

# MUD CRABS (2018)

*Scylla* spp., *Scylla olivacea*, *Scylla serrata*



**Mark Grubert:** Department of Primary Industry and Resources, Northern Territory, **Daniel Johnson:** Department of Primary Industries, New South Wales, **Danielle Johnston:** Department of Primary Industries and Regional Development, Western Australia, **Sue Helmke:** Department of Agriculture and Fisheries, Queensland

## STOCK STATUS OVERVIEW

Jurisdiction	Stock	Fisheries	Stock status	Indicators
Western Australia	Kimberley Developing Mud Crab Fishery	KDMCF	Sustainable	Catch, effort, catch rate
Northern Territory	Arafura-West Mud Crab Fishery	AWMCF	Sustainable	Catch, effort, catch rate
Northern Territory	Western Gulf of Carpentaria Mud Crab Fishery	WGOCMCF	Sustainable	Catch, effort, catch rate, biomass, fishing mortality
Queensland	East Coast	MCF	Sustainable	Catch, effort, catch rate, fishing mortality
Queensland	Gulf of Carpentaria	MCF	Sustainable	Catch, effort, catch rate, biomass, fishing mortality
New South Wales	Estuary General Fishery	EGF, N/A	Undefined	Catch

EGF Estuary General Fishery (NSW), N/A Not Applicable (NSW), AWMCF Arafura-West Mud Crab Fishery (NT), WGOCMCF Western Gulf of Carpentaria Mud Crab Fishery (NT), MCF Mud Crab Fishery (QLD), KDMCF Kimberley Developing Mud Crab Fishery (WA)

## STOCK STRUCTURE

Two species of Mud Crabs are found in Australian waters: Giant Mud Crab (*Scylla serrata*) and Orange Mud Crab (*S. olivacea*). The former constitutes more than 99 per cent of the commercial catch of Mud Crabs in the Northern Territory and Queensland, and the entire commercial catch in New South Wales. The species composition in the Kimberley Developing Mud Crab Fishery (Western Australia) is uncertain but is known to vary considerably between locations.

The life history and biology of Giant Mud Crab in the Northern Territory and Queensland are

well documented [Alberts-Hubatsch H 2015, Heasman MP 1980, Hill BJ 1994, Hill et al. 1982, Hyland et al. 1984, Knuckey IA 1999] but, with some exceptions [Alberts-Hubatsch et al. 2014, Butcher PA 2004, Butcher et al. 2003], corresponding information from Western Australia and New South Wales is scarce. There are no published accounts on the biology of Orange Mud Crab in Australian waters. Hence, all catch, and biological information presented here refers to the Giant Mud Crab (*S. serrata*), unless otherwise stated.

Genetic evidence suggests that there are at least two biological stocks of Giant Mud Crab in Australian waters: one to the west and another to the south east of the Torres Strait [Gopurenko and Hughes 2002], referred to as the Northern Australian and East Coast biological stocks, respectively.

Female Giant Mud Crab in northern Australia migrate up to 95 km offshore to release their eggs [Hill BJ 1994], which average around 4.5 million per individual [Mann et al. 1999]. Coupled with a planktonic larval stage that can last for several weeks [Nurdiani and Zeng 2007], this may facilitate significant gene flow between areas (depending on local oceanography). However, there have been significant changes in the relative performance of some fisheries operating across these stocks since 2014, suggesting that, despite larval connectivity, there are different exploitation rates on components of the adult stock in different areas. These changes, combined with different management arrangements for each of the four jurisdictions that harvest Giant Mud Crab, and (in some cases) the need for more information on local population dynamics, and fine-scale stock structure, have resulted in this status report providing status determinations for Giant Mud Crab at the level of fishery management units: Kimberley Developing Mud Crab Fishery (Western Australia); Arafura-West Mud Crab Fishery (Northern Territory), Western Gulf of Carpentaria Mud Crab Fishery (Northern Territory); Gulf of Carpentaria (Queensland), East Coast (Queensland); and the Estuary General Fishery (New South Wales).

