

SECTION XI.

FISHERIES AND PISCICULTURE.

§ 1. Commercial Fisheries.

1. **Early Fishing Excursions of Malays.**—Economic fisheries in Australia date back to a period long before the exploration of the northern and north-western shores of the continent by Tasman and Dampier. The Malays of Macassar, in their proas, made fishing excursions amongst the reefs and shoals skirting the coast, collecting and curing trepang or bêche-de-mer, a practice continued up to the present time. They arrive ordinarily at the beginning of the north-west monsoon, and return to Macassar after a few weeks, as the south-east monsoon sets in. In addition to collecting trepang, the Malays barter rice, tobacco, bright coloured handkerchiefs, etc., for tortoise shell, pearlshell, and seed pearls collected by the aborigines.

2. **Fish Stocks.**—Australasia, extending from 10° to 45° south latitude, possesses an abundant and varied fish fauna, which embraces both tropical and temperate varieties and includes destructive as well as edible species. In rivers and lakes both indigenous and imported varieties thrive. The latter have been introduced and acclimatised for industrial and sporting purposes by Governments and angling societies. Exploitation of the fishing areas—for some classes of fish for the whole year, for others during the breeding season only, or until a certain size is attained—is, where necessary, expressly forbidden; proclaimed localities are closed against net-fishing, and a minimum size of mesh for nets is sometimes fixed. The sea-fishermen in some districts have made regulations in their own interests for the purpose of controlling the market supply, and these they rigorously observe.

3. **Economic Fisheries.**—Australia's food fishes, though abundant, have not led to the development of an industry of national importance, though fresh and salt water fisheries pay handsomely in other countries, and could no doubt do so in Australia. It has been authoritatively asserted that:—"The collection and distribution of the knowledge of the world's work in fish-culture would make an acre of water more valuable than an acre of land, and the toilers of the sea could reap manifold their present harvest." This would involve also better arrangements for the distribution of fish than exist at present. Official reports state that the possession of scientific knowledge by the fishermen would greatly benefit the industry.

4. **Lake and River Fishing.**—Lake and river fishing take even lower industrial rank than marine fishing, though local catches furnish on the aggregate a not inconsiderable amount of food supply.

5. **Distribution of Supplies.**—Present methods of distribution impose serious difficulties on the development of fishing generally, since there is a wide divergence between the price paid by the consumer and the return received by the producer.

State Governments are interesting themselves in the direction of more economic distribution, while municipal oversight has been undertaken in Sydney and is proposed in other capitals. It is anticipated that an efficient system of fish supply to private customers will soon be established in the chief centres of population, where good markets are assured for regular deliveries of fresh fish.

6. Oyster Fisheries.—Natural oyster beds, whose ample product is of excellent quality, exist on the foreshores in the shallow waters of inlets and estuaries in several parts of Australia. By husbanding the natural crop, and by judicious transplanting, the oyster output has been very materially augmented, and it is believed that there is a great future for the industry. The areas are leased by the Government to private persons, lengths of foreshore being taken up and profitably exploited. In New South Wales particularly, the industry has developed recently, and satisfactory experiments have been conducted in Victoria. In Queensland, the methodical cultivation of the beds has proved of great benefit to cultivators, besides improving the class of oyster marketed.

7. Pearl-shelling.—Pearl-shelling is carried on in the tropical districts of Queensland, the Northern Territory, and Western Australia. The pearl oyster inhabits the northern and western coasts from Cape York to Shark Bay, a length of shore of over 2000 miles. Along the north coast the pearls taken are small, and their aggregate value inconsiderable; but the shells are marketed in considerable quantities, the industry giving directly and indirectly employment to a large number of people, mostly Japanese, Chinese, and Malays. The Shark Bay pearling industry, however, is carried on for both gems and shells. The fishing is generally conducted with the aid of diving apparatus, in water varying from four to twenty fathoms in depth. The inshore banks and shallower waters have been almost entirely worked out, and the deeper waters, from three to twenty miles off shore, are now being worked.

In tropical Queensland pearl-shell diving is actively pursued, and is by far the most important of fishing industries, Torres Straits being the centre of production. With it the pursuit of *bêche-de-mer* is carried on, and tortoiseshell is obtained on the coasts. The industry is supervised by the Marine Department, which administers the Fisheries Acts. A statutory limit is fixed for the minimum size of shell that may be gathered. Experiments have been made in cultivating the pearl oyster on suitable banks. A small variety has been discovered at Stradbroke Island, in Moreton Bay, but the commercial value of the produce is unimportant. In 1909, a pearl of 32½ grains weight, of great beauty and fine quality, and valued at £1000, was obtained from the Thursday Island Fisheries.

The discovery of mother-of-pearl shell in Darwin Harbour in 1884 caused a rush of pearling boats from Torres Straits. But the muddiness of the water, rendered almost opaque by the heavy tides, prevented the divers from satisfactorily working the area, and led to the abandonment of the industry within three years of its birth. Prospecting in new patches has lately been carried out and the industry has been revived. In addition to pearl and trepang fishing, dry-salted fish is also exported from the Territory.

In Western Australia the centres of the industry are Broome, Cossack, Onslow, and Shark Bay. There are two distinct species of mother-of-pearl shell exported. The principal trade is done in the large shell (*Meleagrina margaritifera*), limited in distribution to tropical waters and extending in habitat from Exmouth Gulf northwards. It is used for the larger manufactured articles, such as dessert and fish knife and fork handles, large buttons, and inlaid work. The largest and finest pearls are obtained from it. The second species is that known commercially as the Shark Bay variety (*Meleagrina imbricata*). It is of smaller size and used chiefly for the manufacture of small buttons. The pearls found are of varying value. The Shark Bay pearlshell is collected by dredging in the deeper waters and gathering by hand from the shallow banks at low tide. In October, 1911, a pearl weighing 178 grains, and valued at £3000, was obtained at Broome.

