

Australia mentioned earlier opened the way for exports to go to New South Wales River Murray ports, and the exports by this route increased as those by sea through Port Adelaide decreased. Imports of preserved fish from overseas peaked at 865 tonnes in 1883 and then decreased to 354 tonnes in 1886 but rose again to 568 tonnes in 1890 (Table 2).

"By 1880 there were indications that the colony had overreached itself financially. The boom reached its peak in 1884. The onset of a dry decade showed that farmers had spread beyond the limits of safe agriculture. Thus South Australia moved into a depression that was long and severe for private enterprise. The high levels of prosperity in 1884 were not reached again until 1906" (Pike 1958). It was fortunate for the Goolwa and Milang communities that the steam railway link from Strathalbyn to Goolwa was completed and opened in December 1884 before the depth of this depression was reached. Additionally, good hauls of fish were made in the Coorong and Murray Mouth area during June 1884 and fishing was good again the following year ("Southern Argus" June 26, 1884; March 19, September 2, and October 15, 1885). There were positive economic benefits to Goolwa and Milang fishers with improved railway transport to Adelaide and other outlets from 1885 onwards. River boat captains were among the many successful Goolwa fishers. It is interesting to conjecture that one of the effects of the depression was to lessen demand for the more highly priced imported preserved fish in favour of the cheaper locally caught fresh fish. Imports of preserved fish declined from a maximum of 865 tonnes in 1883 and likewise exports declined (imports exported!) through Port Adelaide during the same period (Table 2).

Recognising the needs of Adelaide people for fresh fish, the Adelaide City Council built a separate Fish Market in Wright Street in 1887. Mr Edwin Daw, a fish buyer, already operating in the Adelaide Produce Market, was the successful tenderer for the 14 year lease of the Fish Market Buildings (Wallace-Carter 1887). Most of the fish caught in the Coorong and Murray Mouth area were sent by rail to Adelaide.

On June 14 1888, the "Southern Argus" reported that 85.60 tonnes of fish were sent by rail to the Adelaide Market in 1887, this was the first newspaper report of an annual catch of fish landed at Goolwa. On August 25, 1888 the same newspaper reported that good catches of mulloway were being made at the Murray Mouth by hook and line methods. The fish fetched 1/- 1b for the flesh, in strong contrast to lack of demand for the flesh in the early 1860's when only the dried air bladders were saleable.

In the Annual Reports of the Commissioners of Railways to Parliament there were no separate entries of fish weights among the list of multitudinous goods carried by the railways. However data on weights of fish carried by railways were collected and this information was made available on request at the time to the responsible organisations. Thus in some annual reports of early Inspectors of Fisheries information was provided of the weights of fish carried from nominated stations. Between 1887 and 1901 no weights of fish were given in tables of freight carried but there was a solemn entry in one category of the Annual Report of the Commissioners of Railways to Parliament for 1890 that stated one fish van (covered wagon class) on the Goolwa connection was converted into a mortuary van!

Those fishers, who had settled permanently in Goolwa (43 men) and Milang (11 men), had a more rapid and sure transport by rail for their fish to the Adelaide Fish Market after 1885 than the wagon and relay of horses method of

earlier years. In 1893, one Milang fisher was sending between 305 and 356 kg of fish weekly to Adelaide (evidence given at 1910 enquiry).

During the first 25 years of rail transport the annual weights of fish carried from Goolwa and Milang increased to 167.29 tonnes in 1908 and rose to 209.68 tonnes by 1912-13 (Table 3). The mean annual weight of fish carried by rail for those 4 years from Coorong sources was 187.44 tonnes which represented the Coorong area's yearly production.

The total weights of fish carried by SA Railways within the state from 1900 to 1915 are shown in Table 4. The Goolwa and Milang catches represented 10 to 14.32% of the State total carried by rail. The monthly weights of fish sent by rail to Adelaide from Goolwa and Milang from July 1911 to June 1913 are shown in Tables 5 and 6, the freight cost varied from £2.22 - 2.75/tonne and the value of the fish from £36.6 to £46/tonne or 11 pence/kg.

Exports of fresh fish to Melbourne, Sydney and Ballarat by railway varied between 26 and 33% of the total weight of all fish carried by rail. Melbourne was the greatest importer, taking 82-83% of the total weight exported by rail (Table 7).

These exports of fresh fish had little real effect on the fishing effort in the Coorong as the preferred imports to Melbourne were spotted whiting, snapper and garfish whereas catches from the Coorong area were mulloway, yellow eye mullet and tommy ruffs. Melbourne importers drew most of their supplies from the Spencer Gulf ports of Wallaroo, Moonta and Port Pirie. Evidence given by a Melbourne auctioneer (19.7.1907) to the Committee investigating Adelaide City Council Fish Market said that "most of our goods come from Moonta and a fair supply from Port Wakefield and Port Pirie". "The fish arrive here in perfect condition, the whiting and snapper in particular." Murray cod and callop were also sent from South Australian River Murray towns to Melbourne Market. Gordon (1908) says that about 300 tonnes of freshwater fish were forwarded annually to interstate markets.

