CapReef

Recreational Fishing and Fish Resources in Central Queensland 2005-09

CapReef

Recreational Fishing and Fish Resources in Central Queensland

2005-09

Bill Sawynok

Infofish Services PO Box 9793 Frenchville Qld 4701

John Platten

Capricorn Bunker Consulting
2/17 Bernard Street Rockhampton Qld 4701

Wendi Parsons

Infofish Services PO Box 9793 Frenchville Qld 4701

Published

September 2009

Front Cover photographs: (Top) Rosslyn Bay boat ramp at Yeppoon which is the major launching site for offshore fishing in the Capricorn area (Bottom) Steve Watson tackling a large fish in a Capricorn estuary

Information in this publication is provided as general advice only. For application to specific circumstances, further advice should be sought.

Infofish Services have taken all steps to ensure the information contained in this publication is accurate at the time of publication. Readers should ensure that they make the appropriate enquiries to determine whether new information is available on a particular subject matter.

© Infofish Services
All rights reserved. No part of this publication may be reprinted, reproduced, stored in a retrieval system or transmitted, in any form or by any means, without prior permission from Infofish Services.

Table of Contents

Acknowledgements 7
About CapReef 9
Fish Species 10
Acronyms used in this report 12
Summary 13
1. Introduction 18
2. Aim of this report 19
3. Description of CapReef Area 19
4. Questions posed to CapReef 20
Q1 What are the social, economic and ecological characteristics of fish and recreational fisheries in Central Queensland? 22
Q1.1 What is the Recreational fishing effort? 22
Q1.2 What is the recreational catch? 42
Q1.3 What is the use of habitats by fish species? 55
Q1.4 What are the social, economic and ecological impacts of major fishing competitions? 61
Q1.5 What are the social values of recreational fishing? 66
Q1.6 What are the economic values of recreational fishing? 66
Q2 What social, economic and institutional factors influence these characteristics and how can we use this understanding to maintain and enhance fish and recreational fishing? 69
Q2.1 What are the effects of management change on fisher behaviour? 69
Q2.2 What are the effects of management change on fish stocks? 78
Q2.3 What are the likely effects of climate change on fish stocks? 88
Q3 How can we develop and utilise the social capital and social networks of the local region in support of socially, economically and ecologically sustainable management of fish resources and the fisheries they support? 96
Q3.1 What can CapReef contribute to research projects and monitoring programs such as QPIF Long Term Monitoring Program (LTMP)? 96
Q3.2 Can the CapReef concept be extended to other areas? 97
Q3.3 Can the CapReef concept be extended interstate? 97
Q3.4 Are community monitoring programs such as CapReef worth the investment? 97
5. Status of Fish Resources in Central Queensland 99
6. Conclusion 106

List of Figures

Figure 1: Area cover by CapReef data collection - Capricorn and Burnett 19
Figure 2: Trip distances travelled to go fishing in Central Queensland 22
Figure 3: Trip distances travelled to Rosslyn Bay, Auckland VMR and Burnett Heads ramps to go fishing 23
Figure 4: Trip distances travelled to Calliope (Power Station), Coorooman and Nerimbera ramps to go fishing 23
Figure 5: Trip distances travelled by landbased fishers to go fishing 25
Figure 6: Distances travelled to participate in major competitions 26
Figure 7: Comparison of boat registrations in 2005 and 2009 for CapReef area 28
Figure 8: Trends in boat registrations from 2005 to 2009 for boats from 3.01-8.0m in length 28
Figure 9: Average number of trailers each day at Rosslyn Bay from 2005-09 29
Figure 10: Maximum number of trailers on a day at Rosslyn Bay from 2005-09 29
Figure 11: Average number of trailers at Rosslyn Bay on weekends and weekdays from 2005-09 29
Figure 12: Locations where offshore fishing occurs in the CapReef area 31
Figure 13: Schematic diagram showing the categories of fishing locations 31
Figure 14: Offshore fishing trips to locations for Capricorn (Rosslyn Bay and Auckland VMR) and Burnett (Burnett Heads) 32
Figure 15: Offshore locations fished each season over the past 2 years in the Capricorn area 32
Figure 16: Average number of trailers at Rosslyn Bay compared with wind speed 35
Figure 17: Profile of usage of Rosslyn Bay boat ramp over a full day 35
Figure 18: Average number of trailers at Burnett Heads compared with wind speed 36
Figure 19: Profile of usage of Coorooman boat ramp compared with Rosslyn Bay 37
Figure 20: Profile of landbased freshwater fishing trips 37
Figure 21: Number of freshwater fishing trips each season 38
Figure 22: Percentage of days in each season where wind speed was less than 15 knots at Rundle Island at 9:00am 39
Figure 23: Comparison of number of trips with the number of calm weekends each season for Rosslyn Bay 40
Figure 24: Modelled numbers of fishing trips for Rosslyn Bay and Auckland VMR at Gladstone 40
Figure 25: Average number of trailers at Rosslyn Bay compared with adjusted catch rates 41
Figure 26: Number of spearfishing trips each season over the past 2 years 41
Figure 27: Numbers of species caught over the past 3 years 44
Figure 28: Numbers of species kept over the past 3 years 45
Figure 29: Median adjusted offshore catch rates for each season from winter 2005 to autumn 2009 48
Figure 30: Comparison of Capricorn and Burnett offshore catch rates for autumn 2008 49
Figure 31: Median adjusted estuary catch rates for each season from winter 2007 to autumn 2009 50
Figure 32: Comparison of Capricorn and Burnett offshore catch rates for autumn 2008 50
Figure 33: Median adjusted freshwater catch rates for each season from spring 2008 to autumn 2009 51
Figure 34: Estimated offshore catch from Rosslyn Bay from 2005/06 to 2008/09 52
Figure 35: Estimated offshore catch from Auckland VMR from 2005/06 to 2008/09 52
Figure 36: Composition of species in the catch of the Yaralla Fishing Club from 2000-2008 52
Figure 37: Median catch rates (fish/person/day) of Yaralla from 1976 to 2008 with vertical bars showing the 25th to 75th percentile catch rates 53
Figure 38: Composition of the spearfishing catch 2006/07 and 2007/09 54
Figure 39: Comparison of catch rates of spearfishing, linefishing by trailer boat and Yaralla Fishing Club 54
Figure 40: Percentage of reef species kept in each habitat type 55
Figure 41: Percentage of Coral Trout and School Mackerel kept in each habitat type 56
Figure 42: Size distribution of Red Snapper in creeks of Shoalwater Bay 56
Figure 43: Movement of a Saddletail Snapper from Shoalwater Bay to High Peak Island 57
Figure 44: Road culvert on Raglan Station Road showing drop in water level affecting fish passage 59
Figure 45: Fishway on the culvert on Raglan Station Road 59
Figure 46: Road bridge on Gentle Annie Road on Raglan Creek before fishway showing drop in water level affecting fish passage 60
Figure 47: Fishway on the Gentle Annie Road on Raglan Creek 60
Figure 48: Comparison of total catch rates in the Boyne Tannum Hookup with CapReef catch rates during the same season 61
Figure 49: Comparison of kept catch rates in the Boyne Tannum Hookup with CapReef catch rates during the same season 62
Figure 50: Percentage of species kept during the Boyne Tannum Hookup and CapReef trips 62
Figure 51: Comparison of trailers at Bray Park boat ramp during Boyne Tannum Hookup and at other times 63
Figure 52: Comparison of fishing effort during the Boyne Tannum Hookup and on comparable fishing days for Auckland VMR boat ramp 63
Figure 53: Comparison of catch rates in the Rocky Barra Bounty with CapReef estuary trips in spring 64

Figure 54: Comparison of Barramundi catch rates in the Rocky Barra Bounty with CapReef estuary trips in spring 64
Figure 55: Rocky Barra Bounty certification from NEATFish 65
Figure 56: Trip frequency in the last 12 months 67
Figure 57: Projected changes in visit rate due to changes in catch rates 67
Figure 58: Projected changes in visit rate due to changes in other conditions 68
Figure 59: Average amount spent on a fishing trip 68
Figure 60: Main fishing spots that recreational fishers lost due to rezoning as no-take areas 70
Figure 61: Schematic representation of displacement of fishing distribution in the Rockhampton region. N represents the number (N) of fishing locations provided for pre- and post-rezoning, with distances represented by the means. White bars indicate previous fishing locations, and grey bars the current fishing locations 70
Figure 62: Trends in locations fished over time 71
Figure 63: Percentage of past trips to current zone types off Gladstone 72
Figure 64: Number of trips and combined reef fish caught per person in 2007/08 73
Figure 65: Number of trips and combined reef fish caught per person in 2008/09 74
Figure 66: Trends in the percentage of the catch kept for key species 75
Figure 67: Catch rates for the Yaralla Fishing Club from 1976 to 2008 showing when new management changes were implemented 76
Figure 68: Change in proportion of Redthroat Emperor in the catch of Yaralla Fishing Club from 1999 to 2008 77
Figure 69: Sizes of Barred Javelin tagged in Suntag and from creeks in Shoalwater Bay 78
Figure 70: Comparison of fish caught on fishing trips with observed in BRUV sets in 2007/08 79
Figure 71: Comparison of fish caught on fishing trips with observed in BRUV sets in 2008/09 79
Figure 72: Comparison of number of fish observed in BRUV footage in fishing and no fishing zones 80
Figure 73: Comparison of fish observed in BRUV sets in fished and no fishing zones 81
Figure 74: Comparison of fish in green zones over open zones 81
Figure 75: Percentage of fish feeding in green and open zones 2007/08 83
Figure 76: Percentage of fish feeding in green and open zones 2008/09 83
Figure 77: Length/frequency of Longfin Rockcod in no fishing and fishing zones 85
Figure 78: Length/frequency of Stripey Snapper in no fishing and fishing zones 85
Figure 79: Green zones around the Keppel Islands where tagging was undertaken 86
Figure 80: Model of Barramundi recruitment in the Fitzroy River system 1988-2009 88
Figure 81: Number of juvenile Barramundi recorded in the Fitzroy River system from 2003-2009 89
Figure 82: Frogmore Lagoon at Roopes Bridge several days before and after the flooding in the Fitzroy river in January 2008 90
Figure 83: Modelled (triangles) and observed catch rates for Wanderers Fishing Club for Gladstone Harbour compared with wet season flows of the Boyne and Calliope Rivers. Solid line is the average wet season flows of the combined Boyne and calliope Rivers (MAF combined), dashed line the flows of the Calliope alone (MAF) 92
Figure 84: Modelled (triangles) and observed catch rates for Cape Capricorn compared with wet season flows of the Fitzroy River. Solid vertical line demonstrates mean wet season flow, dashed line median wet season flows 92
Figure 85: Modelled (trianges) and observed catch rates for the Great Barrier Reef site compared with wet season flows of the Fitzroy River. Solid vertical line demonstrates mean wet season flow, dashed line median wet season flows 93
Figure 86: Recruitment of Barramundi in 12 Mile Creek related to log wet season flows (November-March). [Note the reduction in scale of 1996 recruitment which was actually 1,271] (adapted from Sawynok & Platten 2008) 94
Figure 87: Potential risk profile of Barramundi persistence in 12 Mile Creek 95
Figure 88: CapReef Capricorn offshore catch rates each season from 2005-2009 99
Figure 89: Fish/set in open zone BRUV observations in 2007/08 and 2008/09 100
Figure 90: Percentage of Sets in open zone BRUV observations in 2007/08 and 2008/09 100
Figure 91: Estuary catch rates for each season for the past 2 years 101
Figure 92: Freshwater catch rates for the past year 101
Figure 93: Catch rates for School Mackerel from 2005/06 to 2008/09 102
Figure 94: Catch rates for Spanish Mackerel from 2005/06 to 2008/09 103
Figure 95: Catch rates for Spotted Mackerel for 2005/06 to 2008/09 103
Figure 96: Percentage of Longfin Rockcod kept from 2005/06 to 2008/09 104
Figure 97: Catch rate of Longfin Rockcod from 2005/06 to 2008/09 104
Figure 98: Estuary Barramundi catch rates from 2005/06 to 2008/09 105
Figure 99: Commercial Barramundi catch from February 2006-March 2009 105

List of Tables

Table 1: Names used in this report for key species 11
Table 2: Summary of major fishing competitions in the CapReef area 25
Table 3: Summary of fishing clubs in CapReef area 27
Table 4: Top 20 species caught over the last 3 years 43
Table 5: Demersal species comprising over 1.0% of the catch over the last 3 years 43
Table 6: Pelagic species in the catch over the last 3 years 44
Table 7: Percentage of species kept over the last 3 years 44
Table 8: Most common species caught by location over the last 3 years 45
Table 9: Composition of estuary catch over the past 2 years 46
Table 10: Estuary species caught and kept in 2008/09 47
Table 11: Freshwater species caught and kept in freshwater in 2008/09 47
Table 12: Number of reef fishing trips that reached the bag limit for individual species and the combined limit for reef fish in 2008/09 73
Table 13: Numbers of species caught and percentage retained 74
Table 14: Fish kept each year for reef species caught 75
Table 15: Number of trips each year by Yaralla Fishing Club and percentage that reached or exceeded the current bag limit of 20 reef fish combined 76
Table 16: Fish observed more frequently in BRUV sets than in fishing trips 80
Table 17: Species that are seen more often and in greater numbers in BRUV sets 82
Table 18: Percentage of fish feeding in green and open zones 84
Table 19: Numbers of fish where sizes were available 84
Table 20: Numbers of reef species tagged and recaptured in green zones 87
Table 21: Number of species caught outside the green zone and the distance moved 87
Table 22: Barramundi caught in Fitzroy floodplain lagoons following the 2008 flood 91

Acknowledgements

For the past 4 years CapReef collected information on the fisheries resources of Central Queensland. In order for it to be successful the CapReef team was supported in many ways by a wide range of organisations and individuals, much of that support being voluntary.

The support for CapReef came from 3 groups that were:

- Government and non-government agencies
- Fisheries researchers
- Fishing clubs and community volunteers

The following have provided funding to CapReef:

- Fitzroy Basin Association
- Natural Heritage Trust
- Great Barrier Reef Marine Park Authority
- Recreational Fishing Community Grants Program
- Queensland Primary Industries and Fisheries
- James Cook University (Fish and Fisheries)
- CQUniversity Australia
- NRG Energy
- Capricorn Sunfish
- Gladstone Sunfish
- Capricorn Coast Local Marine Advisory Committee
- Burnett Mary Local Marine Advisory Committee

The Fitzroy Basin Association (FBA) and Natural Heritage Trust (NHT) need special acknowledgement as FBA provided the initial funding to CapReef and has been the largest funding contributor.

As well as the above the following government, non-government and private sector bodies have provided support or in-kind resources to CapReef:

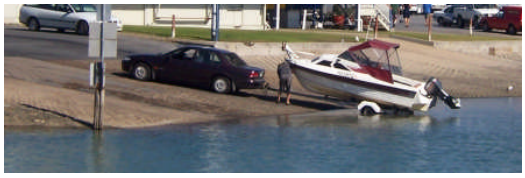
- Department of Defence
- Department of Main Roads
- Australian Institute of Marine Science
- Department of Environment and Resource Management
- Infofish Services
- One Pixel

A number of community groups, especially fishing clubs, have provided support and in-kind resources to CapReef:

- Suntag
- Captag Sportfishing Club
- Gladstone Sportfishing Club
- Yaralla Fishing Club
- Apex Deep-Sea Fishing Club
- Bundaberg Sportfishing Club
- Keppel Bay Sportfishing Club
- Capricorn Skindivers Club
- Capricorn Sunfish
- Gladstone Sunfish
- Australian National Sportfishing Association Qld
- Fitzroy River Fish Stocking Group
- Sunfish Queensland

Finally there were many individuals, too many to list here without risk of missing someone out, that made significant voluntary contributions to CapReef and made what has been achieved possible.

About CapReef



CapReef is a community monitoring program that was established in 2005 following a series of changes to management of the Great Barrier Reef (GBR). It is a partnership program involving government, science and the community. CapReef provides an umbrella for a wide range of activities dealing with fish resources.

The purpose of CapReef is defined as monitoring fish resources in Central Queensland in relation to:

- Status and trends of fish resources;
- The effects of management measures on fish resources eg GBRMPA Rezoning Plan 2004, Fisheries (Coral Reef Fin Fish) Management Plan 2003/04 and Fisheries (Inshore Fin Fish) Management Plan 2009;
- The effects of water regulation and quality on fish resources;
- The effects of habitat modification;
- The likely effects of climate change on fish resources and critical habitats.

Projects under CapReef have focused on:

- Changes in catch and effort, relative abundance and size structure of key fish species;
- Determining changes in fisher participation and fishing patterns resulting from management changes;
- Movement of key fish species using estuaries and the adjacent coastal waters;
- Baited Remote Underwater Video of fish in no fishing and fishing zones;
- Fish resources in creeks entering the southern part of Shoalwater Bay;
- Information from fishing clubs and competitions;
- Barramundi stocks, recruitment and the effects of climate change;
- The effects of river flows on catch rates.

CapReef has also provided support for projects on:

- Collecting water quality data at Rosslyn Bay for Australian Institute of Marine Science;
- Expenditure survey on recreational fishing on the Capricorn Coast by CQUniversity Australia;
- Communicating with recreational fishers by James Cook University;
- Understanding why people are involved in CapReef by James Cook University;
- "Spillover" of reef fish from green (no fishing zones) around the Keppel Islands by James Cook University;
- Collecting fish frames for the Queensland Primary Industries and Fisheries Long Term Monitoring Program;
- Habitat usage by Barcheek Coral Trout by CQUniversity Australia.

An important part of CapReef is to provide feedback to the community. This is done in a number of ways including a series of technical reports on various aspects of the data that have been collected. This report is another in that series.

Fish Species

Fish names cause considerable confusion as there are many names that can be applied to the same fish species, even in the same region. The Australian Fish Names Committee has developed a list of standard names that is available for the website www.fishnames.com.au. CapReef uses the Standard name of fish species in all reports. *Table 1* provides a list of the standard names used in this report.

Standard Name	**Local Names**	**Scientific Name**
Barcheek Coral Trout	Coral Trout, Island Coral Trout, Inshore Coral Trout	*Plectropomous maculatus*
Common Coral Trout	Coral Trout	*Plectropomous leopardus*
The identification of these two species is often confused by those inexperienced with the species and are collectively referred to as Coral Trout		
Goldspotted Rockcod	Cod, Estuary Cod, Goldspot Cod	*Epinephelus coioides*
Blackspotted Rockcod	Cod, Estuary Cod, Blackspot Cod	*Epinephelus malabaricus*
These two species are collectively referred to as Estuary Cod however their identification should not be confused		
Longfin Rockcod	Matty Cod, Wirenetting Cod	*Epinephelus quoyanus*
Saddletail Snapper	Largemouth Nannygai, Red Jew	*Lutjanus malabaricus*
Crimson Snapper	Smallmouth Nannygai, Red Jew	*Lutjanus erythropterus*
These two tropical Snapper species are collectively referred to as Red Snapper as there is often confusion in their correct identification		
Red Emperor	Red Emperor	*Lutjanus sebae*
Stripey Snapper	Stripey	*Lutjanus carponatus*
Moses Snapper	Moses Perch, Fingermark	*Lutjanus russelli*
Hussar	Hussar, Inshore Hussar	*Lutjanus adetii*
Brownstripe Snapper	Hussar	*Lutjanus vitta*
These two species are collectively referred to as Hussar even though there is little confusion with their identity		
Venus Tuskfish	Parrotfish	*Choerodon venustu*
Blackspot Tuskfish	Parrotfish, Bluetooth	*Choerodon schoenleinii*
These species are collectively referred to as Parrotfish and there may be some confusion in their correct identification		
School Mackerel	School Mackerel, Doggie Mackerel	*Scomberomorus queenslandicus*
Spotted Mackerel	Spotty Mackerel	*Scomberomorus munroi*
These two Mackerel species are often confused and it is likely that some incorrect identification has occurred		
Spanish Mackerel	Spanish Mackerel, Narrowbarred Mackerel	*Scomberomorus commerson*
Cobia	Cobia, Black Kingfish	*Rachycentron canadus*
Redthroat Emperor	Redthroat, Sweetlip, Lipper	*Lethrinus miniatus*
Grass Emperor	Grassy, Grass Sweetlip, Redthroat	*Lethrinus fletus*
Barred Javelin	Grunter, Barred Grunter	*Pomadasys kaakan*

Standard Name	**Local Names**	**Scientific Name**
Collar Seabream	Iodine Bream, Baldy Bream	*Gymnocranius audleyi*
Painted Sweetlips	Blackall, Moke, Morwong	*Diagramma pictum*
Scribbled Rabbitfish	Happy Moment, Spinefoot	*Siganus spinus*
Starry Triggerfish	Triggerfish	*Abalistes stellaris*
Wolf Herring	Ribbonfish	*Chinocentrus dorab*
Remora	Remora, Suckerfish	*Remora remora*
Blueface Whiptail	Whiptail	*Pentapodus paradiseus*
Trevally	Trevally	*Number of species*
Fusilier	Fusilier	*Caesio spp*
Grinner	Grinner, Lizardfish	*Saurida spp*
Shark	Shark	*Number of species*
Yellowfin Bream Pikey Bream	Bream, Silver Bream Bream, Black Bream	*Acanthopagrus australis* *Acanthopagrus berda*
These two species are collectively referred to as Bream however their identification should not be confused		
Golden Snapper Mangrove Jack	Fingermark Red Bream	*Lutjanus johnii* *Lutjanus argentimaculatus*
These two tropical Snapper are easy to identify however some confusion does occur with those inexperienced with the species		
King Threadfin Blue Threadfin	King Salmon Blue Salmon	*Polynemus sheridani* *Eleutheronema tetradactylum*
The identification of these species is sometimes confused by those inexperienced with the species		
Snapper	Snapper, Squire, Pinkie	*Pagrus auratus*
Barramundi	Barramundi	*Lates calcarifer*

Table 1: Names used in this report for key species

Acronyms used in this report

The following acronyms have been used in this report:

AIMS	Australian Institute of Marine Science
CQUA	Central Queensland University Australia
DERM	Department of Environment and Resource Management
FBA	Fitzroy Basin Association
GBR	Great Barrier Reef
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
JCU	James Cook University
NHT	Natural Heritage Trust
QPIF	Queensland Primary Industries and Fisheries
VMR	Volunteer Marine Rescue
LTMP	Long Term Monitoring Program
UQ	University of Queensland

Summary

CapReef has collected data on recreational fishing and fish resources in Central Queensland from 2005-09. A series of 15 reports have been produced over that time on various aspects of the data collected. This report aims to answer the questions that have been posed to CapReef in various forums over the that time. These questions were complied under the following headings. Specific questions were aggregated under those headings.

CapReef Questions

Question 1: What are the social, economic and ecological characteristics of fish and recreational fisheries in Central Queensland?

Question 2: What social, economic and institutional factors influence these characteristics and how can we use this understanding to maintain and enhance fish and recreational fishing?

Question 3: How can we develop and utilise the social capital and social networks of the local region in support of socially, economically and ecologically sustainable management of fish resources and the fisheries they support?

By attempting to answer those questions CapReef has been able to provide a comprehensive, if incomplete, picture of recreational fishing and fish resources in Central Queensland.

At the commencement of CapReef the area of data collection was from Stanage Bay in the north to Bustard Head in the south which is referred to as the Capricorn area. In 2007 the area from Bustard Head to Elliott Heads was added as the Burnett area.

The characteristics of recreational fishing in Central Queensland

The following characteristics are based on data obtained from over 13,000 fishing trips from 2005-09.

Overall 97% of fishing trips in the CapReef area were undertaken by local fishers that travelled less than 100km to go fishing. However in major fishing competitions 36.5% of fishers were visitors from other areas of Queensland that travelled over 100km to take part in the competition.

Vessel registrations and the number of trailers at key boat ramps suggest that the level of fishing effort has increased. Vessels from 3.0-8.0m are most used for fishing and registrations of boats in that size range rose by 13% from 2005 to 2009. At Rosslyn Bay the maximum number of trailers on a day has risen by 46% from 2005/06 to 2008/09.

Where people fished indicated that from 2007-09 in the Capricorn area 88.2% of offshore trips were to inshore and island locations while in autumn 2008 in the Burnett area 98.9% of offshore trips were to inshore and wide ground (inter-reef) locations.

All estuaries from Stanage Bay to Bundaberg are regularly fished except those in Shoalwater Bay. Freshwater fishing mostly targets Barramundi and occurs in Lake Monduran, Lake Awoonga and lagoons and creeks associated with the Fitzroy River delta.

Wind strength was the major factor influencing fishing trips out of Rosslyn Bay with 77.2% of trips occurring when wind speeds were less than 15 knots at 9:00am. Of these 88.0% of trips occurred between 5:00am-5:00pm and 5.3% of trips were overnight. At Burnett Heads 76.5% of trips occurred when wind speeds were less than 15 knots at 9:00am. Of these trips 88.4% occurred between 5:00am-5:00pm and there were no overnight trips.

Fishing trips in estuaries were generally between 5:00am-5:00pm with 98% of trip from the Coorooman ramp during those times. For both offshore and estuary fishing most fishing was from a boat.

A greater proportion of freshwater fishing is landbased except for fishing in impoundments which is mostly from a boat. For landbased freshwater fishing 98.5% of trips were during daylight hours from 5:00am-6:00pm.

A typical offshore fishing trip is from a boat with 2-3 fishers fishing for around 7 hours. A typical estuary fishing trip is from a boat with 2-3 fishers fishing for around 5.5 hours and a typical freshwater fishing trip is landbased with 1-2 fishers fishing around 3.5 hours.

Offshore fishing effort has increased by around 15% from 2005/06 to 2008/09.

Spearfishing occurs largely at offshore locations and constitutes around 1.3% of offshore fishing trips.

In examining the recreational catch over the past 3 years Longfin Rockcod was the most caught species (19%) while Coral Trout was the most likely species to be kept (85%) and Grass Emperor was the most numerous kept species.

School Mackerel was the most caught species inshore, Longfin Rockcod around the islands, Hussar at the Wide Grounds and Redthroat Emperor on the offshore reefs.

In estuaries in 2008/09 Mud Crab was the most caught species (25.9%) while Grass Emperor was the most likely to be kept species (47.1%) and Pikey Bream was the most common species kept. Barramundi was the fifth most common species caught (5.0%) however of those caught only 3.7% were kept.

In freshwater in 2008/09 Barramundi was the most common species caught (97.3%) however only 0.3% of those caught were kept.

Offshore catch rates for Capricorn for each adjusted trip have ranged from a low of 5.0 fish caught and 0.6 fish kept per trip in winter 2007 to 14.9 fish caught and 6.0 fish kept in autumn 2009. Offshore catch rates for Burnett were only available for autumn 2008 with an adjusted fishing trip having 12.8 fish caught and 2.3 fish kept.

Estuary catch rates for Capricorn for each adjusted trip have ranged from a low of 5.1 fish caught and 1.3 fish kept per trip in spring 2008 to a high of 23.3 fish caught and 5.5 fish kept in autumn 2009.

Estuary catch rates for an adjusted fishing trip for autumn 2008 in Capricorn were 16.0 fish caught and 4.0 fish kept while in Burnett for the same season was 6.7 fish caught and 0.1 fish kept.

Freshwater catch rates for Capricorn for each adjusted trip were only available for 3 seasons and have risen from 7.0 fish caught in spring 2008 to 18.8 fish trip in autumn 2009. Most fish caught on freshwater trips, primarily Barramundi, were released.

The estimated offshore kept catch from Rosslyn Bay increased by around 15% from 65,000 to 85,000 fish from 2005/06 to 2008/09. The estimated offshore kept catch for Auckland VMR at Gladstone increased by around 15% from 20,000 to 26,000 fish from 2005/06 to 2008/09.

The catch of charter boats was examined using the catch of the Yaralla Fishing Club. From 2000 to 2008 the number of Redthroat Emperor declined from 59.3% to 32.0% of the kept catch while the number of Venus Tuskfish increased from 12.9% to 25.9%. There has been a decline in catch rates from around 20-30 to 10-15 fish/person/day.

The spearfishing catch rate is not significantly different to linefishing by offshore trailer boats and over 60% of the catch is Coral Trout compared with only 4.2% of the offshore catch.

In examining habitats used by juvenile and adult reef species there was an increasing trend in the number of fish above legal size from estuary and inshore grounds to wide grounds and offshore reefs with the greatest proportion of larger fish occurring on the wide grounds.

Red Snapper (Crimson and Saddletail Snapper) use estuary habitats in creeks of Shoalwater Bay and are likely to migrate offshore when they reach 400-500mm in length.

Access of marine species to freshwater has been improved by the installation of fishways which have improved fish passage in Raglan Creek.

A comparison of fishing during competitions was made in relation to the Boyne Tannum Hookup which is the largest fishing competition in the CapReef area. Catch rates during the competition were not significantly different to CapReef catch rates in the same season.

Fishing effort in the Boyne Tannum Hookup was around 5 times higher than at other times at Bray Park (headquarters for the event) and around 60% higher than at comparable fishing times at Auckland VMR.

The other major competition examined was the Rocky Barra Bounty. This is a tag and release event in the Fitzroy River that targets Barramundi. Catch rates in the event were lower for total catch however catch rates were higher for Barramundi for the comparable season.

NEATFish provides a 1-5 star rating based on ecological, social, economic and risk management performance for fishing competitions and has been used to used to assess the impact of local fishing competitions on fish stocks. The Rocky Barra Bounty has a 5 star rating and the Boyne Tannum Hookup received a 3.5 star rating in 2007.

A CQUA survey of expenditure on offshore fishing in the Capricorn area showed that the average amount spent for each trip on ice, tackle, bait, travel, food, boat fuel and other (excluding accommodation) was $182.

The influence of legislative and institutional changes on fisheries

Changes in zoning of the GBR marine park

As a result of the rezoning of the Marine Park most fishers lost at least 1 or more preferred fishing locations and compensated for the loss by fishing more at locations that were still open to fishing and finding new areas they had previously not exploited.

Historical records from fishing clubs, past fishing surveys and radio positions reported to the air sea rescue at Gladstone suggest that there has been a decrease in the proportion of fishing trips to offshore reefs and an increase in fishing inshore and around islands.

Historic records also suggest that less than 20% of fishing trips were to areas now zoned as no fishing (green) zones for most fishers however some groups such as the Yaralla Fishing Club were more affected.

Changes in catch related to bag and size limits

The effect of changes in fishing regulations were assessed in relation to bag and size limits. It was found that less than 1% of trips in the CapReef area achieved the individual or reef species combined bag limit.

Changes in size limits in 2004 have reduced the proportion of fish kept to less than 1% for Longfin Rockcod and 16% for Red Emperor while for Red Snapper and Redthroat Emperor over 55% are usually kept.

Prior to 2004 around 30% of the Yaralla Fishing Club trips achieved a catch rate of 20 fish/person/trip and since then no trips have achieved that catch rate.

Changes to bag and size limits appear to have reduced the catch of the Yaralla Fishing Club of Redthroat Emperor from around 54% of kept catch in 2004 to 32% in 2008.

The change to the minimum size limit of Barred Javelin from 300mm to 400mm in March 2009 is likely to reduce the number of legal fish caught in estuaries.

Assessment of fish stocks in zones open and closed to fishing

Baited Remote Underwater Video (BRUV) was used as a fishery independent method of obtaining data on fish stocks. Grass Emperor and Stripey Snapper were recorded more often in catches than in BRUV sets suggesting they may not be a prevalent as indicated by catches. Coral Trout and Red Snapper were more often observed in BRUV sets than in catches suggesting they may be more prevalent than indicated in catches.

Red Emperor and Starry Triggerfish were more common in open zones while Coral Trout, Stripey Snapper and Painted Sweetlips were more common in green zones.

Most species observed by BRUV were more likely to feed in green zones than in open zones.

Tagging of reef species in green zones around the Keppel Islands showed little evidence of "spillover" of adult fish.

For Longfin Rockcod there was no difference in size structure for fish in no fishing and fishing zones. For Stripey Snapper the average size in no fishing zones was 300-320mm while in fished zones it was 380-399mm.

Effect of river flow and rainfall on fish and fisheries

Barramundi recruitment in the Fitzroy River system is dependent on river flows and coastal rainfall with good recruitment occurring when river flows exceed 0.4GL in January-February, 1.5GL over the wet season and local rainfall of over 140mm in January-February.

There was a strong recruitment of Barramundi in both 2008 and 2009 when flows and rainfall were within the required parameters. The 2008 flood allowed juvenile Barramundi to access freshwater and brackish wetland lagoons on the Fitzroy River floodplain in significant numbers. Over 1,000 juvenile Barramundi have been tagged in both 12 Mile Creek and Frogmore Lagoon since the 2008 flood indicating the significance of these wetland lagoons.

The risk profile of water allocation to development in the Fitzroy River indicates that the value of a persistent population of Barramundi in 12 Mile Creek is potentially at higher risk under current and full development scenarios than under pre-development conditions.

Monitoring Barramundi stocks and recruitment will provide an early warning on the possible effects of climate change.

Coastal and offshore catch rates increase exponentially when the median or mean annual flow in adjacent rivers is exceeded however reach an upper limit where additional flow does not result in improved catch rates.

Extension of the CapReef concept

CapReef has been a catalyst for a number of research projects that have helped build relationships between researchers, government agencies and the community and improved understanding of the status of fish resources.

CapReef is assisting the QPIF Long Term Monitoring Program and other researchers by collecting fish frames.

In 2007 CapReef was extended to cover the Bundaberg area and MackReef has been established in the Mackay area, however funding is the greatest constraint in getting programs established elsewhere.

A Barramundi monitoring program along the lines of CapReef has been set up on the McArthur River in the Northern Territory in conjunction with the King Ash Bay Fishing Club and support from Northern Territory Fisheries.

CapReef and Suntag have been included in a national review by the Bureau of Rural Science of community involvement in recreational fisheries data collection and a report is expected before the end of 2009.

Status of fish resources in Central Queensland

The available information collected by CapReef suggests that there has been an overall increase in the numbers of offshore, estuary and freshwater species from 2005/06 to 2008/09. The improvement in fish stocks is likely to have been the result of good recruitment by a number of species as a result of the flooding in 2008.

While stocks have generally improved there are concerns in relation to a number of species.

There is a real question mark over the status of the 4 common Mackerel species with declines in catch rates of School and Spanish Mackerel and the near non-existence of Spotted and Grey Mackerel in catches in the past 2 years.

Longfin Rockcod are the most common reef species caught however they are almost a no take species because of the legal minimum size of 380mm.

The percentage of Longfin Rockcod kept has fallen from around 1.7% in 2005/06 to 0.5% in 2008/09 while the catch rate has risen from around 2.2 to 3.2 fish/trip

There is considerable concern over the status of Barramundi stocks with loss of habitat, high fishing effort, low levels of adult stocks and climate predictions.

There is considerable concern over the catch share of commercial and recreational fishers, particularly as commercial fishers appear to have been the major beneficiary of Barramundi stocked by recreational fish stocking groups.

CapReef

Recreational Fishing and Fish resources in Central Queensland 2005-09

1. Introduction

CapReef is a community monitoring program that was set up in response to management changes introduced into Queensland from 2001-2004 that affected fish resources in Central Queensland (see About CapReef). It has attempted to answer questions that have been posed by the community in various forums about those changes. As new issues emerged and resulted in additional questions being raised, these were included under CapReef.

To address these questions CapReef has taken a number of approaches. Data were collected that would help answer the questions raised and research projects were encourages to address some of the more complex issues that could not be answered by community monitoring alone. A number of technical reports were produced that dealt with some of the specific questions.

These reports are available from the Infofish website at www.info-fish.net:

- The effects of management changes on the catches of two deep-sea fishing clubs in Central Queensland (April 2006)
- Is what is there what you catch? Baited Remote Underwater Video in the southern Great Barrier Reef (July 2007)
- Is what is there what you catch? 2008 Update Baited Remote Underwater Video in the southern Great Barrier Reef (July 2008)
- How much fishing effort is there? Patterns of recreational fishers offshore from Central Queensland (August 2007)
- How much fishing effort is there? 2005-08 Patterns of recreational fishers in Central Queensland (September 2008)
- What is the catch? The catch of recreational fishers offshore from Central Queensland (August 2007)
- What is the catch? 2005-08 The catch of recreational fishers offshore from Central Queensland (August 2008)
- Shoalwater Bay – Fish stocks in southern creeks entering Shoalwater Bay Report 11 (July 2006)
- Shoalwater Bay – Fish stocks in southern creeks entering Shoalwater Bay Report 12 (July 2007)
- Shoalwater Bay – Fish stocks in southern creeks entering Shoalwater Bay Report 13 (April 2009)
- Tagged fish recaptures, movement and growth – Tagging of key reef species in Central Queensland (September 2007)
- Rocky Barra Bounty Results 1999-2007 (November 2007)
- Do river flows affect coastal and offshore catch rates? A numerical model of fisheries response to flow regime change in the estuaries and Great Barrier Reef Waters in Central Queensland (February 2008)
- Use of 12 Mile Creek by Barramundi: Effects of Local Climate 1984-2007 (April 2008)
- Boyne Tannum Hookup – Do fishing competitions impact local fish stocks? (May 2008)

2. Aim of this report

The aims of this report are to:

- Outline the questions that have been posed to CapReef;
- What we have provided in answer to those questions; and
- Provide an assessment of the status of fish resources in Central Queensland.

3. Description of CapReef Area

Initially the CapReef area was identified as being from Stanage Bay in the north to Bustard Head in the south (Capricorn). In 2007 a second area from Bustard Head to Elliott Heads (Burnett) was added. The primary focus has been on the Capricorn area and limited data were collected from the Burnett area.

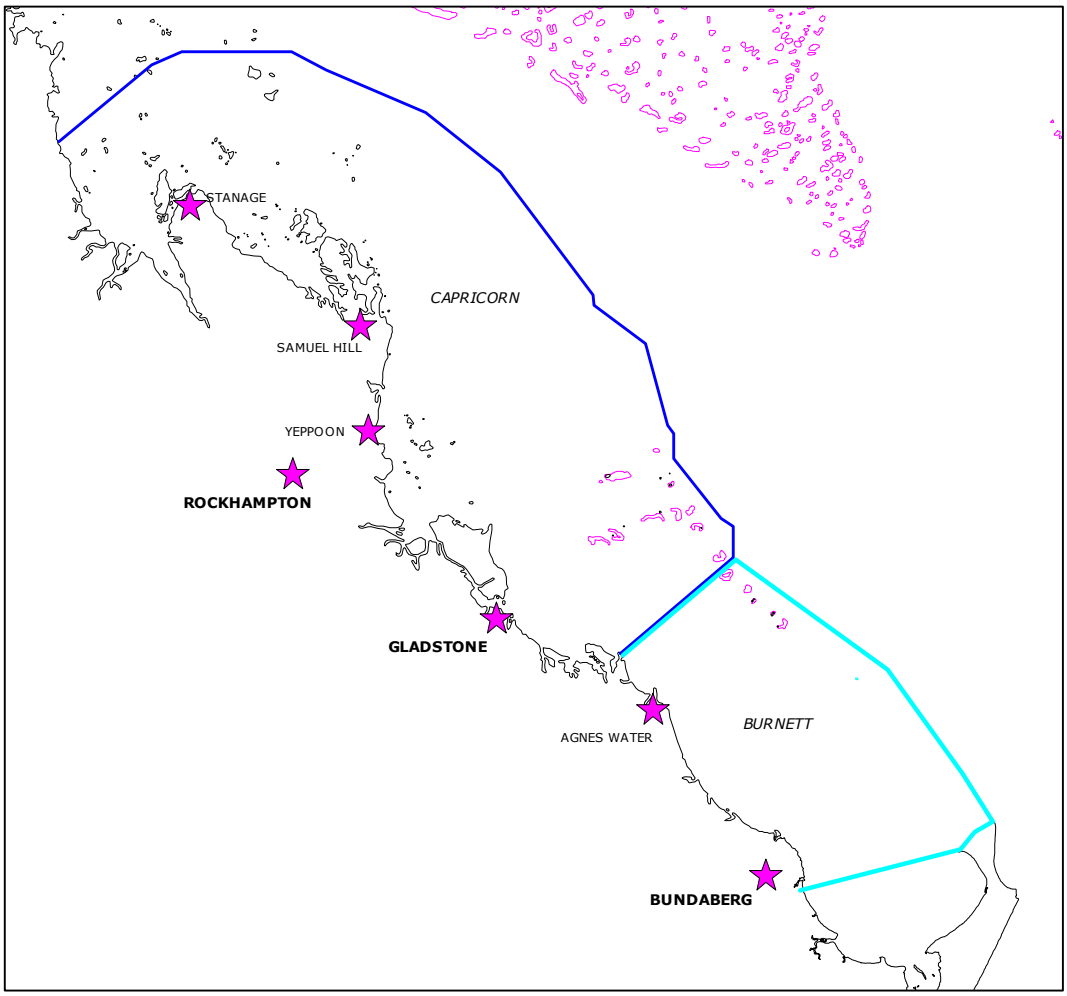


Figure 1: Area cover by CapReef data collection - Capricorn and Burnett

4. Questions posed to CapReef

The questions posed to CapReef were grouped to provide consistency in the way in which they were addressed and answered. There were 3 primary questions which had a series of further questions dealing in greater detail with that issue.

Question 1: What are the social, economic and ecological characteristics of fish and recreational fisheries in Central Queensland?

1.1 What is the recreational fishing effort?

- 1.1.1 Who fishes?
- 1.1.2 How many people fish?
- 1.1.3 Where do they fish?
- 1.1.4 When do they fish?
- 1.1.5 What is the level of recreational fishing effort?
- 1.1.6 What is the level of spearfishing effort?
- 1.1.7 What is the level of aquarium fishing effort?

