

Annual status report

Queensland Mud Crab Fishery

2007



The Department of Primary Industries and Fisheries (DPI&F) seeks to maximise the economic potential of Queensland's primary industries on a sustainable basis.

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Introduction

Mud crabs (*Scylla* spp.) are found throughout the Indo-Pacific region. In Australia, they are found in tropical and subtropical areas in association with mangrove-lined estuaries from southern New South Wales, north to the Exmouth Gulf in Western Australia. Fast growth rates, early maturity, wide distribution and high fecundity are all biological characteristics that contribute to the resilience of mud crabs to harvest. Mud crabs are highly desired in both the commercial and recreational sectors. Queensland is unique among Australian states in protecting all female mud crabs and only allowing males to be harvested.

This report covers the 2006 calendar year.

Fishery profile 2006

Total harvest from all sectors: approximately 1599 t

Commercial harvest: approximately 898 t

Preliminary recreational harvest in 2005: approximately 689 t

Indigenous harvest in 2000/01: approximately 12 t

Charter harvest: <1 t

Commercial Gross Value of Production (GVP): approximately \$9.4 million

Number of licences: 859 as of 30 June 2006¹

Commercial fishing boats accessing the fishery: approximately 406

Fishery season: January–December

Description of the fishery

Fishing methods

Commercial operators are permitted to use collapsible traps² and crab pots³ (Figure 1). In addition to pots and traps, recreational fishers are also permitted to use dillies⁴.

Size and shape of pots vary, but most are cylindrical and have two entrance funnels.

Mud crabs are enticed into the pot or trap by bait attached to the inside of the apparatus.



Figure 1: Rigid crab pot.

¹ As of 30 June 2006, the Australian Government Department of the Environment and Water Resources (DEW) (formerly known as the Department of the Environment and Heritage) held 77 licences under the Great Barrier Reef Marine Park (GBRMP) Structural Adjustment Package.

² Under the Fisheries Regulation 1995, a collapsible trap is defined as 'a trap made of rigid material, with one or more collapsible sides'.

³ Under the Fisheries Regulation 1995, a crab pot is defined as 'a fishing apparatus comprising a cage with a round opening top, or an elongated opening (parallel to the base)'.

⁴ Under the Fisheries Regulation 1995, a dilly is 'a fishing apparatus comprising a frame and a net that hangs below the frame's horizontal plane when the apparatus is in use'.

Fishing area

The Mud Crab Fishery comprises the following tidal waters on the East Coast:

- east of longitude 142°31'49" E
- north of latitude 10° S and between longitude 141°20' E and longitude 142°31'49" E,

and in the Gulf of Carpentaria:

- between the 25 nautical mile line and the shore, south of latitude 10°48' S.

This essentially covers all Queensland tidal waters (Figure 2).

Main management methods used

The Department of Primary Industries and Fisheries (DPI&F) Queensland manages the Mud Crab Fishery in accordance with ecologically sustainable development principles. The Mud Crab Fishery is managed under the Queensland *Fisheries Act 1994* and in accordance with the Queensland Fisheries Regulation 1995.

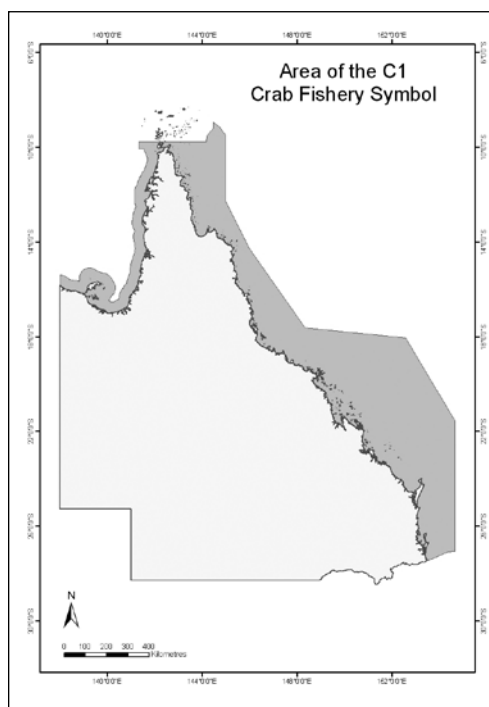


Figure 2: Boundary of the Mud Crab Fishery.

