Blue Swimmer Crab

Portunus armatus

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STOCK STATUS OVERVIEW

Stock status determination

Jurisdiction	Stock	Fisheries	Stock status	Indicators
Western Australia	Cockburn Sound	CSCMF	Environmentally limited	Catch, CPUE, fishery-independent recruitment index, egg production index
South Australia	Gulf St. Vincent	BCF	Sustainable	Fishery-independent legal-sized and pre-recruit abundance
Queensland	North-Eastern Australia	BSCF, ECOTF	Sustainable	Biomass, Standardised catch rates, Fishery-independent recruitment abundance, Catch and Effort
Western Australia	Peel-Harvey Estuary	PHECF	Sustainable	Catch, CPUE
Western Australia	Shark Bay	SBCMF	Transitional-recovering ↑	Catch, fishery-independent recruitment and breeding stock abundance
New South Wales	South-Eastern Australia	EGF, OTF	Sustainable	Catch, CPUE
South Australia	Spencer Gulf	BCF, MSF	Sustainable	Fishery-independent legal-sized and pre-recruit abundance
South Australia	West Coast	MSF	Undefined	Catch

Jurisdiction	Stock	Fisheries	Stock status	Indicators
Western Australia	Western Australia North Coast	EGDCF, PDCF, KDMCF, EGPMF, NBPMF	Sustainable	Catch, CPUE
Western Australia	Western Australia South-West Coast	JASDGDLMF, MBDCF, SCRCF, SWTMF, WSCMF, WL (SC), SCEMF	Sustainable	Catch, CPUE

BCF Blue Crab Fishery (SA)
BSCF Blue Swimmer Crab Fishery (QLD)
CSCMF Cockburn Sound Crab Managed Fishery (WA)
ECOTF East Coast Otter Trawl Fishery (QLD)
EGDCF, PDCF, KDMCF
Exmouth Gulf Developing Crab Fishery, Pilbara Developmental Crab Fishery, Kimberley Developing Mud Crab Fishery (WA)
EGF Estuary General Fishery (NSW)
EGPMF Exmouth Gulf Prawn Managed Fishery (WA)
JASDGDLMF
Joint Authority Southern Demersal Gillnet and Demersal Longline Managed Fishery (Zone 1 & Zone 2) (WA)
MBDCF, SCRCF, SWTMF, WSCMF, WL (SC)
Mandurah to Bunbury Developing Crab Fishery, Swan and Canning Rivers Crab Fishery (Area 1 of West Coast Estuarine Managed Fishery), South West Trawl Managed Fishery, Warnbro Sound Crab Managed Fishery, Open access in the South Coast (WA)
MSF Marine Scalefish Fishery (SA)
NBPMF Nickol Bay Prawn Managed Fishery (WA)
OTF Ocean Trawl Fishery (NSW)
PHECF Peel–Harvey Estuary Crab Fishery (Area II of West Coast Estuarine Managed Fishery) (WA)
SBCMF Shark Bay Crab Managed Fishery (WA)
SCEMF South Coast Estuarine Managed Fishery (WA)

STOCK STRUCTURE

Blue Swimmer Crab is distributed in Australia from the south coast of Western Australia, north to the Northern Territory, across Queensland, down the east coast and to the New South Wales–Victoria border. They are also found in the warmer waters of the South Australian gulfs [1].

In Western Australia, Blue Swimmer Crab is fished in numerous fisheries across five regions. The stock delineation between these regions is unknown [2,3]. Stock structure on the east coast of Australia is uncertain, involving overlapping stocks or a semi-continuous stock [2]. Due to the geographic separation between the major fishing grounds for Blue Swimmer Crab in New South Wales and Queensland, they are managed as two separate biological stocks. In South Australia,

research has identified three separate biological stocks of Blue Swimmer Crab—in Spencer Gulf, Gulf St Vincent and on the coastline west of the Eyre Peninsula [4,5].

Here, assessment of stock status is presented at the management unit level—Shark Bay Crab Managed Fishery, Cockburn Sound (Crab) Managed Fishery, Peel-Harvey Estuary Crab Fishery (Area 2 of West Coast Estuarine Managed Fishery), Western Australian north coast and Western Australian south-west coast (Western Australia); and at the biological stock level—north-eastern Australia (Queensland), south-eastern Australia (New South Wales), and the Spencer Gulf, Gulf St Vincent and West coast (South Australia).