The system of licensing boats and men engaged in the pearling industry restricts, in the States where it is in force, indiscriminate exploiting of the areas, and returns a small revenue.

Poaching in Australian territorial waters has long been rife, particularly on the north-west coast. Recently the Commonwealth Customs Department arranged with the Celebes Islands Government for administering a check. One of the vessels of the Australasian Squadron searched the coast for poachers during a cruise, and it is believed that the evil has been almost entirely eradicated.

In accordance with the "White Australia" policy, it has been determined that the employment of coloured labour in the pearl-shelling industry shall be restricted, and ultimately cease altogether. After 31st December, 1913, permits to indent Asiatics for the pearling fleet will cease, and all divers and tenders employed upon the luggers must be white men. Arrangements have been made for the introduction of experienced divers from England. In 1912, eleven ex-naval men arrived at Perth from London, under engagement as linesmen and divers at Broome. Further relays for Broome and Thursday Island are being sent out. It is believed that practical difficulties which may arise in the transition period will be overcome. In March, 1912, the Commonwealth Government appointed a Royal Commission to inquire into the pearling industry generally, and particularly as regards its labour problems. The Commission commenced its work at Cairns, Queensland, on 30th April, 1912, and has taken evidence of a valuable nature in various centres.

The heavy mortality amongst divers has led to suggestions for their medical inspection, and for the establishment of a diving school subsidised by the Government for training white divers.

§ 2. Fisheries Statistics.

1. **Estimates for the Commonwealth.**—The returns given below have been furnished by the State departments. Estimates and approximations, where shown, are official. The data do not generally lend themselves to presentation on a uniform scheme, but the principal facts have been compiled as far as possible for the Commonwealth.

GENERAL FISHERIES (EXCLUDING EDIBLE OYSTERS, PEARLSHELL AND BECHE-DE-MER), COMMONWEALTH, 1911.

State.	No. of Boats Engaged.	Value of Boats and Equipment.	No. of Men Employed.	Total Take of		Value of Take.	
				Fish.	Lobsters.	Fish.	Lobsters.
	No.	£	No.	cwt.	doz.	£	£
New South Wales ...	567	25,585	1,075	128,624	14,279	139,585	6,426
Victoria ...	725	43,811	1,112	88,584	34,435	61,183	8,492
Queensland...	264	10,771	488	36,800	...	36,182	...
South Australia ...	722	30,000	1,088	96,000	11,000	164,728	5,000
Western Australia ...	217	16,000	435	*	16,000	60,000	4,800
Tasmania† ...	95	5,000	197	‡	7,167	11,324	3,000
Northern Territory ...	3	550	10	820	...	1,025	...
Commonwealth ...	2,593	131,717	4,405	350,828§	82,881	474,027	27,718

* Figures not available. † Returns incomplete; refer mainly to Hobart. ‡ 69,928 dozen.
§ Exclusive of Western Australia and Tasmania.

EDIBLE OYSTER-FISHERIES, COMMONWEALTH, 1911.

State.	Number of Boats Engaged.	Value of Boats and Equipment.	Number of Men Employed.	Number of Leases.	Length of Foreshore in Leases.	Oysters Taken.	
						Quantity.	Value.
New South Wales ...	No. 363	£ 9,714	No. 431	No. 2,003	Miles. 444	cwt. 36,655	£ 42,106
Victoria ...	...	...	...	...	...	...	...
Queensland...	114	8,462	149	682	*	27,030	33,586
South Australia ...	5	640	9	*	15†	712	1,388
Western Australia ...	...	...	...	...	...	...	...
Tasmania ...	...	...	...	...	...	...	...
Northern Territory ...	...	...	...	...	...	...	...
Commonwealth ...	482	18,816	589	2,685†	*	64,397	77,080

* Figures not available. † 1907 figures; returns for later years not available.
‡ Exclusive of South Australia.

PEARL, PEARLSHELL, AND BÉCHE-DE-MER FISHERIES, COMMONWEALTH, 1911.

State.	Number of Boats Engaged.	Value of Boats and Equipment.	Number of Men Employed.	Quantity of Pearls obtained.	Value of Pearls obtained.	Value of Pearls obtained.	Value of Béche-de-mer obtained.	Quantity of Tor-toiseshell obtained.	Value of Tor-toiseshell obtained.
N.S.W.
Victoria ...	...	...	...	...	...	...	...	...	...
Q'sland ...	188	59,000	1,347	457	84,545	12,151	16,370	916	474
S. Aust. ...	...	...	...	...	...	...	...	...	...
W. Aust. ...	360	177,401	2,519	1,189	227,233	75,562	...	...	...
Tas. ...	...	...	...	...	...	...	...	...	...
N. Terr. ...	30	7,820	186	71	15,666	...	1,342	140	98
C'wlth. ...	578	244,221	4,052	1,717	327,444	87,713	17,712	1,056	572

PUBLIC REVENUE FROM FISHERIES, COMMONWEALTH, 1911.

State.	Licenses.	Leases.	Fines and Forfeitures.	Other Sources.	Total.
New South Wales ...	1,088	6,437	187	292	7,954
Victoria ...	...	...	...	...	...
Queensland...	2,014	4,623	29	...	6,666
South Australia ...	363	...	2	...	365
Western Australia ...	880	523	124	74	1,601
Tasmania* ...	534	...	3	20	557
Northern Territory ...	4	...	...	...	4
Commonwealth ...	4,833	11,583	345	386	17,147

* Returns incomplete; refer mainly to Fisheries Board of Hobart.

GENERAL AND OYSTER FISHERIES, COMMONWEALTH, 1907 to 1911.