1.2 What is the recreational catch?

- 1.2.1 What is the species composition?
- 1.2.2 What are the catch rates?
- 1.2.3 What is the estimated total catch offshore from Rosslyn Bay and Gladstone?
- 1.2.4 What are the historical changes in catch composition?
- 1.2.5 What are the historical changes in catch rates?
- 1.2.6 What is the spearfishing catch?
- 1.2.7 What is the aquarium fish catch?

1.3 What is the use of habitats/bioregions by fish species?

- 1.3.1 What habitats are used by juveniles and adults of key species?
- 1.3.2 When do fish move between habitats used by juveniles and adults?
- 1.3.3 Can access of marine species to freshwater habitats be improved by addressing fish passage?

1.4 What are the social, economic and ecological impacts of major fishing competitions in the CapReef area?

- 1.4.1 Do major fishing competitions significantly impact local fish stocks?
- 1.4.2 How do major fishing competitions rate on their social, economic and ecological performance?

1.5 What are the social values of recreational fishing in the CapReef area?

- 1.5.1 What are the trends in participation in recreational fishing in the CapReef area?

1.6 What are the economic values of recreational fishing in the CapReef area?

- 1.6.1 What is the expenditure on recreational fishing along the Capricorn coast?

Question 2: What social, economic and institutional factors influence these characteristics and how can we use this understanding to maintain and enhance fish and recreational fishing?

2.1 What are the effects of management change on fisher behaviour?

- 2.1.1 What changes have occurred in fishing locations with changes to zoning?

2.1.2 What are the historical changes in fishing effort?
2.1.3 What was the historical use of locations with changed zoning?
2.1.4 What changes have occurred to species harvested or targeted?
2.1.5 What have been the effects of changes in fishing regulations?
2.1.6 How will future changes to bag and size limits influence recreational fishing in the CapReef area?
2.1.7 What changes have occurred in commercial fishing activities?

2.2 What are the effects of management change on fish stocks?

2.2.1 Do catch rates reflect fish abundance?
2.2.2 Are there difference in fish stocks and behaviour in fished and unfished zones?
2.2.3 Is there evidence of "spillover" from green zones?
2.2.4 Can changes be made to the size limits of key species?

2.3 What are the likely effects of climate change on fish stocks?

2.3.1 Can CapReef assess the effect of climate and rainfall change on fish species and catches?
2.3.2 What was the effect of the 2008 flood in the Fitzroy River and coastal streams on fish stocks?
2.3.3 What is the value of freshwater flows to the marine system and offshore fisheries production?
2.3.4 Can CapReef provide data to water managers to quantify the value of environmental flows?
2.3.5 What is the carbon footprint of recreational fishing in the CapReef area?

Question 3: How can we develop and utilise the social capital and social networks of the local region in support of socially, economically and ecologically sustainable management of fish resources and the fisheries they support?

3.1 What can CapReef contribute to research projects and monitoring programs such as the Queensland Primary Industries and Fisheries Long Term Monitoring Program?

3.2 Can the CapReef concept be extended to other areas?

3.3 Can the CapReef concept be extended interstate?

3.4 Are community monitoring programs such as CapReef worth the investment?

Q1 What are the social, economic and ecological characteristics of fish and recreational fisheries in Central Queensland?

Q1.1 What is the Recreational fishing effort?

1.1.1 Who fishes?

Five groups were used to assess who fishers. These groups were:

- Recreational trailer boat fishers
- Landbased fishers
- Competition fishers
- Charter boat fishers
- Fishing clubs

Data on who fishes were obtained from details of fishing trips that were collected during boat ramp surveys and from fishing trips reported to CapReef from winter 2005 to autumn 2009. These trips identified the boat ramp or landbased locations for fishing activities and the home town for the fishers. For boat fishers the home town was identified for the skipper of the boat. These data were then used to determine the distance between the home town and where they went fishing.

A total of 9,881 fishing trips, excluding during major fishing competitions, had details of the home town of those using boat ramps or landbased locations. Overall fishers lived 100km or less from where they went fishing for 96.9% of trips and 20km or less for 70.3% of trips.

> ***Overall 97% of fishing trips in the CapReef area were undertaken by local fishers that travelled less than 100km to go fishing***

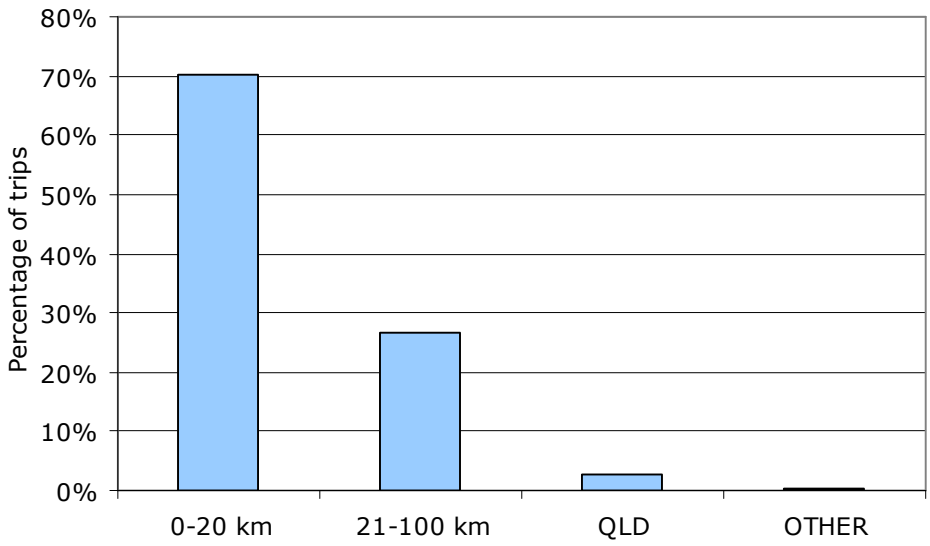


Figure 2: Trip distances travelled to go fishing in Central Queensland

1.1.1.1 Recreational trailer boat fishers

Boat ramp surveys were undertaken at a number of boat ramps over the period. The Rosslyn Bay boat ramp at Yeppoon is used to launch boats for offshore fishing while the Auckland VMR ramp at Gladstone and the Burnett Heads ramp at Bundaberg are used to launch boats for both offshore and estuary fishing.

Over 97% of fishing trips from the Rosslyn Bay, Auckland VMR and Burnett Heads boat ramps were undertaken by local fishers that travelled less than 100km to go fishing

A total of 8,028 fishing trips had details of the home town of those using the ramps with fishers living less than 100km from the ramp for 97.3% of trips. Overall fishers lived 100km or less from the ramp used for 97.2% of trips from the Rosslyn Bay ramp, for 99.2% of trips from the Auckland VMR ramp and 94.2% from the Burnett Heads ramp.

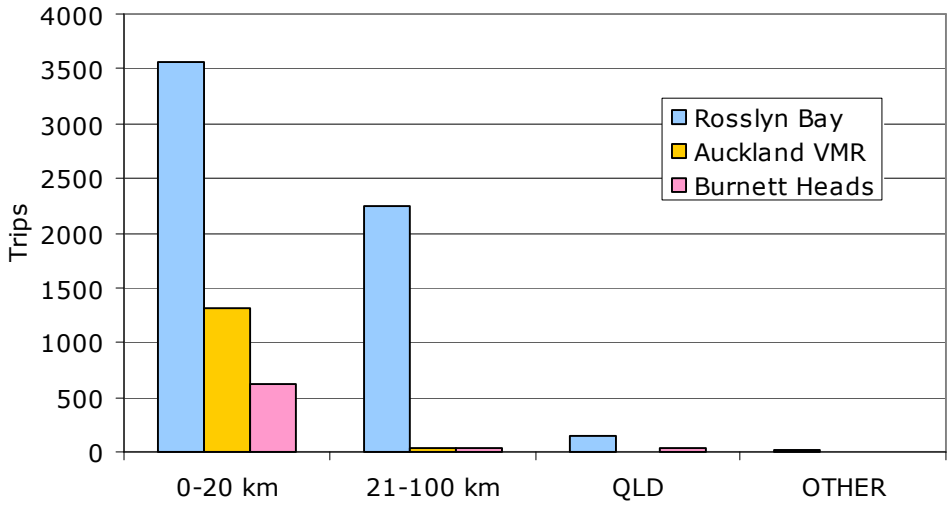


Figure 3: Trip distances travelled to Rosslyn Bay, Auckland VMR and Burnett Heads ramps to go fishing

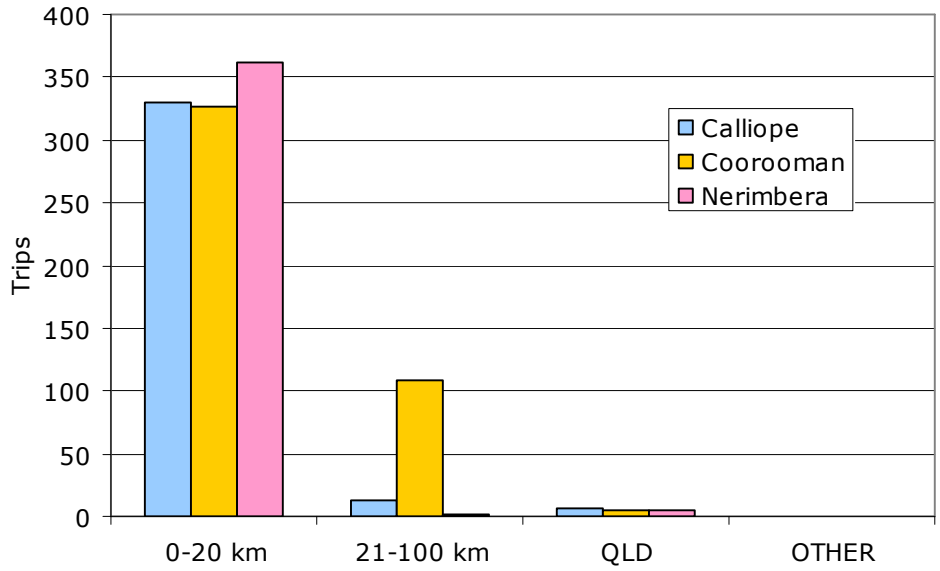


Figure 4: Trip distances travelled to Calliope (Power Station), Coorooman and Nerimbera ramps to go fishing

Boat ramp surveys were undertaken at the Calliope (Power Station) on the Calliope River, Coorooman on Coorooman Creek and Nerimbera on the Fitzroy River. These boat ramps are used primarily for estuary fishing although some offshore trips are made from Coorooman.

A total of 1,157 fishing trips from these ramps had details of the home town of those using the ramps with fishers living less than 100km from the ramp for 97.3% of trips. Overall fishers lived 100km or less from where they went fishing for 98.0% of trips from the Calliope ramp, for 99.1% of trips from the Coorooman ramp and for 98.6% of trips from the Nerimbera ramp.

> ***Over 98% of fishing trips from the Calliope Power Station, Coorooman and Nerimbera boat ramps were undertaken by local fishers that travelled less than 100km to go fishing***

Within the CapReef area almost 97% of fishing trips, excluding those during major fishing competitions, are made by fishers that live 100km or less from where they went fishing. This indicates that the fisheries in the area are largely fished by local fishers. Only 2.8% of fishers came from other areas of Queensland and 0.3% were fishers from other States.

The boat ramps where data were collected are representative of the boat ramps in the area however for many of the other ramps it is expected that almost all fishers were locals as these ramps are not as well known, have poorer access and may only be usable over limited tidal periods. This makes these less attractive to visiting fishers who may be unfamiliar with the area.

This does not reflect the level of participation of non-local boat fishers in the fishery. Many of those that identified their home town as local worked in the mining industry and lived near their work but had homes at the coast, especially from Yeppoon to Turkey Beach. Also during boat ramp surveys it was noted that while the skipper was a local, crew members were often family or friends from other areas. No data were collected on this aspect of those fishing however it is considered that non-locals, those living more than 100km from where they fished, could account for around 10-20% of those fishing.

1.1.1.2 Landbased fishers

Surveys of landbased fishers were undertaken at a number of locations and trips were also obtained direct from those fishing from the shore.

A total of 696 landbased trips had details of the home town of those fishing. Overall fishers lived 100km or less from where they went fishing for 90.3% of landbased trips.

> ***Over 90% of landbased fishing trips were undertaken by local fishers that travelled less than 100km to go fishing***

With over 90% of landbased fishing trips made by fishers travelling less that 100km to go fishing, compared with 97.5% for boat fishing trips, this suggests that more people travelling to or through the region go landbased fishing as compared with boat fishing. Some locations that are close to the Bruce Highway and have parking or camping facilities, such as the old Bruce Highway crossing on the Calliope River and the Boyne River crossing at Benaraby are popular with travellers.

The sample of trips for landbased fishing may not have covered sufficient locations to be fully representative of where people live compared with where they go fishing.

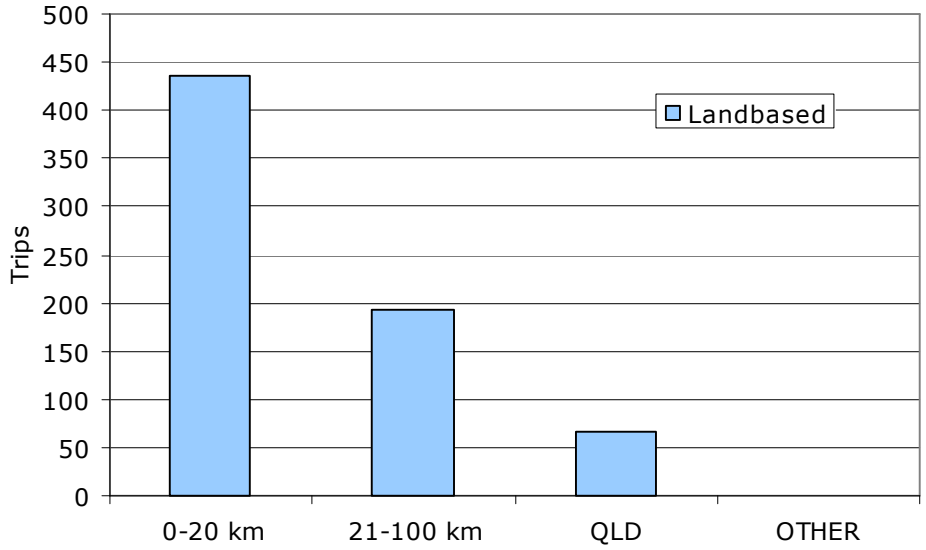


Figure 5: Trip distances travelled by landbased fishers to go fishing

1.1.1.3 Competition fishers

There are a number of large public participation fishing competitions held each year in the CapReef area that attract both local and visiting fishers. Most events are held annually and attract a significant number of competitors. Major events include:

Event	Location	When Held	Days	Entrants 2008-09
Boyne Tannum Hookup	Boyne Island	June	3	2,500-4,000*
Rocky Barra Bounty	Rockhampton	October	2	140
Stanage Fishing Comp	Stanage Bay	Easter	3	200-300
Tight Lines Fishing Classic	Rosslyn Bay	August	2	900
VMR Fishing Classic	Burnett Heads	June	3	720
Family Fishing Classic	Lake Monduran	October	3	750
Bag a Bream	Burnett Heads	March	2	350
Baffle Creek Challenge	Baffle Creek	February	5	200

* not all entrants fish

Table 2: Summary of major fishing competitions in the CapReef area

Surveys of competition fishers were undertaken at the Bray Park boat ramp on the Boyne River during the Boyne Tannum Hookup fishing competition each year from 2005-09. Bray Park is used as the headquarters for the competition. Home towns were also recorded for competitors in the Rocky Barra Bounty fishing competition from 2006-08. Competitors used a number of ramps in the competition area to go fishing. Surveys of competition fishers were undertaken at Stanage Bay in 2006-07 and at the Tightlines competition in 2008, which was the first year for that event.

A total of 2,176 competition trips from these competitions had details of the home town of those fishing. Overall 63.5% of fishers taking part lived 100km or less from the boat ramp while 36.5% of fishers lived elsewhere in Queensland over 100km from the boat ramp used for the competition as shown in *figure 6*.

Visiting fishers taking part in the competitions were:

- Boyne Tannum Hookup (31.0%)
- Rocky Barra Bounty (50.9%)
- Stanage Bay Easter competition (86.0%)
- Tight Lines event at Rosslyn Bay (4.3%)

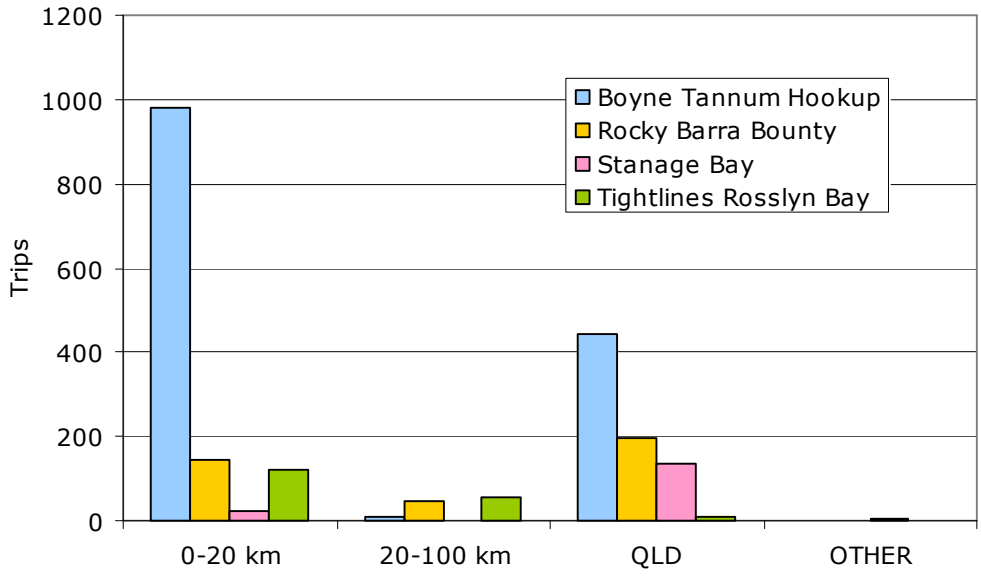


Figure 6: Distances travelled to participate in major competitions

In major fishing competitions 36.5% of fishers were visitors from other areas of Queensland and elsewhere that travelled over 100km to take part in the competition

Major fishing competitions attracted a greater number of visiting fishers compared to normal fishing times except for the Tight Lines event. This was the first year for this event with mostly local promotion and that was reflected in where the competitors came from.

For all events where boats were local it was often noted that crew members were not from the local area and were family members or friends from other areas. The number of non-locals participating in competitions was even higher that the figures suggest. It was possible that up to 50% of those taking part in major fishing competitions were visiting fishers.

1.1.1.4 Charter boats and fishing guides

Most charter boats in the CapReef area are geared up to fish offshore for reef and game fish. Charter boats operate from Rosslyn Bay, Gladstone, Agnes Water and Burnett Heads and mainly fish the Capricorn-Bunker and Swain reefs.

There are 6 charter operators at Gladstone, 2 at Rosslyn Bay, 1 at Agnes Water and 6 at Burnett Heads[1]. These operators provide a service to fishing clubs and groups and can cater for up to 15 fishers per charter.

There are 4-5 guides that mainly fish Lake Awoonga and Lake Monduran and they are primarily focused on Barramundi. Guides generally cater for a small number of fishers from 1-3. There are further guided fishing businesses being set up that will target estuaries in the Gladstone and Bundaberg areas.

Operators are required to complete logbooks providing details of their catch to QPIF and no data have been collected on charter and guided fishing.

[1] 2009 Local Telephone Directories Rockhampton, Gladstone and Bundaberg

1.1.1.5 Fishing club fishers

Fishing clubs in the Capricorn and Burnett areas are based around particular categories of fishing as shown in *table 3*.

Type of club	Number of clubs	Approximate membership
Sportfishing	4	250+
Gamefishing	0	0
Light gear	13	500+
Deep-sea	3	100+
Spearfishing	1	20+
Social	10	1500+
Total	31	2370+

Table 3: Summary of fishing clubs in CapReef area

Fishing clubs generally hold competitions among members or conduct club fishing trips throughout the year with many clubs holding competitions monthly.

Some fishing clubs have provided details of their competition catches which have allowed trends in catch rates to be assessed (see section 1.2.5). Clubs that provided details were:

- Yaralla Deep-Sea Fishing Club (Gladstone)
- Apex Deep-Sea Fishing Club (Rockhampton)
- Wanderers Light Gear Angling Club (Gladstone)

1.1.2 How many people fish?

CapReef did not set out to obtain an estimate of the total numbers fishing in the area as this would require resources beyond those available. However 2 datasets have been used to assess trends in the numbers fishing. These were:

- Vessel registrations
- Trailers at Rosslyn Bay

Vessel registrations were used to assess trends in the number of boats in the area from 2005 to 2009. This provides an indicator of any changes in the numbers fishing as a large proportion of boats in the size range 3.0-8.0m are used for fishing.

Vessel registrations were obtained for speedboats at 31 December 2005 and 31 March 2009[2] for the following areas:

- Rockhampton Regional Council area
- Gladstone Regional Council area
- Bundaberg Regional Council area

Vessels from 3.0–8.0m were considered to be the size range most used for trailer boat fishing with boats from 4.01–8.0m most used for offshore fishing. *Figure 7* shows the numbers of vessels registered in each size range in 2005 and 2009. From 2005 to 2009 there was a 13.0% increase in registrations of vessels from 3.0–8.0m in length however the increase was 24.2% for vessels from 4.01–8.0m. Registrations of boats from 3.01–4.0m did not change from 2005 to 2009.

However on a regional basis as shown in *figure 8* registrations for boats from 3.01-4.0m went down by 3.9% in Rockhampton and 4.1% in Gladstone while rose by 5.7% in Bundaberg. For boats from 4.01–8.0m registrations rose by 16.7% in Rockhampton, 33.6% in Bundaberg and 24.8% in Gladstone.

[2] Vessel registrations from Department of Transport and Main Roads

Vessels from 3.0-8.0m are most used for fishing and registrations of boats in this size range rose by 13.0% from 2005 to 2009

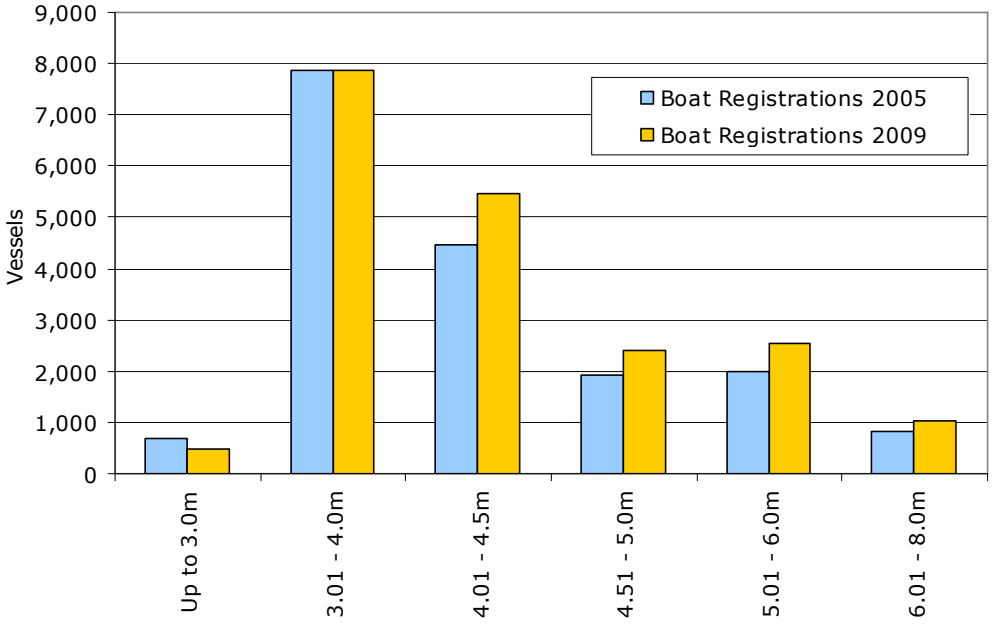


Figure 7: Comparison of boat registrations in 2005 and 2009 for CapReef area

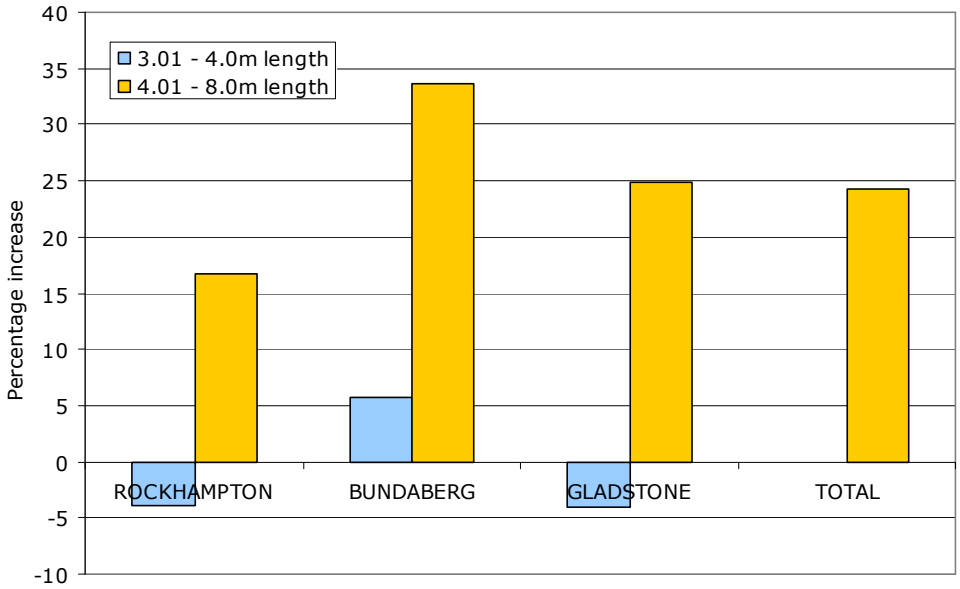


Figure 8: Trends in boat registrations from 2005 to 2009 for boats from 3.01-8.0m in length

Boat registrations provide data on the increase in the number of boats however not all boats are used for fishing or not used for fishing all of the time.

Trailer boats at Rosslyn Bay were examined to determine trends in boating and the numbers fishing. *Figure 9* shows the average number of trailers on weekends and weekdays at Rosslyn Bay in each year while *figure 10* shows the maximum number of trailers on a day in each year. *Figure 11* shows the average number of trailers on weekends and weekdays.

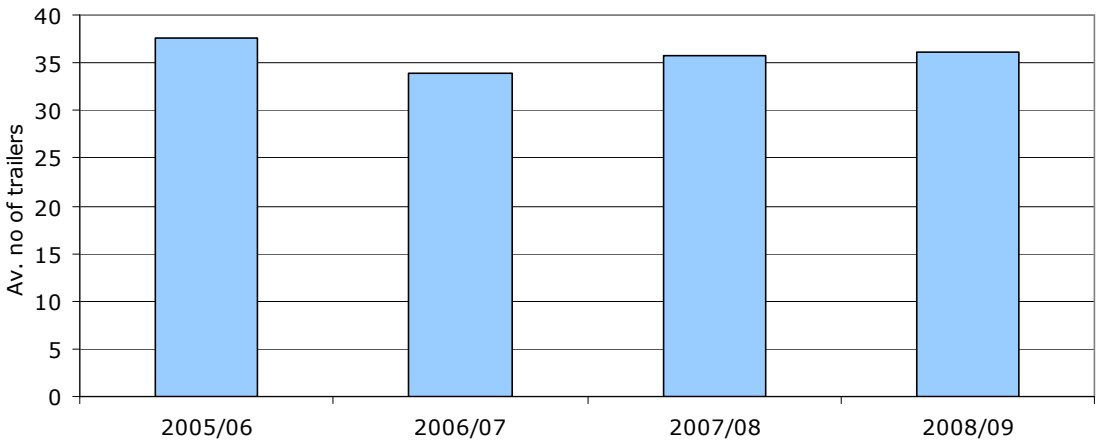


Figure 9: Average number of trailers each day at Rosslyn Bay from 2005-09

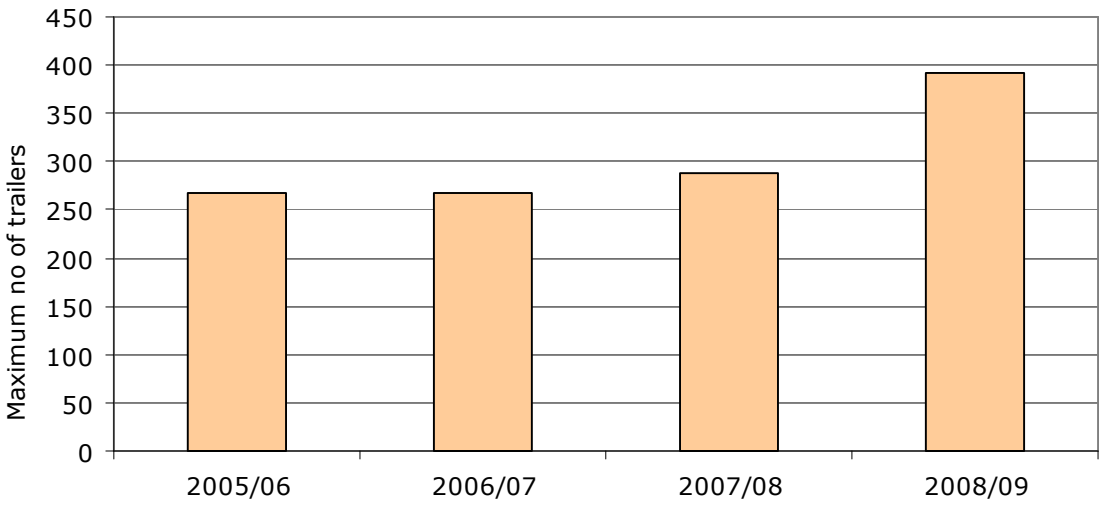


Figure 10: Maximum number of trailers on a day at Rosslyn Bay from 2005-09

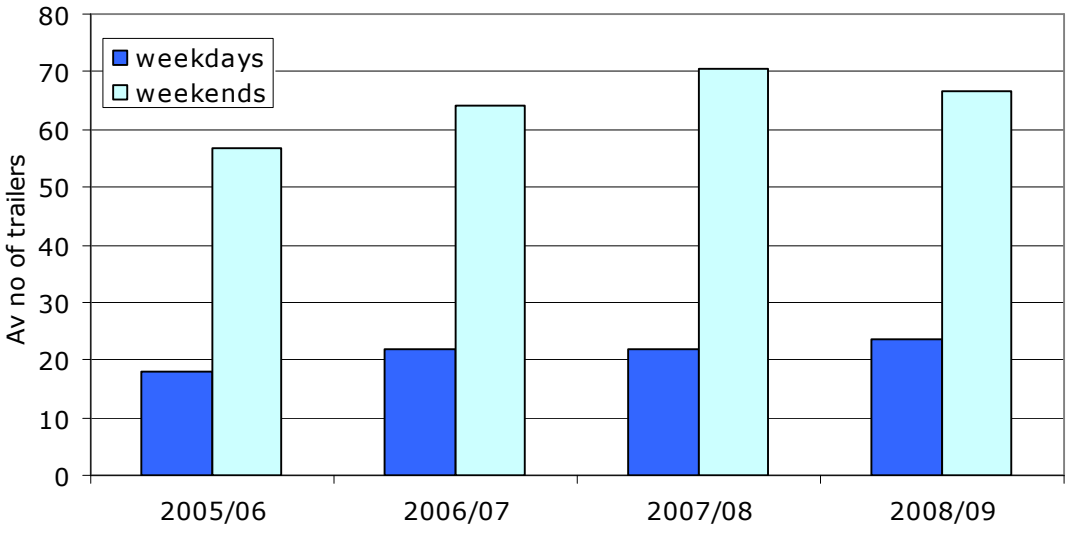


Figure 11: Average number of trailers at Rosslyn Bay on weekends and weekdays from 2005-09

The issues affecting the numbers of boating trips are complex and this is reflected in the results. The average number of trailers present on weekends and weekdays has increased only slightly since 2005/06. Similarly *figure 9* indicates that the overall average number of trailers has increased a little (by around 15% on weekends and weekdays) over the past 4 years (*figure 11*). The maximum number of trailers present on a day in contrast has increased considerably. *Figure 10* indicates that the maximum number of trailers has increased by around 46%. There are several reasons why this combination has occurred.

The increase in the maximum number of trailers probably reflects an increase in boat ownership. It is also likely that the number using their boats increases noticeably after a period of rough weather. So that on a calm weekend after a long period of rough weather there will be a large number of boats using the ramp. However the average number of trailers reflects both the number of boats as well as the weather (*figure 16*). If there are many rough weekends then the average number of trailers will fall, despite there being more boats potentially using the ramp. However even if there are long periods of calm weather this does not mean there will be large numbers of trailers. It is also the case that the number of boats gradually decreases as a prolonged calm period develops (reflecting that many fishers do not have the time available to fish every weekend).

Not all boats fish. Data was collected on those that did not fish during boat ramp surveys and on average around 77% of trips fish.

Both vessel registrations and trailers at Rosslyn Bay indicate that there has likely been an increase in the number of people fishing over the past 4 years.

> ***At Rosslyn Bay the maximum number of boat trailers on a day has risen by 46% from 2005/06 to 2008/09***

1.1.2.3 Fishing in competitions

Details of major public participation fishing competitions are in *table 2*.

For these competitions not all entrants fished and for some events not all entrants fished on all days. It is estimated that around 75% of the potential fishing days are actual fishing days based on observations during some of the events although no data are available to confirm that estimate. During these events in 2008 there were approximately 17,250 potential fishing days for entrants and approximately 13,000 actual fishing days.

As entrants in fishing competitions often fish together this would translate to a lower number of fishing trips however there are no data available to make an estimate of the number of trips during these events.

There are many other smaller fishing competitions, especially those conducted by fishing clubs however no estimates are available of the number of participants or fishing days in those competitions.

1.1.3 Where do people fish?

Where people fished was categorised as:

- Offshore
- Estuary
- Freshwater

1.1.3.1 Offshore Fishing

Where people fished offshore was categorised as:

- Inshore
- Islands
- Wide grounds
- Offshore reefs

Figure 12 shows how offshore trips have been categorised and the key boat ramps along the coast that are used to access offshore fishing. *Figure 13* is a schematic diagram showing the categories of fishing locations. Note that there is no islands category in the Burnett section as there are no islands in this area.

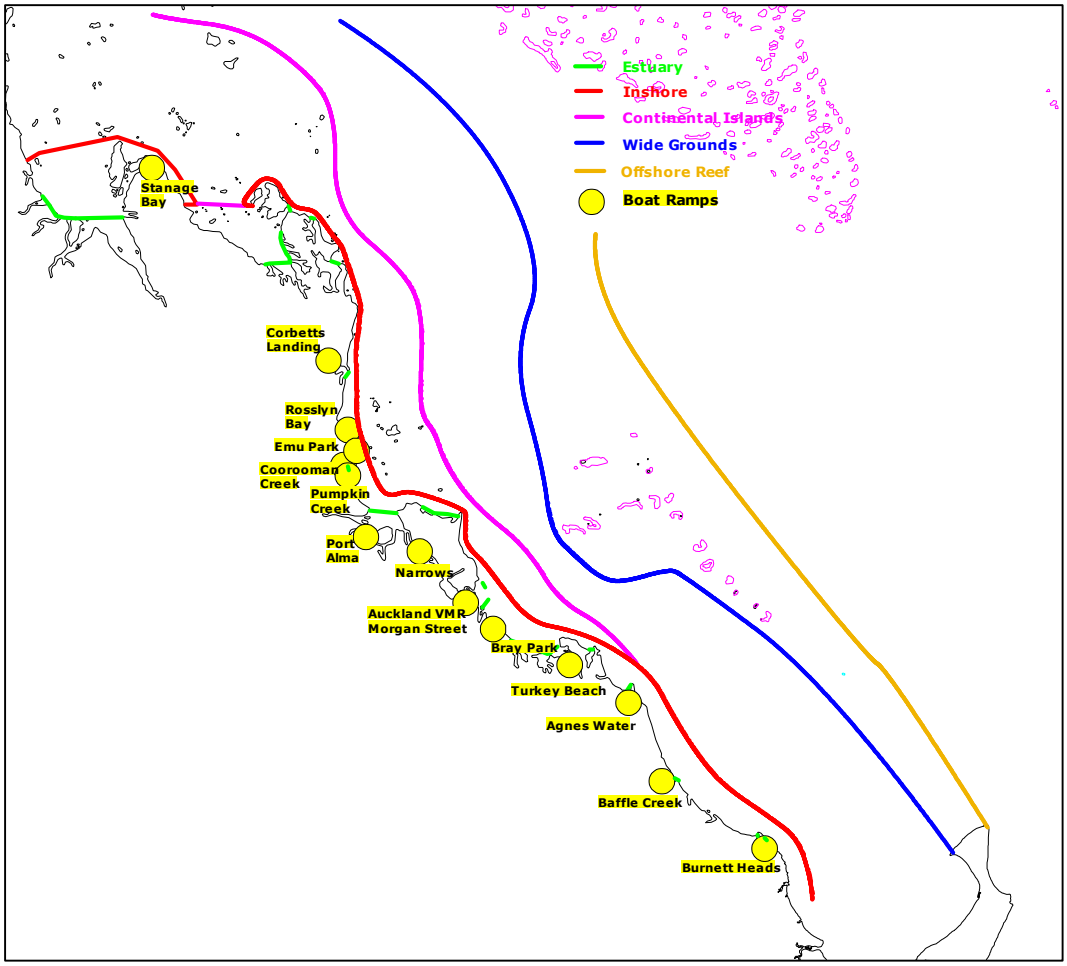


Figure 12: Locations where offshore fishing occurs in the CapReef area

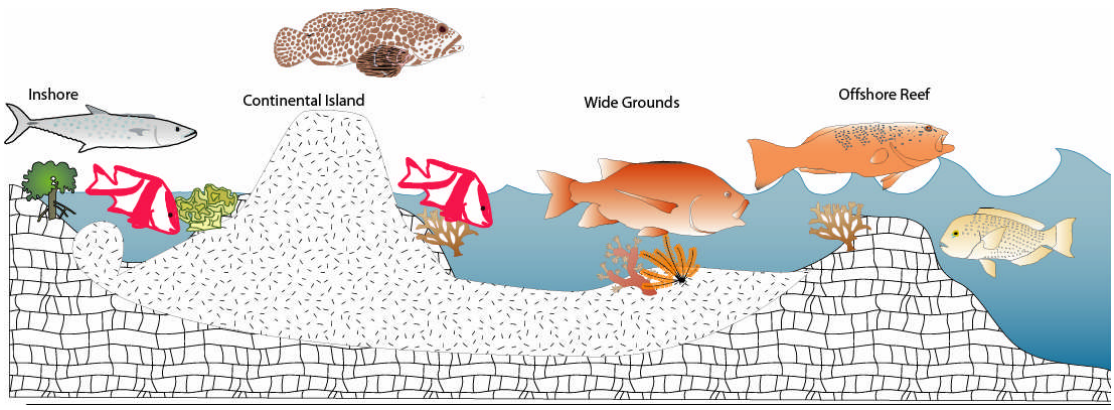


Figure 13: Schematic diagram showing the categories of fishing locations

Figure 14 shows the percentage of offshore fishing trips to each of the location categories. The Burnett Heads and Auckland VMR ramps are used for both estuary and offshore. There is a very small component of offshore fishing which is landbased from beaches and rocky headlands and there are a number of beaches where boats are launched for offshore fishing. However these are very small components of offshore

fishing and no specific data have been obtained on where such fishing is undertaken but most of it is likely to be to inshore and island locations.

Figure 15 shows the locations fished each season for the past 2 years in the Capricorn area. This indicates that there has been a reduction in fishing inshore and an increase in fishing around the islands in all seasons except spring. During spring many inshore trips target School Mackerel.

