	
	Parry's Inlet	Internal	51	5	Two good movements - Hamelin Bay and Boranup
	"	Operculum	86	4	Two good movements - Nornalup & Cheyne Beach
1952	Cheyne Beach	"	11	2	Local recoveries

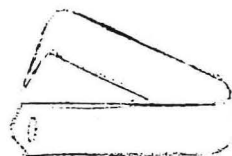
SUMMARY OF TAG RECOVERIES

Tag Type	Releases	Recoveries	% Recovery
Internal	290	90	31%
Operculum	1,518	267	17.6%
Petersen	217	15	6.9%
TOTAL:	2,025	372	18.4%

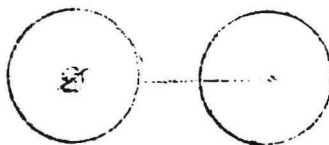
NOTE: The internal tag used is a white plastic disc which has obverse a serial number and a request to the finder to return to C.S.I.R.O. Division of Fisheries, and reverse a notification of the reward payable. The following drawing is of the exact size used for salmon -



The operculum tag is a serial-numbered metal strap which is clamped on the operculum or gill-cover of the fish. The drawing shows its exact size.



The Petersen tag consists of two serially-numbered plastic buttons connected with a silver wire passed through the back or caudal peduncle of the fish. One of the buttons is coloured and the other transparent. The drawing is the actual size used -



## THE CLEARING HOUSE

### Haphazard Harvest

The commercial fisheries are under-educated and under-researched. They are the only remaining food-producing calling which has not taken on the attributes of a profession. These attributes include a body of real knowledge of the practical aspects of the product: where it grows best and why; what encourages its growth; what inhibits it; and what man can do about it. More than anything else, the professional character of an industry implies a body of trained men in possession of this knowledge and using it, not in theoretical papers and research for the sake of research, but in the everyday, down-to-earth production of food.

We of the fisheries have "gotten away with" an essentially sloppy attitude towards our resources because the ocean is so generous that even comparatively clumsy efforts at harvesting its treasures are well rewarded. We have been encouraged in this attitude also by a psychological factor not shared by any other food industry; for in all other animal and vegetable foods the harvest is the culmination and reward for a long, closely supervised process - whereas our concern just begins with the harvest. The important point here is that until the fish are caught nobody owns them. Until the fish are actually in the hold nobody has any tangible, specific investment in a specific school of fish in the sense that a cattleman has in a herd of cattle, or a farmer in an acre of corn. Without this incentive of "private property" it is only natural that what happens to the fish before the harvest should be neglected. Moreover, in the light of the vastness and the apparent inscrutability of the sea, it is only natural that the unknown should appear unknowable. The erratic behaviour of the ocean's citizens only adds to this illusion.

The facts are, however, that the sea is mysterious only to the extent that it has not been explored and it is, indeed, almost the last comparatively unexplored area of the earth's surface. Moreover, the behaviour of its populations would not appear either erratic or unpredictable if enough information were available. From what research has been done, we know that fish do not move by whim but by necessity. Like all other animal

life, they go where climate is right and food plentiful. Sufficient knowledge of what marine climates and what feeding conditions favour a species of fish and the facilities to observe these factors could enable us to predict their movements.

Against this vast area of ignorance are arrayed a pitiful handful of scientists armed with a pitifully small complement of facilities. The commissioning of the "Albatross" as a full research vessel was a triumph for the American fisheries, but it was at the same time a tragedy that at this late date in their history the commissioning of just one vessel should cause such a stir . . . so many are needed and so many justified by the present and potential importance of our marine resources.

In the fishing industry itself there is indifference to the need for this kind of knowledge and, in some cases, there is downright hostility: research means scientists; scientists mean conservation; conservation means restrictions and nuisance, etc., etc. Also, we hear that "the scientists have been fooling around for years and with all they know they haven't put one more fish in my nets than my grandfather caught in his". We have heard it expressed by a member of one of the somewhat better explored fisheries, a veteran oyster producer, who said "Son, when I started in this business my Dad said to me, 'You're going to know a lot less about oysters in ten years than you know now and when you get to be my age you're going to decide you don't know anything about them'". Now this is a quaint and appealing attitude with a kind of charm - but it is a very expensive attitude for an industry.

To change this we need young men who will regard the fisheries as a profession - who by dint of their training will have enough technical knowledge to close the gap now existing between the practical fisherman and the theoretical researcher. Young men who will be neither scientists nor marine biologists but trained fish producers with enough knowledge of marine science and of the ocean's potential to give them an intelligent understanding of the scientists' work and the ability to make intelligent application of his findings. This is the kind of professional who

represents the best in American agriculture today and who should be found in the fisheries. The existence of such a spirit in the commercial fisheries would also make them a more attractive research field than they are now to the competent scientist and would be a basis for getting increased appropriation of funds for research so desperately needed.