A range of input and output controls are in place to manage the harvest of mud crabs by commercial and recreational fishers, including:

- minimum legal size limit that applies to both commercial and recreational fishers (150 mm carapace width)
- a prohibition on taking female crabs
- apparatus restrictions (50 pots per licence for the commercial fishery and four pots per person for the recreational fishery)
- limited entry to the commercial fishery (C1 endorsement required)
- prescriptions on the size of the float that may be used
- closures (Eurimbula Creek and all adjoining waterways are closed to the harvesting of mud crabs, along with closures enforced through marine park zoning established under the Australian Government *Great Barrier Reef Marine Park Act 1975* and the Queensland *Marine Parks Act 2004*).

Approximate allocation between sectors

Information provided to DPI&F through commercial fisher logbooks and recreational fish diaries indicates that the commercial sector harvests the majority of the catch (approximately 56%) with the recreational sector harvesting slightly less (43%). Compared to the recreational and commercial sectors, the annual harvest of mud crabs by the Indigenous and charter sectors is considered very low (12 t and less than 1 t, respectively).

Fishery accreditation under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The Mud Crab Fishery was granted a Wildlife Trade Operation (WTO) approval on 13 August 2004 under Part 13A of the Australian Government EPBC Act. This accreditation acknowledges that the Mud Crab Fishery is being managed in an ecologically sustainable manner and allows the export of catch. The approval expires on 31 August 2007.

Catch statistics

Commercial

Queensland mud crab fishers are required to report commercial catch in a daily logbook which is maintained by DPI&F. Total reported commercial catch in Queensland has decreased from 959 t in 2005 to 898 t in 2006 (Figure 3, Table 1). Catch per unit effort (CPUE)—based on kilogram per boat-day—had remained relatively stable during 2000–06, ranging between approximately 23–26 kg/day (Figure 3, Table 1).

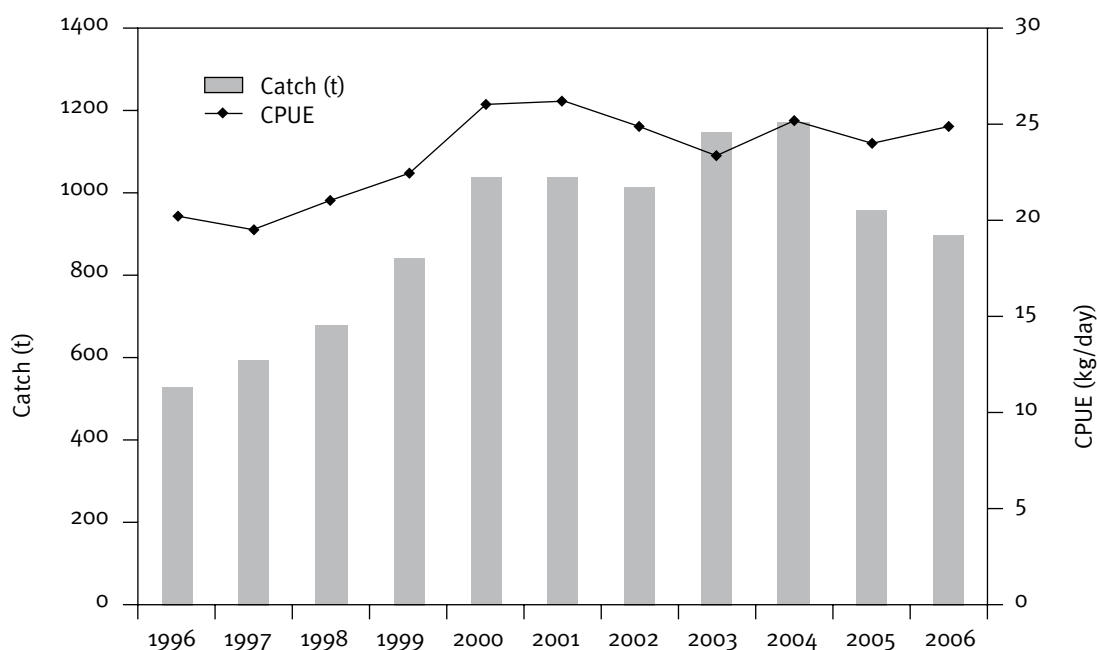


Figure 3: Reported commercial catch and effort in the Mud Crab Fishery, 1996–2006 (Source: DPI&F CFISH database 29 March 2007).

Table 1: Commercial details for the Mud Crab Fishery, 2000–06 (Source: DPI&F CFISH database 29 March 2007).

