

**MANAGEMENT DIRECTIONS FOR
WESTERN AUSTRALIA'S
ESTUARINE AND MARINE
EMBAYMENT FISHERIES**

A strategic approach to management

FISHERIES MANAGEMENT PAPER No. 131



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Fish for the future

Integrating fisheries management

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GLOSSARY OF TERMS

Fishery

A fishery means -

- (a) one or more fish stocks, or part of stocks, that can be treated as a unit for the purposes of conservation or management; and
- (b) a class of fishing activities in respect to those stocks, or parts of stocks, of fish.

Latent effort

Latent effort is that part of the total fishing capacity of the fishery that is not currently being used.

Management plan

A management plan is the rules and regulations governing a managed or interim managed fishery.

Recreational fishing

Fishing for pleasure, to catch a feed for oneself or one's family or friends.

Section 43 Order

Legislation made under s.43 of the *Fish Resources Management Act (FRMA) 1994* which allows the Minister to manage fisheries without the complexities of a full management plan. It allows the regulation of a particular activity, groups of persons, or areas of waters.

Wetfish

Cartilaginous fish (for example, sharks and rays) and scale-fish or finfish (for example, dhufish and snapper).

Wetfish fishery

Any fishery or fishing activity which targets cartilaginous fish and scale-fish or finfish.

EXECUTIVE SUMMARY

Marine and embayment fisheries have been consistent features of commercial fishing in Western Australia since the early 1900s. Tonnages of fish taken from these fisheries have never been high, but by the 1960s a number of them were over-exploited - Shark Bay, Swan-Canning, Mandurah and Cockburn Sound. This is in spite of these fisheries being based largely on lifestyle preferences of the fishers involved, rather than on the desire to develop high production fisheries.

Most of these small fisheries are now fished at sustainable levels and contribute in some significant way to local economies.

The number of participants in these commercial fisheries has been approximately halved since 1987, following a concerted effort by the Government to reduce real and latent fishing effort. However, there are still a number of management issues that need to be addressed in these fisheries. These issues largely revolve around the environment and the interaction of participants with recreational fishers.

This paper ('Fisheries Management Paper No. 131') aims to present a picture of the estuarine and marine embayment fisheries in Western Australia - the nature, dynamics and management issues - as a focus for future discussions and then to pose possible solutions to *some* of the strategic management problems associated with the fishery today - and those looming in the future.

The paper does not attempt to provide solutions to individual fishery problems, nor to all of the strategic problems, nor does it claim to evaluate all the options available to managers. Rather, the paper is intended to trigger discussion as to how all interest groups can work together to achieve a balance for these fisheries and their environment. It is a starting point.

Although the paper addresses the management of the commercial fisheries in the estuaries and marine embayments, it is important to recognise that successful management of the commercial fisheries in itself cannot guarantee sustainability. Recreational fishing targets the same fish stocks and unless this sector is also managed, little will be achieved by stabilisation or further reduction of the commercial fleet.

As big an influence is the changing environmental conditions, some of which are natural, some of which are man-made and all of which contribute to the long term degradation of the estuarine and marine embayment fisheries.

The fisheries addressed by this paper are those in the west coast estuaries (Swan-Canning, Mandurah, Leschenault Inlet, and Hardy Inlet Estuarine Fisheries); the Cockburn Sound Fish Net and Line and Pot Managed Fisheries; the Shark Bay and Exmouth Gulf Beach Seine Fisheries; and the Kimberley Gillnet and Barramundi Fishery. A summary of the main features of these fisheries is at Appendix 1.

A full discussion of the issues associated with the South Coast Estuarine Fishery can be found in 'Fisheries Management Paper No 126': *The South Coast Estuarine Fishery: A Discussion Paper*, Pearn and Cappelluti, Fisheries WA, 1999. Resolution of these issues will be through a separate process, but the objective will be consistency across all estuaries and marine embayments in Western Australia.

The discussions on management in this paper will focus on the remaining estuarine and marine embayment fisheries.

1.0 HISTORY OF THE ESTUARINE AND MARINE EMBAYMENT FISHERIES

1.1 Lower West Coast Estuaries

Much of the following history is drawn from *The Commercial Fisheries of Temperate Western Australian Estuaries: Early Settlement to 1975*, RCJ Lenanton, 1984.

Western Australia's estuaries have been fished for as long as there has been human habitation near them. By the late 1840s there was already concern over the over-exploitation of stocks in Western Australia's estuarine fisheries and closed waters regulations were introduced. There was also conflict between commercial fishers and amateur fishers and other recreational users with regard to commercial fishing in the Swan-Canning estuary.

By the twentieth century, a number of commercial estuarine fisheries had been established, but there were many problems, largely to do with marketing and competition for use of the estuaries. During the early twentieth century, the activities of amateur fishers were very intense, particularly in the Peel-Harvey and Swan-Canning estuaries, where in some years the amateurs caught as much as the commercial fishers. Amateur fishing also intensified in the Leschenault estuary, which at this time was totally closed to all forms of netting.

By the late 1920s and early 1930s commercial catches from estuaries in south Western Australia had begun to increase. King George Sound and Princess Royal Harbour, Oyster Harbour and Wilson Inlet became the major commercially fished estuaries in the south. By this time fishing was also happening in estuaries east of Albany.

Growth in estuarine fishing continued from the 1930s onwards, although the rapid growth in inshore ocean fishing meant the overall contribution of the estuarine fisheries to the State's fish production was dropping.

The 1940s, 1950s and 1960s saw the development of an export market for rock lobster and later prawns, scallops and abalone. With this development came a move by fishers away from wetfish fisheries, that is, those fishing activities that target finfish.

Markets for the small estuarine fish shrank considerably and demand for high quality species such as whiting and cobbler exceeded supply from estuaries. These fish were not available in sufficient quantities to support the large number of estuarine fishers operating in the State.

In 1969, the Government commissioned a study into the wholesale and retail marketing of wetfish in Western Australia (WD Scott & Co, 1969). The study concluded that there were far more commercial fishers than the estuaries could support and, using economic indicators of the time, indicated estuarine fishing offered "full-time employment for only 20-30 fishers".

The study also noted that the estuaries were becoming increasingly used for recreational purposes. It recommended that "estuarine fishers be given no grounds to expect any improvement in their economic position and be encouraged to leave the industry".

The then Department of Fisheries and Wildlife accepted the recommendations of the *WD Scott Report* and put in management measures aimed at reducing the number of commercial fishers to a

level where each received a worthwhile economic return. The measures implemented were:

- no issue of any new estuarine licences; and
- no renewal of estuarine fishing licences that have expired, either as a result of the death of the fisherman, or the lost desire of the fisherman to remain in the fishery.

This is, in effect, the 'grandfather' licensing arrangement which aimed to reduce the number of commercial fishers operating in each of the State's estuarine and marine embayment fisheries.

In the mid-1970s, the estuarine fisheries were grouped, as follows, for management purposes:

- Hardy Inlet Estuarine Fishery;
- Leschenault Estuarine Fishery;
- Mandurah Estuarine Fishery (Peel Harvey estuary);
- Swan-Canning Estuarine Fishery; and
- South Coast Estuarine Fishery.

The aforementioned study by Dr Lenanton (Lenanton 1984) noted two problems: that management of the level of commercial take was not sufficient and that amateur fishers were capable of fishing stocks to a low level as they were not concerned with economic return from their efforts.

"Sustained intensive amateur effort may seasonally reduce the abundance of certain species to levels which would make commercial exploitation unacceptable economically. Therefore it would be useful, and perhaps in the very near future necessary, from the point of view of responsible management of our estuarine fisheries, to determine the relative proportions of the estuarine fish resource taken annually by the licensed and unlicensed components of the amateur fishery."

The following three graphs show the total commercial catch, effort and catch per unit effort (CPUE) from 1974 to 1998 for the Leschenault Inlet (Leschenault Estuarine Fishery), Peel-Harvey Inlet (Mandurah Estuarine Fishery) and Swan-Canning (Swan-Canning Estuarine Fishery) estuaries.

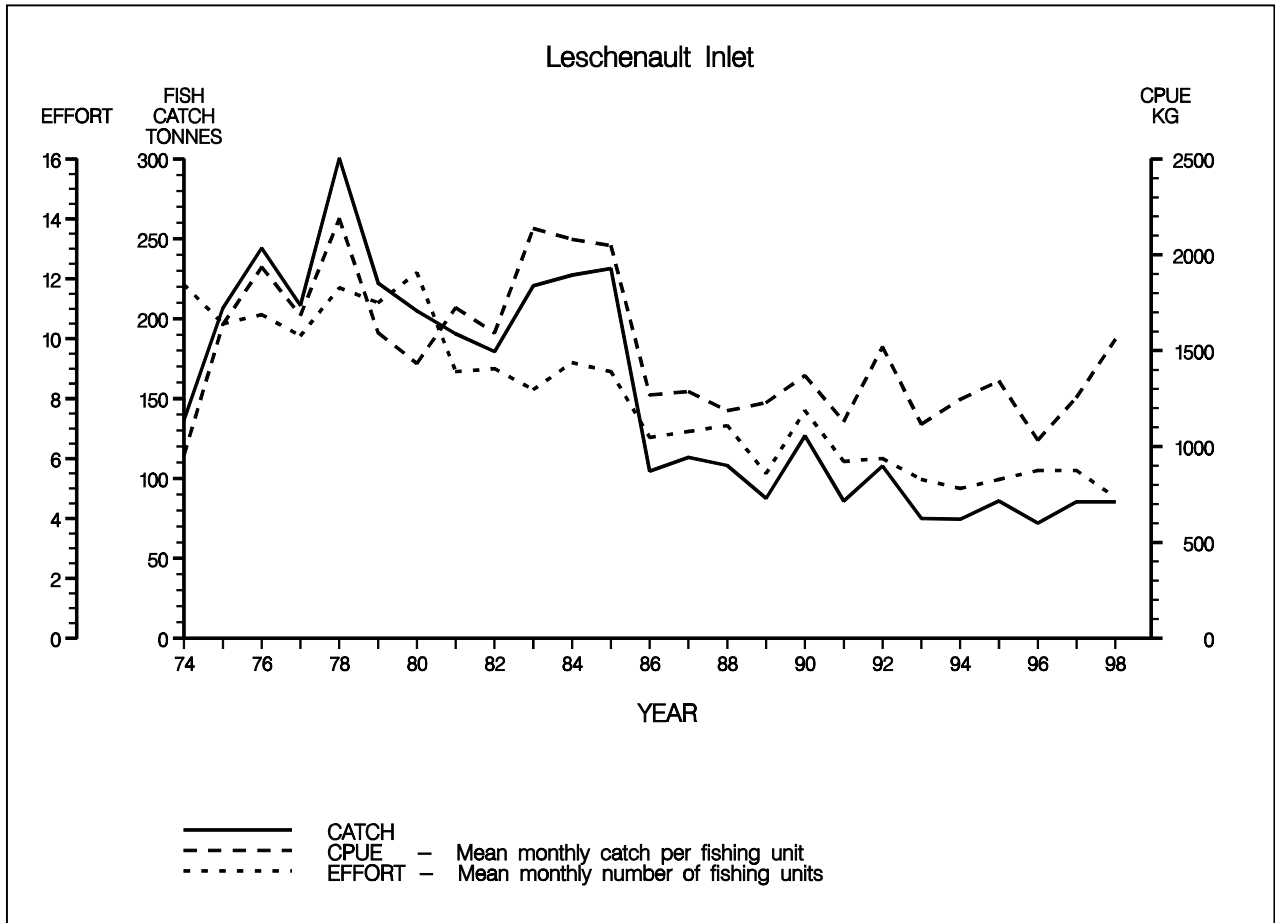
Examination of these graphs (Graphs 1,2 and 3) shows a reduction in catch and effort over this period, with catch per unit effort either decreasing or remaining constant. From this, it would be easy to conclude that the commercial catch was decreasing because commercial fishing was driving down the fish population. However, with the current levels of commercial fishing, this is most unlikely to be the cause.

More likely, the fish production from the estuaries is decreasing because of:

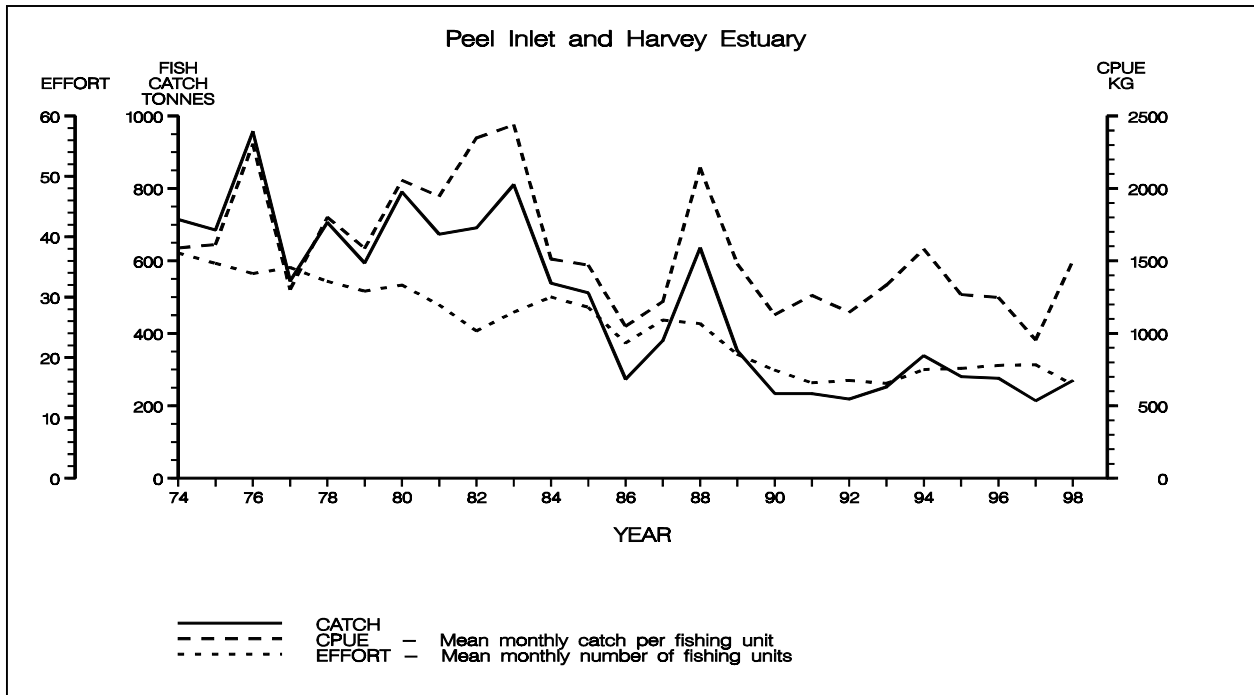
- adverse environmental conditions;
- decreasing demand for high volume/low valued species (this is certainly the case for species such as mullet); or
- recreational fishing has increased significantly to take up the catch previously taken by the commercial sector.