## STOCK STATUS

### **Arafura- West Mud Crab Fishery**

The Arafura-West Mud Crab Fishery (Northern Territory) (AWMCF) encompasses the city of Darwin. The non-commercial harvest of Mud Crabs close to this population centre is substantial. The only concurrent estimates of the harvest by visiting recreational fishers, resident recreational fishers and Indigenous fishers within the AWMCF (derived from surveys in 2000–01) indicate that their combined take accounted for around 40 per cent of the overall harvest within this management unit at that time [Coleman, 2004, Henry and Lyle, 2003] (using a regional weight multiplier of 0.80 kg per crab; Henry and Lyle, 2003). A more recent, non-Indigenous, resident only angler survey confirms the significance of the recreational harvest in this region [West et al. 2012]. However, a lack of annual catch estimates for recreational and Indigenous fishers means that the assessment presented here is primarily based on data from commercial logbooks.

Commercial catch rates during the period 2007–16 have been variable, ranging from 0.2 kg per pot-lift–0.7 kg per pot-lift (average 0.5 kg per pot-lift). Both the catch and catch rate for this fishery in 2016 were the lowest in more than a decade, with a similar pattern seen in the WGOCMCF that year. However, the catch across the AWMCF increased in 2017, to 92 t (28 per cent above the 2016 catch) and the catch rate increased to 0.4 kg per pot-lift (double the 2016 catch rate). The catch rate in 2017 was 30 per cent above the upper-most trigger reference point in the harvest strategy for this fishery [NTG 2017].

The performance of the AWMCF in 2016 is considered to have been affected by ocean warming events [Benthuisen et al. 2018] and a concurrent influx of fishers from the Western Gulf of Carpentaria Mud Crab Fishery (where fishing conditions were even more strongly affected) that increased fishing pressure in a few key areas, temporarily reducing catch rates. The rebound in the fishery in 2017, which saw the return of more typical environmental and operational conditions, illustrates the resilience of the stock to a range of perturbations. The above evidence indicates that the biomass of this stock is unlikely to be depleted

and that recruitment is unlikely to be impaired.

A range of protective management measures (contained within the management plan and harvest strategy for the fishery), long sections of sparsely populated coastline subject to little or no crab fishing (particularly in Arnhem Land), and a strong, westward flowing long-shore wet season current (that can facilitate long distance dispersal of larvae [Schiller A 2011]) lessen the impact of moderate fishing pressure in a few discrete areas within the AWMCF. Commercial minimum size limits for both species of *Scylla* found in the Northern Territory are the same; 140 mm CW for males and 150 mm CW for females. In the case of the Giant Mud Crab, these limits ensure that more than 50 per cent of male crabs and over 98 per cent of female crabs reach sexual maturity before harvest [Knuckey IA 1999]. Although the size at maturity of Orange Mud Crab within the AWMCF is not known, contemporary market monitoring data indicate that less than 1 per cent of individuals harvested by licensees are female [Grubert MA, unpublished data]. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Arafura-West Mud Crab Fishery (Northern Territory) management unit is classified as a **sustainable stock**.

**East Coast** The only simultaneous estimates of the recreational and Indigenous harvest within the East Coast (Queensland) Mud Crab Fishery (MCF) management unit are now more than a decade old but indicate that the combined take by these sectors once exceeded 50 per cent of the total catch within this management unit (using a regional weight multiplier of 1.00 kg per crab [Henry and Lyle 2003]). More recent surveys, which may include some harvest by Indigenous fishers (survey respondents were not asked about their heritage), confirm the ongoing significance of the non-commercial harvest, at around 24 per cent of the overall take [Taylor et al. 2012, Webley et al. 2015]. The lack of annual catch estimates for recreational and Indigenous fishers means that the stock status presented here is primarily based on data from commercial logbooks.

The male-only harvest policy in Queensland means that fishing mortality on female Giant Mud Crab is minimal. However, female crabs may be handled and released many times during their life and so some incidental damage and discard mortality is probable (see the above-mentioned study in Moreton Bay). Nonetheless, this harvest policy maximises the number of females that survive to spawn. Protection of some sexually mature male crabs in Queensland is afforded by a minimum size limit of 150 mm CW (above the size at first maturity in this state [Heasman MP 1980], recreational possession limits and restrictions on commercial licence numbers and fishing effort.