The Melbourne Market preference for spotted whiting, snapper and garfish from South Australian marine sources was in marked contrast to the preferences of the South Australian public for mulloway, tommy ruffs and yellow eye mullet from the Coorong. In evidence to the 1935 Royal Commission on Fishing at Adelaide an auctioneer, from his experiences, gave the following graded consumer fish preferences:

1st Grade	snapper, mulloway, spotted whiting, flounder and Murray cod
2nd Grade	flathead, snook, garfish, Coorong mullet and sweep
3rd Grade	groper, tommy ruff, trevally and yellow-tail
4th Grade	barracouta, strong fish and Australian salmon.

The order of quantities received at the Adelaide Fish Market was: first whiting, then mulloway and lastly snapper.

Evidently there was little change in consumer preference for fish species by the South Australian public over the period 1907 to 1935. The main species caught in the Coorong area were mulloway and yellow eye mullet and tommy ruffs

in Encounter Bay; most were sent from Goolwa and Milang to the Adelaide Fish Market by rail and road transport.

The first Commonwealth Year Book (No 1 of 1908, p 483) in a preface to a table giving the 1906 annual total fish catches for the different States wrote of South Australia that "prior to 1906 there are no records of the number and value of boats, number of men employed, take and value of fish". It gives estimates of the number of men employed, estimated total catch (cwt) and value for the calendar years beginning 1906. Subsequent editions likewise give only estimates which are less than the weights of fish carried by SA Railways for the years 1906-8, nearly similar for 1909 and greater for succeeding years (Table 4).

After a spate of data on total amounts of fish carried by SA Railways to 1915, subsequent annual reports by Inspectors of Fisheries gave only annual total weights carried and their value, number of licences issued but no breakdown of landings at ports. There were, at times, some comments about various factors affecting the condition of the general fisheries. For instance, inland droughts from 1910 affected the River Murray flows and, as a consequence years of low flow, there was a large incursion of marine water into the Lakes and lower reaches of the River Murray itself. This incursion had a disastrous effect on the stocks of freshwater fish and "many hundreds of fine cod and callop were killed in the lower sections of the river" (Annual Report 1912-13). The incursion did not adversely affect the catches of the marine species mostly fished by Goolwa fishers (Tables 5 and 6). Mullet and, to some extent, garfish followed the incursion into Lakes Alexandrina and Albert. The 1913-14 annual report of the Inspector of Fisheries stated that it had been a favourable season for mullet at the Murray Mouth and in the Channels. In the same report was advice that ice was now being supplied at various landing centres for use by fishers. This technological improvement was probably the basis for the statement in the 1915 report that "the season for butterfish (mullet) has been a record one, large hauls were taken from Goolwa and the Lakes. These fish put in an appearance early and were taken in good numbers there and also at the mouth of the Port Adelaide River. It is pleasing to note the very fine condition in which these fish reached Adelaide from Goolwa". There were 15 fishers operating at Goolwa and 11 at Milang.

In 1914 the total number of fishing licences issued for South Australian waters was about 1,400, but because of enlistments for WWI, and the impact of the drought years drastically reducing catches in freshwaters, the total number fell to about 800. There was an increase in the quantity of fish sent to Adelaide Fish Market the next year because prices were better locally than at interstate markets. The River Murray was not navigable by steamers because of the low flow and, as a consequence of the marine water incursion, mullet and garfish were again being caught in the eastern areas of Lakes Alexandrina and Albert and the lower reaches of the River Murray.

In the 20 year period between 1915 and 1935 there are no data available on the annual total catches of fish for South Australia.

In the Commonwealth Year Book compilation of fisheries statistics for all States, it comments that the figures for South Australia are estimates only. It is readily understood why the 1935 Royal Commission strongly recommended in the Final Report the need for the introduction of a system to collect statistics of fish landings in South Australia when such widely varying

estimates of total fish production were presented to the Commission. However, some witnesses appearing before the Royal Commission did provide valuable personal catch data which was used in this study of the Coorong fishery.

During the year ending May 1935 20-25 tonnes of fish/week were sold in the Adelaide Market thus for 50 trading weeks the calculated annual total weight for the year would be between 1,000 - 1,250 tonnes.

During the same period Goolwa fishers sent by rail 86.36 tonnes and Milang fishers 56.89 tonnes to the Adelaide Market and the combined total of 143.25 tonnes represented between 11.25 and 14% of the Fish Market throughput of mulloway, yellow eye mullet, tommy ruffs and flounder. This weight of 143.25 tonnes probably represented more than half of the total Coorong catch because motor transport was used regularly, also, to transport fish to Adelaide. Inspector Frinsdorf, Department of Fisheries, estimated the total catch for South Australia for the period July 1934 to May 1935 at about 3,149.6 tonnes and the Commonwealth Year Book estimate for the same period was 6,082.8 tonnes.