Although variability in estuarine environments can have a significant impact on production, our knowledge of coastal development and recreational fishing activities indicates there has also been a substantial increase in recreational fishing.

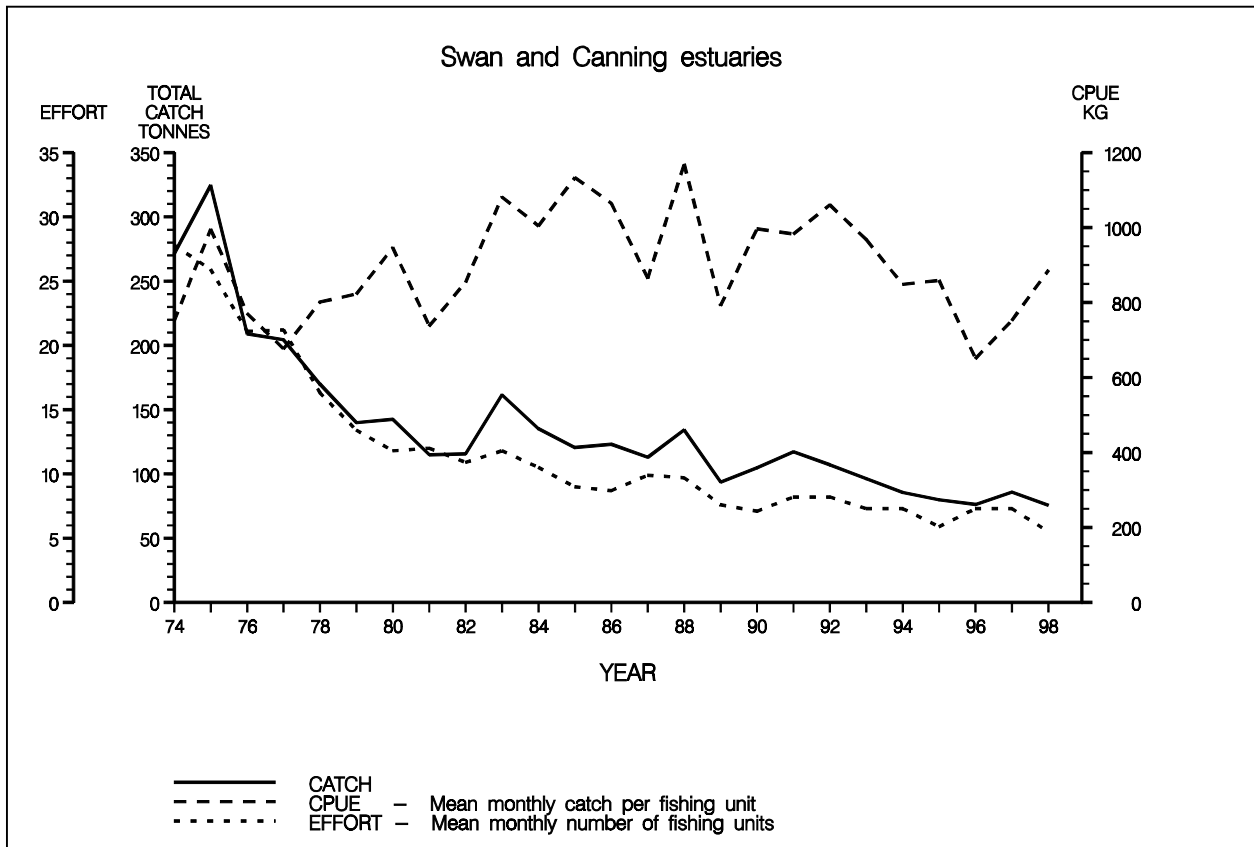
Graph 1: Total commercial catch, effort and catch per unit effort for Leschenault Inlet



Graph 2: Total commercial catch, effort and CPUE for the Peel - Harvey Inlet (Mandurah)



Graph 3: Total commercial catch, effort and CPUE for the Swan-Canning Estuaries



Various regulatory tools and adjustment mechanisms have been applied to the commercial fisheries in an attempt to further control the commercial take in the estuaries. Table 1 shows the reduction in commercial fishing licences in these estuaries over the last two decades. However, it is only in recent years that some initial attempts have been made to quantify the recreational fishing effort in these estuaries, and to start to identify the relative shares of these two fishing sectors.

Table 1: Number of Fishing Units in the Lower West Coast Estuaries

Fishery	Number of fishing units			
	1979	1987	1/1998	10/1998
Hardy Inlet Estuarine Fishery	6	6	4	2
Leschenault Estuarine Fishery	18	14	7	6
Mandurah Estuarine Fishery	45	41	24	14
Swan-Canning Estuarine Fishery	32	17	8	6

Catch and effort trends for each of the temperate estuarine fisheries, by species, are shown in Appendix 2.

1.2 Cockburn Sound

Being close to the metropolitan area, Cockburn Sound has long been a popular area for commercial and recreational fishing. As with the lower west coast estuarine fisheries, restrictions on commercial fishing were placed on the fisheries early in their development.

In 1986, broad restrictions were brought into place, resulting in a fleet of 67 fishing units which could access any of the resources. These restrictions were not sufficient, and in 1990, the then Minister for Fisheries commenced a consultation process that would result in the establishment of five Managed Fisheries in 1994.

Thirty five fishers were licensed to operate in at least one, and often more, of the following five fisheries:

- the Cockburn Sound Mussel Fishery;
- the Cockburn Sound Crab Fishery;
- the Cockburn Sound Line and Pot Fishery;
- the Cockburn Sound Fish Net Fishery; and
- the West Coast Beach Bait and Fish Net Fishery.

Adjustment of the crab and west coast beach bait fisheries, primarily to meet resource sharing objectives, is ongoing through various processes and hence is not addressed in this paper. Nor is the Cockburn Sound component of the purse seine fishery addressed here.

In this paper, the only fisheries of relevance are the Cockburn Sound Fish Net Fishery, which targets finfish, and the finfish component of the Cockburn Sound Line and Pot Managed Fishery.

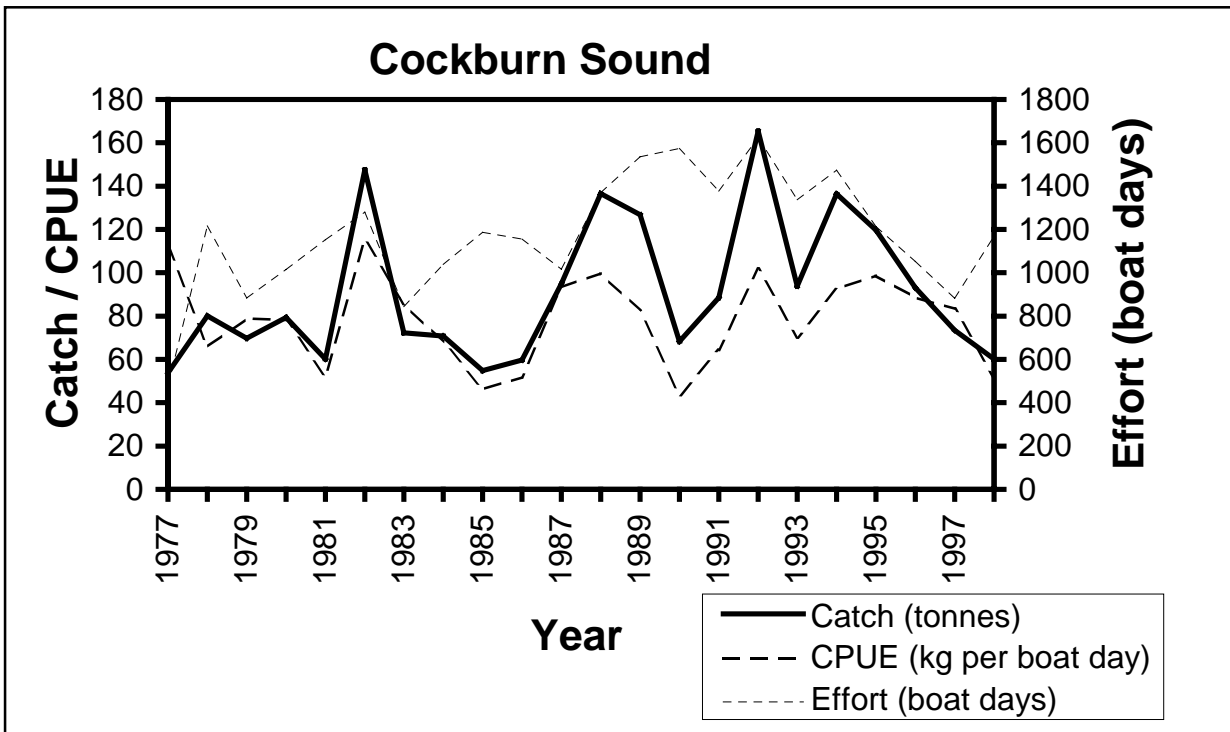
The Cockburn Sound Fish (mesh) Net Fishery has the main impact on finfish in Cockburn

Sound. Target species are Australian herring, garfish, whiting and some snapper. Restrictions in 1986 saw a possible 60 fishers with access to this fishery. The introduction of the managed fishery in 1994 resulted in four licences - and these four remain in the fishery today.

The Cockburn Sound Line and Pot Fishery uses pot for octopus and line for finfish and squid. The effort on finfish is limited by gear restrictions: three lines with three hooks or gangs of hooks, or three squid jigs, all of which must be attended.

Through the various management processes, numbers of fishers in the Cockburn Sound Line and Pot Managed Fishery have fallen from a possible 60 in 1986 to 33 in 1994. Thirty remained in 1998.

Graph 4: Total commercial catch, effort and CPUE for finfish in the Cockburn Sound Fisheries (excluding bait fish and pilchards)



Catch and effort trends for these fisheries, by species, are shown in Appendix 3.

1.3 Shark Bay

Net fishing commenced in Shark Bay in the late 1920s when pearl shell started to show signs of over-exploitation. When the market for pearl shell fell after the war, net fishing increased significantly.

Catch and effort increased steadily until the early 1960s when catch and catch per unit effort (CPUE) declined sharply. From 1965 onwards effort also decreased and since 1971 the fishery has been stable. Research undertaken during the 60s determined sustainable target effort levels.

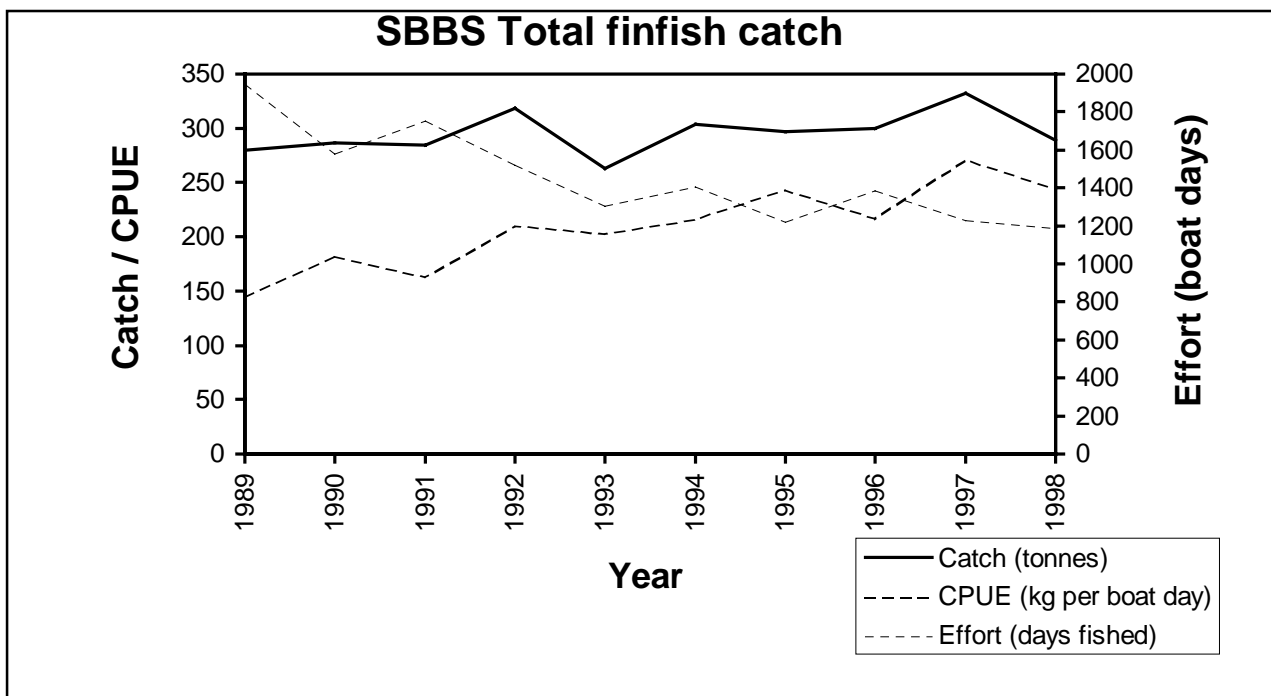
The target species were initially whiting and mullet, but this expanded to include bream, tailor, garfish and snapper.