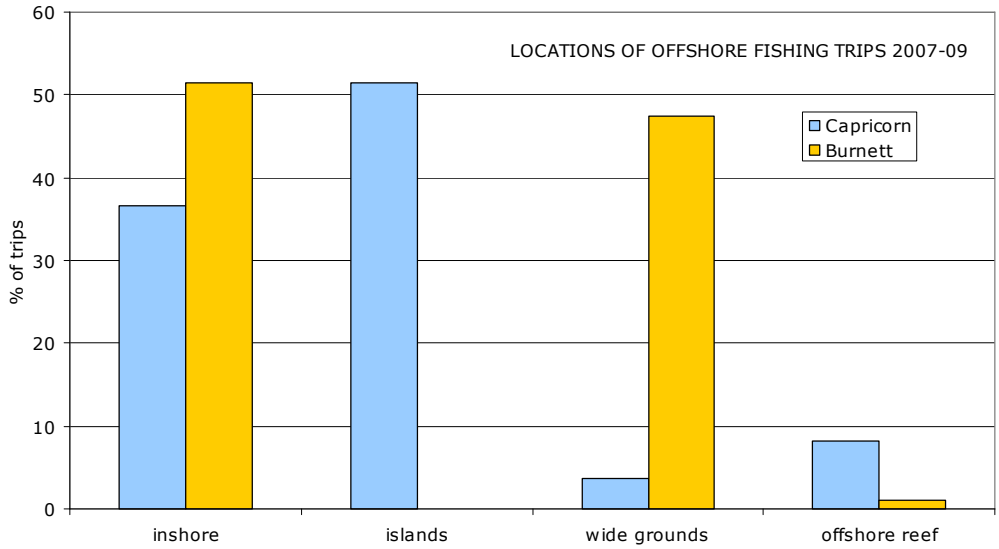


Figure 14: Offshore fishing trips to locations for Capricorn (Rosslyn Bay and Auckland VMR) and Burnett (Burnett Heads)

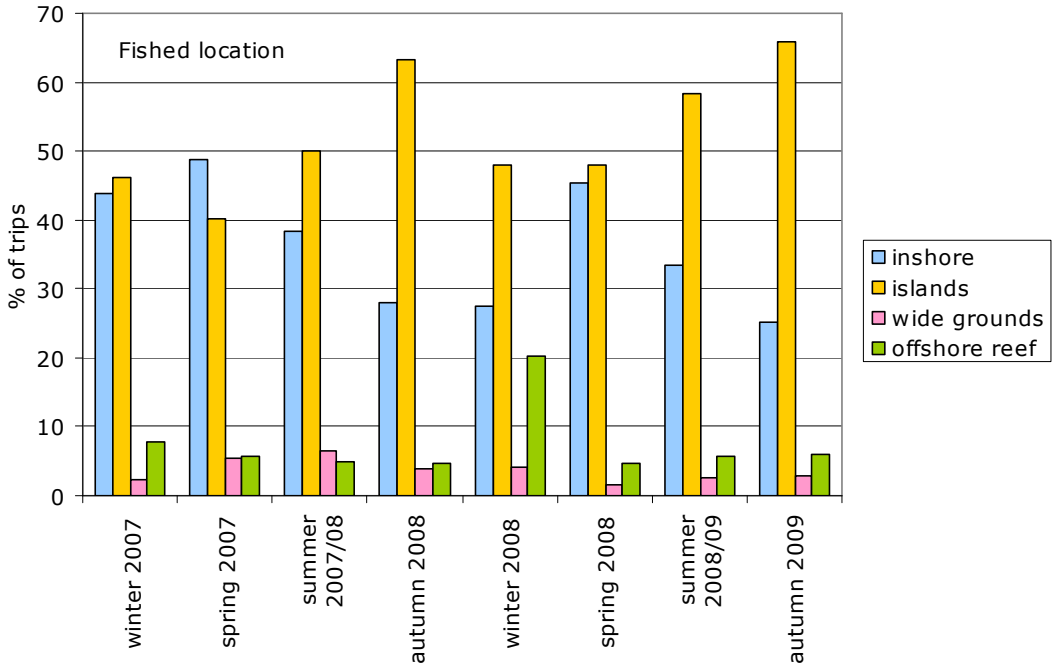


Figure 15: Offshore locations fished each season over the past 2 years in the Capricorn area

There is no islands location in the Burnett area. For that area there were only data on fishing locations available for 1 season in autumn 2008. During that season offshore trips to inshore and wide ground locations accounted for 98.9% with 1.1% of trips to offshore reefs.

> ***From 2007-2009 in the Capricorn area 88.2% of offshore fishing trips were to inshore and island locations***

> ***For autumn 2008 in the Burnett area 98.9% of offshore fishing trips were to inshore and wide ground locations***

1.1.3.2 Estuary Fishing

Almost all estuaries in the CapReef area have at least 1 boat ramp that allows fishing in the estuary with larger estuaries, rivers and creeks having several ramps. Official boat ramps are often supplemented by unofficial ramps or launching sites where smaller boats are launched directly from the bank.

There are a total of 46 recognised boat ramps[3] in the CapReef area that are used to launch boats for fishing in estuaries. It is estimated that there are a further 20 unrecognised or unofficial ramps and an unknown number of launching sites where small boats can be launched direct from the bank.

The only area where there is limited boat ramp access to estuaries is within the Shoalwater Bay Defence Training Area. While there are a number of ramps into some of the creeks these are not available for public use.

> ***All estuaries from Stanage to Bundaberg are regularly fished except those in Shoalwater Bay***

1.1.3.2 Freshwater Fishing

There are limited locations for freshwater fishing in the CapReef area and most freshwater fishing is related to Barramundi, both wild and stocked fish. Lake Awoonga and Lake Monduran have been stocked with Barramundi and other species and have grown steadily in importance as freshwater fishing locations which now attract many fishers from southern Queensland and even interstate. These impoundment fisheries are largely boat based.

There is low level of fishing in freshwater above tidal barrages or dam walls such as those on the Burnett, Kolan, Boyne and Fitzroy Rivers. These barriers block the upstream movement of marine fish and particularly Barramundi. While some of these barriers have fishways that allow upstream passage of some species they have not proven to be very effective for Barramundi.

The Fitzroy River has a large delta system which includes a series of wetland freshwater and brackish lagoons, which are accessed by Barramundi under flood or high rainfall conditions. Due to drought conditions in the early 2000s, from 2005 and 2007 a number of lagoons on the southern side of the river dried up and all fish in those lagoons were lost. It was not until the flooding in early 2008 that these lagoons filled again. With the flooding Barramundi returned to the lagoons and fishing recommenced almost immediately.

Barramundi have been stocked above the barrage on the Fitzroy River at a number of locations. There is limited fishing effort above the barrage.

Prior to 2008 there was very little fishing in freshwater due to the drought conditions and most fishing has occurred since then. Unlike offshore and estuary fishing much of the fishing in freshwater is landbased. Fishing freshwater is also constrained as access to many of the locations is limited as they are on private property.

The most fished freshwater locations in the Capricorn area are:

- Calliope River
- Raglan Creek
- Lagoons on southern floodplain of Fitzroy River

[3] Queensland Tide Times 2009

- Fitzroy River and Alligator Creek above the Barrage
- Hedlow Creek
- Tilpal and Herbert Creek

> ***Freshwater fishing mostly targets Barramundi and occurs in Lake Monduran, Lake Awoonga and lagoons and creeks associated with the Fitzroy River delta***

1.1.4 When do people fish?

When people go fishing depends on where they go fishing as different factors influence decisions to go fishing. Fishing locations determine what factors are considered and can be categorised as:

- Offshore
- Estuary
- Freshwater

The most important factors that affect the decision to go fishing offshore are:

- Wind speed and weather (most significant factor)
- Weekday or weekend
- Time of day
- Seasonality of species
- Tides
- Personal factors (large number)

The most important factors that affect the decision to go fishing in estuaries are:

- Tides and time of day (most significant factor)
- Weekday or weekend
- Wind speed and weather
- Seasonality of species
- Freshwater input and water clarity
- Personal factors (large number)

The most important factors that affect the decision to go fishing in freshwater are:

- Time of day
- Water levels, water temperature, flows and clarity
- Weekday or weekend
- Availability and seasonality of species
- Wind speed and weather
- Personal factors (large number)

1.1.4.1 When do people fish offshore?

Wind speed and weather are the most important factors considered when fishing offshore, especially if good weather forecasts coincide with weekends or public holidays as this is when more people have the opportunity to go fishing.

Most offshore trips occurred when the wind speed was less than 15 knots. For Rosslyn Bay all trips are offshore and the number of trailers at the boat ramp was compared with wind speed at Rundle Island at 9:00am. Wind speed at Rundle Island is indicative of offshore wind speed however winds are generally lighter inshore in the morning at Rosslyn Bay. Overall 77.2% of trailers at the ramp were there on days when the wind speed was less than 15 knots.

Figure 16 shows the corrected number of trailers[4] at Rosslyn Bay compared with wind speed on both weekends and weekdays.

[4] Corrected to the expected number of trailers each day

Most offshore trips occur in daylight hours. Traffic counters were used at Rosslyn Bay to estimate hourly trailer movements in November-December 2006 (22 days) and April 2007 (14 days). This indicated that most boating activity occurred between 5:00am to 5:00pm with the greatest number of boats on the water around 9:00am as shown in *figure 17*.

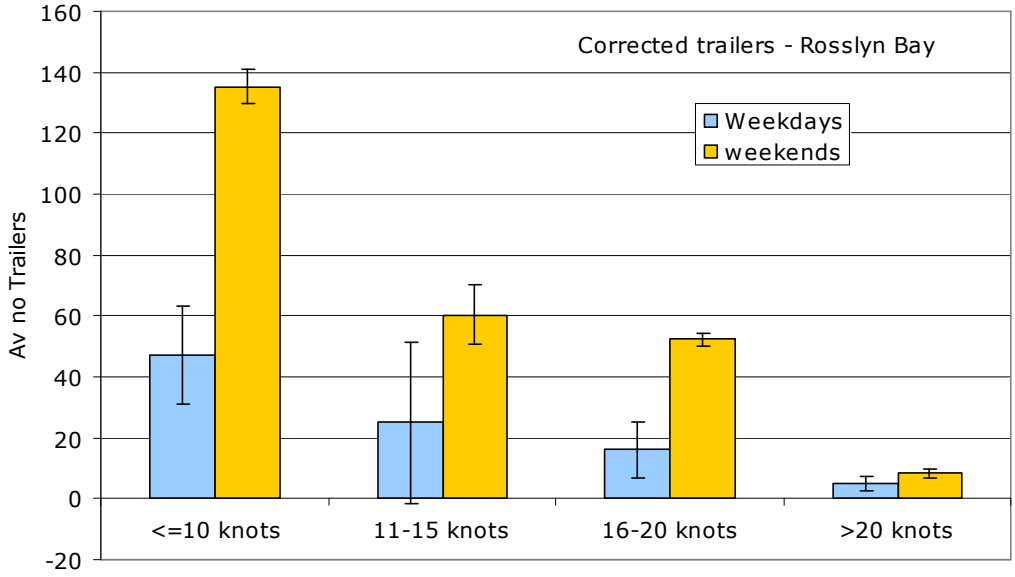


Figure 16: Average number of trailers at Rosslyn Bay compared with wind speed

From boat ramp surveys at Rosslyn Bay it was found that 317 (5.3%) of 5,938 trips were overnight trips. The area offshore from Rosslyn Bay is amenable to overnight trips with numerous safe anchorages around the Keppel Islands, other islands and along the coast, both north and south.

The low number of overnight trips indicates this is primarily a daylight fishery.

> ***At Rosslyn Bay 77.2% of trips occurred when wind speeds were less than 15 knot at 9:00am***

> ***At Rosslyn Bay 88% of trips occurred between 5:00am-5:00pm and 5.3% of trips were overnight***

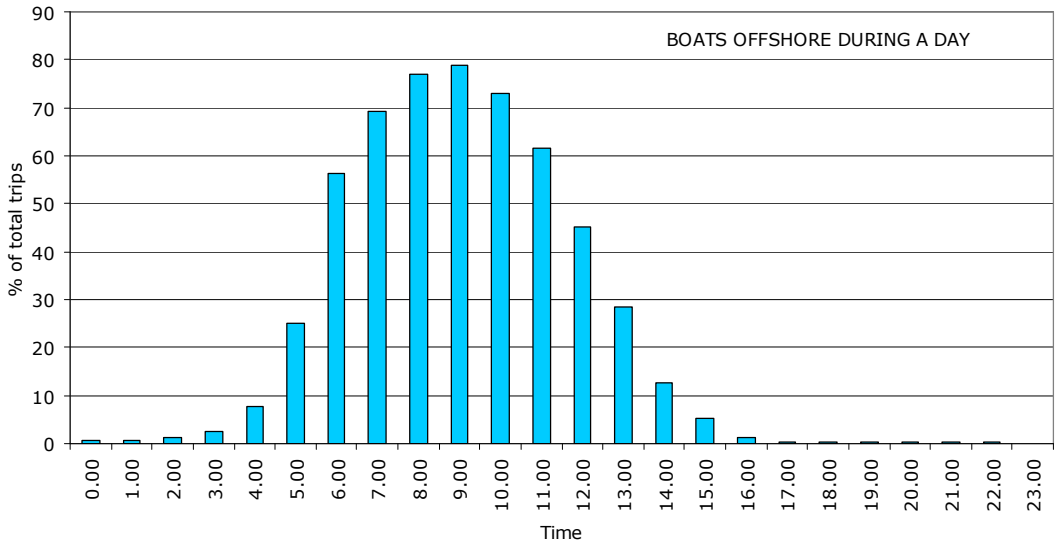


Figure 17: Profile of usage of Rosslyn Bay boat ramp over a full day

At Burnett Heads the boat ramp is used for both estuary and offshore trips and the number of trailers at the boat ramp was compared with wind speed at Bundaberg at 9:00am. Wind speed at Bundaberg is generally less that offshore. Overall 76.5% of trailers at the ramp were there on days when the wind speed was less than 15 knots during autumn 2008.

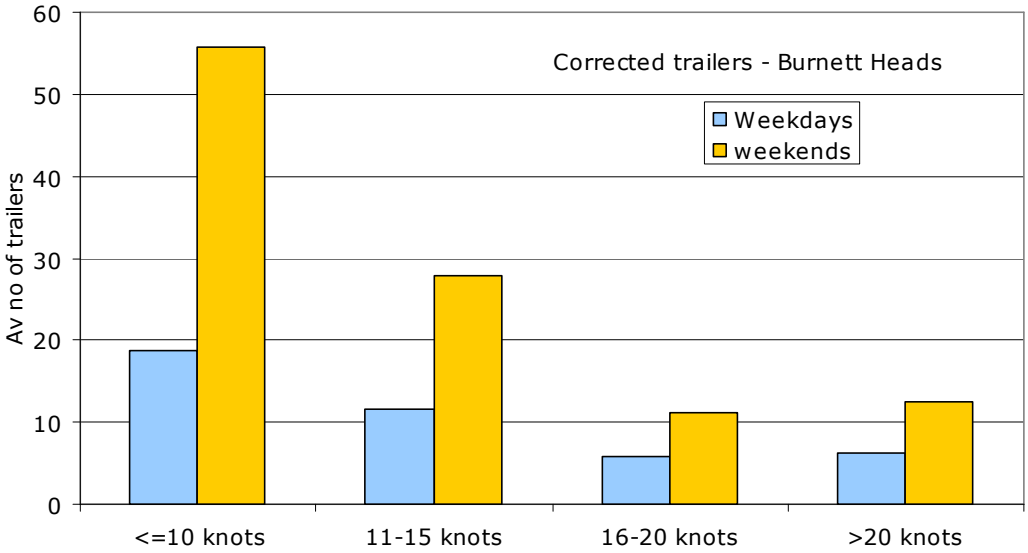


Figure 18: Average number of trailers at Burnett Heads compared with wind speed

Figure 18 shows the corrected number of trailers[5] at Burnett Heads compared with wind speed on both weekends and weekdays. Of the 277 trips in autumn 2008 88.4% were between 5:00am-5:00pm, the remaining trips started before 5:00am and no trips were overnight. Boat ramp surveys were mostly in the afternoon so that would limit the number of overnight trips intercepted. However it is also indicative of having no islands providing overnight shelter in the areas most fished.

> ***At Burnett Heads 76.5% of trips occurred when wind speeds were less than 15 knot at 9:00am and 88.4% of trips were between 5:00am-5:00pm with no overnight trips***

1.1.4.2 When do people fish in estuaries?

Tides, time of day and weekends or weekdays are the most significant factors that determine when fishers decide to go estuary fishing, especially if good weather and light winds coincide with a weekend. However estuary trips are less affected by wind speed compared with offshore trips.

As with offshore trips most estuary trips occur in daylight hours. Traffic counters were used at the Coorooman ramp on Coorooman Creek to estimate hourly trailer movements in July 2008 (16 days). This showed that trips mostly occurred between 5:00am and 5:00pm with most boats on the water from 10:00am to 12:00 noon as shown in *figure 19*. For 439 trips from the Coorooman ramp 97.8% were between 5:00am-5:00pm with 1 overnight trips. Boat ramp surveys were mostly in the afternoon so that would limit the number of overnight trips intercepted.

For all estuaries a typical trips was 5.5 hours.

> ***For estuary trips the typical trip was 5.5 hours and 98% of trips from the Coorooman ramp were between 5:00am-5:00pm***

[5] Corrected to the expected number of trailers each day

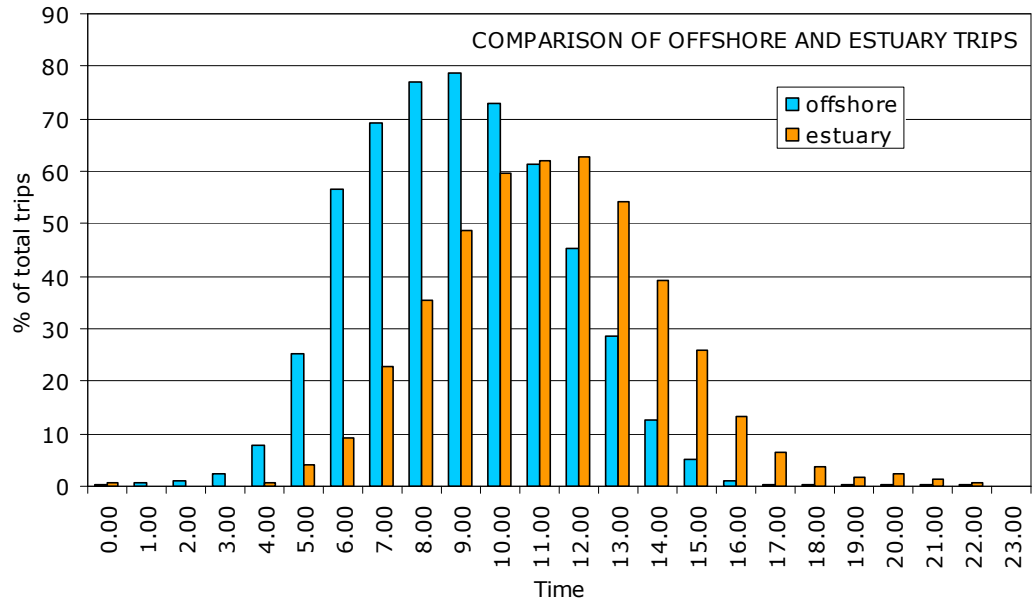


Figure 19: Profile of usage of Coorooman boat ramp compared with Rosslyn Bay

1.1.4.3 When do people fish in freshwater?

CapReef commenced collecting data on freshwater fishing trips in 2008 following the flooding of the Fitzroy River. This flooding filled offstream lagoons that had previously been dry and juvenile Barramundi moved into these lagoons. Some locations such as 12 Mile Creek at Marmor have been included as freshwater even though at times they are brackish or saline.

While offshore and estuary trips were mostly boat based, freshwater trips were mostly landbased. A total of 336 trips were recorded as landbased freshwater fishing trips with 1.5 fishers per trip and an average trip length of 3.6hrs.

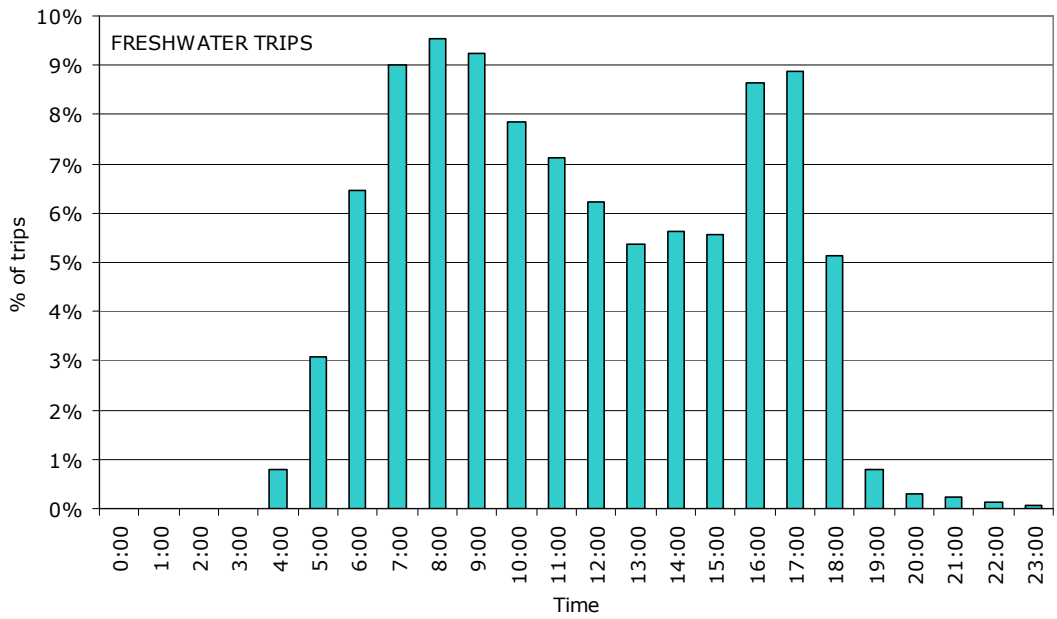


Figure 20: Profile of landbased freshwater fishing trips

Landbased fishing trips to freshwater locations mostly occur between 5:00am and 6:00pm with the greatest number of trips between 7:00am and 9:00am and 4:00pm and 6:00pm as shown in *figure 20*. Freshwater fishing trips are more frequent in the early morning and late afternoon and are less frequent during the middle of the day when temperatures are highest and fish activity at its lowest.

No overnight trips were recorded and only 1.5% of trips extended into the night from 7:00pm to midnight.

> ***For landbased freshwater fishing trips 98.5% occurred during daylight hours from 5:00am - 6:00 pm with 1.5 fishers fishing for 3.6 hours***

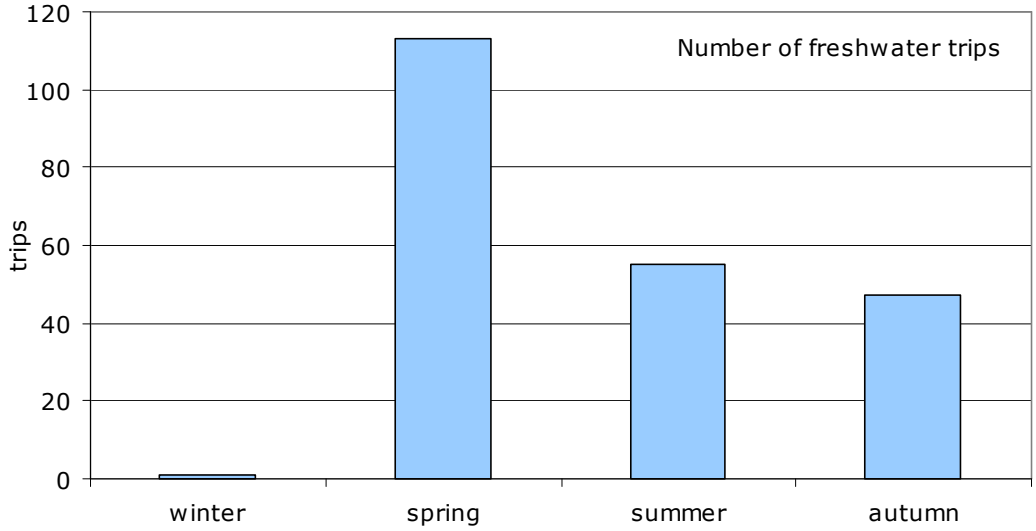


Figure 21: Number of freshwater fishing trips each season

While offshore and estuary fishing trips are undertaken during all seasons there are very few fishing trips to freshwater in winter as shown in *figure 21*.

1.1.4.4 Discussion on when people fish

Fishing in the Capricorn area is generally a daylight activity with over 96% of trips occurring during daylight hours between 5:00am-5:00pm. For overnight trips most of these were associated with offshore fishing where islands are available for overnight anchorage. There are only a small number of overnight trips to estuaries. This is possibly due to the presence of crocodiles in most northern estuaries where the risk of interaction is significantly higher at night. Biting insects can also be more prevalent at night. There were no overnight trips to freshwater, however some afternoon trips extended well into the night.

Most offshore trips commence just before to just after dawn and the number of boats on the water peaked at around 9:00am. Numbers then tapered off with most boats returning by mid afternoon. This was most likely associated with wind speed as conditions are normally the calmest early in the morning. It is common for a sea breeze to commence blowing by mid morning to lunch time and its strength gradually increasing during the day.

Estuary trips generally start early in the morning but are more widely spread throughout the day. When people fish in estuaries was less influenced by wind speed as sheltered areas can be found even when conditions are very windy. Estuary trips are more influenced by tides.

Freshwater fishing trips were more frequent in the early morning and late afternoon and were less frequent during the middle of the day when temperatures are highest and fish activity at its lowest.

As most freshwater trips target Barramundi there are very few trips during winter as Barramundi are not very active over winter due to low water temperatures (less than 18°C) and are not easily caught.

Typical trips can be defines as:

- Offshore trips were 2-3 fishers fishing for around 7 hours
- Estuary trips were 2-3 fishers fishing for around 5.5 hours
- Freshwater trips were 1.5 fishers fishing for around 3.5 hours

1.1.5 What is the level of recreational fishing effort?

The level of recreational fishing effort was only assessed in relation to offshore fishing from Rosslyn Bay and the Auckland VMR ramp at Gladstone. Fishing effort offshore is dependent on wind speed and *figure 22* shows the percentage of days each season when the wind speed was less than 15 knots. This shows that winter and spring have the highest number of good fishing days while autumn has the lowest. *Figure 23* shows the number of fishing trips compared with the number of calm weekends each season for Rosslyn Bay.

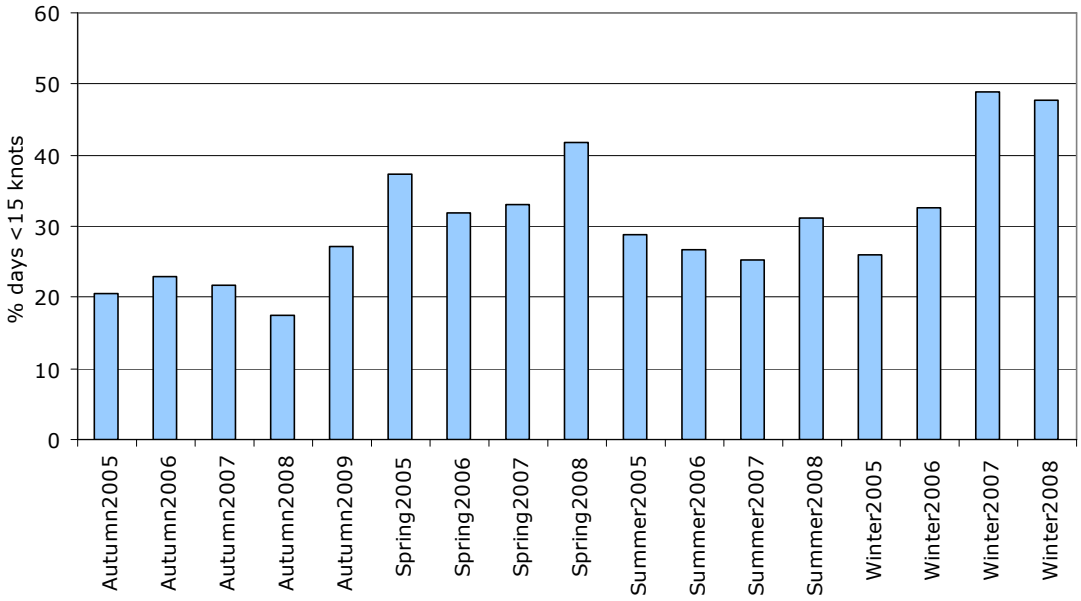


Figure 22: Percentage of days in each season where wind speed was less than 15 knots at Rundle Island at 9:00am

The modelled total number of fishing trips for Rosslyn Bay[6] has increased from around 12,000 in 2005/06 to 14,000 in 2008/09 as shown in *figure 24*. For Gladstone the number of fishing trips has increased from 3,700 in 2005/06 to 4,300 in 2008/09.

For Rosslyn Bay the average number of trailers present on weekends has also increased slightly since 2005/06, however the average number on weekdays has changed little. The maximum number of trailers present has increased over the years as has the average number of trips during periods of good weather.

[6] Details of the modelling methods are in the report "How much fishing effort is there?"

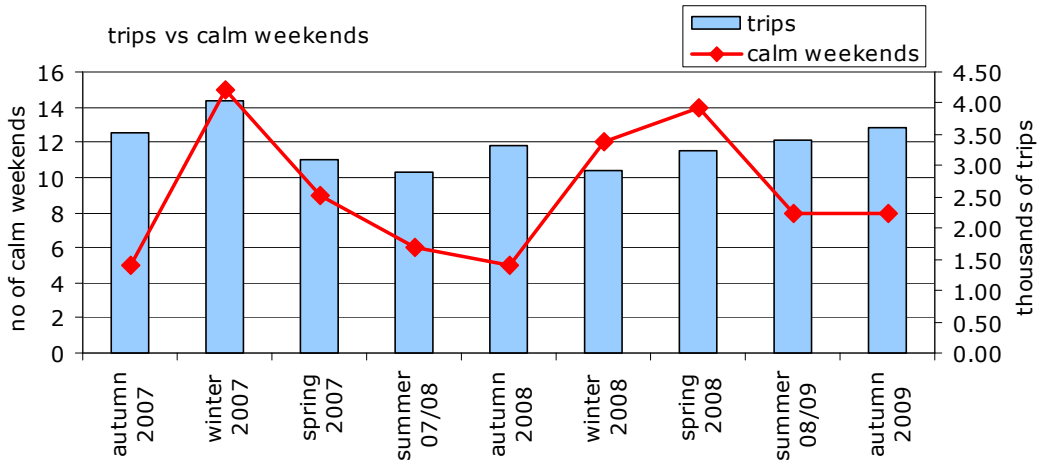


Figure 23: Comparison of number of trips with the number of calm weekends each season for Rosslyn Bay

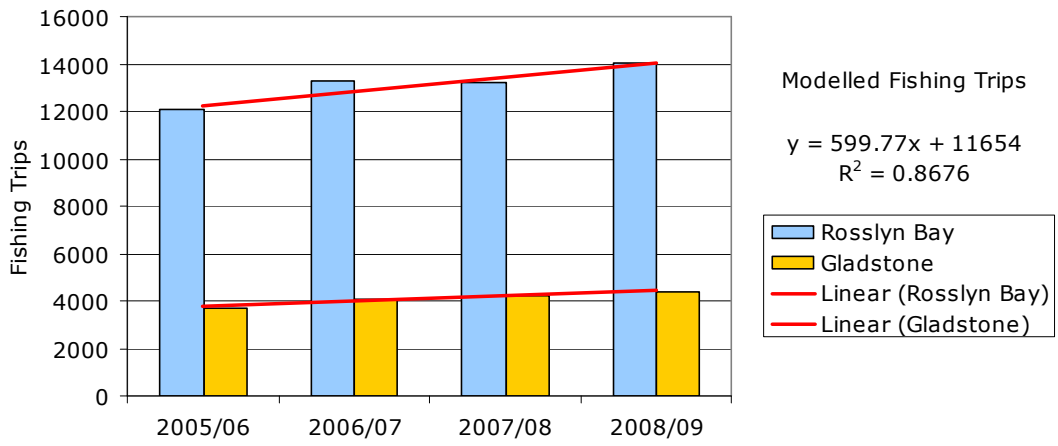


Figure 24: Modelled numbers of fishing trips for Rosslyn Bay and Auckland VMR at Gladstone

Figure 22 and 23 show that the two major factors affecting the number of trips are forecast wind strength and whether the day is a weekend or weekday. The largest numbers of trips occur if good weather forecasts coincide with weekends. In years where fewer weekends with good weather occur, fishing trips are reduced. This seems balanced by an increase in the number of registered trailers. This means that when good weather occurs, the number of trailers present has increased from 2005/06 to 2008/09.

The evidence suggests that the number of fishing trips is not greatly influenced by current catch rates. In fact catch rates tend to be lower when large numbers of trailers are present as shown in *figure 25*.

> ***Offshore fishing effort has increased by around 15% from 2005/06 to 2008/09***

> ***Offshore fishing effort does not appear to be influenced by good catch rates***

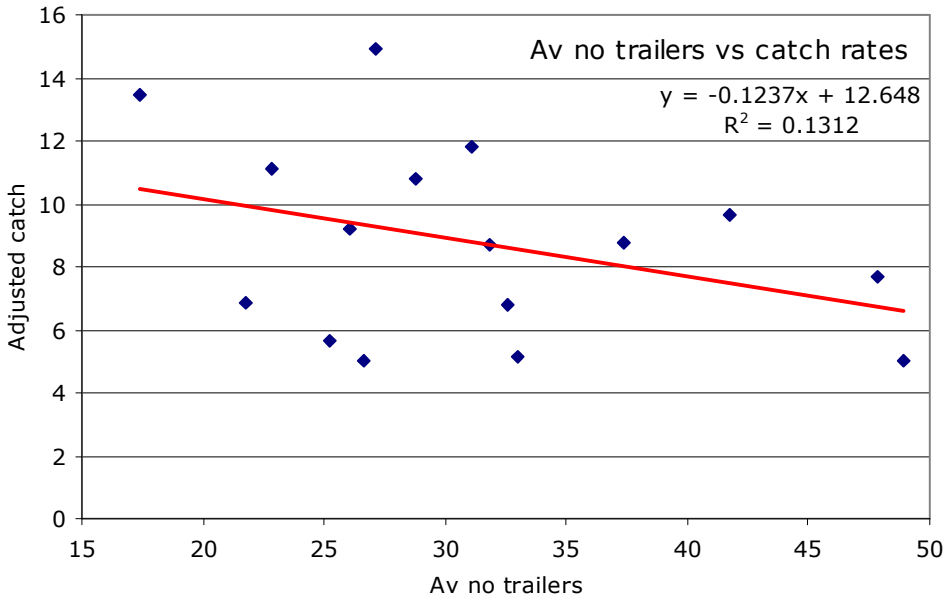


Figure 25: Average number of trailers at Rosslyn Bay compared with adjusted catch rates

1.1.6 What is the level of spearfishing effort?

During boat ramp surveys trips were identified where spearfishing was the fishing method. For trips where there was a mixture of spearfishing and linefishing these trips were categorised as spearfishing trips for fishing effort. Spearfishing trips were generally undertaken from boat ramps that were used for offshore fishing.

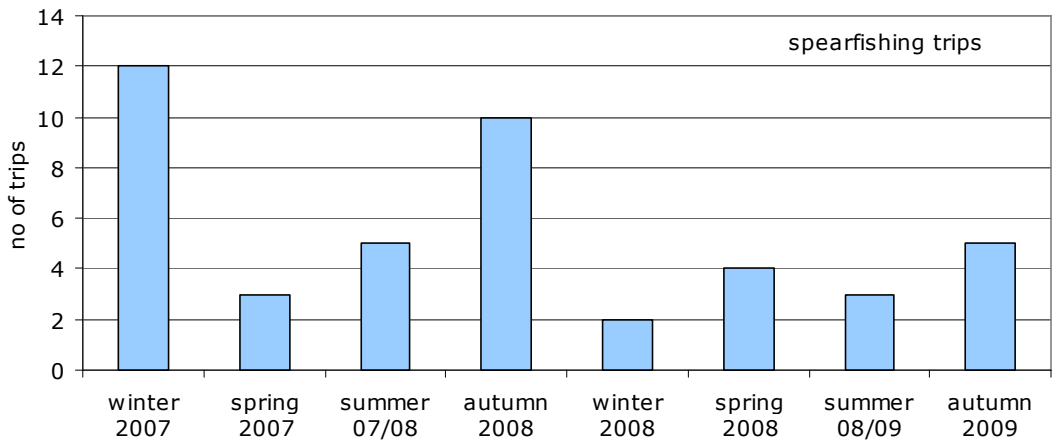


Figure 26: Number of spearfishing trips each season over the past 2 years

At Rosslyn Bay, where all trips are offshore, of 5,632 fishing trips surveyed at the boat ramp 70 (1.2%) were spearfishing trips. At Auckland VMR trips were either to estuary or offshore locations. Of 542 offshore trips from this ramp 9 (1.7%) were spearfishing trips. For both locations there were 6,174 offshore trips of which 79 (1.3%) were spearfishing trips.

Figure 26 shows the number of spearfishing trips for each season for 2007/08 and 2008/09.

> ***For offshore trips from Rosslyn Bay and Gladstone around 1.3% of trips were spearfishing trips***

1.1.7 What is the level of aquarium fishing effort?

A commercial fishing license and a permit are required to collect aquarium fish. There are 43 permits[7] that allow the licensee to collect aquarium fish in the Great Barrier Reef Marine Park (GBRMP) while it is estimated that 4-5 operators are active in the CapReef area.

During boat ramp surveys in the Rockhampton and Gladstone areas fishing trips that targeted aquarium species were identified. Over the survey period there were 2 operators that used Rosslyn Bay with trips that targeted aquarium species being recorded approximately once a month. In the Gladstone area only 1 trip was recorded from the Bray Park boat ramp.

The level of fishing for aquarium species was very low in comparison with other forms of fishing and the data collected did not provide any estimate of overall fishing effort for aquarium fish.

> ***No estimate of fishing effort for aquarium fish was obtained***

Q1.2 What is the recreational catch?

1.2.1 What is the species composition?

Species composition of the catch was determined for 3 fishing locations:

- Offshore
- Estuary
- Freshwater

1.2.1.1 What is the offshore species composition?

The composition of the offshore catch was assessed based on the percentage of species in the catch over the past 3 years. The top 20 fish species are shown in *table 4*. In combination the top demersal species representing 1% or greater of the catch are shown in *table 5*.

The top pelagic species are shown in *table 6* with only 1 species (School Mackerel) occurred in the top 10 catch species. Relatively few fish caught are kept, the percentage of fish kept in the last 3 years is given in *table 7*.