To provide such men, we need the fisheries equivalent to the agricultural, forestry and husbandry programs that are available for the universities of the states in which these occupations are important. The states in which the commercial fisheries are found have an obligation to provide such programs. The resource of young men to work and build our fisheries is just as important as the resource formed by the waters themselves, and in neglecting to make full harvest of the first we are damaging the harvest of the second. It is here, at the university level, that many of our finest young men choose their life work on the basis of the vistas opened to them by the available courses of study. The lack of such programs in fishing states which should have them costs the industry the service of many of the country's finest young men. It costs us full use of the abilities of many men who enter the fisheries without the knowledge they should have. It costs us the serious attention of many splendid scientists. It costs us full utilization of the findings of the scientists we do have. It costs us government funds for the support of needed research. In the end, it costs us heavily in volume and profits in the competitive world market.

(Fishing Gazette, New York, September, 1952).

### Expansion of Fisheries in the Colonies

#### Need for Demonstration, Propaganda and Easy Credit

On Tuesday of last week, Dr. C. F. Hickling, C.M.G., read a paper entitled "The Expansion of Fisheries in the Colonial Empire" to the Commonwealth Section of the Royal Society of Arts. The paper, which will be published in full in the society's official journal, is a valuable source of information on Colonial fisheries. Dr. Hickling is the Fisheries Adviser to the Colonial Secretary.

"In most territories fish are scarce and dear", said Dr. Hickling. "For example, in Lagos fish from Great Britain can be bought in the cold stores, and are cheaper than locally caught fresh fish. Even in distant Singapore and Penang the same is true. This is because in Britain fish are caught by large and powerful fishing craft, with a very high rate of capture per man-hour, and so a low cost of production.

### Bigger Catches Mean More Money

"In 1951, for example, some 27,000 fishermen in England and Wales produced some 700,000 tons of fish, an average of 26 tons per man-year. The average quayside value was slightly less than 5½d. per lb. But in Malaya fish may be 1s.6d. to 3s. per lb. The catch per man per year in Malaya averages less than one ton. Since the fisherman must live, and his creditor must live and make a profit, the small quantity of fish produced per man-year must be sold at a high price.

"This contrast points clearly enough to the remedy: the expansion of the fisheries can best be got by increasing the catch per man-hour or per man-year. That will make fish cheaper and more abundant, yet there will be more money for the producer. Here and there it has been possible to get an increase by introducing better fishing nets which can be used with existing fishing craft. Nigeria, for example, has employed Gold Coast fishermen to teach the use of the more effective nets used on the Gold Coast, with successful results.

"But the type of craft sets a physical limit on the kind of gear which can be used and, generally speaking, fishermen have already discovered, over the years, the best methods to use with the boats or canoes they possess. I should be the last to decry these methods: they show an uncanny understanding of the habits of fish and are the methods of the skilled hunter. But the catch per man-hour is generally low.

### Advantages of the Powered Boat

"The obvious way to raise the catch per man-hour is to call in the aid of the machine. The possession of an engine in his boat must greatly increase a fisherman's capacity to earn. He has a much wider radius of action, and can go to look for fish when his unmechanised fellows must, by comparison,

wait for the fish to come. The power-driven boat can reach grounds inaccessible to the boat driven by wind or by hand, and so catch more fish because fewer competitors are working there. The power-driven boat can reach the fishing areas more quickly and stay there longer. Finally, he can work a greater quantity of fishing gear, and a greater variety of fishing gears.

"What prevents a rapid swing over from the unmechanised to the power-driven fishing craft, leading to a considerable increase in the supplies of fish without increasing the number of fishermen? There are many difficulties and the process is likely to be slow. This results partly from conservatism, for we cling to what has served us well, partly from the low mental vigour and lack of education (in the wide, not the narrow sense) among the fishermen, but chiefly, I feel, in the system of indebtedness which has been described above and which is not only inimical to enterprise and ambition, but makes it impossible for the fisherman to raise capital.

"The creditors who at present finance fishermen could in many cases raise the capital, but it is not always in their interests to do so. In the present state of distribution and marketing, it may suit them better to sell few fish at a high price than many fish at a lesser price. Those who are willing to finance more efficient ways of producing fish must first be convinced that these ways are in fact more efficient and more profitable. Someone must demonstrate, and this should be a government responsibility. So most of the British dependant territories have fisheries departments, charged with the duty not only of administering the fishing industry and the fishermen, but also of doing demonstration and educational work, including the demonstration of power fishing.

"Most of the 30 demonstration fishing craft in the Colonies are small, of 45 ft. or less in length, and are frequently open boats of the coble or surf-boat type. An unexpected difficulty has arisen over the maintenance in commission of these power boats. Except in one or two of the largest towns in each territory, repair facilities and spare parts for engines are lacking. All types of machinery are liable to become faulty, but because repair facilities are so scarce, a motor fishing boat in most colonial

territories must remain unserviceable for a disproportionately long period.