	2000	2001	2002	2003	2004	2005	2006
Catch (t)	1 035	1 036	1 015	1 150	1 173	959	898
Days fished	39 750	39 544	40 808	49 054	46 557	39 878	36 099
Boats	468	491	483	502	497	423	406
CPUE kg/day	26	26	25	23	25	24	25
Days/boat	85	81	84	98	94	94	89
Catch (t)/boat	2.21	2.11	2.10	2.29	2.36	2.27	2.21
GVP \$million	10.87	10.87	10.66	12.07	12.32	10.06	9.42

The decrease in commercial mud crab harvest in 2006 is paralleled by decrease in commercial fishing days; from approximately 40 000 days in 2005 to approximately 36 000 days in 2006 (Table 1 on previous page). It is also a reflection of fewer boats accessing the fishery following the licence buyout under the Great Barrier Reef Marine Park (GBRMP) Structural Adjustment Package (Figure 4). The Australian Government Department of the Environment and Water Resources (DEW) has purchased and surrendered 77 C1 crab fishing symbols, which will not be available for reallocation.

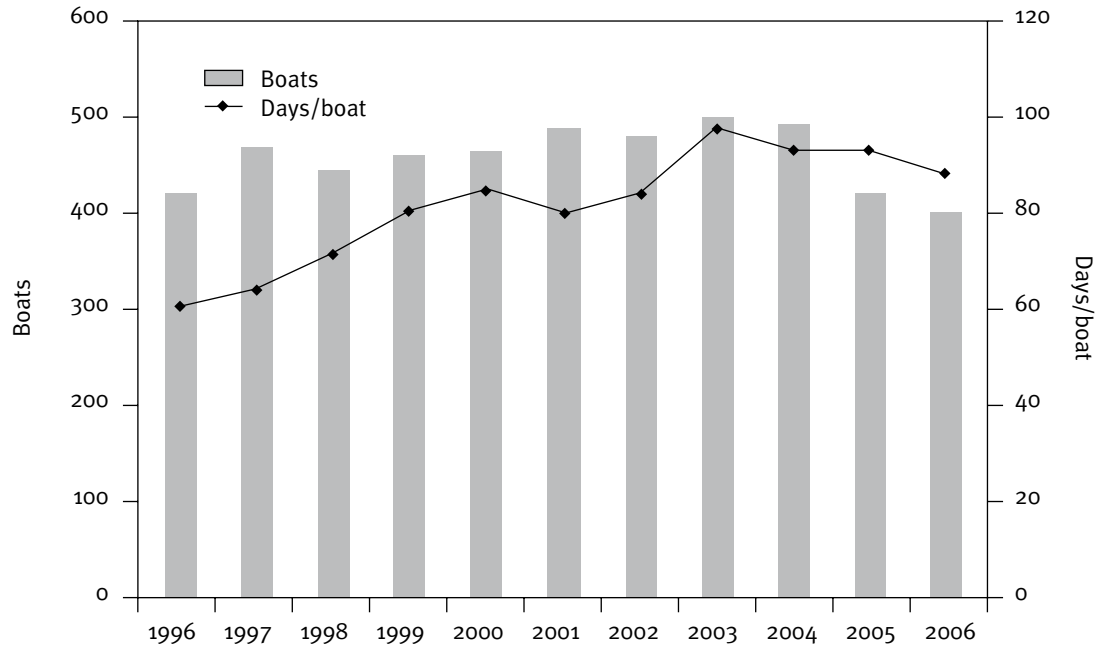


Figure 4: Boats accessing the commercial fishery and distribution of effort between vessels (Source: DPI&F CFISH database 29 March 2007).

In 2006, effort in the commercial sector of the Mud Crab Fishery was concentrated in a number of regional areas including Moreton Bay, Hinchinbrook Channel (north of Townsville), Gladstone, Hervey Bay and in the Gulf of Carpentaria.

East Coast region

The East Coast of Queensland is defined as waters between the New South Wales border and the tip of Cape York. Total reported commercial catch has reduced from 796 t in 2005 to 754 t in 2006 (Figure 5). The reduction in catch is paralleled by a reduced number of boat-days fished in 2006; decreasing from approximately 34 000 in 2005 to 31 000 in 2006. CPUE—based on kilogram per boat-day—has remained relatively stable during 1998–2006, ranging between approximately 22–25 kg/day (Figure 5).

