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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 and 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 and bêche-de-mer, 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.**—The economic arrangements as to distribution impose at present 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. 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.

6. Oyster Fisheries.—Natural oyster beds, whose ample product is of excellent quality, exist in the shallow waters of inlets and estuaries of several parts of the Australian foreshore. 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.

7. Pearl-shelling.—Pearl-shelling is carried on in the tropical districts of Queensland, South Australia (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 pearlshell diving is actively pursued, and is by far the most important of the 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 small. In October, 1909, a pearl of great beauty and fine quality from the Thursday Island fisheries, was exhibited in Melbourne. Its weight was 32½ grains, and its value was stated at £1000.

The discovery of mother-of-pearl shell in Port 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 an abandonment of the industry within three years from its birth. Prospecting in new patches has since 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 shells (*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.

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.

In accordance with the "White Australia" policy, it has lately been urged that the employment of coloured labour in the pearl-shelling industry should be restricted, and white labour encouraged.

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

§ 2. Fisheries Statistics.

1. Estimates for the Commonwealth.—The returns given below have been furnished by the States departments, and estimates, where they have been made, 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, 1909.

State.	No. of Boats Engaged.	Value of Boats and Equip-ment.	No. of Men Em-ployed.	Total Take of		Value of Take.	
				Fish.	Lobsters.	Fish.	Lobsters.
	No.	£	No.	cwt.	doz.	£	£
New South Wales ...	1,155	*	2,381	95,473	8,497	†72,000	†2,100
Victoria ...	780	38,187	1,125	97,933	29,962	67,698	7,403
Queensland...	300	11,233	567	34,050	...	32,987	...
South Australia ...	550	25,000	700	23,095	3,522	40,087	3,299
Western Australia ...	222	17,463	487	30,000	10,920	52,500	3,276
Tasmania§ ...	94	7,520	282	17,800	...	11,400	...
Commonwealth ...	3,101	99,403†	5,492	298,351	52,901	276,672	16,078

* Figures not available. † Exclusive of New South Wales. ‡ Estimated. § 1908 figures; returns for 1909 not available.

EDIBLE OYSTER-FISHERIES, COMMONWEALTH, 1909.

State.	Number of Boats Engaged.	Value of Boats and Equip-ment.	Number of Men Em-ployed.	Number of Leases.	Length of Foreshore in Leases.	Oysters Taken.	
						Quantity.	Value.
	No.	£	No.	No.	Miles.	cwt.	£
New South Wales ...	*	*	*	2,282	376	20,809	27,192
Victoria ...	...	...	...	...	...	...	...
Queensland...	133	7,850	167	807	*	38,300	36,000
South Australia ...	6	*	8	*	*	*	*
Western Australia ...	...	...	...	...	...	...	...
Tasmania ...	...	...	...	...	...	...	...
Commonwealth ...	*	*	*	*	*	*	*

* Figures not available.

PEARL, PEARLSHELL, AND BECHE-DE-MER FISHERIES, COMMONWEALTH, 1909.

State.	Number of Boats Engaged.	Value of Boats and Equipment.	Number of Men Employed.	Quantity of Pearlishell obtained.	Value of Pearlishell obtained.	Value of Pearls obtained.	Value of Beche-mer obtained.
	No.	£	No.	Tons.	£	£	£
New South Wales ...	...	...	...	...	...	...	...
Victoria ...	...	...	...	...	...	...	...
Queensland...	190	57,000	1,362	516	70,505	25,000	14,504
South Australia ...	46	12,375	254	58	10,085	...	1,906
Western Australia ...	331	151,705	2,267	1,196	189,666	52,788	...
Tasmania ...	...	...	...	...	...	...	...
Commonwealth ...	567	221,080	3,883	1,770	270,256	77,788	16,410

PUBLIC REVENUE FROM FISHERIES, COMMONWEALTH, 1909.

