Rock Flathead Stock Assessment 2012

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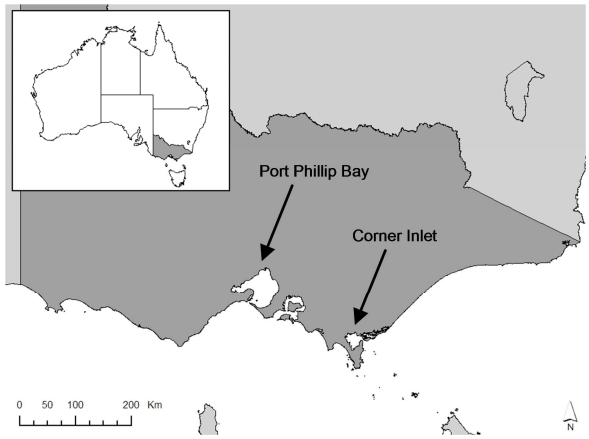
Executive Summary

Victoria's rock flathead stocks and the fisheries they support

The stock structure of rock flathead in Victorian waters is unknown. Each bay/inlet fishery is managed separately and the status of rock flathead is subsequently reported at this level.

Commercial fisheries

Victoria's total commercial harvest of rock flathead in 2010/11 was 99 tonnes. Commercial fishers catch the majority of rock flathead using mesh nets (74%), followed by haul seines (26%).



The main commercial fisheries for rock flathead in Victoria are in Port Phillip Bay and Corner Inlet.

Commercial fishers operate mainly in Corner Inlet (supplying 77% of the state-wide catch) and Port Phillip Bay (23%). The fisheries in Corner Inlet and Port Phillip Bay that harvest rock flathead are relatively small and commercial fishers use specialized fishing gear to minimize damage to the environment and the catch of unwanted species.

Commercial netting in Western Port ceased in December 2007. From 2000/01 to 2006/07 Western Port supplied 10-15% of the state-wide catch.

Recreational fisheries

Rock flathead is not commonly targeted by recreational fishers. However, expert lure fishers that have been catching rock flathead as a secondary target species in Corner Inlet have reported that there is increasing interest in the species.

Management of fisheries

Fisheries Victoria is responsible for managing fisheries and fish resources under the provisions of the *Fisheries Act 1995* and the *Fisheries Regulations 2009*.

National guidelines for ecologically sustainable development (ESD) of fisheries are used to identify environmental, biological, economic, social and governance dimensions for individual fisheries.

These ESD principles underpin the three key strategic goals of Fisheries Victoria:

Rock flathead, *Platycephalus laevigatus*.

- 'Securing' fisheries resources
- 'Sharing' fisheries resources
- 'Growing' or developing the value of the resource for the benefit of the community.

Stock assessments

Stock assessments are designed primarily to provide information on the status of fish stocks in Victoria's bays and inlets to help address biological sustainability objectives and assess management arrangements.

Rock Flathead Stock Assessment 2012

A formal assessment of Victorian rock flathead stocks was conducted at the Welshpool Town Hall, Victoria, in June 2012. The assessment workshop was attended by:

- representatives of the commercial and recreational fishing sectors
- Fisheries Victoria managers, scientists and compliance officers
- natural resource and catchment management representatives.

The assessment process for rock flathead uses a weight-of-evidence' approach that assesses available commercial fishery data including trends in catch, effort and CPUE, catch composition, and catch size/age structures. There is currently no recreational-fishery or fishery-independent data collected on rock flathead in Victorian waters.

Status of Rock Flathead Stocks

Commercial catch composition and catch rates

Corner Inlet

The commercial catch composition over the past 30 years has seen an increase in the proportion of rock flathead harvested in Corner Inlet; and over the past 10 years, there has been a continued increase. Rock flathead is recognized as a particularly important species for the Corner Inlet fishery.

Commercial mesh netting in Corner Inlet.

There have been significant increases in rock flathead catches by mesh nets over the past 30 years and catches have continued to increase over the past decade (10-year average = 39.3 tonnes, 5-year average = 45.0 tonnes, 2010/11 = 53.3 tonnes).

An abundance of crabs in the inlet once limited the soak-time of commercial mesh nets to a few hours (crabs are capable of damaging commercial catches by eating the fish that are caught in mesh nets). Commercial fishers reported considerable increases in soak-times in recent years due to an absence of crabs in the inlet. Mesh net catch rates (in Corner Inlet and Port Phillip Bay) were subsequently standardised for the effects of soak-time using commercial log-book data.

Commercial mesh net catch rates were found to be stable over the past 5 years, and are currently above the 30-year long-term average. The size/age structure of mesh net catches are also within historical ranges. These indicators suggests that rock flathead in Corner Inlet are in good condition.

Healthy fish stocks ensure great fishing.

There have also been significant increases in rock flathead catches by haul seine nets over the past 30 years and catches have continued to increase over the past decade (10-year average = 14.6 tonnes, 5-year average = 15.6 tonnes, 2010/11 = 22.7 tonnes).

Gear modifications to haul seine nets were reported to have occurred in recent years, including modifications that increase gear weight. These modifications are likely to have contributed to increasing catch rates in recent years. Because gear modifications are not reported in commercial log-books, catch rates cannot be standardised for these effects.

The continued loss of seagrass in Corner Inlet was reported to have resulted in small rock flathead having less protection from commercial fishing gear. The increased catchability of small rock flathead may have also contributed to the maintenance/enhancement of catch rates in recent years.

Port Phillip Bay

Commercial mesh net catch rates in Port Phillip Bay were found to be increasing over the past 5 years, and are currently above the 30-year long-term average.

Localised targeting of rock flathead in Port Philip Bay has increased and mesh net gear-type M2 (Multifilament Mesh Net 60-75 mm) is being used more often to target larger rock flathead.

The increase in rock flathead catch rates in Port Phillip Bay appears to be the result of a combination of changes in fisher behaviour (targeting with gear-type M2), increased targeting due to increased market value, and localised increases in seagrass in recent years, as opposed to reflecting increases in the overall abundance of rock flathead.

Trends in commercial catch

There have been significant increases in the annual catch of rock flathead in Corner Inlet and Port Phillip Bay over the past 30 years and catches have continued to increase over the past decade; these increases in catch are driven by an increase in market value.

Management arrangement

Fishery-dependent monitoring data presented at the June 2012 stock assessment workshop did not indicate the need for a review of rock flathead management and monitoring arrangements. Participants supported continuation of the current management and monitoring regime.

Areas of concern

To better understand the status of rock flathead in Victoria it would be prudent to undertake:

- Fishery-independent surveys in Corner Inlet and Port Phillip Bay to assess changes in relative abundance
- Collect representative age/length composition data for both Corner Inlet and Port Phillip Bay

There is continued concern for seagrass decline in Corner Inlet and the effects this will have on rock flathead productivity.

Overview of the status of rock flathead in Victoria

- Rock flathead in Corner Inlet are in good condition. - Limited data is available on the status of rock flathead in Port Phillip bay where the species is harvested to a lesser extent.
Break down by fishery indicators:
Commercial catch rates- • Corner Inlet: stable and above the long-term average • Port Phillip Bay: increasing and above the long-term average
Recreational catch rates- • Limited data
Stock size/age structure- • Commercial size- and age-frequency distributions are within historical ranges for Corner Inlet • Limited commercial size/age data for Port Phillip Bay • Limited recreational size/age data available for Corner Inlet and Port Phillip Bay
Recent spawning success- • Limited data
Management settings: • Maintain current settings
Flagged issues • Monitoring of rock flathead stocks in Victoria could be improved through fishery-independent monitoring methods and the collection of representative size/age composition data in Corner Inlet and Port Phillip Bay • There is continued concern for seagrass decline in Corner Inlet and the effects this will have on rock flathead productivity

Legend

Good condition
↔ Stable
↑ Improving
↓ Decreasing
Poor condition
Requires monitoring
Limited data

Introduction

Fisheries Victoria has developed a process to conduct periodic formal assessments of the status of key marine and estuarine finfish stocks and the fisheries they support.