Despite dominating the total numbers of fish caught (19% of the catch), Longfin Rockcod are seldom kept (less than 1%). This is almost certainly because of the current legal size applying to this species. Some other species such as Coral Trout, Cobia and School Mackerel are usually kept. This means they are both desirable and typically caught at legal size. The most frequently caught fish and those kept are summarised in *figures 27 and 28.*

> ***Over the last 3 years Longfin Rockcod was the most caught species (19%) while Coral Trout was the most likely species to be kept (85%) and Grass Emperor was the most numerous kept***

[7] GBRMPA website www.gbrmpa.gov.au

2006/07			2007/08			2008/09		
Species	Number	% of catch	Species	Number	% of catch	Species	Number	% of catch
LONGFIN ROCKCOD	9540	17.7	LONGFIN ROCKCOD	7121	19.9	LONGFIN ROCKCOD	7764	21.8
RED EMPEROR	4681	8. 7	STRIPEY SNAPPER	3370	9.4	HUSSAR	4039	11.4
SCHOOL MACKEREL	3756	7.0	RED SNAPPER	2934	8.2	GRASS EMPEROR	3498	9.8
VENUS TUSKFISH	3543	6.6	HUSSAR	2834	7.9	REDTHROAT EMPEROR	3342	9.4
GRASS EMPEROR	3062	5.7	GRASS EMPEROR	2365	6.2	RED SNAPPER	2689	7.6
REDTHROAT EMPEROR	3012	5.6	SCHOOL MACKEREL	1886	5.3	STRIPEY SNAPPER	2400	6.7
RED SNAPPER	2780	5.2	RED EMPEROR	1734	4.9	RED EMPEROR	2252	6.3
STRIPEY SNAPPER	2742	5.1	CORAL TROUT	1508	4.2	GOLDSPOTTED ROCKCOD	2120	6.0
HUSSAR	2548	4.7	REDTHROAT EMPEROR	1496	4.2	SCHOOL MACKEREL	1757	4.9
CORAL TROUT	2332	4.3	VENUS TUSKFISH	1434	4.0	CORAL TROUT	1463	4.1
GOLDSPOTTED ROCKCOD	1477	2.7	GOLDSPOTTED ROCKCOD	1005	2.8	VENUS TUSKFISH	1161	3.3
SPANISH MACKEREL	1154	2.1	COLLAR SEABREAM	632	1.8	COLLAR SEABREAM	1008	2.8
SHARK	1153	2.1	BLACKSPOT TUSKFISH	549	1.5	PAINTED SWEETLIPS	860	2.4
SPOTTED MACKEREL	1102	2.0	BARRED JAVELIN	433	1.2	TRIGGERFISH	417	1.2
COLLAR SEABREAM	1076	2.0	WHIPTAIL	422	1.2	MOSES SNAPPER	301	0.9
PAINTED SWEETLIPS	720	1.3	PAINTED SWEETLIPS	388	1.1	SPANISH MACKEREL	135	0.4
BARRED JAVELIN	588	1.1	SHARK	326	0.9	REMORA	79	0.2
TRIGGERFISH	568	1.1	TREVALLY	306	0.9	PAINTED SWEETLIPS	48	0.1
TREVALLY	480	0.9	TRIGGERFISH	263	0.7	BATFISH	46	0.1
WOLF HERRING	441	0.8	COBIA	262	0.7	BLUE TUSKFISH	27	0.1

Table 4: Top 20 species caught over the last 3 years

Species	Number	Av. % of catch
LONGFIN ROCKCOD	24425	19.8
HUSSAR	9421	8.0
GRASS EMPEROR	8925	7.4
RED EMPEROR	8667	6.6
STRIPEY SNAPPER	8512	7.1
RED SNAPPER	8403	7.0
REDTHROAT EMPEROR	7850	6.4
VENUS TUSKFISH	6138	4.6
CORAL TROUT	5303	4.2
GOLDSPOTTED ROCKCOD	4602	3.8
COLLAR SEABREAM	2716	2.2
PAINTED SWEETLIPS	2016	1.6
TRIGGERFISH	1248	1.0

Table 5: Demersal species comprising over 1.0% of the catch over the last 3 years

Species	Number	Av. % of catch
SCHOOL MACKEREL	7399	5.7
SPANISH MACKEREL	1537	1.1
TREVALLY	1153	0.9
COBIA	603	0.5

Table 6: Pelagic species in the catch over the last 3 years

Species	%kept 2006/07	%kept 2007/08	%kept 2008/09
LONGFIN ROCKCOD	1.0	0.6	0.6
STRIPEY SNAPPER	49.4	45.8	54.1
RED SNAPPER	55.8	59.0	50.1
HUSSAR	47.5	47.1	50.6
GRASS EMPEROR	67.4	75.9	61.5
SCHOOL MACKEREL	67.5	78.5	76.5
RED EMPEROR	10.9	14.9	16.0
CORAL TROUT	83.6	80.0	86.0
REDTHROAT EMPEROR	57.1	62.2	50.3
VENUS TUSKFISH	52.6	72.9	72.3
GOLDSPOTTED ROCKCOD	37.4	37.9	22.7
COLLAR SEABREAM	25.6	23.7	18.2
PAINTED SWEETLIPS	41.9	40.7	26.4
TRIGGERFISH	2.6	3.8	1.9
COBIA	72.6	94.3	90.7
SPANISH MACKEREL	83.4	90.7	71.1

Table 7: Percentage of species kept over the last 3 years

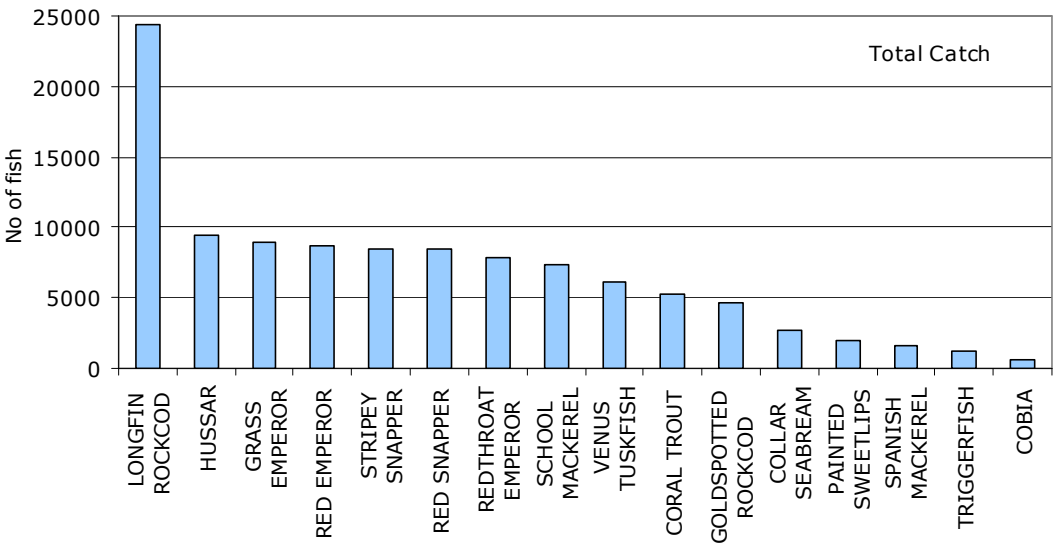


Figure 27: Numbers of species caught over the past 3 years

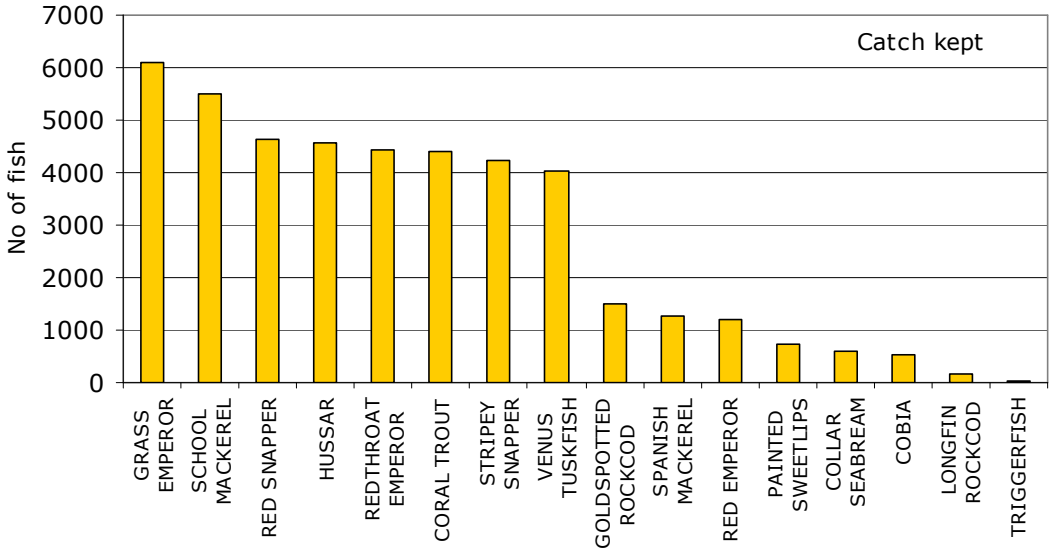


Figure 28: Numbers of species kept over the past 3 years

Catch composition also varied between habitats. Catch locations were assigned locations codes. *Figure 12* is a diagram showing the locations used to assess where fish were caught which were:

- Inshore
- Continental island
- Wide grounds (inter-reef)
- Offshore coral reefs

Inshore	% of catch 2006/07	% of catch 2007/08	% of catch 2008/09
SCHOOL MACKEREL	27.0	17.9	22.6
LONGFIN ROCKCOD	7.5	14.3	15.6
GRASS EMPEROR	2.8	9.1	12.5
STRIPEY SNAPPER	2.1	6.6	7.0
GOLDSPOTTED ROCKCOD	4.1	5.3	3.4
Islands	**% of catch 2006/07**	**% of catch 2007/08**	**% of catch 2008/09**
LONGFIN ROCKCOD	29.5	29.3	31.2
STRIPEY SNAPPER	6.8	11.9	7.6
RED SNAPPER	4.6	9.4	9.6
HUSSAR	4.6	6.8	7.0
GRASS EMPEROR	6.1	6.5	9.6
Wide Grounds	**% of catch 2006/07**	**% of catch 2007/08**	**% of catch 2008/09**
HUSSAR	11.2	20.3	26.3
RED SNAPPER	10.4	12.7	13.6
RED EMPEROR	25.3	11.0	10.1
STRIPEY SNAPPER	2.0	7.0	4.0
GRASS EMPEROR	4.4	6.8	2.8
Offshore Reef	**% of catch 2006/07**	**% of catch 2007/08**	**% of catch 2008/09**
REDTHROAT EMPEROR	20.1	23.3	23.8
HUSSAR	8.8	11.3	18.6
VENUS TUSKFISH	12.5	10.5	5.8
CORAL TROUT	8.1	9.0	5.5
RED EMPEROR	14.3	8.0	9.4

Table 8: Most common species caught by location over the last 3 years

Table 8 shows the top 5 species caught at each of the location codes with different species dominating the catch in each location.

> ***School Mackerel was the most caught species inshore, Longfin Rockcod around the islands, Hussar at the Wide Grounds and Redthroat Emperor on the offshore reefs***

1.2.1.2 What is the estuary species composition?

The composition of the estuary catch was assessed based on the percentage of species in the catch over the past 2 years. The top 20 species is shown in *table 9*. These show the number of fish caught and kept and the percentage of each species kept.

Pikey Bream was the most common finfish species caught over the past 2 years comprising 15.9% of the catch in 2007/08 and 18.0% in 2008/09 with 30.1% of the fish caught in 2008/09 being kept. However there is significant effort targeting Mud Crab which comprised 7.8% of the catch in 2007/08 and 25.9% of the catch in 2008/09 with 30.1% of the crabs caught in 2008/09 being kept. This is significant given that only male crabs can be kept.

2007/08			2008/09		
Species	caught	% of total	Species	caught	% of total
PIKEY BREAM	2309	15.9	MUD CRAB	5186	25.9
BARRED JAVELIN	2020	13.9	PIKEY BREAM	3619	18.0
YELLOWFIN BREAM	1534	10.6	BARRED JAVELIN	2162	10.8
GOLDSPOTTED ROCKCOD	1484	10.2	GOLDSPOTTED ROCKCOD	1389	6.9
MUD CRAB	1140	7.8	BARRAMUNDI	1010	5.0
BARRAMUNDI	726	5.0	YELLOWFIN BREAM	835	4.2
SAND WHITING	659	4.5	GOLDEN SNAPPER	744	3.7
DUSKY FLATHEAD	483	3.3	SAND WHITING	724	3.6
BLUE THREADFIN	406	2.8	FLATHEAD	422	2.1
LONGFIN ROCKCOD	388	2.7	LONGFIN ROCKCOD	294	1.5
GOLDEN SNAPPER	367	2.5	GRASS EMPEROR	274	1.4
MANGROVE JACK	342	2.4	FORKTAIL CATFISH	241	1.2
GRASS EMPEROR	333	2.3	MANGROVE JACK	222	1.1
SADDLETAIL SNAPPER	234	1.6	BLUE THREADFIN	177	0.9
STRIPEY SNAPPER	215	1.5	SHARK	169	0.8
CRIMSON SNAPPER	182	1.3	MOSES SNAPPER	155	0.8
MOSES SNAPPER	134	0.9	STRIPEY SNAPPER	125	0.6
BLACK JEWFISH	117	0.8	RED SNAPPER	102	0.5
STEELBACK	82	0.6	TREVALLY	98	0.5
QUEENFISH	81	0.6	QUEENFISH	56	0.3

Table 9: Composition of estuary catch over the past 2 years

Species	caught	kept	% kept
MUD CRAB	5186	1714	33.1
PIKEY BREAM	3619	1088	30.1
BARRED JAVELIN	2162	646	29.9
GOLDSPOTTED ROCKCOD	1389	178	12.8
BARRAMUNDI	1010	37	3.7
YELLOWFIN BREAM	835	244	29.2
GOLDEN SNAPPER	744	194	26.1
SAND WHITING	724	238	32.9
FLATHEAD	422	160	37.9
LONGFIN ROCKCOD	294	2.0	0.7
GRASS EMPEROR	274	129.0	47.1
FORKTAIL CATFISH	241	2.0	0.8
MANGROVE JACK	222	45.0	20.3
BLUE THREADFIN	177	114.0	64.4
SHARK	169	3.0	1.8
MOSES SNAPPER	155	38.0	24.5
STRIPEY SNAPPER	125	45.0	36.0
RED SNAPPER	102	24.0	23.5
TREVALLY	98	39.0	39.8
QUEENFISH	56	14	25.0

Table 10: Estuary species caught and kept in 2008/09

Barramundi is also an important estuary species in the Capricorn area comprising 5.0% of the catch in 2007/08 and 5.0% in 2008/09. However only 3.7% of the catch was kept in 2008/09. This is the result of a slot limit of 580-1200mm for Barramundi that can be kept, a large number of undersized Barramundi in current stocks, a proportion of legal size fish being released many fish tagged and release.

> ***In 2008/09 Mud Crab was the most caught species in estuaries (25.9%) while Grass Emperor was the species most likely to be kept (47.1%) and Mud Crab was the most common species kept***

> ***In 2008/09 Barramundi was the fifth most common species caught (5.0%) in estuaries however of those caught only 3.7% were kept***

1.2.1.3 What is the freshwater species composition?

Catch data from freshwater trips was only available for 2008/09 from spring 2008 to autumn 2009. *Table 11* shows the species composition for freshwater with the catch dominated by Barramundi however only 0.3% of the fish caught were kept. This is mainly because most of the Barramundi in freshwater were juvenile fish below the legal size limit and most were tagged and released.

Species	caught	kept
BARRAMUNDI	2081	6
FORKTAIL CATFISH	4	0
GIANT HERRING	17	0
MANGROVE JACK	1	0
MULLET	1	0
TARPON	34	0

Table 11: Freshwater species caught and kept in freshwater in 2008/09

> ***In 2008/09 Barramundi was the most common species caught (97.3%) in freshwater however only 0.3% of those caught were kept***

1.2.2 What are the catch rates?

Catch rates were determined for 3 fishing locations:

- Offshore
- Estuary
- Freshwater

Catch rates from individual fishing trips were converted to catch rates for a standardised fishing trip.

1.2.2.1 What are the offshore catch rates?

A typical offshore fishing trip in the Capricorn area was a trip by 2-3 fishers for around 7 hours.

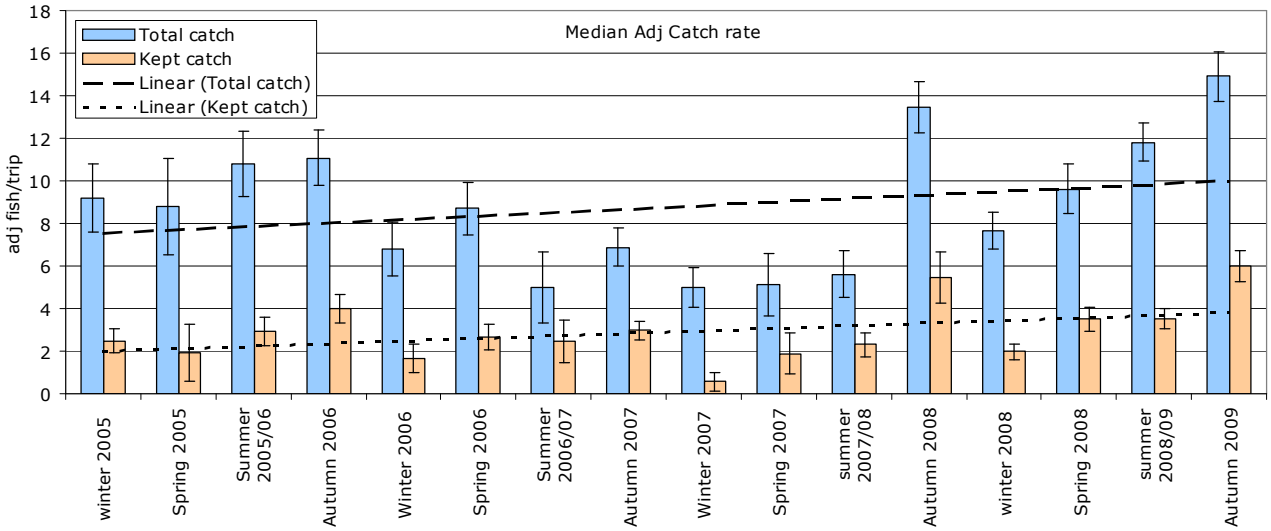


Figure 29: Median adjusted offshore catch rates for each season from winter 2005 to autumn 2009

Catch rates for offshore fishing trips in the Capricorn area were calculated on a seasonal basis from winter 2005 to autumn 2009 as shown in *figure 29*. Catch rates showed a decline in the total number of fish caught from winter 2005 to summer 2007/08 and were steady for the number of fish kept. The 2008 wet season saw moderate flooding in the rivers and creeks, especially in the Fitzroy River. Freshwater extended offshore from all estuaries and from the Fitzroy River extended into Keppel Bay and beyond the Keppel Islands. Following the flooding there was an immediate response in catch rates which have remained elevated since then with autumn 2009 recording the highest catches rates over the entire period.

> ***Offshore catch rates for each adjusted trip have ranged from a low of 5.0 fish caught and 0.6 fish kept per trip in winter 2007 to 14.9 fish caught and 6.0 fish kept in autumn 2009***

An offshore catch rate for the Burnett area was only available from boat ramp surveys carried out at Burnett Heads boat ramp during autumn 2008 so only provides a limited estimate of the catch rate for the Burnett area. *Figure 30* provides a comparison of catch rates for the Capricorn and Burnett areas in that season. Overall catch rates are similar however the number of fish kept were significantly less for the Burnett area.

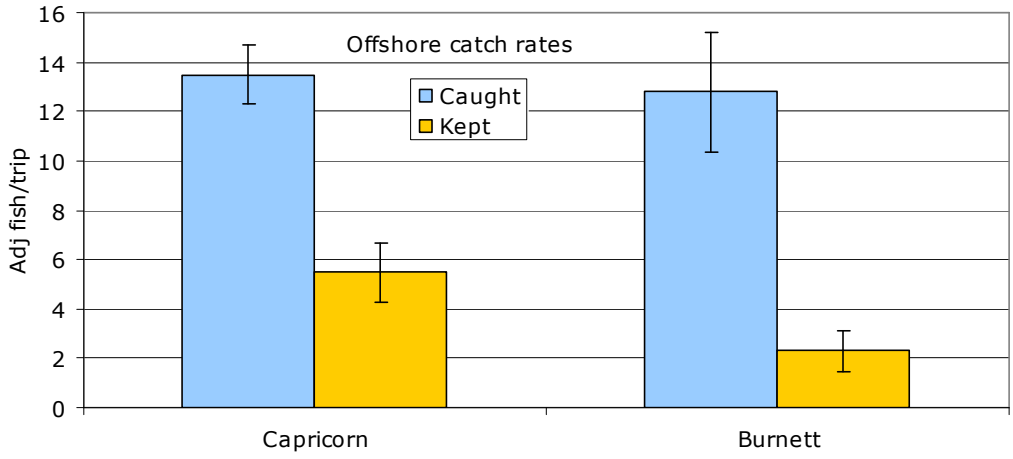


Figure 30: Comparison of Capricorn and Burnett offshore catch rates for autumn 2008

> ***Offshore catch rates for autumn 2008 were similar for trips in the Capricorn and Burnett areas (around 13 fish caught per trip) while the number of fish kept were 5.5 fish in the Capricorn area and 2.3 for the Burnett area***

1.2.2.2 What are the estuary catch rates?

A typical estuary fishing trip in the Capricorn area was a trip by 2-3 fishers for around 5 hours.

Catch rates for estuary fishing trips were calculated on a seasonal basis from winter 2007 to autumn 2009 as shown in *figure 31*. Catch rates in estuaries appear to fluctuate in a similar way to offshore catch rates with higher catch rates in summer and autumn and lower rates in spring and winter. As there are only 8 seasons where catch rates are available there are insufficient data to look at trends.

Catch rates were elevated in summer and autumn 2007/08 following the flooding in rivers and creeks however dropped to a low level in winter 2008 before climbing again in summer 2008/09 and autumn 2009. The highest catch rate over the 8 season was in autumn 2008 which reflects what has happened with offshore catch rates.

> ***Estuary catch rates for each adjusted trip have ranged from a low of 5.1 fish caught and 0.2 fish kept in spring 2008 to 23.3 fish caught and 5.5 fish kept in autumn 2009***

An estuary catch rate for the Burnett area was only available from boat ramp surveys carried out at Burnett Heads boat ramp during autumn 2008 so only provides a limited estimate of the catch rate for the Burnett area. *Figure 32* provides a comparison of catch rates for the Capricorn and Burnett areas in that season. Overall catch rates are similar however the number of fish kept were significantly less for the Burnett area.

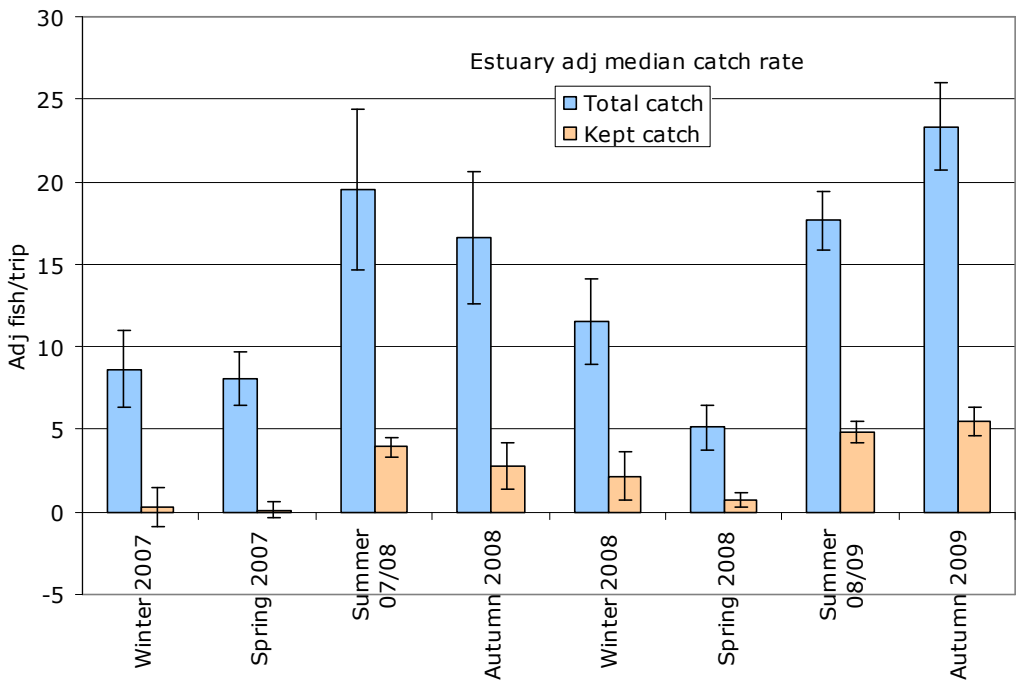


Figure 31: Median adjusted estuary catch rates for each season from winter 2007 to autumn 2009

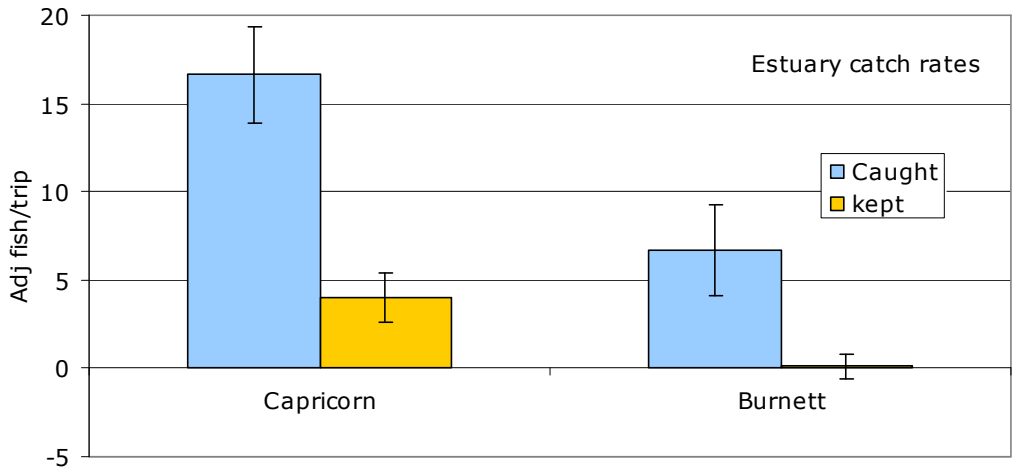


Figure 32: Comparison of Capricorn and Burnett offshore catch rates for autumn 2008

> ***Estuary catch rates for an adjusted fishing trip for autumn 2008 in the Capricorn and Burnett areas was lower for both fish caught (16.6 compared with 6.7 fish) and fish kept (4.0 compared with 0.1 fish)***

1.2.2.3 What are the freshwater catch rates?

A typical freshwater fishing trip was a trip by 1.5 fishers for around 3.5 hours.

Catch rates for freshwater fishing trips in the Capricorn area were calculated on a seasonal basis from spring 2008 to autumn 2009 as shown in *figure 33*. Prior to autumn 2008 there was very little fishing in freshwater as there few Barramundi, the primary target species, in these locations and some lagoons were totally dry. Juvenile Barramundi are now in significant numbers in some of these locations and this is reflected in the steady increase in the catch rate.

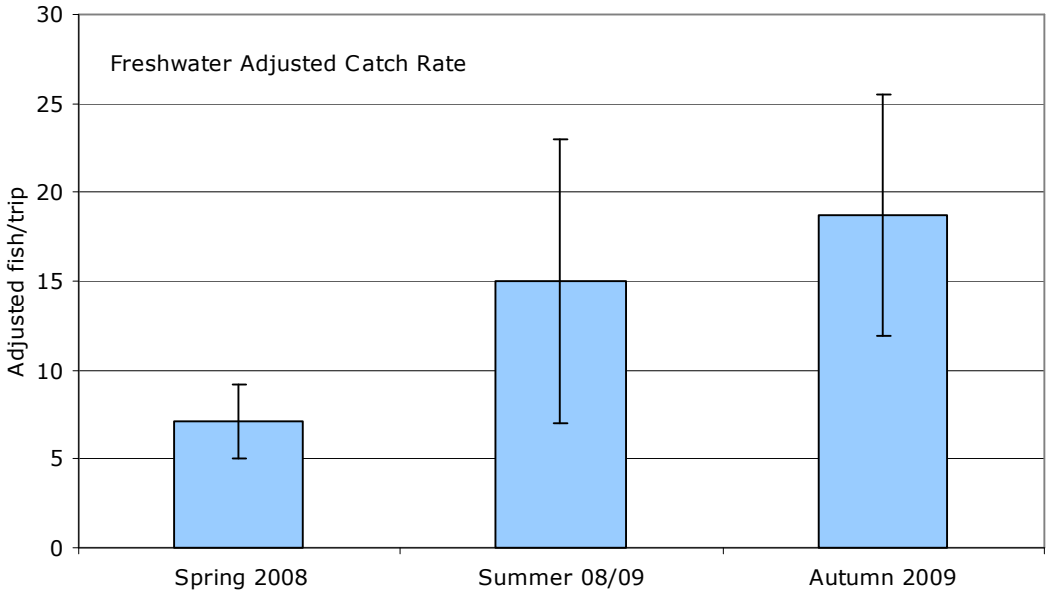


Figure 33: Median adjusted freshwater catch rates for each season from spring 2008 to autumn 2009

> ***Freshwater catch rates for an adjusted fishing trip have risen from 7.1 fish/trip in spring 2008 to 18.8 fish/trip in autumn 2009***

1.2.3 What is the estimated total catch offshore from Rosslyn Bay and Gladstone?

Sufficient data were collected over the past 4 years to provide an estimate of the total offshore catch from the Rosslyn Bay and Auckland VMR boat ramps[8].

Figures 34 and 35 show the estimated total catch and the total numbers of fish kept from 2005/06 to 2008/09 for offshore trips from Rosslyn Bay and Auckland VMR ramps.

Numbers of fish caught offshore from Rosslyn Bay are estimated to have risen from around 164,000 in 2005/06 to 188,000 in 2008/09 while numbers of fish kept have risen from 65,000 to 85,000.

Numbers of fish caught offshore from the Auckland VMR ramp at Gladstone are estimated to have risen from 50,000 in 2005/06 to 58,000 in 2008/09 while numbers of fish kept have risen from 20,000 to 26,000.

> ***The offshore kept catch from Rosslyn Bay has increased by around 15% from 65,000 to 85,000 fish from 2005/06 to 2008/09***

> ***The offshore kept catch from Auckland VMR at Gladstone has increased by 15% from 20,000 to 26,000 fish from 2005/06 to 2008/09***

[8] Methods used to estimate total catch were included in reports "How much fishing effort is there?" and "What is the catch?"

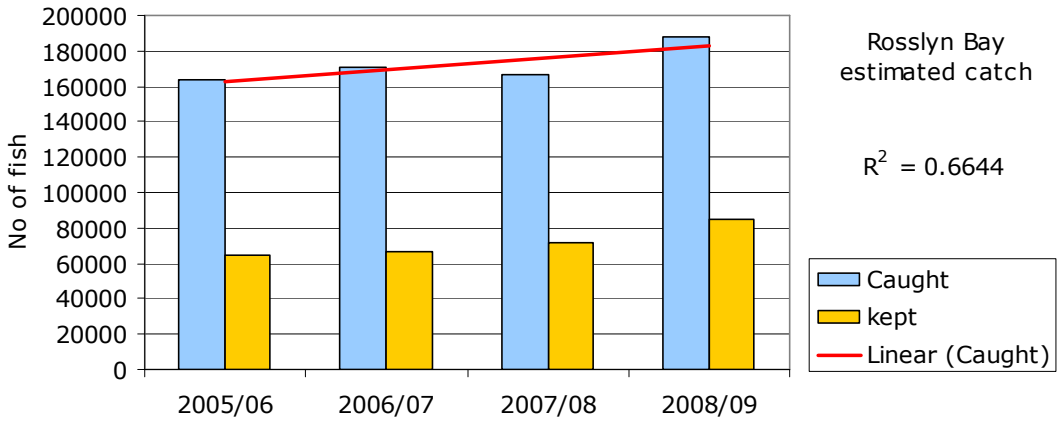


Figure 34: Estimated offshore catch from Rosslyn Bay from 2005/06 to 2008/09

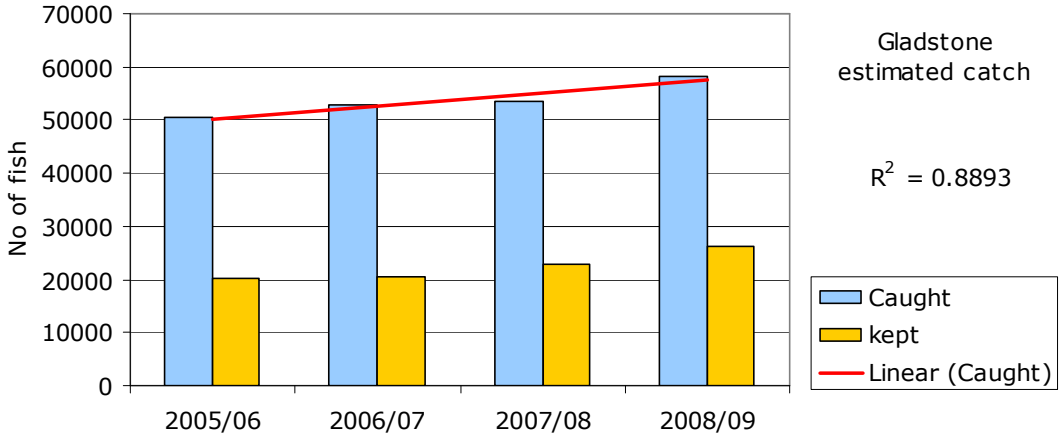


Figure 35: Estimated offshore catch from Auckland VMR from 2005/06 to 2008/09

1.2.4 What are the historic changes in catch composition?

Yaralla Fishing Club catch data from 2000 to 2008 was assessed to determine if there was any change in the composition of the catch over the past 9 years. Data prior to that time did not have sufficient information on species composition.

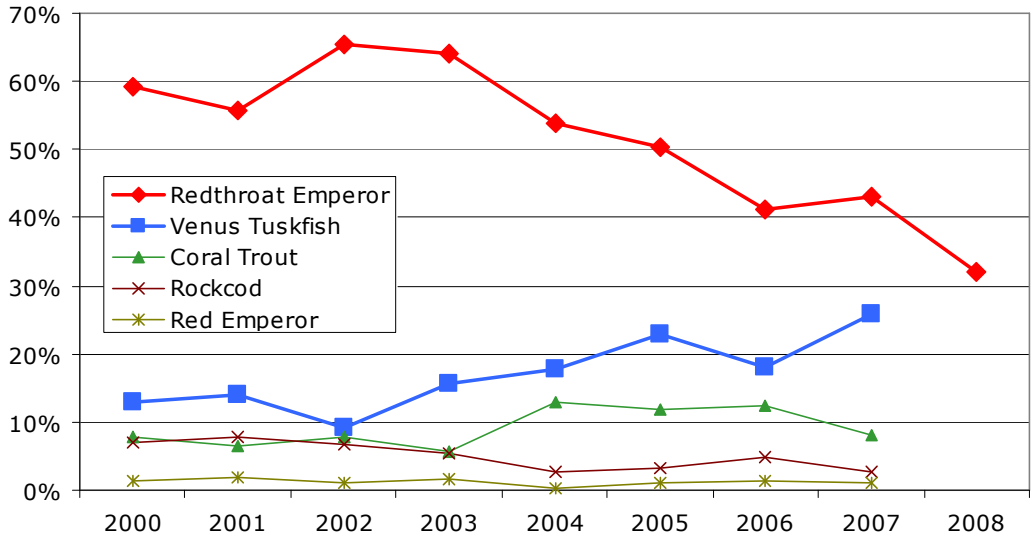


Figure 36: Composition of species in the catch of the Yaralla Fishing Club from 2000-2008

Figure 36 shows that there has been a decline of Redthroat Emperor in the catch from 59.3% in 2000 to 32.0% in 2008 while there has been an increase in Venus Tuskfish from 12.9% to 25.9% (see also section 2.1.5.1).

> ***For the Yaralla Fishing Club from 2000 to 2008 Redthroat Emperor declined in the catch from 59.3% to 32.0% while Venus Tuskfish increased from 12.9% to 25.9%***

1.2.5 What are the historic changes in catch rates?

Historical catch records were obtained from 3 fishing clubs to provide some indication of trends in catch rates over time. These clubs were:

- Yaralla Deep-Sea Fishing Club (Gladstone)
- Apex Deep-Sea Fishing Club (Rockhampton)
- Wanderers Light Gear Angling Club (Gladstone)

Club records were used to obtain catch rates for each club[9] with records available for:

- Yaralla from 1975 to 2009
- Apex from 1995 to 2005
- Wanderers discontinuously from 1982 to 1991 and continuously from 1991 to 2005

Catch rates were available for Yaralla from 1976 to 2008 providing a long timeline of catch rates as shown in *figure 37*. Overall there may have been a slight decline in catch rates from 1976 to 2003 then a significant drop in 2004 and lower catch rates since then (see also section 2.1.5.1).

> ***For the Yaralla Fishing Club from the mid-1970s to 2008 there has been a decline in catch rates from around 20-30 to 10-15 fish/person/day***

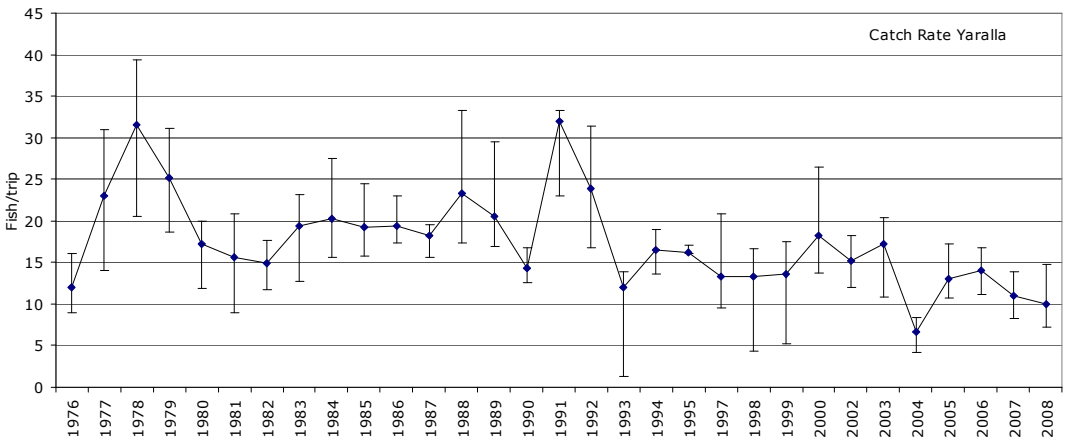


Figure 37: Median catch rates (fish/person/day) of Yaralla from 1976 to 2008 with vertical bars showing the 25th to 75th percentile catch rates

[9] Details of catch rates for each club are in the reports "The effects of management changes on the catches of two deep-sea fishing clubs in Central Queensland" and "Do catch river flows affect coastal and offshore catch rates?"

1.2.6 What is the spearfishing catch?

Boat ramp surveys identified the catch of spearfishing trips. *Figure 38* shows the catch composition and numbers of fish caught from 28 trips in 2006/07 and 20 trips in 2007/09. *Figure 39* provides a comparison of spearfishing, linefishing by trailer boats and Yaralla Club catch rates.

Over 60% of the spearfishing catch is composed of Coral Trout. However a range of other species are also taken including species such as Crayfish which are not taken by linefishing. The catch rate of spearfishing trips was not significantly different to other forms of fishing.

> ***The spearfishing catch rate is not significantly different to linefishing by offshore trailer boats and over 60% of the catch is Coral Trout compared with only 4.2% of the offshore catch***

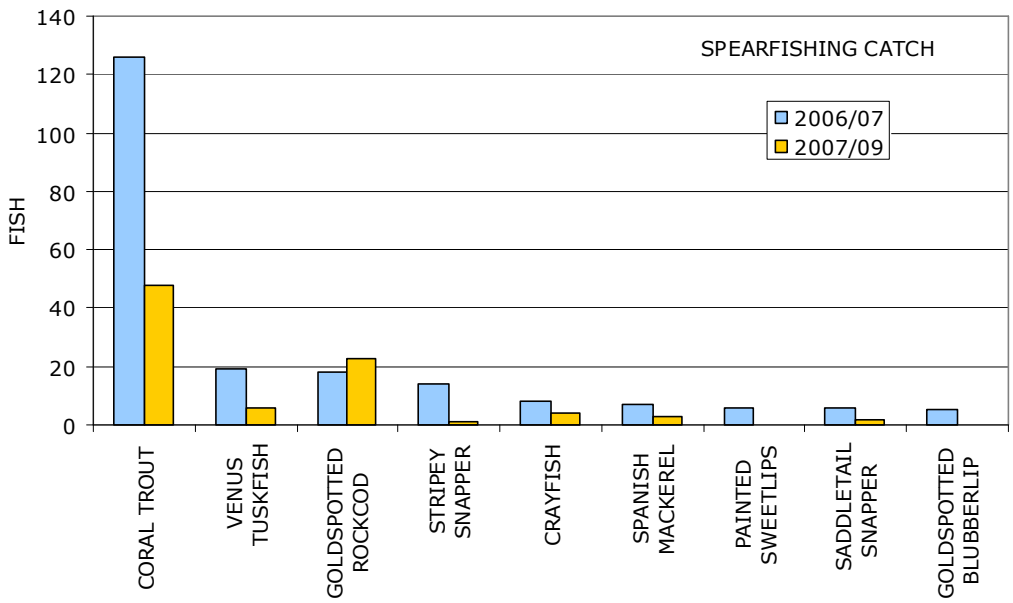


Figure 38: Composition of the spearfishing catch 2006/07 and 2007/09

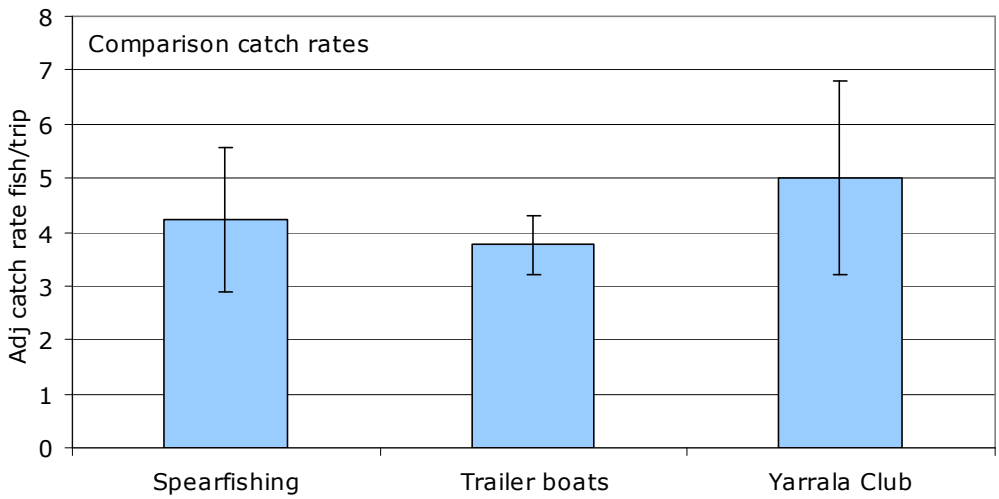


Figure 39: Comparison of catch rates of spearfishing, linefishing by trailer boat and Yaralla Fishing Club

1.2.7 What is the aquarium fish catch?

Some limited data were collected on trips for aquarium fish during boat ramp surveys however no data were obtained on the aquarium fish catch.

Q1.3 What is the use of habitats by fish species?

1.3.1 What habitats are used by juveniles and adults of key species?

Many fish species use different habitats during their life cycle which can generally be defined as 3 stages:

- Larval
- Juvenile (immature)
- Adult (mature)

CapReef has collected data on the habitats used by juveniles and adults of key species. Juveniles were defined as fish below the legal length and adults were defined as fish above the legal length. For fishing trips where no lengths were recorded it was assumed that fish kept were above the legal length and those released were below the legal length for the key species. The proportion of fish kept in each habitat type (see section 1.1.3.1) was used to indicate which habitats were used by juveniles and adults.

Habitats used by juveniles and adults of the following species were assessed:

- Red Emperor
- Red Snapper
- Goldspotted Rockcod
- Grass Emperor
- Stripey Snapper
- Coral Trout
- School Mackerel

For all reef species the percentage of fish kept increased from inshore to offshore habitats, as shown in *figures 40 and 41*, although for most species a higher proportion of fish were kept from the wide grounds (inter-reef). For Coral Trout and School Mackerel a high percentage of fish were kept in all habitat types.