State.	Licenses.	Leases.	Fines and Forfeitures.	Other Sources.	Total.
	£	£	£	£	£
New South Wales ...	1,126	4,980	74	602	6,782
Victoria ...	...	...	...	...	...
Queensland...	5,960	2,132	16	...	8,108
South Australia ...	356	...	...	...	356
Western Australia ...	832	334	44	24	1,234
Tasmania* ...	538	...	8	23	569
Commonwealth ...	8,812	7,446	142	649	17,049

* 1908 figures; returns for 1909 not available.

GENERAL AND OYSTER FISHERIES, COMMONWEALTH, 1905 to 1909.

Particulars.	1905.	1906.	1907.	1908.	1909.
General Fisheries*—					
No. of boats engaged ...	2,031	2,510	2,740	3,063	3,101
„ men employed ...	4,186	4,614	4,722	5,107	5,492
Fish obtained—					
Quantity ... cwt.	203,720	213,290	265,650	289,820	298,351
Value... £	119,060	132,190	222,000	259,392	276,672
Lobsters obtained—Value, £	9,496	12,398	11,460	16,163	16,078
Edible Oyster Fisheries—					
No. of boats engaged† ...	137	150	153	139	139
„ men employed† ...	208	208	218	196	175
Oysters obtained—					
Quantity ... cwt.	18,572‡	20,100‡	79,832	57,590	59,109§
Value ... £	20,787‡	22,509‡	63,438	61,900	63,192§
Public Revenue from Fisheries					
Licenses ... £	9,221	8,200	8,419	8,891	8,812
Leases ... £	6,268	6,939	6,699	7,001	7,446
Fines and forfeitures £	162	388	208	168	142
Other sources ... £	202	334	503	885	649
Total ... £	15,853	15,861	15,829	16,945	17,049

* Exclusive of South Australia for 1905, and of New South Wales for 1905 and 1906. † Queensland and South Australia only. There are practically no oyster fisheries in Victoria, Western Australia, and Tasmania. ‡ New South Wales only. § New South Wales and Queensland only.

PEARL, PEARLSHELL AND BECHE-DE-MER FISHERIES, COMMONWEALTH,*
1905 TO 1909.

Particulars.	1905.	1906.	1907.	1908.	1909.
No. of boats engaged ...	741	603	625	604	567
No. of men employed † ...	3,549	3,767	3,920	3,852	3,883
Pearlshell obtained—					
Quantity ... tons	1,813	1,747	2,034	1,768	1,770
Value ... £	196,874	187,323	249,115	219,098	270,256
Pearls obtained †—					
Value ... £	41,686	59,524	64,890	49,225	77,788
Bêche-de-mer obtained—					
Quantity ... tons	187	235	358	346	352
Value ... £	14,598	20,541	30,931	22,903	16,410
Tortoiseshell obtained—					
Quantity ... lbs.	2,543	3,659	3,437	5,056	3,532
Value ... £	1,370	2,007	2,042	2,776	1,739

* Queensland, Northern Territory and Western Australia only. There is no production in the other States. † Exclusive of Northern Territory from 1905 to 1907. ‡ As returned.

2. States Fisheries Statistics.—(i.) *New South Wales.* Much of the information is approximate. 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. In 1907 the estimated number of men employed was 1935, and of boats, 1025; the take of fish was 124,078 baskets, averaging 75 lbs. each. In 1908 there were 1163 boats, worked by 2093 men, the take being 134,437 baskets of fish, 11,031 dozen lobsters, and 3478 baskets (80 lbs. each) of prawns. In 1909, 1155 boats and 2381 men were licensed; the take was 142,573 baskets of fish, 8497 dozen lobsters, and 6762 baskets of prawns. The approximate value in 1907 was £64,000, in 1908 £72,760, and in 1909 £74,000. The fisheries revenue over a series of years averaged £6000 annually. It was £6626 in 1908, and £6782 in 1909.

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.