The assessment process involves:

- The synthesis of all relevant fisheries data
- Evaluation of fisheries-independent monitoring and research data.
- Convening a workshop for scientists, resource users and resource managers to assess the status of the stock/fishery in question
- Production of an assessment report which provides scientific information and advice to facilitate fishery management decision making.

The assessment process:

- Provides scientific evidence on the status of the fish stocks and the environmental factors and harvest pressures that influence stock abundance
- Provides opportunity to draw on the knowledge of stakeholder groups
- Underpins evidence-based decisions in an ecologically sustainable development management context
- Complements Victorian fisheries management planning processes
- Ensures the fishery assessment process is accountable and transparent.

An assessment of rock flathead, *Platycephalus laevigatus*, stocks in Victoria occurred in June 2012.

The assessment workshop was attended by recreational fishing sector representatives, Fisheries Victoria fishery managers, fishery scientists, and experienced anglers.

This report provides a review of the outcomes of the 2012 assessment.

Assessment of stock status indicators

In general, stock status classifications assess whether the current abundance is at an adequate level and whether the level of fishing pressure is adequately controlled through management. The following stock status classification system has been developed to assess the status of fish stocks in Victorian waters:

Stock status classification	Description	Trend in catch rate five-year moving average*	Is the most recent year above the long-term average**
Good	The indicator suggests that the stock is in good condition. Current management arrangements are considered appropriate.	↑↔	Yes
Stable ↔	The indicator suggests the stock is stable despite being below the long-term average. Current management arrangements may need to be assessed. Where appropriate, management responses to promote stock recovery need to be investigated.	↔	No
Improving ↑	The indicator suggests that the stock is improving. Current management arrangements are considered appropriate.	↑	No
Decreasing↓	The indicator suggests that the stock is decreasing. Current management arrangements may need to be assessed. Where appropriate, management responses to promote stock recovery need to be investigated.	↓	Yes/No
Poor	The status of the stock is considered poor. Current management arrangements need to be assessed. Management responses to promote stock recovery need to be investigated.	↓	No
Limited Data	A limited amount of information has been collected; or, there are inconsistent or contradictory signals in the data that preclude determination of stock status.		

* Trend refers to a significant (P<0.1) linear change (ordinary least-squares regression model) in the five-year moving average of an indicator over the past 5 years; non-significant trends were considered stable.
** Long-term refers to the duration of the time-series.

Table 1. Stock status determination using available commercial catch rate indicators for rock flathead in Victorian waters.

Indicator	**Corner Inlet commercial mesh net (1 and 2) catch rate (kg/km-hour) (Figure 4)**	**Port Phillip Bay mesh net (1 and 2) catch rate (kg/km-hour) (Figure 6)**
Minimum	1980/81: 0.12	1998/99: 0.04
Maximum	1987/88: 1.15	2007/08: 0.25
Ten-year average	0.71	0.14
Five-year average	0.66	0.17
2010/11	0.67	0.16
Trend in five-year moving average	↔	↑
Above long-term average (30-years)	**Yes**	**Yes**
Status	**Good condition**	**Good condition**
Status classification notes	*- Significant decreases in seagrass abundance may be increasing gear efficiency (catchability of small rock flathead is increasing as they have less protection from fishing gear) .*	*- Localised targeting of rock flathead in Port Philip Bay has increased in recent years and mesh net gear-type M2 is being used more often to target larger rock flathead.* *- The increase in rock flathead catch rates appears to be the result of a combination of changes in fisher behaviour (use of M2 to target rock flathead) and localised increases in seagrass in recent years.*
	It is unclear whether rock flathead in Corner Inlet and Port Phillip Bay are part of a larger stock.	

Assessment figures and tables

The following figures and tables support the assessment status of key species of the Corner Inlet fishery.

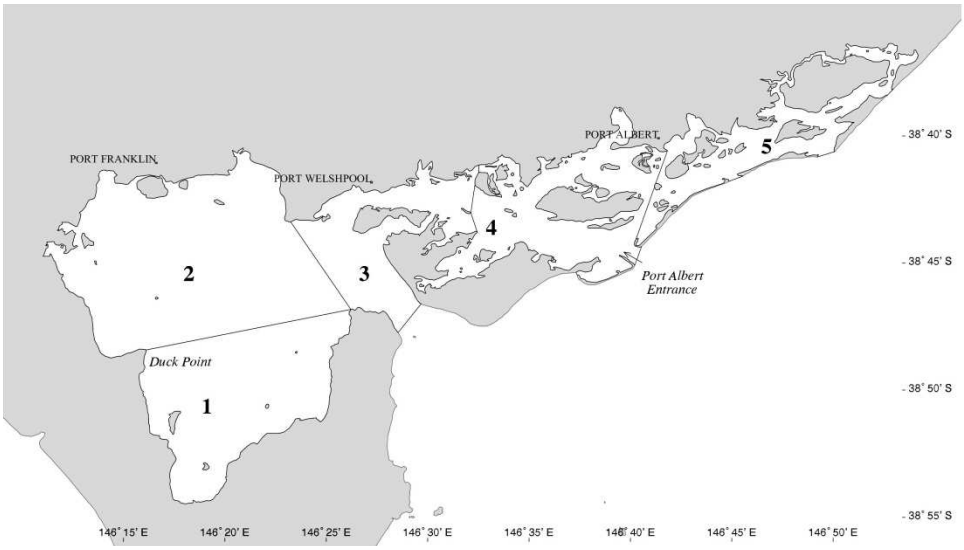


Figure 1. Map of Corner Inlet showing commercial fishing zones numbered 1 to 5.

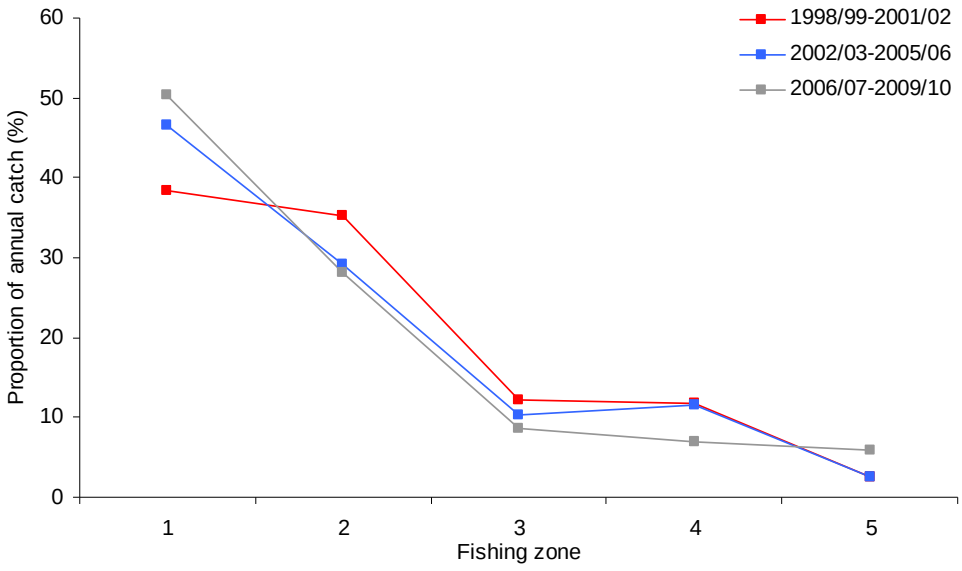


Figure 2. The proportion of rock flathead annual catch harvested from each fishing zone in Corner Inlet-Nooramunga.