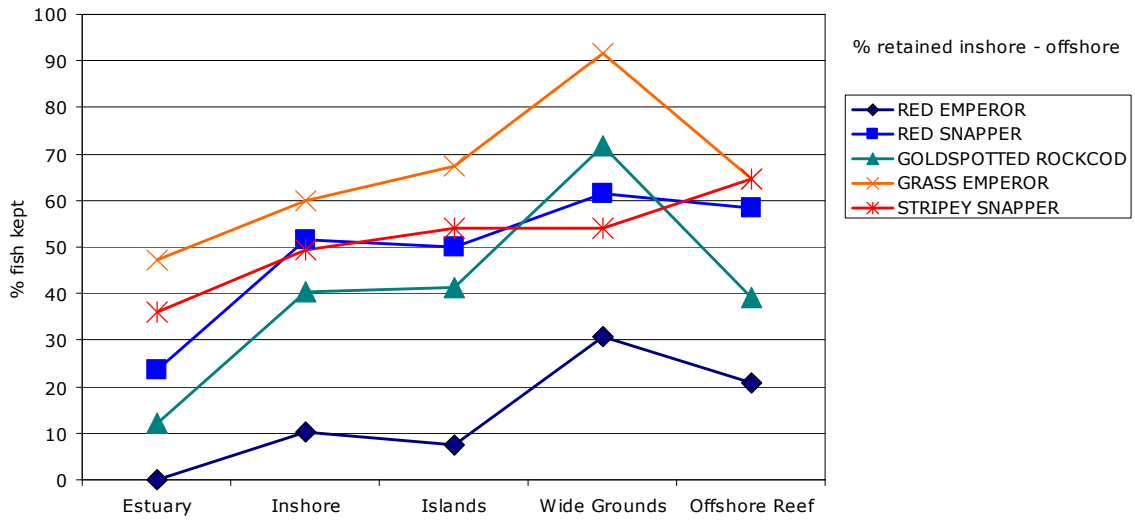


Figure 40: Percentage of reef species kept in each habitat type

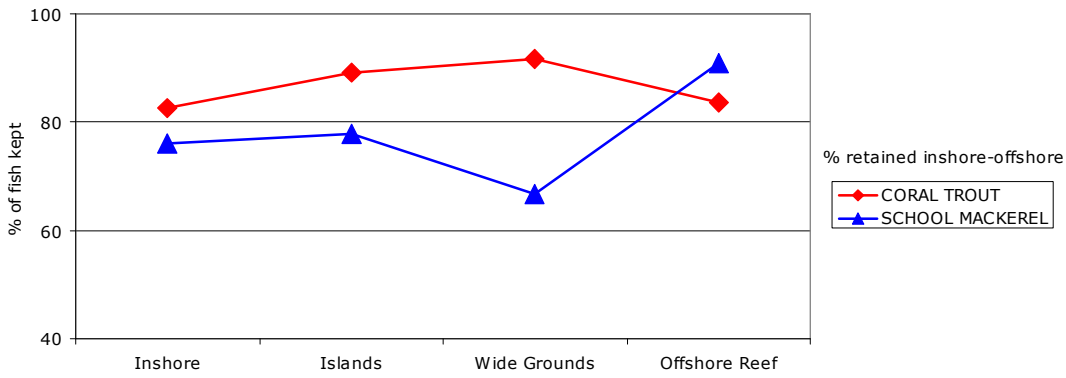


Figure 41: Percentage of Coral Trout and School Mackerel kept in each habitat type

> ***For reef species there is an increasing trend in the numbers of fish above legal size from estuary and inshore to wide ground (inter-reef) and offshore reefs with the greatest proportion of larger fish occurring on the wide grounds***

1.3.2 When do fish move between habitats used by juveniles and adults?

A number of reef species are found in estuaries as juveniles and then move to offshore habitats as they mature to adults. Some species only use estuaries as juveniles while others use estuaries as both juveniles and adults. Juveniles of a number of species use the creeks in the southern part of Shoalwater Bay. These are:

- Red Snapper (Crimson and Saddletail Snapper)
- Goldspotted Rockcod*
- Golden Snapper*
- Snapper
- Grass Emperor
- Barred Javelin*

* These species are found in estuaries both as juveniles and adults

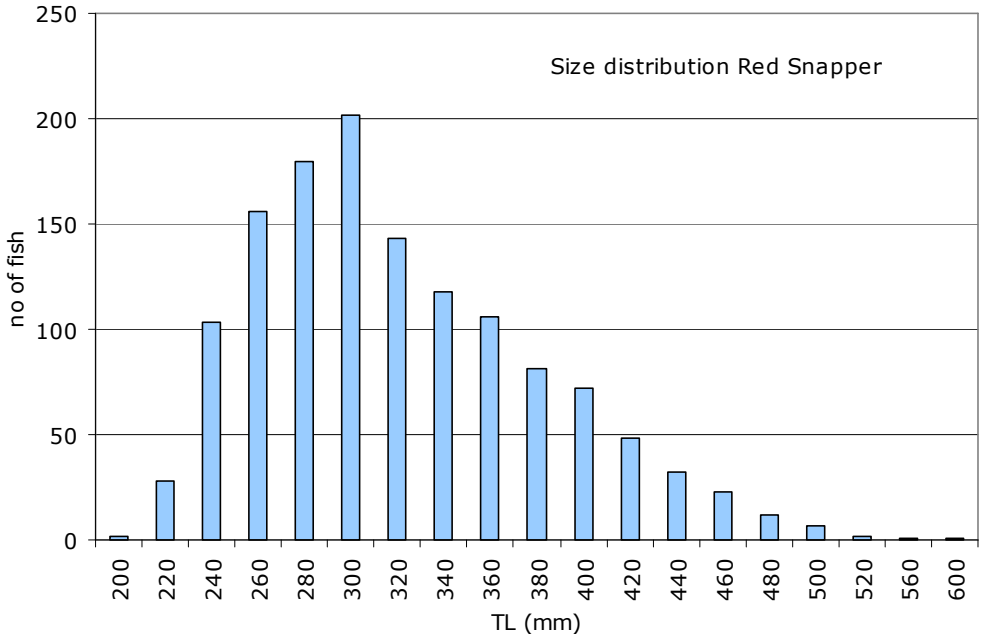


Figure 42: Size distribution of Red Snapper in creeks of Shoalwater Bay

Figure 42 shows the size distribution of Red Snapper in the creeks of Shoalwater Bay. The data for Crimson Snapper and Saddletail Snapper have been combined due to some uncertainty in the identification of fish, particularly during the early years when this data were collected. As there was almost no fishing effort in this area then the size distribution represents closely that of a natural population.

These species generally mature at sizes between 400-500mm and *figure 42* indicates that there are few fish caught over 500mm. This suggests that the estuary habitat is used by juveniles that migrate to offshore areas once they reach 400-500mm.

All Red Snapper caught in the creeks have been tagged. Almost all recaptures have been made within the creeks however a Saddletail Snapper was recaptured offshore at High Peak Island as shown in *figure 43*. This fish was tagged in the creek in February 2006 at 330mm, recaptured again in the creek in August 2007 at 440mm and then recaptured 80km north at High Peak Island (*figure 43*) in January 2009 at 550mm. This fish migrated offshore sometime between August 2007 and January 2009 and at a size between 440mm and 550mm.

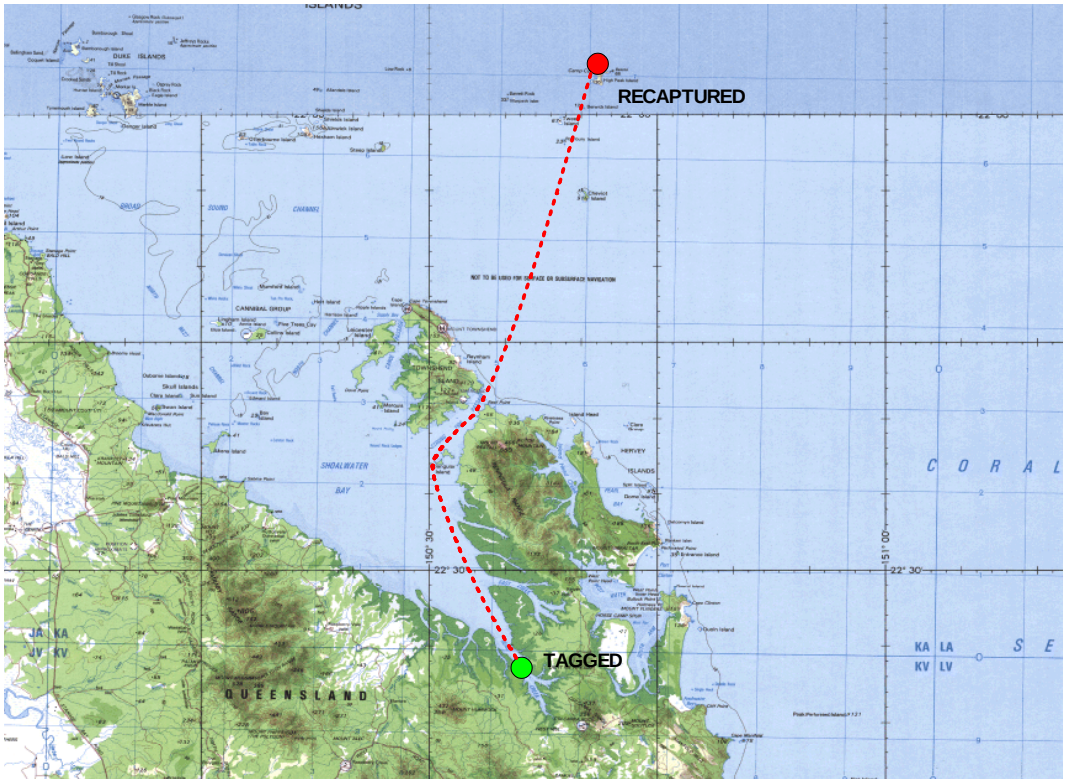


Figure 43: Movement of a Saddletail Snapper from Shoalwater Bay to High Peak Island

> ***Red Snapper (Crimson and Saddletail Snapper) use estuary habitats in creeks of Shoalwater Bay and are likely to migrate offshore when they reach 400-500mm in length***

1.3.3 Can access of marine species to freshwater be improved by addressing fish passage?

Many marine species spend part of their life cycle in freshwater. The importance of wetlands to marine species along the GBR coast has been recognised for some time and the important wetlands in the Central Queensland area have been identified.[10]

For many waterways in the CapReef area fish passage between saltwater and freshwater has been stopped or severely curtailed through the construction of barrages, weirs and dams.

As part of their Regional Investment Strategy (RIS) the FBA, in conjunction with QPIF and CapReef, have identified barriers that impact on fish movement and have installed fishways to improve fish movement past these barriers.

During the study period the following barriers have had fishways constructed to improve fish passage:

- Culvert on Old Bruce Highway on Raglan Creek
- Culvert on Raglan Station Road on Raglan Creek

QPIF have monitored these fishways before and after construction to determine if fish passage has been improved.

The construction of fishways on Raglan Creek has allowed fish passage to be re-established from the estuary to the headwater. *Figure 44* shows the culvert on Raglan Station Road on Raglan Creek while *figure 45* shows the rock ramp fishway that was installed to improve the ability of fish to migrate upstream. Prior to the fishway there was a drop of around 300mm in water level below the culvert. This effectively prevented fish migration upstream during low flows (most of the time).

Following construction of the fishway a monitoring cage was placed upstream which showed a significant improvement in fish passage.

A further fishway was constructed on Raglan Creek at Gentle Annie Road. *Figures 46 and 47* show the road bridge before and after construction of the fishway. The construction of these 2 fishways now allows fish passage all the way from the estuary to the upper reaches of the creek for the first time since the construction of the road bridge.

A further fishway is planned for the weir on Waterpark Creek for 2009/10.

> ***Installation of fishways have improved fish passage in Raglan Creek***

[10] See report "Freshwater wetlands and fish - Importance of freshwater wetlands to marine fisheries resources of the Great Barrier Reef" Veitch V and Sawynok W (2004) Sunfish report

Figure 44: Road culvert on Raglan Station Road showing drop in water level affecting fish passage

Figure 45: Fishway on the culvert on Raglan Station Road

Figure 46: Road bridge on Gentle Annie Road on Raglan Creek before fishway showing drop in water level affecting fish passage

Figure 47: Fishway on the Gentle Annie Road on Raglan Creek

Q1.4 What are the social, economic and ecological impacts of major fishing competitions?

1.4.1 Do fishing competitions significantly impact local fish stocks?

The major fishing competitions and their participation were identified in section 1.1.1.3.

Data on catches from the largest fishing event, the Boyne Tannum Hookup, were used to compare fishing effort and catch rates during the competition with comparable fishing periods.

Data on catches from the Rocky Barra Bounty were used to compare fishing effort and catch rates during the competition with overall estuary catch rates.

1.4.1.1 Boyne Tannum Hookup

Figure 48 shows the comparison of the adjusted catch rate for the Hookup and the same fishing season for the Capricorn area. For 2005 and 2007 there was no significant difference in the catch rates however for 2006 and 2008 the catch rates were lower during the fishing competition. *Figure 49* shows the adjusted catch rate for kept fish which indicates that the catch rates were similar in 2005 and 2006, the competition rates were higher in 2007 and lower in 2008.

However there is evidence that competitors tend to retain a slightly greater proportion of some species eligible in the competition (particularly Cobia, Coral Trout, Red Emperor and Mackerel) as shown in *figure 48*.

There was also evidence that competitors target selectively the eligible species. There was a greater proportion of these species kept during the competitions (58.3%) than during CapReef trips (35.3%).

Catch rates in the Boyne Tannum Hookup were not significantly different to CapReef catch rates in the same season

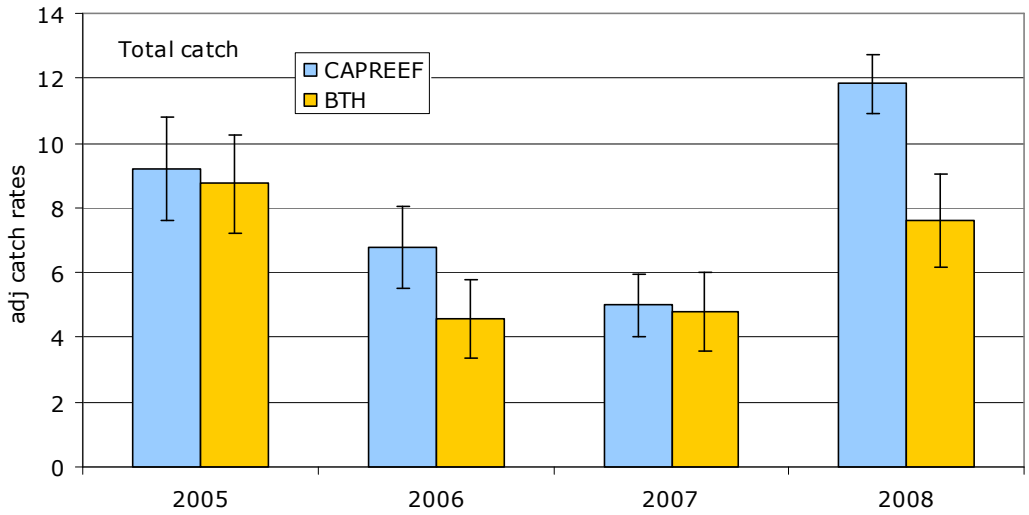


Figure 48: Comparison of total catch rates in the Boyne Tannum Hookup with CapReef catch rates during the same season

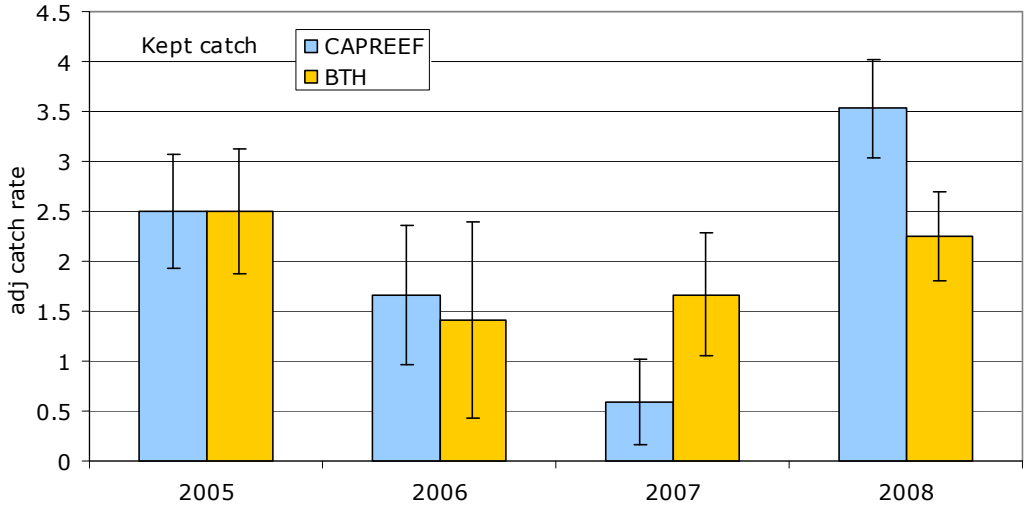


Figure 49: Comparison of kept catch rates in the Boyne Tannum Hookup with CapReef catch rates during the same season

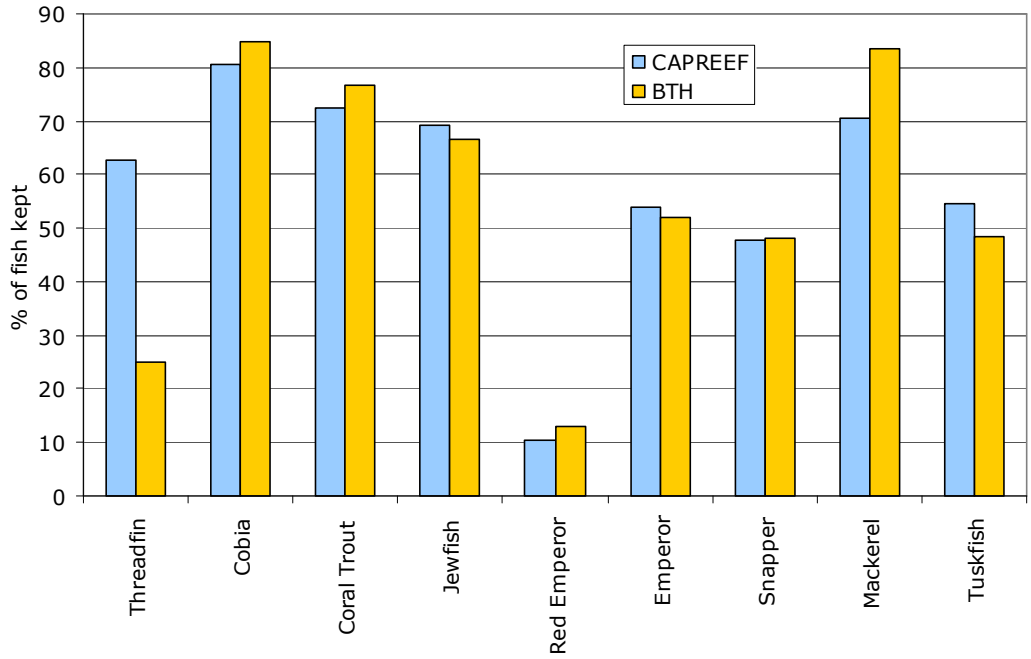


Figure 50: Percentage of species kept during the Boyne Tannum Hookup and CapReef trips

As well as catch, data were collected on effort through trailer counts, and a comparison made of fishing effort during the Hookup and during comparable fishing days. At the main boat ramp at Bray Park there was a significant increase in fishing effort over the periods of the competition. There were limited data to compare effort at that ramp with other times however from unadjusted trailer counts it appears that effort is around 5 times greater than during other times as shown in *figure 51*.

However at other ramps used during the competition the level of fishing effort was elevated but not as high as the maximum numbers of trailers recorded. *Figure 52* shows the level of effort at the second most popular ramp used during the competition. At Auckland VMR the level of effort is approximately 60% higher than at other comparable times but lower than the maximum number of trailers recorded.

> ***Fishing effort in the Boyne Tannum Hookup was around 5 times higher than at other times at Bray Park and around 60% higher that at comparable times at Auckland VMR***

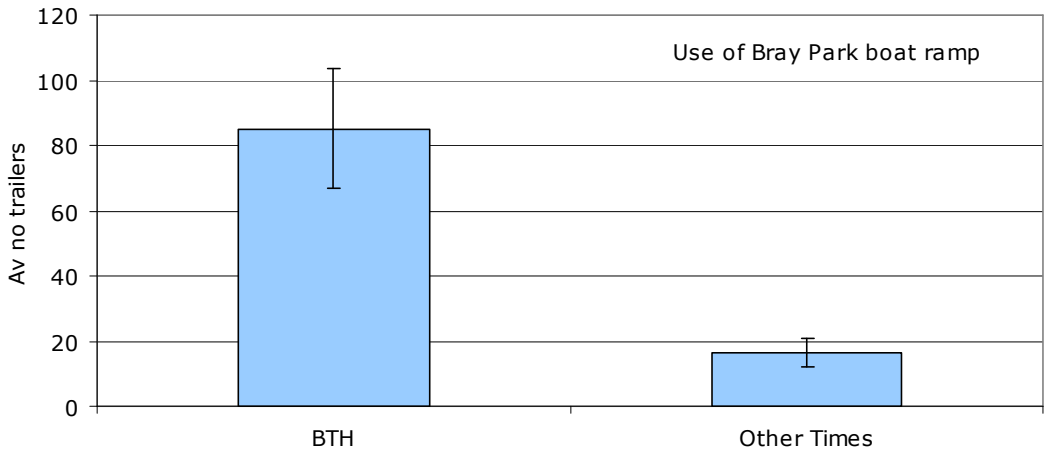


Figure 51: Comparison of trailers at Bray Park boat ramp during Boyne Tannum Hookup and at other times

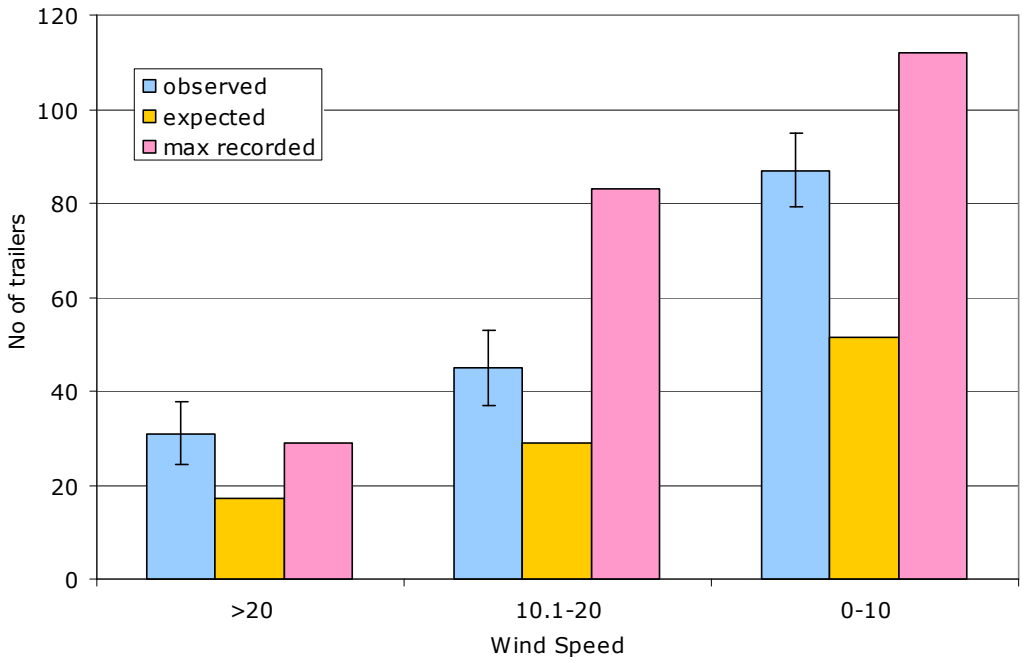


Figure 52: Comparison of fishing effort during the Boyne Tannum Hookup and on comparable fishing days for Auckland VMR boat ramp

1.4.1.2 Rocky Barra Bounty

The Rocky Barra Bounty is a tag and release only event targeting Barramundi with no fish being kept. Total catch rates for the event were available from 2000 to 2008. Catch rates from the competition were compared with catch rates for CapReef estuary trips in spring, the same season in which the event is held. In 2007 and 2008 the adjusted catch rate for all species was higher for CapReef trips while for Barramundi the catch rates were higher as shown in *figures 53 and 54*.

The lower overall catch rates and higher catch rates for Barramundi reflect that the competition targets Barramundi. The lower overall catch rate also reflects that most

competitors use lures rather than bait in targeting Barramundi and so catch fewer fish overall.

> ***Catch rates in the Rocky Barra Bounty were lower than for CapReef estuary trips in the same season however were higher for Barramundi***

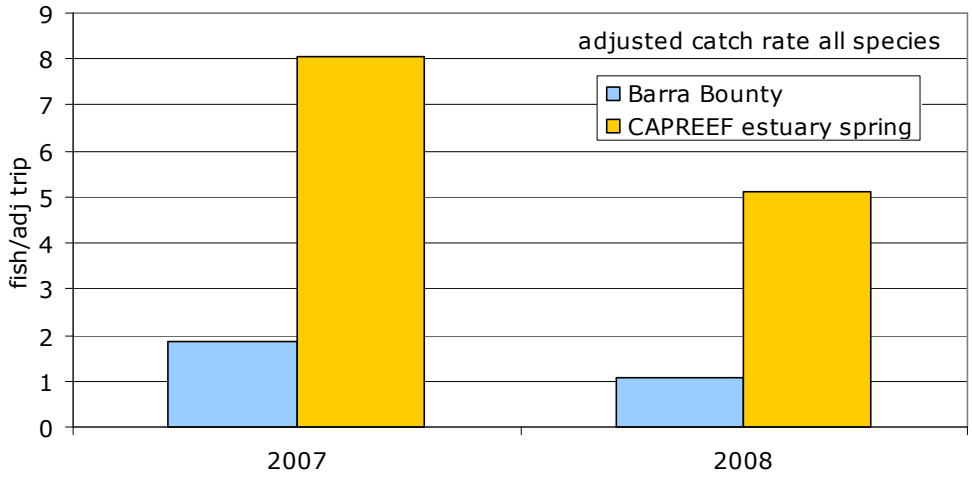


Figure 53: Comparison of catch rates in the Rocky Barra Bounty with CapReef estuary trips in spring

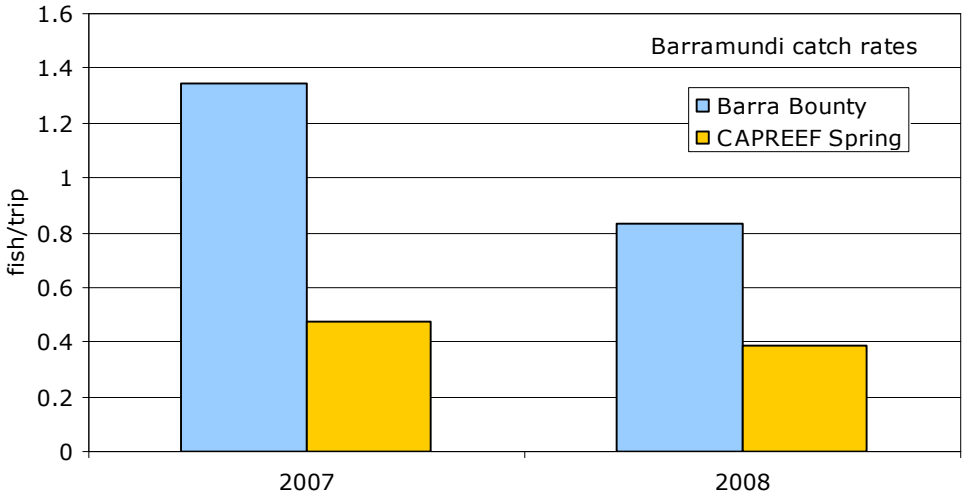


Figure 54: Comparison of Barramundi catch rates in the Rocky Barra Bounty with CapReef estuary trips in spring

1.4.2 How do major fishing competitions rate on their social, economic and ecological performance?

The social, economic and ecological performance of fishing competitions was assessed by the rating that competitions received under National Environmental Assessment of Tournament Fishing (NEATFish) [11].

The NEATFish assessment provides a competition with a 1-5 star rating based on a questionnaire that assesses and awards points in 4 categories:

[11] See NEATFish website www.neatfish.com

- Ecological (2.5 stars)
- Social (1 star)
- Economic (1 star)
- Risk Management (0.5 star)

Two of the major competitions took part in the trial assessment during the development of NEATFish and 1 event has received a rating under the NEATFish. The competitions were:

- Rocky Barra Bounty
- Boyne Tannum Hookup

The ratings for the Rocky Barra Bounty were:

- 2006 – 5 stars
- 2007 – 5 stars
- 2008-2010 – 5 stars

The ratings for the Boyne Tannum Hookup were:

- 2006 – 3 stars
- 2007 – 3.5 stars

Figure 55 shows the NEATFish certificate for the Rocky Barra Bounty which is accredited to October 2011.

Figure 55: Rocky Barra Bounty certification from NEATFish

A NEATFish rating is a useful measure of the ecological, social, economic and risk management performance of fishing

competitions and should be encouraged for competitions in the CapReef area

The Rocky Barra Bounty has received a 5 star certification under the NEATFish standard through to 2011 while the Boyne Tannum Hookup received a 3.5 star rating in 2007

Q1.5 What are the social values of recreational fishing?

1.5.1 Trends in participation?

CapReef has not been able to obtain data on trends in participation. Section 1.1.2 indicates that vessel registrations have increased and the number of boat trailers at key boat ramps have increased. While this cannot be directly related to participation it is possible that participation has increased over the past 4 years.

Q1.6 What are the economic values of recreational fishing?

1.6.1 Expenditure on recreational fishing along the Capricorn Coast?

During 2007 an expenditure survey was conducted by CQUniversity Australia (CQUA) to assess the amount spent on offshore fishing by recreational fishers in the Capricorn area.[12]

The sample for the recreational fishing expenditure survey on the Capricorn Coast was randomly selected at boat ramps as the anglers were either just starting or just returning from their fishing trip. The surveys were collected over a period of about 28 weeks from late January to mid August in 2007. The collection periods were selected to include weekdays and weekends, periods of high and low fishing seasons, public holidays and different seasonal visitation rates. This allowed for the capture of not just local recreational anglers but also recreational anglers for other parts of Queensland and Australia (interstate anglers). In all 318 surveys were collected of which 311 were usable, while 7 were either duplicates or contained insufficient information.

Approximately 55% of the respondents lived along the Capricorn Coast and less than 10kms from the boat ramp, while more than 90% lived in the sub-regional (Rockhampton) area, less than 50kms from the boat ramp. About 5% of the recreational anglers lived in other regions of Central Queensland and travelled more than 270kms to the boat ramp, while the remainder (about 4%) of the respondents lived in other parts of Queensland and Australia and travelled more than 500kms to the boat ramp. The average distance travelled to the boat ramp was about 78kms and the median distance travelled was 8.78kms. The average travel time to the boat ramp was approximately 54 minutes and the median travel time was about 8 minutes.

Recreational anglers surveyed went fishing an average number of 13 times along the Capricorn Coast while the median number of fishing trips was 10, in the 12 months prior to the survey. However the recreational fishing trips were highly skewed, that is a small number of recreational anglers fished quite often contributing disproportionately to the average visit rate while a large number of recreational anglers did relatively less fishing in the last 12 months shown in *figure 56*. About 58% of the anglers fished 10 times or less in the last 12 months while more than a quarter (26.7%) of the recreational anglers surveyed took more than 20 fishing trips along the Capricorn Coast in the 12 months prior to the survey. About 7% of the anglers took 30 or more fishing trips that is, about 22% of all fishing trips, during the same period while almost 30% of recreational anglers made less than 8% of the total fishing trips.

[12] Summary provided by Prabha Prayaga and John Rolfe Central Queensland University Australia

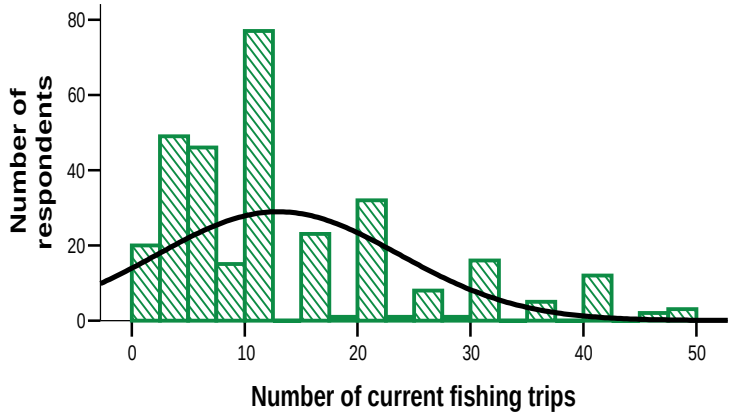


Figure 56: Trip frequency in the last 12 months

1.6.1.1 Changes in visit rates

The respondents were asked whether they would change the number of times they went fishing along the Capricorn Coast if conditions such as catch rates and environmental conditions changed. The responses of recreational anglers are presented below. The responses to changes in catch rates are presented in *figure 57*. A visual examination of *figure 57* shows some differences in visit rates when catch rates either increased or decreased. But these differences were very small.

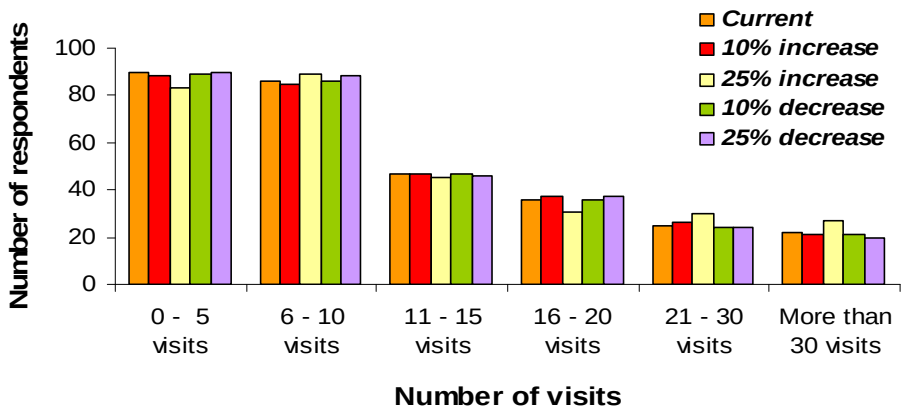


Figure 57: Projected changes in visit rate due to changes in catch rates

The responses to changes in conditions other than catch rates like crowding, persistence of algal blooms and the chance of catching a Red Emperor are presented in *figure 58*. Visit rate appear to change with changes in environmental and other conditions that could influence the fishing experience but the changes appear to be minor.

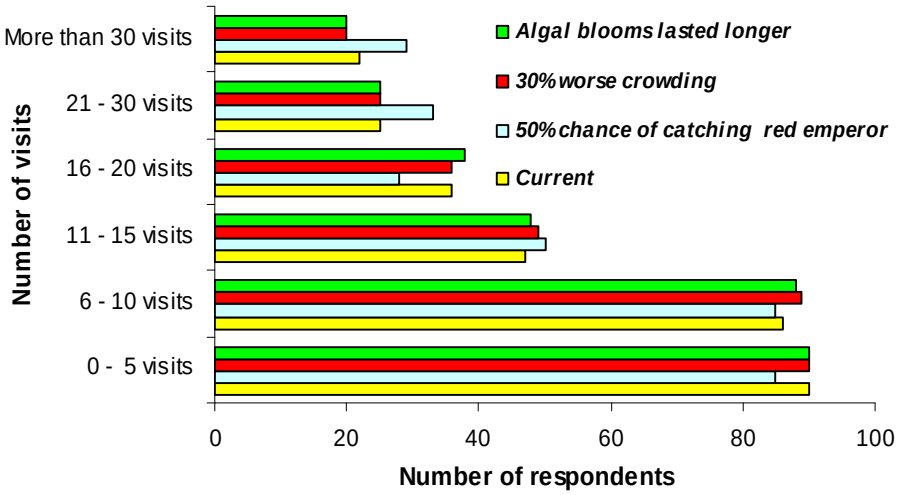


Figure 58: Projected changes in visit rate due to changes in other conditions

1.6.1.2 Costs of fishing

Figure 58 shows the average spent on each fishing trip.

All the recreational anglers surveyed used boat fuel and spent an average of $79 on it. Almost all incurred costs while travelling to the boat ramp (99.7%) and bought food while on the trip (94%). The average costs of travel and food were approximately $28 for each item. About 65% of the respondents bought tackle and 89% bought bait with an average spending of about $18 and $20 respectively. Average spending on accommodation was the highest with about $203 per trip but only 7% of the respondents spent on accommodation. The item with the lowest amount spent was ice with approximately $11 spent on average per trip and only 13% of the respondents spent on ice. The average amount spent on a fishing trip, excluding accommodation, was $181.96.

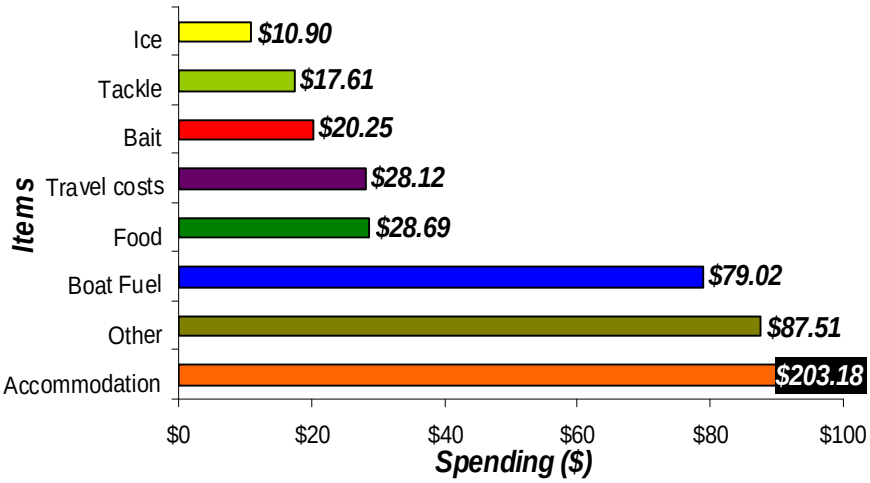


Figure 59: Average amount spent on a fishing trip

The average amount spent on an offshore fishing trip in the Capricorn area in 2007 for ice, tackle, bait, travel, food, boat fuel and other (excluding accommodation) was $182 per trip

Q2 What social, economic and institutional factors influence these characteristics and how can we use this understanding to maintain and enhance fish and recreational fishing?

Q2.1 What are the effects of management change on fisher behaviour?

2.1.1 What changes have occurred in fishing locations with changes to zoning?

The Fishing and Fisheries Research Centre at James Cook University has undertaken a project to understand and document changes in fishing locations as a result of changes to zoning[13].

Spatial redistribution of recreational fishing effort after the 2004 zoning plan was documented using interviews with recreational fishers in the central and southern GBR. Face-to-face interviews with 132 respondents were opportunistically conducted at boat ramps and tackle shops in Townsville and Rockhampton from March 2006 to December 2007. Data was also collected in Cairns and Mackay but the small sample size restricted analysis.

Spatial changes in fishing locations due to rezoning were recorded on paper GBR zoning maps (scale 1:250,000) using the interview map-biography method and structured questions. A total of 690 current (post-rezoning) and 181 previous (pre-rezoning) fishing zones were reported. Average interview length was approximately 20 minutes and responses were validated by meetings of the CapReef program. Maps were scanned, georectified and entered into GIS for analyses. Spatial analysis and mapping were conducted with ArcGIS-ArcMapTM 9.2, using weighted sum and zonal statistics tools to measure and document spatial changes in fishing effort.

Overall, results indicate that changes to rezoning have affected recreational fishing access to the marine resources and the spatial distribution of fishing effort within the Park. Most fishers lost one or more preferred fishing locations and compensated for such loss by adopting two main compensation strategies: (i) fishing more in locations that still remain open and (ii) finding new areas that they had not exploited previously. The main locations lost by recreational fishers are presented in *figure 60*.

Spatially, fishers' substitution choices are directly reflected by fishing distribution patterns. On average, the majority (78%, n=56) of fishers' substitute locations in the Rockhampton region were 32% (with distances ranging from 0.57 to 51.94km, mean= 18.44km) closer to their boat ramp departure points compared with 'lost' locations, resulting in a general shift in recreational fishing effort towards inshore areas (*figure 61*).

Therefore, even though 66% (34% were rezoned as no-take areas by the 2004 plan) of the GBRMP is still open for recreational fishing, the results of this study show that not all the available places are perceived as a satisfactory alternative or substitute for replacing the favorite sites that no longer available for fishing.

Potential consequences of these spatial changes include increased fishing pressure in the new locations, especially locations that received little exploitation previously. In Rockhampton, most fishers (21%, n=56) who replaced the lost of areas by finding new locations have chosen the regions of Johnson Path and Douglas Shoals, and Perforated

[13] Data presented integrates a PhD thesis under conclusion by Debora De Freitas at James Cook University, School of Earth and Environmental Sciences

Island and Flat Island. In addition, changes in spatial fishing distribution also reduced quality of recreational fishing experiences through increased crowding and lower catch rates.

