Proposals for community discussion

A QUALITY FUTURE FOR RECREATIONAL FISHING IN THE PILBARA/KIMBERLEY

A FIVE-YEAR DRAFT STRATEGY FOR MANAGING
THE RECREATIONAL COMPONENT OF THE CATCH

by the Pilbara/Kimberley Recreational Fishing Working Group

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FOREWORD

The Pilbara/Kimberley Region between Onslow and the Northern Territory/Western Australian border offers a wide range of recreational fishing opportunities in near pristine environments. River and creek systems, beaches and an offshore environment host both demersal species and game fish, making the Pilbara/Kimberley Region different to any other region in WA.

With a growing population and advances in technology, fishing pressure will continue to grow and anglers will become more efficient at targeting fish - particularly offshore demersal species, such as tropical snappers and emperors.

There is also a clear need for recreational fisheries management to complement the existing management arrangements for the charter industry, and provide the necessary framework for recreational fishing to be incorporated into an integrated management framework with other fishing sectors.

Before catch allocations can be managed under an integrated management framework, it is first necessary that effective sectoral management arrangements are in place. Some fisheries are not highly managed (e.g. finfish) and a move to a higher level of management is essential for both the commercial and recreational sectors.

To complement the regional recreational fishing strategies, a corresponding review of the unmanaged components of the commercial finfish sector ('wetline') is also planned to ensure the effective management of the commercial catch.

To manage the recreational component of the catch and help protect the future quality of recreational fishing in the Pilbara/Kimberley, representatives from the Department of Fisheries, Recreational Fishing Advisory Committee (RFAC), Regional RFACs (RRFAC), Recfishwest, and Volunteer Fisheries Liaison Officers (VFLO) met to develop the basis of a fishing strategy for the region.

This strategy was then further developed through consultation with Regional RFACs and stakeholder groups. Community comment is now being sought on the draft management proposals. All submissions will be carefully considered before final recommendations are submitted to the Minister for Fisheries for his consideration.

I would encourage anyone who has an interest in the future of recreational fishing in the Pilbara/Kimberley Region to carefully consider these proposals, which are aimed at maintaining or improving the quality and diversity of the region's recreational fisheries.

Your comments, ideas and support for this essential step forward in improving the management of recreational fisheries on the Pilbara/Kimberley are needed - the future depends on you.

DOUG BATHGATE
CHAIRMAN
RECREATIONAL FISHING ADVISORY COMMITTEE

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SUMMARY OF PROPOSALS

Proposal 1 - Key principles for management

It is proposed that recreational fisheries management in the region be based on the following key principles which were endorsed during the Gascoyne and West Coast planning processes:

Government should ensure adequate funding is available for comprehensive research and management necessary for the effective management of recreational fishing.

Western Australia's recreational fishing resources are a highly valued community asset. To protect the future quality of recreational fishing, it is essential that the Government ensure adequate funding is allocated for effective management.

A key aim should be to ensure that the biodiversity of fish communities and their habitats, and sustainability of fish stocks, are preserved.

Management arrangements should take into account the biological characteristics of different species, their abundance, and the level of fishing pressure, being exerted upon them. Fisheries management should therefore encourage fishing across a range of species, permitting a higher take of more robust species, and limit the take of more vulnerable species. Management arrangements must also be revised to account for increasing recreational fishing pressure.

Fisheries management should incorporate controls and measures that cover and anticipate increasing numbers of recreational fishers and their impact on fish stocks.

In the past, management has tended to react to problems as they arise. Management arrangements must recognise projected increases in fishing pressure, as well as impacts of planned developments in the region, which may increase the number of visitors or focus fishing pressure in certain areas.

As new information from research becomes available on biology or stock status, management arrangements should be modified accordingly.

Management should be based on the best available information, and where critical information is unavailable, a precautionary approach which seeks to minimise risk to fish stocks should be adopted.

The concept of precaution requires management authorities to take pre-emptive action where there is a risk of severe and irreversible damage to fish resources and the environment. In a situation of high potential risk and a lack or inadequacy of information, the concept of precaution requires the onus of scientific proof to be on those who intend to draw benefits from the resource and contend that there is no risk.

This contrasts with the existing situation where the Department of Fisheries may be subject to intense scrutiny to justify conservative management decisions which are based on limited available research.

Fishing rules should acknowledge that equitable access to fishing opportunities across recreational user groups is important.

There is a wide range of recreational user groups who may have different values or requirements. These include local residents, visitors, boat fishers, shore-based fishers, charter boat clients, spearfishers, netters, gamefishers seeking 'trophy' fish or fishers seeking a wilderness type experience to which a pristine environment may be as important as fishing quality.

A growing number of recreational fishers focus on quality and enjoyment of fishing and retaining a fish or two as a fresh feed, rather than accumulating large quantities of fish. The values of non-consumptive users of this resource, such as recreational divers, and passive users, should also be recognised.

Fishing rules must endeavour to address the relative impacts of users on an equitable basis and that equity should be based on principles of ensuring 'fair and reasonable' access to the resource.

The value of recreational fishing should be clearly recognised and given proper weight in all government and community planning processes, for example, Marine Parks, industrial developments and agricultural developments on the Ord River.

The value of recreational fisheries must be recognised by the community in terms of both social and economic benefits. It is important that recreational fishing is documented as a legitimate use of fish resources and is given due consideration in marine planning and catchment planning processes. Any development must be considered in terms of its potential impact on the aquatic environment and on the quality of recreational fishing.

Fishing rules should be kept simple, and where possible and practical, made uniform across the region.

Management strategies must be simple enough to be understood by the large numbers of occasional fishers and visitors to the region, while providing for effective conservation of the resource. Where possible, management arrangements should be consistent throughout the region.

Recreational fishing rules should be designed to protect the sustainability of stocks and manage the total recreational catch, as well as protect fish at vulnerable stages in their life cycle, for example, spawning aggregations.

Existing management arrangements do not currently place a ceiling on the total recreational catch. In face of increasing recreational effort, it will become necessary for the total catch to be managed to ensure sustainability of stocks and preserve fishing quality. It is essential that recreational fishing is managed in a spirit of cooperation with the community, and the development of new management for the recreational fishery must take into account community attitudes and values. This needs to be also reflected in commercial fisheries management.

The benefits from management of the total recreational catch should flow back to the recreational sector and be reflected in maintained or improved fishing quality and sustainability.

Management arrangements must be put in place to ensure that benefits in recreational fishing quality accruing from controls on the recreational take do not simply flow instead to the commercial sector. Currently, in all Western Australian fisheries, there is no mechanism to manage to total take of all sectors of the fishery.

Clear processes should exist to resolve resource sharing issues which support the integrated management of fish stocks.

It is outside the scope of this review to adequately resolve resource sharing and allocation issues. A clear process should be developed by Government as a matter of priority to resolve issues of this nature. This will assist in protecting the future quality of recreational fishing and ensure equity in catch as determined by Government policy.

Proposal 2 – Major catch survey

A major recreational catch survey be undertaken every three years to provide detailed information about the spatial and temporal distribution of recreational activity and catches on which to base management decisions.

As a subset on an annual basis, information should be collected on indicator species and areas to monitor recreational fishing quality.

Proposal 3 – Structured logbook program

The Department of Fisheries introduce a structured angler logbook program in the Pilbara/Kimberley Region for key species in specific regional areas. The logbook program needs to be tightly controlled by the Department of Fisheries with regular feedback to logbook participants.

Department of Fisheries' Research Division advice

- The collection of ongoing catch data is of concern, particularly as commercial participation in coastal fisheries is in decline. The development of a structured logbook program run in conjunction with creel surveys may assist in providing useful catch and effort data. The structured logbook program would need to be accompanied by a species identification guide to ensure proper identification of key species such as the different cod and trevally species. Other forms of data collection such as phone surveys may also need to be considered.

Proposal 4 – Priority species for research

Research should be undertaken on the following key recreational species in the Pilbara/Kimberley (in order of priority) to provide information on species biology and stock structure. Predictive fisheries stock assessment models and, where practical, indices of recruitment, are to be developed for these key species:

	Research status			
Species	**Biology**	**Stock assessment**	**Exploitation status**	**Breeding stock level**
Tropical emperors	Limited	N/A	N/A	N/A
Tropical snappers e.g. mangrove jack, fingermark bream	Limited	N/A	N/A	N/A
Giant and golden trevally	Limited	N/A	N/A	N/A
Threadfin salmon	Limited	N/A	N/A	N/A
Tuskfish	Yes	N/A	N/A	N/A
Cherabin	N/A	N/A	N/A	N/A
Mud crabs	Yes	N/A	N/A	N/A
Blue manna crabs	Yes	N/A	N/A	N/A
Estuary cod	Limited	N/A	N/A	N/A
Spanish mackerel	Yes	Yes – Commercial catch only	Fully exploited	Adequate
Sailfish	Limited	N/A	N/A	N/A
Coral trout	Limited	N/A	N/A	N/A
Barramundi	Limited	Yes - Commercial catch only	Fully exploited	Adequate

(note: N/A indicates where data in this table is Not Available)

Department of Fisheries' Research Division advice

- Knowledge of the biology of barramundi is limited in WA, although in other parts of northern Australia, a considerable amount of information is available.
- Research into the biology of mangrove jacks, estuary cods and threadfin salmon is currently in progress.
- Funding applications have been submitted to undertake research work on coral trout, fingermark and other tropical snapper species.
- Research on the biology of tuskfish has just been completed.

Proposal 5 – Fishing quality indicators

A range of 'fishing quality indicators' based on angler surveys should be developed to identify trends in fishing quality in the region and assist in the review of the effectiveness of this strategy.

These indicators should cover fishing quality, diversity and the value associated with the fishing experience.

It is proposed that the following species be used as key indicator species:

	Environment where species is most often found			
Indicator species	**Creeks**	**Near shore**	**Offshore demersal**	**Offshore pelagic**
	Barramundi	Threadfin salmon	Red emperor	Spanish mackerel
	Mangrove jack	Fingermark	Blue lined emperor	Sailfish
	Sooty grunter	Mulloway	Trevally	Cobia
	Mud crabs		Coral trout	
	Cherabin		Tusk fish	
			Rankin and estuary cod	
			Impact of sharks on line-caught fish	

Department of Fisheries' Research Division advice

- Catch and effort information has been gathered for the coast between Onslow and Broome. However, no recreational catch data exists for the coast between Broome and the NT Border. This represents a gap in our understanding of catch and effort in this area.

Bag and Size Limits

Proposal 6 – Bag and size limits

Category 1 Fish – *total mixed daily bag limit of 7*

Category 1 Fish are considered to have the highest risk of overexploitation. Many fish in this category have low catch rates and levels of abundance, while others may be highly valued for their fishing and eating qualities. Many Category 1 Fish are slow growing and mature at four years plus. For these reasons, Category 1 Fish require a high degree of protection.

(Note: *denotes proposed change to current management)

Species	Species bag limit	Size limit	Other controls
Barramundi Note: State-wide possession limit of 2. It is proposed that the possession limit of 1 in the Ord River be increased to the State-wide possession limit of 2	2	550mm	Max. size 800mm*
Billfish (sailfish, swordfish, marlins)	1*		
Cobia	2*	600mm*	
Cod – combined Within this bag limit you may not have more than 2 Rankin, Estuary or Malabar cod	4		Max. size 1000mm*
Coral trout and coronation trout (combined)		450mm	
When taken south of the De Grey River	2*		
When taken north of the De Grey River	1*		
Emperors – spangled, blue-lined and NW snappers (combined)	4*	410/ 320/ 280mm	
Mackerel – shark	4	500mm	
Mackerel – Spanish, broad and narrow-barred	2*	750/900mm	
Mackerel – wahoo	2*	900mm	
Mahi mahi	4	500mm	
Mangrove jack		300mm	
When taken south of the De Grey River	2		
When taken north of the De Grey River	4		
Mulloway – northern	2*	700mm*	
Parrot fish	4*		
Pearl perch	4*		
Pink snapper	4*	410mm	
Red emperor	2*	410mm	
Samson fish/Amberjack/yellowtail kingfish (combined)	2*	600mm	
Sharks and rays (combined)	2*		
Scarlet, crimson, saddle tail seaperch (combined)	2*	300mm*	
Threadfin salmon – giant	2*	450mm*	
Tripletail	4*	300mm*	
Tuna – south, north bluefin, yellowfin, bigeye and dogtooth	2*		
Wrasse (including. baldchin groper and tuskfish)	2*	400mm	

Department of Fisheries' Research Division advice

- Different catch rates for mangrove jack and coral trout in the region may be due to variances in fishing pressure, rather than abundances in fish stocks. Consideration needs to be given to the appropriation of a split bag limit for these species.

Category 2 Fish – *total mixed daily bag limit of 16*

Category 2 Fish have a moderate risk of overexploitation. Many fish in this category have moderate catch rates and levels of abundance. Category 2 Fish are mostly found in inshore and estuarine areas, are highly sought after by recreational fishers and mature at three to four years.

(Note: *denotes proposed change to current management)

Species	Species bag limit	Size limit	Other controls
Barracuda	4*		
Bonefish and giant herring (combined)	4*		
Bonito and tunas – (other)	8		
Bream – north-west and yellowfin (combined)	8*	250/350mm*	
Catfish, freshwater (silver cobbler)	8*		
Catfish, salmon	8*		
Flathead and flounder (combined)	8*	300/250mm	
Goatfish	8*		
Javelinfish and sweetlips (combined)	8*	300mm*	
Leatherjacket	8*	250mm	
Mackerel – Queensland school and spotted (combined)	4	500mm	
Queenfish	4		
Snook and pike (combined)	8*	300mm	
Sooty grunter	8*	250mm*	
Tarwhine	16*	230mm	
Threadfin-bream	8*		
Threadfin salmon – other species (combined)	4		
Trevally (combined)	4		
Tropical seaperch and snappers – (other *Lutjanus* species)	4	300mm*	

Baitfish of the sardine, anchovy and hardyhead families (*Clupeidae*, *Engraulididae* and *Atherinidae* - mulies, whitebait, scaly mackerel, anchovies, hardyheads) are not included in Category 3. For these species, it is proposed to have a combined bag limit of nine litres.

It is proposed mullet be treated the same as garfish and removed from the general finfish possession limit. The daily bag limit of 40 mullet would still apply.

Category 3 Fish – *total mixed daily bag limit of 40*

Category 3 Fish have a lower risk of overexploitation. Fish in this category generally have higher catch rates and levels of abundance and are mainly found inshore. These fish have a widespread distribution and mature at two-plus years. Category 3 Fish include all fish not listed in other categories except baitfish of the sardine, anchovy and hardyhead families (*Clupeidae*, *Engraulididae* and *Atherinidae*), redfin perch, gold fish, carp and tilapia.

(Note: *denotes proposed change to current management)

Species	Species bag limit	Other controls
Dart Garfish Longtom Milkfish Mullet, sea and yellow-eye Whiting	40 combined	
Unlisted species - (all species not specified except baitfish and feral freshwater species)		

Crustaceans

(Note: *denotes proposed change to current management)

Species	Bag limit	Other controls
Cherabin	9 litres	Gear controls
Crab, blue swimmer (manna)	20*	Boat limit of 40* size limit, gear controls
Crab, mud	5*	Boat limit of 10* size limit, gear controls
Prawns, school and king (combined)	9 litres	
Rock lobster	4*	Boat limit 8 Recreational licence required. Note: Proposal to lift night time fishing ban

Molluscs and other reef animals

(Note: *denotes proposed change to current management)

Species	Bag limit	Other controls
Cockles	9litres	
Mussels	9 litres	
Oysters	9 litres*	
Razorfish	20*	
Scallops	20*	
Sea urchins	20*	
Squid, cuttlefish and octopus (combined)	15	Boat limit of 30
All other species of edible mollusc not specifically mentioned (combined)	2 litres	

Proposal 7 - Proposed changes to the current legal size limits

Note: Any changes to the size limit will apply to all sectors including commercial fishers.

Species	Old size (mm)	New size (mm)	Size when 50% of the stock reach maturity (mm)
Barramundi		800 (max)	Change sex to females at around 800
Cobia		600	not known
Cod	1,200 (max)	1,000 (max)	May change sex from female to male
Mahi mahi (dolphin fish)		500	not known
Mulloway, northern	500	700	750
Sooty grunter		250	not known
Threadfin salmon - giant		450	not known
Tripletail		300	not known
Yellowfin bream	250	350	Change sex to males at around 350
Other tropical sea perches and snappers eg: Spanish flag, Moses perch and crimson seaperch		300	not known
Mud crabs	150 (green) 120 (brown)	150 for both	A size limit of 150mm will ensure they breed at least once before being taken

Department of Fisheries' Research Division advice

- Tuskfish (Labrids), cods (Serranids) and some bream (Sparids) are hermaphrodites, i.e. they change sex at a certain size or age. For these species, it is critically important the minimum legal length is greater than the length at which they change sex. For yellowfin bream, the current minimum legal length of 250 mm needs to be above 350 mm, the length at which 50 per cent of females become males. As the biology of more species becomes known, additional changes may be required to the minimum legal size length for some species.

Proposal 8 - Totally protected fish

Due to low abundance levels and vulnerability to over fishing, the following species should be totally protected:

- Freshwater sawfish (*Pristis microdon*) Note: this species may be an important food source for Indigenous people and further consultation will need to occur with this group prior to any decision to classify the freshwater sawfish as a totally protected species.
- Speartooth shark (*Glyphis sp.*)
- Queensland groper (*Ephinephelus lanceolatus*)
- Barramundi cod (*Cromileptes altivelis)*
- Baler shells (*Melo sp.*) - proposed prohibition on the collection of live shell.

Proposal 9 - Haul net fishing

Comment is being sought on two proposals, these being:

9(a) The use of haul nets be prohibited in the Pilbara/Kimberley Region.

9(b) Haul netting be allowed in defined areas with the following conditions:

- Maximum length of haul net to be 30m; and
- Mullet be the only species permitted to be retained.

Due to the potential impact of haul nets in river and creek systems, permitted areas will only be considered in 'ocean waters'.

Proposal 10 – Red claw traps in Lake Kununurra

Due to the number of red claw in Lake Kununurra, a structured gear trial should be undertaken to access the viability of using rigid traps to allow the take of red claw. The gear trial should be supervised by the Department of Fisheries and involve members of the East Kimberley RRFAC.

Proposal 11 – Fishing competitions

11 (a) All fishing competitions with greater than 50 participants must formally register in advance with the Department of Fisheries.

11 (b) Competition organisers be required to keep an accurate record of the participation, catch and effort in each competition and forward catch returns to the Department of Fisheries for inclusion in the recreational fisheries database. If possible, information should be entered in an electronic format compatible with the recreational fishing database.

11 (c) To ensure fishing competitions are conducted in line with recreational fishing ethics and meet requirements under the Animal Welfare Bill, a formal code of conduct for fishing competitions should be developed by the Department of Fisheries in consultation with fishing clubs and organising bodies.

Proposal 12 - Recreational fishing priority areas

The importance of recreational fishing as a component of tourism and lifestyle should be recognised in the Integrated Management Planning Process.

Through this process, the following areas should be considered for the priority management of recreational fishing:

- Ord River;
- King Sound;
- Inshore waters and creeks around Broome;
- Dampier Archipelago;
- Montebello Islands;
- Fitzroy River;

- Keep River near Kununurra (joint management arrangements should be developed with Northern Territory Fisheries, as this river is located within the borders of the NT);
- Cambridge Gulf;
- Rowley Shoals;
- Buccaneer Archipelago;
- Cape Keraudren;
- De Grey River;
- Cape Lambert to Reef Island (Sherlock Bay);
- Nickol Bay to Cape Lambert (crabs, barramundi, threadfin salmon); and
- Offshore island groups in the Pilbara.

Proposal 13 – Code of conduct for accessing pastoral and mining leases and Aboriginal land

A code of conduct should be developed for recreational fishers accessing fishing locations through pastoral and mining leases and Aboriginal land. The code should be developed in consultation with land owners/lease holders, and should contain the following elements:

- Any fish frames or offal are removed, dumped in the ocean or buried.
- All gates which are found shut must be left shut.
- No standing trees or shrubs are to be cut down for firewood.
- All human waste must be buried at least 50m from any watercourse.
- Under no circumstance should any fences be cut or interfered with.
- Leave no rubbish behind.
- Any machinery or equipment that is the property of the station owner should not be interfered with.
- Aboriginal land can only be entered with the approval of the Aboriginal land owners.
- People should not camp within 200m of any watering point to avoid disturbing stock.
- Firearms or dogs should not be taken on to stations without the approval of the station owner.

Proposal 14 – Access to pastoral and mining leases and Aboriginal land

Each Regional RFAC should enter into negotiations with owners/leaseholders to define access route to fishing locations. These routes and the code of conduct should be supported and promoted by the Department of Fisheries in advisory material.

Proposal 15 - Stock enhancement

15(a) Should a proposal to restock Lake Kununurra with barramundi prove both feasible and environmentally acceptable, support should then be provided for a restocking program.

15(b) A study should be undertaken to examine the feasibility and environmental acceptability of stocking Harding Dam with barramundi.

Proposal 16 - Resource sharing

As a priority, the following species should be considered for total catch management under an integrated management framework:

- Northern demersal species;
- Mackerel;
- Barramundi;
- Threadfin salmon; and
- Blue swimmer crabs.

For each species, a forum should be held with key stakeholders including recreational, commercial, Indigenous and conservation groups, to identify key issues that need to be taken into consideration in the development of an integrated management plan for the Pilbara/Kimberley Region.

Proposal 17 – Low impact wilderness fishing experiences

That the following areas be managed on a trial basis as remote wilderness fishing area:

- ` Kalumburu;
- Dampier Archipelago;
- Fortescue River to Robe River;
- Cockatoo Island to Wyndham; and
- Highly valued ‘wild rivers’ that are pristine in nature. These rivers should be considered as fish habitat protection areas and closed to commercial fishing.

The following guiding principles should be used for the management of fishing in the wilderness area:

- Low take;
- Low environmental impact; and
- A code of practice should be developed for recreational fishing in the area.

Proposal 18 - Pilbara/Kimberley Region community education plan

A recreational fisheries community education plan should be developed for the Pilbara/Kimberley Region, which focuses on the most important issues and species in the

region. Such a plan should seek to keep the recreational fishing community informed of management decisions, give a clear lead on the values and attitudes that will assist in sustaining fish stocks, and develop a broad community recognition of the value of recreational fishing.

As a minimum, the plan should contain the following elements:

18(a) Regional fishing guide
A comprehensive regional guide to recreational fishing in the Pilbara/Kimberley Region be produced to inform and educate fishers about recreational fishing management arrangements, fishing ethics, research, conservation issues and promoting stewardship for fish stocks and the environment.

18(b) Educational resource materials
Adequate quantities of practical educational tools such as measuring gauges, fish rulers, adhesive bag limit guides and boat ramp and fishing venue signs should be produced to support the regional fishing guide.

18(c) Annual media campaign
An annual media campaign be implemented to promote recreational fishing and fishing ethics in the region.

18(d) Volunteer involvement in education
Encourage the establishment and development of volunteer groups in structured fisheries education activities across the region.

Proposal 19 – Additional patrol capacity

That an additional three patrols (six fisheries officers) be dedicated to recreational field compliance and education activities during peak fishing seasons in the Pilbara/Kimberley Region.

These resources should be allocated to:

- *Karratha:* One additional patrol crew to service peak season fishing compliance needs in the Dampier Archipelago and south to Onslow.
- *Broome:* One additional patrol crew to be based in Broome and service the area between 80 Mile Beach and Derby.
- *Kununurra:* One additional patrol crew to be based seasonally in Kununurra and provide service south to Wyndham.

Proposal 20 – Volunteer Fisheries Liaison Officer (VFLO) program

That the VFLO program be established in all key regional centres in the Pilbara/Kimberley Region.

Proposal 21 – Regional fishing management officer

The appointment of a specific person to coordinate the implementation of the Pilbara/Kimberley Regional Review and to assist with the development of integrated fisheries management plans for key fisheries in the region.