STOCK STATUS

Shark Bay

The Shark Bay Crab Managed Fishery for Blue Swimmer Crab expanded rapidly between 2000 and 2010. In 2010, it was Australia's highest producing Blue Swimmer Crab fishery, with landings of 828 tonnes (t), collectively caught by the dedicated crab trap sector and as by-product by the trawl sector. In late 2011, the crab stock in Shark Bay was found to be at historically low levels as a result of recruitment failure and the mortality of adult stock. This was attributed to the combination of the effects of a marine heat wave event during the summer of 2010–11 and two flooding events, but also high fishing pressure in the years prior to the stock decline. This crab stock also supports a small (around 2.2 t) but important recreational fishery. Commercial fishing for Blue Swimmer Crabs in Shark Bay ceased in April 2012 on a voluntary industry-agreed basis to facilitate stock rebuilding, at which point is was classified as being environmentally limited. During the closure, intensive monitoring of the resource began, using a combination of trawl and trap based fishery-independent surveys. The surveys provide indices of spawning stock and recruitment levels which are assessed periodically. Substantial improvements in these indices from 2013–14 (recruitment increased from 200–2197 kg per square nautical mile) indicated partial recovery of the stock and provided some confidence for the resumption of limited commercial fishing for crabs in Shark Bay.

In 2013, the fishery transitioned from an interim status to a fully managed status under a new management plan, which includes a system of individual transferable quotas that applies across all three commercial sectors in Shark Bay. A formal resource allocation model was implemented within the commercial sectors, with 66 per cent allocation given to the trap sector, 33.8 per cent given to the prawn trawl sector and 0.2 per cent allocated the scallop trawl sector. The fishery now operates

in two zones separating the inner gulfs from rest of Shark Bay and the fishing season operates over 12 months of the year (1 November–31 October).

A precautionary total allowable commercial catch (TACC) of 400 t was set for the 2013–14 season, of which 371 t was caught. The TACC increased to 450 t for the 2014–15 fishing season, of which 341 t was caught. Levels of spawning and recruitment biomass have stabilised (neither increasing nor declining) under the current fishing levels and environmental conditions, so any further increase in the rate of recovery would require reduced catch and/or improved environmental conditions to increase spawning biomass and improve recruitment success. A formal harvest strategy is being developed for the fishery, incorporating appropriate reference levels.

On the basis of the evidence provided above, the Shark Bay Crab Managed Fishery (Western Australia) management unit is classified as a **transitional–recovering stock**.

Cockburn Sound

Historically, variations in recruitment of Blue Swimmer Crabs in Cockburn Sound (Crab) Managed Fishery have depended on environmental conditions, which have caused large fluctuations in stock abundance and the annual commercial catch [6]. A shift by commercial fishers from using set nets to traps in the mid-1990s resulted in a marked increase in mean annual crab landings. Following a series of high catches (250–350 t) in the late-1990s, the catch declined significantly [7,8]. Fishery-independent surveys indicated that low recruitment was a result of high fishing pressure combined with poor environmental conditions, which reduced the spawning stock to low levels and required the closure of the fishery in December 2006 [6–8]. Recovery of the spawning stock and subsequent recruitment was slower than expected; fishery-independent trawl surveys indicated that the strength of recruitment and the spawning stock biomass did not improve sufficiently to reopen the fishery until December 2009. The fishing season for 2010 was restricted to 3.5 months to ensure that the catch level would enable continued recovery of the spawning stock biomass. At that time, the fishery was assessed to be transitional–recovering.

Based on improving abundances of juveniles (aged 0+ years) and signs of increased egg production levels in 2010, 2011 and 2012, management restrictions were eased. This included lengthening the fishing season to 6 months (December–June) and decreasing in the minimum size to the pre-closure size limit of 130 mm carapace width (CW), while retaining a 20 per cent reduction in trap numbers. However, catch did not improve significantly, remaining at around 50 t, with catch rates declining significantly from 1.1 kg per trap-lift in 2010 to 0.5 kg per trap-lift in 2012. In 2013, despite a slight increase in catch to 62 t, fishery-independent trawl surveys indicated that there had been low recruitment, similar to the low levels preceding the closure in 2006. Although egg production (based on mature female abundance) in 2012 was within historical range, a low proportion of berried

females was observed during commercial monitoring and fishery-independent trawl surveys between September 2012 and January 2013, potentially explaining the low recruitment observed in 2013. The role of the 2010–11 heatwave in the recruitment failure is not clear; some preliminary evidence suggests that crabs in Cockburn Sound were in poor nutritional condition during this period, possibly due to a lack of prey. On this basis, an adaptive management approach was implemented for the 2013–14 season, with the fishery closing early as a result of a very low stock biomass and low egg production. Juvenile and egg production indices have remained below limit levels of the draft harvest strategy in 2014–15 and the fishery remains closed [9].

Reasons for the stock decline are being investigated and it appears that crab catch is correlated with primary productivity (summer chlorophyll–*a* concentration), with stock declines over the past decade being consistent with declines in primary productivity. This indicates that recent declines in biomass are most likely driven by environmental influences, with catch unlikely to increase significantly until primary productivity increases. The spawning stock-recruitment-environment relationship, taking into account water temperature and primary productivity, indicates that both environmental factors may be important. There has been some evidence of density-dependent growth of crabs occurring in Cockburn Sound, with growth rates declining in years when stock levels were high in 2010, 2011 and 2012, and increasing when stock levels were low, as seen in 2014 and 2015. Reduced growth rate may have contributed to the lower proportion of mature and berried females during 2012 (when there was a very large cohort of recruiting crabs), leading to poor spawning and recruitment in 2013 [9].