(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 the consideration of the Government. 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. Legislation is proposed that is expected to result in the industry being considerably advanced in the near future. The number of boats engaged in the industry averages 700 over a series of years, and of men 1100. In 1907 there were 726 boats engaged, valued, with their equipment, at £38,666, and carrying 1153 men; in 1908, 755 boats, carrying 1158 men, and valued at £38,321. 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, 780 boats and 1125 men were

engaged, the value of the former being £38,187. The take was 97,933 cwt. of fish, valued at £67,698; and 29,962 dozen lobsters, valued at £7403. Licenses to net in certain waters are issued without fee. These are not annual, but are supplemented every year by new issues. It is proposed to make the registration annual, and impose a fee. 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 of licenses. In 1906, 39 were issued to men and 38 to boats. In 1907 the numbers were 176 and 80; in 1908, 83 and 45; and in 1909, 85 and 45 respectively. 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. In 1909 only three leases were granted (to take effect from 1st January, 1910); none were granted during the preceding three years.

(iii.) *Queensland.* Prior to 1907 no account was kept of the value of boats and equipment, 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 averaged 250 and 500. In 1907, 242 boats, valued, with equipment, at £6596, and carrying 497 men, were worked; in 1908, 266 boats, valued at £8924, carrying 497 men; and in 1909, 300 boats, valued at £11,233, and carrying 567 men. The take in 1907 was 32,500 cwt., valued at £24,437; in 1908, 31,000 cwt., valued at £28,519; and in 1909, 34,050 cwt., valued at £32,937. There are no lobster fisheries. The amount put up in the fish-preserving establishments is not great, but the demand for fish locally tinned is growing. The revenue from fisheries in Queensland is considerable, and is chiefly derived from licenses. Since 1904 it has annually exceeded £7000, being in 1907, £7921; in 1908, £8176; and in 1909, £8108.

For oyster fisheries, the deep waters in 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 sand flats. In 1907, 149 boats, valued at about £8000, and carrying 212 men; in 1908, 135 boats, valued at £7800, and carrying 190 men; and in 1909, 133 boats, valued at £7850, and carrying 167 men, were engaged. In 1907, 60,000 cwt. of oysters were taken, valued at £37,500; in 1908, 37,000 cwt., valued at £35,000; and in 1909, 38,300 cwt., valued at £36,000. Leases granted numbered 924 in 1907, 885 in 1908, and 807 in 1909.

In the pearlshell industry, the last two years have been satisfactory, notwithstanding the industrial trouble early in 1908. Prices improved considerably, as much as £150 per ton being realised for pearlshell. During the last four years, however, there has been a considerable diminution in production, the number of boats and men engaged having been much fewer than in preceding years. In 1907, 211 boats, valued at £63,800, and carrying 1420 men, were employed. 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, 204 boats, valued at £61,200, and carrying 1300 men, were engaged. 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, there were 190 boats; valued at £57,000, and carrying 1362 men. The take was 516½ tons of pearlshell, valued at £70,505; 14 tons of *bêche-de-mer*, valued at £14,504; and 3156 lbs. of tortoiseshell, valued at £1389. Prior to 1907, no record of the value of pearls obtained was kept, and it is impossible to estimate it. In the year named the value was approximately £30,000; in 1908, £20,000; and in 1909, £25,000.

(iv.) *South Australia and Northern Territory.* In 1907, 633 persons and 512 boats were engaged in general fisheries, the value of boats, equipment, etc., being £21,570. In 1908 the figures were 538 persons, and 487 boats, valued at £19,834; and in 1909, 550 boats, valued at £25,000, carrying 700 men. 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; and in 1909, 23,095 cwt. of fish, valued at £40,087, and 3522 dozen lobsters, valued at £3299. The revenue from general fisheries was £286 in 1907, £368 in 1908, and £356 in 1909, all from licenses. There are two fish-preserving establishments in the Northern Territory. Legislation to increase the powers of inspectors and to enforce compulsory licensing of fishermen and boats in all cases is proposed, the necessary Bill having been introduced into Parliament in August, 1909. Oyster fishing has been introduced, but has not, up to the present, attained any great dimensions. In 1907, 4 boats and 6 men were engaged, and 416 bags were taken, valued at £728. For 1908 no figures are available. In 1909, 6 boats were engaged, employing 8 men.