SECTION 1 PLANNING FOR THE FUTURE

1.1 Managing for the future - Why have a Regional Management Strategy?

Prior to 1989, a limited set of management measures were in place for recreational fishing. With an increase in fishing participation, greater ownership of boats, 4WD vehicles and increased leisure time, it was time to reassess the management of recreational fishing to ensure that the quality of WA's fisheries were maintained and fish stocks were sustainable.

It was for these reasons that the first comprehensive management framework was developed by the Recreational Fishing Advisory Committee (RFAC) during a two-year review between 1989 and 1991. The result of the review was a framework for the management of recreational fishing, which achieved community consensus.

Major outcomes from this review were:

- A State-wide set of daily bag and size limits for all fish species be developed.
- The establishment of a Recreational Fishing Trust Fund into which revenue from species-based recreational fishing licences flowed.
- The establishment of specific management, research and community education programs for recreational fishing; and
- The creation of a network of State and Regional Recreational Fishing Advisory Committees.

This review was the first of its kind in Australia and established a new benchmark in recreational fisheries management.

Now, more than 10 years on, we have seen significant change occur in WA's recreational fisheries. There are now approximately 600,000 people fishing in WA, compared with 284,000 in 1987. There have been advances in angler efficiency through improved technology, and greater pressure has been placed on limited fish resources from competing users.

With more pressure on our fish resources, a range of different fisheries issues has arisen in different parts of WA. This initiated the need for the development and implementation of modified management arrangements for specific areas and species.

This led to fisheries management becoming increasingly reactive between 1992 and 1995, with resources focused on dealing with problems as they arose.

The choice for managing our recreational fisheries resources was either to continue with the same management approach and see a gradual decline in the quality of recreational fishing, or to proactively manage resources for the future.

1.2 The regional management approach

A solution to protecting the future quality of recreational fishing was developed by the Recreational Fishing Advisory Committee and the Department of Fisheries. The solution revolves around the development of four regional management strategies for the State. These strategies incorporate a detailed planning process capable of developing better targeted and more flexible responses to key management issues.

The basis for a more regional approach to recreational fisheries management was an acknowledgment of the natural complexity and diversity of WA's marine life and environments, and a clear need to better link management to the biology and distribution of both fish stocks and fishing activity. In other words, building effective management from the biological characteristics of resource upwards, rather than simply imposing human social values on fish.

Key issues this strategy will address include: localised stock depletion, scientific research, managing the recreational catch, community stewardship and resource sharing.

Licensed recreational fisheries such as the rock lobster fishery already have in place substantial management arrangements to protect the sustainability of these stocks. The area of greatest need for management is our marine finfish stocks, and consequently, this is the focus for the recreational strategy.

The recreational fishing strategy for the Pilbara/Kimberley Region covers the area from just south of the Ashburton River near Onslow to the NT/WA border and includes all marine, estuarine and freshwater environments.

A key element in the regionalised approach is to simplify legislation where possible and provide a more uniform set of rules across each region. However, this does not preclude the establishment of smaller management zones.

The recreational fishing management regions (Figure 1) are:

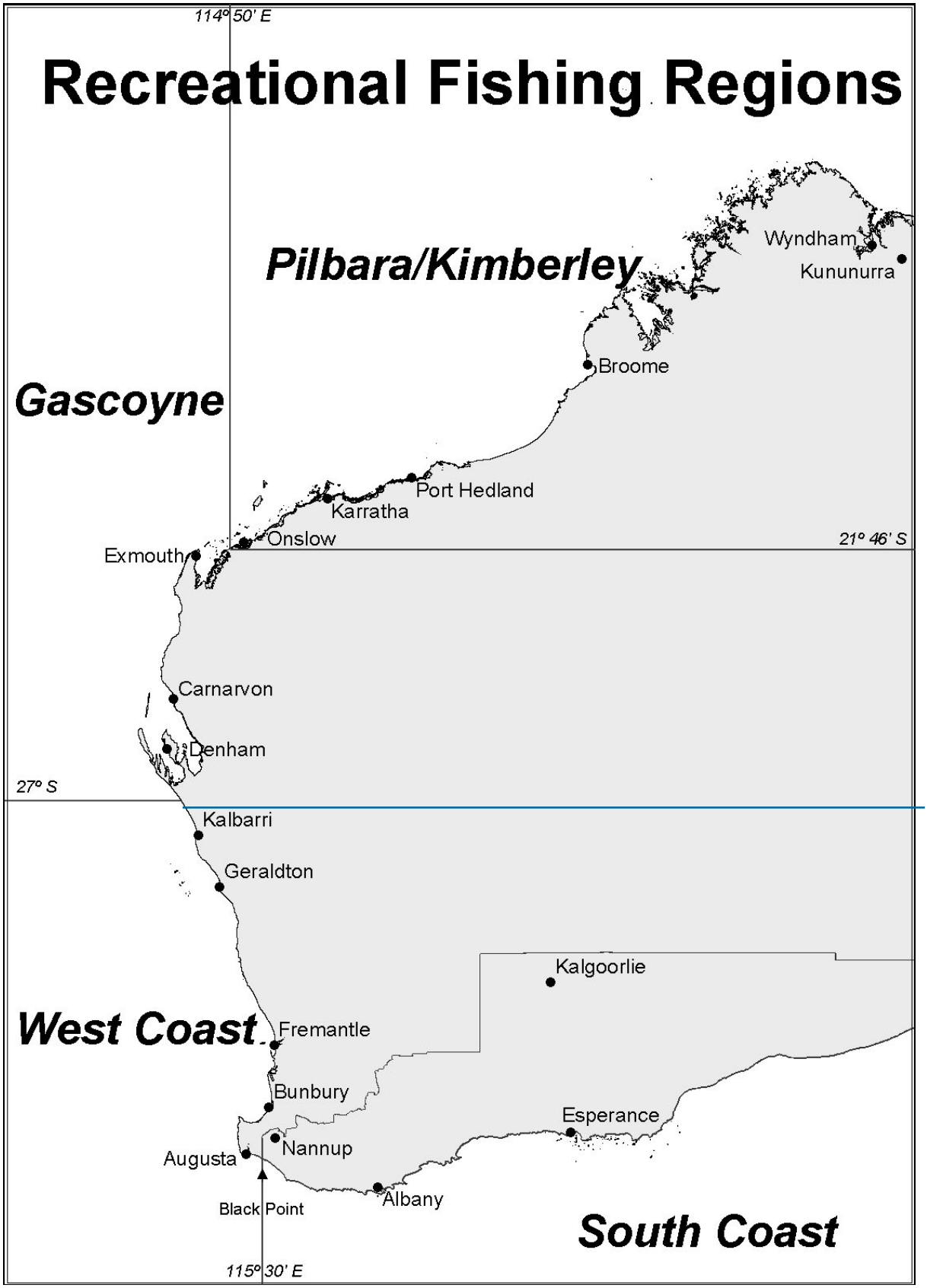
Zone 1: ***Pilbara/Kimberley*** – All land and WA waters east of 114° 50' E longitude (approximately 4nm south of the mouth of the Ashburton River), and north of 21°46' S latitude.

Zone 2: ***Gascoyne*** – All land and WA waters north of 27° S longitude (Zuytdorp Cliffs - between Kalbarri and Steep Point), excluding the Pilbara/Kimberley Region.

Zone 3: ***West Coast*** - All land and WA waters south of 27° S longitude (Zuytdorp Cliffs - between Kalbarri and Steep Point), excluding the South Coast Region.

Zone 4: ***South Coast*** - All WA waters off the southern coast of WA east of 115° 30' E longitude and all land east of 115° 30' E longitude in the cities of Albany and Kalgoorlie-Boulder*;* and the shires of Boyup Brook, Bridgetown-Greenbushes, Broomehill, Coolgardie, Cranbrook, Denmark, Dumbleyung, Dundas, Esperance, Gnowangerup, Jerramungup, Katanning, Kent, Kojonup, Kondinin, Kulin, Lake Grace, Manjimup, Nannup, Plantagenet, Ravensthorpe, Tambellup and Woodanilling.

Figure 1 Regional Map



From a biological perspective, the boundaries of these regions are largely consistent with, or represent sub-sections of, the major bio-geographic regions, coastal and climatic zones of Western Australia, and consequently the distribution of many fish species. This will improve the effectiveness of fishing controls based on species biology such as size limits and closed seasons, and enable bag limits to be tailored according to the target species and fishing pressures in each region.

These zones also coincide with discrete tourism regions of the State, and visitor fishing activity tends to focus on these areas during identifiable seasons. This will reduce perceptions of inequity when setting differential fishing management arrangements, and provide clear demarcation lines.

The rationale behind the development of a bio-regional management approach is provided in more detail in Fisheries Management Paper No. 136 (Management Directions for WA's Recreational Fisheries).

1.3 Terms of reference

1.3.1 Terms of reference of the review

- To identify the key issues and development opportunities facing recreational fishing in the Pilbara/Kimberley Region.
- To prepare a draft five-year recreational fishery management strategy for the region, consistent with the strategic directions identified in the Labor Party Fisheries Policy and Recreational Fisheries Program Business Plan.
- To identify management and resourcing needs, and possible funding strategies, for implementation of the plan.
- To conduct extensive public consultation, including key stakeholders.
- To make final recommendations to the Minister for Fisheries for the management of recreational fisheries over five years within that region.

1.4 How to have your say

The release of this discussion paper for public comment provides an opportunity to provide further information for you to express your opinion on how recreational fisheries should be managed in the Pilbara/Kimberley Region. Whether you agree or disagree with the various proposals, it is equally important to respond as the Working Group will review each of these proposals in light of the comments received.

1.4.1 Points to consider for submissions

To ensure your comments are as effective as possible, please:

- Clearly and briefly describe each separate subject you wish to address.
- Refer to the different section numbers/proposals/page numbers in the paper.
- Tell us whether you agree/disagree with any or all of the proposals or issues identified in each section.
- Suggest alternative ways to resolve any of the issues you have raised.

1.4.2 How to make a submission

Written

- Clearly and briefly describe each separate subject you wish to address.
- Refer to the different section number/proposals/page numbers in the paper.

Questionnaire

- Responses can also be made by completing the enclosed questionnaire in a 'mark the box' format.
- Additional copies of the questionnaire are available from the Department of Fisheries, and the Department's website at **www.fish.wa.gov.au**

For further information, contact the Department of Fisheries:

Telephone: (08) 9482 7333
e-mail: headoffice@fish.wa.gov.au

1.4.3 Where and when to send your submission

The closing date for submissions is **14 October 2004**. Please send your submission along with your full name, address and association details (if applicable) to:

Executive Officer
Pilbara/Kimberley Review
c/- Recreational Fisheries Program
Department of Fisheries
Locked Bag 39
Cloisters Square Post Office
PERTH WA 6850

Fax: (08) 9482 7218
e-mail: nharrison@fish.wa.gov.au

1.4.4 What happens to your submission

All submissions are confidential and will be reviewed only by a committee consisting of members from the Department of Fisheries, RFAC, Regional RFACs and Recfishwest. After consideration of submissions, final recommendations will be forwarded to the Minister via RFAC.

The recommendations approved by the Minister for Fisheries will form the basis of a new management package for recreational fishing in the Pilbara/Kimberley Region.

SECTION 2 FISHING IN THE PILBARA KIMBERLEY REGION

2.1 Profile of fishing in the Pilbara/Kimberley

The Pilbara and Kimberley regions have historically experienced the lowest fishing pressure in WA, with boat fishing focused around major population centres, such as Karratha/Dampier, Port Hedland and Broome.

In recent years, significant growth in recreational fishing activity has become apparent with a booming fishing-based tour and eco-tourism industry based around the region's reputation as remote and pristine.

Creek systems, mangroves, rivers and ocean beaches provide shore and boat fishing for a variety of marine and freshwater species, including barramundi, tropical emperors, sea-perches, trevallies, sooty grunter, threadfin, mud crabs and cods.

The Ord and Fitzroy rivers are two of the State's largest river systems that are highly valued by both visiting and local fishers. Both river systems are relatively easy to access and are focal locations for recreational fishers pursuing barramundi.

Offshore islands, coral reef systems and continental shelf waters provide species of major recreational interest, including many members of the demersal seaperch family (*Lutjanidae*), such as scarlet seaperch and red emperor, cods, coral and coronation trout, sharks, trevally, tuskfish, tunas, mackerels and billfish.

Recreational fishing activity shows distinct seasonal peaks, with the highest number of visitors during the winter months (dry season). Fishing pressure is also concentrated around key population centres. An estimated 6.5 per cent of the State's recreational fishers fished marine waters in the Pilbara/Kimberley during 1998/99, while a further 1.6 per cent fished in freshwater in the region.

A survey commissioned in 1995/96 by the East Kimberley Recreational Fishing Advisory Committee and the Kimberley Development Commission showed the importance of recreational fishing in the Kununurra area (Kewagama Research, 1996).

The 12-month survey indicated that 50 per cent of respondents participated in recreational fishing, reporting an average of 19.6 days per angler fishing in the past 12 months, with a mean annual expenditure of $821 per angler. A total effort of 34,500 fishing days was estimated for the east Kimberley Region, and a total expenditure of $1.1 million.

Fishing charters and fishing tournaments are also growth areas in the region, and have increased in popularity over the past five years or so. The Dampier Classic and Broome sailfish tournaments are both State and national attractions, and WA is gaining an international reputation for the quality of its offshore pelagic sport and game fishing.

Major issues include the maintenance of water quality and levels in the Lower Ord River, control of illegal fishing in remote areas, management of the charter industry and competition with the commercial sector.

A significant opportunity exists for the enhancement of barramundi stocks in the Kununurra area as a drawcard for sportfishing tourism. Since the Ord River was dammed around 30 years ago, the upstream migration of juvenile barramundi, from estuarine spawning grounds, has effectively ceased. A feasibility study is currently underway to determine if the restocking of barramundi into Lake Kununurra could be achieved through the construction of a 'fish way' to allow upstream migration.

2.1.1 Economic impact of fishing

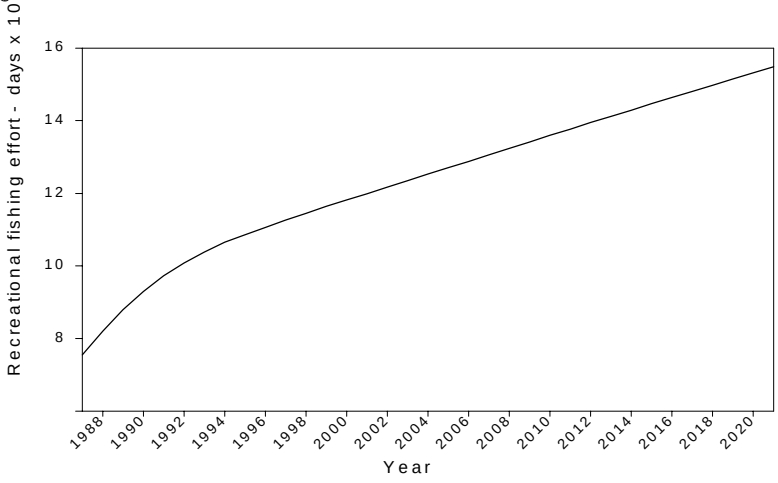
In 1991, Economic Research Associates (Lindner, R. and McLeod, P., 1991) undertook a survey of participation and expenditure patterns of recreational fishers in WA. This survey estimated that recreational fishing activity had a direct expenditure of $205 million in 1989/90, and indirect impact of $184 million, giving an aggregate impact of $389 million and an employment impact of 5,700 full-time jobs.

The State economic impact was updated by a repeat survey in 1998, based on a State population of 1.755m and a participation rate of 36 per cent. Direct expenditure associated with recreational fishing was estimated at of $299 million in 1995/96, giving an aggregate impact of $569 million and an employment impact of 7,000 full-time jobs.

2.1.2 Participation and effort - how many people fished where

With an increase in recreational fishing participation from 287,000 people in 1987 (ABS, 1987) to 598,819 people in 2003 (Baharthah and Sumner), future population growth could lead to significant increases in recreational fishing pressure. Based on projected population growth, projected increases in recreational fishing effort are represented in Figure 2.

Figure 2 Future projection of recreational fishing effort



2.1.3 Assumptions

- The mean number of days fished per recreational fisher is 18 per year (Baharthah and Sumner, 1999).
- For the years 1987 to 1999, the participation rate was estimated by fitting a curve to the participation rates for 1987, 1994, 1997 and 1999. After 1999, the participation rate was assumed to be constant and was set to the rate of 0.34 estimated by Baharthah and Sumner (1999).
- The population projections were based on Australian Bureau of Statistics (1998).
- Note, while different survey methods provide different estimates of total recreational fishing effort, overall trends consistently show significant growth in recreational fishing activity over the last two decades.

2.2 Outcomes of the regional planning process to date

The Pilbara/Kimberley Regional Strategy is the third regional strategy to be undertaken. Recreational fishing strategies have already been completed for the Gascoyne and West Coast Regions.

The West Coast and Gascoyne planning processes have delivered three important outcomes which will have a bearing on recreational fisheries management in the Pilbara/Kimberley Region. These outcomes are:

- A new simplified three-tiered bag limit structure, which will be applied across the State.
- A general State-wide fish possession limit.
- A minimum fillet length for fish which have been processed at sea.

2.2.1 Bag limits

The three-tiered bag limit structure is based on a risk assessment of a species vulnerability to over fishing. Category 1 Fish are deemed to require the highest level of protection; Category 2 Fish require a moderate level of protection; and Category 3 Fish require a lower level of protection.

This three-tiered system of bag limits will be applied across the State. At the recreational fishing planning day in April 2003, it was proposed that the same overall mixed bag limits that apply for each category in the West Coast and Gascoyne should apply for the Pilbara/Kimberley and the South Coast. However, this does not preclude setting different mixed or species bag limits to adjust for fishing pressure and ecological differences between each region.

In summary, it is proposed that the following bag limit structure should be applied across the State.

- **Category 1 Fish**

Category 1 Fish are considered to have the highest risk of overexploitation. Many fish in this category have low catch rates and levels of abundance, while others may be highly valued for their fishing and eating qualities. Many Category 1 Fish are slow growing and mature at four years plus. For these reasons, Category 1 Fish require a high degree of protection.

- **Category 2 Fish**

Category 2 Fish have a moderate risk of overexploitation. Many fish in this category have moderate catch rates and levels of abundance. Category 2 Fish are mostly found in inshore and estuarine areas, are highly sought after by recreational fishers and mature at three to four years. Category 2 Fish include all fish not listed in other categories except baitfish of the sardine, anchovy and hardyhead families (*Clupeidae*, *Engraulididae* and *Atherinidae*), redfin perch, gold fish, carp and tilapia.

- **Category 3 Fish**

Category 3 Fish have a lower risk of overexploitation. Fish in this category generally have higher catch rates and levels of abundance and are mainly found inshore. These fish have a widespread distribution and mature at two-plus years.

2.2.2 Possession limit

The State-wide possession limit, which was endorsed as an outcome of the West Coast and Gascoyne planning processes, sets the maximum quantity of fish a person can be in possession of outside their place of permanent residence.

The State-wide possession limit for recreationally caught fish will apply on the following basis:

- 20 kg of fillets or pieces of fish; or
- 10 kg of fillet or pieces of fish plus one days bag limit of whole fish; or
- Two days' bag limit of whole fish.

2.2.3 Transporting and storing of fish

For the purpose of determining ownership, all recreationally caught fish which are being transported or stored must be labelled under the following circumstances:

- where fish are being commercially consigned or transported; or
- where more than an individual possession limit is stored in a container; or
- on premises involved in the commercial take, processing, transport, storage, sale or dealing with fish.

2.2.4 Filleting at sea

Statewide restrictions on filleting at sea were essential for the enforcement of minimum legal size and bag limits for high risk demersal species.

In summary, the following rules apply to *filleting at sea*:

- Category 1 and 2 fish can be filleted or trunked on trips to sea of any duration provided the fillet/trunk length is at least 30cm. Skin and scales must be left on the fillet/trunk.
- Category 3 fish can be filleted on trips to sea of any duration provided the skin is left on the fillet. No minimum fillet length applies for Category 3 fish.
- When staying overnight on islands, fillets of any length can be transported back to the mainland provided those fish have been landed on the island.

For specific details on filleting at sea, fishers should contact the Department of Fisheries.

2.3 The recreational catch and effort

2.3.1 Creel survey of recreational fishers

A 12-month creel survey of recreational boat-based and shore-based fishing in the Pilbara region of Western Australia was conducted between December 1999 and November 2000 (Williamson *et al*., in prep). The survey area incorporated the region from Onslow up to and including Broome. The preliminary estimates do not include the recreational catches obtained at Thevenard Island and Barrow Island, as these will be included in the research report which is being completed.

In summary, the total annual recreational fishing effort for the Pilbara region in 1999/00 was 190,000 fisher days. This comprised 109,000 fisher days by boats launched from public ramps, 23,000 fisher days by boats launched from beaches and 58,000 days by shore-based fishers.

The total recreational catch of all scalefish species for the region in 1999/00 was estimated at 300 tonnes, excluding charter vessel catches. This equates to approximately 12 per cent of the commercial demersal scalefish catch for this region of 2,311 tonnes during this same period. Spangled emperor, red emperor, barramundi, threadfin salmon species and mackerel species were taken by both the recreational and commercial sectors. For comparison, the commercial catch of these species has been quoted for the same year.

The important recreational species (in order of tonnages landed), which comprised 76 per cent of the total catch by weight, were as follows:

Trevally species: Trevally species (Family *Carangidae*) are predominantly recreationally caught. The estimated recreational catch of golden trevally (*Gnathanodon speciosus*) for the region was 12,000 fish kept (38 tonnes) and 16,300 released. A further 200 fish were estimated to have been eaten by sharks. Golden trevally was predominantly (62 per cent)

caught by boat-based fishers. Only nine tonnes (24 per cent) of the catch was taken from the Dampier Archipelago.

The estimated recreational catch of giant trevally (*Caranx ignobilis*) for the region was 2,300 fish kept (10 tonnes) and 10,600 released. All giant trevally were caught by boat-based fishers.

The estimated recreational catch of big-eye trevally (*Caranx sexfasciatus*) for the region was 2,800 fish kept (2 tonnes) and 1,700 released. All big-eye trevally were caught by boat-based fishers.

Narrow-barred Spanish mackerel and other mackerel species: In the region, all narrow-barred Spanish mackerel (*Scomberomorus commerson*) was caught by boat-based fishers. The estimated recreational catch for the region was 4,300 fish kept (30 tonnes). A further 1,200 fish were estimated to have been eaten by sharks. The commercial catch for the Pilbara region during 2000 was 105 tonnes.

Recreational fishers also caught 2,600 (three tonnes) Queensland school mackerel (*Scomberomorus queenslandicus*), 500 (three tonnes) broad-barred Spanish mackerel (*Scomberomorus semifasciatus*), 200 shark mackerel and 7,000 (eight tonnes) other mackerel species (*Scomberomorus sp.*). The commercial catch of other mackerel species for the same period was 27 tonnes.

Blue-lined emperor: Blue-lined emperor (*Lethrinus laticaudis*), also known as black snapper, is predominantly a recreationally-caught species. The estimated recreational catch for the region was 18,400 fish kept (22 tonnes) and 37,100 released. A further 300 fish were estimated to have been eaten by sharks. All blue-lined emperor were caught by boat-based fishers, and only four tonnes (19 per cent) of the catch was taken from the Dampier Archipelago.

Tuskfish: The estimated recreational catch of blackspot tuskfish (Choerodon schoenleinii) for the region was 7,700 fish kept (20 tonnes) and 17,200 released. Blackspot tuskfish was predominantly (81 per cent) caught by boat-based fishers. One quarter of the catch (25 per cent) was taken from the Dampier Archipelago.

The estimated recreational catch of blue tuskfish (*Choerodon cyanodus*) for the region was 700 fish kept (one tonne) and 3,822 released. All blue tuskfish were caught by boat-based fishers. There was also a small catch of purple (*Choerodon cephalotes*) and bluespotted tuskfish (*Choerodon cauteroma*).