The above evidence indicates that spawning stock biomass is likely to have been reduced to the point where average recruitment levels are significantly reduced, primarily as a result of substantial environmental changes (not recruitment overfishing). Fisheries management has responded appropriately to the environmental change in primary productivity, and the current closure combined with favourable environmental conditions should allow the stock to continue to recover.

On the basis of the evidence provided above, the Cockburn Sound (Crab) Managed Fishery (Western Australia) management unit is classified as an **environmentally limited stock**.

Peel-Harvey Estuary

The gradual conversion from targeting Blue Swimmer Crabs using gillnets to using hourglass traps in the Peel-Harvey Estuary Crab Fishery (Area 2 of West Coast Estuarine Managed Fishery) between the mid-1990s and early-2000s resulted in an increase in annual crab catches, largely due to the increased efficiency of the traps. Conversion to traps increased crab fishing in autumn and winter, but most (62 per cent) of the catch and the highest catch rates are still taken between December and March [10]. Commercial catch levels have generally ranged between 50 and 100 t

annually. A recreational survey conducted in the Peel-Harvey Estuary in 2007–08 estimated that the recreational take from canals, boat and shore-based fishing accounted for an additional 110–180 t of catch [10].

The Peel-Harvey Estuary Crab Fishery (PHECF) is managed under a formal harvest strategy, based on annual standardised catch rates and total catch for each fishing season. Since complete gear conversion in 2001, annual commercial catch rates have fluctuated between 0.7 and 1.4 kg per trap-lift, but have generally remained above 1 kg per trap-lift. In 2010, catch per unit effort (CPUE) was 1.2 kg per trap-lift [9,10], indicating that the stock was not recruitment overfished. In 2013, a catch of 107 t and a CPUE of 1.4 kg per trap-lift were the highest on record. Annual standardised catch rates for the 2014–15 fishing season of 1.3 kg per trap-lift was within the target range and well above the threshold reference level of 0.7 kg per trap-lift. The above evidence indicates that this stock is not recruitment overfished.

The PHECF has recently gained Marine Stewardship Council certification and is the first fishery to have attained certification for both the commercial and recreational sectors [11]. Fishery-independent indices for recruitment and breeding stock and catch prediction are being investigated for this fishery.

The breeding stock in this region has additional protection because the size at maturity (86–98 mm CW) is well below the legal minimum size (LMS; 127–130 mm CW). Spawning occurs outside the estuary following flushing of crabs from the estuary during winter, providing the spawning stock with further spatial protection from fishing. All of the above evidence indicates that current fishing pressure is unlikely to cause the stock to become recruitment overfished.

On the basis of the evidence provided above, the Peel-Harvey Estuary Crab Fishery (Area 2 of West Coast Estuarine Managed Fishery) (Western Australia) management unit is classified as a **sustainable stock**.

Western Australia North Coast

The Western Australian north coast management unit is made up of a dedicated minor developing crab trap fishery—the Pilbara Developmental Crab Fishery (PDCF), and crab taken as by-product in prawn trawl fisheries—the Exmouth Gulf Prawn Managed Fishery and Nickol Bay Prawn Managed Fishery. Total catch for these fisheries was 56.5 t in 2015, more than double the catch of 23.1 t reported in 2013. This trend was attributed to an increase in catch taken in the PDCF in each of the

past 2 years, and is consistent with increased fishing effort compared with 2013. In 2015, the catch rate of 0.8 kg per trap-lift for this dedicated crab trap fishery was above threshold levels of the draft harvest strategy, indicating that stocks are currently being fished at sustainable levels. The above evidence indicates that the biomass in this management unit is unlikely to be recruitment overfished and that current levels of fishing mortality are unlikely to cause the management unit to become recruitment overfished.

On the basis of the evidence provided above, the Western Australia north coast management unit is classified as a **sustainable stock**.

Western Australia South-West Coast

The Western Australian south-west coast management unit is made up of a number of dedicated minor crab trap and gillnet fisheries: the Warnbro Sound Crab Managed Fishery (WSCMF), the Swan and Canning Rivers Crab Fishery (SCRCF) and the Mandurah to Bunbury Developing Crab Fishery (MBDCF); the South Coast Estuarine Managed Fishery (SCEMF), Open Access Fisheries in the West Coast and Joint Authority Southern Demersal Gillnet and Demersal Longline Managed Fishery; as well as crab taken as by-product in other net and trawl fisheries. Total catch for these fisheries in 2015 was 71.8 t, which was a decline from 81.7 t reported in 2013. This decline was primarily attributed to a decline in catch rates for both the WSCMF and the MBDCF. The combined catch rate for these fisheries in 2015 was well above 50 per cent of the long-term average (approximately 30 per cent below the long-term average) indicating that despite the declines, crab stocks remain sustainable.