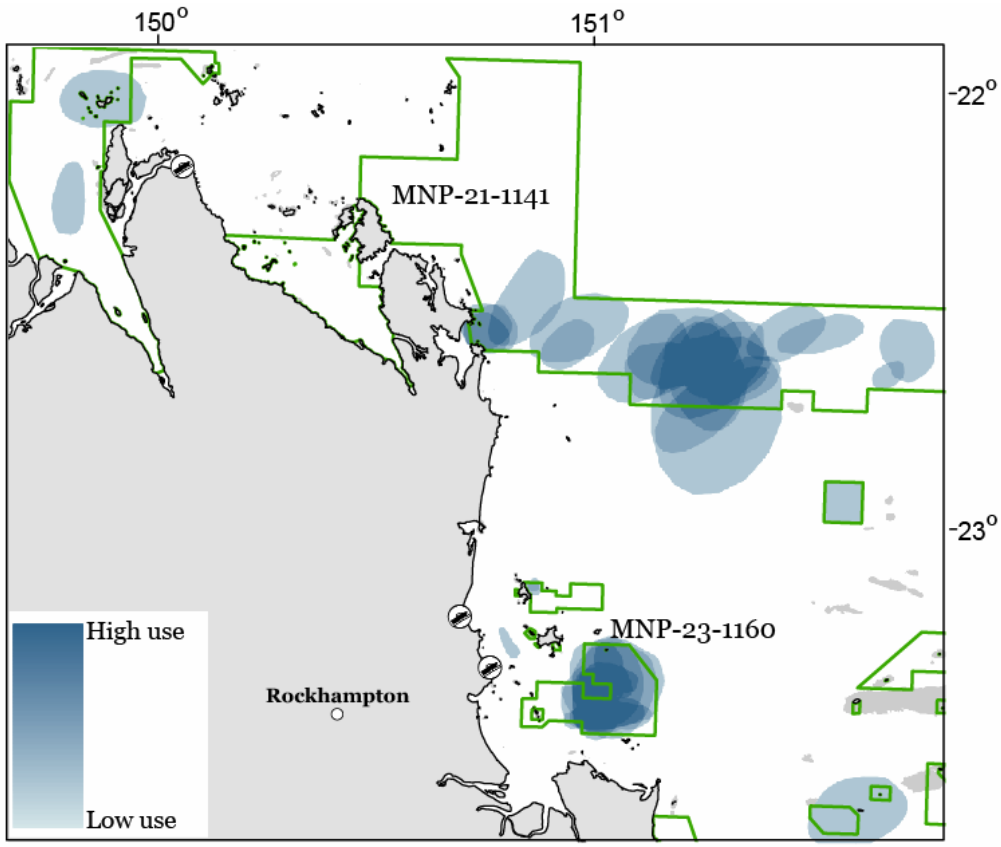


Figure 60: Main fishing spots that recreational fishers lost due to rezoning as no-take areas

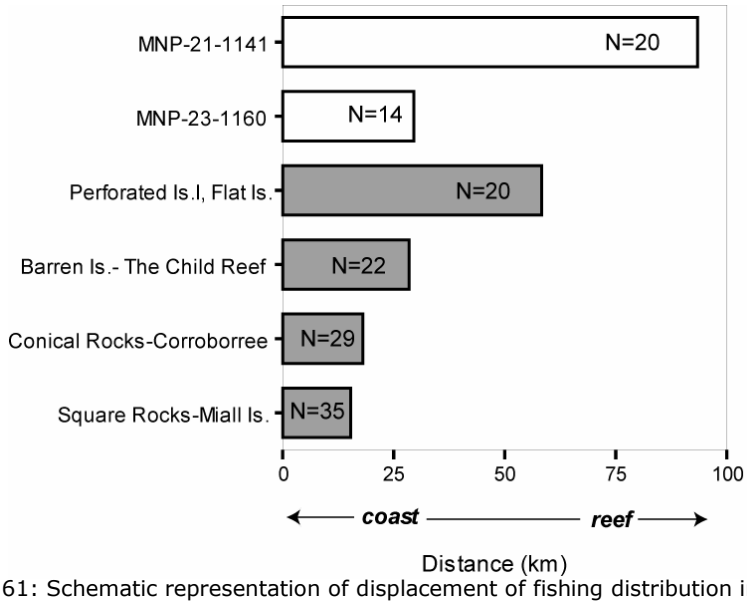


Figure 61: Schematic representation of displacement of fishing distribution in the Rockhampton region. N represents the number (N) of fishing locations provided for pre- and post-rezoning, with distances represented by the means. White bars indicate previous fishing locations, and grey bars the current fishing locations

As a result of the rezoning of the GBRMP in 2004 most fishers lost one or more preferred fishing locations and compensated for the loss by fishing more in locations still open to fishing and finding new areas they had not previously exploited

2.1.2 What are the historical changes in fishing effort?

Examination of historical records from fishing clubs, past fishing surveys and radio positions reported to air sea rescue in Gladstone suggest that there has been a shift in the proportion of fishing trips from offshore reefs to inshore and islands[14] as shown in *figure 62*. From 1989 to 2006/07 there has been a decrease from 85% to less than 20%. Trips to islands have increased from 9% to 50% over the same period.

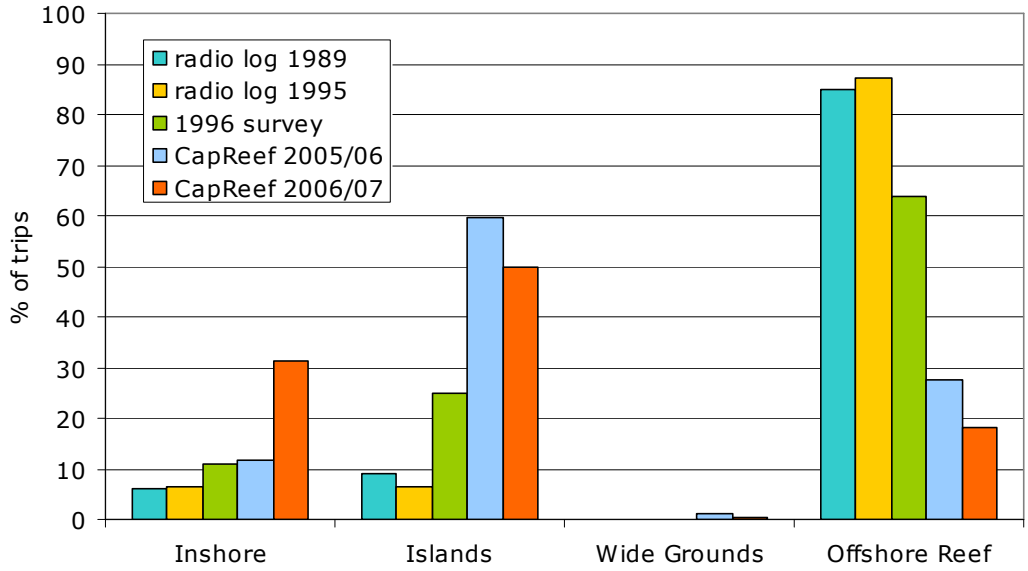


Figure 62: Trends in locations fished over time

Historic records suggest that there has been a decrease in the proportion of fishing trips to offshore reefs and an increase in fishing inshore and around islands

2.1.3 What was the historical use of locations with changed zoning?

Examination of historical records from fishing clubs, past fishing surveys and radio positions reported to air sea rescue in Gladstone suggest that between 11-25% of fishing trips going back to the 1970's were to locations now closed to fishing (green zones). Around 13-66% of trips were to what is now yellow zoned locations and 11-53% were to general use locations[15] as shown in *figure 63*.

This generally supports the information presented in section 2.1.1.

Historic records suggest that less than 20% of fishing trips were to areas now zoned as no fishing (green) zones for most fishers however some groups (Yaralla Fishing Club) were more affected

[14] For details see report "How much fishing effort is there?"
[15] For details see report "How much fishing effort is there?"

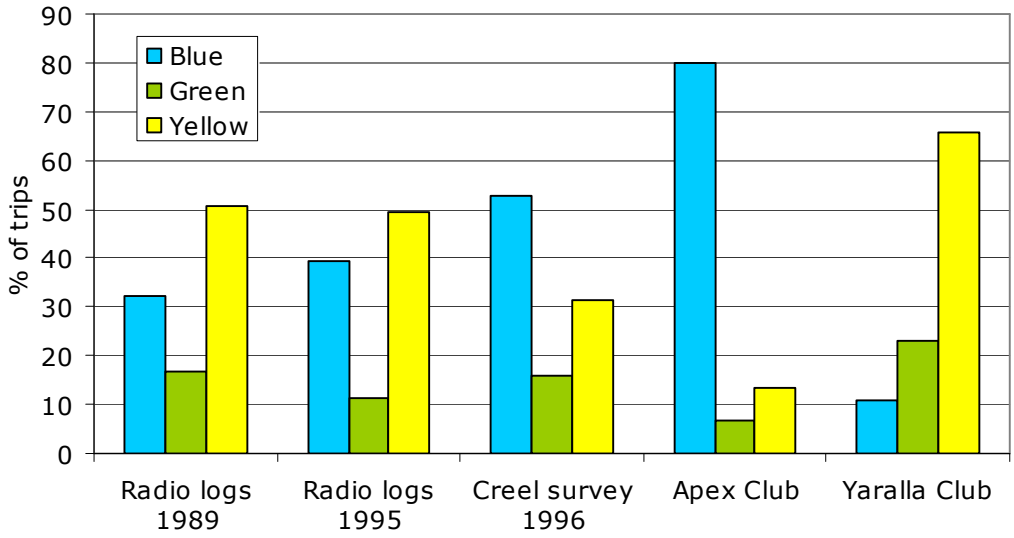


Figure 63: Percentage of past trips to current zone types off Gladstone

2.1.4 What changes have occurred to species harvested or targeted?

Section 1.2.1.1 provided details of the offshore species harvested over the past 3 years. School Mackerel have dropped from 7.0% of the catch in 2006/07 to 4.9% in 2008/09. The status of Mackerel stocks is discussed further in section 5.4.1.

Section 1.2.1.2 provides details of the estuary species harvested over the past 2 years. There has been a significant increase in the numbers of Mud Crab caught which comprised 7.8% of the catch in 2007/08 and 25.9% in 2008/09.

The status of Barramundi stocks is discussed further in section 5.4.3.

2.1.5 What has been the effect of changes in fishing regulations?

As part of the Reef Line Plan introduced in 2004 there were a number of changes to fishing regulations that impacted on the catches of recreational fishers. It was considered that changes to bag and size limits would have the most impact.

2.1.5.1 What has been the effect of bag limits introduced in the 2004 Reef Line Plan?

Bag limits for reef species were amended through the 2004 Reef Line Plan. In order to assess this the number of trips catching the bag limit, both for the combined species trip total for reef fish and for individual species, was calculated for a total of 1,236 offshore trips in 2008/09 as shown in *table 12*.

A total of 6 (0.5%) trips reached the combined reef fish limit of 20 fish while for individual species 9 (0.7%) trips reached the bag limit of 8 fish for Redthroat Emperor and 5 (0.4%) trips reached the bag limit of 10 for Hussar. Very few (less than 1% of trips) captured bag limits for combined reef species in either 2007/08 or 2008/09. There was a slight increase in the number of trips achieving the bag limit in 2008/09 (to 6 in total).

This trend holds both for reef, rocky reef and estuary species. Based on this information it would seem that few trips are impacted by current bag limits.

Figures 64 and 65 show that number of fish caught per person on offshore trips in 2007/08 and 2008/09.

Less than 1% of fishing trips in the CapReef area achieve the individual or reef species combined bag limit

Species	Bag Limit	No of trips with bag limit
CORAL TROUT	7	0
GRASS EMPEROR	10	1
HUSSAR	10	5
RED SNAPPER	9	1
RED EMPEROR	5	2
REDTHROAT EMPEROR	8	9
STRIPEY SNAPPER	5	1
TUSKFISH	6	0
BARRAMUNDI	5	1
BARRED JAVELIN	10	2
BREAM	30	0
FLATHEAD	5	0
WHITING	30	0
GOLDSPOTTED ROCKCOD	5	0
GOLDEN SNAPPER	5	0
MUD CRAB	10	0
SCHOOL MACKEREL	10	1
SPANISH MACKEREL	3	3
SPOTTED MACKEREL	5	0
REEF FISH COMBINED	20	6

Table 12: Number of reef fishing trips that reached the bag limit for individual species and the

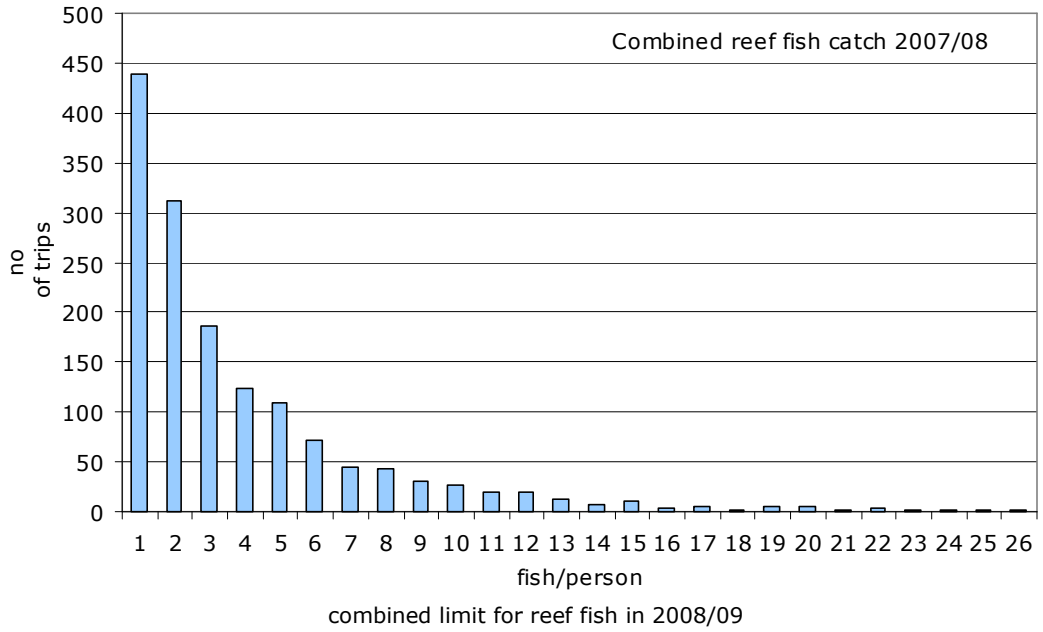


Figure 64: Number of trips and combined reef fish caught per person in 2007/08

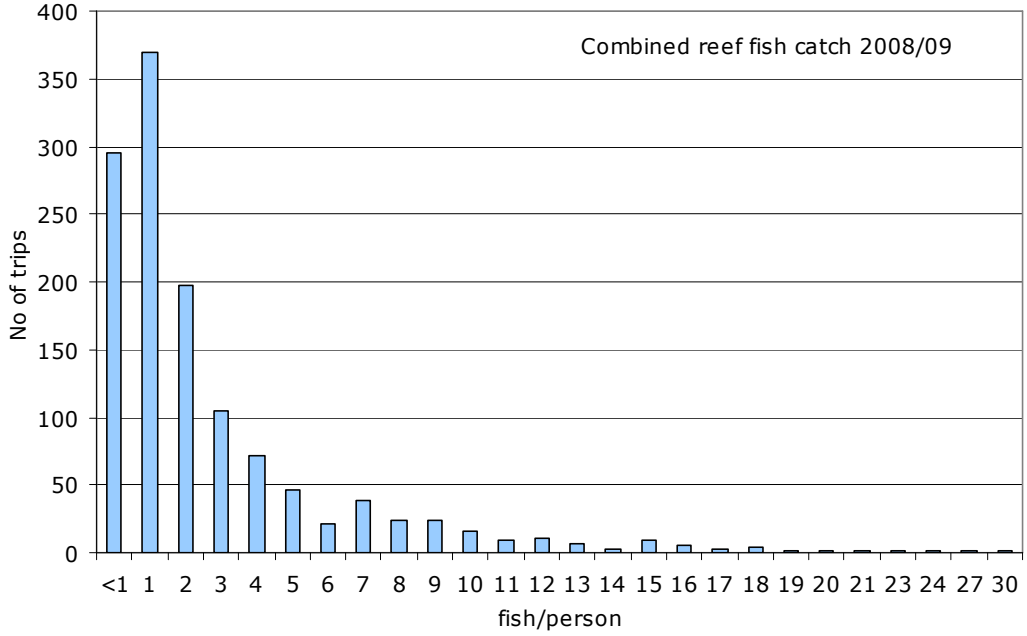


Figure 65: Number of trips and combined reef fish caught per person in 2008/09

2.1.5.2 What has been the effect of size limits introduced in the 2004 Reef Line Plan?

The influence of changes in size limits is not as easily estimated, however the proportion of fish retained should give an indication of how many fish were caught below legal size. The trends for 4 species where legal minimum lengths were changed in 2004 are shown in *table 13*.

Species	Number caught	% retained
LONGFIN ROCKCOD	24425	<1%
RED EMPEROR	8667	16%
RED SNAPPER	8403	55%
REDTHROAT EMPEROR	7850	57%

Table 13: Numbers of species caught and percentage retained

This suggests that the most impact on catches occurred with Longfin Rockcod and Red Emperor. Both show less than 20% of fish retained.

It might be expected that if legal limits are appropriate that the proportion of fish kept might slowly increase over time as more fish gradually recruit to the fishery through natural growth (assuming recruitment and natural mortality remains relatively unaltered). This has occurred for Red Emperor where the proportion of fish kept has gradually increased as shown in *table 14*. However for Longfin Rockcod the proportion kept remains very low (<1%) despite being the most common offshore species caught. It seems that the number of legal sized Longfin Rockcod is very small and the legal limit may not be appropriate.

This is considered further below. The proportion of Red Snapper and Redthroat Emperor increased from 2005/06 to 2007/08 but then declined in 2008/09. This may well be the result of an increase in recruitment of small fish and a subsequent disproportionate number of small fish being caught in 2009 possibly associated with flooding of the Fitzroy River.

This suggests that the current size limits for Red Emperor, Red Snapper and Redthroat Emperor may be appropriate but that for Longfin Rockcod deserves close examination.

%kept	2005-06	2006-07	2007-08	2008-09
LONGFIN ROCKCOD	1.6	1.0	0.6	0.6
RED EMPEROR	9.1	10.9	14.9	16.0
RED SNAPPER	48.5	55.8	59.0	50.1
REDTHROAT EMPEROR	51.5	57.1	62.2	50.3

Table 14: Fish kept each year for reef species caught

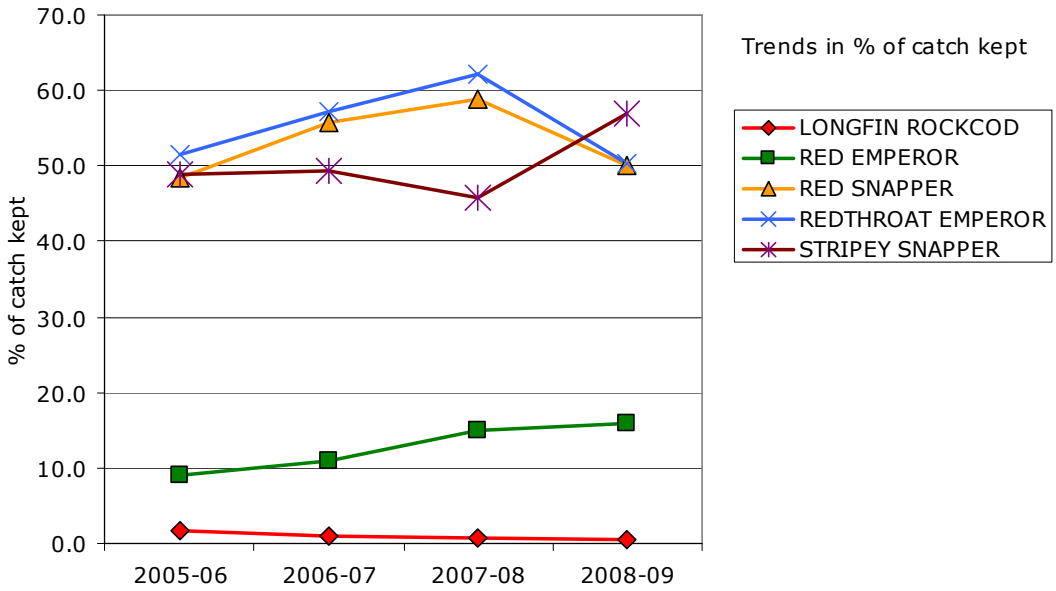


Figure 66: Trends in the percentage of the catch kept for key species

Changes in size limits in 2004 have reduce the proportion of fish kept to less than 1% for Longfin Rockcod and 16% for Red Emperor while for Red Snapper and Redthroat Emperor over 55% are mostly kept

2.1.5.3 What has been the effect of size and bag limits introduced in the 2004 Reef Line Plan on charter fishers?

If the impacts on trailer boat fishers of most bag and size limits are relatively benign, the same may not be true for offshore fishing clubs.

Figure 67 and table 15 show the catch rates of the Yaralla Fishing Club fishing the Capricorn Bunker Group since 1976. Interposed on *figure 67* are the dates of change in fishing regulation. There was little evidence of change in catch rates before the introduction of the Coral Reef Finfish Fisheries management Plan in 2004. Catch rates have fallen and remained at historically low levels since that time.

At least in part this seems to be related to the number of trips where the fishers caught 20 fish or more per person. Prior to 2004 around 30% of trips achieved catch rates of 20 fish or more. In fact only 1 year (1990) had no trips above this catch rate. No trips since 2004 have had a catch rate of over 20 fish per person. In part this is likely to be related to the changes in the size and bag limits of Redthroat Emperor. This species has dominated catches of the club as shown in *figure 68*.

However the reduction in the size and bag limits for the species seems to have reduced the proportion of the species in the catch. The changes in the bag limits applying to extended charters has also affected catch rates of the club.

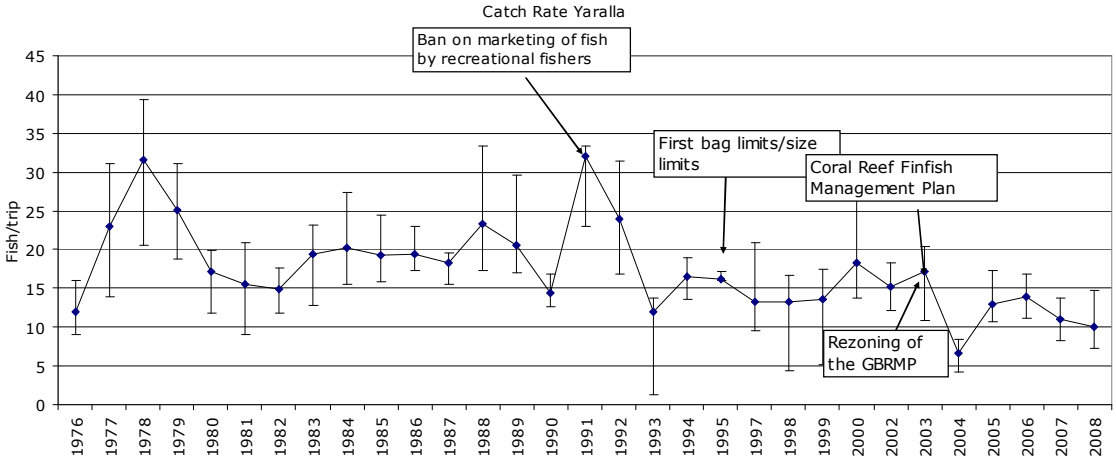


Figure 67: Catch rates for the Yaralla Fishing Club from 1976 to 2008 showing when new management changes were implemented

year	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
over 20 fish/trip	2	9	13	10	6	5	2	6	6	7
Total no of trips	11	15	17	15	15	16	12	12	12	14
% of trips	18	60	76	67	40	31	17	50	50	50
year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
over 20 fish/trip	4	2	6	6	0	8	5	1	2	1
Total no of trips	8	5	10	12	6	9	7	4	5	4
% of trips	50	40	60	50	0	89	71	25	40	25
year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
over 20 fish/trip	1	3	4	5	4	3	4	0	0	0
Total no of trips	9	8	7	8	10	10	10	9	7	9
% of trips	11	38	57	63	40	30	40	0	0	0
year	2007	2008								
over 20 fish/trip	0	0								
Total no of trips	4	5								
% of trips	0	0								

Table 15: Number of trips each year by Yaralla Fishing Club and percentage that reached or exceeded the current bag limit of 20 reef fish combined

Prior to 2004 around 30% of Yaralla Fishing Club trips achieved a catch rate of 20 fish/person/trip and since then no trips have achieved that catch rate

Changes to bag and size limits have reduced the catch of the Yaralla Fishing Club of Redthroat Emperor from around 54% of kept catch in 2004 to 32% in 2008

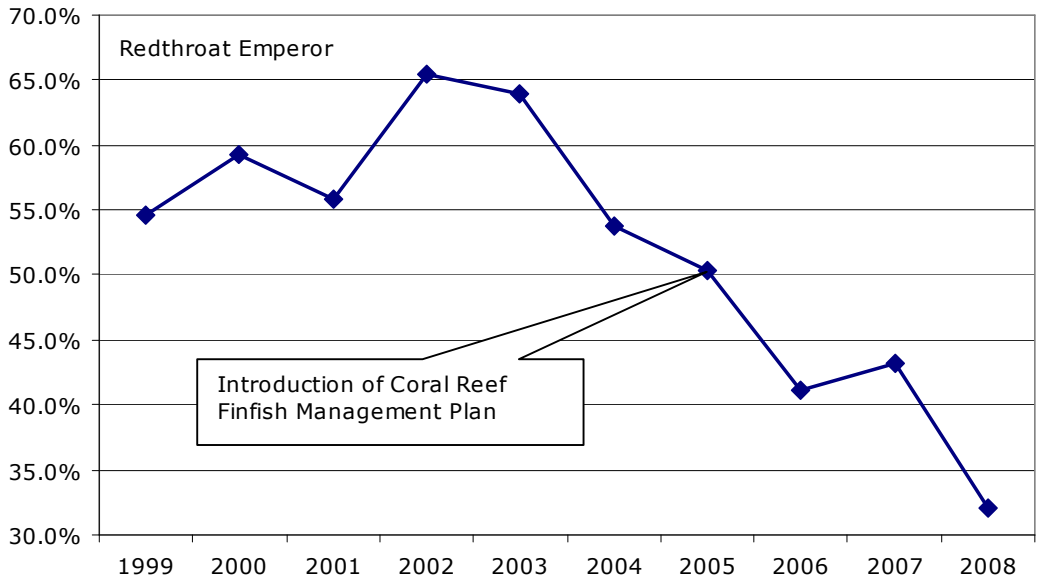


Figure 68: Change in proportion of Redthroat Emperor in the catch of Yaralla Fishing Club from 1999 to 2008

2.1.6 How will future changes to bag and size limits influence recreational fishing in the CapReef area?

This was a question that was posed prior to the introduction of the Inshore Fin Fish Management Plan in 2009. Concerns were raised by recreational fishers on the possible impacts that changes to bag and size limits would have on recreational catches.

The species of most concern was Barred Javelin and the legal size for this species rose from 300mm to 400mm in March 2009. CapReef was asked to provide data on the affect this change would have on recreational catches.

Figure 69 shows the sizes of Barred Javelin tagged in Suntag and for Shoalwater Bay. Under Suntag there have been 23,442 fish tagged while in Shoalwater Bay there were 902 fish tagged. The fish tagged in Shoalwater Bay were tagged in creeks that have very little fishing effort as they are in the Department of Defence training area. This approximates an unfished population. The Suntag data is more representative of a fished population however under represents fish over legal size as many taggers would have kept some fish over legal size. However the data provides a representation of the size structure for Barred Javelin.

Based on the previous size limit of 300mm the Suntag data indicates 31.6% of fish were over that size while the Shoalwater data indicates 73.4% were over that size. For the new minimum size limit of 400mm the Suntag data indicates that 8.1% were over that size while the Shoalwater data indicates 44.9% were over that size.

It is too early since the management changes came into force to assess what the effect of this change will be. The Shoalwater Bay data indicates that Barred Javelin inhabit estuaries both as juveniles and adults so it is expected that the size of fish in estuaries will increase over time. However it is also expected that there will be a significant drop in the proportion of fish caught over legal size in estuaries.

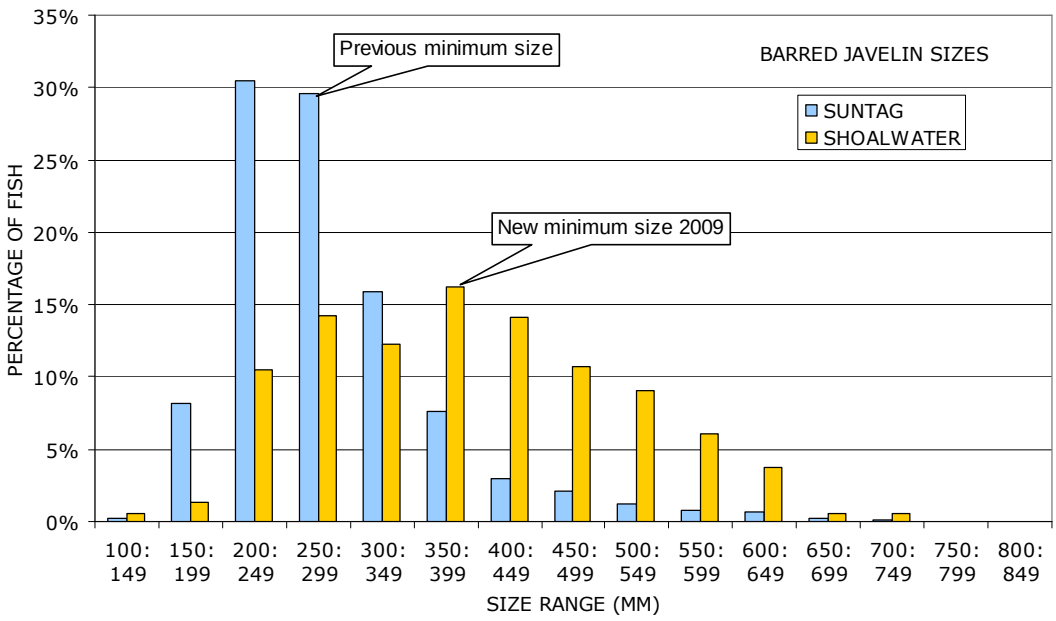


Figure 69: Sizes of Barred Javelin tagged in Suntag and from creeks in Shoalwater Bay

> ***The effect of the change to the minimum size limit of Barred Javelin from 300mm to 400mm is likely to result in a reduced number of legal fish caught in estuaries***

2.1.7 What changes have occurred in commercial fishing activities?

CapReef assisted in a JCU study into the impacts of the 2004 GBR rezoning plan on commercial fishers. The JCU study, funded by the Marine and Tropical Sciences Research Facility, is aimed at understanding commercial fishers' perceptions of the impacts of the zoning plan on their fishing activity and fishing business. As part of that study, CapReef personnel conducted face-to-face interviews with 16 commercial fishers in the southern GBR region on behalf of JCU. Data are currently being analysed and will be available from JCU and the Reef and Rainforest Research Centre in June 2010.

Q2.2 What are the effects of management change on fish stocks?

2.2.1 Do catch rates reflect fish abundance?

Catch rates are not always indicative of the fish actually present. Sometimes fish species are more common than suggested by catch rates. Other species are very susceptible to capture and there are less of these species than catch rates suggest. CapReef has used Baited Remote Underwater Video (BRUV) as a fishery independent means of examining this issue. In 2007/08 and 2008/09 BRUV data was collected in Keppel Bay and around the Keppel Islands.

The percentage of trips catching species was compared with the number of occasions (sets of the equipment) where the species was observed. Where fish were observed in a higher percentage of BRUV sets than fishing trips it is likely more common than catch rates suggest. The data for 2007/08 is in *figure 70* and for 2008/09 in *figure 71* while *table 16* shows fish observed more frequently in BRUV sets than recorded in catches.

Only Grass Emperor and Stripey Snapper were consistently recorded more frequently in the catch. These two species seem to be actively selected by fishing. Some species

such as Angelfish were frequently observed feeding at the BRUV bait but were never caught. Some of the target species such as Coral Trout and Red Snapper were seen more frequently by the BRUV than in the catch. This may suggest they learn to avoid fishing gear. Other less desirable and non-target species such as Triggerfish and Monacle Seabream were also more frequently recorded in BRUV sets. This may reflect that they are either hard to catch or usually released by fishers.

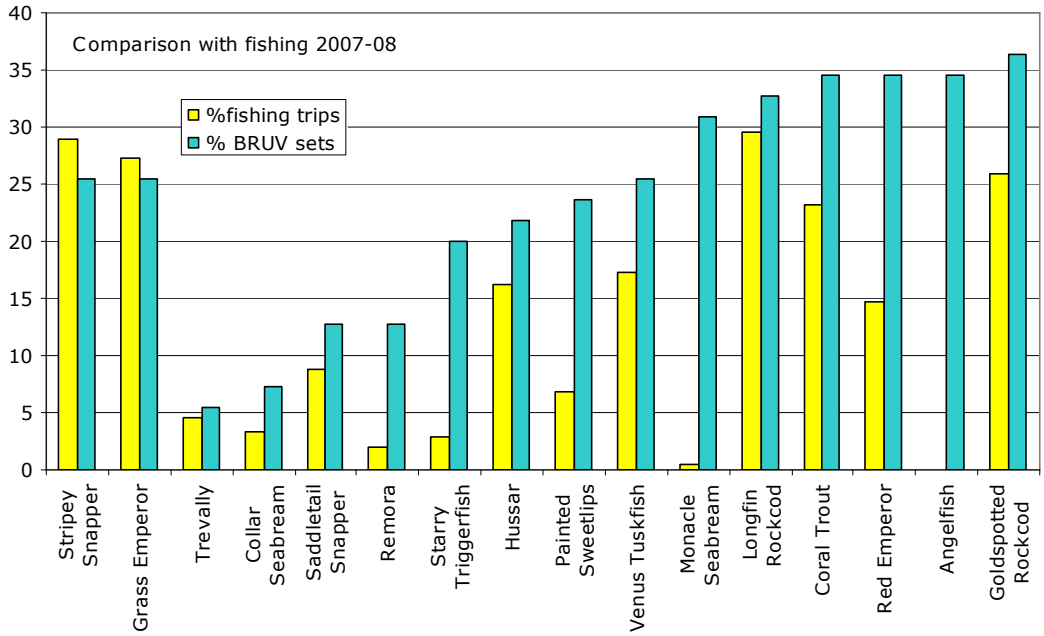


Figure 70: Comparison of fish caught on fishing trips with observed in BRUV sets in 2007/08

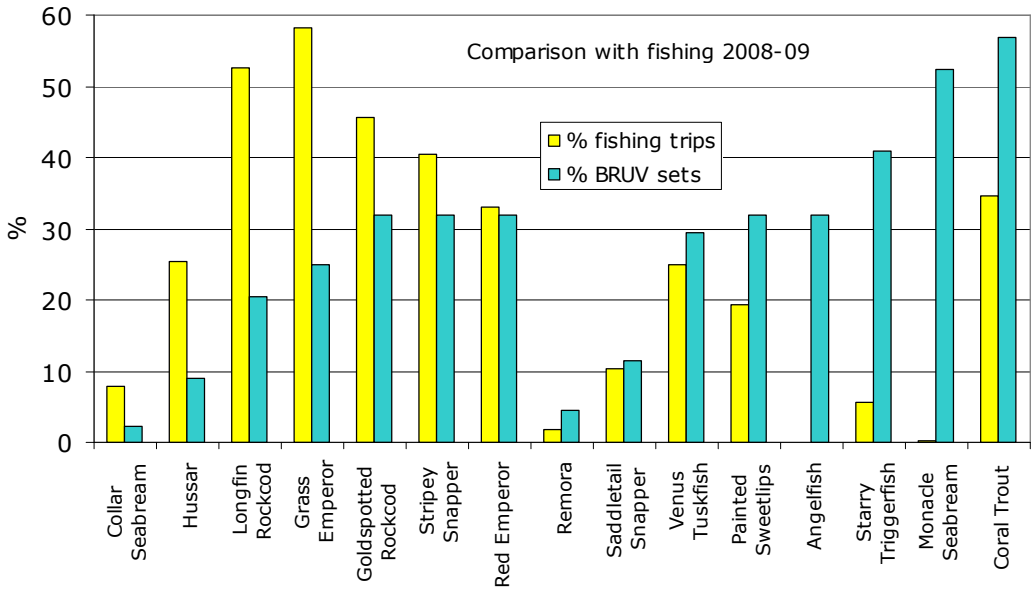


Figure 71: Comparison of fish caught on fishing trips with observed in BRUV sets in 2008/09

Grass Emperor and Stripey Snapper were recorded more often in catches that observed in BRUV sets suggesting they may not be as prevalent as indicated by catches

Coral Trout and Red Snapper were more often observed in BRUV sets than in catches suggesting they may be more prevalent than indicated in catches

BRUV occurence > Fishing trips	2007-08	2008-09
Angelfish	√	√
Collar Seabream	√	X
Coral Trout	√	√
Goldspotted Rockcod	√	X
Grass Emperor	X	X
Hussar	√	X
Longfin Rockcod	√	X
Monocle Seabream	√	√
Painted Sweetlips	√	√
Red Emperor	√	X
Remora	√	√
Saddletail Snapper	√	√
Starry Triggerfish	√	√
Stripey Snapper	X	X
Venus Tuskfish	√	√

Table 16: Fish observed more frequently in BRUV sets than in fishing trips

2.2.2 Are there differences in fish stocks and behaviour in fished and unfished zones?

2.2.2.1 Are there more fish in green zones than fished zones?

One purpose for establishing conservation zones (green zones) in the Great Barrier Reef Marine Park was to provide refuges for fish protected from fishing so that the natural species richness of fish could be maintained in these areas. One aim of the CapReef BRUV was to compare the mix of species approaching the bait of the BRUV. Two measures were used, the number of fish of each species observed (*figure 72*) and the number of sets of the BRUV equipment where the species were observed (*figure 73*). The results from 2007/08 and 2008/09 were combined and are summarised in *figure 74* as well as *table 17*.

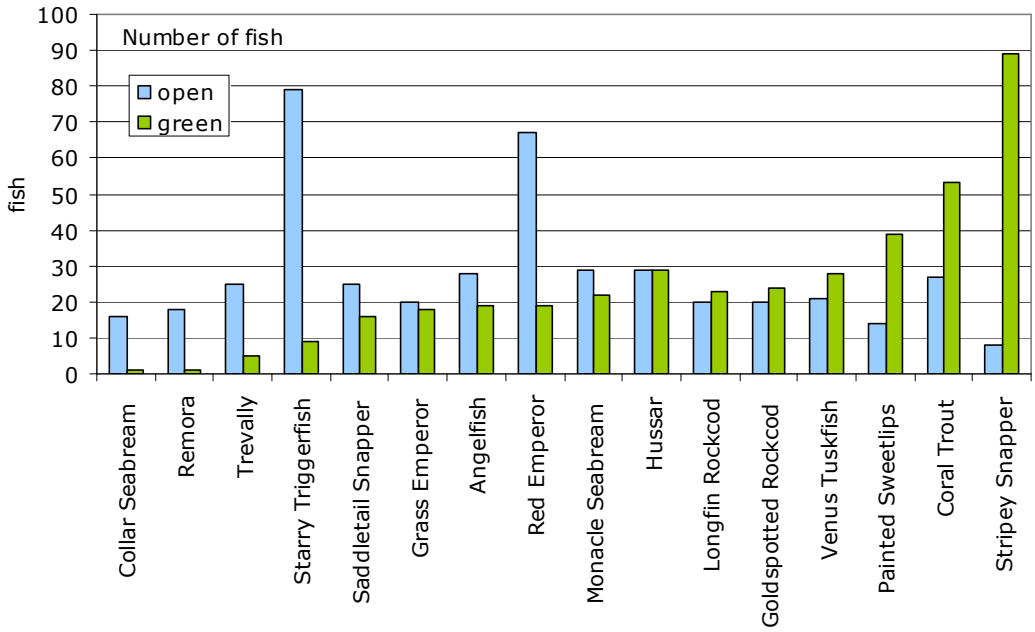


Figure 72: Comparison of number of fish observed in BRUV footage in fishing and no fishing zones

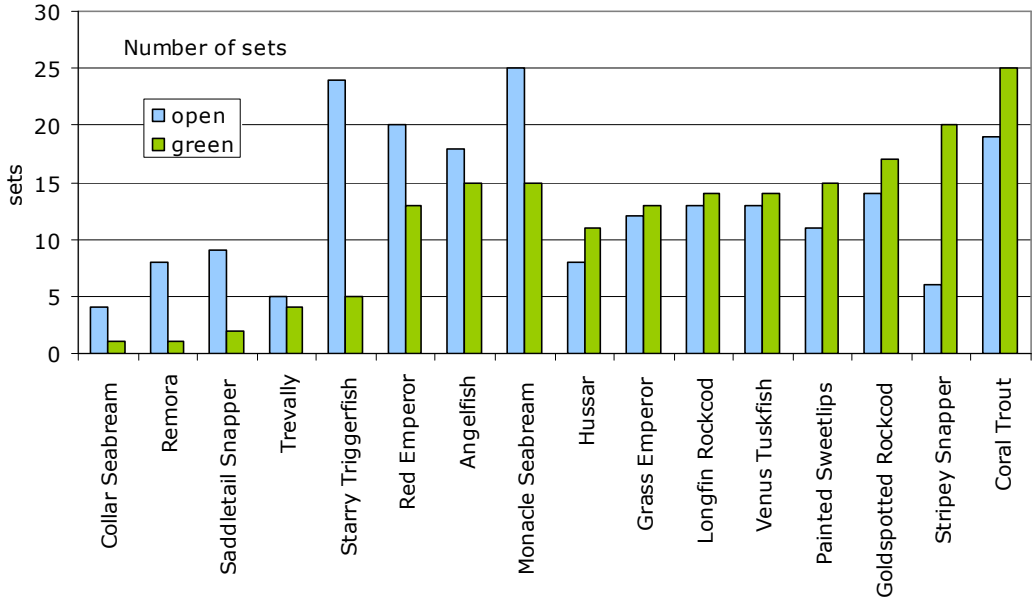


Figure 73: Comparison of fish observed in BRUV sets in fished and no fishing zones

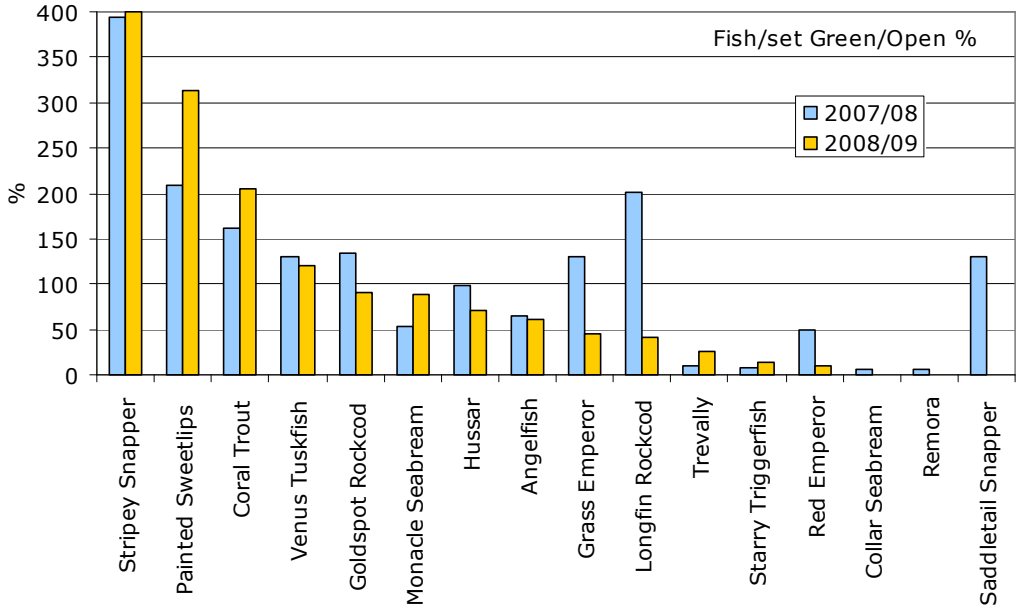


Figure 74: Comparison of fish in green zones over open zones

The results show that not all species are more common in green zones. In fact 8 species were seen in more sets and in greater numbers in open zones. In particular Starry Triggerfish and Red Emperor were observed more frequently in open zones.