Threadfin salmon species: Threadfin salmon species were predominantly recreationally caught. The recreational catch comprised blue threadfin salmon (*Eleutheronema tetradactylum*), giant threadfin salmon (*Polydactylus macrochir*) and northern threadfin salmon (*Polydactylus plebius*). The estimated recreational catch of threadfin salmon species for the region was 15,200 fish kept (18 tonnes) and 9,500 released. Approximately half (53 per cent) of the threadfin salmon species were caught by shore-based fishers. There was also a small catch of black-finned threadfin (*Polydactylus nigripinnis*) and Gunther's threadfin (*Polydactylus multiradiatus*).

Spangled emperor: Spangled emperor (*Lethrinus nebulosus*) is an important species for recreational and commercial fishers. The estimated recreational catch for the region was 8,700 fish kept (12 tonnes). A further 300 fish were estimated to have been eaten by sharks. The commercial catch from the region for the same period was 18 tonnes. All spangled emperor were caught by boat-based fishers, and only three tonnes (28 per cent) of the catch was taken from the Dampier Archipelago. Many fish kept (1,200) were below the minimum size limit at the time of 410 mm.

Estuary cod: The estimated recreational catch of estuary cod (*Epinephelus coioides*) for the region was 5,300 fish kept (12 tonnes) and 13,600 released. Estuary cod was predominantly (86 per cent) caught by boat-based fishers, and one quarter of the catch (25 per cent) was taken from the Dampier Archipelago.

Stripey seaperch (Spanish flag): Stripey seaperch (*Lutjanus carponotatus*) is an important recreational species with 20,800 fish kept (11 tonnes). A further 500 were estimated to have been eaten by sharks. Although at the time of the survey there was no size limit and a bag limit of 40 applied to this species, 48,100 were released. Almost all (99 per cent) stripey seaperch were caught by boat-based fishers, and only 3,600 (17 per cent) of fish were taken from the Dampier Archipelago.

Coral trout: The estimated recreational catch of coral trout (*Plectropomus leopardus*) for the region was 2,100 fish kept (five tonnes) and 3,400 released. A further 300 fish were estimated to have been eaten by sharks. Coral trout was predominantly (96 per cent) caught by boat-based fishers, and most of the catch (59 per cent) was taken from the Dampier Archipelago.

The estimated recreational catch of bar-cheeked coral trout (*Plectropomus maculatus*) for the region was 1,200 fish kept (three tonnes) and 500 released. All bar-cheeked coral trout were caught by boat-based fishers. Most of the catch (95 per cent) was taken from the Dampier Archipelago.

Sweetlip emperor: The estimated recreational catch of sweetlip emperor (*Lethrinus miniatus*) for the region was 4,668 fish kept (seven tonnes). Most (60 per cent) sweetlip emperor were caught by boat-based fishers. One third of the catch (30 per cent) was taken from the Dampier Archipelago.

Red emperor: Red emperor (*Lutjanus sebae*) is an important species for recreational and commercial fishers. The estimated recreational catch for the region was 1,700 fish kept (six tonnes) and 3,000 released. The commercial catch from the region for the same period was 115 tonnes. All red emperor were caught by boat-based fishers.

Mangrove jack: The estimated recreational catch of mangrove jack (*Lutjanus argentimaculatus*) for the region was 7,300 fish kept (five tonnes) and 12,900 released. Mangrove jack were predominantly (92 per cent) caught by boat-based fishers. Approximately one quarter of the catch (27 per cent) was taken from the Dampier Archipelago.

Western yellow-fin bream: The estimated recreational catch of western yellow-fin bream (*Acanthopagrus latus*) for the region was 9,000 fish kept (four tonnes) and 13,396 released. Western yellow-fin bream were predominantly (71 per cent) caught by shore-based fishers.

Moses perch: The estimated recreational catch of Moses perch (*Lutjanus russelli*) for the region was 4,000 fish kept (four tonnes) and 4,300 released. Moses perch were predominantly (87 per cent) caught by boat-based fishers.

Spotted javelinfish: The estimated recreational catch of spotted javelinfish (*Pomadasys kaakan*) for the region was 3,400 fish kept (four tonnes) and 4,400 released. Spotted javelinfish were predominantly (56 per cent) caught by boat-based fishers.

Crab species: In the Pilbara region, blue swimmer crabs (*Portunus pelagicus*) is a recreational species with 72,000 (22 tonnes) kept and 33,000 released. Most of the catch (20 tonnes) was taken from Nickol Bay. Almost all blue swimmer crabs were caught by boat-based fishers. Recreational fishers in the region kept 19,000 (17 tonnes) green mud crabs (*Scylla serrata*) and released 13,000. Green mud crabs were predominantly (93 per cent) taken by boat based fishers. Recreational fishers also kept 7,000 (four tonnes) brown mud crabs (*Scylla olivacea*) and released 10,000. Boat-based fishers took almost all brown mud crabs (99 per cent).

Tropical lobsters: The estimated recreational catch of green (painted) lobster (*Panulirus versicolor*) is 2,400 (two tonnes) kept and 1,100 released. Most (90 per cent) green lobsters were taken from the Dampier Archipelago. A small number of ornate lobsters (*Panulirus ornatus*) were also kept. All lobsters were taken by boat-based fishers.

Northern calamari: The estimated recreational catch of northern calamari (*Sepioteuthis lessoniana*) was 5,600 kept (six tonnes) and 500 released. All northern calamari were caught by boat-based fishers.

2.3.2 Catch and effort from fishing tour operators

The 63 tour operators who fished in the Pilbara/Kimberly Region during 2002 reported the following catch information on the top 10 species kept in the region.

Species	Kept	Released	Estimated kept weight (tonnes) Using average weight from Operators	Estimated kept weight (tonnes) Using length/weight relationship
Emperor, spangled	2,510	451	7	6
Seaperch, stripey	1,773	4,613	1	1
Bream, fingermark	1,632	2,722	4	#
Mangrove Jack	1,588	2,239	3	2
Barramundi	1,566	6,129	8	7
Seaperch, saddle-tailed	1,485	589	4	3
Emperor, blue-lined	1,474	1,006	3	2
Mackerel, narrow-barred Spanish	1,281	570	14	13
Emperor, red	1,015	526	4	4
Chinaman fish	1,001	52	4	5

Denotes # = No length/weight relationship available.

2.4 Impact of fishing on stocks

Around Western Australia, anglers have acknowledged that the quality of some fisheries have declined over a period of time. The Eastern Gulf pink snapper fishery in Shark Bay is one example where it can be demonstrated that recreational fishing pressure has reduced stocks to a point where the sustainability of the stock is now threatened.
This is not to say that all fish stocks in WA are in a state of decline - on the contrary, WA is fortunate to have a healthy population of fish in comparison to other States that have more people and far more fishing pressure.

To protect future fish stocks, it is important to understand what happens to a stock of fish over time with fishing pressure.

When fishing pressure is exerted on a 'virgin' or unfished stock, the catches initially include a number of older or larger fish, which are highly sought after by fishers. At this time, catches are high for a relatively small number of fishers. As more of the larger fish are removed from the population, faster growing young fish replace the older fish. In this situation, the overall catch can actually increase with more medium size fish, but less bigger fish are available to be caught.

As competition between fishers increases, individual catches decline, although the overall catch tends to level off. This can be the start of what is referred to as 'growth overfishing'. This simply means there are still adequate mature fish in the population to produce sufficient juvenile fish, but the number of older mature fish has been significantly depleted.

As competition for fish stocks among user groups increases, individual catches begin to crash as fish are taken from the stock more rapidly than they can be replaced. This situation is called 'recruitment overfishing' where both mature fish and juvenile fish are being fished down below sustainable levels.

With the growing pressure on fish stocks from increased participation, competition from different user groups and advances in technology, existing bag and size limits are not enough to prevent overfishing occurring in future years. In the future, the recreational catch will need to be managed to an agreed share of the sustainable take. Managing to a sustainable take with specific catch allocation for each sector will require the use of management tools other than bag and size limits to limit exploitation on stocks.

2.5 Current management

The State-wide approach to the management of recreational fisheries was developed as a consequence of a major review of recreational fishing conducted in the early 1990s. This review resulted in the implementation of a set of bag and size limits aimed at setting clear social standards for recreational fishing, based on what the community considered was a fair and reasonable daily catch. It is important to note that the bag limits which were implemented at the time were not intended to restrain in any significant way the total recreational catch.

Seasonal closures are currently used as a key control in the licensed recreational fisheries such as rock lobster, abalone, marron and south-west freshwater fisheries, but have generally not been applied to finfish species, or freshwater fisheries in the Pilbara/Kimberley.

Minimum size limits have been set for many species. Minimum size limits can be used to protect fish until they reach maturity and have been able to spawn at least once, and can be set to help enhance fishing quality. Many of the current minimum sizes were set when the biology of individual fish was not known. As a result, the minimum size was often set at the smallest commercial size at which the fish could be sold.

Maximum size limits are currently only used for a small number of species (e.g. cod and barramundi). These may provide valuable protection for larger specimens, which are the most prolific breeders for many species. The ability to determine appropriate size limits and hence their appropriateness as a management tool is limited by the level of biological information available for many species.

Since the implementation of the State-wide bag and size limit controls, specific recreational management packages have been developed in the Pilbara/Kimberley Region for the barramundi fishery.

Management controls in the barramundi fishery have included a reduced daily bag limit, slot limits, possession limits and restrictions on commercial fishing. These measures were introduced to provide more protection for barramundi stocks following community concerns regarding exploitation rates.

Besides bag and size limits, the *Fish Resources Management Act 1994* contains a number of other general provisions which control the take by recreational fishers and may override the general bag limit provisions. For example, Section 50(3) of the Act states that:

> *"A person must not take, or bring onto land or into WA waters, on any one day more fish than the daily bag limit of those fish."*

This provision restricts all persons to landing a single daily bag limit, irrespective of how many days they may have been fishing from a boat or island.

However, this situation is not 'black and white' as the Fish Resources Management Regulations also provide a defence to this general rule for persons who conduct extended fishing trips which involve living on a boat or staying on islands. Under this defence, people can accumulate up to their possession limit of fish, which can be two days' bag limit of whole fish, or 10kg of fillets plus one day's bag limit of whole fish, or 20kg of filleted fish.

2.6 Fishery management strategies - what works and how

There are a limited number of management strategies that can be applied to recreational fisheries. Ultimately, these strategies have one fundamental goal – to ensure WA continues to offer a quality recreational fishing experience by managing the recreational fishing community's share of the total catch within the limits a fish stock can sustain.

This section provides a brief outline of the major recreational fishery management tools used in WA, their strengths and their limitations. It is important to note that these tools are used in combination, and that often there is no single effective solution to any one issue.

Clearly, these strategies also need to be part of an integrated management framework which manages the impact of all users – commercial, recreational, charter, and conservation – on the fish resources and their habitats.

2.6.1 Daily bag limits

Bag limits currently set a social standard for a 'fair day's catch' for an individual angler. The bag limits currently in place in the Pilbara/Kimberley for most species reflect the social values of when they were set in the late 1980s. These values change over time in line with community views and expectations.

Bag limits have the capacity to reduce the rate at which an aggregation of fish or an area is depleted by fishing, and ensure that a larger number of fish are available in the water for a longer period of time.

Bag limits also help to share the available catch among the thousands of anglers who wish to catch a fish.

However, to be effective, bag limits need to be set at a level that is readily attainable for an angler of reasonable skill and knowledge.

Under current WA fishing regulations, bag limits can be accumulated over an unlimited number of days, and consequently, do not in general constrain the total recreational catch.

Their limitations include the unknown mortality factors involved in catch and release fishing – especially for fish caught in deep water or played for long periods of time on light line. They also tend to be seen as unfair by anglers aiming to maximise their catch because they reduce the total quantity they can land on any one occasion.

Depending on the level at which they are set, bag limits may assist in the sustainable management of our fisheries. Then again, the greater the number of people fishing, or the number of days spent fishing, the less effective bag limits are in managing either individual or total catches. In this context, they serve mainly to set a social standard and highlight the need for conservation.

An additional weakness is the concern that, if used in isolation, they may simply make more fish available to the commercial sector by reducing the total recreational catch.

2.6.2 Boat limits

Boat limits can be used to provide protection for recreational species by restricting the total number of fish which can be taken from a boat during a specific fishing trip.

Due to the mobility of a boat and its ability to be enhanced as a fishing platform through fish finding technology, boat limits have the capacity to reduce the rate at which an aggregation of fish or an area is depleted by fishing.

Boat limits can also help to share the available catch among anglers who wish to catch a fish.

The greater the number of people on a boat, the more effective a boat limit becomes in restraining the recreational catch. On the other hand, this can also be seen as placing an unfair restriction on recreational fishers.

2.6.3 Possession and trip limits

Possession and trip limits are a strategy to manage the total take of an individual angler on any one fishing trip. Put simply, a possession limit refers to a maximum limit an angler can have in possession at any time in a defined area. A possession limit can be expressed either in total weight or in numbers of fish, or a combination of both. Places of permanent residence and commercial premises may be excluded from possession limits.

Possession limits were originally introduced in areas such as the Ningaloo Marine Park to reduce the ability of anglers to accumulate commercial quantities of fish. Their major application was to eliminate ‘shamateur’ quasi-commercial fishing and the storing and freezing of large quantities of fish in remote locations.

Possession limits have also been used in limited single-species fisheries elsewhere in the world to effectively establish a total recreational ‘quota’, usually in combination with a limit on the total number of participants.

Weaknesses include the ability of anglers to transport fish unaccompanied without any effective constraint, and the evidentiary and legal issues inherent in proving possession.

Like bag limits, possession limits set a firm social standard for a recreational catch, but become less effective in managing the total catch as numbers of fishers or angler/fishing days increases.

2.6.4 Legal sizes – minimum and slot limits

Minimum size limits are usually based on the breeding biology of a species, and are set to protect fish until they reach maturity and have been able to spawn at least once. They can also be set to help enhance recreational fishing quality by increasing the average size of fish available.

Size limits generally apply equally to both the recreational and commercial sectors. However, their effectiveness as a management tool is reduced in fishing gear such as set nets where there is a very high mortality. Their effectiveness also depends on voluntary compliance – particularly where filleting is allowed at sea and compliance checks are not possible.

Then again, some existing size limits are not set at the size at maturity and reflect the size at which some species are available for capture during a stage in their life cycle. This is particularly true in WA for species such as mulloway, which do not reach maturity until they are around 70 – 80cm in size.

In many cases, current legal sizes also reflect the desirable market size of fish by the commercial sector, and were set early last century with no biological basis.

The ability to determine appropriate size limits and hence their applicability as a management tool is limited by the level of biological information available for many species. There is also increasing concern over the mortality of fish, particularly demersal species, taken from deep water and the appropriateness of size limits as a management tool for these species is being questioned.

Maximum size or slot limits are theoretically useful for protecting large breeding fish or reducing the take of highly prized, and often rare, large specimens.

In a purely recreational fishery they have considerable merit, but in a mixed commercial/recreational fishing area or fishery, they are unlikely to achieve the desired effect unless applied to both sectors.

Like minimum sizes and bag limits, the issue of mortality of fish returned to the water is of great importance.

2.6.5 Closed seasons and closed areas

Closed seasons have been widely used in licensed recreational fisheries and commercial fisheries as a means of containing total effort outside the peak fishing season, or to protect fish at crucial stages in their life cycle.

Their advantages are that they affect all fishers equally and effectively limit the opportunity to fish to a given number of days. Closed seasons have been widely accepted in marron, rock lobster, trout and prawn fisheries.

However, they may be difficult to gain acceptance for in multi-species fisheries such as the demersal finfish fishery. Closed seasons may also not be effective if peak fishing seasons and spawning times are not clearly defined or consistent from year to year.

Closed areas may also be used to protect fish at crucial stages in their life history, for example, during spawning to protect populations of sedentary species or protect important fish habitats from the impact of human use. They have also been proposed as an alternative means of rebuilding depleted fish stocks.

However, their success depends on either widespread community support or effective compliance.

Both closed areas and closed seasons may limit all fishing, or only limit some types of fishing. Consequently, they can also be used as a means of resource sharing and reducing community conflict.

2.6.6 Gear and method restrictions

Gear restrictions may limit the type of fishing gear that can be used, or limit the area and time in which defined types of gear may be used.

In recreational fisheries, gear restrictions aim to prevent the use of highly destructive fishing methods such as poisoning reefs and explosives, the use of highly efficient commercial-type fishing gear, and reduce conflict in some areas between incompatible fishing activities such as set netting and angling.

Fishing gear may also be designed to assist in the release of undersize fish and reduce the likelihood of injury to the fish involved. Examples include drop net bases for marron, defined wire scoops for crabs and marron and banning the use of treble hooks in some interstate fisheries.

Gear restrictions in line fisheries are harder to regulate, although angler education in catch and release methods, including substituting plain limericks for jag or treble hooks, and flattening barbs all helps in improving the survival rate of released fish.

Limitations on the quantity of gear an individual fisher can use are also a means of resource sharing and spreading the opportunity to catch with other participants in the fishery.

Different types of gear and methods include spearfishing. In areas which have a high conservation value, such as marine parks, restrictions have been put on spearfishermen by prohibiting the use of compressed air or not allowing spearfishing in any form. These measures are designed to protect vulnerable residential reef fish.

Spatial closures to limit or prohibit the use of commercial fishing methods in important recreational fishing areas are also a means of managing social conflict and resource sharing.

2.6.7 Licensing

Licensing individual fishers is used world-wide as a key strategy in the management of many recreational fisheries, including five in WA.

Licences provide a ready made and accurate database which can be used for research and education. A database of recreational fishers can enable catch and effort information to be

easily obtained as well as provide a direct mail list for advisory information. Licensing can also ensure that the level of funds for the management of recreational fisheries tracks the participation rate and consequently management demands in developing fisheries.

An additional use is the application of licence cancellations and suspensions as a penalty for serious fisheries misdemeanours, and as a relevant means of reinforcing the need for ethical fishing behaviour.

Licences track participation rates accurately, and provide a basis for estimating fishing effort, individual and average fishing success and total catches from a given fishery.

In the absence of a licensing system, randomised boat ramp and beach-front catch surveys and phone surveys provide the same data. However, these are subject to the availability of funds, and are rarely carried out with the regularity needed to maintain a long-term and accurate fishery monitoring program.

The establishment of a licensing system for recreational fishers requires funds for implementation, ongoing compliance and administration.

2.6.8 Education

Community support for the sustainability of fish resources is a crucial factor in successful recreational fisheries management. Community education is the key process for the development of effective community stewardship.

Community stewardship can be evaluated against four criteria:

- The level of individual knowledge of what is required to ensure healthy fisheries.
- The attitudes and values which individuals hold in relation to fishing.
- The behaviour that people adopt when fishing.
- The level of community support for necessary changes to management.

In promoting a sense of stewardship for fish stocks, it is essential the fishing community is properly informed of management decisions, and given a clear lead on the values and attitudes which will assist in sustaining fish stocks.

A wide range of education and awareness strategies can be used to promote a strong fishing conservation ethic and set social standards within the recreational fishing community. These strategies include, community based education programs such as the Volunteer Fisheries Liaison Officer (VFLO) program, school education programs, TV and radio advertising, and information publications.

Any recreational fishing education program needs to recognise the crucial role that peer education plays in setting the social standards for fishing behaviour, and need to target adults and not just children, with clearly identified key strategies and messages designed to be relevant and accessible to each target group.

A key element of these programs is that they are designed to deliver messages or reminders to recreational fishers at the time and the place where these messages have the most relevance. A prime example of this process at work has been the success of the VFLO program, which was established by the Department of Fisheries in 1992.

The VFLO program is a structured process of peer education, which involves recreational fishers themselves encouraging a change in the knowledge, values and attitudes of individuals that, in combination, influence fishing behaviour. A crucial element in the success of the VFLO program has been VFLOs targeting anglers at the beach and boat ramp when anglers are most receptive to messages on fishing.

2.7 Integrating recreational and commercial fisheries management

The regional recreational fisheries strategies will complement the new management arrangements for the charter industry, and provide the necessary framework for recreational fishing to be incorporated into an integrated management framework with other fishing sectors.

Before catch allocations can be managed under an integrated management framework, it is first necessary that effective sectoral management arrangements are in place. Some fisheries are not highly managed (e.g. finfish) and a move to a higher level of management is essential for both the commercial and recreational sectors.

Integrated management is about managing the total impacts on fish resources. This includes not only the impacts of commercial and recreational fishers, but also takes into account customary fishing, aquaculture and wider ecological requirements.

In essence, the new approach involves setting a total harvest level in each fishery that allows for an ecologically sustainable level of fishing, and allocating explicit catch shares for use by each of the principal user groups. It also requires the catch harvested by each sector to be monitored and broadly managed within their allocated catch level over periods of between five and 10 years.

Complementing the regional recreational fishing strategies, a corresponding review of the unmanaged components of the commercial finfish sector (wetline) is underway to ensure the effective management of the commercial catch.

The commercial wetline review is focussed on implementing a more effective management framework for the commercial sector and preventing further growth in this sector. This duplicates the objectives for the regional recreational reviews.

As was the case with the recreational reviews, the wetline review will involve a number of complex issues and require widespread consultation. The ability to ‘wetline’ is seen as fundamental entitlement to many commercial fishers.

It is anticipated that discussion papers on the future management of the wetline fishery in the West Coast and Gascoyne Regions will be released for public comment in 2004.

It should be noted that the implementation of the regional recreational fishing strategies will achieve two critical steps in the development of integrated management:

1) The regional management strategies will provide a spatial framework for integrating the management of recreational and charter fishing with commercial fishing and other uses in each region, such as Indigenous, conservation, eco-tourism and aquaculture.

2) They will manage the escalation in recreational fishing pressure and efficiency over the last decade.

To assist with the integration of fisheries management, an independent review committee has examined alternative management frameworks and principles for the future allocation of fish stocks to ensure maximum benefit to community. The State Government is currently considering the proposed framework for the integrated management of the State's fish resources.

It must be noted that issues surrounding the allocation of resources are complex and it may take a further 5-10 years to implement the new framework across the majority of fisheries.

In the interim, it is important that each sector continues to be managed effectively within current catch ranges.

The Department believes an integrated management approach is essential to meet growing pressures on our fish resources and the requirements of Ecologically Sustainable Development.

In WA the spatial boundaries for the different regions reflects the distribution of fish stocks, and will permit the determination of sustainable catch levels and the allocation of catch shares to the various user groups on an appropriate spatial scale.

Integration on a regional basis may also provide a spatial framework for data collection that will assist in the proportional management of catch and access shares.

2.7.1 Aboriginal fishing

The Government is currently in the process of developing a strategy for Aboriginal fishing in Western Australia. A draft strategy has been developed which is based on the aspirations of the Aboriginal community. It should be noted the Aboriginal Fishing Strategy has recommended that special rules apply for Aboriginal fishers in recognition of customary fishing practices.

While many people in the recreational fishing community support the recognition of customary fishing practices by people of Aboriginal descent, some recreational fishing groups have expressed concern over the appropriateness of some proposals in the Aboriginal Fishing Strategy. In particular concern was expressed over different management arrangements applying to Aboriginal fishers around key population centres.

For example, if more liberal management arrangements were to apply to Aboriginal fishers when fishing for barramundi off the Broome Jetty, these arrangements could be divisive and lead to tension between Aboriginal and non-Aboriginal fishers.

In recognition of the high fishing pressure on fish stocks around key population centres many recreational fishers expressed the view that the same fishing rules should apply to Aboriginal and non-Aboriginal in the waters adjacent to key population centres such as Broome, Kununurra and Dampier.

This view has been expressed to the working group developing the Aboriginal Fishing Strategy.

All recommendations contained within this recreational fishing strategy are of general application and no special arrangements have been proposed for any individual stakeholder group.

2.8 Summary of commercial finfish fisheries in Pilbara/Kimberley Region

2.8.1 Kimberley gillnet and barramundi managed fishery

Management summary: The Kimberley Gillnet and Barramundi Managed Fishery (KGBMF) extends from the WA/NT border to the top of Eighty Mile Beach, south of Broome (latitude 19° S). It encompasses the taking of any fish by gillnet and the taking of barramundi by any means. The species taken are predominantly barramundi (*Lates calcarifer*) and threadfin salmon (*Eleutheronema tetradactylum*). The main areas of the fishery are the river systems of the northern Kimberley, King Sound, Roebuck Bay and the top end of Eighty Mile Beach.