In contrast, catch and catch rate increased significantly for the SCEMF with some of the highest catches on record. Catch rate in 2015 was 52 per cent above the long-term average for this fishery. This increase is thought to be related to warmer water temperatures and a strong Leeuwin Current increasing the productivity of crab populations on the south coast in recent years. As a result of the increased crab numbers, an Experimental Crab Pot Trial has commenced in some of the inlets with estuarine gillnet fishers allocated a small number of traps for dedicated crab fishing. Catch and catch rate data for dedicated crab trap (WSCMF and MBDCF) and gillnet (SCRCF) fisheries as well as by-product fisheries such as the SCEMF, indicate that stocks are currently fished at sustainable levels. The above evidence indicates that the biomass in this management unit is unlikely to be recruitment overfished and that current levels of fishing mortality are unlikely to cause the management unit to become recruitment overfished.

On the basis of the evidence provided above, the Western Australia south-west management unit is classified as a **sustainable stock**.

North-Eastern Australia

The Queensland Blue Swimmer Crab Fishery primarily operates in southern Queensland. Prior to 1998, the majority of fishing was conducted inshore, in and around Moreton Bay. In 1998, commercial pot fishers began exploiting Blue Swimmer Crab populations further offshore, in areas that were previously lightly fished. Fishing in offshore waters peaked in 2003, when the offshore harvest contributed approximately 70 per cent to total harvest. By 2015, offshore harvest had decreased and returned to levels slightly higher than those pre-expansion. This rise and subsequent fall of harvest in the offshore area is of concern, and may indicate a decline in fishable biomass for the offshore area and the biological stock as a whole [12].

Queensland assessed the pot-caught component of the North-eastern Australian Blue Swimmer Crab stock in 2015 (including data up until 2014) using a population model [13], and representative outputs from Moreton Bay and the Sunshine Coast were used to determine stock status for the entire biological stock. The model estimated spawning biomass between 38 and 58 per cent of assumed equilibrium [13]. At the current LMS, median maximum sustainable yield estimates range from 375–750 t [13]. Current commercial and recreational harvest, from the representative area, 354 and 32 t respectively (a combined total of around 386 t), are within this range.

Standardised catch rates in Moreton Bay are within historic levels; average annual catch rates are 89 per cent of the long-term average of 57 kg per day, indicating a stable level of biomass in this area [13]. Standardised catch rates in the Sunshine Coast, although within historic levels (77 per cent of the long-term average of 200 kg per day) continue to steadily decline, while catch rates in Hervey Bay have declined significantly in recent years and are currently lower than historical levels (64 per cent of the long-term average of 135 kg per day) [12]. Fishery-independent recruitment surveys show a relative increase in recruitment in the inshore area since 2009 [12], although limit reference points have not yet been established. This evidence indicates that, overall, the biomass of the stock is unlikely to be recruitment overfished.

The recent stock assessment estimated fishing pressure on the exploitable component of the stock, analyses indicate male legal Blue Swimmer Crab abundance between 22 and 42 per cent of assumed equilibrium [13]. Active commercial fishing licenses and fishing effort (in days fished) decreased between 2003 and 2015 by more than 50 per cent [12]. Long-term trends in catch and effort are directly proportional to the expansion and subsequent contraction of fishing in offshore areas [12], but overall fishing pressure on Blue Swimmer Crabs has declined.

Spatial closures within the Moreton Bay, Great Sandy Strait and Great Barrier Reef Marine Parks provide some protection of the Blue Swimmer Crab biomass from fishing mortality [12]. Management arrangements in Queensland prohibit the take of female crabs, and a LMS ensures that a high proportion of male Blue Swimmer Crabs have an opportunity to mate before recruitment into the fishery [12]. The above evidence indicates that the current fishing pressure is unlikely to cause the stock to become recruitment overfished.

On the basis of the evidence provided above, the North-eastern Australia (Queensland) biological stock is classified as a **sustainable stock**.

South-Eastern Australia

Blue Swimmer Crabs occur in coastal and estuarine waters along the length of the New South Wales coastline. New South Wales Blue Swimmer Crab populations are at the southern end of the species distribution along the east coast and have a limited spawning period (November–February), rather than the year-round spawning that occurs in more northern latitudes [14]. A LMS of 60 mm carapace length is enforced for both male and female crabs. Female crabs close to the LMS are sexually mature, and are capable of producing one–three batches of eggs within a season [14].