The Shark Bay fishery was declared restricted entry in December 1978. There were 15 full entitlements and two bait fish-only entitlements issued. As the entitlements were non-transferable, the number of fishing units slowly decreased to 12 in 1992.

When the Limited Entry Fishery (LEF) - now Managed Fishery - came into effect on 1 January 1993, eight LEF licences were issued. This number is now 10 due to recent applications. Each fishing unit consists of a mother-ship and up to three dinghies.

Stocks of the key target species are considered healthy and the overall trend in the 1990s has been a decline in fishing effort. Catch per unit effort has slowly increased over the past ten years.

Graph 5: Total commercial catch, effort and CPUE for Shark Bay Beach Seine and Mesh Net Fishery



Catch and effort trends for this fishery, by species, are shown in Appendix 4.

1.4 Exmouth Gulf

Netting in Exmouth Gulf first commenced in the early 1950s when two fishing boats started taking mullet to supply a new cannery in the Learmonth area. When this cannery was destroyed by cyclone in 1953, fishing interest turned to developing a trial prawn fishery.

It was not until 1967-69 that net fishing again took place in Exmouth Gulf. Five fishers came to the Gulf for two months over winter to take bony herring for rock lobster bait. This scenario

continued for 20 years until market demand dropped.

Fishing inside Ningaloo Reef for mullet, and later nor' west snapper, commenced in 1965, although fishers operating in both fisheries experienced difficulties in catching and handling fish in the warm water and big tides. These conditions limited fishers to taking small quantities of fish they could handle and store on ice.

The main species taken in the Exmouth Gulf fishery are whiting, mullet, garfish, and boney herring. The fishery was formally created in 1989 and 12 fishing units were licensed, each being able to use up to four dinghies. Even at this stage, there were concerns about the increasing competition with recreational fishing and about potential loss of coastal areas through aquaculture ventures.

The numbers of fishing units has gradually decreased over the last 10 years due to transfer or selling of licences to the Fisheries Adjustment Scheme. Of the original 12 licences in 1989, seven remained by 1992, six by 1996, three by 1998, and today two remain.

As the fishery is considered sustainable with two fishing units, no further reductions are sought.

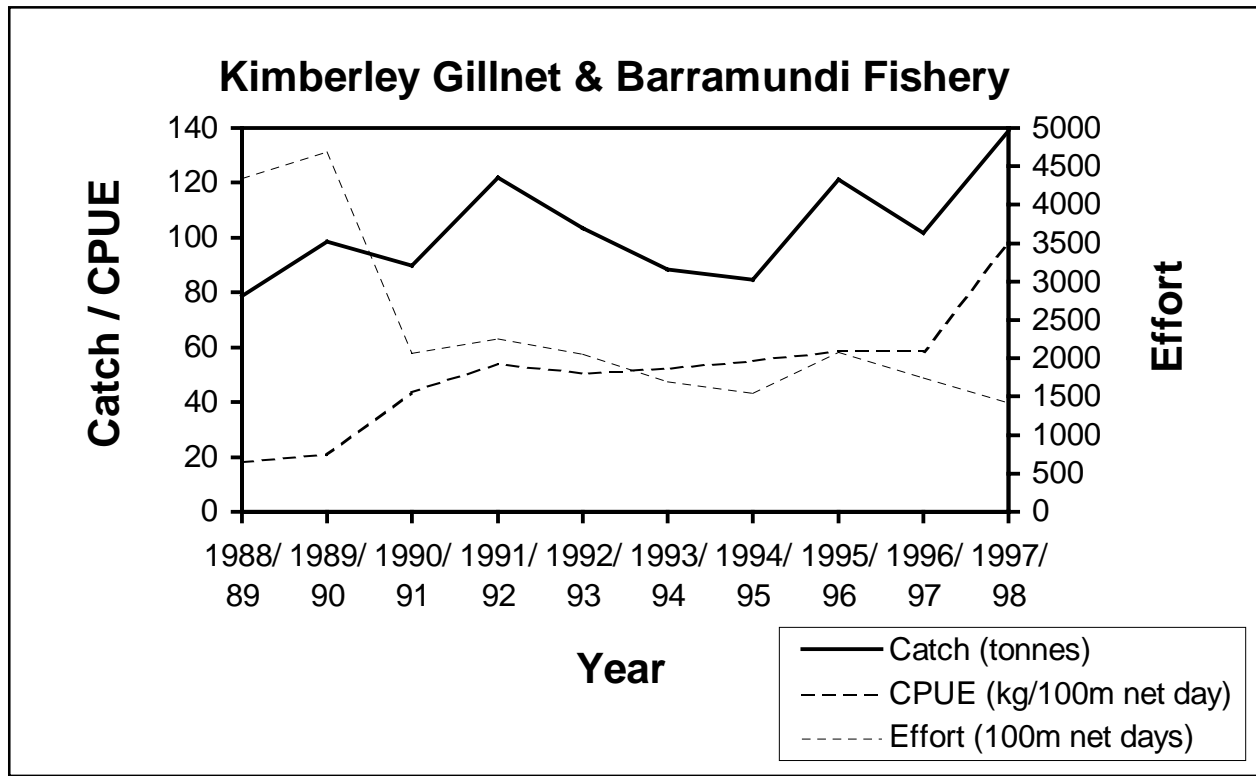
Catch and effort trends for this fishery are not available as the number of fishers is under five. A brief status report on the main target species is shown in Attachment 5 of this document.

1.5 Kimberley Gillnet and Barramundi Fishery

The Kimberley Gillnet and Barramundi Fishery (KGBF) covers the taking of all finfish by net, and barramundi by any method, within three nautical miles of the coastline at low water mark and within tidal waters in the rivers. It came under management in 1989, limiting the number of licences to 17. Prior to this, the fishery was open access, with fishing by means of nets being prohibited in some of the major rivers for specified periods.

Licences are non-transferable, so between 1989 and April 1998, natural attrition resulted in the number of licences dropping to 10. In April 1998, the Minister implemented a Fisheries Adjustment Scheme for the fishery which was open for a year. This reduced the number of licences to seven, with one offer still under consideration.

Graph 6: Total commercial catch, effort and CPUE for the Kimberley Gillnet and Barramundi Fishery



Catch and effort trends for the Kimberley Gillnet and Barramundi Fishery, by species, are shown in Appendix 6.

2.0 OBJECTIVES OF MANAGEMENT

In proposing a management framework for estuarine and marine embayment fisheries, the following objectives were considered. The framework should:

1. allow for long term sustainability of the fish resources;
2. provide equitable, quality fishing opportunities for all user groups;
3. consolidate the benefits gained by the Fisheries Adjustment Schemes;
4. provide a mechanism that allows market forces to deal with longer term access arrangements for commercial fishers;
5. address the requirements of the non-fishing consumers of fish products by maintaining an acceptable number of commercial fishers in estuarine fisheries; and
6. ensure cost-effective, efficient and consistent management across estuarine and marine embayment fisheries in Western Australia.

These are ideals - some are achievable in the short term, some not for a longer time. Some ideals we are able to address now with current knowledge, while others need further information gathering and evaluation. The consultation process and ongoing research will assist in the continual gathering of information to assist in the management of these fisheries.

During the consultation process, it is also likely that these objectives can be refined, clarified or new ones added.

At this stage, they are offered to guide forthcoming discussions and consultations.

3.0 THE MANAGEMENT OF ESTUARINE AND MARINE EMBAYMENT FISHERIES IN WA

3.1 Current management issues

3.1.1 Fish stocks

The 1997/98 'State of the Fisheries Report' identified a number of finfish stocks that are fully to over-exploited, including some local depletion of cobbler and black bream stocks in our temperate estuaries. However, for the most part, fish resources in West Australia's estuarine and marine embayment fisheries are fished commercially at sustainable levels.

The status of fish stocks in each of the fisheries can be found in Appendices 2-5.

Although, at present, sustainability of most fish stocks is not the key issue in the estuarine and marine embayment fisheries, there is still a need to identify key target catch and effort reference points. The main purpose of these would be to establish the relative catch share between the commercial and recreational fishing sectors. Reference points would be established for historical upper limits for catch levels of key species, and traditional net usage (method, length, days fished).

Given the current lack of recreational fishing data, the short term objective would be to identify any commercial catch trends that may indicate the commercial fisheries are taking up catch that would have previously been taken by fishers who had left the fisheries under the Voluntary Fisheries Adjustment Program.

It is also important that fishing catch and effort levels for species that are of concern in terms of sustainability be monitored. Collecting long term catch and effort data is also one of the most cost-effective ways of amassing data for setting target effort levels.

As stated previously, it should be recognised that sustainability of fish stocks cannot be guaranteed through management of the commercial sector alone. Unless environmental concerns are addressed and the recreational fishing sector managed, coastal fish stocks may still become unsustainable.

3.1.2 Environmental factors and resource variability

There are a number of natural environmental factors which will affect production in an estuary, for example, salinity, temperature, oxygen levels, and turbidity. The species of fish which can adapt to varying levels of these factors, especially salinity, will be those which appear regularly in the annual commercial catch. (Lenanton 1984).

Human interference in this already highly variable environment further influences commercial production in the estuarine and marine embayment fisheries. Such interference includes clearing vegetation in catchment areas; agricultural run-off of silt and pesticides; discharge from adjacent industrial development; clearing of seagrass; and dredging.

Mining in the 1970s adjacent to the Blackwood River was brought to an end because of the consequences to the river; and pesticide in the Swan River recently caused a massive kill of

bream.

Eutrophication is a problem in nearly every estuarine and marine embayment fishery along the WA coast - with elevated nutrient levels resulting from clearing catchments and applying fertilisers. It was so severe in the Peel-Harvey Inlet that the Dawesville Cut had to be made to clear out the water. Cockburn Sound has also been subject to industrial pollution and contamination by Tributyl Tin (TBT) from ships.

As population spreads, so does the urbanisation of the foreshores. The shallow water feeding grounds for fish are probably at their most vulnerable as vegetation is cleared and silt runs off into the estuarine system.

Urbanisation has also made some positive contribution to the environment. Canal developments, although habitat-altering in nature and therefore contributory to environmental problems, have in some instances provided an increase in fish numbers. Cobbler, for example, burrow under the walls of the canal, providing a safe habitat for them when they are breeding.

Fishing also has an impact on the environment. The removal of fish from the estuarine and marine embayment fisheries not only affects the numbers of fish from the main target species, but also can affect the food chain of other marine animals and the bird life that feed on them.

3.1.3 Resource sharing

Resource sharing is the key driver in the restructuring of Western Australia's estuarine and marine embayment fisheries. Historically, there has always been competition for the estuarine resources and their environment. As the population spreads from Perth and major regional towns, the pressure to prevent or resolve conflict over estuarine resources increases.

There are a large number of stakeholders in the estuarine and marine embayment fisheries along Western Australia's extensive coastline:

- commercial fishers;
- recreational fishers;
- Aboriginal communities;
- aquaculturalists
- conservationists;
- aquatic charter and fishing tour operators;
- those involved in the tourism industry; and
- the many downstream businesses that support each of the above.

There is also the Western Australian public who gain satisfaction from knowing that the State's estuarine and marine embayment fisheries are well managed and hence that the associated fish resources are sustainable.

The issue of resource sharing needs to be addressed for all sectors, as commercial fishing is only one part of the picture, and its control alone cannot ensure sustainable management of the estuarine resources. Having noted this, the major part of discussion in this paper remains on commercial fishing.

3.1.4 Latent effort

Although various management tools have been successful in reducing the level of latent commercial fishing effort in the estuarine and marine embayment fisheries, there is still latent effort in some of the fisheries. This is largely due to:

- some participants being involved in diverse fishing operations - estuarine fishing is only part of their operations, especially on the lower west coast;
- variation in market prices affecting viability from time to time; and/or
- low level fishing activity by part-time operators, semi-retired operators or fishers approaching retirement.

One of the tools that has assisted in the control of latent effort is the prohibition on transferability of licences in these fisheries. Without transferability, there is little danger of existing latent effort being activated and, as such, little need to further reduce commercial fishing effort.

With transferability, experience has shown that new owners tend to operate differently to previous owners and in some cases will increase fishing effort. Under these conditions, target numbers and new management arrangements would have to allow for possible activation of latent effort.

3.1.5 Target numbers

The determination of an acceptable number of fishing units for each fishery is required to address concerns about the activation of latent effort, fishing sustainability and economic viability of the remaining operators.

The target numbers proposed in this paper are a qualitative judgment based on the following:

- history of activity and catches in the fisheries;
- size of the estuaries;
- need for coverage in terms of collecting research data; and
- demand for use of the estuaries by other stakeholders.

The target numbers are also premised on no change to existing management arrangements. Any change to fishing habits, such as more intense fishing by new entrants if transferability is introduced, would affect target numbers.

Final negotiated targets should build in such likelihood and hence may appear, on surface value, to be more restrictive than necessary under current fishing levels.

Consideration also needs to be given to the effect target numbers will have on the commercial viability of the fishery - will supply be sufficient for processors and service industries - and for the market - so that demand for these products is maintained?

The targets would set the resource shares in these fisheries and the intention then would be for minimal intervention, cost-effective management. The resource shares would provide an upper

limit on the commercial take from estuarine and marine embayment fisheries.

The maximum tonnage from each fishery that is defined as the 'commercial share' would be set at the catch achieved using current effort levels. The definition of the term 'current' would need to be discussed - whether it is taken as 1998, an average of the past three years, or as some other formulae.

This system is not without problems. In addition to the influences mentioned above, it also requires:

- consideration of the total catch, that is, both recreational and commercial;
- the catch composition in the relevant years; and
- recognition that the catch in any year is affected by a number of factors, such as the environment, market demand, and recreational fishing.