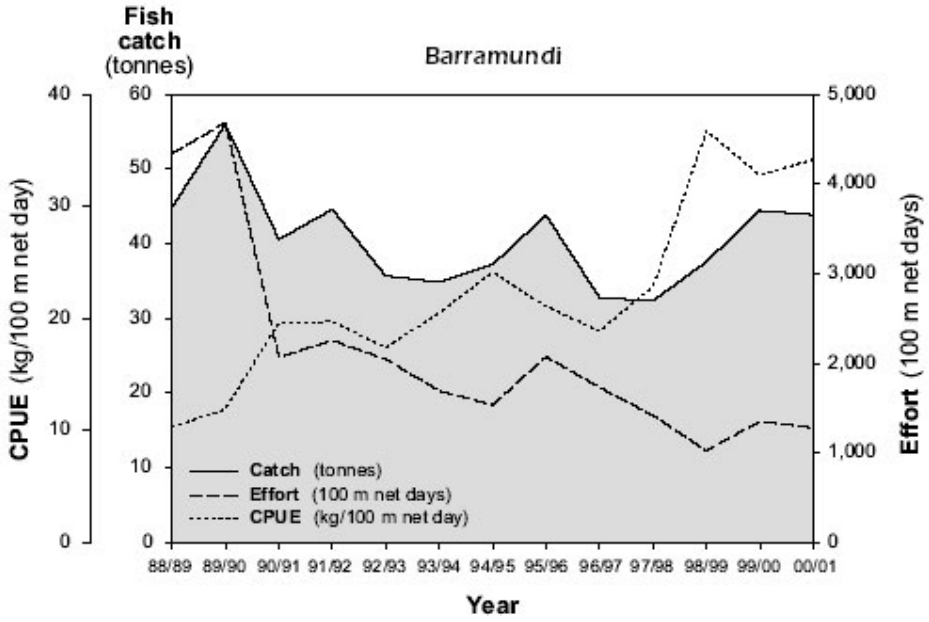
There are currently seven licences in the fishery, reduced from a historical level of 10 through a Voluntary Fisheries Adjustment Scheme in 1999. The licences are currently only transferable between family members, but it is proposed that they become fully transferable in the future.

Members of the KGBMF participated in a resource-sharing process with members of the recreational fishing community, which resulted in the development of an 'Accord' for the future management of the barramundi resource in the Kimberley. Through this process, commercial operators agreed to restricted access to the Ord River and commercial fishing closures in the Fitzroy River, around Roebuck Bay and in a number of creek systems south of Broome.

Boundaries and access: The boundaries of this limited entry fishery are all WA waters lying north of 19° south latitude and west of 129° east longitude and within three nautical miles seawards of the low water mark of the mainland of Western Australia and the waters of King Sound of 16°21'38" south latitude'. Seven vessels accessed the fishery during 2000/01.

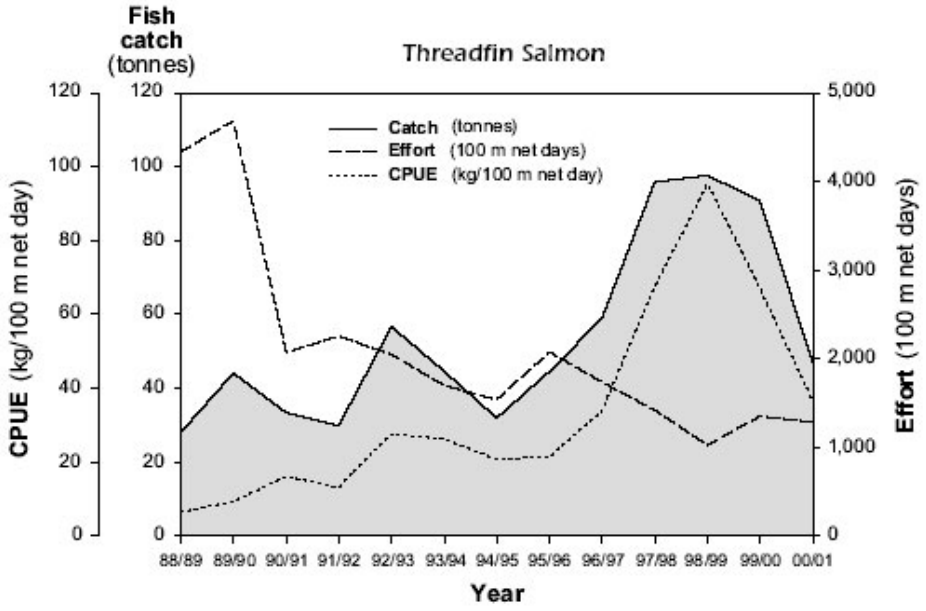
Main fishing method: Gillnet.

Commercial production (season 2000/01): All species: 99.6 tonne; Barramundi: 43.9 tonne.



KIMBERLEY GILLNET FIGURE 1

The annual catch, effort and catch per unit effort (CPUE, kg/100 m net day) for barramundi from the Kimberley Gillnet and Barramundi Managed Fishery over the period 1988/89 to 2000/01.



KIMBERLEY GILLNET FIGURE 2

The annual catch, effort and catch per unit effort (CPUE, kg/100 m net day) for threadfin salmon from the Kimberley Gillnet and Barramundi Managed Fishery over the period 1988/89 to 2000/01.

Figure 3 Kimberley Gillnet Catch and Effort for Barramundi and Threadfin Salmon

2.8.2 Northern demersal scalefish managed fishery

Management summary: The Northern Demersal Scalefish Managed Fishery (NDSMF) operates off the north-west coast of WA in the waters east of 120° E longitude. The permitted means of operation within the fishery include handline, dropline and fish traps. Commercial catches are dominated by the tropical snapper (*Lutjanidae*), which include red emperor *(Lutjanus sebae)*; the emperors or North-West snappers (*Lethrinidae*), which include goldband snapper (*Pristipomoides multidens* and related *Pristipomoides* species); and the cods or gropers (Serranidae).

The Northern Demersal Scalefish Fishery Management Plan 2000 commenced on 1 January 2001, superseding the Northern Demersal Scalefish Fishery Interim Management Plan 1997.

The fishery is managed by input controls, including individually transferable effort allocations, gear restrictions and area closures. The total effort allocation, based on a nominal total sustainable catch (TSC), is allocated on an annual basis. In 2001, the nominal TSC was 800 tonnes of demersal scalefish and the total effort allocation was 1,760 days.

Boundaries and access: The waters of the NDSMF are defined as all WA waters off the north coast of Western Australia east of longitude 120° E. These waters extend out to the edge of the Australian Fishing Zone (200 nautical mile) limit under the Offshore Constitutional Settlement arrangements (Northern Demersal Scalefish, Figure 3).

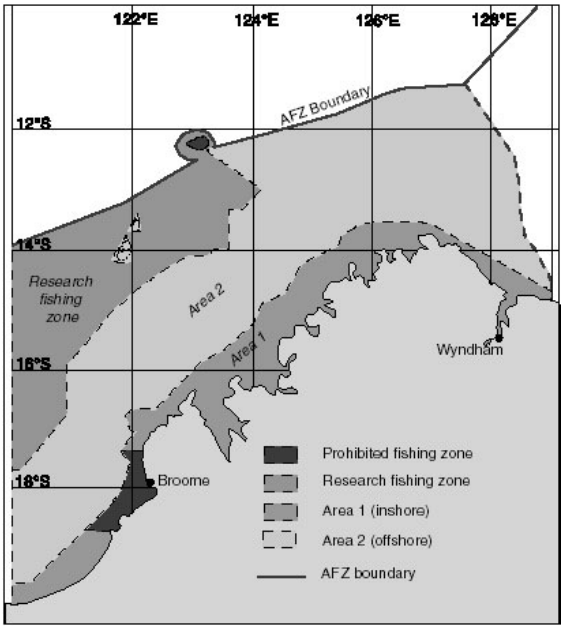


Figure 4 Boundaries for the Northern Demersal Scalefish Managed Fishery

The fishery is further divided into two fishing zones, an inshore zone (Area 1) and an offshore zone (Area 2; see Northern Demersal Scalefish Figure 1). The demersal scalefish resources of the deeper waters of the offshore zone (greater than 200 m depth) remain to be adequately investigated; these waters are shown on Northern Demersal Scalefish Figure 1 as a research fishing area. Fishing access to the research area can be facilitated through an agreed research framework. The inshore waters in the vicinity of Broome are closed to commercial fishing.

The closed area extends from Cape Bossut to Cape Coulomb inside a line that approximates as closely as possible the 30 m bathymetric contour. Access to the offshore zone (Area 2) of the NDSMF is currently limited to 11 licences under an individually transferable effort quota system. This allows the effort quota to be operated by a lesser number of vessels. For example, during 2001, six vessels (five trap vessels and one line vessel) collectively held and operated the effort individually assigned to the 11 licences.

Main fishing method: Principally fish traps, and to a lesser extent, line fishing methods such as handline and/or dropline.

Commercial production (season 2001): 504 tonne.

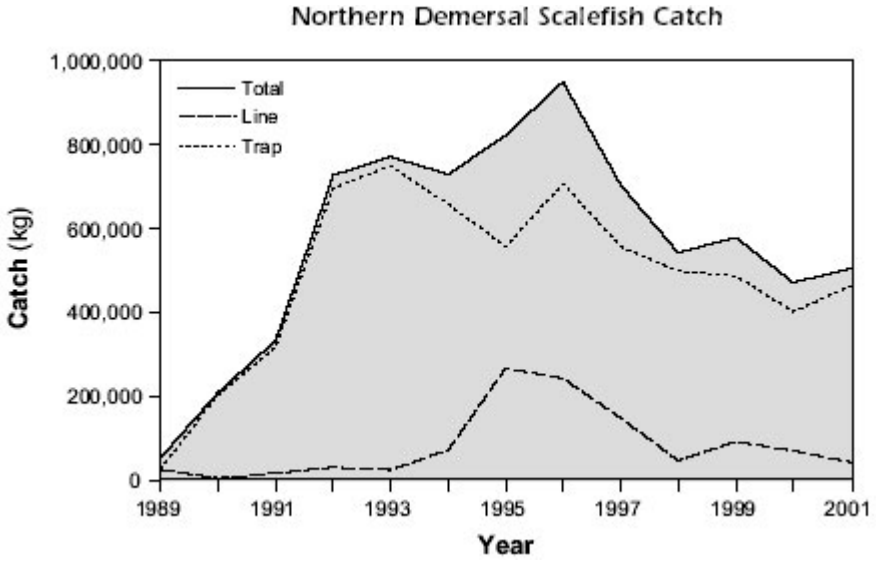


Figure 5 Commercial Production for the Northern Demersal Scalefish Managed Fishery

2.8.3 Pilbara demersal finfish fisheries

Management summary: The majority of demersal finfish produced from the North West Shelf are taken by fish trawling activities, with a lesser quantity taken by fish traps and line. Both the Pilbara Fish Trawl Interim Managed Fishery and the Pilbara Trap Managed Fishery operate under individually transferable effort regimes monitored by the satellite-based Vessel Monitoring System (VMS).

The Pilbara Fish Trawl Interim Managed Fishery commenced in 1998 when a number of fishing boats with conditions authorising fish trawling were brought under a management plan. The fishery is controlled through a combination of area closures, gear restrictions and total and area-specific effort limitations. Since coming into a formal management framework, effort has been reduced and redistributed to achieve the best yield from the fishery, while keeping exploitation rates of key indicator species (red emperor, *Lutjanus sebae*, and Rankin cod, *Epinephelus multinotatus*) at sustainable levels.

Boundaries and access: The Pilbara Trap Managed Fishery (Pilbara, Figure 5) lies north of latitude 21°44' S and between longitudes 114°9'36" E and 120° E on the landward side of a boundary approximating the 200 m isobath and seaward of a line generally following the 30 m isobath. This has been a managed fishery since 1992.

In 2000, effort quota was introduced, with transferable trap units being allocated and their utilisation being monitored by the VMS. The boundaries of the Pilbara Fish Trawl Interim Managed Fishery (Pilbara Figure 5) are the waters lying north of latitude 21°35' S and between longitudes 114°9'36" E and 120° E on the landward side of a boundary approximating the 200 m isobath and seaward of a line generally following the 50 m isobath. The trawl fishery consists of two zones.

Zone 1 in the west of the fishery is currently not being trawled. In Zone 2, the interim management plan introduced in 1998 set down boundaries for six management sub-areas. There are 11 licence units with varying time allocations throughout Areas 1 to 6, with Areas 3 and 6 having zero time allocation.

The allocated effort quota is transferable and monitored by the VMS. In addition, some wetline fishing occurs within the boundaries of the trawl and trap fisheries. Planning for consolidation of the general wetline catch in the Pilbara is continuing.

Figure 6 is a general diagram of the Pilbara showing areas where specific fishing activities are permitted within this fishery. The exact latitudes and longitudes delineating the sectors of the Pilbara fishery are listed in the Pilbara Trap Management Plan 1992 and the Pilbara Fish Trawl Interim Managed Fishery Management Plan 1997.

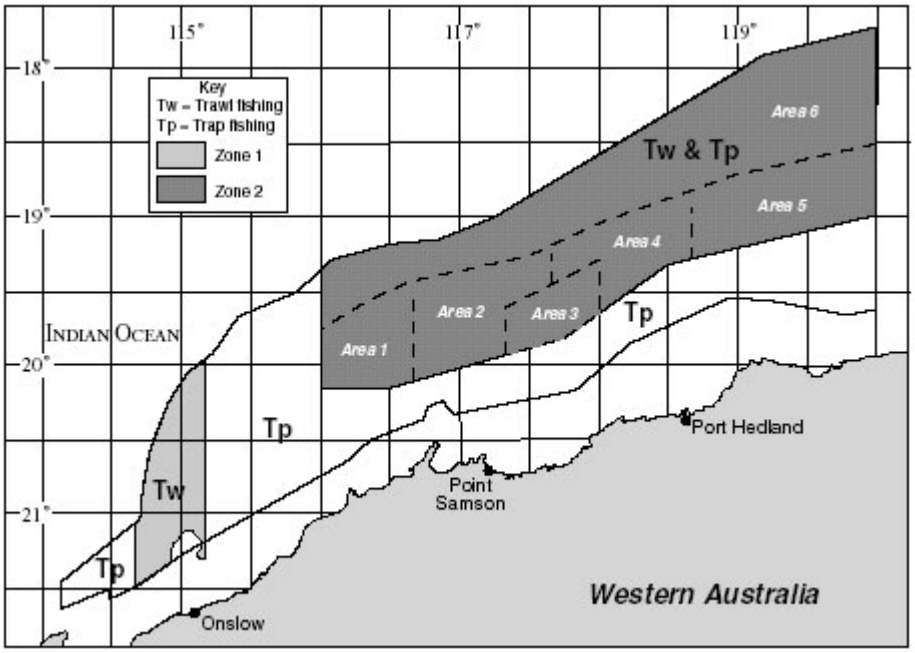


Figure 6 Boundaries for the Pilbara Demersal Finfish Fisheries

Main fishing method: Trawling is the dominant fishing method, with trapping and line fishing being relatively minor components.

Commercial production (season 2001): Trawl: 2,221 tonnes; Trap: 266 tonnes;
Line: 99 tonnes.

2.8.4 Spanish mackerel

Management summary: Fishing for Spanish mackerel, under the general wetline access available to all Western Australian licensed commercial fishing boats, was reported by 72 boats during 2001. Although most of these catches were made opportunistically by boats operating within other fisheries, there were about 10 boats which specifically targeted mackerel.

Owing to concerns over increased catches and evidence to suggest that the species may be in danger of over-fishing, an interim management plan (IMP) was examined by a Mackerel Independent Advisory Panel, which has made recommendations to the Executive Director on criteria for access to and management arrangements for the mackerel fishery.

Boundaries and access: Spanish mackerel are widespread throughout the Indo-West Pacific. In Western Australia, they are fished commercially from Geraldton north to the Northern Territory border. Most of the commercial catch is taken from May through to October, with minor catches made during summer in the Pilbara and Kimberley regions when weather conditions permit.

Kimberley sector: The use of dories (5 - 6.5 m dinghies) is restricted to this sector, which extends east of longitude 121° E (previously 120° E) to the Northern Territory border.
Pilbara sector: This sector extends from longitude 114° E to 121° E and north of 23° S. Vessels used in this area are between 9 and 15 m in length (no dories).
Gascoyne sector: This sector extends from 27° S to 23° S. Vessels used in this area range between 7 and 15 m in length.
West Coast sector: This sector extends south of 27° S. Fishing gear and methods are the same as those used in the Gascoyne sector.

Main fishing method: Trolling.

Commercial production (season 2001): Spanish mackerel: 389.9 tonnes;
Other mackerel: 56.0 tonnes.

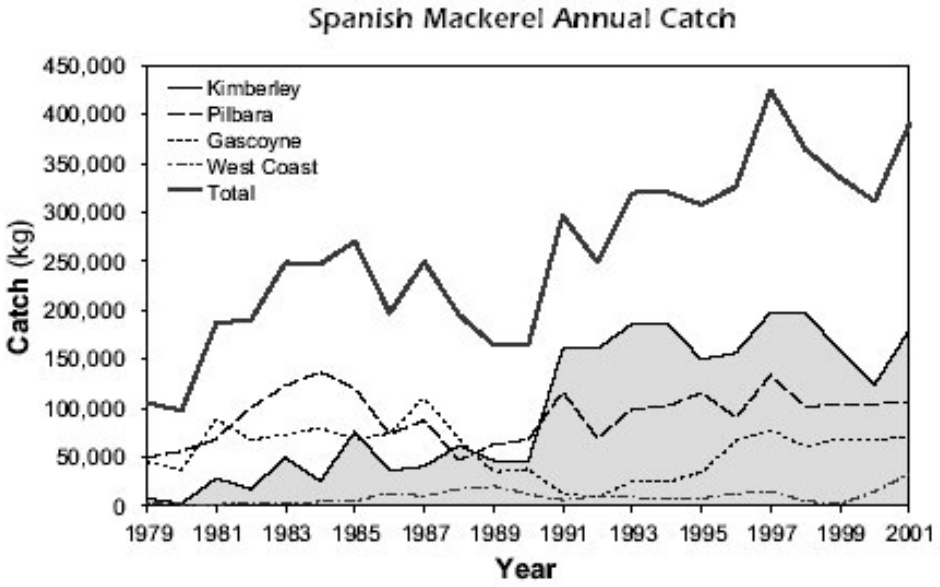


Figure 7 Commercial catch of Spanish mackerel

2.8.5 North Coast shark fisheries

Management summary: Joint Authority Northern Shark Fishery (JANSF): The taking of shark between 123°45' E (Koolan Island) and the WA/NT border (and to the limit of the Australian Fishing Zone) is controlled by a joint authority arrangement between the Commonwealth and the State of Western Australia under State law. In this arrangement, the State is given control of the JANSF on behalf of the Joint Authority.

WA North Coast Shark Fishery (WANCSF): The Western Australian-controlled sector of the northern shark fishery is managed by orders under section 43 of the *Fish Resources Management Act 1994*. The orders were first gazetted in May 1993 and cover the taking of shark in all waters off the north coast, from longitude 114°06' E (North West Cape) to 123°45' E with shark longlines and shark droplines using powered hauling gear. Those permitted to fish in the WANCSF with shark gear do so under a fishing boat licence condition, and are permitted to use longlines and droplines with metal traces.

Boundaries and access: Western Australia manages fishing for shark by longline or dropline from longitude 114°06' E to 123°45' E (the WANCSF). Longline and gillnet fishing for shark from longitude 123°45' E to the WA/NT border is managed by Joint Authority between Western Australia and the Commonwealth (the JANSF). Gillnet fishing is not permitted west of longitude 123°45' E or within 12 nautical miles of the coast east of longitude 123°45' E. A total of 13 fishers have licensed access to one or more of these zones.

Owing to the small number of operators in the JANSF, confidentiality arrangements do not permit the publication of catch and effort data from this fishery on their own. Therefore, as the principal methods and some target species are common to the JANSF and WANCSF, these data have been combined and the two regions are considered as a single northern shark fishery for assessment purposes.

Main fishing methods: Primarily shark dropline and shark longline. During 2000/01, two vessels reported using gillnets in the JANSF.

Commercial production (season 2000/01): 272 tonnes.

2.8.6 Pilbara/Kimberley Wetline Fishery

Research for managing this small fishery involves stock monitoring and assessment utilising the CAES monthly return data provided by industry, as well as information from voluntary logbooks and some interviews with boat skippers. Annual meetings are held with boat operators to consider the status of the stocks and recommend changes to. This assessment, which utilised the CAES database, indicates that around a quarter (24%) of the State's wetline catch during 2001/02 was reported from this bioregion, which includes waters off both the Kimberley and Pilbara coasts.

Top ten species:	Spanish mackerel (*Scomberomorus commerson*)	330 t
	Giant threadfin (*Eleutheroyema tetradactylum*)	106 t
	Goldband snapper (*Pristipomoides multidens*)	24 t

Unspecified shark 19 t
Unspecified mackerel 17 t
Grey mackerel (*Scomberomorus semifasciatus*) 9 t
Trevally (Carangidae) 9 t
Unspecified tuna (Scombridae) 8 t
Unspecified threadfin (Polynemidae) 7 t

The next most numerous species group in the catch were the shovelnose/fiddler rays (Rhinobatidae/Rhinchobatidae, 6 t) that are being increasingly targeted for their fins.

A review of the State's unmanaged commercial finfish (wetline) fishery is currently underway. The initial stages of the review will concentrate on the West Coast and Gascoyne regions, and once completed the review will shift focus to the South Coast and Pilbara/Kimberley regions. The wetline review will implement a more effective management framework for the commercial sector, and preventing further growth in this sector.

2.9 Summary of pearling leases in the Pilbara/Kimberley Region

Production from the Australian pearling industry mostly consists of South Sea pearls cultured in *Pinctada maxima* pearl oysters taken from waters off Western Australia. Australia is recognised as the source of the largest quantity of quality South Sea pearls.

The pearling industry is market driven, with the high value of South Sea pearls based on their rarity and the image of luxury attached to them. Currently, production by the Western Australian industry is controlled through limits placed on the take of wild stock of pearl oysters.

The total number of quota units in the Western Australian pearl oyster fishery is 572, and these are allocated between 16 pearling companies. Generally, one unit of quota equates to 1,000 pearl oysters. An additional 350,000 pearl shells are produced through the successful application of hatchery and grow-out technology. Long-term growth in the pearl industry may be achieved in the future by an increase in the production of pearl oysters through hatchery production.

Listed on the following page are the companies holding pearling leases in the Pilbara/Kimberley Region, the number of leases held by each company, and the area covered by those leases. Due to the number of leases involved, it is not possible to provided maps of the location of each lease site.

Company	**Total Number of Leases**	**Lease Area SQNM**
Paspaley Pearling Company	10	26.3708
Roebuck Pearl Producers	4	11.97
Pearls Pty Ltd	14	25.3882
Paspaley Pearling Company (BH)_	3	8.05q
Paspaley Pearl Hatcheries	1	.245
Paspaley, Roebuck and Pearls as tenants in common in equal shares	1	2.32
Broome Pearls	12	17.45
Exmouth Pearls	4	6.0871
Australian Sea Pearls	3	4.7180
Arrow Pearling Company	5	15.51
Dampier Pearling Company	2	5.21
Clipper Pearls	4	9.49
Tennereef	6	7.4
Morgan & Co	5	15.5
LM & BR Brown	3	9.7
Blue Seas Pearling Company	5	7.9
Maxima Pearling Company	4.	10.8
Fantome Pearls	5	8.5
TOTAL	**91**	**192.84**

SECTION 3 THE PROPOSED RECREATIONAL FISHING STRATEGY

A wide range of issues has been taken into consideration in planning for the future management of recreational fishing in the Pilbara/Kimberley Region.