The most recent estimate of the recreational harvest of Blue Swimmer Crabs in New South Wales was approximately 51 000 crabs (27 t) during 2013–14 [15]. The annual recreational harvest of Blue Swimmer Crabs in New South Wales was previously estimated to lie between 150 and 310 t based on the results of the offsite National Recreational and Indigenous Fishing Survey [16] and onsite surveys undertaken by New South Wales Department of Primary Industries. Commercial catches of this species have tended to fluctuate around a long-term average of about 144 t over the period 2000–15. Nominal catch rates of Blue Swimmer Crabs by the main fishing methods in the Estuary General Fishery have remained relatively steady and have been above long-term averages for the past 5 years. Five estuaries account for 95 per cent of commercial Blue Swimmer Crab landings in New South Wales (192 t in 2015), the most important being Wallis Lake (167 t in 2015). Catch rates in Wallis Lake appear stable and within historic levels indicating a stable level of biomass in this area. Since the transition to daily reporting in 2009–10, annual commercial catch rates (kg per day) for fish trapping, the method that accounts for around 95 per cent of commercial landings (159 t in 2015) have fluctuated between 16.5 and 40.1 kg per day, but have generally remained above 23 kg per day. In 2015, total landings from Wallis Lake (167 t) and CPUE (40.1 kg per day) were 75 and 36 per cent higher than 5-year averages, respectively. The length compositions of the commercial landings for this species have been stable since monitoring commenced in 2009 [17]. Nominal effort levels (in the number of fisher days) over the past 5 years have remained steady, and are well below historical levels. The minimum legal length for both commercial and recreational fishers and spatial closures in New South Wales reduces fishing pressure on the spawning stock.

The above evidence indicates that the biomass of this stock is unlikely to be recruitment overfished and the current level of fishing pressure is unlikely to cause the stock to become recruitment overfished.

On the basis of the evidence provided above, the South-eastern Australian (New South Wales) biological stock is classified as a **sustainable stock**.

Spencer Gulf

In South Australia, TACC levels have been set since 1996 that aim to harvest Blue Swimmer Crab resources within ecologically sustainable limits and protect the species from becoming recruitment overfished. Since 1999–2000, exploitation rates have been limited by setting the TACC at a level below the maximum historical catch for the fishery. A LMS of 110 mm CW is enforced, at which size crabs are approximately 14–18 months old and sexually mature. Females produce at least two batches of eggs each season [18].

The primary measures of status for the Spencer Gulf biological stock are the relative abundance of legal-sized and pre-recruit crabs, as indicated by catch rates in fishery-independent pot surveys that have been conducted in most years since 2002. Catch rates are compared with limit reference points that are defined in the South Australian Blue Crab Fishery Management Plan [19]. These reference points were set at the lower end of the observed range of relative catch rates in the reference period 2002–10, to ensure that relative abundance remains within the range of historical values during a period when the TACC was constant and considered to be harvested sustainably.

No survey was conducted in the Spencer Gulf fishing zone in 2015 because of a high abundance of pre-recruits in the 2014 survey, which permitted the option in the management plan to miss a survey. Relative abundance of legal-sized crabs in 2014 (10 crabs per pot-lift) was above the average for the 9-year reference period (6.9 crabs per pot-lift; range 5.1–9.1 crabs per pot-lift) and above the limit reference point (five crabs per pot-lift). Relative abundance of pre-recruits in 2014 (9.4 crabs per pot-lift) was above the average for the 9-year reference period (5.3 crabs per pot-lift; range 2.3–10.1 crabs per pot-lift) and above the limit reference point (two crabs per pot-lift). Given these abundance levels and the stable commercial catch history throughout the survey period [14], the biological stock is not considered to be recruitment overfished.

During the 2014–15 season (1 July 2014–30 June 2015), the TACC was 381.7 t, and almost all of this (380.1 t) was landed. An additional 3 t was harvested by the Marine Scalefish fishery. This level of fishing mortality is unlikely to cause the biological stock to become recruitment overfished.

On the basis of the evidence provided above, the Spencer Gulf (South Australia) biological stock is classified as a **sustainable stock**.

Gulf St. Vincent

The process for determining the status of the Gulf St. Vincent biological stock is the same as for the Spencer Gulf stock, using a similar fishery-independent pot survey design, and the same definition and usage of limit reference points based on catch rate, as an index of abundance.

This stock was previously considered in 2012–13 to be recruitment overfished. However, relative catch rate of legal-sized crabs in 2015 (5.4 crabs per pot-lift) was above the average for the 9-year reference period (3.2 crabs per pot-lift; range 1.6–4.7 crabs per pot-lift) and above the limit reference point (1.5 crabs per pot-lift). Relative abundance of pre-recruits in 2015 (5.8 crabs per pot-lift) was above the average for the 9-year reference period (4.4 crabs per pot-lift; range 0.4–10.7 crabs per pot-lift) and above the limit reference point (1.5 crabs per pot-lift). During the 2014–15 season (1 July 2014–30 June 2015), 196.4 t was landed, equivalent to 100 per cent of the TACC (196.1 t). In response to low relative abundances of pre-recruit and legal-size crabs in the 2013 survey, a 20 per cent reduction in the TACC was maintained during the 2014–15 season. A 50 per cent reduction in recreational bag and boat limits has also remained in place since 2013–14 to promote stock recovery. The stock response to these actions appears to be positive with an increase in the abundance of pre-recruit and legal-size crabs during the 2014 and 2015 surveys [20]. This level of fishing pressure is unlikely to cause the stock to become recruitment overfished.

Taking into account the management arrangements to promote stock recovery, and the measurable improvements in the abundance of pre-recruits in the fishery-independent survey, increases in the abundance of legal-sized and pre-recruit crabs in the 2015 survey indicate that the stock has recovered from its recruitment overfished state.