In pearl-shelling, the limitation of shelling grounds and the scarcity of suitable labour has considerably hampered the 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, 31 boats were engaged; 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, 52 boats were licensed, valued at £16,500, crews numbering 248. During the year, however, 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 of tortoiseshell, 376 lbs. valued at £350.

(v.) *Western Australia.* In 1907 there were engaged in general fisheries in Western Australia 235 boats, valued, with their equipment, at £16,500, and carrying 504 men; in 1908, 298 boats, valued at £21,328, and carrying 539 men; in 1909, 222 boats, valued at £17,463, and carrying 437 men. 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. Revenue from fisheries amounted in 1907 to £787, in 1908 to £1174, and in 1909 to £1234.

In the pearl and pearlshell fisheries in 1907, 383 vessels carried crews aggregating 2500, a great number of whom were Asiatics; in 1908, 348 vessels carried 2304 labourers; in 1909, 331 boats carried 2267 men. The value of boats and equipment in 1909 was £151,705. 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; and in 1909, 1196 tons, valued at £189,666. Pearls to the value of £64,690, £29,225, and £52,788 were taken in 1907, 1908, and 1909 respectively. The bêche-de-mer fisheries are little developed, and no produce of commercial value was obtained during the last three years, although in previous years small quantities have been marketed.

(vi.) *Tasmania.* The fishing boats and fishermen in Tasmania are not licensed, and no record is kept of them. The fish markets are under the control of the municipalities,

and these do not keep complete records of quantities sold. The number of boats engaged in 1908 was 94, with crews aggregating 282. The estimated total value of boats and equipment was £7500. The estimated take of fish was 17,800 cwt., estimated value £11,400. There are no lobster fisheries. 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.

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.

§ 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, 1905 to 1909.

Classification.		1905.	1906.	1907.	1908.	1909.
Fresh (oysters) ...	{ cwt.	8,195	9,225	12,288	9,702	10,580
	{ £	3,564	4,075	5,607	4,381	4,989
*Fresh, or preserved by cold process... ..	{ cwt.	11,386	9,591	12,970	19,311	11,355
	{ £	16,507	14,632	22,698	48,072	20,785
Potted	{ cwt.	†	†	†	†	†
	{ £	8,508	11,934	13,364	20,874	22,082
Preserved in tins	{ cwt.	120,213	135,872	127,555	144,750	137,860
	{ £	288,371	310,656	316,320	400,981	371,620
*Smoked, dried and n.e.i.	{ cwt.	16,992	17,336	15,933	19,349	21,667
	{ £	27,898	29,729	33,078	34,780	47,096
Total	{ cwt.†	156,786	172,024	168,746	193,112	181,462
	{ £	344,848	371,026	391,067	509,088	466,572

* In 1905 and 1906, smoked fish are included with "fresh or preserved by cold process."

† Not available. ‡ Exclusive of potted fish.

EXPORTS OF FISH (AUSTRALIAN PRODUCE), 1905 to 1909.

Classification.		1905.	1906.	1907.	1908.	1909.
Fish, smoked, or preserved by cold process	{ cwt.	179	264	160	394	994
	{ £	287	468	296	1,230	2,896
Preserved in tins, dried, salted, etc.	{ cwt.	6,234	6,107	8,651	7,006	6,746
	{ £	22,499	24,559	38,977	23,299	15,556
Total	{ cwt.	6,413	6,371	8,811	7,400	7,740
	{ £	22,786	25,027	39,273	24,529	18,452

A considerable development has taken place lately in the fish preserving industry. Two factories were opened in the Northern Territory of South Australia 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 to £350,000 in 1907, £475,000 in 1908, and £450,000 in 1909.

The exports of pearlshell and tortoiseshell are given hereunder for the five years 1905-9:—

EXPORTS OF PEARLSHELL AND TORTOISESHELL, 1905 to 1909.
COMMONWEALTH.