Particulars.	1907.	1908.	1909.	1910.	1911.
General Fisheries—					
No. of boats engaged ...	2,740	3,063	3,101	3,088	2,593
„ men employed ...	4,722	5,107	5,492	5,515	4,405
Fish obtained—					
Quantity ... cwt.	265,650	289,820	298,351	341,659†	350,828§
Value... .. £	222,000	259,392	276,672	381,182	474,027
Lobsters obtained—Value, £	11,460	16,163	16,078	22,172	27,718
Edible Oyster Fisheries—					
No. of boats engaged* ...	153	139	139	113	482
„ men employed* ...	218	196	175	174	589
Oysters obtained—					
Quantity ... cwt.	79,832	57,590	59,109†	59,854	64,397
Value £	63,438	61,900	63,192†	60,769	77,080
Public Revenue from Fisheries					
Licenses £	8,419	8,891	8,812	5,496	4,833
Leases £	6,699	7,001	7,446	9,842	11,583
Fines and forfeitures	208	168	142	180	345
Other sources £	503	885	649	742	386
Total revenue £	15,829	16,945	17,049	16,260	17,147

* Queensland and South Australia only for years 1907 to 1910. There are practically no oyster fisheries in Victoria, Western Australia, and Tasmania. † New South Wales and Queensland only. ‡ Exclusive of Tasmania. § Exclusive of Western Australia and Tasmania.

PEARL, PEARL-SHELL AND BÊCHE-DE-MER FISHERIES, COMMONWEALTH,*
1907 to 1911.

Particulars.	1907.	1908.	1909.	1910.	1911.
No. of boats engaged ...	625	604	567	586	578
No. of men employed ...	3,920	3,852	3,883	4,038	4,052
Pearlshell obtained—					
Quantity tons	2,034	1,768	1,770	1,853	1,717
Value £	249,115	219,098	270,256	299,143	327,444
Pearls obtained †—					
Value £	64,890	49,225	77,788	94,768	87,713
Bêche-de-mer obtained—					
Quantity tons	358	346	352	251	323
Value £	30,931	22,903	16,410	14,088	17,712
Tortoiseshell obtained—					
Quantity lbs.	3,437	5,056	3,532	2,070	1,056
Value £	2,042	2,776	1,739	998	572

* Queensland, Northern Territory and Western Australia only. There is no production in the other States.

† As returned.

2. State Fisheries Statistics.—(i.) *New South Wales.* From 1904 to 1906 the average numbers of men and boats employed in general fisheries were respectively 1730 and 849; the average annual quantity of fish marketed was nearly six million pounds. More recently the estimated number of men employed has exceeded 2300, working

upwards of 1200 boats. In 1911, however, there was a falling-off. In 1907 the take of fish was 124,078 baskets, averaging 75 lbs. each. In 1908 the take was 134,437 baskets of fish, 11,031 dozen lobsters, and 3478 baskets (80 lbs. each) of prawns. In 1909 the take was 142,573 baskets of fish, 8497 dozen lobsters, and 6762 baskets of prawns; in 1910, 130,000 cwt. of fish, and 11,100 dozen lobsters, and in 1911, 128,624 cwt. of fish, and 14,279 dozen lobsters. The approximate value in 1907 was £64,000, in 1908 £72,760, in 1909 £74,000, in 1910 £126,765, and in 1911 £146,000. The fisheries revenue over a series of years averaged £6000 annually, amounting to £6626 in 1908, £6782 in 1909, £7071 in 1910, and £7954 in 1911.

Considerable portions of the foreshores and shallow areas of the river estuaries are excellent natural oyster-beds, and with constant attention the annual yield of oysters could no doubt be materially increased. In 1907 the oyster leases covered 65 acres of deep water, and 553,975 yards of foreshore, and the yield was 14,406 bags, valued at £25,210. In 1908 there were leased 72 acres of deep water, and 597,495 yards of foreshore, from which 20,590 bags, value £26,900, were taken. The foreshore leased in 1909 was 662,135 yards, the take being 15,538 bags, valued at £27,192. Leases were not quite so extensive in 1910, 651,200 yards representing the foreshore worked, the produce being nearly 30,000 cwt., valued at £30,000. In 1911, the leases were 781,440 yards, from which were gathered 36,655 cwt., valued at £42,106.

(ii.) *Victoria.* In 1908 a Fisheries Inquiries Board investigated the conditions of the fishing industry in Victoria. The scope of the inquiry covered questions as to the permanent and temporary closing of areas against fishing; the length and number of nets to be used by any one party; poaching; the destruction of cormorants; the appointment of local inspectors; adequate punishment for offences against the Fisheries Act; trawling and long line fishing experiments; and the handling, freight, and marketing of fish. Some of the recommendations of the Board were given effect to, others are still under consideration. The Fisheries Branch was, in 1909, transferred from the Public Works to the Agricultural Department, with a view to its reorganisation on the lines suggested in the Board's report. In April, 1913, legislation will begin to operate which is expected to result in the industry being immediately benefited. The number of boats engaged in the industry averages 700 over a series of years, and of men 1100. The take in 1907 was 99,707 cwt. of fish, valued at £60,442; and 24,889 dozen lobsters, valued at £6179. In 1908 it was 93,899 cwt. of fish, valued at £65,184; and 27,127 dozen lobsters, valued at £6726. In 1909 the take was 97,933 cwt. of fish, valued at £67,698; and 29,962 dozen lobsters, valued at £7403, in 1910, 93,243 cwt. of fish, valued at £64,706; and 32,059 dozen lobsters, valued at £7881; and in 1911, 88,584 cwt. of fish, valued at £61,183; and 34,435 doz. lobsters valued at £8492. Licenses to net in certain waters are issued, and these will become annual under the new Act. In 1907 legal proceedings, which called attention to the fact that the necessary licenses had not been taken out in many cases, resulted in a large increase in the issue. There is no separate revenue credited to fisheries, the small amount derived by way of fines being credited to general revenue.

Annual leases have been granted to oyster fisheries, but the return has been insignificant.