On the basis of the evidence provided above, the Gulf St. Vincent (South Australia) biological stock is classified as a **sustainable stock**.

West Coast

Blue Swimmer Crabs are harvested in low quantities (generally less than 60 t per year) on the west coast of South Australia as part of the Marine Scalefish Fishery. Fishers in this fishery target a range of species, and effort patterns generally reflect changes in seasonal abundance of the various species and their market prices.

As for the Spencer Gulf and Gulf St. Vincent biological stocks, a minimum legal size of 110 mm CW for Blue Swimmer Crab is enforced, under the assumption that growth rates and size at sexual maturity are similar for the West coast stock.

During the 2014–15 season (1 July 2014–30 June 2015), 41 t was landed from the West coast over 608 boat days. The 2014–15 catch rate was 68 kg per boat dayand catch rate has remained around this level since 2002–03 (range: 53–78 kg per boat day). Given the multispecies nature of the Marine Scalefish Fishery, and the sustained low annual catches of Blue Swimmer Crabs in the fishery, it is unlikely that the West coast biological stock is recruitment overfished; however, insufficient information is available to classify its status.

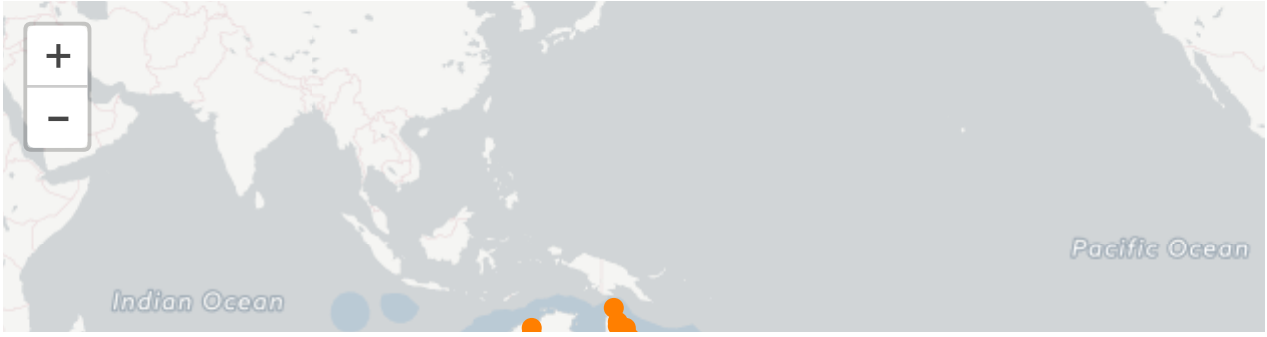
On the basis of the evidence provided above, the West coast (South Australia) biological stock is classified as an **undefined stock**.

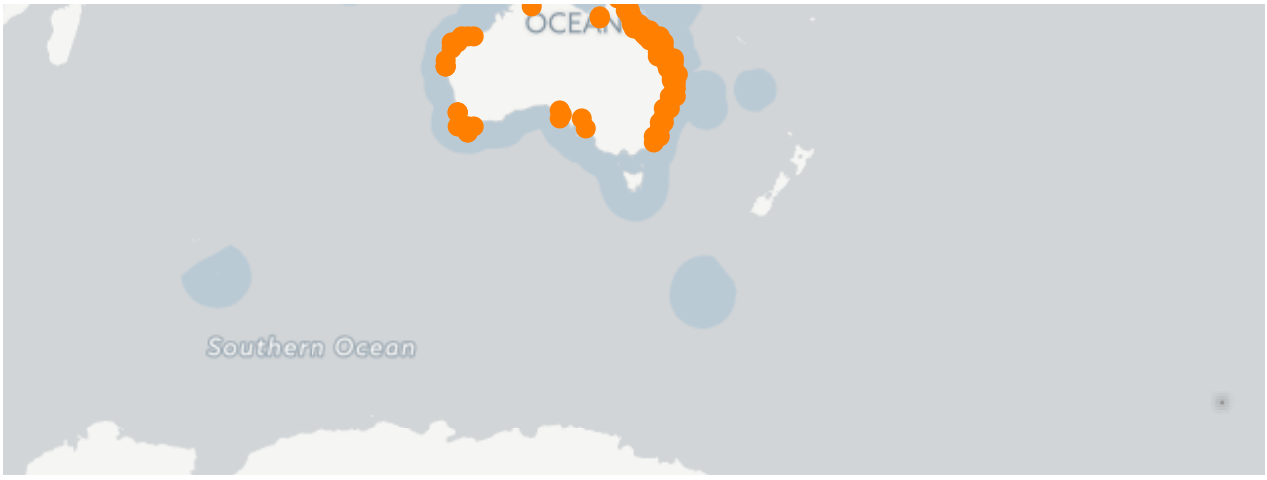
BIOLOGY

Biology

Species	Longevity / Maximum Size	Maturity (50 per cent)
Blue Swimmer Crab	3 - 4 years; ~ 200 mm CW	Varies among locations; 6–14 months; 86–98 mm CW