In evidence to the Royal Commissioners it was stated that fish were distributed to the Adelaide public through 14 city fish shops and another 24 shops in the suburbs. 77 fish hawkers were licensed and all operated in the winter months and a lesser number in the summer. The amounts sold through these outlets, together with exports sent by rail, motor transport and steamer, would account for some of the differences in totals given by Adelaide Fish Market, Inspector Frinsdorf's estimates and those published in the Commonwealth Year Book.

Prior to the hearings of the 1934-35 Royal Commission on the Fishing Industry, six locks on the River Murray to maintain pool levels had been completed and a start was made on the construction of 5 barrages across the Goolwa channel to the islands and across their channels ending at Pelican Point (Tauwitcherie Barrage). In evidence to the Commission many Lakes fishers expressed concern about the possible adverse environmental effects of creating freshwater lakes behind the barrages. During the period taken to change from a marine dominated environment in the western areas of the two Lakes there was the potential for loss of income by many fishers. The Commission expressed a view that the loss of marine species would probably be offset by the return of freshwater fish. In 1932 there was a total of 63 licensed fishers operating 43 vessels in the Lakes and Coorong, 65 in 1937 and 64 fishers using 46 vessels in 1940 (Table 12).

The Royal Commission wrote at the conclusion of their Second Progress Report on August 30, 1935 that "the State has been alive to its responsibilities as regards those industries that appertain on the land but the fishing industry, not only in this State but throughout Australia, has been neglected. The result is apparent in the ignorance that prevails today". In their First Progress Report (November 21, 1934) they recommended "That a properly qualified officer be appointed at the earliest possible date to succeed the present Chief Inspector of Fisheries and Game in order to effect the reorganisation of the Fisheries and Game Department with a view to the inauguration of practical research into the habits of fish and experimental work generally in connection with the fishing industry, to the keeping of fisheries statistics, and to the revision of the policing work of the department".

When F W Moorhouse, MSc, was appointed Chief Inspector of Fisheries and Game in November, 1936 in response to the recommendation in the First Progress Report of the Royal Commission, he began campaigning almost immediately for the collection of statistical catch returns from fishers. In the meantime he instituted procedures for "keeping a tally of all fish passing through the Adelaide Market". The Annual Report of the Fisheries and Game Department 1938-39 contains the statement by Moorhouse that "An amendment to the Fisheries Act, passed in September (1938), now makes the submission of returns by fishers possible, but a proclamation prescribing the returns required from fishers has not yet been proceeded with". In the following year's annual report he stated "It is still not incumbent on fishers to supply details:

- (a) of the areas from which they obtain fish, and
- (b) of the species which are taken by them".

Despite his frequent requests for the implementation of the necessary proclamation to authorise him to collect catch and effort data from fishers, the proclamation was never promulgated. It is to Moorhouse's credit that he maintained his tally system. He wrote in his 1939-40 annual report that "from the tally system in use for recording fish passing through the Adelaide Market, Tables I(a) (approximate quantity of fish passing through the Adelaide Market) and Table I(b) (approximate value of fish passing through the Adelaide Market) have been compiled" --- "Owing to the valuable assistance by the market proprietors in making these recordings, the quantities shown in these tables are a close approximation to the actual quantities handled at the markets. Unfortunately these recordings do not indicate the localities from which the fish were taken". It must be emphasised that the railway freight fish weights and the Fish Market weights are mostly cleaned weights.

The Tables I(a) and I(b) continued to be published annually in his yearly reports until 1945-46. In his annual report for the following year (1946-47) Moorhouse wrote "From information in possession of the department, but of which most is not published herein, the total known production of fish amounted to 2,155.17 tonnes. Some difficulty was experienced in obtaining these figures which were tendered voluntarily. It is emphasised that they are far from accurately representing the total production. Of this total 771.32 tonnes were dispatched by rail to Melbourne and 8.32 tonnes were destroyed as unfit for human consumption".

The Annual Report for the Department of Fisheries and Game for 1954-55 (Parliamentary Paper No 39) gives "the known production of fish (all species except crayfish) from incomplete records, amounted to 2,949.18 tonnes a decrease of 385.66 tonnes on last year's production. This decrease is due to the non-supplying of returns by several traders who formerly cooperated. It is still not incumbent on fishers or buyers to submit monthly statistical returns, therefore the Department has to rely upon figures given voluntarily at the end of the year by buyers. The position is not accurately presented by these partial returns". It is now known that several buyers refused to supply details of their purchases that year because of lack of confidentiality of these figures within the Department. Certain buyers believed they had evidence that details of their purchases had been leaked to their competitors.