The East Coast (Queensland) MCF management unit accounts for approximately 83 per cent of the commercial harvest of the east coast Giant Mud Crab biological stock. The commercial catch in 2017 (862 t) was 16 per cent below the average catch for the previous 10 years (1 030 t) [QDAF 2018]. The nominal catch rate in 2017 was 23 kg per fishing day, 18 per cent below the 10 year average (28 kg per fishing day; range 23–33 kg per fishing day). Although standardised catch rates have not been calculated for recent years, comparisons of nominal and standardised catch rates in earlier years showed good agreement.

Several no take zones (applying to all marine organisms) along the east coast of Queensland provide additional protection to Giant Mud Crab and result in higher crab densities and larger mean sizes within the protected areas, as well as spillover of crabs into adjacent fished areas [Alberts-Hubatsch H 2015, Pillans et al. 2005]. However, the benefit of these closures, over and above the single-sex harvest policy (and the male size limit) on a fishery-wide scale has not been quantified. While the localised benefits of spatial closures can be significant, their cumulative benefit on Giant Mud Crab spawning biomass across the entire

East Coast (Queensland) MCF management unit is unlikely to be great when considering the suite of protective measures already in place. All the above evidence indicates that the biomass of the management unit is unlikely to be depleted and that recruitment is unlikely to be impaired.

The most recent estimate of fishing mortality in the East Coast (Queensland) MCF management unit (based on commercial data to 2008) was around 1.5 [Brown IW 2010], 24 per cent above the estimate of natural mortality for *S. serrata* (1.2 - derived from crabs in the Northern Territory [Knuckey IA 1999]). There are indications from the size distribution of male crabs that fishing mortality is not evenly spread across eastern Queensland, with localised depletion in some areas and low to moderate fishing mortality in others [Grubert and Lee 2013]. Annual fishing effort in 2017 (around 37 000 fishing days) was 12 per cent above the 2008 figure (33 000 fishing days) and the 2017 catch rate (23 kg per fishing day) was 7 per cent below the 2008 value [QDAF 2018]. The effect of the increase in effort since 2008 on the fishing mortality rate of male crabs is not known. However, the proportional change in fishing effort and catch rate is minor when compared to the variation seen in equivalent data for the Northern Territory. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the East Coast (Queensland) Mud Crab Fishery management is classified as a **sustainable stock**.

### Estuary General Fishery

The Estuary General Fishery (New South Wales) (EGF) accounts for approximately 17 per cent of the commercial harvest from the East Coast Giant Mud Crab biological stock, with the annual catch composition by sex being very close to 1:1 (49 per cent female, 51 per cent male). A recent survey of recreational fishing in New South Wales (which may include some harvest by Indigenous fishers) indicated that the non-commercial take accounts for around 10 per cent of the overall Giant Mud Crab harvest in this state [West et al. 2016] (using a regional weight multiplier estimated at 0.70 kg per crab).

Part of the Giant Mud Crab population in New South Wales is protected through a minimum size limit (85 mm CL ) although the effectiveness of this measure is uncertain because the size at maturity of *S. serrata* in this jurisdiction is not known. Studies on the reproductive biology of *S. serrata* from different catchments in northern Australia have reported regional differences in size at sexual maturity (Knuckey, 1999). The life history of *S. serrata* in New South Wales may differ from populations elsewhere as this jurisdiction represents the southern limit of the species' typical distribution on the eastern seaboard.

Several "no take" zones (applying to all marine organisms) along the New South Wales coast afford some protection to Giant Mud Crab and result in higher crab densities in the closed areas, size class distributions biased towards larger crabs, and spillover of crabs into adjacent fished areas [Butcher et al. 2003, Butcher et al. 2014]. However, these spatial closures are relatively small and fragmented, and their cumulative benefit on a fishery-wide scale has not been quantified.