(iii.) *Queensland.* Prior to 1907 no account was kept of the value of boats and equipments, but an approximation believed to be very close was furnished. Over a series of years the number of boats and men engaged in general fisheries average 250 and 500. The take in 1907 was 32,500 cwt. of fish, valued at £24,437; in 1908, 31,000 cwt., valued at £23,519; in 1909, 34,050 cwt., valued at £32,987; in 1910, 40,000 cwt., valued at over £36,000, and in 1911, 36,800 cwt., valued at £36,182. There are no lobster fisheries. The quantity put up in tins in the fish-preserving establishments is not great, but the local demand is growing. The revenue from fisheries in Queensland is considerable, and is chiefly derived from licenses and leases. Since 1904 it has generally exceeded £7000, being in 1907, £7921; in 1908, £8176; in 1909, £8108; in 1910, £6848; and in 1911, £6666.

For oyster fisheries, the deep waters in the Moreton Bay and Sandy Strait are leased as dredge sections, which extend across the channels to the islands, and contain from 100 to 1000 acres each. Within these sections the majority of the oyster banks (ground containing up to 30 acres lying within two feet of low-water mark) are situated on the foreshores of the islands, and on the mud and sands flats. In 1907, 60,000 cwt. of oysters were taken, valued at £37,500; in 1908, 37,000 cwt., valued at £35,000; in 1909, 38,300 cwt., valued at £36,000; in 1910, 29,829 cwt., valued at £30,592; and in 1911, 27,000 cwt., valued at £33,586.

In the pearlshell industry, the last three years have been satisfactory, notwithstanding the industrial trouble early in 1908. As much as £150 per ton was lately realised for pearlshell. During recent years, however, there has been a diminution in the production, the number of boats and men engaged being considerably less than formerly. In 1907 the take was 577 tons of pearlshell, valued at £70,495; 338 tons of bêche-de-mer, valued at £30,033; and 3095 lbs. of tortoiseshell, valued at £1927. In 1908 the take was 424 tons of pearlshell, valued at £50,514; 322 tons of bêche-de-mer, valued at £21,631; and 4805 lbs. of tortoiseshell, valued at £2617. In 1909 the take was 516½ tons of pearlshell, valued at £70,505; 314 tons of bêche-de-mer, valued at £14,504; and 3156 lbs. of tortoiseshell, valued at £1389; in 1910, 571 tons of pearlshell, valued at £82,652; 221 tons of bêche-de-mer, valued at £12,785; and 1848 lbs. of tortoiseshell, valued at £838. In 1911, the take was 457 tons of pearlshell, valued at £84,545; 291 tons of bêche-de-mer, valued at £16,370; and 916 lbs. of tortoiseshell, valued at £474. Almost the whole of the bêche-de-mer collected was exported in a cured state to the East, and with few exceptions was fished for by Japanese and Manila men. Prior to 1907 no record of the value of pearls obtained was kept, and it is impossible to make an accurate estimate. In the year named the value was approximately £30,000; in 1908, £20,000; in 1909, £25,000; in 1910, £26,620; and in 1911, £12,150.

(iv) *South Australia.* In 1907 the take was 20,734 cwt. of fish, valued at £25,121, and 1380 dozen lobsters, valued at £369; in 1908, 25,796 cwt. of fish valued at £34,756, and 14,000 dozen lobsters, valued at £3677; in 1909, 23,095 cwt. of fish, valued at £40,087, and 3522 dozen lobsters, valued at £3299; in 1910, 48,214 cwt. of fish, valued at £87,500, and 3500 dozen lobsters, valued at £4500; and in 1911, 96,000 cwt. of fish, valued at £164,728, and 11,000 dozen lobsters, valued at £5000. The revenue from general fisheries was £286 in 1907, £368 in 1908, £356 in 1909, £301 in 1910, and £365 in 1911, all except £2 in 1911 being derived from licenses. Oyster fishing has been introduced, but has not, up to the present, attained any great dimensions. In 1910, 167 cwt. of oysters, valued at £167, were marketed, and in 1911, 712 cwt., valued at £1388.

(v) *Western Australia.* The take in 1908 was 1500 tons of fish, valued at £50,000, and 10,000 doz. lobsters, valued at £3000. In 1909 it was 1500 tons of fish, valued at £52,500, and 10,920 dozen lobsters, valued at £3276; in 1910 it was 1511 tons, valued at £56,400, and 9000 dozen lobsters, valued at £3150. In 1911 the value of the fish catch was £60,000, and of the lobsters taken £4800. Revenue from fisheries amounted in 1907 to £787, in 1908 to £1174, in 1909 to £1234, in 1910 to £1474, and in 1911 to £1601.

The quantity of pearlshell obtained in 1907 was 1393 tons, and the value £169,815; in 1908 the quantity was 1286 tons, valued at £161,006; in 1909, 1196 tons, valued at £189,666, in 1910, 1227 tons, valued at £206,461; and in 1911, 1189 tons, valued at £227,233. Pearls to the value of £64,690, £29,225, £52,788, £68,148, and £75,562 were taken in 1907, 1908, 1909, 1910, and 1911 respectively. The bêche-de-mer fisheries are little developed, and no produce of commercial value has been obtained of late years, although previously small quantities were marketed.

(vi. *Tasmania*. The fishing boats and fishermen in Tasmania are not licensed. No record was kept of them prior to 1911. The fish markets are under the control of the municipalities, and these do not keep complete records of quantities sold. In 1908 the estimated take of fish was 17,800 cwt., estimated value £11,400. In 1910 the Hobart fisheries produced 83,269 dozen fish, valued at £14,113, and 6830 dozen lobsters, valued at £2200. In 1911 the production was 69,928 dozen fish, valued at £11,324, and 7167 dozen lobsters, valued at £3000. The revenue over a series of years averages about £600, mostly derived from licenses to angle for salmon and trout with rod and line. In 1907 the total receipts were £596; in 1908, £569; in 1909, £470; and in 1910 and 1911, £557. A special report on the prospects of Tasmanian fisheries was made in 1911 by a Glasgow expert, specially appointed for the purpose. It is stated that fish are very plentiful around the Tasmanian coasts, the variety being large, and the quality choice.