Moorhouse continued to present only the total production figures collated from buyers' returns in his annual reports. In his last annual report (1958-59) before retiring late in 1959, he stated that "this year affords a sharp

reminder of some of the difficulties that follow from the absence of official returns from fishers. At this early date (July 23, 1959) I am unable to give a reliable account of the year's fishing". In 1962, A E Caton was appointed research officer to assist the new Director, A.C. Bogg. Caton was responsible for preparing tables from buyers' returns showing annual catches of individual fish species from 1951-52 to 1967-68. All fish weights in these tables from 1951-52 onwards were converted to live weights.

The author was responsible for the introduction of the legislation on February 1, 1968 requiring those fishers holding special permits or authorities ie for rock lobsters initially, and later for prawns, abalone and River Murray reaches, to send their monthly catch and effort returns to the Department of Fisheries and Fauna Conservation.

Failure to forward these data on approved forms was an offence under the amended Fisheries Act 1917-1967. From 1968 onwards when attending fishers' meetings I urged full-time scale fishers to submit voluntarily their catch and effort returns in order to establish their bona fides and to facilitate the issue of their fishing licences under the proposed new Fisheries Act. Those fishers not reached by these means were counselled by the fisheries inspectors in the course of their other duties. There was a good response from genuine full-time fishers who were concerned about the numbers of recreational fishers destabilising the industry by selling in opposition to them.

Under the provisions of the Fisheries Act 1971 proclaimed on December 1, 1971, all licensed fishers for the first time, were required to submit monthly catch and effort returns showing weights of fish species caught, gear used and duration of use and place of capture. In 1967-68, there were 13,871 fishing licenses issued which entitled the holders to sell fish but in January 1972 only 1,771 applicants had the necessary qualifications to meet the requirements of the Fisheries Act 1971. There were 913 Class A and 858 Class B fishers licensed to fish in South Australian waters and who were required to forward monthly catch and effort returns. 1,771 such returns were a much more realistic number to have to be collated monthly!

It was considered desirable for the digression above to be given here so that problems associated with collection and interpretation of statistical data on annual landings of fish species in South Australia, under governments unresponsive to the long term needs of the fishing industry, can be appreciated.

For instance, the 1935 Royal Commission was told that 143.25 tonnes of fish were carried from Goolwa and Milang to Adelaide by rail in 1934-35. Previously this tonnage had been considered as the annual total production of the Coorong. It could be interpreted as indicating a decline in abundance of fish stocks over the past 20 years or more because the mean annual catch for the 5 year period 1908-13 was 187 tonnes when all fish were only carried by rail. However the situation in 1934-35 was different as a proportion of the catch was forwarded by road transport. There are no records of road transported fish but in January - March 1936, 8 Milang fishers sent 10.16 tonnes of their 41.65 tonnes catch for that 3 month period by road transport and 10.16 tonnes by rail. Thus, if 31.49 tonnes represents three quarters of their total catch then by analogy 143.25 tonnes sent the previous year by rail also represented three quarters of a total catch, then the full weight landed and sent to market by the two types of transport would be 191 tonnes. If the

calculated annual catch of 191 tonnes is acceptable then the annual total catch of the Coorong had not declined much from the mean of 187 tonnes (1908-13) established some 20 or more years earlier. Most of the Coorong landings were from netting operations, ie mullocky, mullet, tommy ruffs and flounder. These landings contrast strongly with line fishing landings from a Spencer Gulf area, such as Port Pirie, where between January - September 1934, 313.94 tonnes of fish were landed of which 45.8% were spotted whiting, 45.8% were garfish, 2.5% snook, 1.29% snapper and 0.3% tommy ruffs. Most of these fish were sent for sale in Melbourne.

Moorhouse in his first annual report (1936-38) noted that netting methods were in common use in the Lakes and Coorong. The fishers were skilful in the use of the mesh and hauling nets for taking large quantities of mullocky and yellow eye mullet. In areas other than the Coorong he actively promoted the use of nets by line fishers. As a consequence of this promotion, in a few years, catches of certain fish species rose, particularly yellow eye mullet, ruffs and garfish at fishing centres in both gulfs and the west coast.

With the closing of the gates of the Tauwichee Barrage in 1940 began the conversion of Lake Alexandrina from a partially or totally marine dominated environment in certain years to a completely freshwater one. In earlier years during droughts and low flows in the River Murray it was not uncommon to have reports of dead freshwater fish floating on the lake and river surfaces during saltwater incursions. At times yellow eye mullet and garfish were reported in the lower reaches of the river and in both lakes. While the dead fish on the surface alerted people to the cause of death, it is certain that the extent of the "fish kills" by the marine inflow was not fully appreciated. Dead fish do not necessarily surface in all areas penetrated by salt water. There have been a number of previous occasions when dead fish were present lying on the bottom but none appeared on the surface. This phenomenon was recognised by experienced fishers when gear was fouled by dead freshwater fish species. Thus the "fish kill" was often much greater or more extensive than that evident on the surface. A similar situation occurred during the spring of 1989 when some of the barrages were opened to allow excess freshwater to flow to sea and it is almost certain that marine water flowed into the lake under the outgoing freshwater during periods of high tides and killed European carp. Enormous numbers of dead European carp littered the bottom upstream from Goolwa Barrage but none came to the surface. This observation was given to me by an experienced fisherman (D. Evans.) who when pulling his anchor found the flukes were fouled with dead carp. I have had the personal experience of seeing a strong flow of brown river flood waters running seawards through the narrow entrance of a large harbour (Macquarie Harbour, Tasmania) and at the same time watching the water level continuing to rise on a graduated tide gauge. The rising water level was due to the incoming heavier seawater flood tide flowing underneath the outgoing lighter freshwater.