Eight species were observed in more sets (on more occasions) in green zones than in open zones, while 6 species were seen in greater numbers and on more occasions in green zones than in open zones. The difference was most pronounced for Coral Trout, Stripey Snapper and Painted Sweetlips.

Species	Seen in greater numbers	Seen on more occasions
Collar Seabream	X	X
Remora	X	X
Saddletail Snapper	X	X
Trevalley	X	X
Starry Triggerfish	X	X
Red Emperor	X	X
Angel fish	X	X
Monacle Seabream	X	X
Hussar	Same	√
Grassy Emperor	X	√
Longfin Rockcod	√	√
Venus Tuskfish	√	√
Painted Sweetlips	√	√
Goldspot Rockcod	√	√
Stripey Snapper	√	√
Coral Trout	√	√

Table 17: Species that are seen more often and in greater numbers in BRUV sets

The trends were the same in most species from 2007/08 to 2008/09 (*figure 74*). The exceptions were Grass Emperor, Longfin Rockcod and Saddletail Snapper. No Saddletail Snapper were observed in green zones in 2008/09. This may reflect the green zone locations that were able to be sampled. Longfin Rockcod and Grass Emperor were observed more frequently in 2007/08 in green zones.

> ***Red Emperor and Starry Triggerfish were more common in open zones while Coral Trout, Stripey Snapper and Painted Sweetlips were more common in green zones***

2.2.2.2 Do fish feed more readily in green zones?

One aspect that the previous report on BRUV results showed was that there were differences in how frequently fish fed at the baits of the BRUV between green and open locations. The results from 2008/09 show similar trends, a number of species feed more frequently in green zones than in open zones. *Figure 75* shows the percentage of fish feeding in green and open zones in 2007/08 while *figure 76* shows the results for 2008/09. The results are summarised in *table 18*.

The results showed that a number of species (at least 8) were more likely to feed in green zones. This may demonstrate that fish behavior is influenced by fishing. In more fished locations fish are more wary and less likely to feed than in green zones.

> ***Most species were more likely to feed in green zones than in open zones***

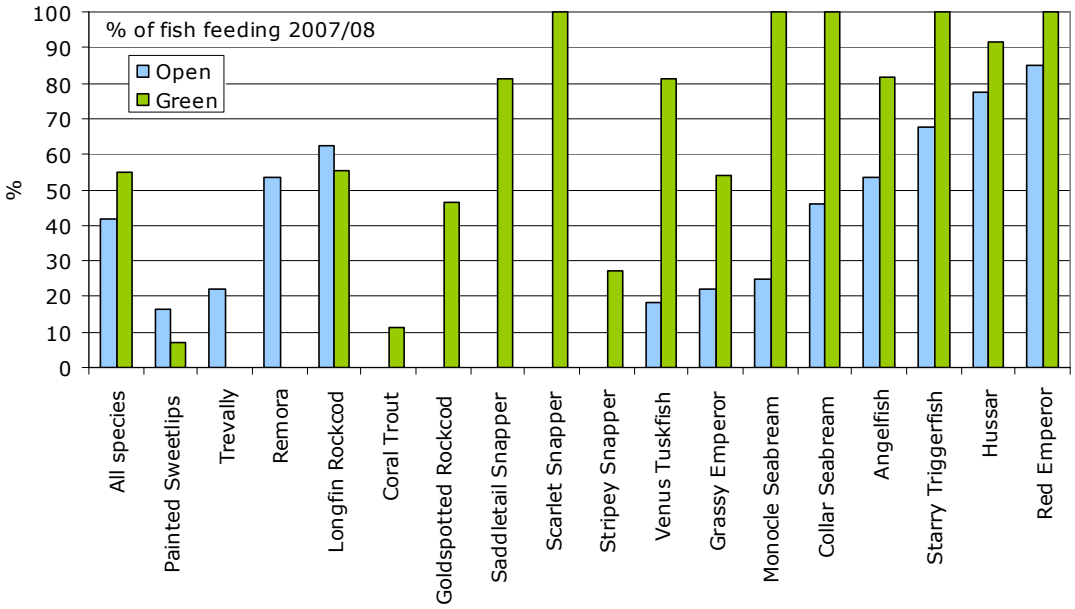


Figure 75: Percentage of fish feeding in green and open zones 2007/08

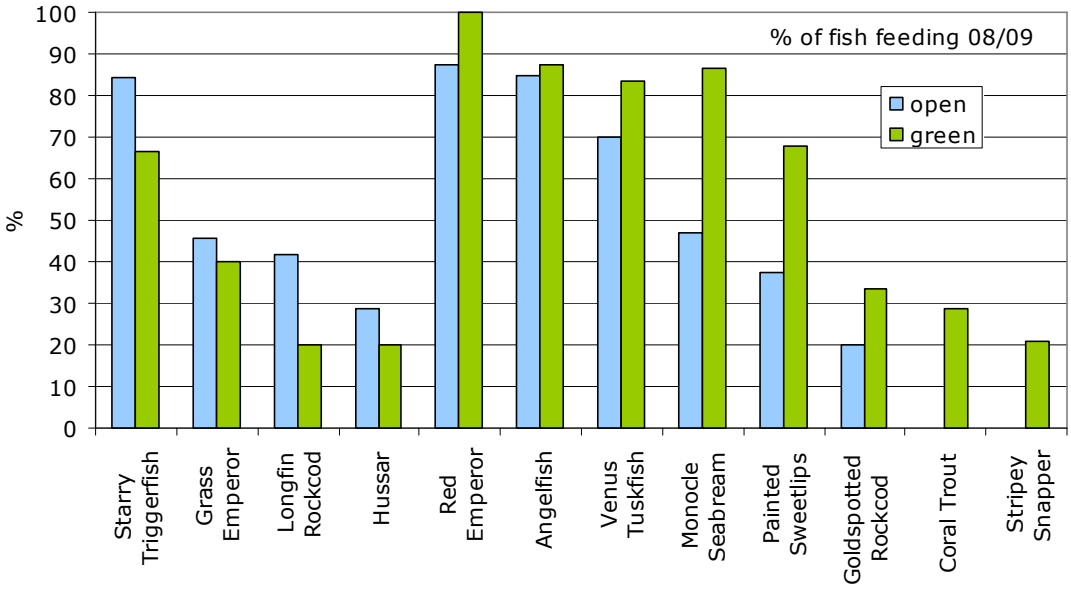


Figure 76: Percentage of fish feeding in green and open zones 2008/09

Species	Fed more often in green zones 2007/08	Fed more often in green zones 2008/09
Starry Triggerfish	√	X
Grass Emperor	√	X
Longfin Rockcod	X	X
Hussar	√	X
Red Emperor	√	√
Angelfish	√	√
Venus Tuskfish	√	√
Monocle Seabream	√	√
Painted Sweetlips	X	√
Goldspotted Rockcod	√	√
Coral Trout	√	√
Stripey Snapper	√	√
Remora	√	N/A
Trevally	√	N/A

Table 18: Percentage of fish feeding in green and open zones

2.2.2.3 Are the sizes of fish different in green and open zones?

The project on tagging of fish in no fishing (green) zones provided the opportunity to examine the size structure of populations some fish species. Lengths of fish in no fishing zones were compared with lengths of fish from fished zones for 2 species:

- Longfin Rockcod
- Stripey Snapper

As both species are small and slow growing the lengths were aggregated into 2cm intervals to reduce the effects of measurement errors. Total numbers of fish where lengths were available are shown in *table 19*.

Species	No Fishing Zones	Fishing Zones	Total
Longfin Rockcod	1586	1252	2838
Stripey Snapper	744	1995*	2739

* Keppel Bay only

Table 19: Numbers of fish where sizes were available

Longfin Rockcod grow to a maximum length of a little over 400mm and with a legal size of 380mm the number of legal size fish recorded was only 3.8% of the fish measured. There was no significant difference in the length frequency of fish in no fishing and fishing zones as shown in *figure 77*.

> ***For Longfin Rockcod there was no difference in size structure for fish in no fishing and fishing zones***

Stripey Snapper grow to a maximum size of around 500mm. Of the fish measured there were 92.3% of fish over legal size of which 92.8% were kept. The length/frequency of Stripey Snapper is shown in *figure 78* and there was a significant difference in the size composition in no fishing and fishing zones. The fish in no fishing zones were most common around 300-319mm while in fish zones they were most recorded at 380-399mm. This result was unexpected given that most Stripey Snapper caught over legal size were kept.

A reason for this may be that a disproportionate number of larger fish were measured, however most fish were measured during boat ramp surveys which should have provided an unbiased sample. It may be possible that the fishing gear used targeted the larger fish and they were overrepresented in the catch.

The no fishing areas where the fish were measured were small (around 5km^2 in total) with a high density of fish. There was no evidence of Stripey Snapper tagged in these

areas moving out so that competition for food in these areas may be resulting in smaller fish and slower growth rates. The fished area was the entire area of the Keppel Islands and surrounding reefs. With the large proportion of legal sized fish removed it is possible competition between fish was lower and that growth rates were higher. There were insufficient tagging data to test this.

> ***For Stripey Snapper the average size of fish in no fishing zones was 300-320mm while in fished zones it was 380-399mm***

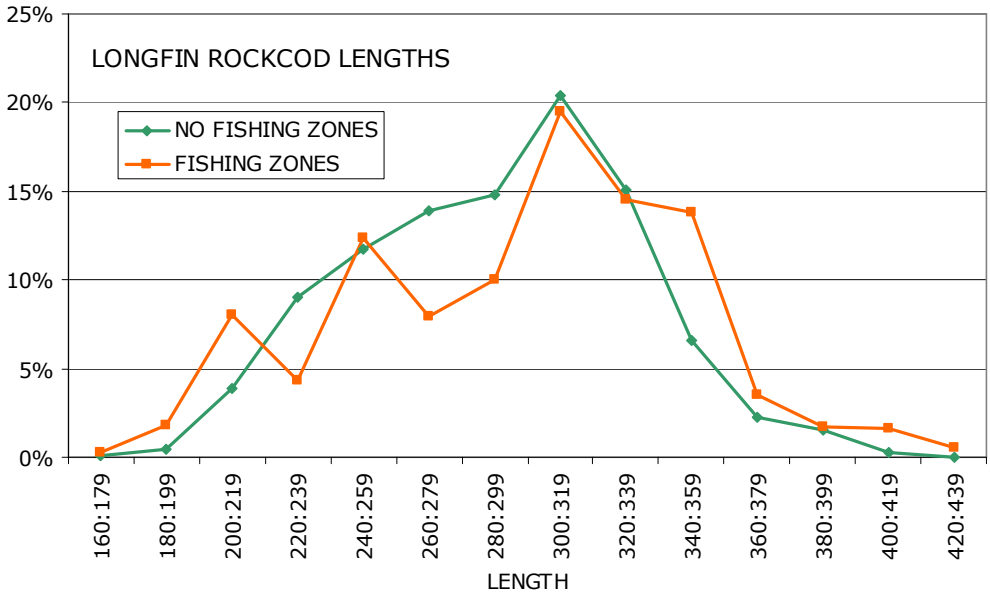


Figure 77: Length/frequency of Longfin Rockcod in no fishing and fishing zones

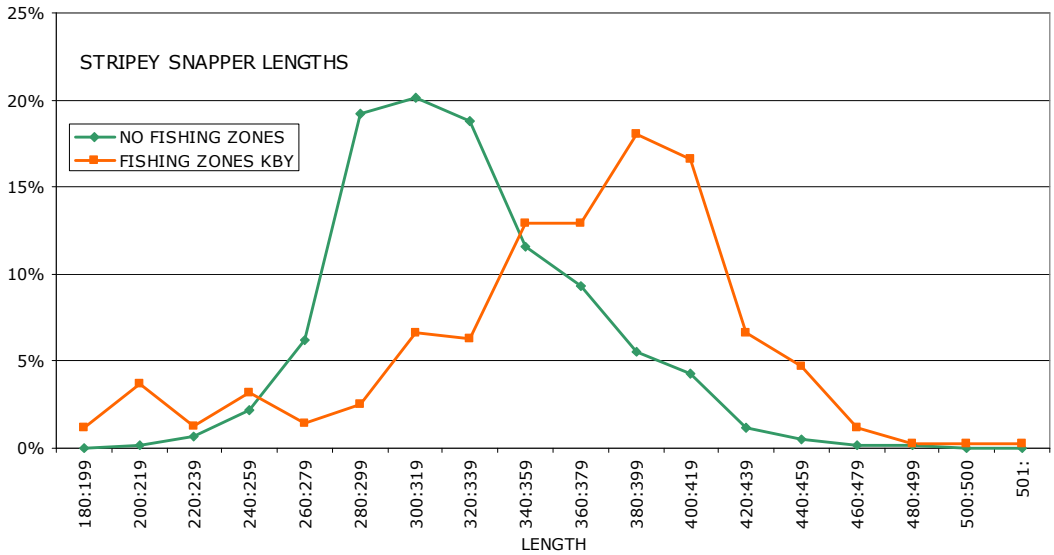


Figure 78: Length/frequency of Stripey Snapper in no fishing and fishing zones

2.2.3 Is there evidence of "spillover" from green zones?

In 2007 JCU initiated a project titled "Larval dispersal, population connectivity and export effects of no-take marine reserves on the Great Barrier Reef". The objectives of the project were to determine scales of larval dispersal and population connectivity for target fish species, and to establish if green zones within the Keppel Islands were contributing both larval and adult fish to surrounding blue zones.

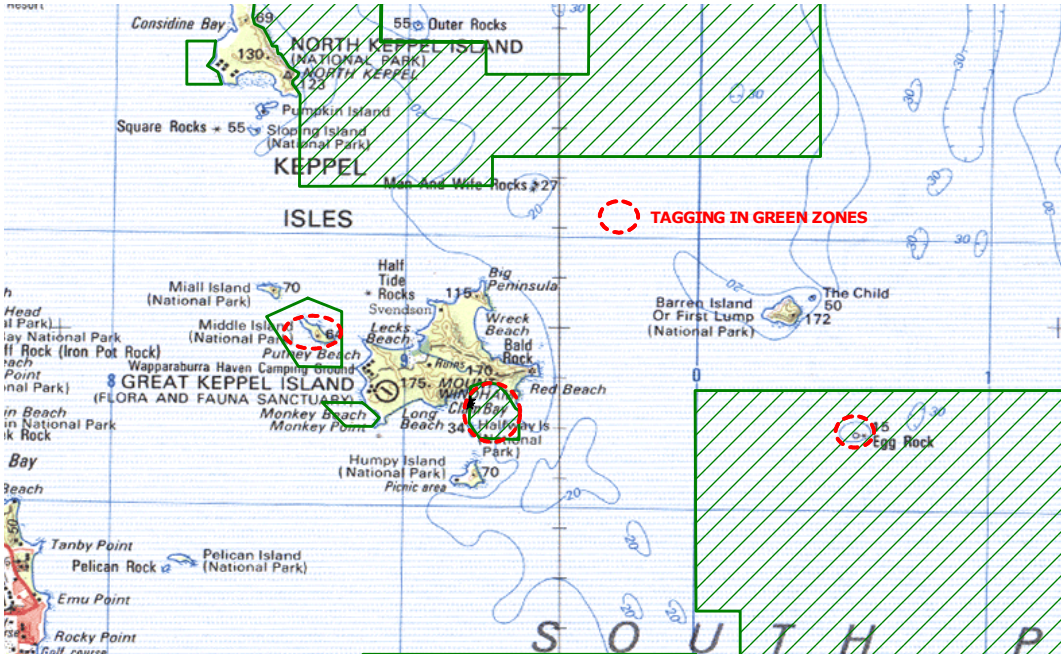


Figure 79: Green zones around the Keppel Islands where tagging was undertaken

Fish in 3 green zones around the Keppel Islands as shown in *figure 79* were tagged, chemically marked with an enriched stable barium isotope and fin clipped to obtain DNA samples. Tagging was carried out under GBRMPA permit over 2 periods, the first in November-December 2007 and the second in January- February 2008. Local recreational fishers involved in CapReef and local sportsfishing clubs assisted with the catch and release fishing in the green zones. Each boat had a number of fishers that caught the fish and were supported by a researcher that was responsible for tagging, measuring, chemical marking, fin clipping and data recording. This proved to be an efficient method of conducting the work and a large number of fish were captured, tagged and released.

A total of 6,145 fish of 46 species were tagged with the number for the 18 top species in *table 20*. During the tagging period there were 1,213 (19.7%) individual fish recaptured and of these 633 were recaptured more than once.

Following the tagging there have been 23 fish recaptured outside the green zone they were tagged in as shown in *table 21*. Of these 19 were recaptured close to where they were tagged. All were recaptured on a patch of reef that is bisected by a green zone boundary and were likely to have moved less than 100m. Only 4 (0.07%) fish were recaptured away from the green zone where they were tagged. One Coral Trout moved 127km south east to Bustard Head.

Tagging was completed in early February 2008. At that time there was a moderate flood in the Fitzroy River and the freshwater plume reached the Keppel Islands and the green zones around that time. It was considered that this flood plume was an event that could trigger movement of fish however there was very little evidence of that occurring.

Following the tagging there has also been sampling of larval fish within the Keppel Islands and on surrounding reefs to determine if any had the barium signature that would identify their parentage from the green zones. Processing of samples is currently still underway, no

results are yet available from the larval sampling, but the researchers expect to have the results completed early in 2010 and available for public dissemination soon after.

> ***Tagging of reef species in green zones around the Keppel Islands showed little evidence of "spillover" of adult fish***

Species	Tagged	Recaptured once	Multiple recaptures
LONGFIN ROCKCOD	3102	639	359
STRIPEY SNAPPER	1375	320	188
BARCHEEK CORAL TROUT	409	92	38
RED EMPEROR	229	64	16
BLUE TUSKFISH	224	38	17
GOLDSPOTTED ROCKCOD	152	23	12
MOSES SNAPPER	135	9	1
PAINTED SWEETLIPS	106	3	1
GRASS EMPEROR	89	6	0
SPECKLEFIN ROCKCOD	53	2	0
Cephalopholis cyanostigma	53	1	0
SADDLETAIL SNAPPER	37	2	0
Chromileptes altivelus	31	2	0
REDTHROAT EMPEROR	19	2	0
SPECKLEFIN GROUPER	18	2	0
COMMON CORAL TROUT	14	4	1
BLACKTIP ROCKCOD	13	2	0
SPANGLED EMPEROR	12	2	0

Table 20: Numbers of reef species tagged and recaptured in green zones

Species	Number of fish	Distance
BARCHEEK CORAL TROUT	1	127
LONGFIN ROCKCOD	1	5
BARCHEEK CORAL TROUT	2	2
GRASS EMPEROR	1	0
LONGFIN ROCKCOD	15	0
STRIPEY SNAPPER	3	0

Table 21: Number of species caught outside the green zone and the distance moved

2.2.4 Can changes be made to the size limit of key species?

Within the CapReef area there are 2 species where recreational fishers consider that the current size limits are not appropriate and have requested that data be collected on these species for use in any future review of management arrangements. These species are:

- Longfin Rockcod
- Barred Javelin

For details on Longfin Rockcod see sections 2.1.5.2 and 5.4.2. For details on Barred Javelin see section 2.1.6.

Q2.3 What are the likely effects of climate change on fish stocks?

2.3.1 Can CapReef assess the effects of climate and rainfall change on fish species and catches?

To assess the effects of climate and rainfall change on fish species and catches it is necessary to have long term data on both fish and weather. In the Capricorn area Suntag has been collecting tag data on Barramundi since the mid 1980s and monitoring of recruitment has been underway since the late 1990s. This data provided the opportunity to examine the effects of variations in rainfall and temperature on Barramundi recruitment.

A predictive model was developed for Barramundi recruitment that linked recruitment to river flows in the Fitzroy River and to local coastal rainfall. The model was tested with data from 1984-2007. A report was produced in 2008 that examined the effects of local climate on Barramundi.[16]

Since the report there have been 2 years where conditions have been favourable for strong Barramundi recruitment and monitoring has confirmed that with a very high level of recruitment in 2008 and high recruitment in 2009. This is the first time in over 20 years that there has been 2 successive years where recruitment has been strong. The last time this occurred was in 1991-92. The model does not show 1992 as having the right conditions for strong recruitment, especially river flows however there was good local coastal rainfall in the catchment and this followed a year where there was a near record flood.

YEAR	FLOW AND TIMING				RECRUITS		FITZROY RIVER			12 MILE	
	monthly flow> 0.4GL	wet season flow> 1.5GL	Max flow Jan/Feb	monthly 12 mile rain>140mm in Jan/Feb	Fitzroy recruits <350mm	12mile recruits <350mm	wet season flow	monthly flow	flow timing	12 mile rain	rain timing
1988	√	√			73	41					
1989	√	√	√	√	56	0					
1990				√	9	0					
1991	√	√	√	√	227	117					
1992					27	0					
1993			√		5	0					
1994	√	√		√	29	0					
1995			√	√	21	5					
1996	√	√	√	√	1271	1236					
1997	√	√			37	18					
1998			√		5	0					
1999	√	√			80	49					
2000			√	√	31	9					
2001	√	√	√	√	253	193					
2002			√		44	7					
2003	√	√		√	42	14					
2004	√		√	√	189	11					
2005			√	√	140	24					
2006					68	6					
2007					29	0					
2008	√	√	√	√	546	385					
2009	√	√	√	√	193	48					

Conditions outside range
Conditions close to range
Conditions inside range

Figure 80: Model of Barramundi recruitment in the Fitzroy River system 1988-2009

[16] See report "Use of 12 Mile Creek by Barramundi: Effects of Local Climate 1984-2007"

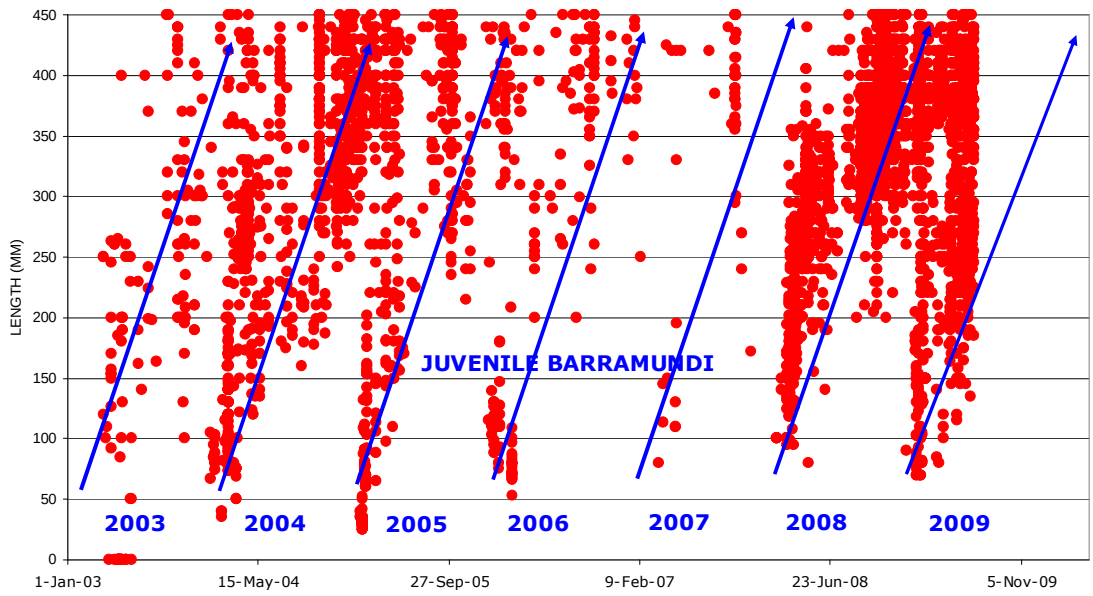


Figure 81: Number of juvenile Barramundi recorded in the Fitzroy River system from 2003-2009

Figure 82 shows the model used to predict Barramundi recruitment and the number of recruits detected each year in the Fitzroy River system and 12 Mile Creek. *Figure 83* shows the number of juvenile Barramundi recorded over time from 2003-2009. Arrows show the growth of recruits over time. The density of dots indicates the strength of recruitment each year.

> ***Barramundi recruitment in the Fitzroy River system is dependent on river flows and local coastal rainfall with good recruitment occurring when river flows exceed 0.4GL in January-February, 1.5GL over the wet season and local rainfall of over 140mm in January-February***

> ***There was a strong recruitment of Barramundi in both 2008 and 2009 when flows and rainfall were within the required parameters***

> ***Monitoring Barramundi stocks and recruitment will provide an early warning on the possible effects of climate change***

2.3.2 What was the effect of the 2008 flood in the Fitzroy River and coastal streams on fish stocks?

The 2008 flooding resulted in a moderate flood in the Fitzroy River (11.8M ML from December to March[17]) and adjacent coastal streams north and south. This followed a number of dry years that significantly impacted local wetlands used by fish. Many of the lagoons on the Fitzroy floodplain dried up with the loss of all fish. The Woolwash Lagoon dried up in 2005 with a significant loss of Barramundi and other fish. The Frogmore Lagoon dried up in 2006, again with a significant loss of Barramundi and other fish.

Figure 84 shows Frogmore Lagoon several days before then several days after the flooding in 2008. Barramundi, including recruits, used this flow to access this and other lagoons. The lagoons were not connected back to the river in 2009 so all fish have been landlocked since 2008. Since then there have been numbers of Barramundi tagged in these lagoons as shown in *table 22*.

The 12 Mile Creek is a well recognised Barramundi nursery area on the Fitzroy River delta. During the dry years of 2006 and 2007 there were 2 major fish kills there which

[17] Flow data from the Gap gauging station 130005A on the Fitzroy River

reduced Barramundi and other species to very low or even non-existent levels. While the creek was not affected by the flooding in the Fitzroy River it was affected by local flooding.

Figure 82: Frogmore Lagoon at Roopes Bridge several days before and after the flooding in the Fitzroy river in January 2008

The 2008 flood allowed juvenile Barramundi to access freshwater and brackish wetland lagoons on the Fitzroy River floodplain in significant numbers

Over 1,000 juvenile Barramundi have been tagged in both 12 Mile Creek and Frogmore Lagoon since the 2008 flood indicating the significance of these wetland lagoons

Waterway	Barramundi	Method
12 Mile Creek	1002	Linefishing and castnetting
Bates Lagoon	2	Electrofishing and linefishing
Frogmore Lagoon	1279	Electrofishing and linefishing
Woolwash Lagoon	2	Electrofishing and linefishing
Yeppen Lagoon	65	Electrofishing and linefishing
Springers Lagoon	0	Electrofishing
Fairlybower Lagoons	0	Electrofishing

Table 22: Barramundi caught in Fitzroy floodplain lagoons following the 2008 flood

2.3.3 What is the value of freshwater flows to the marine system and offshore fisheries production?

CapReef examined historical fishing clubs catch records to determine if there was a link between flooding in coastal rivers and stream and coastal and offshore catch rates. A report was produced in 2008 that showed there was an immediate response through increased catch rates following flooding over the past 28 years.[18]

The 2008 flood coincided with the release of that report and provided the opportunity to use the data collected by CapReef to further test that relationship.

Offshore catch rates of the Yaralla Fishing Club were compared with flows in the Fitzroy River[19] between November of the previous year and March of the same year (the previous wet season). Coastal catch rates for the Wanderers Fishing Club at Cape Capricorn were also compared with flows in the Fitzroy River and catch rates in Gladstone Harbour with flows in the Calliope River[20] and the estimated flows in the Boyne River.[21]

Figure 85 shows the catch rates for the Wanderers Fishing Club for Gladstone Harbour compared with the summer (wet season) flows. *Figure 86* shows the catch rates the that club at Cape Capricorn compared with river flows and *figure 87* shows the catch rates for the Yaralla Fishing Club in the Capricorn-Bunker Group compared with river flows. All models show a period where catch rate increases only slightly with flow, then a period where catch rate increases exponentially then an upper level where the influence once again decreases.

Examination of the two models based on Fitzroy River flows (Cape Capricorn and Great Barrier Reef) shows that both begin and end the exponential growth phase at the same wet season flows (*figures 86 and 87*). When compared with the mean annual flow and median annual flow (solid vertical line and dotted lines respectively), the asymptote where exponential growth begins corresponds closely with mean annual flow (solid line) and is greater than the median annual flow (dashed line). In Gladstone Harbour the asymptote lies between the mean annual flow for the Calliope (dashed line) and the mean flow for the Boyne and Calliope combined (solid line).

> ***Coastal and offshore catch rates increase exponentially when the median or mean annual flow in adjacent rivers is exceeded however reach an upper limit where additional flow does not result in improved catch rates***

[18] See report "Do river flows affect coastal and offshore catch rates? A numerical model of fisheries response to flow regime change in the estuaries and Great Barrier Reef Waters in Central Queensland"
[19] River flows at Gap gauging station 130005A
[20] River flows at Castlehope gauging station 132001A
[21] See report "Do river flows affect coastal and offshore catch rates?"

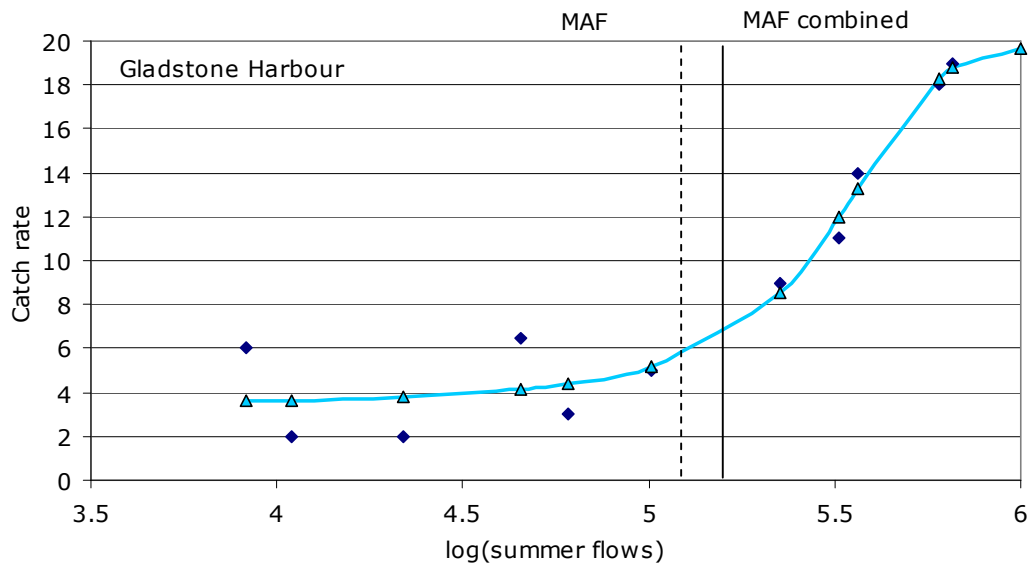


Figure 83: Modelled (triangles) and observed catch rates for Wanderers Fishing Club for Gladstone Harbour compared with wet season flows of the Boyne and Calliope Rivers. Solid line is the average wet season flows of the combined Boyne and calliope Rivers (MAF combined), dashed line the flows of the Calliope alone (MAF)

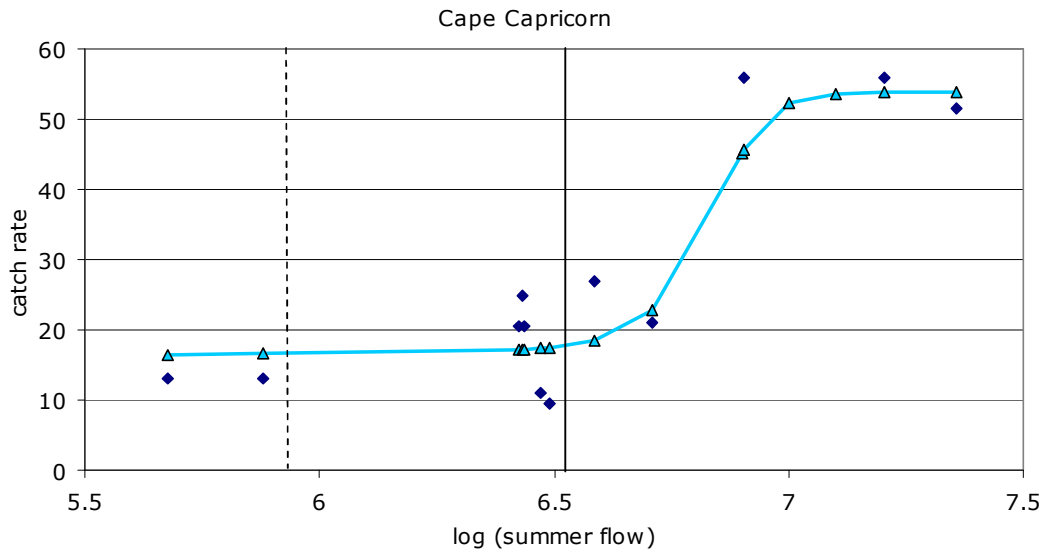


Figure 84: Modelled (triangles) and observed catch rates for Cape Capricorn compared with wet season flows of the Fitzroy River. Solid vertical line demonstrates mean wet season flow, dashed line median wet season flows

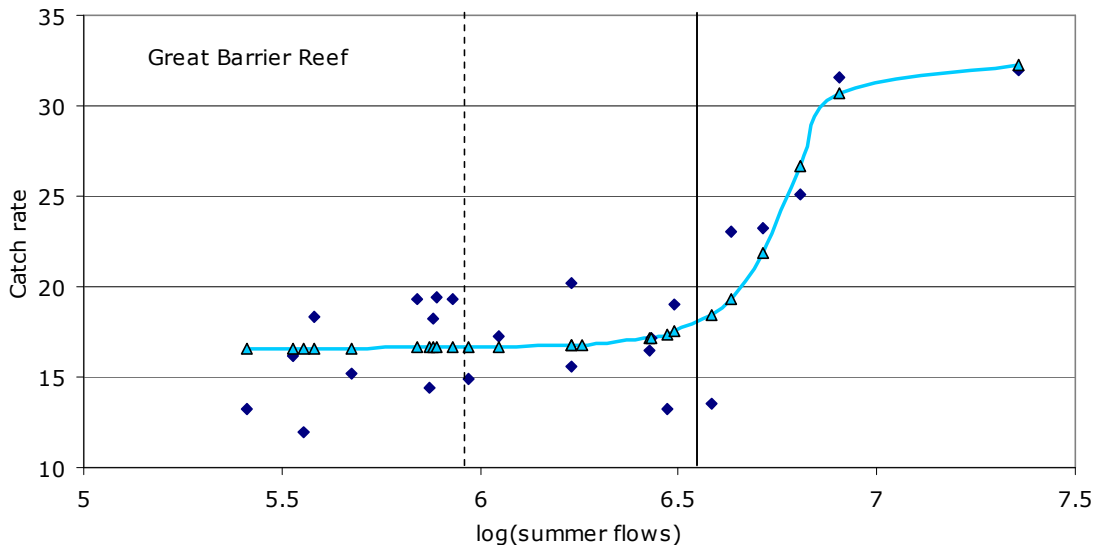


Figure 85: Modelled (trianges) and observed catch rates for the Great Barrier Reef site compared with wet season flows of the Fitzroy River. Solid vertical line demonstrates mean wet season flow, dashed line median wet season flows

2.3.4 Can CapReef provide data to water managers to quantify the value of environmental flows?

CapReef has provided data to the Department of Environment and Resource Management (DERM) on Barramundi growth, movement and recruitment to allow an assessment of the effects of water allocation and regulation on fish. The following is a summary provided to the Water Resources (Fitzroy Basin) Plan 1999 review.[22]

As a part of the Water Resource (Fitzroy Basin) Plan 1999 review, ecological risk assessments were undertaken to examine the implications of flow regime changes from water resource development on the long term viability of ecological assets. The risk assessment approach was based on methods developed for population viability analysis and was formalised through the construction of conceptual models, knowledge acquisition, and the construction of semi-quantitative and quantitative population models. A variety of data sources were used in the development of risk assessment models, including literature reviews, monitoring data and expert advice.

One asset assessed included Barramundi. The Fitzroy estuary and surrounding creek systems, is one of a few worldwide which have had detailed research conducted on the effects of freshwater flows on barramundi populations.

One such project, which was produced under the CapReef program, included 'Use of 12 Mile Creek by Barramundi: Effects of Local Climate 1984-2007' (Sawynok and Platten 2008). This report was the culmination of 23 years of research collected under a number of monitoring and tagging programs and research organisations, also documented aspects of Barramundi recruitment within the Fitzroy estuary and surrounding creek, wetland and lagoon systems. The objectives were to (Sawynok and Platten 2008):

1. Describe the use of 12 Mile Creek by Barramundi over the 23 year period.
2. Describe the influence of local climatic conditions, especially rainfall, on the use of the habitat by Barramundi.
3. Review long term trends on the use of 12 Mile Creek by Barramundi in relation to changes in the local climate.

[22] Summary report provided by Bernie Cockayne of Department of Environment and Resource Management

Recruitment of Barramundi into 12 Mile Creek was found to be dependent on the success of spawning in the adjacent Fitzroy River delta, the timing and volume of Fitzroy River flows and localised coastal rainfall events (*figures 80 and 86*). Strong recruitment was observed when the total volume of wet season flows were > 1500 GL, the timing of the maximum flow events occurred during January and February, at least one monthly wet season flow exceeded 400 GL and when the localised rainfall during January and February exceeded 140 mm (green shading in *figure 80*). In years when either the timing or the flow volume were outside the range (red shading in *figure 80*) then recruitment was significantly low. In the remaining years when conditions were close to the range (yellow/green shading in *figure 80*) there was a moderate level of recruitment.

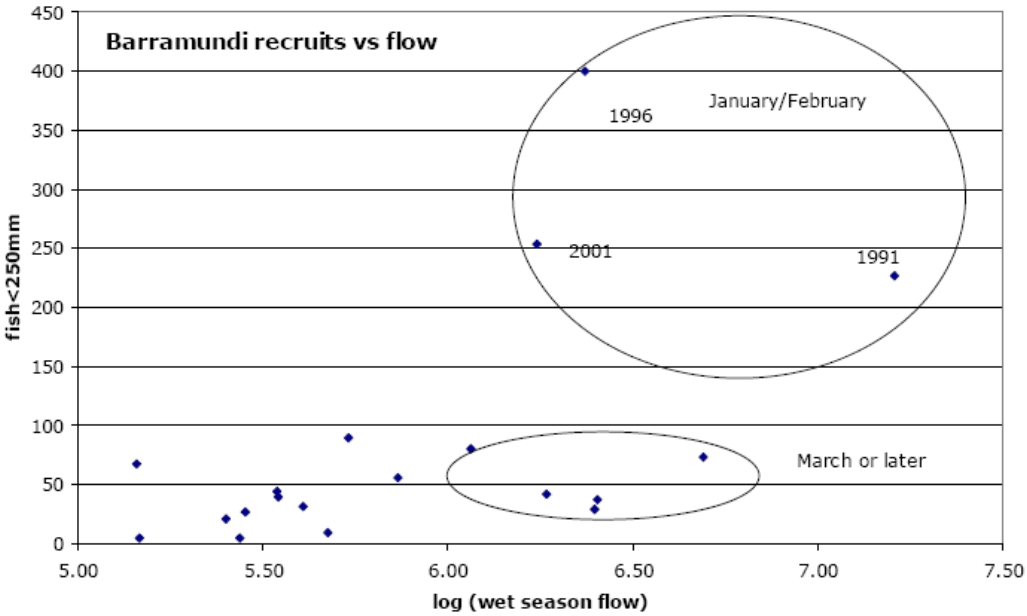


Figure 86: Recruitment of Barramundi in 12 Mile Creek related to log wet season flows (November-March). [Note the reduction in scale of 1996 recruitment which was actually 1,271] (adapted from Sawynok & Platten 2008)

The flow parameters of the Barramundi recruitment model were applied to the log10 wet season (November to March) IQQM modelled flow data. Three IQQM flow scenarios were tested which characterised natural flow regimes (i.e. pre-development scenario), current flow regime (i.e. current development flow scenario), and future development flow regime (i.e. full development- which reflects the flow regime with increased development provided for under the existing Fitzroy WRP). A yearly time series of juvenile Barramundi recruitment was created for each flow scenario.