Oyster fisheries are not worked except in a most primitive way.

The work of the Commissioner trends mostly in the way of breeding and distributing young fresh-water fish, especially acclimatised trout.

(vii.) *Northern Territory*. The limitation of shelling grounds and the scarcity of suitable labour has considerably hampered the pearl shelling industry, not more than half the fleet of boats having been engaged in late years. No pearls have been declared, but it is hardly possible that none were procured. It is believed that a quantity of pearls pass through the post office without the knowledge of the Customs, and that dishonest divers send some away unknown to the boat owners—in some instances by special messengers. There are indications that trepang fishing will receive more attention than hitherto from Europeans, in whose hands the whole of the industry is now held. The closing of the coast against the Macassar proas must necessarily cause a shrinkage, but it is expected that in the course of a year or two this will prove a great boon to local boats, inasmuch as it will give the fishing grounds time to recoup. Both the pearlshell and the trepang fisheries are capable of expansion. In 1907 pearlshell taken amounted to 64 tons, valued at £8805. Other products were:—342 lbs. of tortoiseshell, valued at £115; 38,976 lbs. of dried fish, valued at £822; and 20 tons of bêche-de-mer, valued at £898. In 1908, many of the boats were taken off for want of men, others to carry on different work. The take was 58 tons of pearlshell, valued at £7578; 24 tons of bêche-de-mer, valued at £1272; 83,900 lbs. of dried fish, valued at £1697; and 251 lbs. of tortoiseshell, valued at £159. Revenue from licenses amounted in 1908 to £59. In 1909 the licensed pearling fleet consisted of 39 luggers, one steamer, and six canoes. Of these boats only 26 were actually engaged. The area worked over was old ground. The pearlshell taken was 58½ tons, valued at £10,085. With a take equal to that of the previous year, the price realised was about 25 per cent. better. No pearls were reported. The export of trepang was 38 tons, valued at £1906. This industry has been steadily increasing since 1905, when the coast was closed to the Macassar fishermen. The production of dried fish in 1909 was 63,504 lbs., valued at £1091; and tortoiseshell, 376 lbs., valued at £350. In 1910, 55 tons of pearlshell were produced, valued at £10,030; 30 tons of bêche-de-mer, valued at £1303; 34,272 lbs. of dried fish, valued at £5917; and 222 lbs. of tortoiseshell, valued at £160. For 1911 the figures are 71 tons of pearlshell, valued at £15,666; 32 tons of bêche-de-mer, valued at £1342; 140 lbs. of tortoiseshell, valued at £98; 820 cwt. of fish were also taken, valued at £1025. A recent Ordinance of the Federal Government regulates the industry. Vessels engaged in the trade must be licensed, but no licenses are required for the crew. The inspector of fisheries is given power to enter places where fish, pearls, pearlshell, or trepang are being prepared or marketed. The administrator is authorised to close waters against fishing, to declare devices for taking fish illegal, and to fix a minimum weight.

§ 3. Oversea Trade in Fish.

That the development of the fishing industry in Australia leaves much to be desired is evident from the fact that the import of preserved fish into the Commonwealth is large, the export inconsiderable. The figures for the trade are as follows:—

IMPORTS OF FISH, COMMONWEALTH, 1907 to 1911.

Classification.		1907.	1908.	1909.	1910.	1911.
Fresh (oysters) ...	{ cwt.	12,288	9,702	10,580	9,640	7,152
	{ £	5,607	4,381	4,989	4,805	3,462
Fresh, or preserved by cold process...	{ cwt.	12,970	19,311	11,355	11,248	20,455
	{ £	22,698	48,072	20,785	23,001	44,536
Potted ...	{ cwt.	*	*	*	*	*
	{ £	13,364	20,874	22,082	25,408	26,024
Preserved in tins ...	{ cwt.	127,555	144,750	137,860	154,547	148,846
	{ £	316,320	400,981	371,620	466,381	443,049
Smoked, dried and n.e.i.	{ cwt.	15,933	19,349	21,667	19,448	21,605
	{ £	33,078	34,780	47,096	42,918	52,289
Total ...	{ cwt. †	168,746	193,112	181,462	194,883	198,058
	{ £	391,067	509,088	466,572	562,513	569,360

* Not available. † Exclusive of potted fish.

EXPORTS OF FISH (AUSTRALIAN PRODUCE), 1907 to 1911. COMMONWEALTH.

Classification.		1907.	1908.	1909.	1910.	1911.
Fish, fresh, smoked, or preserved by cold process	{ cwt.	160	394	994	912	248
	{ £	296	1,230	2,896	1,963	1,026
Preserved in tins, dried, salted, etc.	{ cwt.	8,651	7,006	6,746	5,346	6,891
	{ £	38,977	23,299	15,556	17,532	23,185
Total ...	{ cwt.	8,811	7,400	7,740	6,258	7,139
	{ £	39,273	24,529	18,452	19,495	24,211

A considerable development has taken place lately in the fish preserving industry. Two factories were opened in the Northern Territory in 1907, and a large output resulted from the operations of those previously established. There was, however, for the Commonwealth an excess of imports over exports amounting approximately to £350,000 in 1906 and 1907, £485,000 in 1908, £450,000 in 1909, £540,000 in 1910, and £545,000 in 1911.

The exports of pearlshell and tortoiseshell are given hereunder for the five years 1907-11:—

EXPORTS OF PEARLSHELL AND TORTOISESHELL, 1907 to 1911. COMMONWEALTH.