Table 8 has been extracted from data supplied to F W Moorhouse from weights of fish sold at the Adelaide Fish Market annually for the ten years from 1936-37 to 1945-46. The annual landings of the new fisheries for Australian salmon, tuna and shark have been excluded from the State annual total catch of scalefish from marine sources ie "traditional fisheries". These exclusions were made in order to derive comparative percentage contributions of each of the three species predominating in Coorong catches. It is recognised that unknown quantities of fish were also consigned to recognised buyers in Adelaide. It should be noted that the figures provided by the Adelaide Fish

Market were given in number of cases of each fish species and therefore represents the cleaned weight. A case of fish averaged 45 - 46 kg in weight.

Tables 8 and 9 show that mulloway and mullet catches represented about 29% of the marine scalefish supplies passing through the Adelaide Market in 1936-37. But with the promotion by Moorhouse of greater effort with netting activities in other areas the annual yields of both species rose to peaks in 1939-40 and contributed 58% of the scalefish passing through the market. There were gluts of these two species from time to time. In three years to 1939-40 the mullet catch more than trebled in weight landed, mulloway increased by 2 1/2 times whereas landings of tommy ruffs decreased. The annual total landings also increased, rising from 1,270 tonnes to 1,794 tonnes in three years. By 1941-42 there was a real decline in mulloway landings notably from the Coorong, Murray Mouth and Port Adelaide areas and it was not due to fuel restrictions on transporters but rather to a lack of abundance from poor recruitment in earlier years. The poor flow of the River Murray through the barrages may have adversely affected all three species during the 1943-46 drought period as all annual catches were still falling at the end of the ten year period (1937-1946) (Table 8).

On the other hand the gradual desalination of the Lakes Alexandrina and Albert to a freshwater environment, following the 1940 closure of the barrages, produced a favourable response from the freshwater callop stocks as large quantities of small callop made their appearance in 1941-42. The following year congolli reappeared and helped tide fishers over their winter fishing period. By 1943-44 congolli catches had risen from virtually nothing to an annual catch of 9.07 tonnes and a year later to 22.68 tonnes after which catches declined only to return to relative importance again in 1948 (Annual Report 1947-48).

The Coorong area fishers, who had enlisted, returned to their former calling during this changing period only to find the marine stocks of mulloway still low in 1946 but in 1948 tommy ruffs returned in numbers in Encounter Bay after a two year absence. In Gulf St Vincent in 1946, barracouta, a cold water fish, was being caught in numbers in and around Adelaide but it is not known whether the colder water regime, favoured by barracouta, had adversely affected the ruffs over this period of declining catches of fish stocks of the Coorong.

It was not until 1948-49 that mullet returned to the Coorong in quantity and ruffs were increasing outside also. Mulloway, 20 cm long, also reappeared in fair numbers around the Murray Mouth after an absence of several years.

By 1950 more weekend shacks were being built along the Coorong and there was added pressure on Coorong fish stocks from increasing numbers of recreational fishers. Commercial fishers were encountering more problems with getting their fish in good condition to market using rail transport. In 1942-43 fish consignments sent by rail left Milang at 1430 hours on Tuesdays and Thursdays and arrived at Mile End, Adelaide at 0200 hours the next morning. The consignments were held at the goods sheds until the market opened the next morning. Road transport would have taken 2 hours but it was difficult to procure vehicles because of fuel restrictions on transporters. By 1950 road transport had superseded rail, the latter being directed to passenger convenience and was not conducive to the carriage of perishable foodstuffs. Fish caught the previous afternoon and night had to be ready for a 0700 hour departure and a 3-4 hour journey. The next train left at 1400 hours and



arrived in Adelaide at 1700 hours when business was closing and fish would have to be held overnight. Without fresh icing of the fish these delays were disastrous in the summer months. The rail freight service was much slower, the journey taking about 12 hours.

In his 1950-51 annual report, Moorhouse reported that "fishers operating in the Murray Lakes (Alexandrina and Albert) reported the presence of ever increasing quantities of freshwater fish. These men are taking heart again after the loss of their salt water fishery which followed the closing of the barrages at Goolwa. Amateur fishers, too, enjoyed good catches". There was a railway strike during part of October and November 1950, which adversely affected fish production by depriving fishers of transport for catches to market but not from the Coorong area because fish landings were sent by road transport to Adelaide.