Management arrangements would build in adjustment mechanisms to maintain these resource shares should there be extra pressure if transferability of licences is introduced.

Careful consideration will be needed of the method of establishing these targets. Both the method of setting targets and how they are adjusted are open for discussion and will be the subject of consultation with industry.

3.1.6 Transferability

As a result of the recommendations of the *WD Scott Report* (WD Scott & Co, 1969), transferability of licences to operate in most estuarine fisheries has been essentially prohibited. However, in some fisheries and subject to certain conditions, direct descendants of licensees have been granted various types of licences as assistants and trainees, eventually resulting in full access on application when the father/grandfather left the estuarine fishery.

The current transfer policies are:

- Swan-Canning - no transfers, even between family members;
- Peel-Harvey - transfers permitted between family members after consideration of individual circumstances;
- Leschenault - transfers permitted between family members after consideration of individual circumstances;
- Hardy Inlet - no transfers, even between family members;
- Cockburn Sound Fish Net - no transfers, even among family members;
- Shark Bay Beach Seine - transfers permitted between family members after consideration of individual circumstances;
- Exmouth Gulf Beach Seine - no transfers, even between family members; and
- Kimberley Gillnet and Barramundi Fishery - no transfers, even between family members.

Despite these limitations, this personal access has had some of the nature of a 'property right' as fishers were able to surrender their access to the estuary, together with their associated fishing dinghy licences, to the 'General Fisheries Adjustment Scheme' - a joint industry/Government funded initiative and, more recently, to a specific Government funded series of schemes.

Transferability of licences is a major issue in the management of most of these fisheries. Any introduction of transferability is likely to be tied to a series of trade-offs, not only in terms of reaching fishing effort target numbers, but also recreational fishing concessions.

It should also be noted that full transfer would have the potential to increase the number of active participants and release latent effort. To account for this, management would need to incorporate measures to pull back the commercial effort to agreed target levels, and hence restore the resource shares between the sectors. However, it may also be possible to use the market to restore resource shares.

3.1.7 Consistent management rules

One of the current complexities of management for the estuarine and marine embayment fisheries is that many of the regulations are different between the various fisheries, such as gear definitions and restrictions; temporal closures; the number of dinghies in a fishing unit; and the existence of trainees.

This situation results in higher cost management for the Government. Although some estuaries have attributes that require specific management approaches, any new management proposals need to minimise the variation in regulation.

However, at this stage it is intended that the management rules in each of the estuaries and marine embayment fisheries remain as is, after which fisheries would be reviewed and appropriate management arrangements developed to maintain resource shares.

There is also a need to bring these estuarine and marine embayment fisheries under a consistent and unified management approach supported by appropriate legislation. Possible outcomes are discussed in Section 4 of this paper.

3.1.8 Cost of management

Cost recovery was introduced into the major commercial fisheries in WA in the mid 1990s and may continue to expand to cover all commercial fisheries and other sectors using the State's fish resources. Under cost recovery, the participants in commercial fisheries contribute to the cost of managing fisheries in which they are licensed to operate.

Management of minor commercial fisheries, recreational fisheries and fish and fish habitat protection is subsidised by the Government. In the case of estuarine and marine embayment fisheries, for the most part, participants contribute only a small percentage of the cost of managing these fisheries.

As the majority of estuarine and marine embayment commercial fisheries are marginal economically, there is limited capacity for fishers within these fisheries to bear the additional cost associated with complex management plans. Neither is there capacity within the Fisheries WA budget to further subsidise the administration of these plans.

3.1.9 Economic factors

On the whole, estuarine and marine embayment commercial fisheries are faced with a long-term cost price squeeze. There is a limited range of fish available for the market, and despite the cost of catching fish being low, in most of these fisheries the yield will not increase and nor will the real prices. The exception to this will be fisheries where operators are successful in developing niche markets.

Operators who are supplying fresh fish into the local tourism market or value adding existing products are already seeing an increase in real prices. However, at this stage, these fishers are in the minority.

Many others have turned to higher value species, such as black bream and crabs, which may not ease the economic conditions in the long run unless resource shares are maintained, as these are prime targets of the recreational sector.

Other fisheries, such as the Shark Bay Beach Seine and the Swan-Canning Estuarine fisheries, are economically healthy.

3.2 Management strategies for restructuring commercial fisheries

Although there have been occasions in the past where management measures in the estuarine and marine embayment fisheries have been introduced for both resource sustainability and resource sharing reasons, the majority of management issues in these fisheries now revolve around resource sharing.

It has been recognised by both industry and the Government over the years that there are competing uses for the State's estuaries and marine embayments.

In the past, the Government has responded to the needs of user groups by introducing controls on commercial fishing through regulatory mechanisms - particularly temporal and area closures - and through buy-back schemes. These schemes are described in the following text.

However, both the Government and the community need to recognise that control on commercial fishing is not sufficient - management needs to be integrated and apply to all users of the resource.

3.2.1 Regulatory mechanisms

Each estuary or marine embayment has associated with it a plan of management, initially made up of a combination of legislation and policies. Legislative tools are found in the *Fish Resources Management Act (FRMA) 1994* and the *Fish Resources Management Regulations 1995* (the *Regulations*). The legislation and policies put in place:

- restrictions on the number of participants;
- the time the fishery is open for commercial fishing;
- the areas which are closed to commercial fishing;
- the type and amount of gear that can be used; and
- in some cases, the species which can be taken or kept from these commercial operations.

Fisheries WA is currently developing legislative options for repackaging the current management arrangements, along with any changes that may be negotiated with industry. Despite this, the use of regulatory mechanisms in restructuring fisheries to meet management objectives may have little success unless they are supported by economic incentives.

3.2.2 Buy-back strategies

Although a legislative solution, the *Fisheries Adjustment Schemes Act 1987* (as amended) provides the means to reduce commercial fishing effort in open access fisheries, inshore/coastal fisheries and in estuarine and marine embayment fisheries through buy-back of fishing licences. Funding would have to be identified for this purpose.

3.2.3 The Resource Sharing Initiative

In 1996 the Government committed \$8 million over four years for voluntary resource sharing. The initiative had two facets: the 'Resource Re-allocation and Licence Buy-out Initiative' and the 'Guidelines for Voluntary Resource Sharing'.

Voluntary Guidelines Process

The 'Guidelines for Voluntary Resource Sharing' initiative provided Fisheries WA with a process for addressing resource sharing issues. The objective is to provide an administrative vehicle for achieving defensible voluntary resource sharing arrangements among interested sectors.

To date, two fisheries have been accepted for mediation under this process - the West Coast Beach Bait and Fish Net Managed Fishery and the Cockburn Sound Crab Managed Fishery. Both were nominated by commercial fishers' associations.

An agreement has been reached between parties for the Cockburn Sound Crab Managed Fishery and mediation is to cease for the other fishery.

Voluntary Fishery Adjustment Schemes

These were targeted schemes for fisheries either nominated by the 'Voluntary Resource Re-allocation and Buy-out Committee of Management', or through the 'Guidelines for Voluntary Resource Sharing' process.

Between January and May 1998, Voluntary Fisheries Adjustment Schemes operated for each estuarine fishery. These schemes were successful in reducing the number of fishing units in estuaries on the lower west coast and the south coast from 85 in January 1997 to 61 in October 1998.

A similar scheme in the Kimberley Gillnet and Barramundi Fishery reduced the number of fishing units from 10 in April 1998 to seven in April 1999.

4.0 PROPOSALS FOR FUTURE MANAGEMENT OF ESTUARINE AND MARINE EMBAYMENT FISHERIES

There has been a strong push over about 30 years by the Government to reduce the number of participant fishers in commercial estuarine and marine embayment fisheries. However, these objectives were implicit, and never appeared in a management plan or other public policy statement.

In practice, management has focused on:

- reducing the number of participant fishers;
- removing latent and therefore excessive commercial fishing effort;
- easing the difficulties of industry structural adjustment; and
- providing for gradual change over time to introduce fish resource use re-allocation.

These subsidiary objectives align in part with the prime aim of sustainability. Conversely, public demand for local fish for both retail and restaurant markets has created a dilemma for management, due to the need to maintain some commercial production from these coastal stocks.

Management of estuarine and marine embayment fisheries now needs to take a long term view. Where do we want these fisheries to be in the next 20 years?

Although the push from some sectors of the community is for the total removal of commercial fishing from estuarine and marine embayment fisheries, commercial fishing in these fisheries plays an important role. These fishers:

- collect data for research purposes (as do recreational fishers) - long-term data series on catches and variations in stocks is critical in the management of these systems;
- are custodians of the resource (along with recreational fishers) - the eyes and ears to report any potential problems and information on the environment and health of estuaries in which they fish;
- supply fish to the local community, tourists and the metropolitan markets;
- take a range of fish not exploited by recreational fishers, such as yelloweye mullet and Perth herring;
- collect fish and provide knowledge for aquaculture ventures; and
- have the potential to participate in local tourism, not only by direct contact, but through ventures such as the development of regional cuisine based on local fish.

Commercial fishers, because of their consistent day-to-day and long term involvement on fishing on the estuaries, provide both quantitative and qualitative data. As commercial fishing becomes a smaller and smaller percentage of fishing activities in estuarine and marine embayment fisheries, supplementary research data will need to be collected on a structured basis from recreational fishers, the cost of which is currently unfunded.

To a large extent, resource sharing issues have been settled for the estuarine and marine embayment fisheries on the west coast through the use of Voluntary Adjustment Schemes and the *Guidelines for Voluntary Resource Sharing* process. Some of the remaining resource sharing issues could be resolved by moving commercial fishing effort from the species of interest to the recreational fishing sector.

The debate is now largely on the level of activity - are the target levels proposed in this paper appropriate? In entering this debate, it must be realised that reducing commercial fishing below the levels proposed raises questions as to the logic in managing the commercial fisheries at all.

Their contribution to the total take from the estuarine and marine embayment fisheries will be small and the research data collected of little use - these commercial fisheries may even cease to be commercially viable units. If this occurred, in addition, there would be the temptation for the consequent 'holes' in the market for locally caught fresh fish to be filled by illegal sales of recreationally caught fish.

Further to the size of the targets, the debate must consider:

- how we reach these targets;
- how the fisheries are managed once the targets are attained; and
- how we manage the overall sustainability of individual species in this scenario - which must take into account the large cost associated with complex management arrangements.

Complex management is not required. In the long term, it may be possible to bring all estuarine and marine embayment fisheries into a series of management plans:

- one management plan for the south and west coast estuaries;
- maintain the existing management plans in Cockburn Sound for mussels, crab, and bait fish;
- a modified management plan in Cockburn Sound for octopus pots and squid jigging;
- use the existing management plan for Shark Bay Beach Seine and Mesh Net Fishery; and
- a section 43 Order (under the *Fish Resources Management Act 1994*) for Exmouth Gulf Beach Seine.

Numbers in these fisheries would be moved towards target numbers and transferability could be introduced once these targets reached. However, as transferability often results in an increase in fishing efficiency, an adjustment mechanism would be an essential part of any management arrangements.

One option for adjustment being proposed for the coastal fisheries is unitisation of effort. This system of Individual Transferable Effort units (ITEs) involves allocating each commercial fisher a number of days each season/year in which particular amounts of gear can be used in a fishery.

Whatever tools are chosen for the future management of these fisheries, management must be simple and cost-effective. The following proposals are raised for discussion.

4.1 West Coast estuarine and marine embayment fisheries

4.1.1 Lower West Coast Estuaries

The West Coast estuaries are a principal focus of the State's recreational fishing and boating activity. This extends right across the range of fishing pursuits including crabbing and prawning, as well as line fishing for key species such as whiting, flathead, flounder, garfish, trevally, black bream, mulloway and tailor. In some estuaries such as the Peel-Harvey and Leschenault, recreational netters also take mullet.

Much of the State's coastal development has focused on these estuaries, particularly the major estuaries. They are all widely used for recreation including, of course, much recreational fishing. Being close to metropolitan Perth and the major southern tourist destinations, pressure has been applied by Recfishwest, as well as other recreational fishing groups, to have commercial fishing removed or substantially decreased in these estuaries.

Commercial netting in all the major estuaries provides a valuable source of fresh fish for local and metropolitan Perth consumption. However since the late 1960s such netting in all these estuaries has been reduced through netting regulations, restricted licence transfers and licence buy-back.

One such estuary, the Hardy Inlet, currently has two fishing units remaining after the buy-back process and only one of these is active. This may be one estuary in which commercial fishing is eventually removed.

Fishing in this estuary may, however, remain to service the south west region if the other major estuary in the region is closed to commercial fishing. For example, Leschenault fishers have indicated they will be putting in a submission for the buy-out of all commercial licences from this fishery.

There is a strong case, however, for retention of low level commercial fishing in representative estuaries and perhaps further reduction in others, especially if commercial licences become transferable. However, any transferability should occur only when effective controls on total commercial exploitation are in place, and fishing is subject to the provision of detailed research records.

Commercial effort would need to be contained and managed, and take into account fishing and gear efficiency changes over time, as the result of transferability, if it were to be introduced. The number of fishers permitted to fish commercially must take into account current fishing levels and the capacity of each estuary.

4.1.2 Cockburn Sound

Land adjacent to Cockburn Sound is heavily populated, both by permanent residents and by holiday makers. With this population has come an increasing number of recreational fishers and increasing competition for the finfish resources in the area.

The Government has been working with industry over the last 10 years to bring the Cockburn Sound fisheries under management plans and to restructure the commercial fishing effort to reduce resource sharing conflicts. Satisfactory resolution has been achieved, or is near, for all but the wetfish fisheries.

As Cockburn Sound is now flanked by residential land and is a popular boating, fishing and tourist destination, commercial fishing in these waters is no longer a priority for the community. The most satisfactory solution in the eyes of the community is the removal of commercial wetfish fishing (excluding bait fish) from Cockburn Sound.

Should the Government take this path, it would not be a sudden prohibition, but would be achieved using the legislative and administrative mechanisms available to the Government and to industry, such as the buy-out options and voluntary guidelines processes.