Article.		1907.	1908.	1909.	1910.	1911.
Pearlshell ...	{ cwt.	41,244	40,746	34,579	39,559	38,339
	{ £	252,063	250,901	250,274	318,647	325,218
Tortoiseshell ...	{ lbs.	3,566	5,310	3,207	1,742	1,693
	{ £	2,192	2,783	1,557	823	964

§ 4. Development of the Fishing Industry.

1. **Transport and Marketing.**—The large importations of fish into the Commonwealth indicate the scope for the development of the local fishing industry, and for many years the question of securing to the consumer a regular supply of a wholesome article at a moderate price has been under consideration. The handling and marketing of the product has been undertaken in Sydney by the City Council. Where quick transport by rail or steamer is not provided, the catch of fish in tropical or sub-tropical waters can only be locally consumed, since speedy marketing is essential. Adequate refrigerating apparatus on railway waggons and coasting steamers and quick transport to centres of population might, however, alter the economic condition in a satisfactory direction. In the temperate regions there are adequate supplies close to the principal ports—a fact which is of considerable advantage, since short trips mean marketing of the produce in good condition, and less sea risks are incurred. At the present time the natural wealth of Australia in fish is exploited only to a very slight extent.

2. **Experiment and Culture.**—(i.) *The Existing Fisheries.* In many respects the fishing industry is capable of modification and development. A good deal has been effected by the State Governments in the way of experiment and culture, but much yet remains to be done before the industry is at all commensurate with the industrial progress and consuming capacities of the Commonwealth. A uniform policy of development for Australia is desirable, and recommendations have been made that the Fisheries Departments of the various States should co-operate with the Federal Government with a view to increasing the productiveness of the Commonwealth waters; and that uniform fisheries laws should be adopted by adjacent States. The existing fishing is inshore, the supplies being obtained from the vicinity of river estuaries and lakes. Deep-sea fishing, as established and carried on in older countries, is, so far, practically non-existent in Australia. It has been established that the deposits of fish eggs generally float upon the water. The drift of currents or the influence of winds often carries them a considerable distance from the shore, thus affording very little chance of development. The problem that is now engaging experts all over the world is how to artificially control the drift of eggs, so that the fish may be hatched near shore under the most favourable conditions.

To prevent the importation of fish of predaceous habits, or otherwise undesirable, all live fish arriving in Australia are examined on shipboard.

(ii.) *New South Wales.* In New South Wales, trawling experiments have shewn that considerable areas along the coast are suitable fishing grounds, but practical work on commercial lines is yet undeveloped. The stocking of rivers and lakes was begun by private enterprise, but Government aid was granted later, and eminent success has been attained, particularly with the Californian rainbow trout. Young fry are distributed annually from the trout hatcheries at Prospect, and the natural reproduction of the fish in the streams that issue from the mountain ranges is regarded as a valuable asset. In 1902 attempts were successfully made to transport European fishes alive to Australia. A marine hatchery and biological station has been completed at Gunnamatta Bay, Port Hacking, by means of which it is proposed to gradually acclimatise suitable fishes. There is an increasing output each season of ova and fry. The natural oyster beds are also being extended. In September, 1909, a Fisheries Exhibition was held at Sydney, to shew the resources of the State.

With the object of ascertaining something of the movements of oceanic fishes, as well as of those estuarine fishes which make periodical oceanic migrations, lighthouse-keepers on the coast report weekly the various kinds of fishes, etc., observed travelling along the coast, as well as the quantity and size of fish seen. Some very useful information has in this way been obtained.

By arrangement with the Commonwealth Fisheries Department, members of the staff of the Australian Museum, Sydney, accompany the F.I.S. " *Endeavour* " on various cruises. Specimens are collected, mounted for scientific purposes, and distributed to other Australian Museums, a considerable number being put aside for the Fishery Museum to be established by the Commonwealth Government in connection with the department.

(iii.) *Victoria.* In Victoria, besides the culture that has been mainly the work of private individuals and angling clubs, the Government has incurred the expenditure of a sum of money on hatcheries, with good results. Fry and yearlings are distributed, and one consignment of the latter was despatched from the Geelong hatchery and liberated without loss at Mundaring, Western Australia. Young rainbow and Loch Leven trout are also released into the rivers of the State from the hatcheries lately established at the Zoological Gardens. At Studley Park, Melbourne, and at Ballarat, there are also ponds for experimental culture. Trawling experiments were conducted some years ago, but the results were inconclusive.

(iv.) *Queensland.* In Queensland, artificial hatching was undertaken by the Acclimatisation Society of Southern Queensland. Here, also, the American rainbow trout has succeeded, fry being distributed from the hatchery at Spring Creek, Killagney. The lung-fish, formerly known only in two streams, has been successfully transplanted to several other streams. Oyster beds are also being developed in several localities, and improved methods of culture have largely increased the output. The trawling experiments of 1901 and 1902 point to the improbability of a great trawling industry being established. The trawling area of Queensland would be a mere strip, because of the presence of the coral region immediately to the north, and the fact that the sea deepens very rapidly to the east.

(v.) *South Australia.* In South Australia the indiscriminate exploitation of the Port Lincoln and adjacent oyster beds led to the necessity for their being closed from time to time to prevent the district from being altogether worked out. The future outlook has in this way been improved as regards oyster culture. The South Australian general fishing grounds have been stated to be most desirable areas, only wanting men and boats to ensure a large take. Many new grounds have been opened up on the West Coast and the unsuitable areas have been defined. Trawling by private individuals has been undertaken.

On the 1st April, 1910, the Fisheries Act Amendment Act of 1909 became law, and revised regulations were promulgated. Provision is made that a fisherman must be a natural born or naturalised British subject, and must be licensed and have his boat registered and marked. Inspectors are given considerable powers for the protection of the industry and those engaged in it.

The Fisheries Department is taking active steps to increase supplies, and is gathering information respecting natural breeding grounds, with a view to making them sanctuaries for the breeding of young fish. It is believed that the reservation of these spawning places will replenish the supplies with more certainty and less expense than by artificial hatcheries. The closing of certain waters for breeding grounds has had the effect of increasing the fish supply on the coast and in the River Murray.