"No doubt, when motor fishing boats become numerous, local enterprisers may start repair shops to meet the demand. Meanwhile, the present demonstration fishing craft suffer the fate of the pioneer; and a motor fishing boat lying unserviceable at her moorings, while the sailing canoes proceed to sea to fish, is poor propaganda for mechanisation.

### Progress in Malaya and Hong Kong

"Mechanisation has made best progress in Malaya and Hong Kong. In Malaya there are over 1,000 motor fishing craft, ranging in size and power from 60 or even 70 ft. purse seiners to the usual sailing and oared boats equipped with outboard motors. Here, at all events, capital has been found, for even an outboard motor of the type and power most popular costs some £60. Motor-driven boats catch five times as much fish in unit time as the same type of boat without an engine.

"In Hong Kong there are over 150 fishing junks equipped with engines. Their average catch is twice that of the sailing junks. But these 150 vessels are only about two per cent. of the Hong Kong fleet. Now progress is in the direction of building fishing craft designed to take an engine, the logical successor to the sailing vessel equipped with an engine.

"On the Gold Coast, the two government demonstration motor boats outfish the local hand and sail-propelled fishing boats by up to six to one; as inshore trawlers they catch an average of one pound of fish per minute. The running expenses of these 28 ft. motor boats are low.

"It is therefore in line with common sense, and in line with the history of the expansion of our own fisheries, that the machine must be brought to the aid of muscle, and that the result will be an expansion of the fisheries and their products. What seems to be most needed is continuous long-term demonstration and propaganda by governments, and easier and more abundant credit for the fishing industry.

"I am not very worried about the marketing and distribution of increased catches of fish. True, if the increase were sudden, there might be chaos; but the switch-over to power-driven boats will be gradual. It took 70 years, in this country, to complete the change-over from sail to power, for the first genuine steam trawler was launched in 1882, while the last sailing trawler was laid up in 1946. The change may well be swifter in the Colonies, because motors for fishing craft are easily acquired, at a price, and the advantage conferred by an engine, once demonstrated effectively, may cause a demand limited only by the availability of the capital on reasonable terms."

The latter part of Dr. Hickling's paper was an informative and constructive discussion on fish farming.

(The Fishing News, London, December 6, 1952).

#### Tagging of Mullet

Tagging of mullet by the Division of Fisheries in both Western Australia and Queensland is yielding interesting information on the habits and migrations of this fish which provides up to 40 per cent. of the total fish catch in these areas.

During the year, 995 mullet were tagged and 25 tags were returned.

Mullet of the two-year-old group are distributed all over the estuaries, but the greater number of young mullet concentrate in the upper tidal reaches.

The older fish appear only spasmodically in the upper rivers, but concentrate towards the end of summer when they pass downstream in large schools for spawning in the sea mullet run.

Small mullet fry enter the estuaries during August or October working their way rapidly up the rivers to become plentiful in the freshwater zone by mid December.

Spawning is not necessarily an annual affair as not all adult fish migrate every year; moreover small groups of adult fish can be found in the lower estuaries

even during the non-migratory season.

(CSIRO Digest of Current Activities, No. 26, December 1952).

### Japanese Oysters

The Division of Fisheries reports successful attempts to establish the Pacific oyster (Ostrea gigas) in Australian waters.

A trial shipment of five cases of seed oysters was flown this year from Japan to Pittwater in Tasmania with negligible loss, and these have now become satisfactorily acclimatized to the local environment.

Growth rates have been good, but as spawning and spat-fall are not yet adequate to replace the parent stock a trial batch of oysters has been transferred to the warmer waters of Port Sorell to test this area as a spawning ground.

In view of the success of these trials and the potentialities of the Pacific oyster, some two million spat are being flown from Japan with the object of establishing a large breeding stock in Tasmania.

(CSIRO Digest of Current Activities, No. 26, December 1952).

### Antarctic Whaling Season

Sixteen floating expeditions and three shore stations, with 250 catchers and 12,000 men, will take part in this winter's whaling season in the Antarctic. Of the floating expeditions, seven will be Norwegian (as against 10 last winter), three British, two Japanese, one ("Olympic Challenger") of Greek-German-Panamanian origin. Of the shore stations on South Georgia, two are Norwegian and one Argentine.

The season opens on January 2 and the combined catch is limited to 16,000 blue whale units. Sperm whales may be caught before the season opens, and a number of the expeditions will arrive in the Antarctic before January 2 in order to hunt these.

The seven Norwegian floating expeditions will carry a stock of 66 films to entertain the men.

("The Fishing News", London, December 13, 1952).