4.2 Shark Bay

Fish stocks targetted within the beach seine and mesh net fishery are considered healthy. Snapper catches are minimal, with the key target species (whiting and mullet) being of little interest at present to recreational fishers.

Commercial fishing is not in high conflict with recreational fishing in this fishery, neither is most of the fishing in high visibility tourist areas. Latent effort is small as these fishers do not participate in any other fisheries. However, as there is still some latent effort in this fishery, a small reduction in the current number of fishing units would be necessary before any transferability could be introduced.

The report into management of the recreational fisheries in the Gascoyne region said: "The management arrangements for 'recreational priority areas' should not necessarily exclude particular activities, although these must be assessed to be of a type or at a level that does not adversely impact on recreational values. For example, commercial fishing in the Gascoyne for species such as rock lobster, mullet or whiting may not conflict with recreational fishing". (**Gascoyne Recreational Fisheries Working Group, 1999**).

It is therefore recognised that, although this fishery occurs in an area of high tourism, it is not necessarily incompatible with recreational fishing.

4.3 Exmouth Gulf

As the number of fishing units in Exmouth Gulf is only two, there is no immediate need to reduce commercial fishing in this fishery. Latent effort is not an issue as these fishers only fish in this beach seine fishery.

The issues in Exmouth Gulf are now:

- transferability of licences;
- need to introduce new legislation setting out the management arrangements;
- loss of coastal land to aquaculture; and
- consideration of 'recreational priority' fishing areas.

As this fishery has such a low level of participation and management arrangements that are not complex, the most cost-effective method of managing this fishery would be by section 43 Order under the *Fish Resources Management Act 1994*.

4.4 Kimberley Gillnet and Barramundi Fishery

High latent capacity over recent years has led to a concerted effort to reduce the number of commercial fishers in this fishery. After the recent Fisheries Adjustment Scheme, seven licences remain in the fishery. However, if the final offer still under consideration is removed, the target number of six licences will have been reached and transferability could be introduced into the fishery.

The other outstanding management issues are:

- inland boundaries; and
- development of recreational fishing-based tourism in high use areas.

Both of these issues are being negotiated through an independent industry-government consultative process.

4.5 Specific Management Proposals

There should be community discussion on the following proposals as a longer-term objective:

Proposal 1

That all commercial fishing and all forms of netting be phased out of either the Hardy Estuary and Blackwood River or the Leschenault Estuary.

Proposal 2

That, with the exception of the pilchard purse seine and bait fish fisheries, all near shore net and line fishing for finfish be phased out of Cockburn Sound.

Proposal 3

That the number of commercial fishing operators using nets or wetlining for finfish (other than bait fish) in key West Coast inshore fishing areas including the Swan-Canning, Leschenault and Peel-Harvey (Mandurah) estuaries, Cockburn Sound, Shark Bay, Exmouth Gulf and the Kimberley be reduced to a lower level. Once targets are reached and effort and catch controls are in place, fishers should be given the right of full licence transferability. Suggested target licence levels are:

<i>Fishery</i>	<i>Current Number</i>	<i>Target Number</i>
<i>Hardy Estuarine</i>	<i>2</i>	<i>0-1</i>
<i>Leschenault Estuarine</i>	<i>6</i>	<i>3</i>
<i>Peel-Harvey Estuarine</i>	<i>14</i>	<i>5</i>
<i>Cockburn Sound Fish Net</i>	<i>4</i>	<i>0</i>
<i>Swan-Canning Estuarine</i>	<i>6</i>	<i>5</i>
<i>Shark Bay Beach Seine and Mesh Net</i>	<i>10</i>	<i>8</i>
<i>Exmouth Gulf Beach Seine</i>	<i>2</i>	<i>2</i>

<i>Kimberley Gillnet and Barramundi</i>	7	6
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As part of the adjustment process, commercial fishing effort would need to be unitised and managed to limit catch, or contain it at a determined exploitation rate, adjusted from time-to-time by taking into account gear and fishing efficiency changes.

Proposal 4

That, regardless of the target levels negotiated, there needs to be a sufficiently adaptive approach to deal with long term changes in estuarine productivity due to changes in water conditions so that the resource sharing balance between commercial and recreational usage is maintained.

Proposal 5

That in the long term, legislation be developed or maintained as follows:

- *one management plan for the south and west coast estuaries;*
- *the existing management plans in Cockburn Sound for mussels, crab, and bait fish;*
- *a modified management plan in Cockburn Sound for octopus pots and squid jigging;*
- *the existing management plan for Shark Bay Beach Seine and Mesh Net Fishery; and*
- *a section 43 Order for Exmouth Gulf Beach Seine.*

5.0 WHERE DO WE GO FROM HERE?

The release of this paper is the first stage in a process aimed at total fisheries resource management for the State's estuarine and marine embayment fisheries. It has been released to all the major estuarine and marine embayment groups within all sectors with an interest in these fisheries, as well as to peak industry bodies.

Approximately one month after the release of this paper, meetings will be held in key areas within Western Australia to discuss meaningful targets and long term management arrangements. These two objectives are interlinked.

It must be recognised that when targets are reached, there needs to be long term resource sharing arrangements in place between commercial and recreational sectors, so that catches are maintained at a sensible level. Fisheries WA would encourage the increased use of resource sharing buy-back money to achieve target levels, however, once targets are reached, this money would no longer be available.

Any further adjustment would be achieved through management arrangements, recognising that for some areas, this may take a number of years to achieve.

This process should see agreement on target levels and further processes to move forward by mid 2000.

Fisheries WA is seeking written submissions on the proposals put within this paper, and on the way forward from here. It also invites your attendance and input at relevant regional meetings.

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APPENDIX 1 SUMMARY OF THE CHARACTERISTICS OF WA'S ESTUARINE AND MARINE EMBAYMENT COMMERCIAL FISHERIES

Name of the fishery	Area	No of fishing units at 10/98	Species targetted	Gear used	1997 catch and estimated value to fishers (1997)
Mandurah Estuarine	Waters of the Peel-Harvey estuary Commercial block 9502	14	sea mullet, yellow-eye mullet, King George Whiting, crab	gillnet, haul net	310.5 tonnes \$901,000
Leschenault Estuarine	Commercial block 9503	6	yellow-eye mullet, sea mullet, western sand whiting, herring, King George whiting,	gillnet, haul net	86.4 tonnes \$175,500
Hardy Estuarine	Commercial block 8501	2	yellow-fin whiting, sea mullet	gillnet, haul net	< 5 operators thus data not available
Swan Canning Estuarine	Commercial block 9501	6	black bream, cobbler, crabs, herring, sea mullet	gillnet, haul net	85.8 tonnes \$218,900
Cockburn Sound Line and Pot Managed Fishery	Waters of Cockburn Sound Commercial block 9600	34	finfish - garfish, herring, Perth herring (some snapper and shark by longline)	gillnet, haul net, beach seine, long line	Total of finfish from both fisheries:
Cockburn Sound Fish Net Managed Fishery		4 (including 1 longliner)	finfish component - pink snapper, shark others- crabs, octopus and squid	handline, squid jig, octopus pot	74.5 tonnes (5.7 tonnes from Line and Pot fishery) \$157,000 total value of finfish

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Name of the fishery	Area	No of fishing units at 10/98	Species targetted	Gear used	1997 catch and estimated value to fishers (1997)
Shark Bay Beach Seine and Mesh Net Fishery	Waters of Shark Bay from HWM lying-south of a line drawn from the northernmost point of Cape inscription on Dirk Hartog Island due east to the mainland; and east of a line drawn from Surf Point on Dirk Hartog Island to Steep Point on the mainland; but excluding the waters of Shark Bay due south of a line west of the HWM of Kopke Point on the mainland to the HWM on the mainland south of Petit Point on Perin Peninsula.	10	mainly whiting, but also take mullet, tailor, yellow-fin bream and some snapper	beach seine and haul net	325 tonnes \$886,000
Exmouth Gulf Beach Seine Fishery	Within Exmouth Gulf south of a line from Point Murat to the southern shore of the mouth of the southern arm of the Ashburton River	2	mullet, Perth herring, shark, golden-lined whiting and yellowfin bream	beach seine and gillnet	< 5 operators thus data not available
Kimberley Gillnet and Barramundi Fishery	North of 80 mile beach (19°S) to the NT border, within 3 nm of LWM and in tidal waters of rivers	7	threadfin salmon and barramundi	gillnet for finfish and all methods for barramundi	about 35 tonnes \$256,000

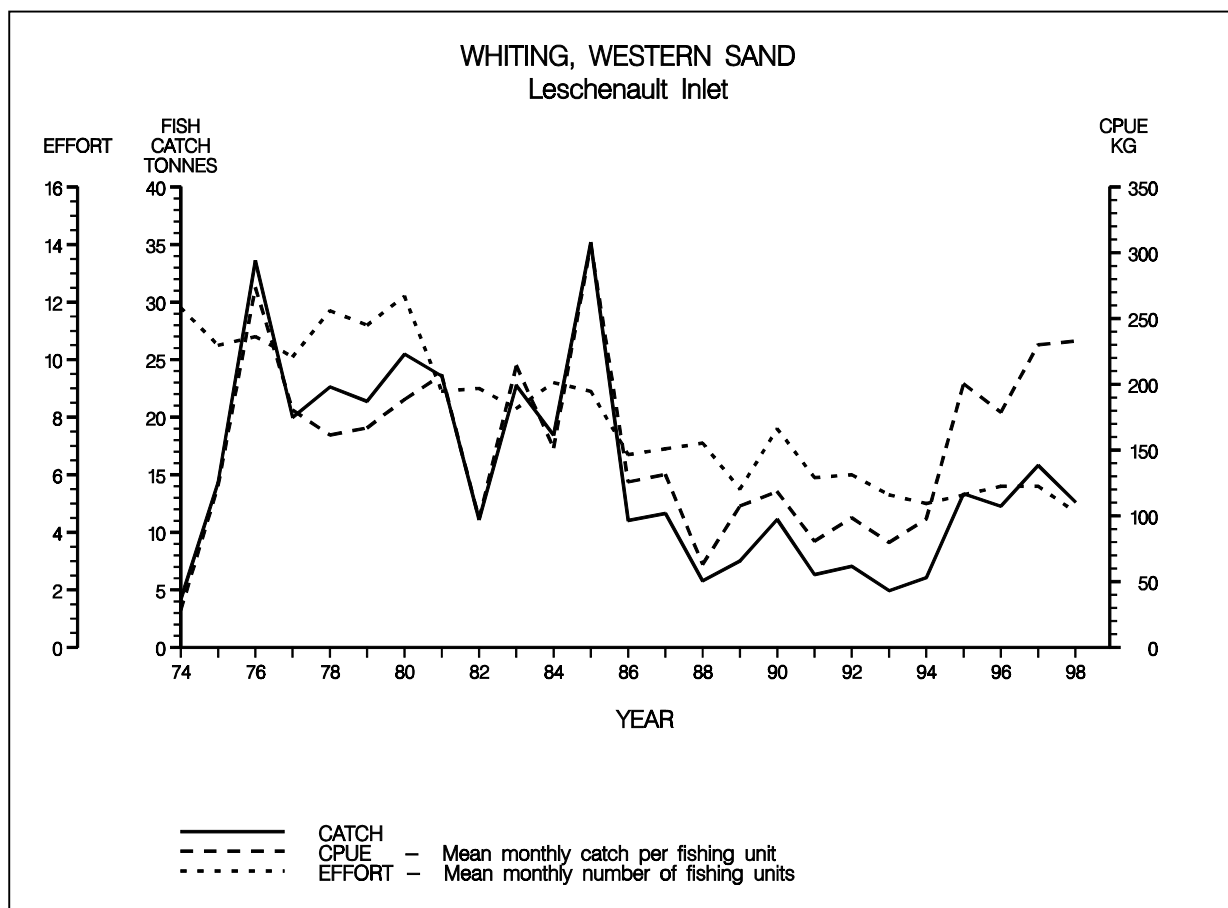
APPENDIX 2 CATCH AND EFFORT TRENDS FOR THE LOWER WEST COAST ESTUARINE FISHERIES

Data for the Hardy Inlet is not available as the number of operators is less than five. Catch, effort and species information for the remaining estuaries follows.