(vi.) *Western Australia.* In Western Australia the coastal waters have been examined to ascertain whether suitable trawling grounds exist. The Acclimatisation Committee has successfully hatched and liberated trout, the Mundaring Weir being stocked with the Loch Leven variety. Perch have been stocked in the lakes near Wanneroo Caves.

(vii.) *Tasmania.* Expert advice indicates that the depths of the ocean surrounding Tasmania are ideal for trawling, and that there are very good openings for a profitable fishing trade in the island. Considerable distributions of ova and fry are annually made from the Plenty River in Tasmania. Besides the supplies to Tasmanian waters, the northern States are also recipients of ova.

§ 5. The Commonwealth Department of Fisheries.

1. **The Federal Council of Australasia.**—The Federal Council had power to legislate with regard to fisheries in Australasian waters beyond territorial limits. In its second session (opened 16th January, 1888), an Act was passed to regulate pearlshell and bêche-de-mer fisheries in Australasian waters adjacent to Queensland; and in the third session, opened shortly afterwards, the Act was made applicable to Western Australia. Upon the passing of the Commonwealth Constitution Act of 1900, however, the Federal Council ceased to exist.

2. **Commonwealth Investigations.**—In 1907 the Commonwealth Government decided to demonstrate what might be attained commercially by the application of modern methods and experiences. A Federal Investigation Ship, the *Endeavour*, was constructed specially for the work, and a Director of Fisheries was appointed. Cruises and experiments were immediately instituted. These shew that the Commonwealth possesses an asset of considerable value in her sea fisheries. The scope and results of the inquiries are set out in the Director's reports, and are summarised below.

3. **Scope of the Inquiry.**—The immediate scope laid down for the investigation was, shortly, as follows:—

- (i.) By various means of capture to ascertain what marketable food-fishes may be found in ocean waters adjacent to Australia.
- (ii.) In what quantity they may be taken.
- (iii.) To what extent they migrate, and where.
- (iv.) How they may be conveniently and economically captured.
- (v.) By systematic survey to find out and chart suitable fishing grounds.

In addition to the work which is being thus carried on in the various recognised methods of capture (including long-line and drift-net fishing, etc.), survey, hydrographic work, etc., is conducted, for the purpose of ascertaining the nature of the bottom, depth of water, currents, and sea temperature.

4. **The F.I.S. "Endeavour."**—The construction of the investigation vessel was undertaken in the Commonwealth, and was upon the lines shewn by the most recent European experience to be of greatest advantage, with necessary modifications to suit the Australian climate. Australian materials were used. On 1st June, 1908, the keel was laid, and on 27th August the steel hull was ready for launching. The official trial took place in January, 1909, and on 9th March, the equipment being complete, there was put in commission the first Commonwealth-owned sea-going ship, named *Endeavour*, after Captain Cook's historic vessel. The measurements of the vessel are:—134 ft. 9 in. over all; beam, 23 ft.; moulded depth, 11 ft. 9 in.; greatest draft, 11 ft. 9 in. The engines are of triple expansion type, and develop 440 i.h.p. The speed is nearly 11 knots. The vessel is suitably equipped for her work, all available space being put to use, and has proved to be an excellent and reliable sea boat. She closely resembles a modern trawler, fittings for her special service having been added. The main winch is especially powerful, and carries 2000 fathoms of 2½ in. and 1½ in. wire rope for trawling purposes. An additional reel attached to the fast running axle on the winch carries 1500 fathoms of ½-in. wire rope for hydrographic observations. The starboard side is generally fitted and equipped for operating the large otter trawl (95 feet head line), while on the port rail a Lucas Sounding Machine (5000 fathoms of piano wire) and davits for various purposes have been fixed. The hold is given up to net stores, and a cool chamber for the keeping of fish, etc. On the deck aft is provided a laboratory, where preliminary investigations are carried out. Here also is stored all the special apparatus, including deep-sea water-bottles, thermometers, etc.

5. **The "Endeavour's" Cruises.**—The first cruise began on 12th March, 1909, and ended six days later. Up to the end of 1912 sixty-seven cruises had been made in various localities in the waters off the coasts of Queensland (as far north as Bowen, latitude 20° S.), New South Wales, Victoria, South Australia, and Tasmania. In many cases, areas have been revisited and tested at different seasons of the year, thus affording a fair indication of their true fisheries value.

6. **Results.**—The object of the investigations is to shew how and where food-fish may be obtained in quantity, rather than to bring large catches into port. Moreover, in untested areas, sounding and survey work generally becomes a main feature. The early surveys were extended to cover fields as large as possible, the duration of each haul with the trawl being limited to average about two hours. A commercial vessel, working on well-known grounds, would remain continuously on the richest fields until a freight was secured, and would work longer drags. The take of the *Endeavour*, therefore, is usually considerably below what is to be expected from a vessel working the fields for profit.

Experiments with drift nets and long lines, although up to the present not largely carried out, have given promising results. Trawling has been the principal method tried. By this means the fish are disturbed by a large bag-shaped net drawn along the sea bottom, and they are caught and retained in a trap arrangement at the tail-end of the net. Prior to 1912 the trials were limited to waters of not more than 100 fathoms in depth. During 1912 the work was, in several localities, extended to a depth of 200 fathoms, and shewed that excellent catches could be obtained.

The cruises have shewn that both suitable and unsuitable trawling grounds were met with in all parts, and that not all suitable grounds are rich in fish life. This is a common experience in all parts of the world, and not peculiar to Australia alone. Over vast areas the bottom consists of coarse ("hungry") sand, which is almost barren and desert-like, while in other instances the sand is covered with quantities of sponges and other growth. The richest grounds were found in localities where a reversal of currents or eddies facilitates the accumulation of fish food. Good catches are nearly always obtained along the "edge of the bank" at a depth varying from 70 to 120 fathoms.