The catch by the EGF increased 70 per cent between the 2010–11 and 2014–15 financial years (from 111 t to 189 t, respectively), and the catch for the 2016–17 financial year was 181 t. Catch in the EGF is (as of 1 December 2017) is controlled through an Interim Total Commercial Access Level (ITCAL) of 205 t, with catch allocations based on current shareholdings. The length composition of commercial landings for this species have been stable since monitoring commenced in 2009 [Stewart et al. 2015, NSW DPI unpublished data]. Issues within the EGF pertaining to the use of excess gear (above the allowable pot limit) means that it is not appropriate to infer the status of the stock from catch rate data. There are no estimates of the biomass within, or the fishing mortality rate exerted by, the EGF and so there is insufficient information to confidently classify the status of this stock.

On the basis of the evidence provided above, the Estuary General Fishery (New South Wales) management unit is classified as an **undefined stock**.

**Gulf of  
Carpentaria**

The commercial sector takes 90 per cent of the Giant Mud Crab catch in the Gulf of Carpentaria (Queensland) Mud Crab Fishery (MCF) management unit [Taylor et al. 2012] (using a regional weight multiplier of 1.00 kg per crab [Henry and Lyle 2003]) and so the status determination for this management unit is primarily based on data from commercial logbooks.

Female Giant Mud Crab cannot be retained in Queensland and the minimum legal size for males (150 mm CW) ensures that 50 per cent of males attain sexual maturity before harvest (based on male size at maturity estimates from the WGOCMCF, [Knuckey IA 1999]).

Although female Giant Mud Crab are not retained by the Gulf of Carpentaria (Queensland) MCF management unit, they are probably impacted by it to some degree, given that they may be handled and released many times. Indirect evidence of potential post-release mortality in Queensland comes from an analysis of female size frequency distributions inside and outside parts of the Moreton Bay Marine Park [Grubert and Lee 2013], with larger females being more prevalent in the catch in areas closed to fishing for 12 years compared to those where fishing is still allowed, even though female harvest is prohibited in both areas. Nonetheless, the male-only harvest policy maximises the number of female crabs that survive to spawn the next generation.

Catches in the Gulf of Carpentaria (Queensland) MCF management unit have historically been the most stable of any commercial *Scylla* fishery in Australia, averaging 161 t (range 100–199 t) between 2005 and 2016 [QDAF 2018]. As occurred in other areas, the catch and catch rate for this fishery in 2016 (100 t and 25 kg per fishing day, respectively) were the lowest in a decade, following several years of poor monsoon rainfall in the eastern Gulf of Carpentaria. By contrast, the catch in 2017 (130 t) was the highest in three years and the catch rate (35 kg per fishing day) was 25 per cent greater than the 10 year average (28 kg per fishing day); showing that the Giant Mud Crab population within this management unit is rebuilding rapidly, and is resilient to the above environmental impacts. The above evidence indicates that the biomass of the management unit is unlikely to be recruitment depleted and that recruitment is unlikely to be impaired.

Brown IW [2010] applied a high-resolution age-sex structured assessment model (that divides each age cohort into 'growth-type groups' - Walters [2007]) to catch and effort data from the Gulf of Carpentaria (Queensland) MCF management unit for the period 1998–2008. This analysis, which also incorporated an assumed five per cent increase in fishing efficiency each year, estimated that the annual fishing mortality rate for male Giant Mud Crab in 2008 was around 0.6, 50 per cent below the estimate of annual natural mortality for crabs caught in the adjacent Northern Territory (1.2 [Knuckey IA 1999]). Fishing effort in this management unit has decreased 16 per cent since 2008.

There has been a history of comparatively light exploitation of male crabs (as indicated by the relatively low fishing mortality rate), female Giant Mud Crab are completely protected, and the species exhibits rapid growth and high fecundity [Knuckey IA 1999, Mann et al. 1999]. The above evidence indicates that the current level of fishing mortality is unlikely to cause this management unit to become recruitment impaired.

On the basis of the evidence provided above, the Gulf of Carpentaria (Queensland) Mud Crab Fishery management unit is classified as a **sustainable stock**.