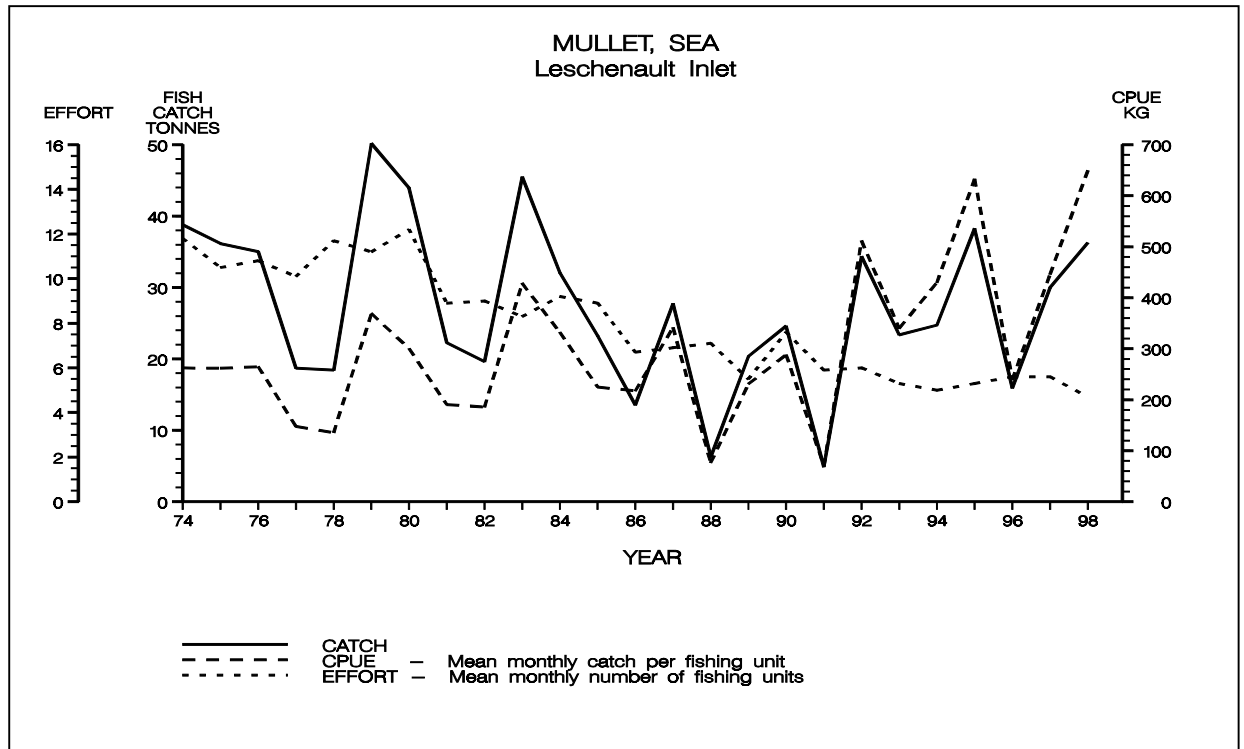
Hardy Inlet

Fishing effort, measured as the mean monthly number of fishing units, declined to be consistently between one and two during the 1990s. During that same period, catch and CPUE also declined, with a catch of about 15 tonnes being recorded during the most recent years. With the exception of black bream, for which extremely low catches were recorded, the commercial catches of all other species, such as mullet and whiting, comprise a small proportion of the overall catch of a more widely distributed stocks of these species, and as such cannot be used in isolation to determine the status of these stocks.

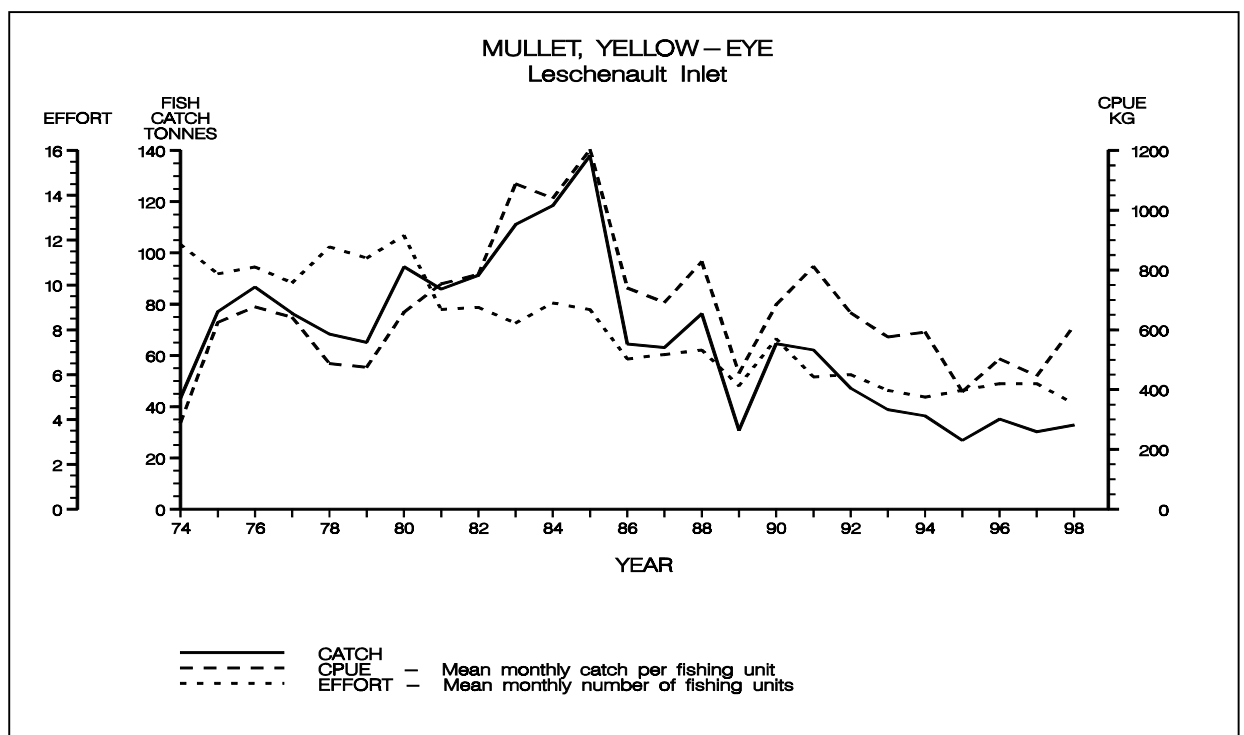
Graph 7: Total commercial catch, effort and CPUE for western sand whiting in Leschenault Inlet



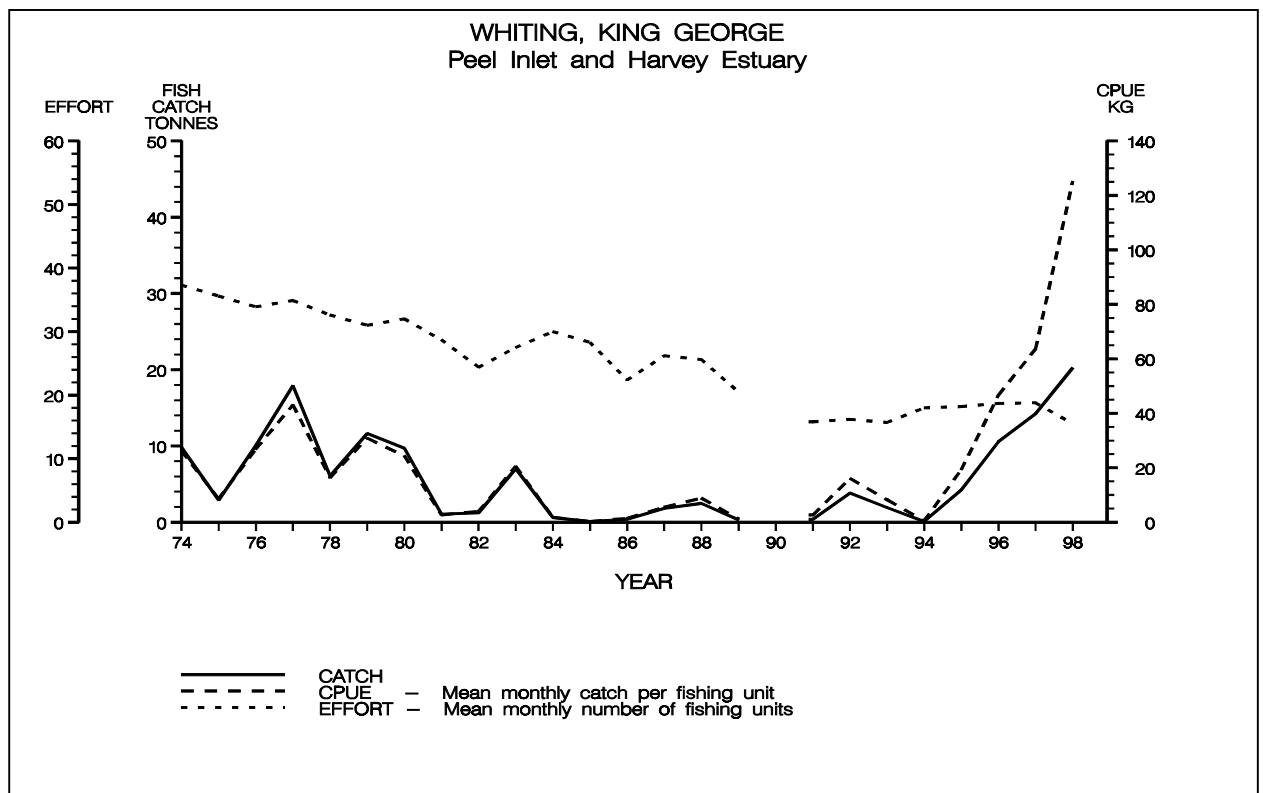
Graph 8: Total commercial catch, effort and CPUE for sea mullet in Leschenault Inlet



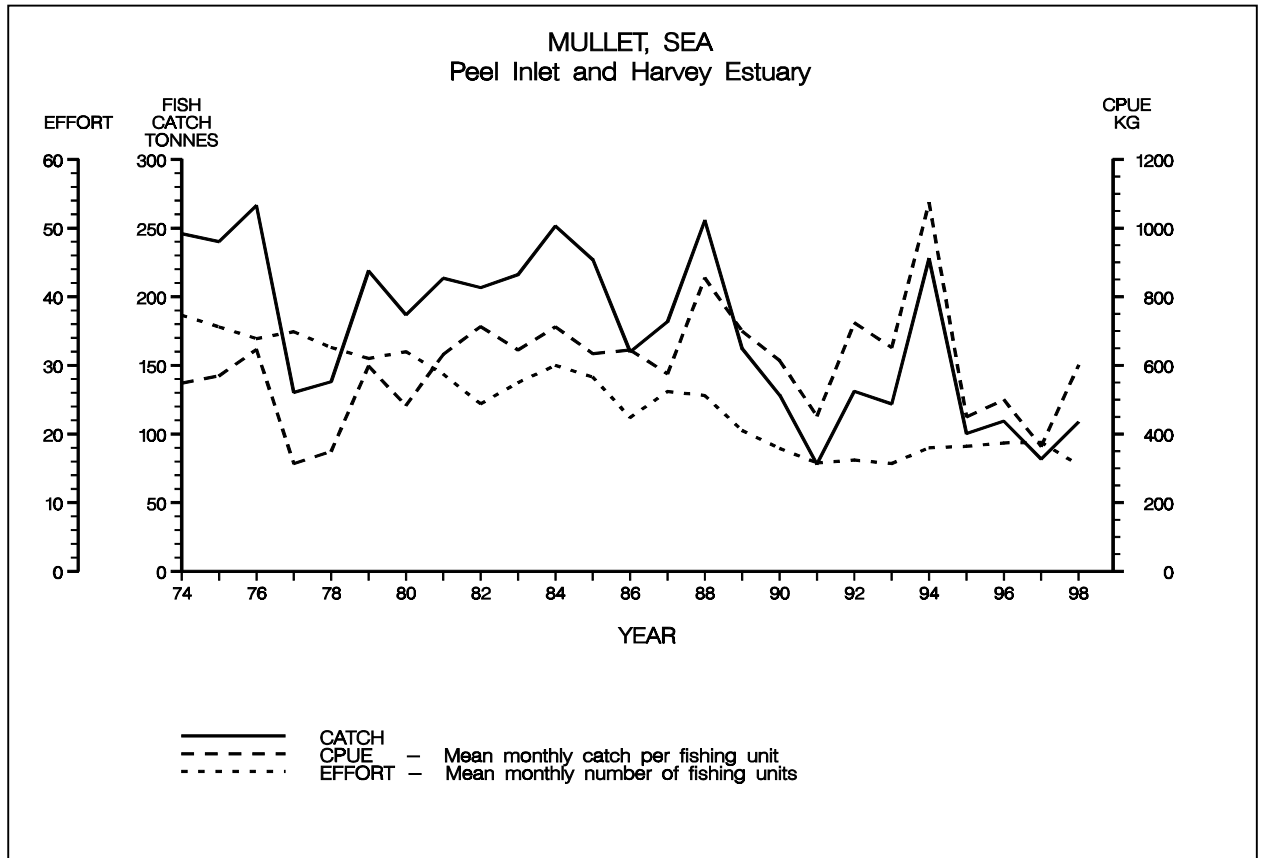
Graph 9: Total commercial catch, effort and CPUE for yellow-eye mullet in Leschenault Inlet



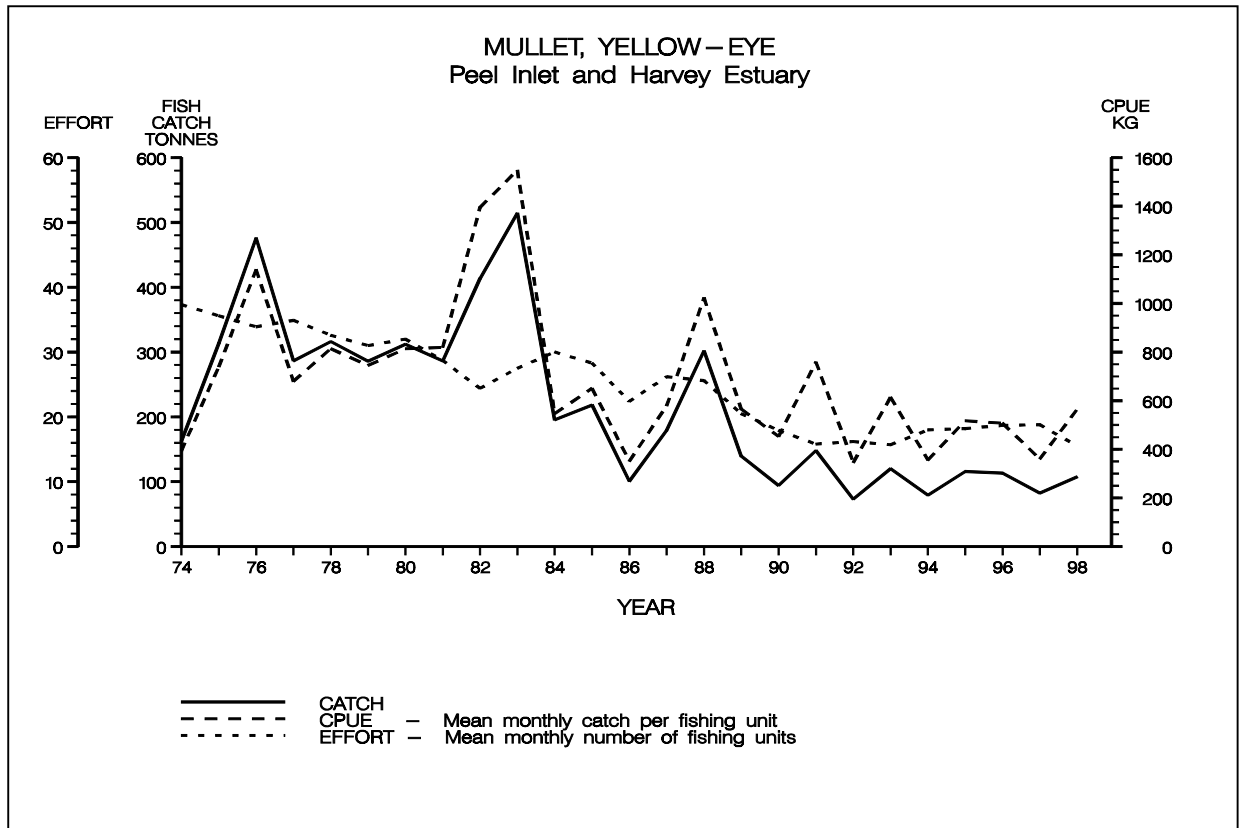
Graph 10: Total commercial catch, effort and CPUE for King George Whiting in the Peel-Harvey Estuary