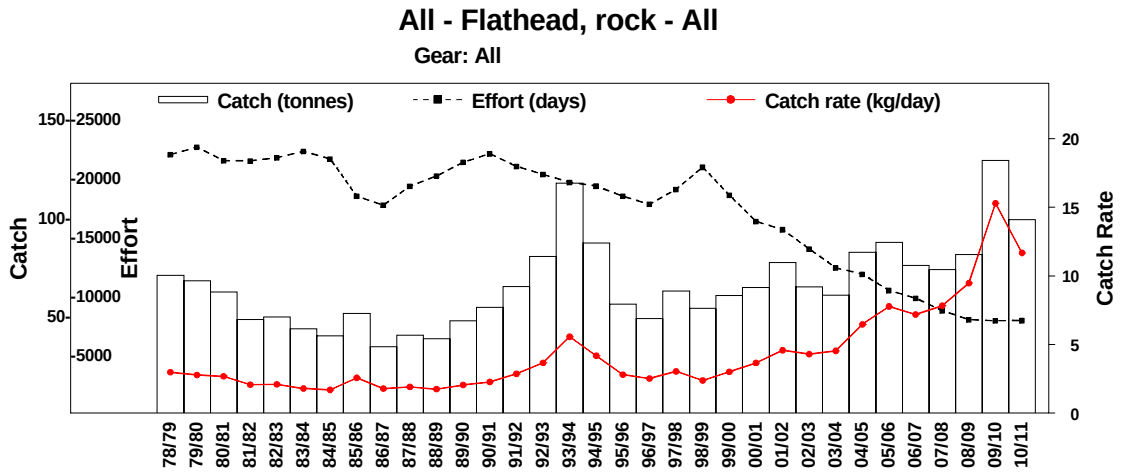


Figure 3. Annual commercial catch (tonnes) and catch rate (kg/day) of rock flathead, and effort (days) targeting rock flathead and other species in Victorian waters, all gear-types combined, from 1978/79 to 2010/11, presented by financial year.

Table 2. Commercial catch (tonnes) statistics for rock flathead harvested from Corner Inlet and Port Phillip Bay.

Location	**Fishing method (fishing method % of rock flathead total catch from location)**	**Catch (tonnes)**			
		10-year average	5-year average	2010/11	Trend
Corner Inlet	Mesh net (70%)	39.3	45.0	53.3	↑
	Haul seine (30%)	14.6	15.6	22.6	↑
Port Phillip Bay	Mesh net (87%)	17.0	22.6	19.6	↔

Table 3. Commercial effort (tonnes) statistics of the main fishing methods used to harvest rock flathead.

Location	**Fishing Method**	**Effort**			
		10-year average	5-year average	2010/11	Trend
Corner Inlet	Mesh net (km-lifts)	657	734	766	↑
	Haul seine (shots)	2850	2494	2419	↓
Port Phillip Bay	Mesh net (km-lifts)	1441	1356	1420	↔

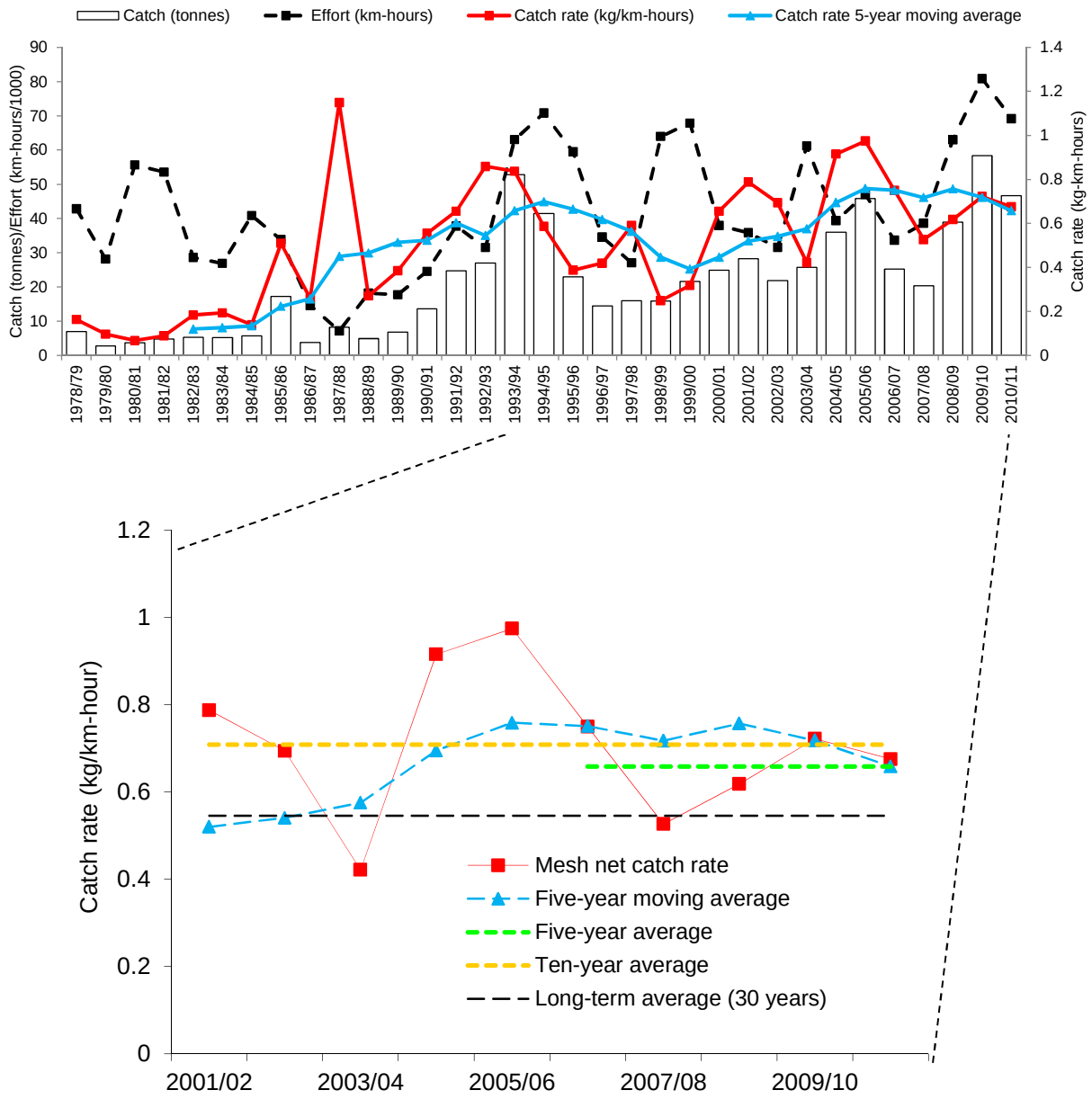


Figure 4. Mesh net (1 and 2) annual commercial catch (tonnes) and catch rate (kg/km-hour) of rock flathead, and effort (km-hours) targeting rock flathead and other species in Corner Inlet from 1978/79 to 2010/11.