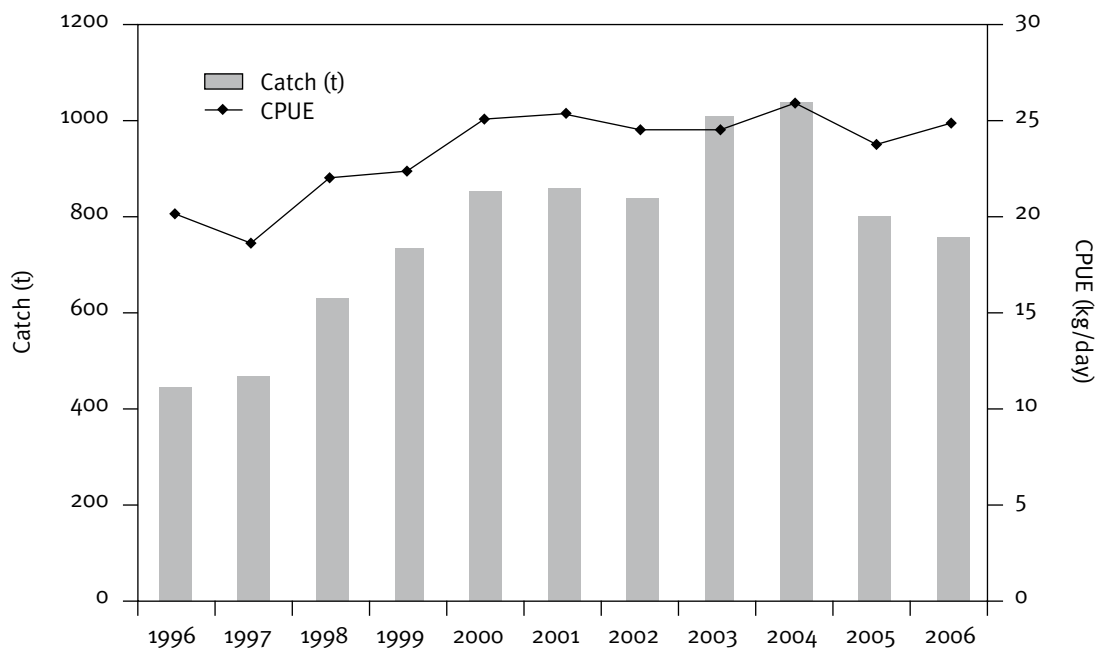


Figure 5: Reported catch and CPUE in the East Coast region of Queensland, 1996–2006 (Source: DPI&F CFISH database 29 March 2007).

Gulf of Carpentaria region

The Gulf of Carpentaria region is defined as intertidal waters from the tip of Cape York to the Northern Territory border. Commercial catch has reduced from 162 t in 2005 to 142 t in 2006. The observed reduction in total catch is paralleled by a reduced number of days fished; from 6011 boat-days in 2005 to 5042 in 2006.

The decline in CPUE observed during 2002–03 in the Gulf region is believed to be associated with one of the worst droughts in the region, from 2001–03. The closure in 2002 of a major air cargo carrier operating out of Weipa is believed to have impacted on the fishers' ability to transport live mud crab catch from the Gulf of Carpentaria to east coast fish markets.

The observed increase in CPUE from 2003 onwards (Figure 6) suggests that overall mud crab stocks are healthy in the Gulf of Carpentaria. Despite this, the performance measurement system for the Queensland Mud Crab Fishery has triggered a review of low catch levels in the northern Gulf of Carpentaria region (see Management performance).