Strong Barramundi recruitment occurred when all flow and rainfall conditions were met. A high risk profile (i.e. potential local population failure) was defined as any year where the number of consecutive years without strong recruitment exceeded the most common longevity of Barramundi, 11 years. A moderate risk profile was defined as any year where the number of consecutive years without strong recruitment was between the average age of protandry of five years (Pusey et al. 2004, Sawynok pers com) and the high risk profile. All other years were deemed as being low risk to Barramundi populations. Overall risk from water resource development was interpreted as a change in the risk profiles (i.e. relative proportion of each risk category) between the pre-development scenario and the two development scenarios.

Overall risk to Barramundi populations was low for the pre-development case, with over 94% of the modelled years having a low risk profile (*figure 87*). The risk profiles for both development cases were similar and showed a higher risk as a result of water resource management. Approximately 3% of years were at high risk (i.e. the number of years since strong recruitment opportunities exceeded Barramundi longevity) and 14% at moderate

risk (i.e. the number of years since strong recruitment opportunities exceeded the age at protandry, but less than Barramundi longevity). Fewer than 83% of years were under low risk. These results indicate that the value of a persistent population of Barramundi in 12 Mile Creek is potentially at higher risk under both development scenarios evaluated.

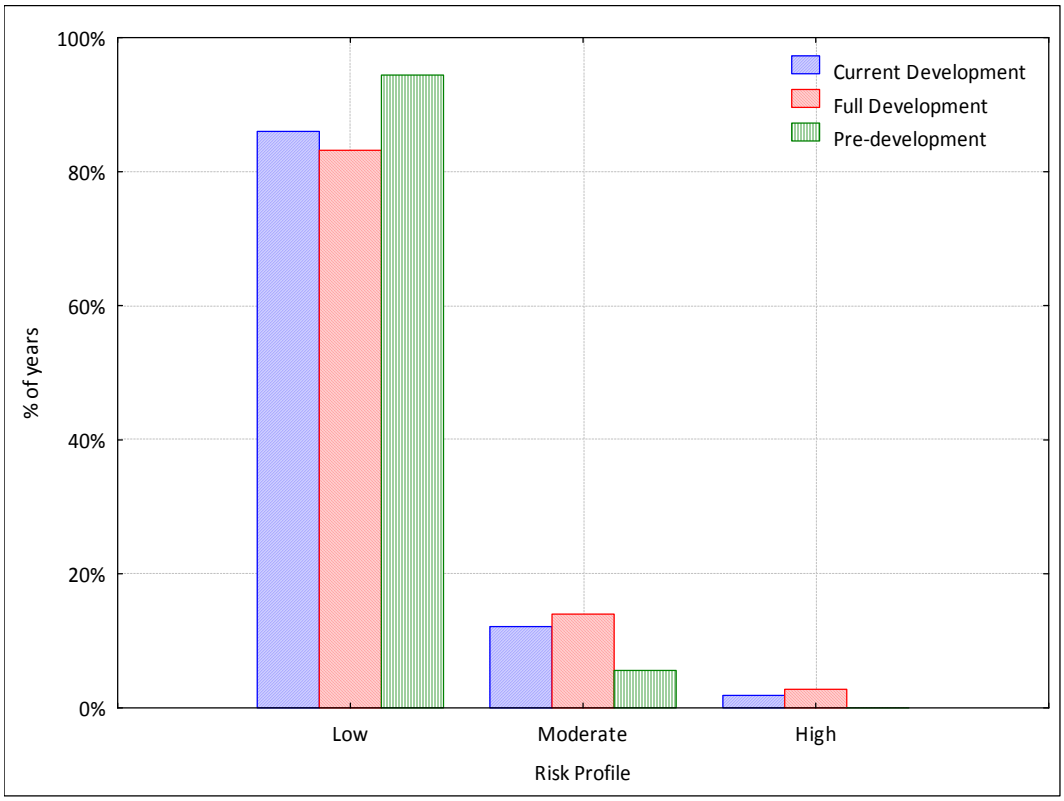


Figure 87: Potential risk profile of Barramundi persistence in 12 Mile Creek

> ***The risk profile of water allocation to development in the Fitzroy River indicates that the value of a persistent population of Barramundi in 12 Mile Creek is potentially at higher risk under current and full development scenarios than under pre-development conditions***

2.3.2 What is the carbon footprint of recreational fishing in the CapReef area?

This question was added in the 2008/09 year and no attempt has yet been made to address this question.

Q3 How can we develop and utilise the social capital and social networks of the local region in support of socially, economically and ecologically sustainable management of fish resources and the fisheries they support?

Q3.1 What can CapReef contribute to research projects and monitoring programs such as QPIF Long Term Monitoring Program (LTMP)?

CapReef has been a catalyst for a number of research projects in the area and these have provided valuable additional data that has helped to understand the status of fish resources and recreational fishing. CapReef assisted with data collection and provided data to a number of research projects. These were:

- Expenditure survey for CQUA
- Commercial fishers survey for JCU
- Attitudinal survey for JCU
- Boat ramp survey data on reef species for JCU
- Tagging fish in green zones for JCU
- Habitat usage by Coral Trout for CQUA

The interaction of researchers and government agencies with those involved in CapReef and the local fishing community has helped in breaking down the barriers and developing trust between government, science and the community.

> ***CapReef has been a catalyst for a number of research projects that have helped build relationships between government agencies, researchers and the community and improved understanding of the status of fish resources***

At the commencement of CapReef, QPIF had its own arrangements for its LTMP collection of fish frames at boat ramps through the employment of a casual staff member. During 2007 the staff member resigned and QPIF approached CapReef to take over the responsible for the collection of frames under contract. The contract commenced in 2008 and continues through 2009.

Species for which frames are collected from recreational fishers with target numbers of frames for 2009 are:

- Spanish Mackerel (100)
- Spotted Mackerel (100)
- Grey Mackerel (opportunity basis)
- Barramundi (50)

Frames are also collected from other species for other researchers which are:

- King Threadfin for UQ and JCU
- Barcheek Coral Trout for CQUA

At the time of writing this report CapReef has almost met its target for Barramundi frames and is over halfway towards the Spanish Mackerel target. Few Spotted and Grey Mackerel frames have been collected due to very poor catches.

> ***CapReef is assisting the QPIF Long Term Monitoring Program and other researchers by collecting fish frames***

Q3.2 Can the CapReef concept be extended to other areas?

When CapReef was established in 2005 its area of focus was the area extending from Stanage Bay to Bustard Head. Interest was shown in the CapReef concept from the Bundaberg area and this was added as the southern area of CapReef in 2007.

Interest was also shown from the Mackay area and MackReef was established in 2008 as an autonomous program to collect data in that area. CapReef is providing some support with advice and training.

Following the recent establishment of the Moreton Bay Management Plan the Moreton Bay Access Alliance has also shown interest in establishing a CapReef type program for Moreton Bay.

Interest has also been shown in the Cairns and Mossman areas. In 2008 a trial collection of data was undertaken during the Port Douglas fishing competition however no monitoring program has been established.

An assessment of community monitoring in fisheries is being undertaken by the Department of Agriculture, Fisheries and Forestry (DAFF) in 2009. CapReef and Suntag are programs being included as part of that assessment and a report is expected before the end of 2009.

The greatest difficulty in establishing programs such as CapReef is the lack of recognition of and provision of funding opportunities by government agencies and funding bodies.

> ***In 2007 CapReef was extended to cover the Burnett area and MackReef has been established in the Mackay area however funding is the greatest constraint in getting programs established elsewhere***

Q3.3 Can the CapReef concept be extended interstate?

In 2009 the King Ash Bay Fishing Club was successful in gaining funding for a CapReef type program on the McArthur River in the Northern Territory. This project aims to use community resources to monitor Barramundi stocks in the McArthur River and is being set up with the support of Northern Territory Fisheries.

The project is using a similar approach to CapReef and is being supported by Infofish Services. The project is being funded by the McArthur River Mine Community Benefits Trust. It commenced in June 2009 and will be completed in April 2011.

> ***A Barramundi monitoring program along the lines of CapReef has been set up on the McArthur River in the Northern Territory in conjunction with the King Ash Bay Fishing Club and with the support of Northern Territory Fisheries***

Q3.4 Are community monitoring programs such as CapReef worth the investment?

This is a question that has been posed primarily by some government agencies, in particular by fisheries agencies. There is a view among some fisheries managers and some fisheries researchers that community data cannot be used as it has not been collected in a scientific way and therefore cannot be used to underpin management decisions or policy development.

However community monitoring has other benefits which can lead indirectly to better management and policy decisions. This is through the development of stewardship, partnerships and the building of trust that will allow a greater involvement of the community in decision processes.

This is not a question that CapReef can answer. It can only be answered by those that seek to pass judgment on CapReef. What we can say is that the delivery of this report provides a means for those to make such a judgment.

In early 2009 the Bureau of Rural Science initiated a review of community monitoring in fisheries around Australia. The review involved 6 community monitoring programs or projects. Three of the programs were community based while the other 3 were government programs. CapReef and Suntag were 2 of the community based projects reviewed. As part of the review a number of key informants from CapReef and Suntag were interviewed as well as users of the information generated. The report is expected to be available before the end of 2009.[23]

> ***CapReef and Suntag have been included in a national review by the Bureau of Rural Science of community involvement in recreational fisheries data collection and a report is expected before the end of 2009***

[23] Report titled "Community involvement in recreational fisheries data collection: Opportunities and Challenges" Nyree Stenekes and Phil Sahlqvist - Bureau of Rural Science (in preparation)

5. Status of Fish Resources in Central Queensland

CapReef was designed to provide evidence that is useful in indicating the status of fish stocks in Central Queensland. There are two types of evidence that is provided. Some evidence is fishery dependent. That is it is based on the statistics of the catch. Factors such as trends in catch rate can give indications of the status of fish stocks provided that catch increases or decreases are directly dependent on the number of fish present. This is not necessarily the case. For instance fish can be present but be difficult to catch. For this reason a second fishery independent line of evidence (using BRUV data) was collected to provide a comparison of trends. The BRUV on its own could not be used often enough or in as wide a range of locations as was necessary to provide sufficient information. However in combination with the fishery dependent measures reliable trends should be possible.

5.1 Status of offshore fish stocks

5.1.1 Catch rate information

Overall catch rates have been variable. From 2005/06 to 2006/07 the overall trend was down however since the flood in 2008 catch rates have risen to the highest observed. Over the 4 years of the project catch rates have risen both in terms of total catch and kept catch (*figure 88*). This suggests that fish stocks at least remain robust.

However the CapReef area fishery is based on a number of species and general trends may not apply to all species. Section 1.2.1.1 suggests that the overall trend in catch rates is reflected in most species. Only a very few did not show an overall increase in catch rate over the last 4 years. The exceptions to this are pelagic species particularly the Mackerels. These are considered below.

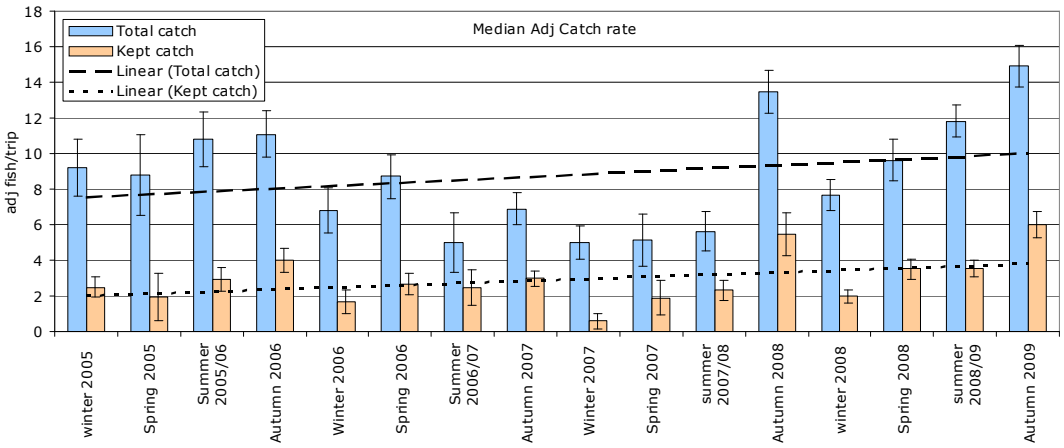


Figure 88: CapReef Capricorn offshore catch rates each season from 2005-2009

5.1.2 BRUV information

If the trends in catch rate are not indicative of the number of fish present and in fact the number of fish are decreasing in number, despite catch rates rising, then it would be expected that BRUV measures should show that fish are observed more frequently in the catch than in BRUV observations. The data should also show that their occurrence is becoming less common (a decline in the number of fish per set and percentage of sets where the species is observed).

Figures 89 and 90 shows that of the 15 most common species observed, 11 showed an increase in the number of fish/set across 2007-2009 and 11 an increase in the number of sets where the species were observed. This suggests that catches reflect increased abundance.

Table 16 shows that the 2 species where fish were consistently more common in fishing trips than in BRUV observations were Grass Emperor and Stripey Snapper. However these species were observed frequently in the BRUV and there is no evidence to suggest that the species are becoming less common. In fact Grass Emperor were seen in greater numbers and a greater percentage of sets in 2008/09 than in 2007/08. There was little difference in the observations for Stripey Snapper.

Other species such as Coral Trout and Red Snapper are seen more frequently in BRUV scenes suggesting they could be more common than catch rates indicate.

The available information suggests an overall increase in the numbers of offshore species from 2005/06 to 2008/09

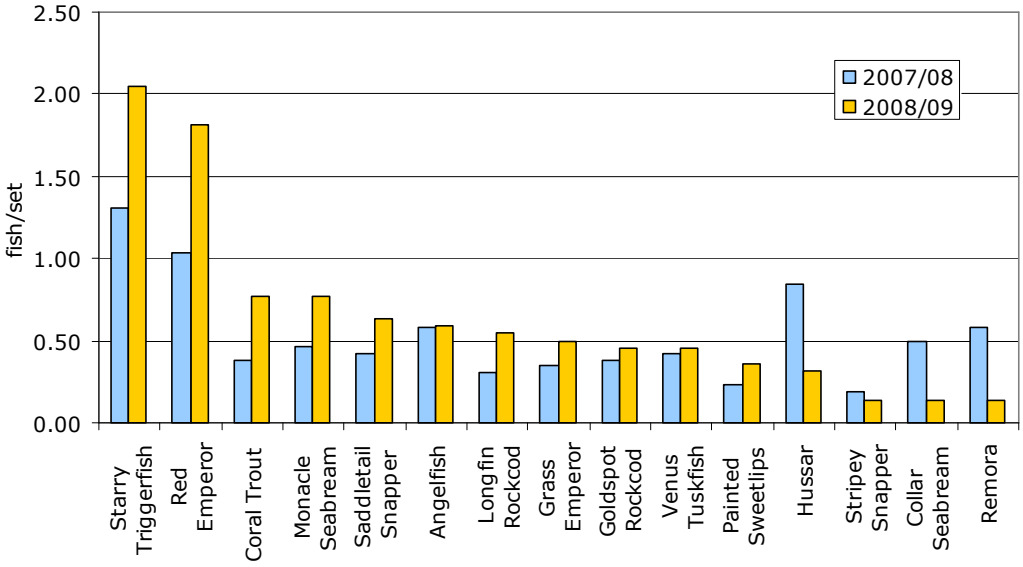


Figure 89: Fish/set in open zone BRUV observations in 2007/08 and 2008/09

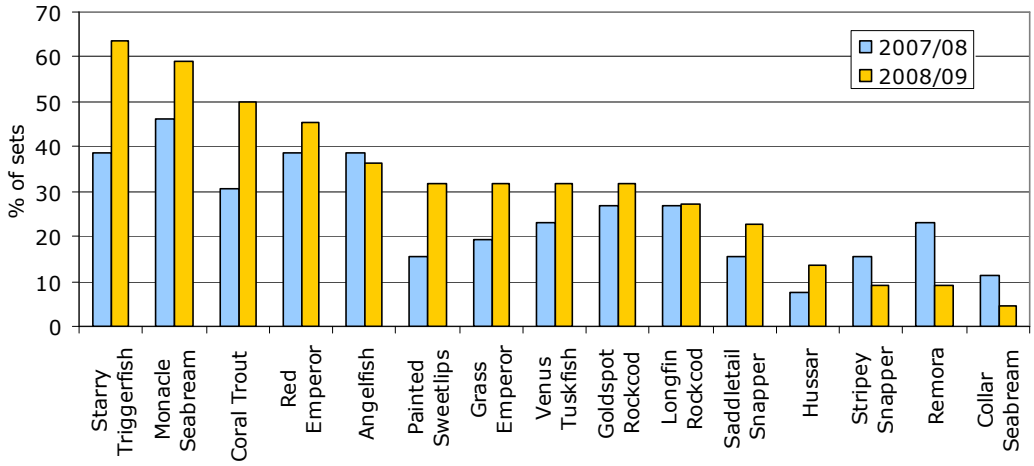


Figure 90: Percentage of Sets in open zone BRUV observations in 2007/08 and 2008/09

5.2 Status of estuary and freshwater fish resources

The BRUV was not used in freshwaters or estuaries because of the turbid waters involved. This means that no fishery independent measures are available. However if catch rates reflect fish numbers then the numbers of fish have increased over the CapReef survey periods as shown in *figures 91 and 92*. While for estuaries this covers a range of species for freshwater this primarily refers to Barramundi.

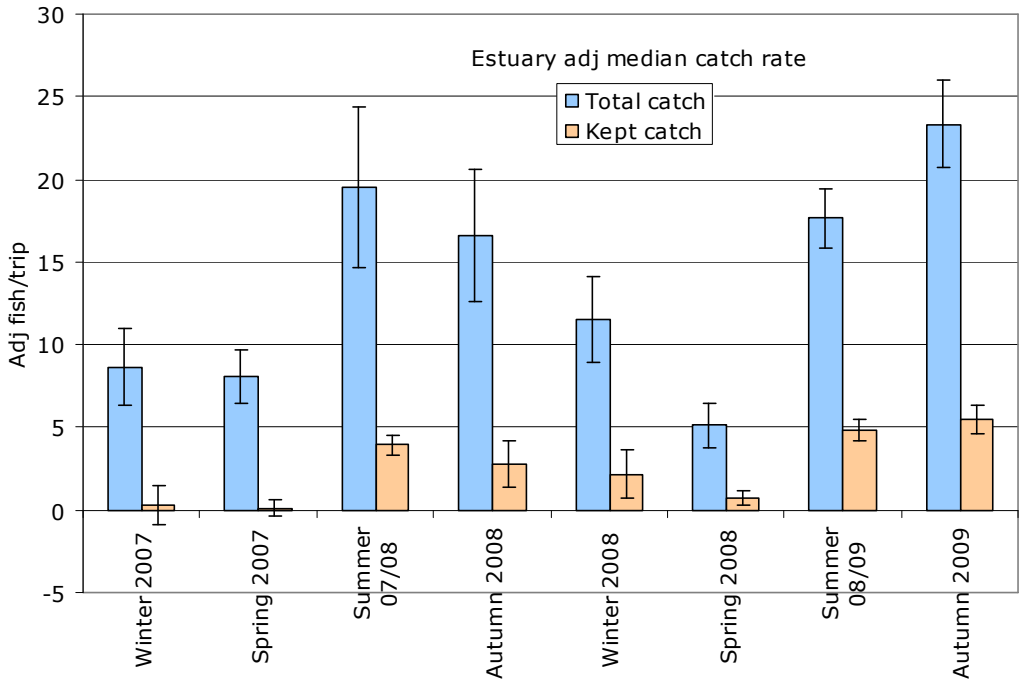


Figure 91: Estuary catch rates for each season for the past 2 years

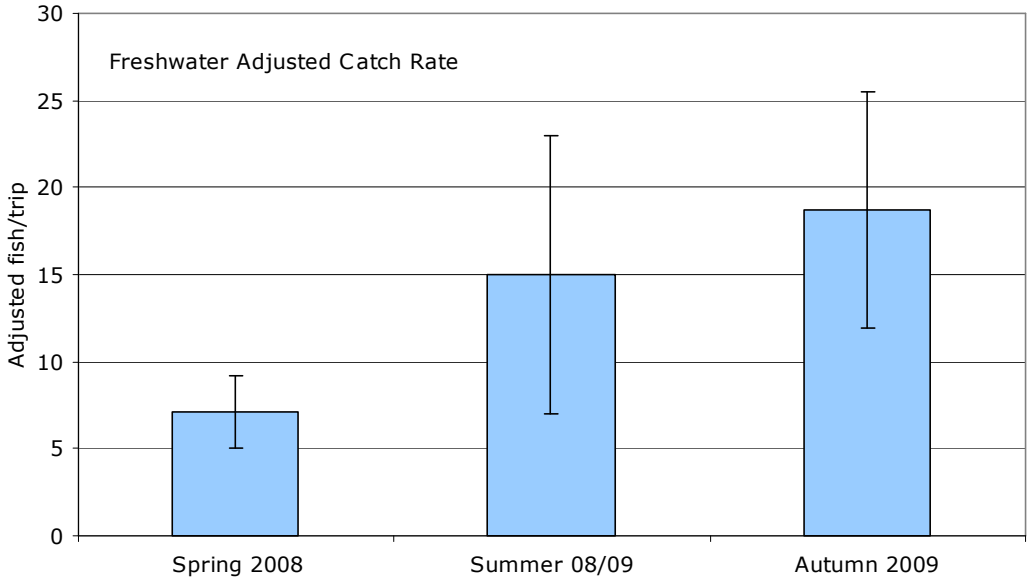


Figure 92: Freshwater catch rates for the past year

> ***The available information suggests an overall increase in the numbers of estuary and freshwater (primarily Barramundi) species from 2005/06 to 2008/09***

5.3 Recruitment

The apparent increase in fish numbers discussed above could be due to lower fishing effort or increased fish recruitment. There has been a steady increase in effort over the CapReef period and the trends in the proportion of fish kept suggest that recruitment of a range of species has been enhanced by the 2008 flood.

5.4 Species of concern

While fish stocks in the Capricorn area generally appear healthy the surveys have indicated some causes for concern.

5.4.1 Mackerel

During 2005/06 and 2006/07 Mackerel significantly contributed to catch rates. However the catch rates of both School and Spanish Mackerel have remained low (although there is some evidence of recovery in 2008/09) as shown in *figures 91 and 92*. There has been no change in size limits for this species although there has been a change in bag limits. However analysis shows that very few trips catch their bag limits and this does not seem to be the cause for falling catch rates. Of further concern for School Mackerel is that the proportion of fish released is also low (particularly if spring rates are considered). This may indicate that there are relatively few small fish present.

Spotted Mackerel are a migratory and seasonal species that show up in the Capricorn area mainly during late winter and spring. Some catches shown outside those season are possibly incorrectly identified School Mackerel. Catch rates shown in figure 93 shown a decline in catch rates each year with almost no fish in 2008/09.

During CapReef trips there have only been 265 Grey Mackerel caught in total over the past 4 years indicating that stocks of this species are very low.

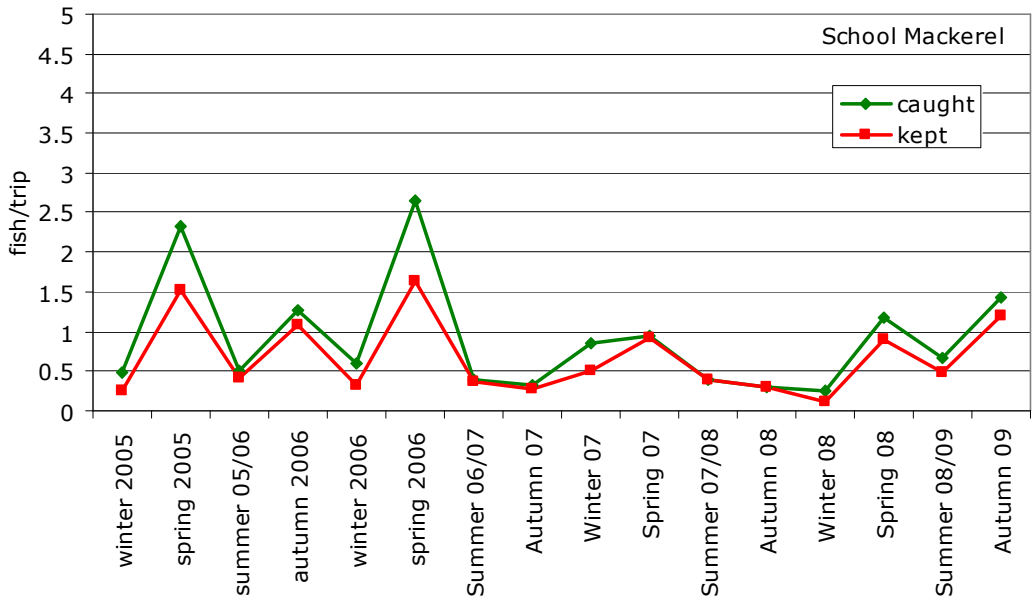


Figure 93: Catch rates for School Mackerel from 2005/06 to 2008/09

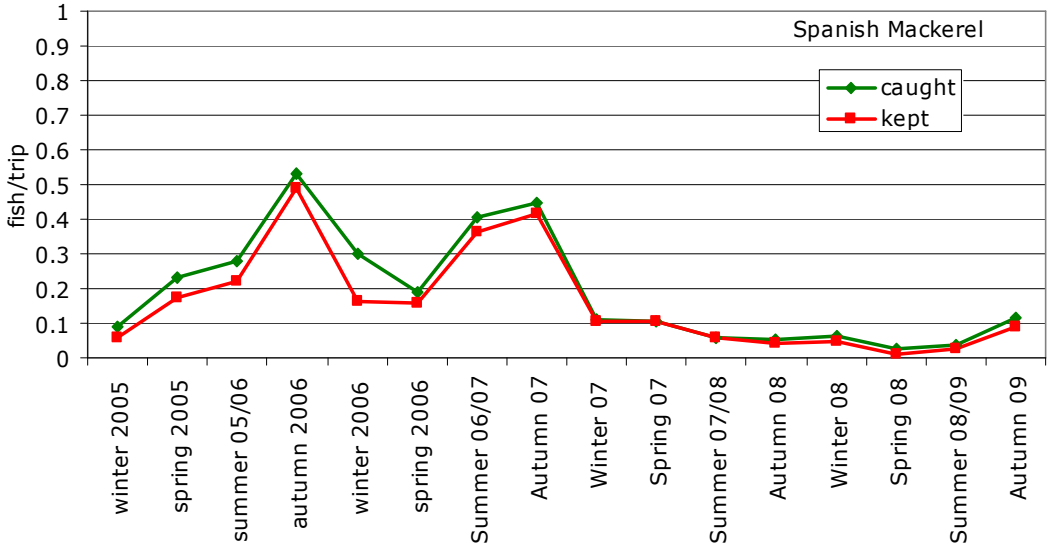


Figure 94: Catch rates for Spanish Mackerel from 2005/06 to 2008/09

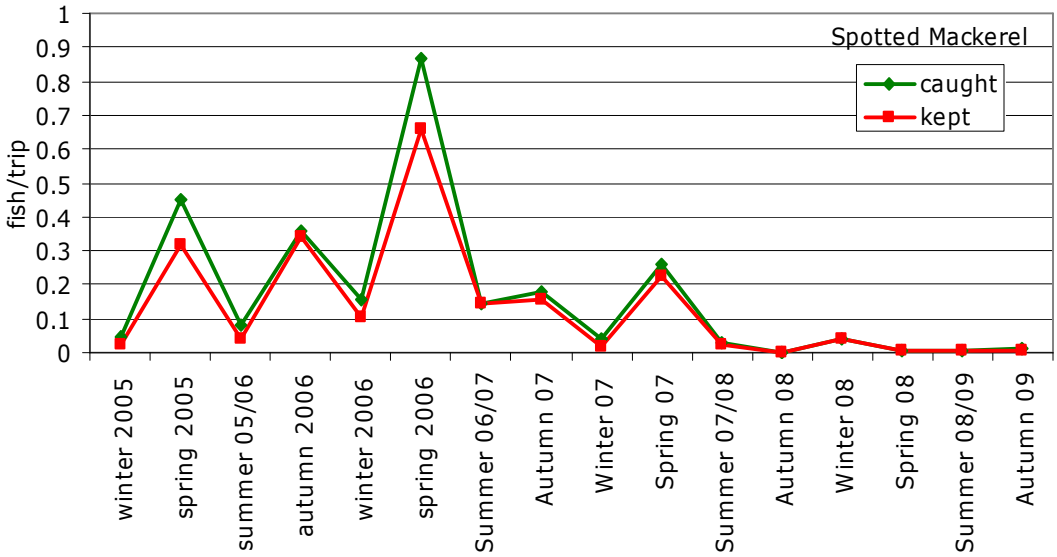


Figure 95: Catch rates for Spotted Mackerel for 2005/06 to 2008/09

> ***There is a real question mark over the status of the 4 common Mackerel species with declines in catch rates of School and Spanish Mackerel and the near non-existence of Spotted and Grey Mackerel in catches in the last 2 years***

5.4.2 Longfin Rockcod

The issues in relation to this species are quite different. Longfin Rockcod remains the most frequently captured species (particularly at inshore and island locations). However a very low percentage of fish are retained and the percentage is showing a declining trend. This is despite catch rates showing a slight increase. As stated above this may be the result of the current minimum size limit (38cm total length). The usual criterion for assigning size limits is to allow fish to spawn at least once. Information on

the size at first maturity for this species is sparse, however Lau and Li (2000)[24] list the species as becoming mature at 24.0cm total length. One recommendation from this study is to examine this issue in order to establish the size at first maturity in GBR waters.

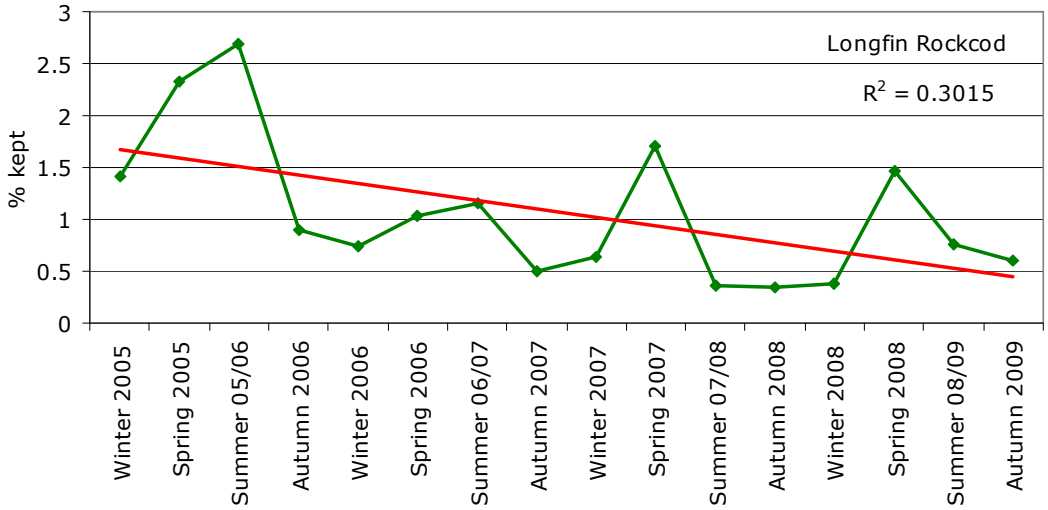


Figure 96: Percentage of Longfin Rockcod kept from 2005/06 to 2008/09

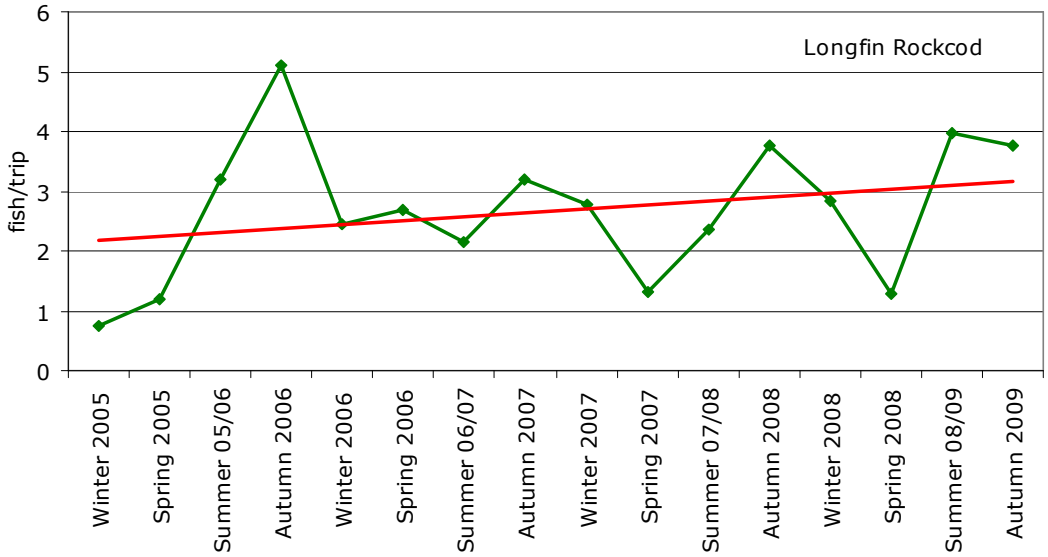


Figure 97: Catch rate of Longfin Rockcod from 2005/06 to 2008/09

Longfin Rockcod are the most common reef species caught however they are almost a no take species because of the legal minimum size of 380mm

The percentage of Longfin Rockcod kept has fallen from around 1.7% in 2005/06 to 0.5% in 2008/09 while the catch rate has risen from around 2.2 to 3.2 fish/trip

[24] Lau PPF and Li LWH (2000): Identification guide to fishes in the live seafood trade of the Asia-Pacific region: World Wide Fund for Nature Hong Kong 137 p

5.4.3 Barramundi

CapReef has collected information on Barramundi catches in estuaries since winter 2007 and in freshwater since spring 2008 however Suntag has data on Barramundi and recruitment from the past 25 years. Since 2007 the catch rate of Barramundi caught has been seasonal but increasing. However the kept proportion of the catch has not increased nor has the kept catch rate, particularly in the Fitzroy River.

This may be due to the number of small fish associated with the large recruitment events in 2008 and 2009 but this issue needs to be monitored carefully. Initial results indicate that very few legal sized fish are taken or captured by recreational fishers as reflected in the catch rates of the Rocky Barra Bounty as shown in *figures 53 and 54*.

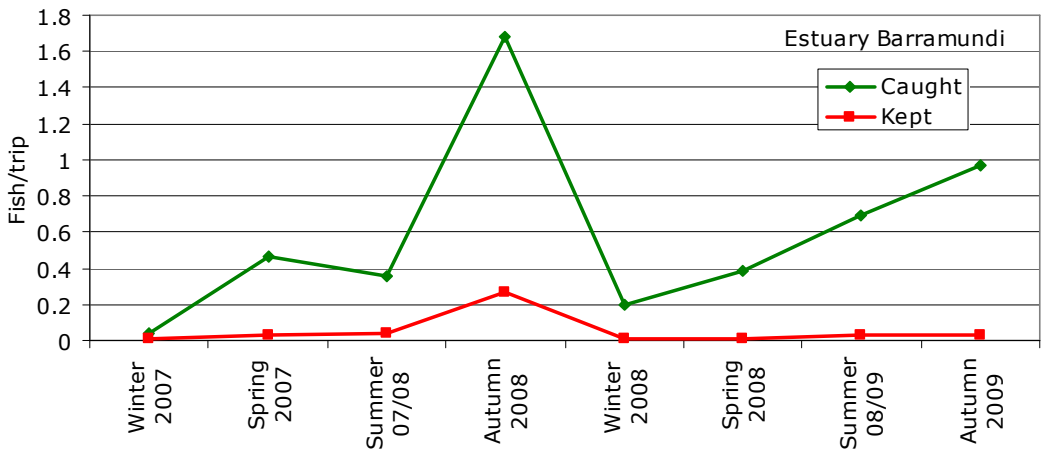


Figure 98: Estuary Barramundi catch rates from 2005/06 to 2008/09

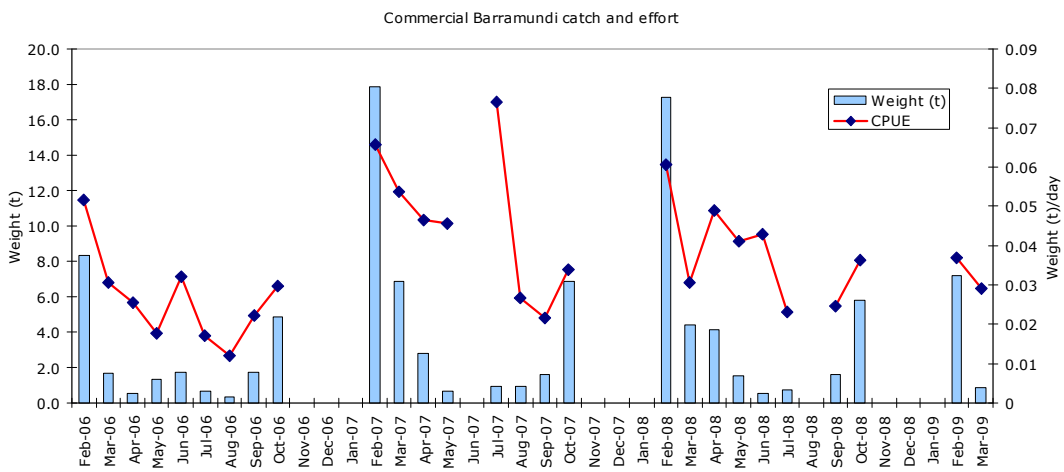


Figure 99: Commercial Barramundi catch from February 2006-March 2009

Figure 97 shows the commercial catch and catch rates of Barramundi from February 2006-March 2009.[25] Commercial fishers have expressed concern at the lack of fish in the 2009 season. Catches were down considerably on the same periods in 2007 and 2008 but were similar to those reported in 2006.

[25] Data obtained from the Qld Primary Industries and Fisheries CFISH database for grids R29 and R30 where there were more than 5 fishers in each month

The data suggests that the numbers of adult fish in the Fitzroy River are well down on previous years. This is likely to be the result of good commercial catches in 2007 and 2008 and poor recruitment in 2006 and 2007 as shown in *figures 80 and 81*. In the 2008 season commercial fishers reported significant number of tag returns from fish stocked by stocking groups in various locations above the Barrage (68 of 129 recaptures reported). The support of commercial fishers in reporting these recaptures is acknowledged. These fish migrated to the estuary during the 2008 flood and were mostly caught from February-April 2008.

There is considerable concern over the status of Barramundi stocks with the loss of habitat, high levels of fishing effort (particularly commercial), low levels of adult stocks and climate predictions.

Based on good recruitment in 2008 and 2009 it is expected that there will be a significant boost in adult Barramundi numbers in the 2010 season however the majority of fish are likely to be in the range of 580-700mm which will be fish from the 2008 recruitment.

Locally there is also considerable concern that there is an imbalance in the catch share of the recreational sector and the commercial sector. Barramundi stocked extensively by recreational fish stocking groups throughout the freshwater parts of Fitzroy River system have primarily benefited commercial fishers who caught these fish when they migrated to the estuary in 2008.

In response to the concerns about Barramundi stocks CapReef has proposed a project to develop a model that will allow Barramundi stocks to be predicted into the future. The project is titled "A 'crystal bowl' for Barramundi" and an application has been developed for submission to the Fisheries Research and Development Corporation.

> ***There is considerable concern over the status of Barramundi stocks with loss of habitat, high fishing effort, low levels of adult stocks and climate predictions***

> ***There is considerable concern over the catch share of commercial and recreational fishers, particularly as commercial fishers appear to have been the major beneficiary of Barramundi stocked by recreational fish stocking groups***

6. Conclusion

CapReef was set up in response to management changes introduced in 2004 that affected local fishing. It soon took on the role of helping the community to understand the status of our fish resources and the recreational fishery that relied on them. Along the way a series of questions were posed to CapReef about the issues and concerns of the local community.

In this report we have attempted to provide some information that will help answer those questions. We believe that from the many data sources we have accessed and the data that we have collected we have been able to develop a picture of the status of our fishery and fish resources.

CapReef has been a product of the desires and aspirations of our community. We, the CapReef team, believe that we have responded to those desires and aspirations in a way that has contributed to the knowledge base of the community, improved trust and forged new or improved partnerships with government agencies and researchers and shown that there is another way of doing things.

This report is the culmination of all those things. It is now up to the community to make its judgment on whether it considers that the investment in the CapReef experiment has been worthwhile. We believe that CapReef has been worthwhile.