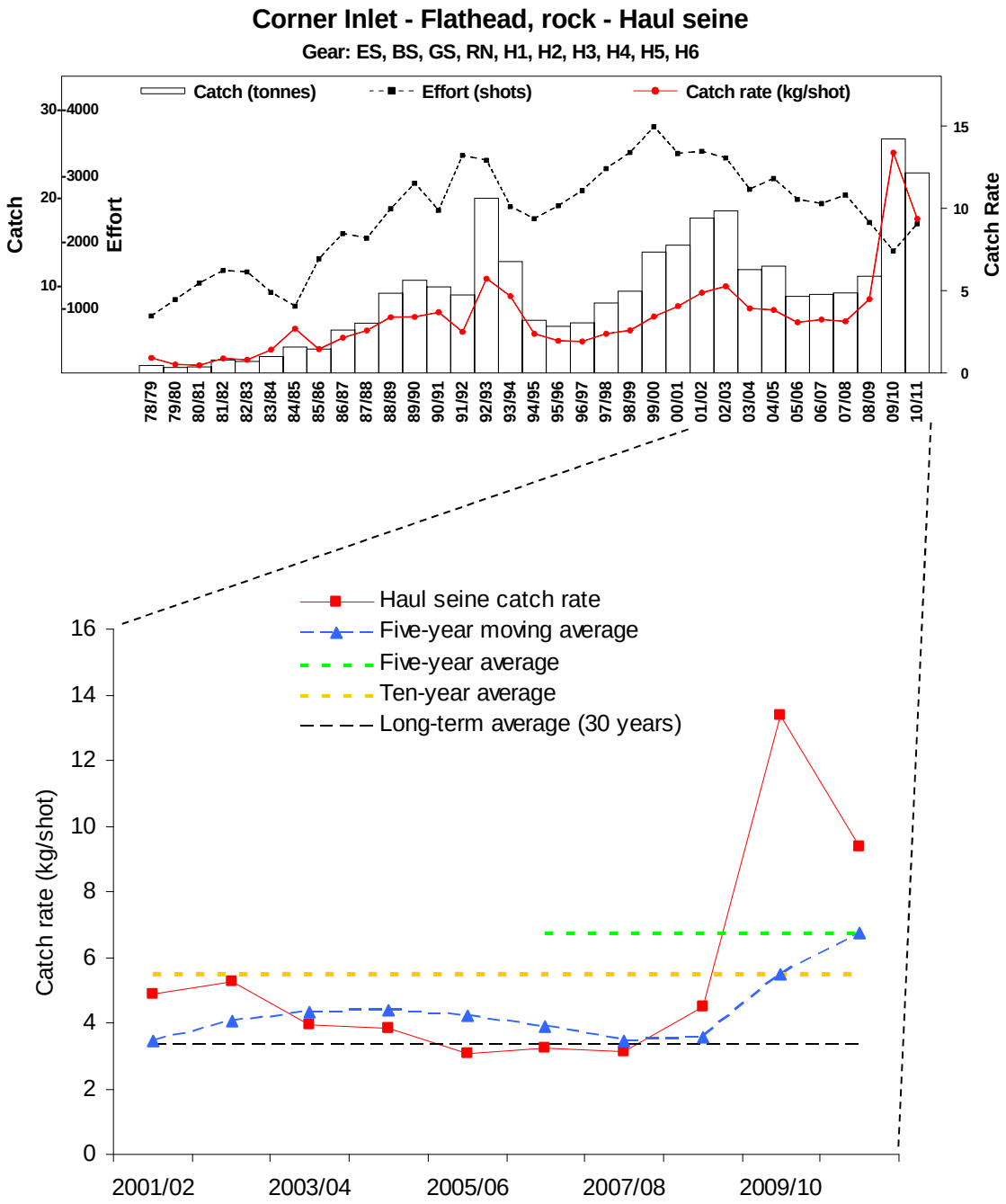


Figure 5. Annual commercial catch (tonnes) and catch rate (kg/shot) of rock flathead, and effort (shots) targeting rock flathead and other species in Corner Inlet by haul seine from 1978/79 to 2010/11, presented by financial year.

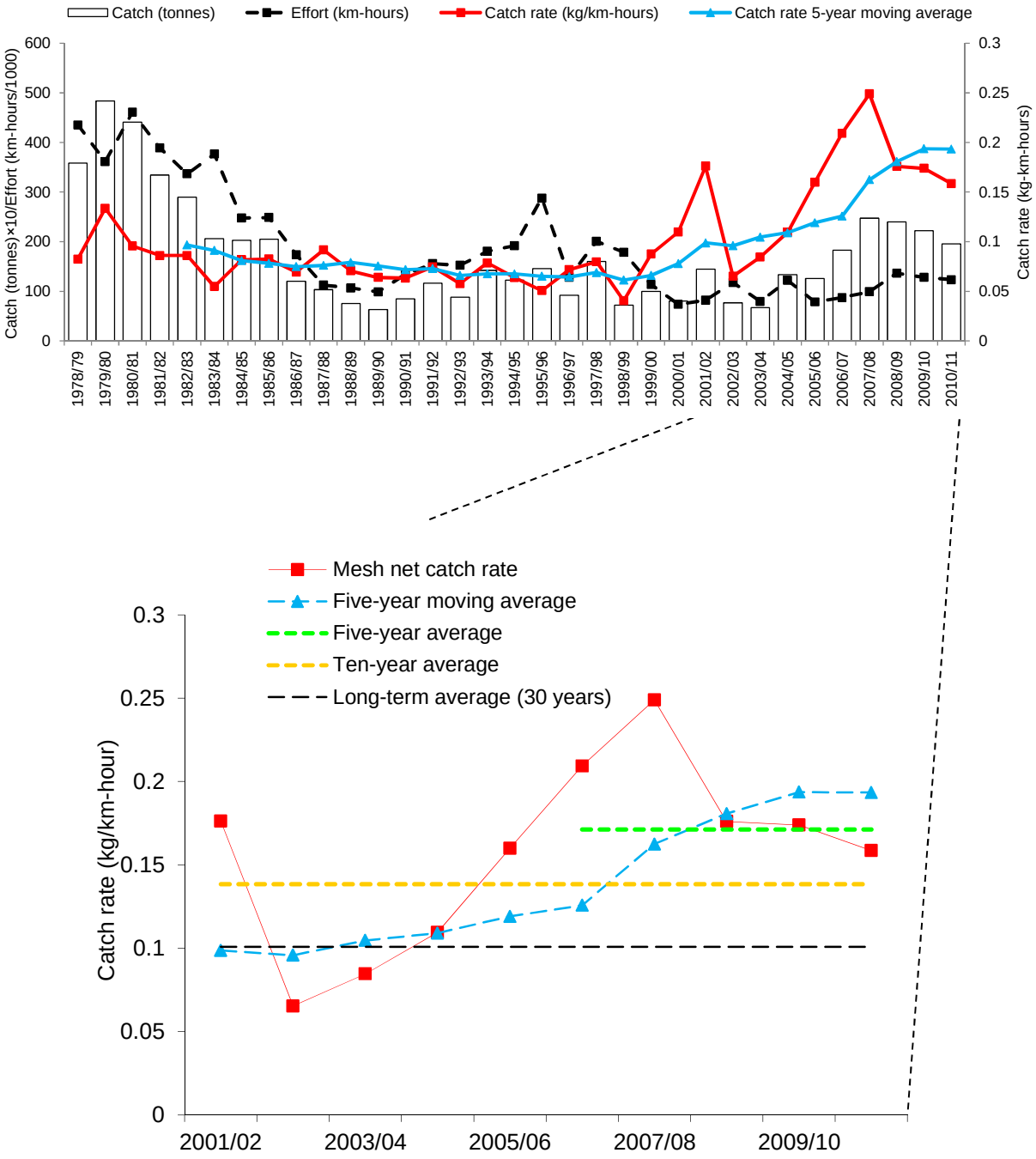


Figure 6. Mesh net (1 and 2) annual commercial catch (tonnes) and catch rate (kg/km-lift) of rock flathead, and effort (km-lifts) targeting rock flathead and other species in Port Phillip Bay from 1978/79 to 2010/11.