Between 1945-46 and 1951-52 there were no annual production figures available for the different fish species from the Coorong. Table 9 shows the annual South Australian production of totals of scalefish, (less shark, tuna and Australian salmon) catches for the period 1951-52 to 1961-62 and details of those three species which are the mainstay of the marine fishery of the Coorong and Murray Mouth. All mullet, mulloway and ruff total catches had risen during the 6 year period (1945-46 to 1951-52) as did most of the other scalefish species. The increased yields for mullet, ruffs and mulloway were due to the geographical expansion of these fisheries. The percentages of mullet and ruffs of the total scalefish catch have remained much the same throughout the two periods whereas those of mulloway have fallen consistently showing a real decline in abundance for that species, doubtless due to the effect of the barrages controlling outflow of freshwater at crucial biological stages of the mulloway.

Two years after the big flood of 1956, there was a significant recovery of mulloway in both the annual total catch and its percentage of the scalefish total, but both of these indices continued to decline thereafter. There were gluts of mullet and ruffs in 1957 and 1959 followed by annual catches over the next 9 years to 1969-70 fluctuating around a mean annual catch of 238.40 tonnes (165.1 - 276.0 tonnes range) for mullet and 234.3 tonnes (188.7 - 378.5 tonnes range) for ruffs.

In 1970 the escape of the European carp (*Cyprinus carpio*) from Lake Hawthorne, across the border in Victoria, introduced an exotic pest into the River Murray. The carp spread rapidly downstream with the 1973-4 flood establishing itself throughout the full length of South Australian section of the River Murray, its backwaters and the freshwater environment of Lakes Alexandrina and Albert. This species is now fished commercially for rock lobster bait and the Melbourne Market. The annual catches of European carp varied between 586 tonnes in 1983-84 to 346 tonnes in 1986-87.

Flounder, which was an important component of the Coorong marine fish catches to 1953-54, when a maximum annual catch of 31.76 tonnes was taken, collapsed and thereafter the landings were low and were lumped with mixed fish landings. On the other hand, black bream landings, which until 1960-61 were included under 'mixed fish', was quoted as 29.49 tonnes that year and thereafter fluctuated between 4 tonnes in 1970-71 to 73 tonnes in 1979-80.

In his study of the Coorong mullet Harris (1968) reported "the total weight of mullet handled by the SAFCOL Adelaide market from July 1, 1961 to June 30,

1962 was 265.4 tonnes. Approximately 75% of this total came from the Coorong Lagoon, the other 25% from the shallow coastal waters of South Australia". Thus that year 199.06 tonnes of mullet were taken from the Coorong area, by fishers known to send their catch through the Adelaide Market. This total from the Coorong represented 65% of the total South Australian annual production of 305.81 tonnes of mullet collated from buyers' returns at the Department of Fisheries. The 1961-62 mullet production was the 3rd highest in the 20 year period from 1951-52 to 1970-71, the year before compulsory fishers' returns was required. In this 20 year period the South Australian mean annual total catch of mullet was 249.86 tonnes with a range from the highest in 1958-59 of 407.41 tonnes to the lowest in 1970-71 of 61.25 tonnes. The calculated Coorong component (65%) would have indicated a mean annual total of 163.79 tonnes of mullet from the Coorong with the highest total (1958-59) being 265.42 tonnes in 1958-59 and the lowest 39.81 tonnes in 1970-71. These calculated catches are approximately 10% lower than those given in Noye (1975) and Paton (1982).

Likewise, the other two major components of the Coorong fishery, the tommy ruff and mulloway, have also shown wide fluctuations in annual landings.

The ruffs have shown 4 peaks in the 20 year period when the annual production exceeded 220 tonnes namely 1953-54, 1956-57, 1964-65 and 1966-67. There were only two occasions (1957-58 and 1966-67) when the annual total catches of mulloway exceeded 160 tonnes and both occurred shortly after flood years in the River Murray. Other than the two years mentioned above the annual total catches of mulloway have been falling progressively since the 1939-40 peak of 440 tons.

Both species are fished along the whole of the South Australian coast, the tommy ruff more consistently than the mulloway. 80% of the mulloway catch now comes from the Coorong and Murray Mouth area.

From January 1972 fishers were required to forward monthly catch and effort returns showing in which 1° latitude x 1° longitude square they caught their fish. The area covered by these 60 x 60 n. miles squares often precluded a precise fishing location being identified. For that reason it has not been possible to indicate the precise weight of tommy ruff caught annually in and around the Murray Mouth.

Those fishers holding Lakes and Coorong permits are required to furnish particulars of their fishing areas in much smaller area units and hence the catches of mullet and mulloway from the Coorong and Murray Mouth are more readily extracted. Thus, in the six year period, 1984-5 to 1989-90, the 42 Lakes and Coorong permit holders landed a mean annual total of 238.62 tonnes (range 128.4 - 361.0 tonnes) live weight of mullet and a mean annual total catch of 29.84 tonnes (range 13.8 - 40.5 tonnes) live weight of mulloway. The Coorong catch of mullet represented between 49 and 78% of the state annual total mullet catch and the Coorong mulloway catch was 53 to 80.5% of its state total. In 1987-8, Coorong mulloway catch represented only 0.58% of the state annual total scalefish production. In the six year period 10 of the 42 permit holders, who landed their catches at Goolwa and Milang, averaged 137.26 tonnes live weight of all species (range 110.6 to 210 tonnes).