These issues have been identified through State-wide recreational fishing planning days, through the Gascoyne and West Coast planning processes and through consultation with regional stakeholder groups.

Through this consultation the following vision statement was developed for the Pilbara/Kimberley Recreational Fishing Management Strategy:

> *"To protect quality recreational fishing experiences in the Pilbara/Kimberley for all fishers now and in the future."*

3.1 Guiding principles for management

Proposal 1 - Key principles for management

It is proposed that recreational fisheries management in the region be based on the following key principles which were endorsed during the Gascoyne and West Coast planning processes:

Government should ensure adequate funding is available for comprehensive research and management necessary for the effective management of recreational fishing.

WA's recreational fishing resources are a highly-valued community asset. To protect the future quality of recreational fishing it is essential that the Government ensure adequate funding is allocated for effective management.

A key aim should be to ensure that the biodiversity of fish communities and their habitats, and sustainability of fish stocks, are preserved.

Management arrangements should take into account the biological characteristics of different species, their abundance, and the level of fishing pressure being exerted upon them. Fisheries management should therefore encourage fishing across a range of species, permitting a higher take of more robust species, and limit the take of more vulnerable species. Management arrangements must also be revised to account for increasing recreational fishing pressure.

Fisheries management should incorporate controls and measures that cover and anticipate increasing numbers of recreational fishers and their impact on fish stocks.

In the past, management has tended to react to problems as they arise. Management arrangements must recognise projected increases in fishing pressure, as well as impacts of planned developments in the region which may increase the number of visitors or focus fishing pressure in certain areas.

As new information from research becomes available on biology or stock status, management arrangements should be modified accordingly.

Management should be based on the best available information, and where critical information is unavailable, a precautionary approach which seeks to minimise risk to fish stocks should be adopted.

The concept of precaution requires management authorities to take pre-emptive action where there is a risk of severe and irreversible damage to fish resources and the environment. In a situation of high potential risk and a lack or inadequacy of information, the concept of precaution requires the onus of scientific proof to be on those who intend to draw benefits from the resource and contend that there is no risk. This contrasts with the existing situation where the Department of Fisheries may be subject to intense scrutiny to justify conservative management decisions that are based on limited available research.

Fishing rules should acknowledge that equitable access to fishing opportunities across recreational user groups is important.

There is a wide range of recreational user groups who may have different values or requirements. These include local residents, visitors, boat fishers, shore-based fishers, charter boat clients, spearfishers, netters, gamefishers seeking 'trophy' fish or fishers seeking a wilderness type experience to which a pristine environment may be as important as fishing quality.

A growing number of recreational fishers focus on quality and enjoyment of fishing and retaining a fish or two as a fresh feed, rather than accumulating large quantities of fish. The values of non-consumptive users of this resource, such as recreational divers and passive users, should also be recognised.

Fishing rules must endeavour to address the relative impacts of users on an equitable basis and that equity should be based on principles of ensuring 'fair and reasonable' access to the resource.

The value of recreational fishing should be clearly recognised and given proper weight in all government and community planning processes, for example, Marine Parks, industrial developments and agricultural developments on the Ord River.

The value of recreational fisheries must be recognised by the community in terms of both social and economic benefits. It is important that recreational fishing is documented as a legitimate use of fish resources and is given due consideration in marine planning and catchment planning processes. Any development must be considered in terms of its potential impact on the aquatic environment and on the quality of recreational fishing.

Fishing rules should be kept simple, and where possible and practical, made uniform across the region.

Management strategies must be simple enough to be understood by the large numbers of occasional fishers and visitors to the region, while providing for effective conservation of the

resource. Where possible, management arrangements should be consistent throughout the region.

Recreational fishing rules should be designed to protect the sustainability of stocks and manage the total recreational catch, as well as protect fish at vulnerable stages in their life cycle, for example, spawning aggregations.

Existing management arrangements do not currently place a ceiling on the total recreational catch. In the face of increasing recreational effort, it will become necessary for the total catch to be managed to ensure sustainability of stocks and preserve fishing quality. It is essential that recreational fishing is managed in a spirit of cooperation with the community, and the development of new management for the recreational fishery must take into account community attitudes and values. This needs to be also reflected in commercial fisheries management.

The benefits from management of the total recreational catch should flow back to the recreational sector and be reflected in maintained or improved fishing quality and sustainability.

Management arrangements must be put in place to ensure that benefits in recreational fishing quality accruing from controls on the recreational take do not simply flow instead to the commercial sector. Currently, in all WA fisheries, there is no mechanism to manage to total take of all sectors of the fishery.

Clear processes should exist to resolve resource sharing issues which support the integrated management of fish stocks.

It is outside the scope of this review to adequately resolve resource sharing and allocation issues. A clear process should be developed by Government as a matter of priority to resolve issues of this nature. This will assist in protecting the future quality of recreational fishing and ensure equity in catch as determined by Government policy.

3.2 Information for management – catch and fishery performance

3.2.1 Key issues and proposals

It is critical that good quality time-series data on fishing activity, catches, and fish population structure is developed for all recreational fisheries.

This type of information is essential for understanding what is being caught by the recreational sector and assisting with the resolution of fishery management and resource sharing issues.

The Department of Fisheries completed a 12-month creel survey of recreational catches between Onslow and Broome in 2000/2001. While this survey provided valuable baseline information, data on recreational fishing impacts on the Pilbara/Kimberley is far from complete.

Comprehensive creel surveys of both shore and boat anglers should be repeated on a regular basis to assist the monitoring of fisheries and the evaluation of management arrangements.

Detailed 12-month catch surveys for a region such as the Pilbara/Kimberley cost in the order of $250,000 each and utilise a significant proportion of the resources of Department of Fisheries research and compliance officers. To provide adequate catch and effort data, surveys should be conducted at a minimum of every three years.

Proposal 2 – Major catch survey

A major recreational catch survey be undertaken every three years to provide detailed information about the spatial and temporal distribution of recreational activity and catches on which to base management decisions.

As a subset on an annual basis, information should be collected on indicator species and areas to monitor recreational fishing quality.

Proposal 3 – Structured logbook program

The Department of Fisheries introduce a structured angler logbook program in the Pilbara/Kimberley Region for key species in specific regional areas.

Department of Fisheries' Research Division advice

- The collection of ongoing catch data is of concern, particularly as commercial participation in coastal fisheries is in decline. The development of a structured log book program run in conjunction with creel surveys may assist in providing useful catch and effort data. The structured log book program would need to be accompanied by a species identification guide to ensure proper identification of key species such as the different cod and trevally species. Other forms of data collection such as phone surveys may also need to be considered.

3.2.2 Species biology

Only a limited amount of biological information is available for many of the species targeted by recreational anglers in the Pilbara/Kimberley.

A considerable amount is known about the biology of some species such as barramundi and Spanish mackerel. However, very little stock assessment information is available for most species.

It must be acknowledged that to carry out comprehensive biological work on a range of important recreational species would be difficult within the current recreational fishing

program budget, particularly at a regional level, and additional funding is required if research is to be undertaken in the near future.

Proposal 4 – Priority species for research

Research should be undertaken on the following key recreational species in the Pilbara/Kimberley (in order of priority) to provide information on species biology and stock structure. Predictive fisheries stock assessment models and, where practical, indices of recruitment are to be developed for these key species:

	Research required			
Species	**Biology**	**Stock assessment**	**Exploitation status**	**Breeding stock level**
Tropical emperors	Limited	N/A	N/A	N/A
Tropical snappers e.g. mangrove jack, fingermark bream	Limited	N/A	N/A	N/A
Giant and golden trevally	Limited	N/A	N/A	N/A
Threadfin salmon	Limited	N/A	N/A	N/A
Tuskfish	Yes	N/A	N/A	N/A
Cherabin	N/A	N/A	N/A	N/A
Mud crabs	Yes	N/A	N/A	N/A
Blue manna crabs	Yes	N/A	N/A	N/A
Estuary cod	Yes	N/A	N/A	N/A
Spanish mackerel	Yes	Yes – Commercial catch only	Fully exploited	Adequate
Sailfish	Limited	N/A	N/A	N/A
Coral trout	Yes	N/A	N/A	N/A
Barramundi	Yes	Yes - Commercial catch only	Fully exploited	Adequate

Department of Fisheries' Research Division advice

- Knowledge of the biology of barramundi is limited in WA, although in other parts of northern Australia, a considerable amount of information is available.
- Research into the biology of mangrove jacks, estuary cods and threadfin salmon is currently in progress.
- Funding applications have been submitted to undertake research work on coral trout, fingermark and other tropical snapper species.
- Biology on tuskfish has just been completed.

3.2.3 Quality indicators for recreational fisheries

In the absence of detailed information on the biology of species or status of many stocks, management has tended to be reactive as problems arise. To assist in monitoring fishing quality, 'fishing quality indicators' should be developed to monitor recreational fishing in the Pilbara/Kimberley and used to measure effectiveness of management strategies.

It is proposed that information be collected on a group of 'signature' species that are recognised as important to the recreational fishery.

Quality and diversity indicators should encompass the level of fishing activity, fishing success of anglers, the relationship of catches to bag limits, the range and number of species caught per trip, and the range of sizes for each key species caught.

Value indicators should encompass participation levels, including estimates of the number of recreational fishers who fish in the Pilbara/Kimberley each year, the number of days fished, and expenditure by fishers in the region.

Proposal 5 – Fishing quality indicators

A range of 'fishing quality indicators' based on angler surveys should be developed to identify trends in fishing quality in the region, and assist in the review of the effectiveness of this strategy.

These indicators should cover fishing quality, diversity and the value associated with the fishing experience.

It is proposed that the following species be used as key indicator species:

Indicator species	*Environment where species is most often found*			
	Creeks	**Near shore**	**Offshore demersal**	**Offshore pelagic**
	Barramundi	Threadfin salmon	Red emperor	Spanish mackerel
	Mangrove jack	Fingermark	Blue lined emperor	Sailfish
	Sooty grunter	Mulloway	Trevally	Cobia
	Mud crabs		Coral trout	
	Cherabin		Tuskfish	
			Rankin and estuary cod	
			Impact of sharks on line-caught fish	

Department of Fisheries' Research Division advice

- Catch and effort information has been gathered for the coast between Onslow and Broome. However, no recreational catch data exists for the coast between Broome and the NT Border. This represents a gap in our understanding of catch and effort in this area.

Besides providing quality indicators based on catch level and the size of fish, the range of species selected will also provide quality indicators for fishing in the offshore, nearshore and estuarine environments. To provide ongoing monitoring, data should be collected annually.

3.3 Protecting vulnerable fish and managing the recreational catch

3.3.1 Key issues and proposals

Bag limits: Based on the three-tiered bag limit structure and an assessment of a species risk of overexploitation, individual species have been placed into one of the following three categories.

- **Category 1 Fish.**
  These fish are considered to have the highest risk of over exploitation and require high levels of protection.
- **Category 2 Fish**
  These fish are considered to have a moderate risk of over exploitation and require moderate levels of protection.
- **Category 3 Fish**
  These fish are considered to have a lower risk of over exploitation and require lower levels of protection.

For Category 1, 2 and 3 fish, the bag limit for each species was proposed following consultation between Department of Fisheries managers, research scientists and key stakeholder groups.

The proposed bag limits should be seen as part of a total management approach to managing the total recreational catch. In the future, as recreational fishing pressure continues to grow, more emphasis may need to be placed on input controls, such as restricting the time people can fish rather than by winding down the bag limit.

It should be noted that the proposed new limits still constitute a reasonable feed for a fisher and his family.

Proposal 6 – Bag and size limits
(see table on next page)

Category 1 Fish – *total mixed daily bag limit of 7*

Category 1 Fish are considered to have the highest risk of overexploitation. Many fish in this category have low catch rates and levels of abundance, while others may be highly valued for their fishing and eating qualities. Many Category 1 Fish are slow growing and mature at four years plus. For these reasons, Category 1 Fish require a high degree of protection.

(Note: *denotes proposed change to current management)

Species	Species bag limit	Size limit	Other controls
Barramundi Note: Statewide possession limit of 2. It is proposed that the possession limit of 1 in the Ord River be increased to the Statewide possession limit of 2	2	550mm	Max. size 800mm*
Billfish (sailfish, swordfish, marlins)	1*		
Cobia	2*	600mm*	
Cod – combined Within this bag limit you may not have more than 2 Rankin, Estuary or Malabar cod	4		Max. size 1000mm*
Coral trout and coronation trout (combined)		450mm	
When taken south of the De Grey River	2*		
When taken north of the De Grey River	1*		
Emperors – spangled, blue-lined and NW snappers (combined)	4*	410/320/280mm	
Mackerel – shark	4	500mm	
Mackerel – Spanish, broad and narrow-barred	2*	750/900mm	
Mackerel – wahoo	2*	900mm	
Mahi mahi	4	500mm*	
Mangrove jack		300mm	
When taken south of the De Grey River	2		
When taken north of the De Grey River	4		
Mulloway – northern	2*	700mm*	
Parrotfish	4*		
Pearl perch	4*		
Pink snapper	4*	410mm	
Red emperor	2*	410mm	
Samson fish/amberjack/yellowtail kingfish (combined)	2*	600mm	
Sharks and rays (combined)	2*		
Scarlet, crimson, saddle tail seaperch (combined)	2*	300mm*	
Threadfin salmon – giant	2*	450mm*	
Tripletail	4*	300mm*	
Tuna – south, north bluefin, yellowfin, bigeye and dogtooth	2*		
Wrasse (including baldchin groper and tuskfish)	2*	400mm	

Category 2 Fish – *total mixed daily bag limit of 16*

Category 2 Fish have a moderate risk of overexploitation. Many fish in this category have moderate catch rates and levels of abundance. Category 2 Fish are mostly found in inshore and estuarine areas, are highly sought after by recreational fishers and mature at three to four years. Category 2 Fish include all fish not listed in other categories except baitfish of the sardine, anchovy and hardyhead families (*Clupeidae, Engraulididae* and *Atherinidae*), redfin perch, goldfish, carp and tilapia.

(Note: *denotes proposed change to current management)

Species	Species bag limit	Size limit	Other controls
Barracuda	4*		
Bonefish and giant herring (combined)	4*		
Bonito and tunas – (other)	8		
Bream - north-west and yellowfin (combined)	8*	250/350mm*	
Catfish, freshwater (silver cobbler)	8*		
Catfish, salmon	8*		
Flathead and flounder (combined)	8*	300/250mm	
Goatfish	8*		
Javelinfish and sweetlips (combined)	8*	300mm*	
Leatherjacket	8*	250mm	
Mackerel – Queensland school and spotted (combined)	4	500mm	
Queenfish	4		
Snook and pike (combined)	8*	300mm	
Sooty grunter	8*	250mm*	
Tarwhine	16*	230mm	
Threadfin-bream	8*		
Threadfin salmon – other species (combined)	4*		
Trevally (combined)	4*		
Tropical seaperch and snappers – other Lutjanus species (combined)	4*	300mm*	

Baitfish of the sardine, anchovy and hardyhead families (*Clupeidae*, *Engraulididae* and *Atherinidae* - mulies, whitebait, scaly mackerel, anchovies, hardyheads) are not included in Category 2. For these species it is proposed to have a combined bag limit of nine litres.

It is also proposed that mullet be treated the same as garfish and removed from the general finfish possession limit. The daily bag limit of 40 mullet would still apply.

Department of Fisheries' Research Division advice

- Different catch rates for mangrove jack and coral trout in the region may be due to variances in fishing pressure, rather than abundances in fish stocks. Consideration needs to be given to the appropriation of a split bag limit for these species.

Category 3 Fish – *total mixed daily bag limit of 40*		
(Note: *denotes proposed change to current management)		
Species	**Species bag limit**	**Other controls**
Dart Garfish Longtom Milkfish Mullet, sea and yellow-eye Whiting **Unlisted species - (all species not specified except baitfish and feral freshwater species)**	40 combined	

Crustaceans		
(Note: *denotes proposed change to current management)		
Species	**Bag limit**	**Other controls**
Cherabin	9 litres	
Crab, blue swimmer (manna)	20*	Boat limit of 40* size limit, gear controls
Crab, mud	5*	Boat limit of 10* size limit, gear controls
Prawns, school and king	9 litres	
Rock lobster	4*	Boat limit 8 Recreational licence required. Note: Proposal to lift night time fishing ban.

Molluscs and other reef animals		
(NOTE: *denotes proposed change to current management)		
Species	**Bag limit**	**Other controls**
Cockles	9litres	
Mussels	9 litres	
Oysters	9 litres*	
Razorfish	20*	
Scallops	20*	
Sea urchins	20*	
Squid, cuttlefish and octopus (combined)	15	Boat limit of 30*
All other species of edible mollusc not specifically mentioned (combined)	2 litres	

Size limit for mud crabs: There are two species of mud crabs found in Western Australian waters - the green mud crab (*Scylla serrata)* and the brown mud crab (*Scylla olivacea).* Despite their names, the two species are difficult to identify as their name does not refer to their colour but rather to the colour of the water in which they are found: brown mud crabs are found in estuarine water and green mud crabs in more oceanic waters.

The best way of identifying them is to check their claws. Males have spines behind the fingers and on the wrists – single spines for brown mud crab and double spines for green – however, many fishers still have difficultly separating the two species. In WA, the two species have different minimum size limits: 150mm for green crabs (*Scylla serrata*) and 120mm for brown crabs (*Scylla olivacea*).

In 2000/01, in WA, the commercial catch of mud crabs was less than two tonnes landed with the majority of the commercial catch landed around Onslow. Mud crabs are also an important recreational catch with an estimated 12 tonnes of *S. serrata* landed in the Pilbara region in 2000/01. Despite small populations of *S. olivacea* in the north of the State, both the commercial and recreational catch are dominated by *S. serrata*.

Previous research in the Northern Territory on *S. serrata* has shown that sexual maturity occurs between 90-110 mm CW (Heasman et al., 1985: Knuckey, 1996), which indicates that the current minimum size of 150 mm CW (*S. serrata*) ensures adequate protection of breeding stock. Therefore, given that only a small proportion of the catch in WA is *S. olivacea* and the difficulty of separating the two species, it is recommended that the size limit is made consistent.

As previous research indicates that the current minimum size of 150 mm CW (*S. serrata*) offers adequate protection of the breeding stock, it is recommended that this size limit be implemented for both species to prevent future confusion over identification and associated difficulties with enforcement of the regulations.

Proposal 7 - Proposed changes to the current legal size limits

Note: Any changes to the size limit will apply to all sectors including commercial fishers.

Species	**Old size (mm)**	**New size (mm)**	**Size when 50% of the stock reach maturity (mm)**
Barramundi		800 (max)	Change sex to females at around 800
Cobia		600	not known
Cod	1,200 (max)	1,000 (max)	May change sex from female to male
Mahi mahi (dolphin fish)		500	not known
Mulloway, northern	450	700	750
Sooty grunter		250	not known
Threadfin salmon - giant		450	not known
Tripletail		300	Not known
Yellowfin bream	250	350	Change sex to male at around 350
Other tropical sea perches and snappers eg: Spanish flag, Moses perch and crimson sea perch		300	Not known
Mud crabs	150 (green) 120 (brown)	150 for both	A size limit of 150mm will ensure they breed at least once before being taken

Department of Fisheries' Research Division advice

- Tuskfish (*Labrids*), cods (*Serranids*) and some bream (*Sparids*) are protegenous hemaphrodites i.e change sex at a certain size or age. For these species it is critically important the minimum legal length is greater than the length at which they change sex. For yellowfin bream, the current minimum legal length of 250 mm needs to be above 350 mm, the length at which most females become males (about 50%). As the biology of more species becomes known, additional changes may be required to the minimum legal size lengths for some species.

Proposal 8 - Totally protected fish

Due to low abundance levels and vulnerability to over fishing, the following species should be totally protected:

- Freshwater sawfish (*Pristis microdon*). Note: this species may be an important food source for Indigenous people and further consultation will need to occur with this group prior to any decision to classify the freshwater sawfish as a totally protected species.
- Speartooth shark (*Glyphis sp*)
- Queensland groper (*Ephinephelus lanceolatus*)
- Barramundi cod (*Cromileptes altivelis)*
- Baler shells (*Melo sp*) - proposed prohibition on the collection of live shell.

Net fishing: During consultation with stakeholders, concern was expressed about the potential impact of haul netting in the Pilbara/Kimberley Region. Currently, all set netting is prohibited north of Onslow. Recreational haul netting is currently only permitted seasonally between Beadon Creek near Onslow, and Cunningham Point north of Broome.

It should be noted that with the exception of mullet the majority of species caught in haul nets can be caught by line.

The use of haul nets by Aboriginal fishers as a customary form of fishing has also been highlighted as an issue in the past. An Aboriginal fishing strategy is currently being developed which is likely to recommend separate fishing rules be established for Aboriginal fishers in recognition of customary fishing practices.

Regardless of the outcomes of the Aboriginal fishing strategy, key stakeholder groups held the opinion that the regional recreational fishing strategy should contain proposals which are designed to protect recreational fishing quality in the region as a whole.

During consultation with stakeholder groups, which included RFAC, Regional RFACs, Recfishwest and regional recreational fishers, the view was expressed that recreational haul

netting was having a negative impact on the quality of recreational line fishing in the region. Given that the majority of target species can be caught by line with the exception of mullet, in the interests of protecting the quality of the recreational line fishery, comment is sought on two proposals for the future management of recreational haul netting in the Pilbara/Kimberley Region.

Proposal 9 - Haul net fishing

9(a) The use of haul nets be prohibited in the Pilbara/Kimberley Region.

9(b) Haul netting be allowed in defined areas with the following conditions:

- Maximum length of haul net to be 30m; and
- Mullet be the only species permitted to be retained.

Due to the potential impact of haul nets in river and creek systems, permitted areas will only be considered in 'ocean waters'.

Fishing gear: In recent years, the freshwater crustacean 'red claw' has been discovered in Lake Kununurra. Red claw are not native to WA and are likely to have been illegally introduced from stocks in the Northern Territory or Queensland. Due to their eating qualities, red claw are targeted by recreational fishers with the use of illegal fish traps.

The illegal traps are primarily the soft mesh 'opera house' style traps, and are capable of catching a range of species including tortoises and freshwater crocodiles. On a number of occasions, freshwater crocodiles have died after becoming entangled in the illegal traps.

Given that red claw is a feral species, it is desirable that they be removed from Lake Kununurra, but only if the bycatch issues can be addressed.

There is a possibility that the bycatch issues may be reduced through the use of rigid traps that are not capable of capturing tortoises or entangling crocodiles.

With regard to other forms of gear, there was general support during consultation for the methods that are currently permitted.

Proposal 10 – Red claw traps in Lake Kununurra

Due to the number of red claw in Lake Kununurra, a structured gear trial should be carried out to access the viability of using rigid traps to allow the take of red claw. The gear trial should be supervised by the Department of Fisheries and involve members of the East Kimberley RRFAC.

Fishing competitions: Stakeholder groups have raised a number of concerns associated with fishing competitions.

Key issues identified included:

- The potential impact of large-scale fishing competitions on fish stocks, and the risk of localised, serial or seasonal depletion of key target species.
- Impact of fishing competitions on the seasonal availability of fish for other recreational fishers.
- Catch handling and catch care and the dumping of fish targeted for prizes.
- The continuation by some clubs of 'heaviest bag' or quantity-based competitions, where points or prizes are awarded for the take of large numbers or weights of key recreational target species.
- The commercial nature of some competitions, where revenue raised from entry fees and sponsorships is then used to benefit clubs.
- The effect of these issues on the general community's view of recreational fishing.
- The growing interest in commercial scale competitions which attract thousands of entrants, offer significant prizes, and attract major commercial sponsors.

The greatest concern has been expressed over fishing competitions which were open to the public, attracted large numbers of people, raised funds and encouraged people to take fish primarily for prizes, rather than for human consumption. These competitions appeared to be commercial fundraising or promotional ventures, with revenue or sponsorship benefits channelled back into covering organisation costs and profits used to fund club facilities or activities.