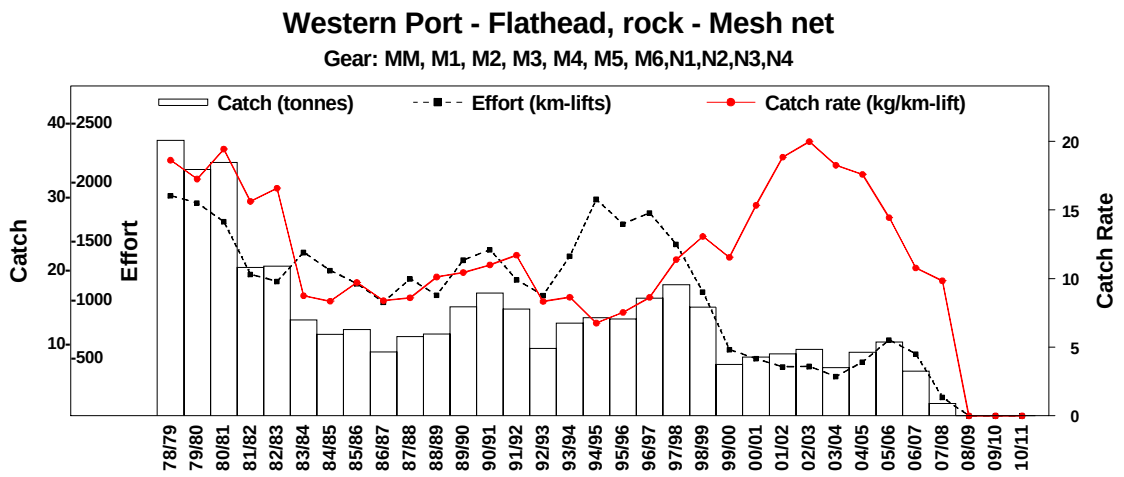


Figure 7. Annual commercial catch (tonnes) and catch rate (kg/km-lift) of rock flathead, and effort (km-lifts) targeting rock flathead and other species in Western Port by mesh net from 1978/79 to 2010/11, presented by financial year.

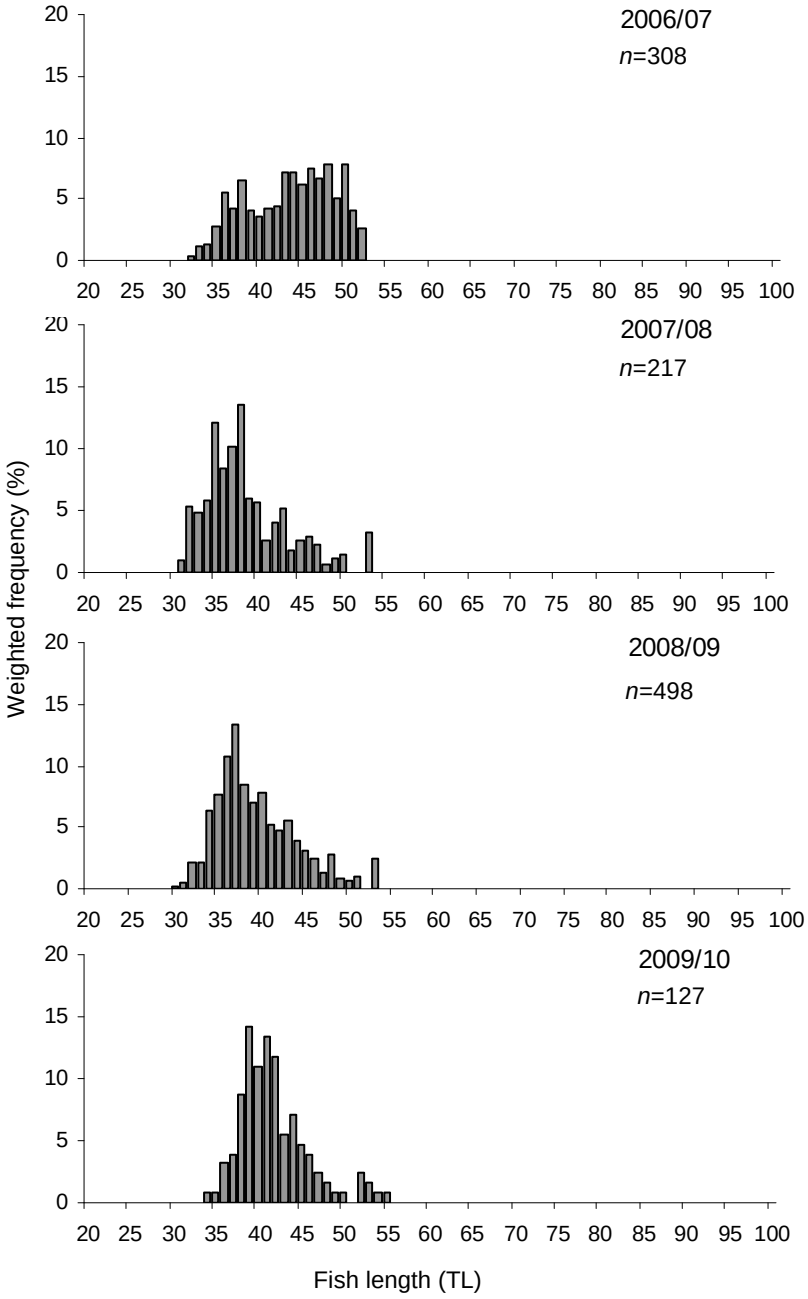


Figure 8. Length frequency distributions of rock flathead harvested by commercial mesh nets in Corner Inlet from 2006/07 to 2009/10, data is available from 1994/95 to 2009/10, excluding 2001/02 to 2005/06 and 2010/11.

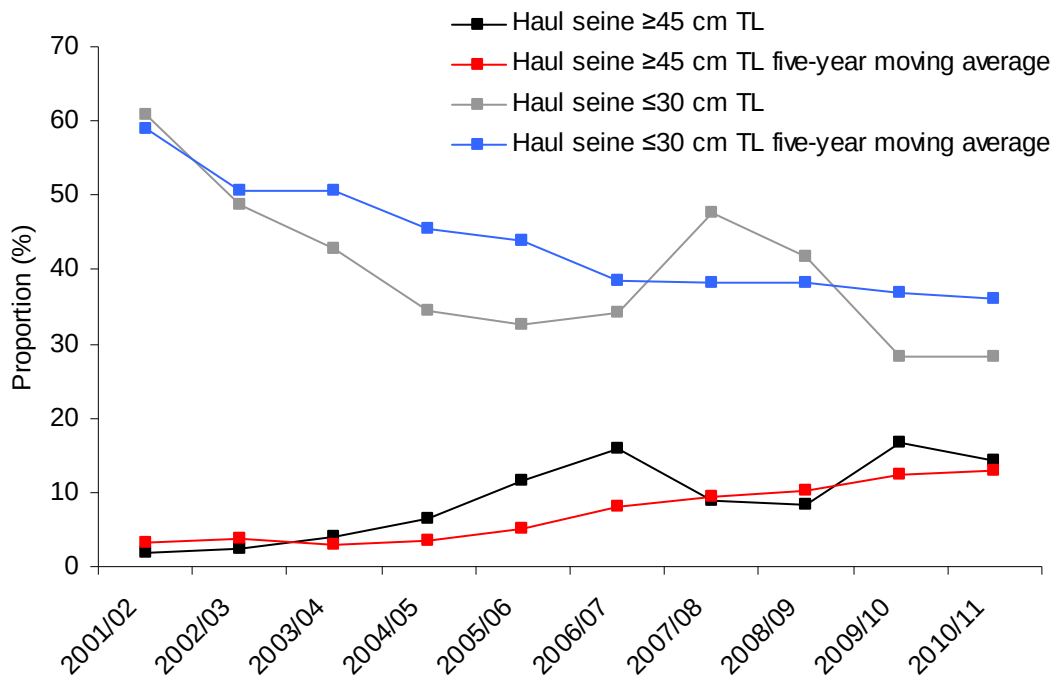


Figure 9: Annual proportion of rock flathead harvested by commercial haul seine nets in Corner Inlet that are ≥45 cm and ≤30 cm total length. Mesh net data is limited and not displayed; see Table 4 for mesh net size frequency distribution statistics.