**Kimberley**

The Kimberley Developing Mud Crab Fishery (Western Australia) (KDMCF)

**Developing Mud Crab Fishery** operates in a remote part of Western Australia and commercially harvests a varying mixture of Giant Mud Crab and Orange Mud Crab in relatively small quantities. Estimates of the harvest of Mud Crabs by recreational and Indigenous fishers in the Kimberley zone of the North Coast bioregion of Western Australia (the section of the tropical Western Australian coastline east of 120°00' east) indicate that the non-commercial harvest is around two-thirds of the commercial catch. The catch is calculated from the estimated number of crabs kept, multiplied by a regional average weight of 0.67 kg per crab (across both species) [Henry and Lyle 2003, Ryan et al. 2017], a method employed in this assessment of individual management units.

Western Australia is the only Australian jurisdiction to impose separate minimum size limits for Giant Mud Crab (150 mm CW ) and Orange Mud Crab (120 mm CW ). Although size at maturity estimates are not available for either species within this state, studies of their reproductive biology in other places (the Northern Territory and Malaysia, respectively) suggest that the two size limits allow a large proportion of each species to reach sexual maturity before harvest. In the case of Giant Mud Crab, approximately 50 per cent of males and 98 per cent of females attain sexually maturity at a size of 150 mm CW [Knuckey IA 1999]. Reproductive development of the Orange Mud Crab begins at a much smaller size, with around 98 per cent of both sexes mature at 120 mm CW [Ikhwanuddin et al. 2011].

Commercial fishing activity in the KDMCF over the past decade has been sporadic, with annual effort ranging widely from around 300 to 30,000 pot-lifts. Confidentiality provisions preclude the disclosure of exact catch figures for 2017 as they are based on data from less than three operators but annual catches by the KDMCF have yet to exceed 20 tonnes (t). The average nominal catch rate for the period 2008–17 was 0.7 kg per pot-lift (range 0.4–1.0 kg per pot-lift), which is higher than the neighbouring Arafura-West Mud Crab Fishery in the Northern Territory (0.5 kg per pot-lift). The nominal catch rate in 2017 (1.0 kg per pot-lift) was 43 per cent above the 10 year average (0.7 kg per pot-lift) and double the draft harvest strategy threshold of 0.5 kg per pot-lift [Johnston et al. 2018]. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

There are no estimates of the fishing mortality rate in the KDMCF. However, the small and sporadic commercial catch by the fishery is considered to have little impact on the resource, given the stable harvest rates. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Kimberley Developing Mud Crab Fishery (Western Australia) management unit is classified as a **sustainable stock**.

**Western Gulf of Carpentaria Mud Crab Fishery** The Western Gulf of Carpentaria Mud Crab Fishery (Northern Territory) (WGOCMCF) has accounted for more than 70 per cent of the commercial harvest of Mud Crabs in the Northern Territory over the past 20 years. There are no records indicating the presence of Orange Mud Crab within this management unit [Keenan et al. 1998, The Atlas of Living Australia 2018] and so the catch of Mud Crabs in this region is assumed to consist entirely of Giant Mud Crab. The harvest of this species by resident recreational fishers, visiting recreational fishers and Indigenous fishers within the WGOCMCF in 2000–01 was estimated to be relatively low, at around 10 per cent of the overall take within this management unit [Coleman APM 2004, Henry and Lyle 2003,] (using a regional weight multiplier of 0.80 kg per crab [Henry and Lyle 2003]).

A more recent (2009–10) survey of Northern Territory anglers (which also collected information on visiting fisher activity at three popular fishing sites) confirmed that the harvest of Giant Mud Crab by resident anglers within the WGOCMCF is less than five per cent of the overall harvest of *Scylla* spp. by this

sector across the Northern Territory [West et al. 2012]. It also showed that the Giant Mud Crab harvest by interstate fishers visiting King Ash Bay (on the McArthur River) was almost eight times greater than that of resident recreational fishers at this site. The lack of current estimates of the overall harvest of Giant Mud Crab by visiting recreational fishers, resident recreational fishers and Indigenous fishers within this management unit means that the assessment presented here is based on data from commercial logbooks.

The oceanography of the southern Gulf of Carpentaria, and topography of the adjacent coast, differs markedly from that of other areas in northern Australia. Wind is a significant driver of seasonal fluctuations in sea level in this semi-enclosed water body, and its impact on biological processes in this region can be profound [Wolanski 1993]. Large areas of low-lying salt pans (behind the mangrove fringe) can be inundated during temporary rises in sea level and flood events, providing extensive nursery areas for juvenile Mud Crabs.