The Green Paper on the Marine Scalefish Fishery prepared for public discussion by the Department of Fisheries and released in January 1990 showed that, in 1987-88, 70 marine species of fish, sharks, molluscs and crustaceans were

taken for sale by holders of marine scalefish permits. The total catch that year was valued at \$19.8 million.

The Green Paper listed 14 species (Table 2.2) (excluding the offshore shark and tuna fisheries) ranked in order of the 1987-8 annual total landings and value. Seven of the 14 species, which had been deemed "traditional fisheries" throughout this study, have been extracted and are given in Table 10, together with the Green Paper ranking orders for live weight landings and value.

To the total weight of the 7 species listed in Table 10 must be added the Coorong mullet catch of 145.66 tonnes and the total State catch of 25.899 tonnes of mulloway (includes 13.815 tonnes from the Coorong) to give the modified higher total of 2,218.479 tonnes for that year. 1987-8 was a relatively poor year for mullet landings, the State annual total catch reaching only 297.414 tonnes. This State total for mullet represented only 13.40% of the total scalefish landings from the "traditional scalefish" fisheries and almost half (48.9%) came from Coorong sources. Over the 14 year period 1976-7 to 1989-90, the mean annual mullet catch from the Coorong was higher at 190.69 tonnes (range 90 to 361 tonnes) than the 1987-8 catch of 145.66 tonnes (Table 11). A mean annual percentage of 56% (range 36 to 78%) of the State total mullet catch came from Coorong sources.

Forty years earlier (1936-7 to 1945-6) the mean annual catch of mullet was 215.499 tonnes (range 71.9 to 447 tonnes), ie represented as sales through the Adelaide Fish Market, and was taken by 65 fishers operating in the Coorong. In the 40 plus year period the mullet stocks of the Coorong have fluctuated between a mean annual catch of 190 and 215 tonnes. From this evidence it may be deduced that the mullet stock of the Coorong has not been adversely affected by the introduction of the barrage system in Lake Alexandrina and fishing pressures of man.

It is believed that a similar situation applied also to the tommy ruff stock. The State annual total yield for the 19 year period, 1971-2 to 1989-90, had a mean annual catch of 324.88 tonnes (range 208 to 498 tonnes). This 19 year mean annual catch is much higher than the 10 year mean annual tommy ruff throughput of the Adelaide Fish Market of 72.8 tonnes 40 years earlier (1936-1946) (Table 8). On the basis of data available over 40 years, the Coorong moiety of the stock appears to be able to accommodate to present day fishing practices and has not been adversely affected by the changed conditions produced in the marine environment seaward of the barrages.

On the other hand, data accumulated over the same period of 40 years indicated that the present mulloway fishery of the Coorong is in a parlous condition. During the 5 year period, 1936-7 to 1940-1 before the closing of the barrages, the mean annual catch of mulloway from Coorong sources was 425.76 tonnes. In those five years, mulloway represented one quarter of the State's annual total scalefish production.

After the closing of the barrages in 1940 there was a dramatic fall in the mean annual catch to 78.9 tonnes in the five year period 1941-2 to 1945-6.

When catch figures became available from buyers in 1951-2 to 1956-7 there had been a further decline to 65.95 tonnes in the 5 year mean annual catch of mulloway. Following the big 1956 River Murray flood there was a remarkable response to favourable environmental conditions, the mulloway catch rose from 40 tonnes in 1956-7 to 213.5 tonnes in 1957-8. However this large catch was

not sustained and by 1960-2 the mean annual catch had dropped to 33.8 tonnes (Table 9). For two years after the 1973-4 River Murray flood mulloway catches rose only to decline thereafter.

27 years later in the six year period, 1984-5 to 1989-90, the mean annual mulloway catch in the Coorong had fallen to 29.8 tonnes. This fishery in 1987-8 contributed only 0.58% of the state annual total scalefish production. It is evident from these data that the installation of the barrages to retain freshwater in Lake Alexandrina has had a devastating effect on the mulloway fishery of the Coorong. There have been changes in fishing methods and the "swinger" method of fishing is now much reduced but these changes have had minimal effects on the stock of mulloway.

An assessment of the mulloway fishery in South Australia with particular reference to the Coorong Lagoon was made by Hall (1986). This 1986 report presents all the available biological information and analyses on catch and effort data from 1972 to 1986.