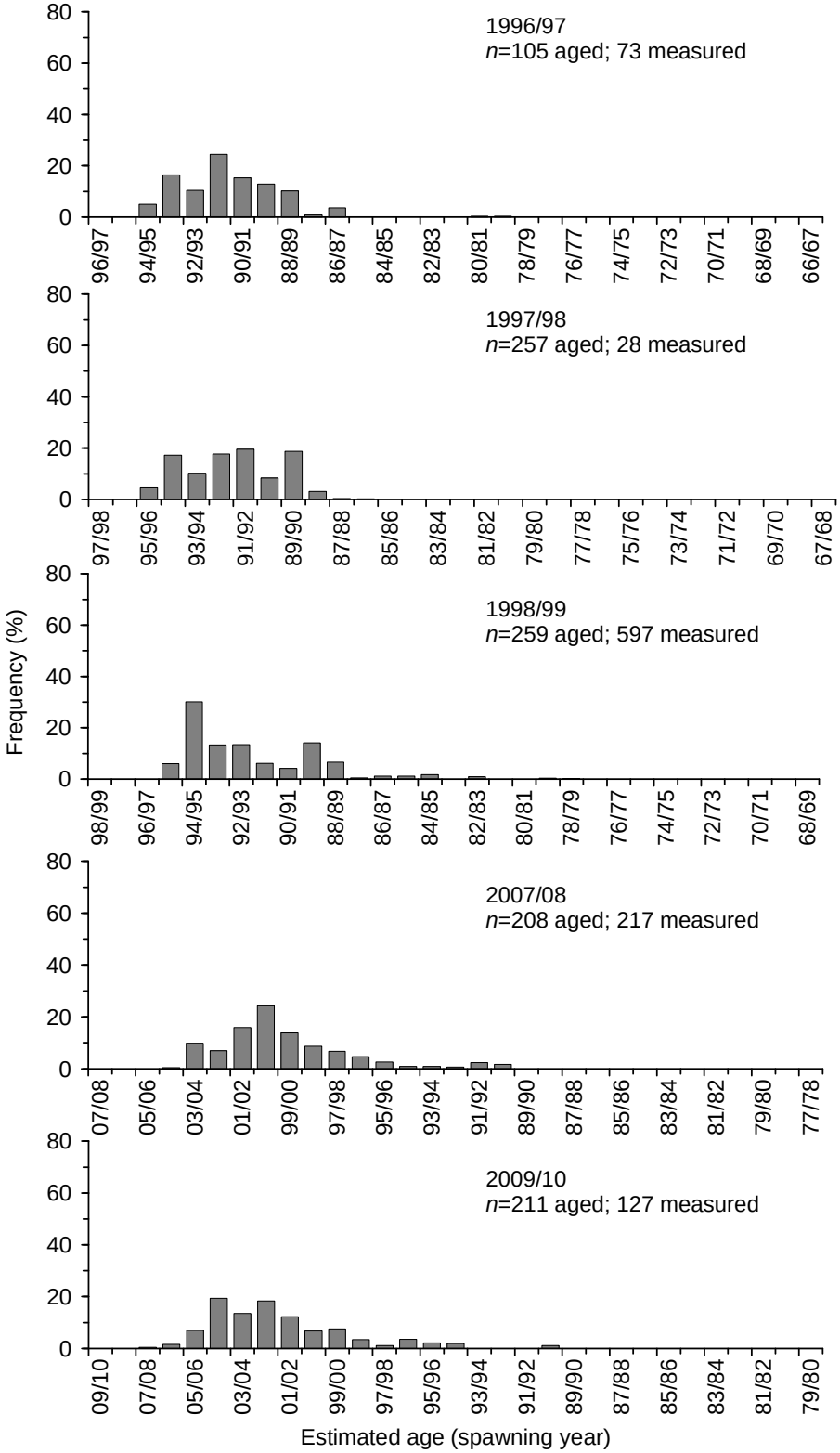


Figure 10. Age frequency distributions of rock flathead harvested by commercial mesh nets in Corner Inlet-Nooramunga from 1996/97 to 2009/10 (excluding 1999/00−2006/07 and 2008/09). Data is available from 1995/96 to 2009/10, excluding 1999/00−2006/07 and 2008/09.