By contrast, prolonged declines in sea level may compromise survival of mangroves, which form a key habitat for juvenile and adult Mud Crabs [Alberts-Hubatsch 2015]. Duke et al. [2017] cites a temporary drop in sea level as one of several potential factors that caused a widespread mangrove die-back in the Gulf of Carpentaria in 2015–16. Other possible causes of natural mortality of Mud Crabs at that time include a prolonged period of drought [Duke et al. 2017] and a series of extreme ocean warming events in the area [Benthuisen et al. 2018].

The commercial catch in 2016 was 51 t, a historically low level [NTG 2018]. The combination of reduced coastal productivity during a protracted drought, loss of mangrove foliage and associated mortality of juvenile Giant Mud Crabs (through increased desiccation and/or predation), and extreme water temperatures (avoided by adult crabs so that they were temporarily unavailable to the fishery) are considered to be likely causes of the historically low catch and catch rate in the WGO CMCF in 2016. The subsequent substantial increase in catch in 2017 (to 185 t) is attributed to above average rainfall during the 2016–17 monsoon season, recovery of juvenile nursery areas and a return to average sea surface temperatures that year [COA BOM 2017, IMOS 2018].

Estimates of spawning biomass within the WGO CMCF at the end of 2017 ( $B_t$ ) as a proportion of spawning biomass at Maximum Sustainable Yield ( $B_{MSY}$ ) derived by Grubert et al. [*in press*], ranged from 1.04 to 1.07, indicating that the stock is currently above the target reference level. Estimated female Spawning Stock Biomass (FSSB) at the end of the most recent fishing year (which is used as a performance indicator in the harvest strategy for the fishery [NTG 2017]) was 61 t; roughly twice the previous five year average and 87 per cent of the harvest strategy target of 70 t. 2015 was also the first time in over five years when recruitment was above average. The above evidence indicates that the biomass of the management unit is unlikely to be recruitment depleted and that recruitment is unlikely to be impaired.

The analysis by Grubert et al. [*in press*] estimates that overfishing (defined as  $F/MSY > 1$ ) is not currently occurring under any modelled catchability scenario. The WGO CMCF has been operating under a formal harvest strategy for two years, with the strategy supported by a year-round market monitoring program and fishery observer program targeting the months of April and May (to validate catch rate estimates derived from logbook data). Commercial minimum size limits of 140 mm CW for males and 150 mm CW for females ensure that at least 50 per cent of male and around 98 per cent of female Giant Mud Crabs reach sexual maturity before harvest [Knuckey IA 1999]. This level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Western Gulf of Carpentaria Mud Crab Fishery (Northern Territory) management unit is classified as a **sustainable stock**.

**BIOLOGY**

**Giant Mud Crab biology** [Butcher et al. 2003, Grubert and Lee 2013, Heasman MP 1980, Jebreen et al. 2008, Knuckey IA 1999]

Species	Longevity / Maximum Size	Maturity (50 per cent)
MUD CRABS	3–4 years, 230 mm CW, but rarely exceeds 200 mm CW in most areas	Varies by sex and location but generally 120–150 mm CW

**DISTRIBUTION**



Distribution of reported commercial catch of Mud Crabs

**TABLES**

Commercial Catch Methods	New South Wales	Northern Territory	Queensland	Western Australia
Crab Trap		✓		✓
N/A			✓	
Net	✓		✓	
Traps and Pots	✓		✓	✓
Unspecified	✓			✓

Fishing methods	New South Wales	Northern Territory	Queensland	Western Australia
<b>Commercial</b>				
Crab Trap		✓		✓
Net	✓		✓	
Traps and Pots	✓		✓	
Unspecified	✓			