In conjunction with the survey work, investigations were undertaken regarding the deep water currents and their relation to the abundance of fish food and migrations. Bottom samples have been obtained from various depths down to 1200 fathoms, and water samples and temperatures from intermediate depths. Plankton collections from the surface have also been obtained, particularly to ascertain the distribution of pelagic fish eggs.

A varied and scientifically interesting collection of rare fishes, invertebrates, etc., has also been obtained. The specimens have been classified and mounted by naturalists in various parts of the Commonwealth.

Reports on the hydrographic, survey, and scientific departments of the vessel's activity are being prepared. At the end of 1911, part I. of the zoological results of the fishing experiments of the *Endeavour* was published; parts II. and III. followed in 1912. These embody reports on the fishes, the mollusca, and the sponges obtained during the cruises. A number of new species have been discovered, and scientifically examined.

7. **Treatment and Disposal of the Catch.**—It was decided that the wisest method of disposing of the fish was to distribute them to recognised charitable institutions. Clashing with the established industry was thus avoided, and upwards of one hundred charities have benefited.

Upon capture, the prompt gutting and washing of the fish is performed. The necessary records are taken regarding the number, size, food, etc. They are then dried, and stowed in the cool chamber.

Unmarketable fish constitute a considerable proportion of the catch. Experience elsewhere has shewn that fish for which there is no sale for consumption, have a considerable value as material for rich fertilisers, and the extraction of oil. For both these by-products there is a good overseas market.

8. Possibility and Scope for Future Development.—The records of the *Endeavour's* cruises are preserved in the departmental office, and there all particulars of the progress of the work are available. Throughout the years 1909 and 1910, catches have been obtained that commercially would be considered very satisfactory. In particular two instances are recorded of the remarkable return that experience shews is to be expected to accrue from working the areas examined. A vessel working at Flinders Island with Melbourne as a base would yield profits averaging 40 to 45 per cent.; while part of the east coast of New South Wales worked, with Eden as a base, would in one year earn the cost of the trawl and working expenses. It should not be forgotten that the main purpose of the *Endeavour's* cruises is to ascertain by what method the public may most easily be supplied with cheap fish.

The *Endeavour's* work during 1911 and 1912 has not only confirmed previous results as regards the abundance of marketable fish on certain grounds described, but it has been found that these grounds are more extensive than was anticipated, and in some instances even richer than the earlier results indicated. New trawling grounds were located—one very extensive area in the Great Australian Bight at depths up to 120 fathoms; catches averaging about 250 lbs. of marketable fish per hour of trawling were obtained over an area nearly 200 miles in extent east and west, but the full extent of this field has not yet been ascertained.

A special enquiry made in May, 1911, into the methods and character of the *Endeavour's* investigation work, and the prospects and most advantageous scope for future work, resulted in a thoroughly satisfactory report as to past efforts, particularly in the demonstration of profitable trawling grounds, and the possibility of making large supplies of fish available to the public. It was recommended that the investigations be continued for the purpose of further testing areas already shewn to be favourable, and for extending the work in South Australian and Western Australian waters.

In 1911, a cruise was undertaken with the express object of discovering whether large quantities of fish were obtainable within a limited time. The usual survey work was omitted, also experimental fishing in unknown grounds. A highly satisfactory result was obtained, more than five tons of marketable fish being obtained in 19 hours of actual fishing, or about 600 lbs. per hour.

The inadequacy of the present supply of fish in Australia is universally admitted, yet all reports agree that there is, on the coast, a bountiful supply of fish. It is not, as in Great Britain and the northern countries of Europe, a popular article of diet, but is rather in the nature of a luxury. While the value of fish consumed in Norway is nearly 20s., and in Holland, Denmark, and the United Kingdom 5s. per head of population, in Australia it is little over 1s. 6d. Moreover, in the European countries named, notwithstanding the fact that the trawlers have generally to go much further afield for their catches, a shilling's worth of fish represents a much larger quantity than could be obtained for the same amount in the Commonwealth, where the wealth of the coastal waters indicates that, with satisfactory handling, the product of the sea would become an article of food for the poorest classes, and a valuable industry would be developed. The uncertainties and limitations of the market, caused by the irregularity of the supply, will be overcome when the fact is recognised that the ocean product, properly exploited, is adequate to supply the demand, however strong. Under present conditions, it is not surprising that Australians are not great fish-eaters. As a result of the *Endeavour's* experiments, definite steps are being taken to carry out well-considered schemes, which it is hoped will stir up enterprise, and revolutionise the now obsolete and cramped condition of the Australian fish trade.

§ 6. Fish Preserving.

Bounties have been provided by the Federal Government for fish preserving, the rate payable being $\frac{1}{4}$ d. per lb. The amounts paid were £27 in 1907-8; £1727 in 1908-9; £311 in 1909-10; £115 in 1910-11; and £168 in 1911-12. The amount available for 1912-13 is £47,652. It is anticipated that the bounties, together with the increased yield that may be expected to result from the fisheries investigations now being conducted, will lead to a considerable output and consumption of locally preserved fish. The abundance of fish in Australian waters offers excellent opportunities for the institution of preserving establishments, particularly in those coastal districts which enjoy a temperate climate. Up to the present but little development has taken place, and the establishments for fish preserving at the present time are very few.

NUMBER OF FISH-PRESERVING ESTABLISHMENTS IN COMMONWEALTH, 1907 to 1911.

State.	1907.	1908.	1909.	1910.	1911.
New South Wales	1	1	1	1	1
Victoria	...	...	...	1	1
Queensland	4	5	6	6	6
South Australia	...	...	...	...	...
Western Australia	3	3	3	3	...
Tasmania	...	...	...	...	...
Northern Territory	2	2	2	2	2
Commonwealth	10	11	12	13	10