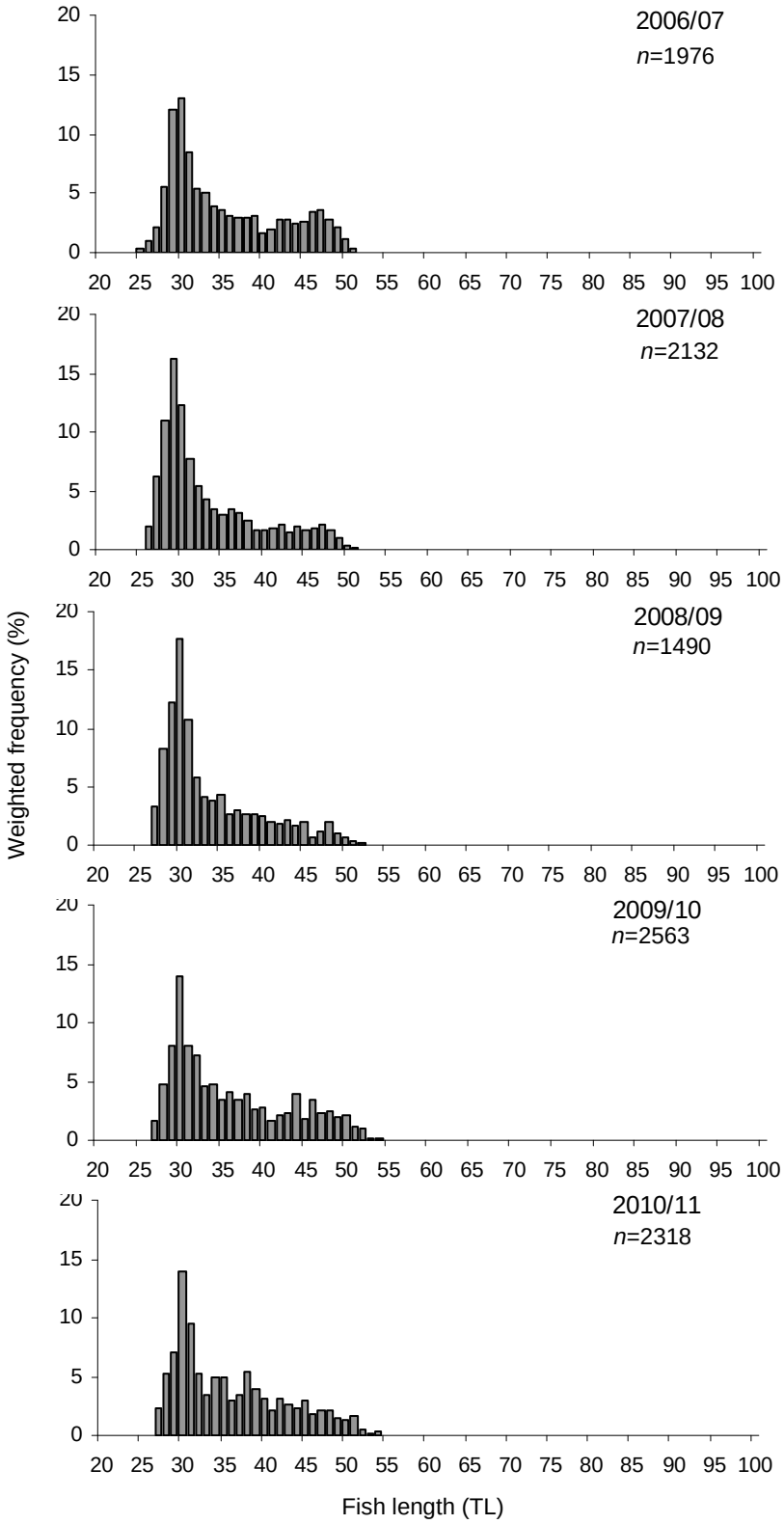


Figure 11. Length frequency distributions of rock flathead harvested by commercial haul seines in Corner Inlet from 2006/07 to 2010/11, data is available from 1994/95 to 2010/11.

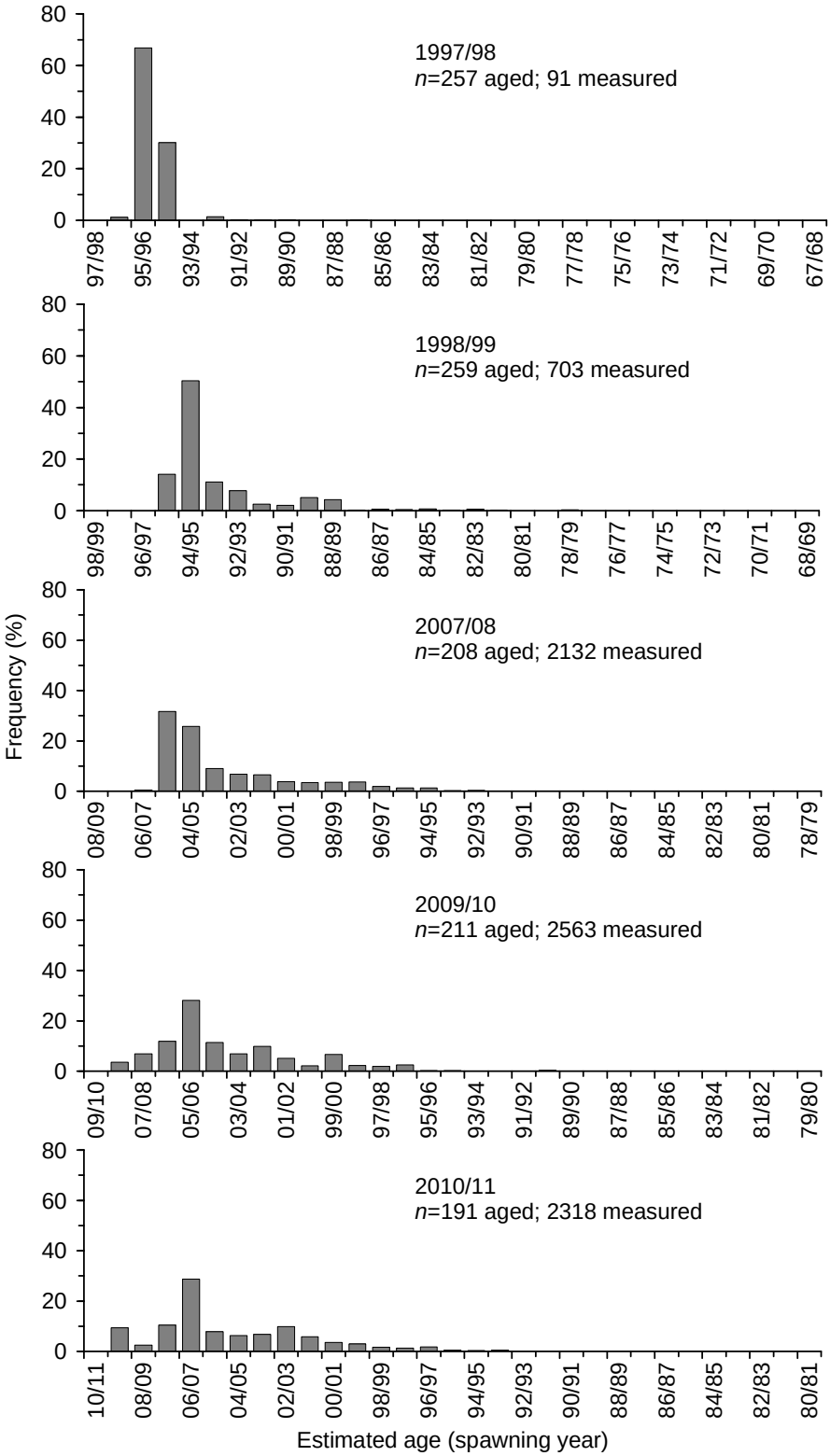


Figure 12. Age frequency distributions of rock flathead harvested by commercial haul seines in Corner Inlet-Nooramunga from 1997/98 to 2010/11 (excluding 1999/00−2006/07 and 2008/09). Data is available from 1995/96 to 2010/11, excluding 1999/00−2006/07 and 2008/09.

Table 4. Summary of length-frequency distributions of rock flathead commercial catches in Corner Inlet.

Indicator	Mesh net length (TL)-frequency distribution time-series of retained catch (1994/95 to 2009/10, excluding 2001/02−2005/06 and 2010/11) (Figure **8**).	Haul seine size (TL)-frequency distribution time-series of retained catch (1994/95– 2010/11) (Figure **11**)
Minimum	26 cm	23 cm
Maximum	66 cm **2009/10: 55 cm**	62 cm **2010/11: 56 cm**
Mean (10-year average)	N/A	34 cm
Mean (5-year average)	N/A	35 cm
Mean (most recent)	**2009/10: 42 cm**	**2010/11: 36 cm**
Mode (most recent)	**2009/10: 39 cm**	**2010/11: 30 cm**
Size-frequency distribution significance test results	2009/10 is significantly different to all available years prior (1994/95−1996/97, 1998/99 and 2006/07−2008/09)	2010/11 is significantly different ($p<0.05$) to all available years prior (1994/95−2009/10)
Proportion of retained catch ≥45 cm TL	**≥45 cm TL** **2009/10: 20%** Trend in five-year moving average over the past 10 years: N/A Trend in five-year moving average over the past 5 years: N/A	**2010/11: 14%** Trend in five-year moving average over the past 10 years: Increasing Trend in five-year moving average over the past 5 years: Increasing (Figure **9**)
Proportion of retained catch ≤30 cm TL (size at first maturity is unknown, however, is <30 cm TL for other closely related species)	**2010/11: 0%** Trend in five-year moving average over the past 10 years: N/A Trend in five-year moving average over the past 5 years: N/A	**2010/11: 28%** Trend in five-year moving average over the past 10 years: Decreasing Trend in five-year moving average over the past 5 years: Decreasing (Figure **9**)

Table 5. Size ranges of rock flathead harvested in Corner Inlet by recreational fishers.