<b>Indigenous</b>				
Beach Seine		✓	✓	
Cast Net		✓	✓	
Coastal, Estuary and River Set Nets		✓	✓	✓
Dip Net		✓	✓	✓
Gillnets and entanglement nets	✓			
Hand collection	✓	✓	✓	✓
Hook and Line	✓	✓	✓	✓
Spearfishing		✓	✓	
Traps and Pots	✓	✓	✓	
<b>Recreational</b>				
Beach Seine		✓	✓	
Cast Net		✓	✓	
Coastal, Estuary and River Set Nets		✓	✓	✓
Dip Net		✓	✓	✓
Gillnets and entanglement nets	✓			
Hand collection	✓	✓	✓	✓
Hook and Line	✓	✓	✓	✓
Spearfishing		✓	✓	
Traps and Pots	✓	✓	✓	
<b>Management Methods</b>				
	<b>New South Wales</b>	<b>Northern Territory</b>	<b>Queensland</b>	<b>Western Australia</b>
<b>Charter</b>				
Gear restrictions			✓	
Male-only harvest			✓	
Possession limit			✓	
Size limit			✓	
Spatial closures			✓	
Spatial zoning			✓	
<b>Commercial</b>				
Catch limits	✓			

Effort limits	✓	✓	✓	✓
Gear restrictions	✓	✓	✓	✓
Limited entry	✓	✓	✓	✓
Male-only harvest			✓	
Protection of berried females	✓	✓		✓
Protection of soft-shelled crabs		✓		
Size limit	✓	✓	✓	✓
Spatial closures	✓	✓	✓	✓
Spatial zoning	✓	✓	✓	✓
<b>Indigenous</b>				
Bag limits	✓			
Gear restrictions				✓
Native Title	✓			
Section 37 (1d)(3)(9), Aboriginal cultural fishing authority	✓			
Spatial closures				✓
<b>Recreational</b>				
Bag limits				✓
Gear restrictions	✓	✓	✓	✓
Male-only harvest			✓	
Possession limit	✓	✓	✓	
Protection of berried females	✓	✓		✓
Size limit	✓	✓	✓	✓
Spatial closures	✓	✓	✓	✓
Spatial zoning	✓	✓	✓	✓
Vessel limits		✓		✓
<b>Active Vessels</b>				
	<b>New South Wales</b>	<b>Northern Territory</b>	<b>Queensland</b>	<b>Western Australia</b>
	229 Fishing Business in	35 LICENCES in MCF.	295 in MCF, 33 in MCF.	<3 in KDMCF. 21 in

	EGF, 10 Fishing Business in EPTF, 12 Fishing Business in OTF,			Charter,
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**EGF** Estuary General Fishery(NSW)

**EPTF** Estuary Prawn Trawl Fishery(NSW)

**OTF** Ocean Trawl Fishery(NSW)

**MCF** Mud Crab Fishery(NT)

**MCF** Mud Crab Fishery(QLD)

**KDMCF** Kimberley Developing Mud Crab Fishery(WA)

**Charter** Tour Operator(WA)

Catch	New South Wales	Northern Territory	Queensland	Western Australia
<b>Charter</b>		1.22t in FTO,		0.78 t in Charter
<b>Commercial</b>	161.151t in EGF, 7.672t in N/A,	91.8933t in AWMCF, 183.658t in WGOCMCF,	987.977t in MCF,	
<b>Indigenous</b>	Unknown	69 t (2000–01)	13 t (2000–01)	6 t (2000–01)
<b>Recreational</b>	21 t (2013–14)	24 t (2009–10)	332 t in East Coast MCF (2013–14), 7 t in Gulf of Carpentaria MCF (2010–11)	2.5 t North Coast (2015–16)

EGF Estuary General Fishery (NSW), N/A Not Applicable (NSW), AWMCF Arafura-West Mud Crab Fishery (NT), WGOCMCF Western Gulf of Carpentaria Mud Crab Fishery (NT), MCF Mud Crab Fishery (QLD), KDMCF Kimberley Developing Mud Crab Fishery (WA),

**Western Australia – Indigenous (catch)** The estimate of the Indigenous harvest tonnage of Mud Crabs in Western Australia has been revised down as the weight multiplier previously used to calculate this value (1.34 kg per crab) is now considered unrealistically high given that the average weight of harvested Mud Crabs in Western Australia was recently estimated at 0.65 kg.

**Northern Territory — Charter (management methods)** In the Northern Territory, charter operators are regulated through the same management methods as the recreational sector but are subject to additional limits on license and passenger numbers.