To gain an understanding of the relative impact that fishing competitions may have on fish stocks, a formal data collection and registration system is needed. Such as system would also allow the Department of Fisheries to manage the frequency and impact of large public competitions where required.

This data collection system has already been endorsed for the Gascoyne and West Coast Regions for competitions where there are more than 100 participants.

In the interests of collecting comprehensive data from across the State on the relative impact fishing competitions may be having on fish stocks, the same registration and data collection system that has been endorsed for the West Coast and Gascoyne Regions is proposed for the Pilbara/Kimberley Region.

To address any issues associated with poor catch care, handling and fish wastage, a code of conduct for fishing competitions will be developed with angling clubs. This code, together with the national recreational fishing code of practice, could form the basis for any codes of practice that may be required under animal welfare legislation.

Proposal 11 – Fishing competitions

11(a) All fishing competitions with greater than 50 participants must formally registered in advance with the Department of Fisheries.

11 (b) Competition organisers be required to keep an accurate record of the participation, catch and effort in each competition and forward catch returns to the Department of Fisheries for inclusion in the recreational fisheries database. If possible information should be entered in an electronic format compatible with the recreational fishing database.

11(c) To ensure fishing competitions are conducted in line with recreational fishing ethics, and meet requirements under the Animal Welfare Bill, a formal code of conduct for fishing competitions should be developed by the Department of Fisheries in consultation with fishing clubs and organising bodies.

3.4 Protecting and enhancing recreational fishing quality

3.4.1 Key issues and proposals

Recreational fishers have a range of values that they associate with fishing. These values define the 'quality' of the fishing experience and collectively become the motivation for continuing involvement in fishing.

For most people, the quality of the fishing experience is not defined by the quantity of fish they catch. Instead, the experience of seeing fish, being confident that they are available for capture, and capturing some fish are core values which differentiate fishing from other forms of outdoor recreation.

Community surveys (FWA 1996 on) support the view that many recreational fishers view 'fishing quality' as a blend of experiences related to personal involvement in the process of seeking, capturing, and sometimes consuming fish.

However, equally important are values that include the enjoyment of being in a 'wild' and unpolluted environment, and the social dimensions of fishing.

If heavy fishing occurs on fish populations, the proportion of large fish available tends to diminish, along with the stock density. Under heavy fishing pressure which approaches the maximum sustainable yield, the stock may be sustainable, but its structure changes. Larger, older individuals are quickly removed from the population and the fishery moves to targeting recruits as they reach legal size. While this may not always represent a threat to the sustainability of the stock as a whole, it represents a threat to the quality of the recreational fishing experience. This situation is amplified where recreational and commercial fishers target the same species, particularly near major tourism centres.

The trade-off for a high level of fishing quality in the face of growing fishing activity is a reduction in total exploitation of the resource. Concern has been expressed in past planning

processes that benefits obtained by managing the recreational fishery may merely 'spill over' as increased catches to the commercial sector. An important consideration is therefore the management of user conflict and competition for localised resources through spatial or temporal separation for different management objectives and different styles of fishing and fishing methods.

Recreational fishing priority areas: At the recreational fishing planning day, suggestions were made that to protect recreational fishing quality, areas should be established which are managed primarily for recreational fishing values.

The nearshore waters around key population centres were identified as being of significant importance to recreational fishers. Management decisions such as those affecting resource allocation and access should give prime consideration to recreational fishing values in these areas. Other uses such as commercial fishing and aquaculture should be of a type and level compatible with recreational fishing values for the area.

The management arrangements for 'recreational priority areas' should not necessarily exclude particular activities. However, these must be assessed to be of a type or at a level that does not adversely impact on recreational values.

To maintain and enhance the quality of recreational fishing in these zones, a number of key management initiatives will be required which seek to limit the commercial exploitation of particular species or incompatible fishing techniques.

The establishment of discrete zones that recognise recreational fishing as a priority would have the following significant social benefits:

- Guard against unmanaged shifts in resource sharing through increased commercial fishing activity.
- Secure long-term recreational access to key areas.
- Highlight the importance of recreational fishing in other planning processes.
- Help ensure that the majority of benefits from tighter regulation of recreational fishing flow back to the recreational sector in the shape of improved fishing quality and reduced risk of serious localised depletion.
- Help minimise social conflict by reducing the incidence of incompatible activities.
- Create a focus for recreational fishing as a major tourism drawcard in the Pilbara/Kimberley Region.

This initiative should be progressed through the Integrated Fisheries Management Planning Process for the Pilbara/Kimberley Region.

Proposal 12 - Recreational fishing priority areas

The importance of recreational fishing as a component of tourism and lifestyle should be recognised in the Integrated Management Planning Process.

Through this process, the following areas should be considered for the priority management of recreational fishing:

- Ord River;
- King Sound;
- Inshore waters and creeks around Broome;
- Dampier Archipelago;
- Montebello Islands;
- Fitzroy River;
- Keep River near Kununurra (joint management arrangements should be developed with Northern Territory Fisheries, as this river is located within the borders of the NT);
- Cambridge Gulf;
- Rowley Shoals;
- Buccaneer Archipelago;
- Cape Keraudren;
- De Grey River;
- Cape Lambert to Reef Island (Sherlock Bay);
- Nickol Bay to Cape Lambert (crabs, barramundi, threadfin salmon); and
- Offshore island groups in the Pilbara.

Access for recreational fishers: Continued access for recreational fishers to coastal areas, pastoral leases, freshwater systems, mining reserves, Aboriginal land and conservation areas is an important and significant issue.

On occasions in the past, due to problems associated with the interference with fences or livestock, the owners of pastoral leases have restricted or prohibited recreational fishers from accessing fishing locations through pastoral leases.

It is recognised that or owners of pastoral leases have the right to take steps to protect livestock and ensure their equipment and property is not interfered with.

Members of the recreational fishing community believe it is important that fishers act with a sense of personal responsibility when accessing fishing locations through pastoral or mining leases, or Aboriginal land, and steps should be taken to promote responsible angler behaviour.

To achieve a desirable outcome where recreational fishers can continue to access fishing locations, members of the recreational fishing community are supportive of the development of a code of conduct for fishing on pastoral and mining leases, or when entering Aboriginal land.

The recreational fishing community was supportive of the code have the following key elements:

- Any fish frames or offal are removed, dumped in the ocean or buried.
- All gates which are shut must be left shut.
- No standing trees or shrubs are to be cut down for firewood.
- All human waste must be buried at least 50 m from any watercourse.
- Under no circumstance should any fences be cut or interfered with.
- Leave no rubbish behind.

- Any machinery or equipment that is the property of the station owner should not be interfered with.
- Aboriginal land can only be entered with the approval of the Aboriginal landowners.
- People should not camp within 200 m of any watering point to avoid disturbing stock.
- Firearms or dogs should not be taken on to stations without the approval of the station owner.

In the interests of defining access routes and promoting responsible fishing behaviour, the Regional RFACs in each region could take a lead role in negotiating access routes for recreational fishers with pastoral and mining lease owners as well as the owners of Aboriginal land. These routes could then be included in fisheries publications along with the code of conduct for fishers.

Proposal 13 – Code of conduct for accessing pastoral and mining leases and Aboriginal land

That a code of conduct be developed for recreational fishers accessing fishing locations through pastoral and mining leases and Aboriginal land. The code should be developed in consultation with land owners/lease holders and should contain the following elements:

- Any fish frames or offal are removed, dumped in the ocean or buried.
- All gates found shut must be left shut.
- No standing trees or shrubs are to be cut down for firewood.
- All human waste must be buried at least 50 m from any watercourse.
- Under no circumstance should any fences be cut or interfered with.
- Leave no rubbish behind.
- Any machinery or equipment that is the property of the station owner should not be interfered with.
- Aboriginal land can only be entered with the approval of the Aboriginal land owners.
- People should not camp within 200 m of any watering point to avoid disturbing stock.
- Firearms or dogs should not be taken on to stations without the approval of the station owner.

Proposal 14 – Access to pastoral and mining leases and Aboriginal land

Regional RFACs should enter into negotiations with owners/leaseholders owners to define access route to fishing locations. These routes and the code of conduct should be promoted by the Department of Fisheries in advisory material.

Translocation and restocking: Members of the recreational fishing community in the East Kimberley have advocated the stocking of Lake Kununurra with barramundi. Should stocking this body of water with barramundi prove feasible, members of the local community believe this could substantially improve the quality of recreational fishing around Kununurra.

To progress the possibility of restocking Lake Kununurra with barramundi, the East Kimberley RRFAC has joined a local stocking committee to further progress the idea of restocking Lake Kununurra with barramundi.

This community group secured funds to conduct an economic impact study on the expected benefits from restocking Lake Kununurra with barramundi. This study indicated that having a high quality 'still water' barramundi fishery could act as a major tourism drawcard for the area and provide significant economic returns for the community.

The stocking committee has also secured funds for a feasibility study to determine if restocking could be achieved through the construction of a 'fishway' to allow upstream migration.

Should the feasibility study indicate stocking Lake Kununurra with barramundi is viable, an environmental impact assessment will be undertaken, which would involve the Department of Fisheries and other relevant Government agencies.

Proposal 15 - Stock enhancement

15(a) Should a proposal to restock Lake Kununurra with barramundi prove both feasible and environmentally acceptable, support should be provided for a restocking program.

15(b) A study should be undertaken to examine the feasibility and environmental acceptability of stocking Harding Dam with barramundi.

3.5 Resource sharing

3.5.1 Key issues and proposals

One issue of great concern to the recreational fishing community relates to resource sharing between the commercial and recreational fishing sectors.

Many recreational fishers believe that the activities of the commercial fishing sector are having a significant impact on the quality of the recreational fishery.

Of particular concern were perceptions that the commercial catch of finfish from inshore waters was directly affecting the abundance of fish available for recreational take, particularly near major population centres and key holiday destinations.

In the regional reviews already completed for the Gascoyne and West Coast regions, there has been a high level of support for the commercial wetline benchmark date of 3 November 1997. After this date, it was proposed that no wetline fishing activity should be considered in the development of any new management arrangements for the finfish fishery. Discussion papers on the West Coast and Gascoyne wetline reviews are expected to be released for public comment by mid-2004. The north coast wetline review will be released later in 2004.

Resource sharing does not just relate to ‘catch shares’, but includes competition in space and time for access to specific areas or fish stocks by various user groups.

This is demonstrated in the concern expressed over the number of pearling and aquaculture leases which have been granted in recent years.

Recreational fishers believe the establishment of pearling leases in key recreational fishing locations is resulting in a loss of access to specific areas, and also reduces the quality of the fishing experience in remote locations.

Resource sharing may also include setting aside areas for purposes other than commercial or recreational fishing, such as conservation or eco-tourism, or traditional use by Aboriginal communities.

Consequently, the simple assignment of catch ‘quotas’ for each sector is unlikely to resolve resource sharing issues, even if a fishery has a comprehensive monitoring program in place for both sectors, reliable stock assessment, and is managed through a quota system.

It is the view of many key recreational stakeholder groups that resource sharing should be based on a clear set of principles and processes, and a sound understanding and recognition of the relative social and economic values for each fish species, fishery or area in question.

It is also critical that any ‘resource sharing’ is clearly carried out within the context of sustainable fisheries.

It must be noted that while separate management arrangements are in place for different sectors of the commercial fishery, these management arrangements do not necessarily take into account the cumulative impact on the finfish resource.

Similarly, the current management arrangements in place for the recreational sector do not constrain the total recreational catch or effort.

Clearly, without management of the total catch from any fish stock, sustainability becomes a key issue.

While commercial fishing plays an important part in WA's economy, and also provides an essential community service in supplying local markets with fresh local seafood, it should be noted that some commercial fisheries heavily exploit key recreational species, generate low levels of income for operators, low economic and social returns, and demand high levels of management due to the conflict issues associated with their operations.

Suggestions put forward at the recreational fishing planning day included phasing out or significantly reducing commercial fishing activity on species or in areas of high importance to the recreational sector, which, for the most part, have a low commercial value.

This would allow full development of the fishing tourism potential and recreational value associated with these species.

3.5.2 Resource sharing processes

To achieve better management of the finfish resource, a more integrated approach to management should be adopted and a separate process should be established to resolve resource sharing issues.

Integrated management is about achieving a long-term shift in the management of fisheries. However, the final form of such a new framework, or a timeframe for its implementation, has not been determined. It should be noted that at the time of writing this strategy, the Government was considering its position on a new management framework proposed by the Integrated Fisheries Management Review Committee (Fisheries Management Paper 165).

Once the sectoral management frameworks are in place, and a new integrated system implemented, allocation issues can be addressed.

At the recreational fishing planning day, it was felt strongly that the following issues must be addressed through any resource sharing process in order to meet the recreational fishing community's expressed needs, reduce social conflict, maximise social benefits from the use of key fish stocks, and ensure continuing fishing quality.

Proposal 16 - Resource sharing

As a priority, the following species should be considered for total catch management under an integrated management framework:

- Northern demersal species;
- Mackerel;
- Barramundi;
- Threadfin salmon; and
- Blue swimmer crabs.

For each species, a forum should be held with key stakeholders, including recreational, commercial, Indigenous and conservation groups to identify key issues that need to be taken into consideration in the development of an integrated management plan for the Pilbara/Kimberley Region.

3.6 Protection of fish habitats

3.6.1 Key issues and proposals

Recreational fishing in WA tends to focus around coastal towns and major river systems. In the past, the small population of many coastal communities, the distance between towns, poor or no access roads and lack of launching facilities effectively protected many areas of coastal water and inshore reef from high levels of fishing activity.

One of the greatest influences on the productivity of our river systems and near shore environment is human land use practices. Agricultural farming practices, fertilisers and industrial developments have impacted in different ways on the aquatic environment.

There has been concern expressed by recreational fishers that insufficient protection had been afforded to areas subject to increasing fishing pressure.

The Government introduced the Acts Amendment (Marine Reserves) Act 1997 to amend six Acts of Parliament, including the *Fish Resources Management Act 1994*, to allow for the establishment of a representative system of multiple use marine conservation reserves along the Western Australian coastline.

However, this process alone does not necessarily ensure that habitats important to fish stocks, such as breeding grounds or nursery areas, are identified or protected. To complement this process, the Department of Fisheries is taking steps to establish comprehensive database on important fish habitats in the different regions around WA.

It is also important that recreational fishers are recognised as important stakeholders in planning processes and assessment of development proposals. The potential impacts of proposed developments must be carefully assessed - not just regarding impact on important habitat or nursery areas, but on the impacts of increasing or focussing fishing pressure into

particular areas created from infrastructure developments (e.g. new roads, boat ramps, marinas, tourist resorts), and associated potential impacts.

Proposal 17 – Low impact wilderness fishing experiences

That the following areas be managed on a trial basis a remote wilderness fishing areas:

- Kalumburu;
- Dampier Archipelago;
- Fortescue River to Robe River;
- Cockatoo Island to Wyndham; and
- Highly valued 'wild rivers' which are pristine in nature. These rivers should be considered as fish habitat protection areas and closed to commercial fishing.

The following guiding principles should be used for the management of fishing in the wilderness area:

- Low take;
- Low environmental impact; and
- Code of practice should be developed for recreational fishing in the area.

3.7 Improving community stewardship - education and compliance

3.7.1 Key issues and proposals

A major objective is to establish and maintain a clear standard of community fishing behaviour which aims to ensure non-compliance is minimised, and where detected, appropriate sanctions applied.

These priorities were reflected in the Recreational Fisheries Program Business Plan (Fisheries WA 1996) with the creation of a separate community stewardship sub-program focused on angler contact and involvement of the community in both management planning and education activities, and an extended higher profile compliance program.

Recreational fisheries management currently relies on an effective and broadly-based set of compliance and education strategies, structured around activities designed to encourage peer education.

3.7.2 Education strategies

Education strategies currently in place for recreational fisheries in the region include:

- Interviews with anglers at beach front and boat ramp locations by both Fisheries Officers and Volunteer Fisheries Liaison Officers;
- The distribution of educational resource and reference materials;
- Broad-scale media campaigns through the print and electronic media; and
- Targeted media releases.

These are supported by focused compliance investigations into specific incident reports, and high penalties under the Fish Resources Management Act and Regulations for many offences. Fisheries Officers are empowered to issue warnings, infringement notices or to take prosecution action as compliance responses to detected breaches of Fisheries Legislation.

With the future quality of the recreational fishing resource largely being dependent on the majority of the public voluntarily abiding by fishing rules, a structured communications and community education plan is needed that focuses on the issues and species pertinent to recreational fishing in the Pilbara/Kimberley Region.

Such a plan should seek to ensure the recreational fishing community is properly informed of management decisions and given a clear lead on the values and attitudes which will assist in sustaining fish stocks.

The plan should also seek to help develop a broad community recognition of the value of recreational fishing, as well as promote community support for responsible fishing behaviour and key management initiatives.

The plan should clearly identify key target groups, the strategies by which these groups will be kept informed, and performance indicators by which the effectiveness of the plan can be assessed.

The plan must deliver educational messages to recreational fishers when they are fishing. This is the time recreational fishers are most receptive to receiving conservation messages on fishing. There are also significant educational benefits in maximising the direct involvement of fishing organisations and recreational fishers in planning and implementing structured education programs.

A key element in the communications plan for the Pilbara/Kimberley Region should include the development of a comprehensive, widely available, regional fishing guide to replace the wide range of brochures and leaflets currently produced by the Department of Fisheries.

This regional fishing guide would need to be supported by a comprehensive Internet website, and effective advertising and media communication strategies that target regional as well as Statewide media, including an annual media campaign with changes in theme from year to year.

The production of adequate quantities of practical educational tools, such as measuring gauges, fish rulers, adhesive bag limit guides and boat ramp and fishing venue signs, is also seen as essential in getting the message across to anglers where and when it is most relevant.

Proposal 18 - Pilbara/Kimberley Region community education plan

A recreational fisheries community education plan should be developed for the Pilbara/Kimberley Region that focuses on the most important issues and species in the region. Such a plan should seek to keep the recreational fishing community informed of management decisions, give a clear lead on the values and attitudes which will assist in sustaining fish stocks and develop a broad community recognition of the value of recreational fishing.

As a minimum, the plan should contain the following elements:

18(a) *Regional fishing guide*
A comprehensive regional guide to recreational fishing in the Pilbara/Kimberley Region be produced to inform and educate fishers about recreational fishing management arrangements, fishing ethics, research, conservation issues and promoting stewardship for fish stocks and the environment.

18(b) *Educational resource materials*
Adequate quantities of practical educational tools such as measuring gauges, fish rulers, adhesive bag limit guides and boat ramp and fishing venue signs should be produced to support the regional fishing guide.

18(c) *Annual media campaign*
An annual media campaign be implemented to promote recreational fishing and fishing ethics in the region.

18(d) *Volunteer involvement in education*
Encourage the establishment and development of volunteer groups in structured fisheries education activities across the region.

3.7.3 Field management and compliance

A number of surveys indicated that there had been a significant positive change in community attitudes and behaviours since the last major review of recreational fishing in 1992, with the vast majority of the recreational fishing community abiding by fish conservation controls most of the time.

However, compliance officers still report that there are small numbers of anglers who continue to fish irresponsibly and take excessive quantities of fish.

Fisheries compliance officers have also stated that deliberate and repeated non-compliance by its nature was difficult to observe without detailed surveillance and investigation programs.

Community feedback indicates that the level and strength of community support for fish stock conservation is linked to the frequency of a visible fisheries management presence, as well as an effective education program, supported by freely available and clearly constructed educational resource material, such as brochures.

Community feedback also indicates that there is widespread support for an enhanced presence of Fisheries Officers to provide a more effective deterrent to illegal and irresponsible fishing behaviours, and to strongly reinforce the positive community attitudes and behaviours needed to ensure fish for the future.

VFLO program: Following the success of the Volunteer Fisheries Liaison Officer (VFLO) program in the south of the State, the program was expanded to Broome, Port Hedland, Derby

and Karratha. However, due to the small number of people residing in these population centres, maintaining an active group of volunteers in each centre has been difficult.

The key role of the volunteers is to promote awareness of the fishing rules and encourage fishers to treat fish stocks with a sense of personal responsibility and stewardship. A central philosophy behind the Volunteer Fisheries Liaison Officer (VFLO) program was the establishment of a structured process of peer education as a key long-term management strategy for recreational fisheries.

Working outside the conventional law enforcement and compliance model, the volunteer program involves recreational fishers themselves promoting awareness of management measures and conservation issues, and encouraging a change in the values and attitudes of individuals that combine to influence fishing behaviour.

The VFLOs receive a significant amount of support and assistance from Department staff, and the size and effectiveness of the volunteer program is closely linked to the availability of adequate resources and support.

With extremely limited resources, the VFLO program has achieved a significant impact in changing community attitudes and values to recreational fishing over the last eight years.

The impact of this strategy could be significantly enhanced by setting target contact levels for key fisheries for both Fisheries officers and VFLOs which relate to the total fishing effort being exerted in the fishery.

Compliance program: The Recreational Fisheries compliance program in the Pilbara/Kimberley Region is supported through the Department of Fisheries' district offices in Karratha and Broome.

Fisheries officers are responsible for monitoring and compliance for commercial fisheries, aquaculture and fish habitat protection, and recreational fishing. The equivalent in hours of an estimated 1.5 full-time Fisheries and Marine Officers are dedicated to recreational fisheries compliance across the Pilbara/Kimberley Region.

To boost recreational fishing compliance resources, two mobile patrols dedicated to recreational fishing compliance have been established through funds raised from an increase in recreational licence fees.

The mobile patrols operate seasonally in areas of greatest demand, and will have the capacity to work seasonally in the Pilbara/Kimberley Region.

While the two mobile patrols provide some additional compliance presence, given the size of the Pilbara/Kimberley Region, significant gaps exist in the geographic spread of Fisheries recreational fishing compliance capacity, and the provision of compliance resources is not keeping pace with the growth in recreational fishing activity.

It should be noted that the introduction of cost recovery for major commercial fisheries and the development of service level agreements to meet cost recovery obligations in commercial

fisheries has reduced the flexibility that Department of Fisheries regional managers previously had in deploying staff in response to recreational fishing activity or incidents.

The direct cost of placing a Fisheries and Marine Officer in the field in the Pilbara/Kimberley Region when salaries and operating costs are taken into account is typically in the order of $90,000 a year per officer.

To resolve this issue, dedicated resources needed to be secured for recreational fishing compliance in the region, and the level of resources required need to be linked to the scale and urgency of management demands generated by the fishery, and keep pace with predicted increases in population and fishing activity.

As an initial step, a baseline field contact rate for both the compliance and VFLO program of between five and 10 per cent per cent of all fishing trips conducted should be set for recreational fisheries. Peer education and communications theory indicates that a direct contact rate of 10 per cent should have a flow on educational benefit to at least a further 40 per cent of participants, and significantly improve community confidence in management, as well as increasing the detection rate of illegal activity.

With an angling effort of 190,000 angler days in the area from Onslow to Broome, the target contact rate for all recreational fisheries should be an estimated 19,000 contacts per year. This target should be evaluated against the community education and compliance outcomes required in this recreational fisheries management strategy.

It must be recognised that even with adjustments to current operational priorities, existing resources within the Recreational Fisheries Program and the VFLO program would not be sufficient to achieve anywhere near a 10 per cent contact to trip ratio for most recreational fisheries.

This is an issue that requires serious consideration by the Government and the community in the provision of adequate recurrent funding to ensure effective recreational fisheries management.

The following proposals are presented as representing the minimum additional resources needed to ensure fisheries compliance capacity keeps pace with the growth and spread of population over the next five to 10 years.

Proposal 19 – Additional patrol capacity

That an additional three patrols (six fisheries officers) be dedicated to recreational field compliance and education activities during peak fishing seasons in the Pilbara/Kimberley Region.

These resources should be allocated to:

- *Karratha:* One additional patrol crew to service peak season fishing compliance needs in the Dampier Archipelago and south to Onslow.

- *Broome:* One additional patrol crew to be based in Broome and service the area between 80 Mile Beach and Derby.
- *Kununurra:* One additional patrol crew to be based seasonally in Kununurra and provide service south to Wyndham.