DISTRIBUTIONS





TABLES

Fishing methods

	Western Australia	Queensland	New South Wales	South Australia
Commercial				
Unspecified	✔			
Various	✔			✔
Otter Trawl		✔	✔	
Blue Swimmer Crab Trap		✔	✔	✔
Coastal, Estuary and River Set Nets			✔	
Mesh Net			✔	
Fish Trap			✔	
Recreational				
Diving	✔			✔
Coastal, Estuary and River Set Nets	✔			✔
Blue Swimmer Crab Trap	✔	✔	✔	
Dip Net			✔	
Indigenous				
Traditional apparatus		✔		

Management methods

Method	Western Australia	Queensland	New South Wales	South Australia
Commercial				
Effort limits	✔			
Gear restrictions	✔	✔	✔	✔
Limited entry	✔	✔	✔	✔
Protection of egg-bearing females	✔		✔	✔
Protection of female crabs		✔		
Size limit	✔	✔	✔	✔
Spatial closures	✔	✔	✔	✔
Spatial zoning	✔		✔	✔
Temporal closures	✔			✔
Total allowable catch	✔	✔		✔
Vessel restrictions	✔	✔	✔	
Indigenous				
Gear restrictions		✔		
Section 31 (1)(c1), Aboriginal cultural fishing authority			✔	
Recreational				
Bag limits	✔		✔	✔
Boat limits	✔			✔
Breeding status limits		✔		

Method	Western Australia	Queensland	New South Wales	South Australia
Gear restrictions	✔	✔	✔	✔
General recreational licence or fishing boat licence (not species specific)	✔		✔	
Limited entry (licensing)	✔			
Passenger restrictions	✔			
Possession limit		✔		
Protection of egg-bearing females	✔		✔	✔
Protection of female crabs		✔		
Size limit	✔	✔	✔	✔
Spatial closures	✔	✔	✔	✔
Spatial zoning	✔			
Temporal closures	✔			

Active vessels

	Western Australia	Queensland	New South Wales	South Australia
	6 in EGPMF, 21 in JASDGDLMF, 5 in NBPMF, 10 in PHECF, 23 in SBCMF, 27 in SCEMF, 69 in SWTMF	109 in BSCF, 211 in ECOTF	130 in EGF, 51 in OTF	6 in BCF, 33 in MSF

BCF Blue Crab Fishery (SA)
BSCF Blue Swimmer Crab Fishery (QLD)
ECOTF East Coast Otter Trawl Fishery (QLD)
EGF Estuary General Fishery (NSW)
EGPMF Exmouth Gulf Prawn Managed Fishery (WA)

JASDGDLMF
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NBPMF Nickol Bay Prawn Managed Fishery (WA)
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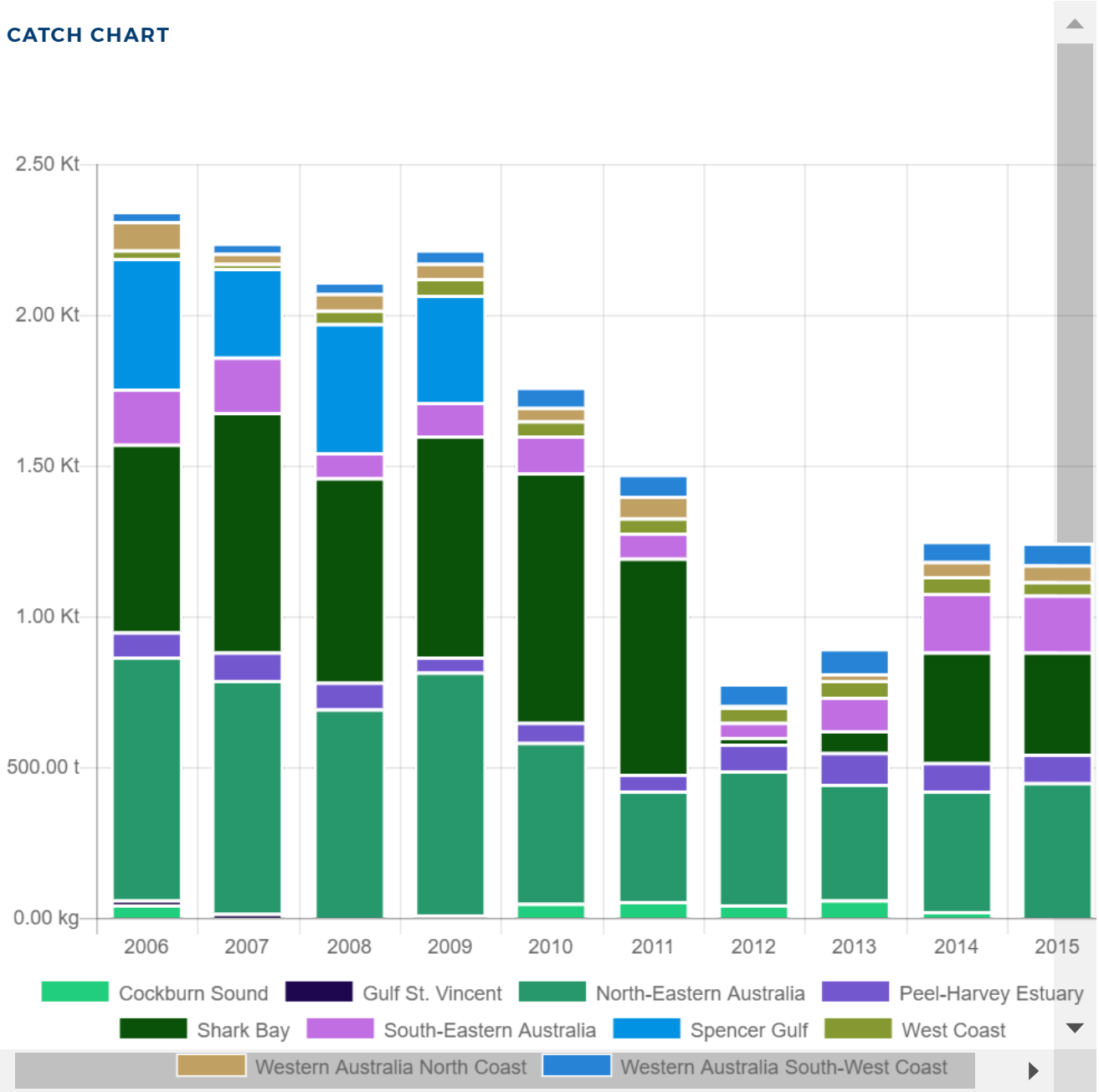
SBCMF Shark Bay Crab Managed Fishery (WA)
SCEMF South Coast Estuarine Managed Fishery (WA)
SWTMF South West Trawl Managed Fishery (WA)