Article.				1905.	1906.	1907.	1908.	1909.
Pearlshell	...	...	{	cwt. 47,648	35,632	41,244	40,746	34,579
				£ 252,895	212,242	252,063	250,901	250,274
Tortoiseshell	...	...	{	lbs. 4,139	4,835	3,566	5,310	3,207
				£ 2,812	2,507	2,192	2,783	1,557

§ 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. 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. In Sydney, the City Council has undertaken the handling and marketing of the product, but the result of the experiment is as yet indecisive. 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. At the present time the natural wealth of Australia in fish is exploited only to a very slight extent. The daily supply of fish in Great Britain is 300,000 tons, and the deep sea fisheries cover an enormous area.

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 in its efforts to increase the productiveness of the Commonwealth waters, and the research work generally undertaken by it; 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 carry 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, among other fish, with the Californian rainbow trout. Young fry are distributed annually from the trout hatchery 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. The output of ova and fry last season was in excess of that of previous years. 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 were requested to report weekly the various kinds of fishes, etc., observed travelling along the coast, as well as the quantity and size of the 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, Killarney. 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 parts, 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 off 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. Trawling by private individuals has been undertaken. The question of establishing a floating hatchery is under consideration.

On the 1st April, 1910, the Fisheries Act Amendment Act of 1909 became law. It provides 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 power to protect 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.

(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 were stocked in the lakes near Wanneroo Caves.

(vii.) *Tasmania.* Considerable distributions of ova and fry are annually made from the River Plenty in Tasmania. Besides the supplies to Tasmanian waters, the northern States are also recipients of ova.

§ . 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. By the passing of the Commonwealth Constitution Act of 1900, however, the Federal Council was abolished.

2. **Commonwealth Investigations.**—In 1907, the Commonwealth Government decided to demonstrate what might be attained commercially by the application of modern methods and experience. 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 investigations 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 seagoing 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 seaboat. 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 $\frac{1}{2}$ -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 19th October, 1910, twenty-nine cruises had been undertaken in the waters off the coasts of Queensland (as far north as Bowen, latitude 20° S.), New South Wales, Victoria, South Australia (preliminary surveys), 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 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 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 it, 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. Generally, the inquiries have been limited to waters of not more than 100 fathoms in depth.

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. 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. In South Australia, in particular, large sections are covered with a fine white sand, and in all these cases fish life is scarce. The richest grounds were found in localities where a reversal of currents or eddies facilitates the accumulation of fish food.

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, and arrangements made with naturalists in various parts of the Commonwealth to classify and mount the specimens.

Reports on the hydrographic, survey, and scientific departments of the vessel's activity are being prepared.

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. 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 their 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.

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. The Director's report gives two instances 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.

The inadequacy of the present supply of fish is universally admitted. It is not, as in Great Britain and the northern countries of Europe, a popular article of diet. While the value of consumption of fish was in Norway 12s., and in Holland, Denmark, and the United Kingdom 5s. per head of population, in Australia it was little over 1s. Moreover, in the countries named, a shilling's worth of fish represents a much larger quantity than could be obtained 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. As a result of the *Endeavour's* experiments, definite steps are being taken to carry out well-considered schemes, which it is hoped will 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 amounts paid were £27 in 1907-8; £1727 in 1908-9; and £311 in 1909-10. The amount available for 1910-11 is £10,000. It is anticipated that the bounties, together with the increased yield that may be expected as a 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. The establishments for fish preserving at the present time are very few.

NUMBER OF FISH-PRESERVING ESTABLISHMENTS, 1905 to 1909.
COMMONWEALTH.

State.	1905.	1906.	1907.	1908.	1909.
New South Wales	2	2	1	1	1
Victoria ... ..	...	...	...	...	...
Queensland	4	4	4	5	6
South Australia ... ..	...	...	2*	2*	2*
Western Australia	3	3	3	3	3
Tasmania... ..	1	...	...	...	...
Commonwealth	10	9	10	11	12

* These are in the Northern Territory.