Proposal 20 - VFLO program

That the VFLO program be established in all key regional centres in the Pilbara/Kimberley Region.

3.7.4 Implementing management and education strategies

Dedicated resources within the Department of Fisheries are needed to implement the Pilbara/Kimberley Regional Review and ensure that fisheries management and educational outcomes envisaged in the plan are achieved.

A specific person should be appointed as recreational fisheries manager for the Pilbara/Kimberley Region, with end of line responsibility for planning, coordination and implementation of key management, research, education, and compliance strategies for recreational fisheries operating within the Pilbara/Kimberley Region.

An additional role would provide executive support for the Regional RFACs in the region, releasing Fisheries and Marine Officers who have performed these tasks in the past for field duties.

This person would be also be responsible for overseeing the implementation of the Pilbara/Kimberley recreational fishing communication and education strategy, including production and circulation of the regional fishing guide, planning and coordinating community education activities and providing leadership and support to the VFLO program.

Proposal 21 – Recreational fishing management officer

The appointment of a specific person to coordinate the implementation of the Pilbara/Kimberley Regional Review and to assist with the development of integrated fisheries management plans for key fisheries in the region.

3.8 Providing adequate resources for management and enhancement

Adequate funding for recreational fishing management will be a critical factor in whether or not WA can meet the challenges in managing a growing recreational fishery over the next decade.

The approved Recreational Fisheries Program budget for 2002/2003 management is $11 million, of which recreational fishers contribute an estimated $2 million through licence fees. This funding is currently used for management, consultation, research, education and compliance activities across the State.

To fund all proposals within the recreational fishing strategy, additional funding is required.

The Government has indicated that to adequately fund the future management of recreational fishing, it will consider future funding options during the development of Integrated Fisheries Management Framework for the State's fish resources.

APPENDIX A CURRENT BAG AND SIZE LIMITS

PRIZE FISH			
Mixed daily bag limit – *8 per angler* **Prize fish are highly sought after for their catching or eating qualities and some are vulnerable to overfishing.**			
Species	**Scientific Name**	**Minimum Legal Size**	**Bag Limit**
Billfish – sailfish, swordfish, and marlins combined	Families *Istiophoridae* and *Xiphiidae*	N/A	4
Cobia	*Rachycentron canadus*	N/A	4
Cods – combined (inc. breaksea and harlequin)	Family *Serranidae*	Fish over 1200mm or 30kg are protected. Breaksea – 300mm	4
Coral Trout	*Plectropomus spp.*	500mm	4
Dhufish	*Glaucosoma hebraicum*	500mm	4
Mackerel, shark	*Grammatorcynus bicarinatus*	500mm	4
Mackerel, Spanish broad-barred	*Scomberomorus semifasciatus*	750mm	4
Mackerel, Spanish narrow-barred	*Scomberomorus commerson*	900mm	4
Mackerel, spotted	*Scomberomorus spp.*	500mm	4
Mackerel, school	*Scomberomorus spp.*	500mm	4
Mackerel, wahoo	*Acanthocybium solandri*	900mm	4
Mahi mahi (dolphinfish)	*Coryphaena hippurus*		4
Mulloway and Northern mulloway	*Argyrosomus hololepidotus* and *Protonibea diacanthus*	500mm	4
Queenfish	*Scomberoides commersonnianus*		4
Salmon, Australian	*Arripus truttaceus*	300mm	4
Samson fish	*Seriola hippos*	600mm	4
Sharks (all species except protected species)		N/A	4
Trout, brown and rainbow* - combined	*Salmo trutta* and *Oncorhynchus mykiss*	300mm	4
Tuna, southern bluefin	*Thunnus maccoyii*		4
Yellowtail kingfish	*Seriola lalandi*	600mm	4

* Licence required

REEF FISH			
Mixed daily bag limit – *8 per angler* **Reef fish are usually resident species and are highly vulnerable to overfishing.**			
Species	**Scientific Name**	**Minimum Legal Size**	**Bag Limit (Combined)**
Emperor, blue-lined	*Lethrinus laticaudis*	320mm	8
Emperor, red	*Lutjanus sebae*	410mm	
Emperor, spangled	*Lethrinus nebulosus*	410mm	
Groper, baldchin and tuskfish (excluding western blue groper)	*Choerodon rubescens, cyanodus* and *shoenleinii*	400mm	
Queen snapper (blue morwong)	*Nemadactylus valenciennesi*	410mm	
Snapper, pink	*Pagrus auratus*	410mm Wilson Inlet - 280mm	
Snapper, North-west (all other species)	*Lethrinus spp.*	280mm	

KEY ANGLING AND SPORT FISH			
Daily bag limit – *8 per angler* **An important protection category – cobbler and tailor stocks have declined in recent years, with fish often caught before spawning.**			
Species	**Scientific Name**	**Minimum Legal Size**	**Bag Limit**
Bonito	*Sarda orientalis, Cybiosarda elegans*		8
Cobbler	*Cnidoglanis macrocephalus*	430mm	8
Tailor	*Pomatomus saltatrix*	300mm	8
Mangrove jack	*Lutjanus argentimaculatus*	300mm	8
Fingermark bream	*Lutjanus russelli*		8
Giant threadfin salmon	*Polydactylus macrochir*		8

TABLE FISH

Daily bag limit – *20 per angler*

This group contains many of WA's most popular angling species and bag limits are crucial for maintaining future stocks.

Species	Scientific Name	Minimum Legal Size	Bag Limit
Bream, black, North-west black and yellowfin	*Acanthopagrus spp.*	250mm	20
Flathead and flounder – combined	Family *Platycephalidae* and *Pseudorhombus* spp	Flathead – 300mm Flounder – 250mm	20
Leatherjackets	Family *Monacanthidae*	250mm	20
Pike and snook - combined	*Sphyraena spp.* and *Dinolestes spp.*	300mm	20
Skipjack trevally	*Pseudocaranx spp.*	250mm	20
Snapper, red	*Centroberyx spp*.	230mm	20
Tarwhine	*Rhabdosargus sarba*	230mm	20
Threadfin			
Whiting, King George	*Sillaginodes punctata*	280mm	20

BREAD AND BUTTER FISH

Daily bag limit – *40 per angler* (No size limits apply)

'Bread and butter' species are all fish not listed in other categories with the exception of baitfish of the sardine and anchovy families (Clupeidae and Engraulididae – mulies, whitebait, scaly mackerel, anchovies), redfin perch, goldfish, carp and tilapia.

Species	Scientific Name	Bag Limit
Australian herring	*Arripis georgianus*	40
Garfish	Family *Hemirhamphidae*	40
Mackerel, blue (common)	*Scomber australisicus*	40
Mullet, sea and yellow-eye	Family *Muglidae*	40
Whiting, sand, school and yellowfin	*Sillago spp.*	40
All other unlisted species		40 each

SPECIAL BAG LIMITS			
Species	**Scientific Name**	**Minimum Legal Size**	**Bag Limit**
Barramundi (only one rod or handline to be used at any one time) – special rules apply in the lower Ord River, Fitzroy River and Broome areas	*Lates calcarifer*	550mm	Possession limit 2
Groper, Western blue	*Achoerodus gouldi*	500mm	1

CRUSTACEANS AND SHELLFISH				
Species are often sedentary or resident in nature, but may have pelagic or migratory phases in their life cycle with larvae or eggs widely distributed by ocean currents. Specific regulations apply to each species, based on biological characteristics. Low catch limits apply to shellfish due to high risk of localised depletion.				
Species	**Scientific Name**	**Minimum Legal Size**	**Bag Limit**	**Boat Limit#**
CRUSTACEANS				
Cherabin	*Macrobrachium spp.*		9 litres	N/A
Crab, blue swimmer (mana)	*Portunus pelagicus*	127mm	24	40
Crab, mud – all species	*Scylla* spp	Green – 150mm Brown – 120mm	10	N/A
Marron*	*Cherax tenuimanus*	*	*	*
Prawns	Family *Peneaidae*	N/A	9 litres	N/A
Rock lobster* - all species combined	*Panulirus* and *Jasus spp.*	*	8	16
Rock lobster* - Dampier Archipelago	*Panulirus spp.*	*	4	8
MOLLUSCS AND OTHER REEF ANIMALS				
Abalone, Roe's*	*Haliotis roei*	60mm	20	N/A
Abalone, greenlip and brownlip* - combined	*H. laevigata* and *H. conicopora*	140mm	5	10
Mussels	Family *Myrtilidae*	N/A	9 litres	N/A
Sea urchins	Class *Echinoidae*	N/A	40	N/A
Squid, cuttlefish and octopus – all species combined	Class *Cephalopoda*	N/A	15	30
All other species of edible molluscs		N/A	2 litres	N/A

* Licence required

Only applies when two or more fishers aboard.

N/A – Not applicable

APPENDIX B VULNERABILITY TO OVER-EXPLOITATION

	BLACK BREAM *Acanthopagus butcheri*	**COD** *Epinephelus species*
Biology Age maturity (years)	Wellstead F = 1.8 m = 1.8 Walpole/Nornalup F = 4.9 m = 2.8	Possible hermaphrodite – change sex from female to male.
Size at maturity (mm)	Wellstead F = 157 m = 145 Walpole/Nornalup F = 201 m = 158	
Max weight/size	Wellstead F = 377 m = 344 Walpole/Nornalup F = 367 m = 323 (mm)	2.9kg breaksea cod
Spawning times	Mid spring - early summer	
Fecundity (number of eggs)	Multiple spawner, range 13,000 –612,000	
Abundance	Moderate in limited locations	Moderate
BIOLOGICAL RISK	MODERATE	HIGH

Habitat	Estuarine	Reefs. Often found in caves and around rock ledges.
Behavioural traits		Ambush feeders. Often found as single fish rather than in schools.
Value eating/fishing	High	High
Other issues	Limited gene exchange among isolated populations and heavy fishing pressure around population centres.	Possible mortality issue with fish caught in deep water.
VULNERABILITY DUE TO FISHING AND ENVIRONMENTAL FACTORS	**MODERATE/HIGH**	**HIGH**

LEVEL OF RISK OF OVER EXPLOITATION	Moderate, due to isolated nature of fisheries and localized depletion issues.	High, due to low abundance, possible sex change and limited biological information.

CURRENT APPROPRIATE CONTROLS FOR MANAGEMENT

Size limits	Yes	Yes (if survive release)
Species bag limits	Yes	Yes
Mixed bag limits	Not essential due to targeting of black bream	Yes
Gear restrictions (over and above standard hook and line controls)	No	No
Species possession limits	No	Yes
Area closures	Possible, if breeding areas can be defined	No
Season closures	Possible, to protect breeding fish	No
Individual quota: tags, licences	No	No
Total allowable recreational catch	No	No

	CORAL TROUT *Plactropomus maculatus*	**GARFISH** Hyporhamphus melanochir
Biology Age maturity (years)	2-3 years Change sex from female to male at 4.42 yrs	3yrs (SA)
Size at maturity (mm)	350	250
Max weight/size	70cm	520mm
Spawning times		Oct – Nov (SA)
Fecundity/no of eggs		10 000
Abundance	Low	High
BIOLOGICAL RISK	**HIGH**	**LOW**

Habitat	Reef structures, inshore and offshore.	Sheltered embayments and over seagrass beds.
Behavioural traits	Individual fish often territorial.	Can form large schools.
Fishing pressure	High/increasing	Medium/increasing
Value eating/fishing	High	Medium/low
Other issues	Use of technology to improve efficiency at targeting.	
VULNERABILITY DUE TO FISHING AND ENVIRONMNETAL FACTORS	**HIGH**	**LOW**

LEVEL OF RISK OF OVER EXPLOITATION	High, due to low abundance, highly targeted and hermaphrodite.	Low, due to abundant nature.

CURRENT APPROPRIATE CONTROLS FOR MANAGEMENT

Size limits	Yes	No
Species bag limits	Yes	Yes
Mixed bag limits	Yes	Yes
Gear restrictions (over and above standard hook and line controls)	No	No
Species possession limits	Yes	No
Area closures	No	No
Season closures	No	No
Individual quota: tags, licences	No	No
Total allowable recreational catch	No	No

	MAHI MAHI *Coryphaena hippurus*	**MULLOWAY** *Argyrosomus hololepidotus*	**PINK SNAPPER** *Pagrus auratus*
Biology Age maturity (years)	7 months	6 years	4-5 (Shark Bay)
Size at maturity (mm)	700	75cm	400 - 410
Max weight/size	39kg	43kg	1300mm 17kg+
Spawning times	Summer	Oct – Feb (SA)	Sept - Nov
Fecundity/no of eggs			114500 -182500
Abundance	Moderate/low *more abundant in specific locations where aggregations occur.	Low	Moderate/low *more abundant during breeding.
BIOLOGICAL RISK	**LOW**	**HIGH**	**HIGH**

Habitat	Offshore open water environment.	Sheltered embayments, estuaries and near surf zone.	Juveniles – bays and inlets. Adults inshore and offshore environments.
Behavioural traits	Will often form aggregations around floating objects.	Small fish can form schools.	Form large breeding aggregations.
Value eating/fishing	High	High	High
Other issues	Fast growing. Ability to target due to aggregating behaviour.		Targeting of breeding aggregations.
VULNERABILITY DUE TO FISHING AND ENVIRONMNETAL FACTORS	**MODERATE/HIGH**	**HIGH**	**HIGH**

LEVEL OF RISK OF OVER EXPLOITATION	Moderate/high, fast growing and early age at maturity; however, heavy targeting of aggregations.	High, due to low abundance, time to reach maturity, and highly targeted.	High, due to targeting of breeding aggregation and 4 –5 years to reach maturity.

CURRENT APPROPRIATE CONTROLS FOR MANAGEMENT

Size limits	Yes	Yes	Yes
Species bag limits	Yes	Yes	Yes
Mixed bag limits	Not essential due to targeting of species.	Yes	Yes
Gear restrictions (over and above standard hook and line controls)	No	No	No
Species possession limits	Yes	Yes	Yes
Area closures	No	No	Yes
Season closures	No	No	Yes
Individual quota: tags, licences	No	No	No
Total allowable recreational catch	No	No	No

	RED SNAPPER *Centroberyx gerrardi*	**SPANISH MACKEREL** *Scomberomorus commerson*	**SPANGLED EMPEROR** *Lethrinus nebulosus*
Biology Age maturity (years)		3 years	
Size at maturity (mm)		900	380(fl)
Max weight/size	660	59kg	7kg
Spawning times		Aug – Mar (Queensland) Oct – Dec south of Queensland.	Oct - Mar
Fecundity/no of eggs			
Abundance	Moderate	Low in region	Low in region
BIOLOGICAL RISK	**MODERATE**	**HIGH**	**MODERATE/HIGH**

Habitat	A temperate occurring on rocky reefs and muddy substrates of the continental shelf and upper slopes.	Juvenile fish may inhabit nearshore coastal waters. Adults offshore reefs and open water.	Coral reefs, usually adjacent to sandy areas.
Behavioural traits	Schooling fish.	Some fish undertake seasonal migration.	
Value eating/fishing	Moderate/high	Moderate(when available)	Low in region
Other issues	Little biological data known on red snapper. Possible mortality issues with fish from deep water.	High	High
VULNERABILITY DUE TO FISHING AND ENVIRONMNETAL FACTORS	Moderate	Concerns over sustainability at current catch levels.	
BIOLOGICAL RISK	**MODERATE**	**HIGH**	**HIGH**

LEVEL OF RISK OF OVER EXPLOITATION	High, long-lived may take longer to reach maturity. Significant fishing pressure on stocks.	High, due to targeting and low abundance.	High, due to low abundance in region and fishing pressure.

CURRENT APPROPRIATE CONTROLS FOR MANAGEMENT

Size limits	Yes	Yes	Yes
Species bag limits	Yes	Yes	Yes
Mixed bag limits	Yes	Yes	Yes
Gear restrictions (over and above standard hook and line controls)	No	No	No
Species possession limits	No	Yes	Yes
Area closures	No	No	No
Season closures	No	No	No
Individual quota: tags, licences	No	No	No
Total allowable recreational catch	No	No	No

	SAMSON FISH *Seriola hippos*	**SEA MULLET** *Mugil cephalus*	**SHARK** **DUSKY AND BRONZE WHALERS** *Carcharinus species*
Biology Age maturity (years)			M = 13 bronze whaler F = 19 bronze whaler 14 – 18 dusky whalers
Size at maturity (mm)			2,800 dusky whaler
Max weight/size	50kg		323kg dusky whaler 295kg bronze whaler
Spawning times		March - September	Peak in summer.
Fecundity/no of eggs			Give birth to live young – bronze whaler 3 –14 pups.
Abundance	Low	High	Low
BIOLOGICAL RISK	**INSUFFICIENT DATA**	**LOW**	**HIGH**

Habitat	Inshore and continental shelf waters associated with reefs, jetties and pylons.	Estuary systems, sheltered embayments, near-shore marine environments.	Continental shelf waters.
Behavioural traits	Often form schooling aggregations around structures.	Migrate into upper reaches of estuaries.	Both species will move inshore to drop their young.
Value eating/fishing	Moderate/high	Low	High
Other issues	Little biological data known on Samson fish	Not targeted by line fishers	
VULNERABILITY DUE TO FISHING AND ENVIRONMNETAL FACTORS	**MODERATE**	**LOW**	**HIGH**

LEVEL OF RISK OF OVER EXPLOITATION	Insufficient data to determine.	Low, given abundance and non-targeting by line fishers.	High, due to time to reach maturity, low fecundity and highly targeted.

CURRENT APPROPRIATE CONTROLS FOR MANAGEMENT

Size limits	Yes	No	Yes
Species bag limits	Yes	Yes	Yes
Mixed bag limits	Yes	Yes	Yes
Gear restrictions (over and above standard hook and line controls)	No	Yes (netting)	No set lines
Species possession limits	No	No	Yes
Area closures	No	To gear (nets)	No
Season closures	No	To gear (nets)	No
Individual quota: tags, licences	No	No	No
Total allowable recreational catch	No	No	No

	SILVER BREAM *Rhabdosargus sarba*	**SKIPJACK TREVALLY** *Pseudocaranx dentex*	**SOUTHERN SCHOOL WHITING** *Sillago bassensis*
Biology Age maturity (years)			F = 2 m =2
Size at maturity (mm)		280(NSW)	m and F = 200
Max weight/size		700mm	328mm
Spawning times		Summer (New Zealand)	Dec - Mar
Fecundity/no of eggs		Serial spawners	Multiple spawner
Abundance	Medium	Moderate	High
BIOLOGICAL RISK	**INSUFFICIENT DATA**	**LOW/MODERATE**	**LOW**

Habitat	Inshore reefs and surf zones and areas of rock and weed.	Juveniles – inshore embayments, estuaries. Adults – inshore and offshore reefs and open water over sand and gravel.	Exposed near shore marine environments.
Behavioural traits	Often form schooling aggregations where there is a bottom substrate of sand and weed.	Schooling fish Possible migration between onshore and offshore environments.	Schooling fish.
Value eating/fishing	Moderate/low	Moderate	High
Other issues	Little biological data known on tarwine.	High fishing pressure on both juvenile and adult fish.	High fishing pressure.
VULNERABILITY DUE TO FISHING AND ENVIRONMNETAL FACTORS	**LOW/MODERATE**	**MODERATE**	**LOW**

LEVEL OF RISK OF OVER EXPLOITATION	Insufficient data to determine.	Moderate/low, due to abundance.	Low, due to abundance and size and age at maturity.

CURRENT APPROPRIATE CONTROLS FOR MANAGEMENT

Size limits	Possible	Yes	Possible, but low priority due to abundance.
Species bag limits	Yes	Yes	Yes
Mixed bag limits	Yes	Yes	Yes
Gear restrictions (over and above standard hook and line controls)	No	No	No
Species possession limits	No	No	No
Area closures	No	No	No
Season closures	No	No	No
Individual quota: tags, licences	No	No	No
Total allowable recreational catch	No	No	No

	TUNA Southern Bluefin Yellowfin Bigeye	**YELLOW EYE MULLET** *Aldrichetta forsteri*	**YELLOW FIN WHITING** *Sillago schomburgkii*
Biology Age maturity (years)	8 years (bluefin) 3+ years (bigeye) 2 years (yellowfin)	2-3 years (Swan River)	2 years
Size at maturity (mm)	1,200 (bluefin) 1,000 (bigeye) 1,000 (yellowfin)		F = 200 m = 180
Max weight/size	200kg (bluefin) 210kg (bigeye) 176kg (yellowfin)	353mm	400mm
Spawning times	Sept – Mar (bluefin) Jan – Mar (bigeye)	March – August	Dec- Feb
Fecundity/no of eggs	14 –15 million (bluefin)	125,000 – 630,000(sa)	Multiple spawner
Abundance	Low in region	High seasonally	Moderate/high
BIOLOGICAL RISK	**HIGH**	**LOW**	**LOW**
Habitat	Open ocean, juveniles often found inside Ccontinental Shelf.	Inshore marine embayments and estuaries	Unvegetated areas in sheltered to moderately sheltered nearshore waters in marine embayments.
Behavioural traits	Highly migratory schooling fish.	Schooling fish	Schooling fish
Value eating/fishing	High	Low	High
Other issues	Significant fishing pressure. Mortality issues may exist for fish caught on light line.		
VULNERABILITY DUE TO FISHING AND ENVIRONMENTAL FACTORS	**HIGH**	**LOW**	**LOW**
LEVEL OF RISK OF OVER EXPLOITATION	High, particularly for bluefin which take longer to reach maturity. Significant fishing pressure on stocks.	Low, due to abundance.	**LOW**

CURRENT APPROPRIATE CONTROLS FOR MANAGEMENT

Size limits	Yes (if fish survive release)	No	Possible, however, low priority due to abundance.
Species bag limits	Yes	Yes	Yes
Mixed bag limits	Yes	Yes	Yes
Gear restrictions	No	Netting restrictions	No
Species possession limits	Yes	No	No
Area closures	No	No	No
Season closures	No	No	No
Individual quota: tags, licences	No	No	No
Total allowable recreational catch	No	No	No

REFERENCES

Australian Bureau of Statistics, 1987. Recreational Fishing Western Australia.

Australian Bureau of Statistics, 1998a. Western Australian Year Book.

Australian Bureau of Statistics, 1998b. Population Projections 1997 - 2051.

Baharthah, T, and Sumner, N. (in prep), Fisheries WA Community Survey, 1999. Fisheries WA Research Report.

Conservation and Land Management, 1998. New horizons in marine management.

Fisheries WA 1989. A report on marron fishing in Western Australia. Marron Fishing Advisory Committee. *Fisheries Management Paper No. 26.*

Fisheries WA, 1990. Future policy for charter fishing operations in Western Australia. *Fisheries Management paper No.35.*

Crowe F, Lehre W, and Lenanton R, 1999. A study into Western Australia's open access and wetline fisheries. Fisheries Research Report No 118.

Fisheries Department of Western Australia, 1991. The future for recreational fishing – Forum Proceedings. Recreational Fishing Advisory Committee. *Fisheries Management Paper No. 40.*

Fisheries Department of Western Australia, 1991. The future for recreational fishing - final report of the Recreational Fishing Advisory Committee. *Fisheries Management Paper No. 41.*

Fisheries Department of Western Australia, 1991. Appendix to the final report of the Recreational Fishing Advisory Committee. *Fisheries Management Paper No. 42.*

Fisheries Department of Western Australia, 1994. Future management of recreational gill, haul and cast netting in Western Australia. *Fisheries Management Paper No. 66.*

Fisheries Department of Western Australia, 1995. The bag and size limit review: new regulations and summary of submissions. *Fisheries Management Paper No. 73.*

Fisheries WA, 1997. Strategic Plan 1997-2002.

Fisheries WA, 1997. Programs Business Plan 1997-2002.

Fisheries WA, 1998. Future management of the aquatic charter industry in Western Australia, Final report of the Tour Operators Fishing Working Group. *Fisheries Management Paper No. 116.*

Fisheries WA, 1999. A quality future for recreational fishing in the Gascoyne: Proposals for community discussion by the Gascoyne Recreational Fishing Working Group. *Fisheries Management Paper No.124.*

Fisheries WA, unpubl. (no date).Volunteer Fisheries Liaison Officers Survey Database.