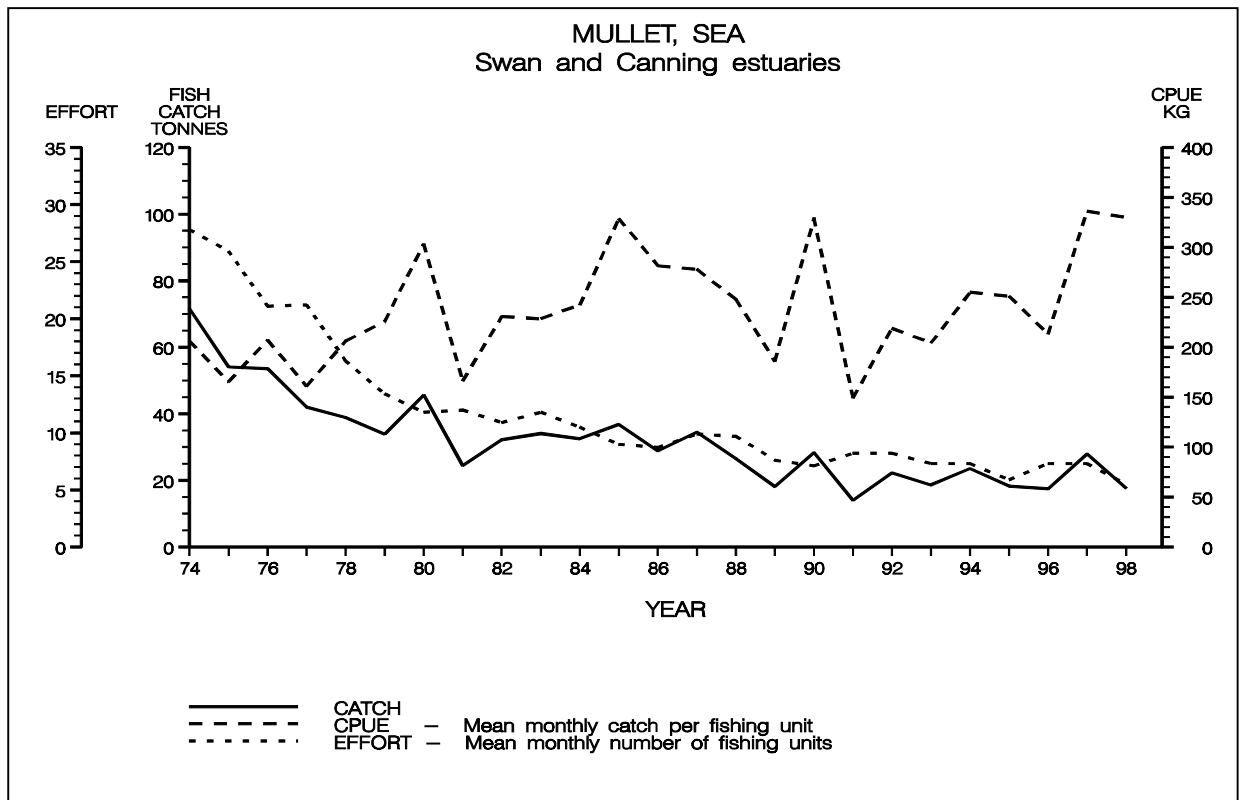
Graph 11: Total commercial catch, effort and CPUE for sea mullet in the Peel-Harvey Estuary



Graph 12: Total commercial catch, effort and CPUE for yellow-eye mullet in the Peel-Harvey Estuary

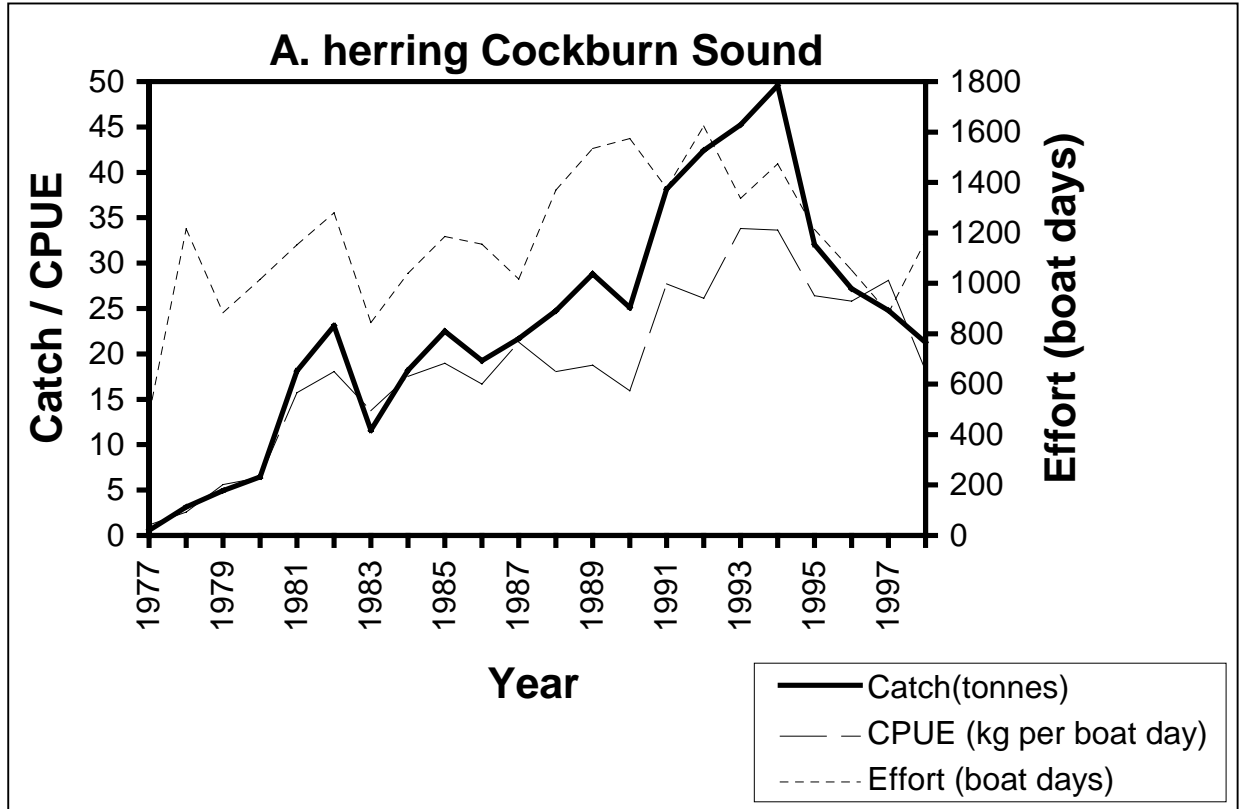


Graph 13: Total commercial catch, effort and CPUE for sea mullet in the Swan-Canning Estuary

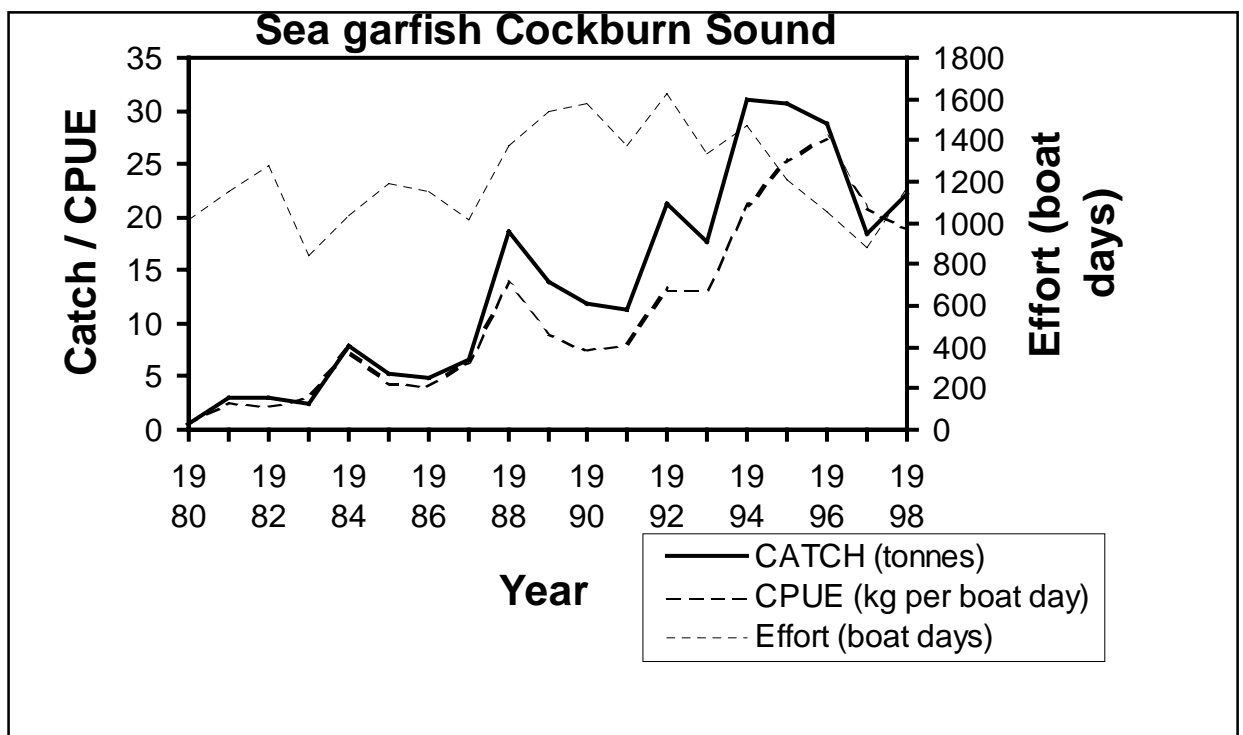


APPENDIX 3 CATCH AND EFFORT TRENDS FOR THE COCKBURN SOUND FISHERIES

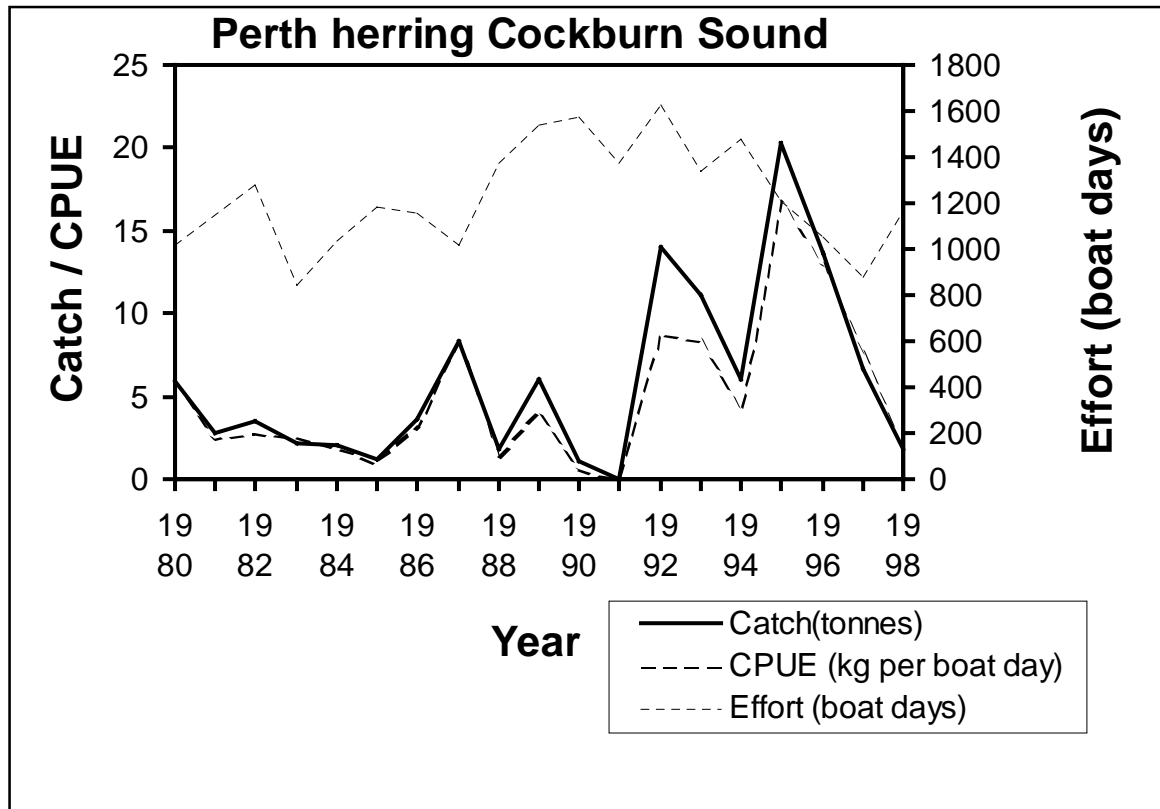
Graph 14: Total commercial catch, effort and CPUE for herring in Cockburn Sound