Catch

	Western Australia	Queensland	New South Wales	South Australia

CATCH CHART



EFFECTS OF FISHING ON THE MARINE ENVIRONMENT

- Because the commercial catch of crabs generally represents a relatively small proportion of the biomass, which is renewed annually, these fisheries are unlikely to have significant impacts on the food chain.

- Fishing with traps results in limited habitat disturbance because it is generally conducted over sand habitats that are resilient.

- Although part of the Blue Swimmer Crab catch in the Shark Bay Crab (Interim) Managed Fishery (Western Australia) is harvested during otter trawling operations for prawns in Shark Bay, this activity is highly regulated and restricted to a small proportion of the area.

ENVIRONMENTAL EFFECTS ON BLUE SWIMMER CRAB

- There is some evidence to suggest that the distribution of Blue Swimmer Crab is extending further south in both of South Australia's gulfs [5,20], possibly as a response to climate change.

- The decline in annual catches of Blue Swimmer Crab in Gulf St. Vincent (South Australia) in recent years has coincided with substantial increases in commercial catches of Snapper (*Chrysophrys auratus*). Trophodynamic modelling work is being done to investigate a potential causal relationship between the two species; Blue Swimmer Crab is known to be a major component of the diet of Snapper. This relationship is also apparent in the Cockburn Sound (Crab) Managed Fishery (CSCMF) in Western Australia where the recent decline in catch of Blue Swimmer Crabs has coincided with an increase in Snapper abundance.

- Climate change impacts on Western Australian Blue Swimmer Crab stocks are currently under investigation. For Shark Bay, average summer temperatures have returned within the historical range since the marine heat wave event of 2010–11, although the long-term decadal warming trend persists. The typical winter months in Shark Bay were August–October, which has more recently shifted forward to June–August. Furthermore, a unique phenomenon has been noted where there appears to be a cooling trend of the winter sea surface temperatures inside the bay that is in contrast to the warming trend outside the bay (unpublished data, Department of Agriculture and Fisheries, Queensland). Preliminary analysis suggests the cooling to be linked to a southward shift in the subtropical high pressure ridge (unpublished data, Hetzel, Y). The winter months represent the period of peak spawning of Blue Swimmer Crabs in Shark Bay and the changing water temperature could be affecting the timing of spawning.

- Recent poor recruitment and egg production in the CSCMF is not attributable to fishing pressure, since a conservative management approach has been taken since the fishery was reopened in 2009, following a 3-year closure. Reasons for the stock decline are being investigated and it appears that crab catch is strongly correlated with primary productivity (summer chlorophyll–*a* concentration), with stock declines over the past decade consistent with declines in primary productivity. This indicates that recent declines in stock are most likely driven by environmental influences, with catch unlikely to increase significantly until primary productivity increases. Temperature and predation also appear to play a key role in influencing catch levels. There has been some evidence of density dependent growth occurring in Cockburn Sound with growth rates declining in years when stock levels were high and increasing when stock levels were low as evidenced recently. This lack of growth may have facilitated the lower proportion of berried females during 2012 when there was a very large cohort of recruiting crabs, leading to poor spawning and recruitment in 2013 [9].

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