**Northern Territory – Indigenous (management methods)** The *Fisheries Act 1988* (NT), specifies that “...without derogating from any other law in force in the Territory, nothing in a provision of this Act or an instrument of a judicial or administrative character made under it limits the right of Aboriginals who have traditionally used the resources of an area of land or water in a traditional manner from continuing to use those resources in that area in that manner”.

**Queensland – Indigenous (management methods)** Under the *Fisheries Act 1994* (Qld), Indigenous fishers in Queensland are entitled to use prescribed traditional and non-commercial fishing apparatus in waters open to fishing. Size and possession limits, and seasonal closures do not apply to Indigenous fishers. Further exemptions to fishery regulations may be applied for through permits.

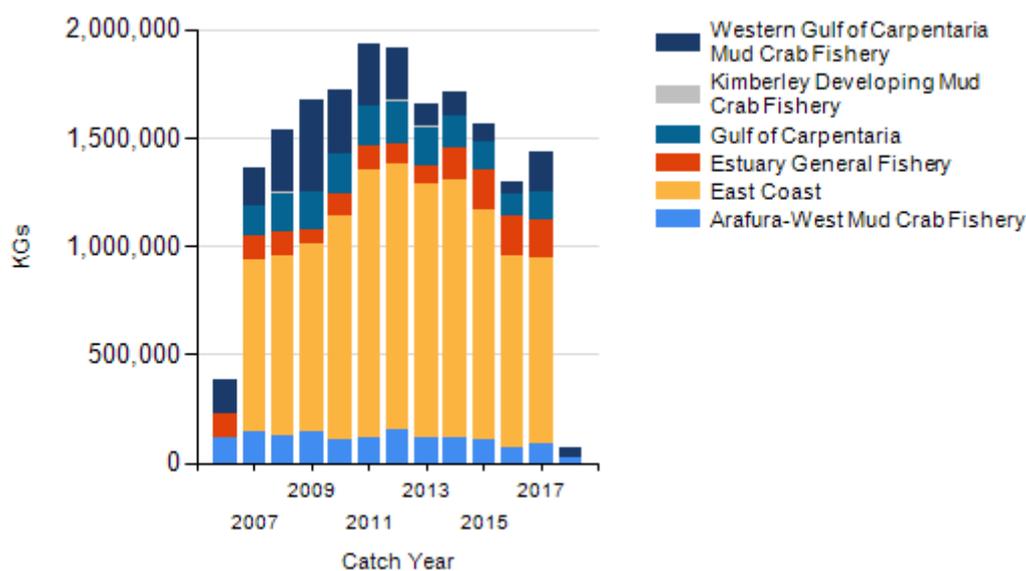
**New South Wales – Indigenous (management methods) (a)**

Aboriginal Cultural Fishing Interim Access Arrangement—allows an Indigenous fisher in New South Wales to take in excess of a recreational bag limit in certain circumstances; for example,

if they are doing so to provide fish to other community members who cannot harvest for themselves; (b) The Aboriginal cultural fishing authority is the authority that Indigenous persons can apply to take catches outside the recreational limits under the *Fisheries Management Act 1994* (NSW), Section 37 (1d)(3)(9), Aboriginal cultural fishing authority; and (c) In cases where the *Native Title Act 1993* (Cth) applies fishing activity can be undertaken by the person holding native title in line with S.211 of that Act, which provides for fishing activities for the purpose of satisfying their personal, domestic or non-commercial communal needs. In managing the resource where native title has been formally recognised, the native title holders are engaged with to ensure their native title rights are respected and inform management of the State's fisheries resources.

**Active Vessels** The number of active exemption holders (for Western Australia), licences (for the Northern Territory and Queensland) or businesses (for New South Wales) are shown here because the number of active vessels is not an appropriate measure of effort in Australian Mud Crab fisheries. Licensing arrangements also vary significantly between jurisdictions.

## CATCH CHART



Commercial catch of Mud Crabs - note confidential catch not shown

## EFFECTS OF FISHING ON THE MARINE ENVIRONMENT

### ENVIRONMENTAL EFFECTS on MUD CRABS

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