Graph 15: Total commercial catch, effort and CPUE for garfish in Cockburn Sound

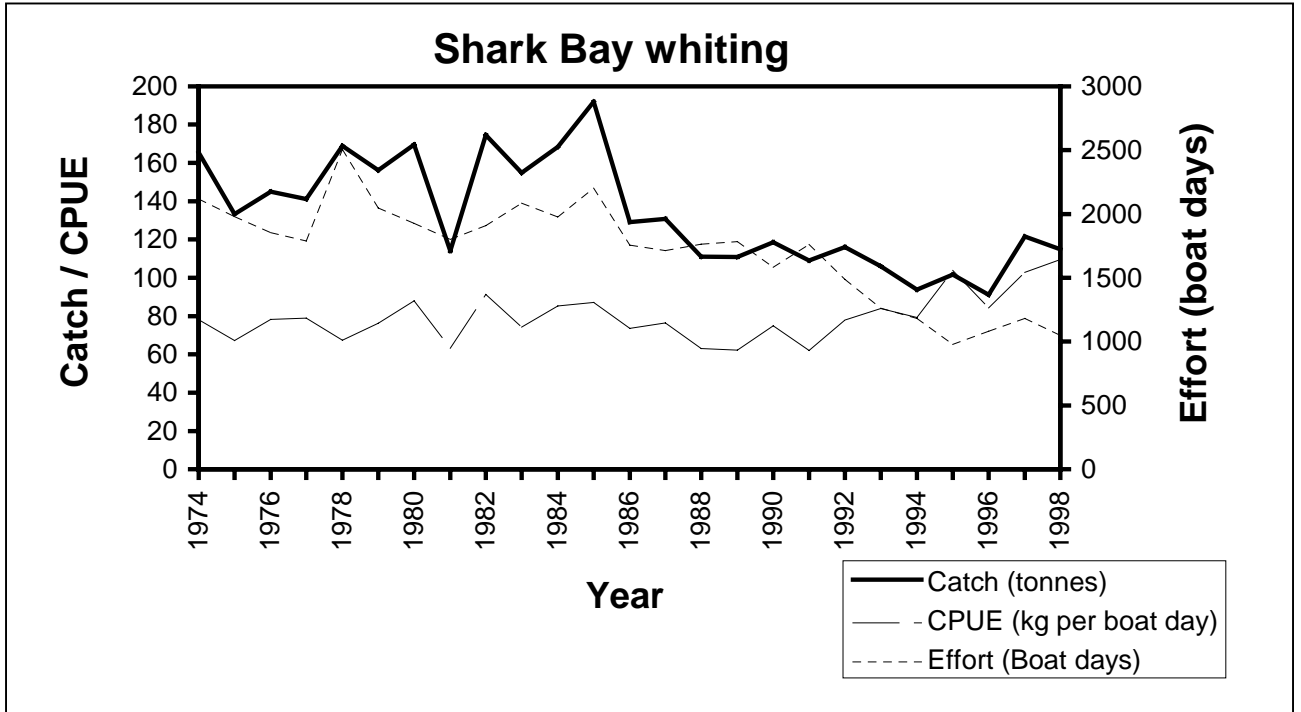


Graph 16 : Total commercial catch, effort and CPUE for Perth Herring in Cockburn Sound

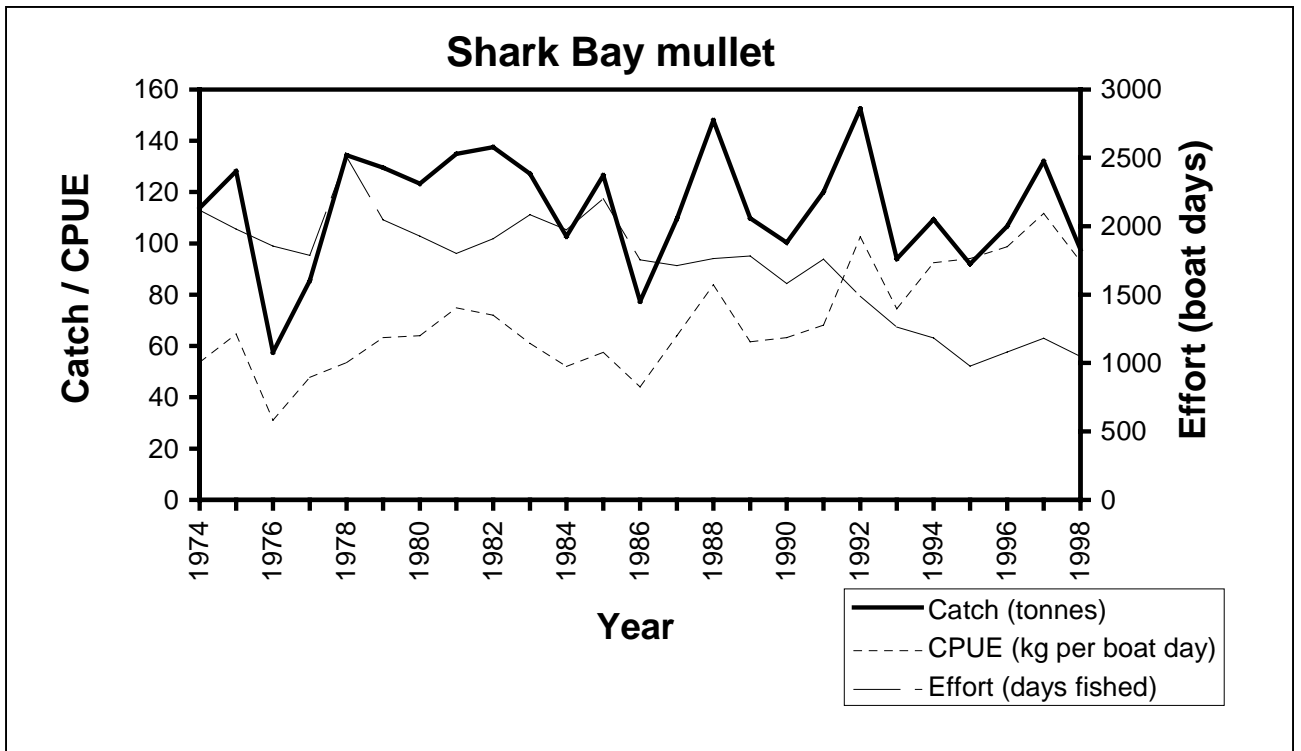


APPENDIX 4 CATCH AND EFFORT TRENDS FOR SHARK BAY BAY BEACH SEINE FISHERY

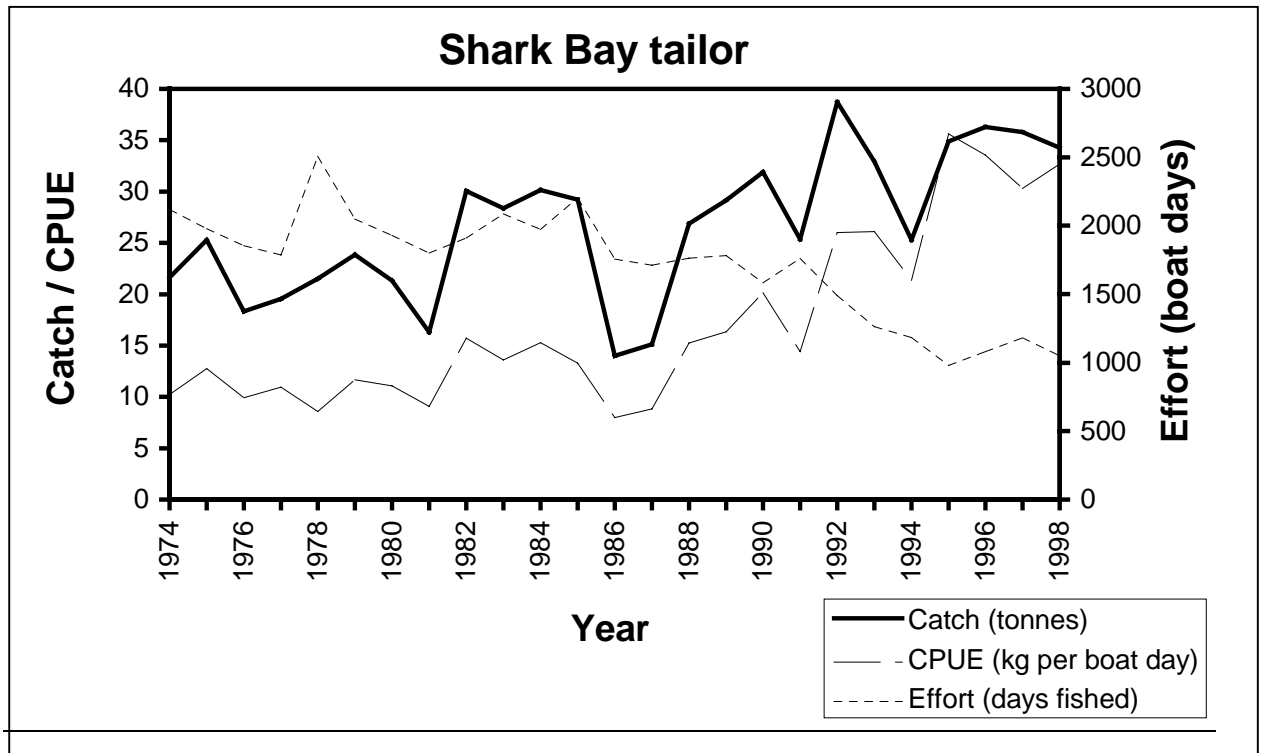
Graph 17: Total commercial catch, effort and CPUE for whiting in Shark Bay



Graph 18: Total commercial catch, effort and CPUE for mullet in Shark Bay



Graph 19: Total commercial catch, effort and CPUE for tailor in Shark Bay



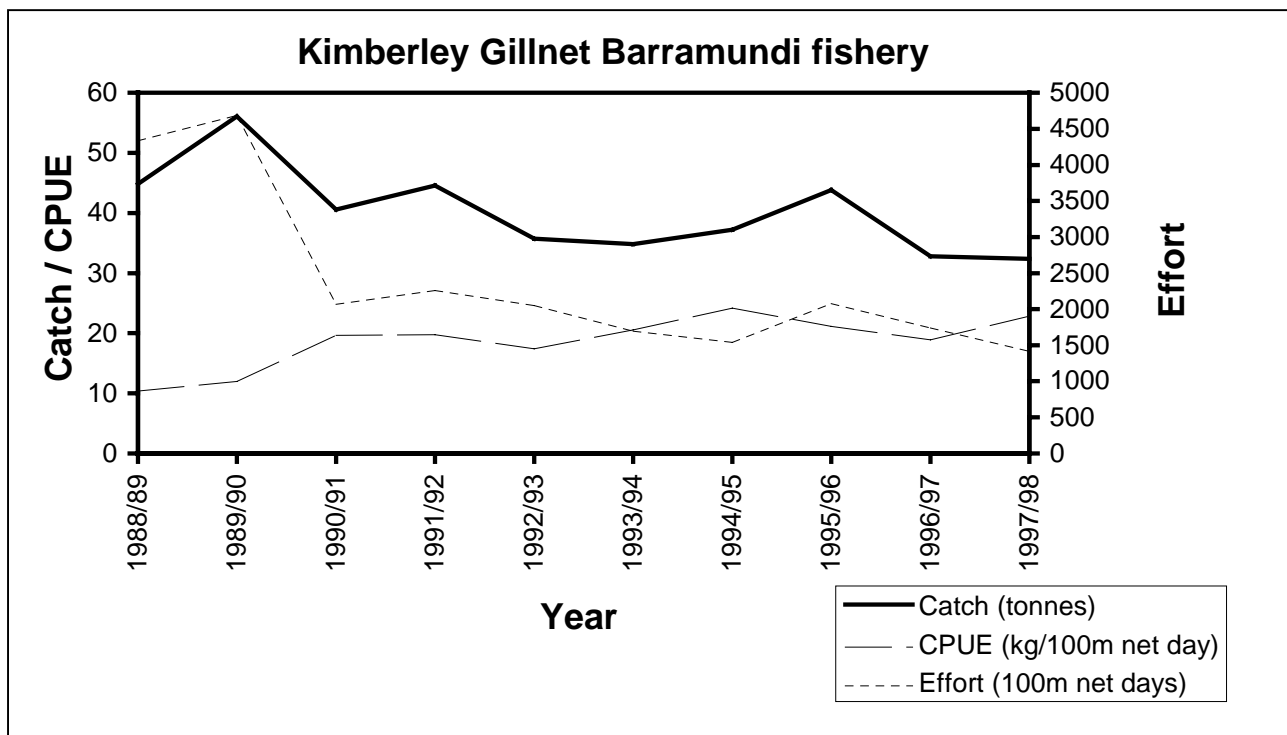
**APPENDIX 5 STATUS REPORT ON MAJOR TARGET
SPECIES FOR THE EXMOUTH GULF BEACH
SEINE FISHERY**

Fishing effort in this small embayment fishery has been declining consistently since the early 1980s, with the lowest catches on record of about 30 tonnes being recorded from a monthly mean of three fishing units during 1998.

Principal species are mullet, whiting, Perth herring and shark. The stocks of none of these are considered threatened in any way as a result of the activities of the current group of commercial operators.

APPENDIX 6 CATCH AND EFFORT TRENDS FOR THE KIMBERLEY GILLNET AND BARRAMUNDI FISHERY

Graph 20: Total commercial catch, effort and CPUE for barramundi in the Kimberley Gillnet and Barramundi Fishery



Graph 21: Total commercial catch, effort and CPUE for threadfin salmon in the Kimberley Gillnet and Barramundi Fishery