Location	**Port Phillip Bay**		**Western Port**		**Corner Inlet**
Source	**Angler diarist size (TL)(years)-frequency time-series (1998 to 2011)** (*n*=59)	**Onsite survey size (TL)(years)-frequency time-series (1997 to 2011)** (*n*=37)	**Angler diarist size (TL)(years)-frequency time-series (1997 to 2011)** (*n*=67)	**Onsite survey size (TL)(years)-frequency time-series (1997 to 2011)** (*n*=64)	**Angler diarist size (TL)(years)-frequency time-series (1998 to 2011)** (*n*=7)
Minimum	23 cm	29 cm	10 cm	28 cm	28 cm
Maximum	70 cm	54 cm	70 cm	56 cm	50 cm

Table 6. Rock flathead stock status determination using age indicators for Corner Inlet.

Indicator	Mesh net age (years)-frequency distribution time-series of retained catch (1995/96 to 2009/10, excluding 1999/00−2006/07 and 2008/09) (Figure **10**)
Minimum	2 yrs
Maximum	20 yrs **2009/10: 24 yrs**
Mean (10-year average)	N/A
Mean (5-year average)	N/A
Mean (most recent)	**2009/10: 8 yrs**
Mode (most recent)	**2009/10: 5 yrs** (bimodal distribution – second mode at 7 yrs)

Local knowledge

It is widely recognised that both scientific and local knowledge are important in assessing natural resources. As part of the assessment process for the Corner Inlet fishery, commercial fishers were provided with semi-structured local knowledge surveys.

There are currently 18 commercial fishery access licenses in Corner Inlet-Nooramunga. Each of the access license holders were provided with a mail-out survey; eight access licence holders responded.

Results

List the three species you most commonly target in Corner Inlet (number of responses):

- King George whiting (7)
- Garfish (5)
- Rock flathead (4)
- Calamari (2)
- Silver trevally (1)
- Gummy shark (1)

Out of the three target species previously mentioned, what is your main target species when fishing in Corner Inlet?

- King George whiting (5)
- Rock flathead (2)
- Garfish (1)

Which locations within Corner Inlet-Nooramunga do you fish for the previously mentioned target species? (multiple locations can be reported for each species):

Area	1	2	3	4	5
King George whiting	(6)	(5)	(4)	(2)	
Garfish	(4)	(4)	(3)	(1)	(1)
Rock flathead	(3)	(3)	(3)		
Silver trevally	(1)	(1)	(1)	(1)	
Gummy shark	(1)	(1)	(1)		
Calamari	(1)	(1)	(1)		

What factors do you believe may be influencing catches of rock flathead?

Decreasing catch rates:

- Seagrass loss (2)
- Increased targeted effort for rock flathead (1)
- Weather (three very wet/windy years) (1)
- Increased recreational catch/effort (1)

The two commercial fishers that listed rock flathead as their main target species were asked the following:

What would you best describe the abundance of legal sized rock flathead over the past 12 months compared with previous years?

- Increased (0)
- Similar (1)
- Decreased (1)
- Unsure (0)

Would you say the average size of legal-sized rock flathead that you've caught over the past 5 years has gotten bigger, smaller, or is about the same?

- Bigger (0)
- About the same (2)
- Smaller (0)
- Unsure (0)

How would you describe the status of rock flathead?

- Good (0)
- Improving (0)
- Deteriorating (2)
- Unsure (0)

Assessment data and methods

Source	Description
Commercial fishery-dependent	Victorian commercial fishers are required as a condition of their licence to record their fishing activities in a logbook and to submit this information to the Department of Primary Industries on a monthly basis. Commercial fishers provide the following information: • Gear code and net length/number of hooks/jigs • Area code • Number of shots • Fishing time • Weight of species caught and retained.
Recreational fishery-dependent	A voluntary general angler diary (GAD) program, established in 1997, provides time-series data on recreational angler catch rates, and the size composition of key target species.
Length and age monitoring	Since the 1990s there has been opportunistic sampling of length and age frequency data for key species landed by commercial and recreational fishers. Otoliths used for ageing are prepared and aged following standard procedures outlined in Morison *et al.* (1998).

Description of the fisheries

General description	• In 2010/11, 99 tonnes of rock flathead was harvested from Victorian waters, which constituted 2% of the total Victorian finfish catch. This had an estimated wholesale market value of $0.7 million. • The majority of rock flathead catch was harvested from Corner Inlet (77%) followed by Port Phillip Bay (23%). • Historically, rock flathead were harvested from Western port; the Western Port fishery was closed to netting in December 2007). • Rock flathead is one of the main species targeted by commercial fishers in Corner Inlet, constituting 23% (by weight) of the Corner Inlet total commercial catch.
Fishing methods	• Mesh nets harvest the majority of rock flathead in Corner Inlet (70%) and Port Phillip Bay (87%).
Fishing areas and seasonality	**The majority of rock flathead harvested from Corner Inlet are from fishing zones 1 and 2 (** • Figure **1** and Figure **2**). • The majority of rock flathead harvested from Port Phillip Bay are from the Geelong arm. • When catches of King George whiting are low, there is increased targeting of rock flathead (e.g. see 2009/10 where there was an increase in mesh net effort to target rock flathead).

Overview of management arrangements

Commercial fishery	**Recreational fishery**
• Commercial catches of rock flathead from Corner Inlet and Port Phillip Bay occur as a component of multi-species commercial finfish fisheries. • The commercial fisheries are currently managed primarily by: o Input (effort) controls (including limited entry licensing, restrictions on fishing equipment and methods, and closed areas/seasons) o Indirect catch controls such as legal minimum size limits. • The number of licensed commercial fishers in Victorian waters was reduced to a third between 1986/87 and 2010/11. The majority of the licence removals occurred as a result of voluntary licence buy-back schemes conducted in 1999/00 and 2005/06. • In 2010/11, there were 18 commercial licence holders in the Corner Inlet and 42 in Port Phillip Bay.	• **Recreational fishing licence:** o Since 15 July 1999, recreational fishers have been required to hold a recreational fishing licence (RFL) to fish in marine and inland waters. Recreational fishers under 18 years of age or over 70 years of age, or those holding one of a range of concession cards are not required to hold a licence. • **Gear restrictions:** o Recreational fishing remained unrestricted, other than size limits, until 1992, when regulations specified a maximum of four lines per person and two hooks per line when fishing in marine waters, and a maximum of two lines with two hooks per line in inland waters. This regulation was modified in 2009 to include two hooks per line or one bait jig when fishing in both marine and inland waters. • **Bag and size limits:** o The current daily bag limit (DBL) for rock flathead is 20 and the minimum legal size limit for rock flathead 27 cm TL.

Life-history

Distribution	• Rock flathead occur from southern Queensland to southern Western Australia, including Tasmania (Gomon *et al*. 2008). • Found in a range of habitats, often seagrass, to a depth of 20 m (Gomon *et al*. 2008; Kuiter 2000). • Forms sex-specific aggregations (Koopman 2002).
Reproduction	• Spawn from September to February, with the peak of the spawning season observed in October (Koopman 2002).
Growth	• Maximum length of 50 cm SL (Gomon *et al.* 2008). • Growth is highly variable. • Females and males from Corner Inlet-Nooramunga attain an average size of 39 and 34 cm TL, respectively, at 5 years of age, and 48 and 40 cm TL at 10 years, respectively (Koopman 2002).
Diet	• Smaller rock flathead (25–33 cm TL) consume mainly fish, squid and shrimp, whilst larger fish (>33 cm TL) consume particular crab species and some fish (Klumpp and Nichols 1983). • In Port Phillip Bay, 50% of the base nutrition is from food webs supported by seagrass (Hindell 2006).

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