Fisheries WA, 1998. State of the Fisheries Report 1996/1997.

Fisheries WA, 1999. State of the Fisheries Report 1997/1998.

Fisheries WA, 2000. State of the Fisheries Report 1998/1999.

Kailola, P, Williams, M, Stewart, P, Reichelt, R, McNee, A, and Grieve, C, 1993. Australian Fisheries Resources.

Lenanton, 1984. The commercial fisheries of temperate Western Australian estuaries: early settlement to 1975. Department of Fisheries and Wildlife Report No. 62.

Malseed, B, Sumner N, and Williamson, P, 1999. A 12-month survey of recreational fishing in the Leschenault Estuary of Western Australia during 1998. Fisheries WA Research Report.

Malseed, B, Sumner, N, and Williamson, P, in prep. 12-month survey of recreational fishing in the Peel-Harvey Estuary of Western Australia during 1998/99. Fisheries WA Research Report.

National Recreational Fisheries Working Group, 1994. Recreational fishing in Australia – A national policy. Department of Primary Industries and Energy, Commonwealth of Australia.

Patterson Market Research, unpubl, 1994. Report on recreational fishing to the Fisheries Department of WA.

Reark Research, unpubl, 1996. Final report - Community Attitudes Survey. Report to Fisheries WA.

Reark Research, unpubl, 1997. Final report - Community Attitudes Survey. Report to Fisheries WA.

Right Marketing, 1998. Fisheries WA Community Survey 1998. Consultants' report for Fisheries WA.

Sumner, N, and Williamson, P, 1999. A 12-month survey of coastal recreational boat-fishing between Augusta and Kalbarri on the Pilbara/Kimberley of WA during 1996/97. Fisheries Research Report No.117.

FISHERIES MANAGEMENT PAPERS

No. 1 The Report of the Southern Western Australian Shark Working Group. Chairman P. Millington (1986).

No. 2 The Report of the Fish Farming Legislative Review Committee. Chairman P.Rogers (1986).

No. 3 Management Measures for the Shark Bay Snapper 1987 Season. P. Millington (1986).

No. 4 The Esperance Rock Lobster Working Group. Chairman A. Pallot (1986).

No. 5 The Windy Harbour - Augusta Rock Lobster Working Group. Interim Report by the Chairman A. Pallot (1986).

No. 6 The King George Sound Purse Seine Fishery Working Group. Chairman R. Brown (1986).

No. 7 Management Measures for the Cockburn Sound Mussel Fishery. H. Brayford (1986).

No. 8 Report of the Rock Lobster Industry Advisory meeting of 27 January 1987 . Chairman B. Bowen (1987).

No. 9 Western Rock Lobster Industry Compensation Study. Arthur Young Services (1987).

No. 10 Further Options for Management of the Shark Bay Snapper Fishery. P. Millington (1987).

No. 11 The Shark Bay Scallop Fishery. L. Joll (1987).

No. 12 Report of the Rock Lobster Industry Advisory Committee to the Hon Minister for Fisheries 24 September 1987. (1987).

No. 13 A Development Plan for the South Coast Inshore Trawl Fishery. (1987).

No. 14 Draft Management Plan for the Perth Metropolitan Purse Seine Fishery. P. Millington (1987).

No. 15 Draft management plan, Control of barramundi gillnet fishing in the Kimberley. R. S. Brown (1988).

No. 16 The South West Trawl Fishery Draft Management Plan. P. Millington (1988).

No. 17 The final report of the pearling industry review committee . F.J. Malone, D.A. Hancock, B. Jeffriess (1988).

No. 18 Policy for Freshwater Aquaculture in Western Australia. (1988).

No. 19 Sport Fishing for Marron in Western Australia - Management for the Future. (1988)

No. 20 The Offshore Constitutional Settlement, Western Australia (1988).

No. 21 Commercial fishing licensing in Western Australia. (1989).

No. 22 Economics and marketing of Western Australian pilchards. SCP Fisheries Consultants Pty Ltd (1988).

No. 23 Management of the south-west inshore trawl fishery. N. Moore (1989).

No. 24 Management of the Perth metropolitan purse-seine fishery. N. Moore (1989).

No. 25 Rock Lobster Industry Advisory Committee report to the Minister for Fisheries November 1988. (1989)

No. 26 A report on marron fishing in Western Australia. Chairman Doug Wenn MLC (1989).

No. 27 A review of the Shark Bay pearling industry. Dr D.A.Hancock, (1989).

No. 28 Southern demersal gillnet and longline fishery. (1989).

No. 29 Distribution and marketing of Western Australian rock lobster. P. Monaghan (1989).

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No. 31 Rock Lobster Industry Advisory Committee report to the Hon Minister for Fisheries September 1989. (1989).

No. 32 Fishing Licences as security for loans. P. Rogers (1989).

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No. 34 The future for recreational fishing - issues for community discussion. Recreational Fishing Advisory Committee (1990).

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No. 36 Long term management measures for the Cockburn Sound restricted entry fishery. P. Millington (1990).

No. 37 Western rock lobster industry marketing report 1989/90 season. MAREC Pty Ltd (1990).

No. 38 The economic impact of recreational fishing in Western Australia. R.K. Lindner, P.B. McLeod (1991).

No. 39 Establishment of a registry to record charges against fishing licences when used as security for loans. P. Rogers. (1991).

No. 40 The future for Recreational Fishing - Forum Proceedings. Recreational Fishing Advisory Committee (1991).

No. 41 The future for Recreational Fishing - The Final Report of the Recreational Fishing Advisory Committee. Recreational Fishing Advisory Committee (1991).

No. 42 Appendix to the final report of the Recreational Fishing Advisory Committee. (1991).

No. 43 A discussion of options for effort reduction. Southern Gillnet and Demersal Longline Fishery Management Advisory Committee (1991).

No. 44 A study into the feasability of establishing a system for the buy-back of salmon fishing authorisations and related endorsements. (1991).

No. 45 Draft Management Plan, Kimberley Prawn Fishery. (1991).

No. 46 Rock Lobster Industry Advisory Committee, Chairman's report to the Minister (1992).

No. 47 Long term management measures for the Cockburn Sound restricted entry fishery. Summary of submissions and final recommendations for management. P. Millington (1992).

No. 48 Pearl oyster fishery policy guidelines (Western Australian Pearling Act 1990). Western Australian Fisheries Joint Authority (1992).

No. 49 Management plan, Kimberley prawn fishery. (1992).

No. 50 Draft management plan, South West beach seine fishery. D.A. Hall (1993).

No. 51 The west coast shark fishery, draft management plan. D.A. Hall (1993).

No. 52 Review of bag and size limit proposals for Western Australian recreational fishers. F.B. Prokop (May 1993).

No. 53 Rock Lobster Industry Advisory Committee, Chairman's report to the Minister for Fisheries. (May 1993).

No. 54 Rock Lobster Industry Advisory Committee, Management proposals for 1993/94 and 1994/95 western rock lobster season (July 1993).

No. 55 Rock Lobster Industry Advisory Committee, Chairman's report to the Minister for Fisheries on management proposals for 1993/94 and 1994/95 western rock lobster seasons (September 1993).

No. 56 Review of recreational gill, haul and cast netting in Western Australia. F. B. Prokop (October 1993).

No. 57 Management arrangements for the southern demersal gillnet and demersal longline fishery 1994/95 season. (October 1993).

No. 58 The introduction and translocation of fish, crustaceans and molluscs in Western Australia. C. Lawrence (October 1993).

No. 59 Proceedings of the charter boat management workshop (held as part of the 1st National Fisheries Manager Conference). A. E. Magee & F. B. Prokop (November 1993).

No. 60 Bag and size limit information from around Australia (Regulations as at September 1993) F. B. Prokop (January 1993).

No. 61 Economic impact study. Commercial fishing in Western Australia Dr P McLeod & C McGinley (October 1994).

No. 62 Management arrangements for specimen shell collection in Western Australia. J. Barrington, G. Stewart (June 1994).

No. 63 Management of the marine aquarium fish fishery. J. Barrington (June 1994).

No. 64 The Warnbro Sound crab fishery draft management plan. F. Crowe (June 1994).

No. 65 Not issued

No. 66 Future management of recreational gill, haul and cast netting in Western Australia and summary of submissions to the netting review. F.B. Prokop, L.M. Adams (September 1994).

No. 67 Long term management strategies for the Western Rock Lobster Fishery. (4 volumes) Evaluation of management options Volume 1. B. K. Bowen (September 1994).

No. 68 Long term management strategies for the Western Rock Lobster Fishery. (4 volumes) Economic efficiency of alternative input and output based management systems in the western rock lobster fishery, Volume 2. R.K. Lindner (September 1994).

No. 69 Long term management strategies for the Western Rock Lobster Fishery. (4 volumes) A market-based economic assessment for the western rock lobster industry, Volume 3. Marec Pty Ltd (September 1994).

No. 70 Long term management strategies for the Western Rock Lobster Fishery. (4 volumes) Law enforcement considerations, Volume 4. N. McLaughlan (September 1994).

No. 71 The Rock Lobster Industry Advisory Committee Chairman's Report, October 1994, The Western Rock Lobster Fishery - Management proposals for the 1994/95 and 1995/96 seasons (November 1994).

No. 72 Shark Bay World Heritage Area draft management plan for fish resources. D. Clayton (November 1994).

No. 73 The bag and size limit review: new regulations and summary of submissions. F. Prokop (May 1995).

No. 74 Report on future management options for the South West trawl limited entry fishery. South West trawl limited entry fishery working group (June 1995).

No. 75 Implications of Native Title legislation for fisheries management and the fishing industry in Western Australia. P. Summerfield (February 1995).

No. 76 Draft report of the South Coast estuarine fishery working group. South Coast estuarine fishery working group. (February 1995).

No. 77 The Offshore Constitutional Settlement, Western Australia. H. Brayford & G. Lyon (May 1995).

No. 78 The Best Available Information - Its Implications for Recreational Fisheries Management. Workshop at Second National Fisheries Managers Conference, Bribie Island Queensland. F. Prokop (May 1995).

No. 79 Management of the Northern Demersal Scalefish Fishery. J. Fowler (June 1995).

No. 80 Management arrangements for specimen shell collection in Western Australia, 1995. J. Barrington & C. Campbell (March 1996).

No. 81 Management Options (Discussion Paper) for the Shark Bay Snapper Limited Entry Fishery. Shark Bay Snapper Limited Entry Fishery Working Group, Chaired by Doug Bathgate (June 1995).

No. 82 The Impact of the New Management Package on Smaller Operators in the Western Rock Lobster Fishery R. Gould (September 1995).

No. 83 Translocation Issues in Western Australia. Proceedings of a Seminar and Workshop held on 26 and 27 September 1994. F. Prokop (July 1995).

No. 84 Bag and Size Limit Regulations From Around Australia. Current Information as at 1 July 1995. Third Australasian Fisheries Managers Conference, Rottnest Island. F. Prokop (July 1995).

No. 85 West Coast Rock Lobster Fishery Management Plan 1995 - Draft for Public Comment. Edited by M. Moran (August 1995).

No. 86 A Review of Ministerial Policy Guidelines for Rock Lobster Processing in Western Australia from the Working Group appointed by the Minister for Fisheries and chaired by Peter Rich (December 1995).

No. 87 Same Fish - Different Rules. Proceedings of the National Fisheries Management Network Workshop held as part of the Third Australasian Fisheries Managers Conference. F. Prokop

No. 88 Balancing the Scales - Access and Equity in Fisheries Management - Proceedings of the Third Australasian Fisheries Managers Conference, Rottnest Island, Western Australia 2 - 4 August 1995. Edited by P. Summerfield (February 1996).

No. 89 Fishermen's views on the future management of the rock lobster fishery. A report. Prepared on behalf of the Rock Lobster Industry Advisory Committee by The Marketing Centre. (August 1995).

No. 90 A report on the issues effecting the use of the Dampier Archipelago. Peter Driscoll, Landvision Pty Ltd (March 1996).

No. 91 Shark Bay World Heritage Property - Management Paper for Fish Resources. Kevin A Francesconi (September 1996).

No. 92 Pearling and Aquaculture in the Dampier Archipelago - Existing and Proposed Operations. A report for public comment. Compiled by Ben Fraser (September 1996).

No. 93 Shark Bay World Heritage Property - Summary of Public Submissions to the Draft Management Plan for Fish Resources. Kevin A Francesconi (September 1996).

No. 94 Rock Lobster Industry Advisory Committee Report - Management arrangements for the Western Rock Lobster Fishery for the 1997/98 season. Frank Prokop (May 1997).

No. 95 Australian Salmon and Herring Resource Allocation Committee. P McLeod & F Prokop (*in press*).

No. 96 Summary Report of the Freshwater Aquaculture Taskforce (FAT) by Chris Wells (*in press*).

No. 97 *(in press).*

No. 98 A Pricing Policy for Fisheries Agencies - Standing Committee on Fisheries and Aquaculture Management Committee. P Millington (March 1997).

No. 99 Management of the South Coast Purse Seine Fishery. J Fowler, R Lenanton, Kevin Donohue,M Moran & D Gaughan.

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No. 105 Plan for the Management of the Houtman Abrolhos Fish Habitat Protection Area (draft). Prepared by the Abrolhos Islands Management Advisory Committee in conjunction with Fisheries Western Australia (October 1997).

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No. 109 Abalone Aquaculture in Western Australia. Cameron Westaway & Jeff Norriss (October 1997).

No. 110 Proposed Voluntary Fishery Adjustment Scheme - South Coast Purse Seine Managed Fishery Report by Committee of Management (October 1997).

No. 111 Management Options for Pilbara Demersal Line Fishing. Gaye Looby (December 1997).

No. 112 Summary of Submissions to Fisheries Management Paper No. 108 - issues affecting Western Australia's inshore crab fishery. Compiled by Cathy Campbell (April 1998).

No. 113 Western Rock Lobster Management - Options and Issues. Prepared by Kevin Donohue on behalf of the Rock Lobster Industry Advisory Committee. (June 1998).

No. 114 A Strategy for the Future Management of the Joint Authority Northern Shark Fishery. Prepared by Tim Bray and Jo Kennedy. (June 1998).

No. 115 Guidelines for granting Aquaculture Leases. Prepared by Fisheries WA, the Aquaculture Development Council & the Aquaculture Council of WA. (July 1998).

No. 116 Future Management of the Aquatic Charter Industry in Western Australia - Final Report. By the Tour Operators Fishing Working Group. (September 1998).

No.117 Management of the Houtman Abrolhos System. Prepared by the Abrolhos Islands Management Advisory Committee in conjunction with Fisheries Western Australia. (December 1998).

No. 118 Plan for the Management of the Houtman Abrolhos Islands Fish Habitat Protection Area (Schedule 1)

No. 119 Access to Wildstock for Aquaculture Purposes (not published).

No. 120 Draft Management Plan for Sustainable Tourism at the Houtman Abrolhos Islands. Prepared by LeProvost, Dames and Moore for the Abrolhos Islands Managment Advisory Committee in conjunction with Fisheries WA. (December 1998).

No. 121 Future Directions for Tourism at the Houtman Abrolhos Islands - Draft for Public Comment. Prepared by LeProvost, Dames and Moore for the Abrolhos Islands Management Advisory Committee in conjunction with Fisheries WA. (December 1998).

No. 122 Opportunities for the Holding/Fattening/Processing and Aquaculture of Western Rock Lobster (*Panulirus cygnus*). A discussion paper compiled by Fisheries WA. (November 1998).

No. 123 Future directions for the Rock Lobster Industry Advisory Committee and the Western Rock Lobster Managed Fishery. A discussion paper prepared by Kevin Donohue on behalf of the Rock Lobster Industry Advisory Committee. (December 1998).

No. 124 A Quality Future for Recreational Fishing in the Gascoyne. Proposals for Community Discussion. A five-year management strategy prepared by the Gascoyne Recreational Fishing Working Group (May 1999).

No. 125 Changes to Offshore Constitutional Settlement Arrangements; North West Slope Trawl Fishery and Western Deepwater Trawl Fishery. A discussion paper by Fiona Crowe and Jane Borg (May 1999)[not published].

No. 126 The South Coast Estuarine Fishery. A discussion paper by Rod Pearn and Tony Cappelluti. (May 1999).

No. 127 The Translocation of Barramundi. A discussion paper by Makaira Pty Ltd.[July 1999]

No. 128 Shark Bay Pink Snapper Managed Fisheries in WA.

No. 129 Review of the Western Australian Pilchard Fishery 12 - 16 April 1999. Prepared by K.L. Cochrane, Fisheries Resource Division, Food and Agriculture Division of the United Nations (November 1999).

No. 130 Developing New Fisheries in Western Australia. A guide to applicants for developing fisheries Compiled by Lucy Halmarick (November 1999).

No. 131 Management Directions for Western Australia's Estuarine and Marine Embayment Fisheries. A strategic approach to management (November 1999).

No. 132 Summary of Submissions to Fisheries Management Paper No. 126 - The South Coast Estuarine Fishery - A Discussion Paper. Compiled by Rod Pearn (November 1999).

No. 133 Abalone Aquaculture in Western Australia, A Policy Guideline (December 1999).

No. 134 Management Directions for WA's Coastal Commercial Finfish Fisheries. Issues and proposals for community discussion (March 2000).

No. 135 Protecting and Sharing Western Australia's Coastal Fish Resources. The path to integrated management. Issues and proposals for community discussion (March 2000).

No. 136 Management Directions for WA's Recreational Fisheries (March 2000).

No. 137 Aquaculture Plan for the Houtman Abrolhos Islands (April 2000).

No. 138 Information on Quota Management of Rock Lobster Fisheries in South Australia, Tasmania and New Zealand. By Kevin Donohue and Eric Barker (May 2000).

No. 139 A Quality Future for Recreational Fishing on the West Coast. Proposals for Community Discussion. A five-year management strategy prepared by the West Coast Recreational Fishing Working Group (June 1999).

No. 140 Aquaculture Plan for the Recherche Archipelago, Western Australia. (June 2000).

No. 141 Fish Protection Measures in Western Australia (June 2001).

No. 142 Fisheries Environmental Management Plan for the Gascoyne Region (June 2002).

No. 143 Western Rock Lobster. Discussion paper for seasons 2001/2002 and 2002/2003 (July 2000).

No. 144 The Translocation of Brown Trout (*Salmo trutta*) and Rainbow Trout (*Oncorhynchus mykiss*) into and within Western Australia. Prepared by Jaqueline Chappell, contributions from Simon Hambleton, Dr Howard Gill, Dr David Morgan and Dr Noel Morrissy. (*not published, superseded by MP 156*)

No. 145 The Aquaculture of non-endemic species in Western Australia - Silver Perch (*Bidyanus bidyanus*). As amended October 2000. Tina Thorne. This replaces Fisheries Management Paper No. 107.

No. 146 Sustainable Tourism Plan for the Houtman Abrolhos Islands (February 2001).

No. 147 Draft Bycatch Action Plan for the Shark Bay Prawn Managed Fishery (Full Report) (April 2002).

No. 148 Draft Bycatch Action Plan for the Shark Bay Prawn Managed Fishery (Summary Report) (April 2002).

No. 149 Final Plan of Management for the Lancelin Island Lagoon Fish Habitat Protection Area (March 2001).

No. 150 Draft Plan of Management for the Cottesloe Reef Proposed Fish Habitat Protection Area (April 2001).

No. 151 Inventory of the Land Conservation Values of the Houtman Abrolhos Islands (July 2003).

No. 152 Guidelines for the Establishment of Fish Habitat Protection Areas (June 2001).

No. 153 A Five-Year Management Strategy for Recreational Fishing on the West Coast of Western Australia. Final Report of the West Coast Recreational Fishing Working Group (August 2001).

No. 154 A Five-Year Management Strategy for Recreational Fishing in the Gascoyne. Final Report of the Gascoyne Recreational Fishing Working Group (September 2001).

No. 155 Plan of Management for the Cottesloe Reef Fish Habitat Protection Area (September 2001).

No. 156 The Translocation of Brown Trout (*Salmo Trutta*) and Rainbow Trout (*Oncorhynchus mykiss*) into and within Western Australia (June 2002).

No. 157 Policy for the Implementation of Ecologically Sustainable Development for Fisheries and Aquaculture within Western Australia. By W.J. Fletcher (May 2002).

No. 158 Draft Plan of Management for the Miaboolya Beach Fish Habitat Protection Area (March 2002).

No. 159 The Translocation of Barramundi (*Lates calcarifer*) for Aquaculture and Recreational Fishery Enhancement in Western Australia. By Tina Thorne. (March 2002).

No. 160 The Introduction and Aquaculture of Non-endemic Species in Western Australia: the 'Rotund' Yabby *Cherax rotundus* and the All-male Hybrid Yabby. A Discussion Paper. (June 2002).

No. 161 Plan of Management for the Miaboolya Beach Fish Habitat Protection Area (September 2002).

No. 162 Reseeding of grazing gastropods and bivalves into the marine environment in Western Australia – a discussion paper. By Jane Borg. (August 2002).

No. 163 Review of recreational take of coral in Western Australia – a discussion paper (October 2002).

No. 164 Report of the Mackerel Independent Advisory Panel to the Executive Director, Department of Fisheries, on criteria for access to, and management arrangements for, the proposed Mackerel Fishery (Interim) Management Plan (November 2002).

No. 165 Report to the Minister for Agriculture, Forestry and Fisheries by the Integrated Fisheries Management Review Committee (November 2002).

No. 166 Fisheries Statutory Management Authority Inquiry. A background paper (February 2003).

No. 167 Draft Fisheries Environmental Management Plan for the Northern Region (*in press*).

No. 168 Aboriginal Fishing Strategy: Report to the Minister for Agriculture, Forestry and Fisheries by the Hon E. M. Franklyn QC, Chairman of the Aboriginal Fishing Strategy Working Group (May 2003).

No. 169 Hardy Inlet discussion paper (February 2004).

No. 170 Management of the proposed Geographe Bay Blue Swimmer and Sand Crab Managed Fishery. By Jane Borg and Cathy Campbell (August 2003).

No. 171 Draft Aquaculture Plan for Shark Bay (April 2004).

No. 172 Draft Aquaculture Plan for Exmouth Gulf (April 2004).

No. 173 Draft Plan of Management for the proposed Point Quobba Fish Habitat Protection Area (August 2003).

No. 174 Translocation of Golden Perch, Murray Cod and Australian Bass into and within Western Australia for the Purposes of Recreational Stocking, Domestic Stocking and Commercial and Non-commercial Aquaculture (December 2003).

No. 175 Fish Stock and Fishery Enhancement in Western Australia - a discussion paper. By Jane Borg (February 2004).

No. 176 Fish Stock and Fishery Enhancement in Western Australia - a summary report. By Jane Borg (February 2004).

No. 177 Fisheries Environmental Management Plan for the Gascoyne Region (*in press*).

No. 178 Draft Plan of Management for the Kalbarri Blue Holes Fish Habitat Protection Area (March 2004).

No. 179 A Draft Policy for the Translocation of Brown Trout (*Salmo trutta*) and Rainbow Trout (*Oncorhynchus mykiss*) into and within Western Australia for the Purposes of Recreational Stocking, Domestic Stocking and Commercial and Non-Commercial Aquaculture (*in press*).

No. 180 The Sustainable Management of Western Australia's Temperate Shark Fisheries (*in press*).

No 181 A Quality Future for Recreational Fishing in the Pilbara/Kimberley. Proposals for Community Discussion. A five-year strategy for managing the recreational component of the catch, prepared by the Pilbara/Kimberley Recreational Fishing Working Group. (*in press*).

No 182 A Quality Future for Recreational Fishing in the Southern Region of WA. Proposals for Community Discussion. A five-year strategy for managing the recreational component of the catch, prepared by the Southern Recreational Fishing Working Group (*in press*).

No 183 Final Report of the Fisheries Statutory Management Authority Advisory Committee. Published by the Department of Fisheries (*in press*).

No 184 South West Beach Seine Management Discussion Paper (*in press*).