#### NUMBER OF FISHERS OPERATING IN LAKES AND COORONG

Historical records of the actual numbers of fishers operating in the Coorong and at the Murray Mouth are very few. Two men were reported to be operating at the Murray Mouth in 1846 (Newland 1906). When the whaling station at Encounter Bay closed down in the early 1870's, many employees went fishing but there are no records of where they fished. After the establishment of the steamer trade on the River Murray in 1854, there were years when the river was too low for navigation so the captains and crews left their vessels moored at Goolwa and Milang and went fishing. It is not known where they fished or how many persons were catching fish for sale.

Fishing enterprises operated at the River Murray Mouth in 1870, 1871 and 1879 but the number of men employed is not known. Two former river steamer captains, operating at the Murray Mouth, were mentioned in a newspaper report ("Southern Argus" 15 October 1885) and, by inference, others too were fishing in the Murray Mouth and Coorong areas.

In evidence given to the City of Adelaide "Particulars re the Fish Market and Fishing Industry Generally" in 1910, a witness advised that 33 fishers from Goolwa had presented a memorial to the Markets Committee on 9 April, 1894 "requesting that better facilities for the sale of their fish be granted" in the Fish Market. Two years later "The Observer" (14 March 1896) reported that "our men who fish here (Goolwa) number about 30 at present but when the steamers are down there are about 100 men engaged at the industry". By 1907, 43 fishers were working from Goolwa and 11 from Milang (Wallace Carter 1987).

Licensing of fishers commenced on 1 March, 1906 and by 1908 400 had been licensed in South Australia. The number rose rapidly to reach 1,662 in 1914 but dropped to about 800 within a year due to enlistments and other reasons. There were 15 licensed fishers working from Goolwa in 1915. The Commonwealth Year Book Statistical Table on Fisheries estimated that in 1918 the number of persons employed was 902 rising to 1,500 in 1929. It would appear that the number of fishers in the Coorong, Lakes and Murray Mouth reached a maximum around 70 in 1930 with 10 of this number targeting on mullet in the Coorong ("Sunday Mail" 15 February 1969).

In evidence given to the 1935 Royal Commission there were 1,463 licences issued in South Australia in 1934 but only 1,200 of these were considered to be full time fishers; 991 boats were registered as fishing crafts. There were many unlicensed fishers operating during the depression years, 1930-35. 13 licensed fishers from Goolwa and 4 from Milang gave statements to the Royal Commission.

In his first annual report (1936-38) Moorhouse reported that the number of licences issued had risen to 1,650, the increase in numbers was due to increased surveillance by the inspectors as "100 were found marketing fish while not in possession of a current fishing licence". 8 fishers were working from Milang in 1937-38. Moorhouse drew attention to the changes in the licensing laws approved in September 1938 whereby persons could obtain a half yearly licence and a yearly licence holder may take out a licence for his assistant (employees' licences). That year 1,243 yearly, 1,066 half yearly, 30 employees' licences and 64 free licences were issued.

The year the barrages were completed (1940) there were 64 yearly fishing licences issued for the Lakes and Coorong, 16 of which were for fishers operating solely in the Coorong and Murray Mouth. The total number of licences for the Lakes and Coorong fell after 1940 mainly because of enlistments and manpower regulations. The reduction in numbers fishing continued after 1950 to only 13 in 1970 (Table 12).

This table was prepared from data supplied by D. Evans in 1972 and is the most comprehensive record available of licensed fishers operating in the Lakes and Coorong. All card records of licences issued since licensing was introduced in 1906 were destroyed sometime after the amalgamation of the Departments of Agriculture and Fisheries in 1976. It is a tragedy that such a decision about the destruction of historical records was not referred to the Fisheries Research Branch for comment before any such action was taken.

In the 1967 Report of the Select Committee, it was recorded that 5,600 licences were issued in 1959-60 and 10,440 in 1965-66. The Report drew attention to the Fisheries Act 1917 - 1962 which "provides that every person who takes fish for sale by any method whatsoever must hold a current fishing licence and this licence allows the use of any quantity of commercial gear". The regulations under that Act also required that any person who assisted, in any way, with the operation of netting must also hold a fishing licence or be covered by an employee's licence. Thus it is readily understood why there were 13,871 licences issued in 1967-8 but under the provisions of the Fisheries Act 1971 only 1,771 applicants had the necessary qualifications to meet these requirements.

By January 1972 there were 104 licences issued to 25 Class A, 42 Class B and 37 employees' licences to operate in the Lakes and Coorong areas. Of this total, 45 were for fishers in the Goolwa - Milang area, 7 held Class A, 20 Class B and 19 were covered by employees' licences issued to the Class A and Class B fishers. It is interesting to note that of the 19 named on employees' licences, 6 held Class A licences and 13 held Class B licences in their own names. These 19 persons were able to take fish and sell them in their own right - working alone of course - but all fish taken while in an employed capacity were sold in the name of the Class A or Class B licence holder who employed them.

Twenty two years later (1984-5 to 1989-90), there were 42 persons holding Lakes and Coorong permits, 11 of whom are currently landing their fish at Goolwa and Milang.

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