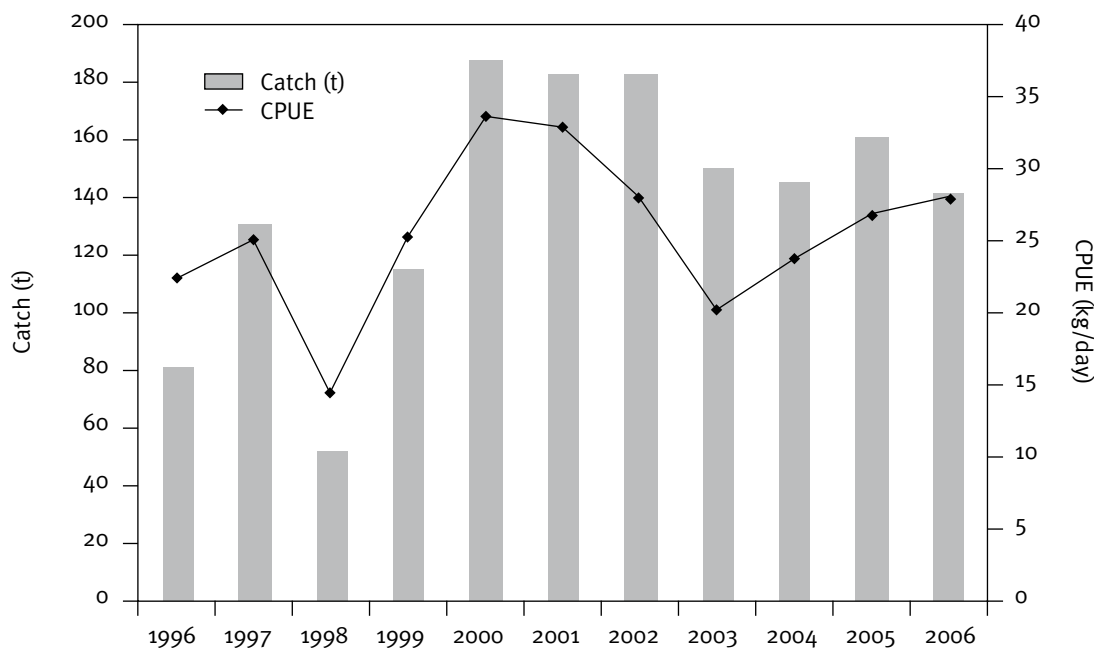


Figure 6: Reported catch and CPUE in the Gulf of Carpentaria region of Queensland, 1996–2006 (Source: DPI&F CFISH database 29 March 2007).

Recreational

Preliminary results from the 2005 Recreational Fisheries Information System (RFISH) diary survey indicates that approximately 688 000 mud crabs were harvested in 2005 and approximately 2.3 million mud crabs were released (Table 2). These estimates equate to a recreational harvest of approximately 689 t—a decrease from the 2002 estimate of 874 t. The recreational harvest represents approximately 43% of the estimated total annual harvest of mud crabs.

The 2001 National Recreational and Indigenous Fishing Survey (NRIFS)⁵ indicated that Queensland recreational fishers take the largest proportion (71%) of the national mud crab harvest, and that they primarily used pots and traps to harvest mud crabs.

Table 2: Recreational catch of mud crab estimated from RFISH surveys (1999, 2002 and 2005).

	1999	2002	2005 ⁶
Number caught	3 512 250	3 880 048	3 049 264
Number released	2 518 813	3 006 461	2 368 399
Number retained	993 436	873 586	688 620
Estimated weight of retained	990 t	874 t	689 t

⁵ GW Henry & JM Lyle, *The National Recreational and Indigenous Fishing Survey*, FRDC Project No. 99/158, Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, Australia, 2003.

⁶ Recreational catch data for 2005 is preliminary as of April 2007. The Australian Bureau of Statistics (ABS) is currently calculating the associated standard errors with the estimated recreational harvest of mud crabs.

Charter

The charter sector of the Mud Crab Fishery is the smallest component of the total annual harvest and represents less than 1% of the commercial catch. Data from compulsory charter logbooks indicates that in 2006, 1526 kg of mud crabs were caught, of which 429 kg were released (Table 3).

Table 3: Charter and catch effort 2000–06 (Source: DPI&F CFISH database 29 March 2007).

Year	Retained Catch (kg)	Discarded Catch (kg)	Number of operators	Number of days fished
2000	731	8	10	432
2001	792	253	12	485
2002	1499	702	15	581
2003	1266	343	14	604
2004	1591	730	19	666
2005	1179	382	13	503
2006	1097	429	15	280

Indigenous

The Indigenous harvest of mud crabs across northern Australia was estimated as part of the NRIFS⁷. In 2001, Indigenous fishers from within the north Queensland communities surveyed harvested an estimated 12 000 mud crabs. These estimates equate to an Indigenous harvest of approximately 12 t. Such harvest levels would represent less than 1% of the estimated total annual harvest of mud crabs for the 2006 season. Indigenous fishers mainly used hand (58%) and spear (27%) fishing methods⁸.

⁷ GW Henry & JM Lyle, *The National Recreational and Indigenous Fishing Survey*, FRDC Project No. 99/158, Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, Australia, 2003.

⁸ *ibid.*

Spatial issues/trends

The Queensland Mud Crab Fishery operates along the entire coast of Queensland (Figure 7). In 2006, regions of high effort included Moreton Bay (Brisbane region), Hinchinbrook Channel (north of Townsville), Gladstone, Hervey Bay (Maryborough) and Kowanyama (Gulf of Carpentaria).

Historically, there have been differences in the catches and catch rates between the north and south of Queensland, mainly due to mangrove habitat availability and variation in the natural abundance of crabs.

On 1 July 2004, the Great Barrier Reef Marine Park Authority introduced a new zoning plan for the reef through the Representative Areas Program (RAP). The RAP increased the extent of closures to commercial fishing from 4% to 33%⁹ in the GBR region.

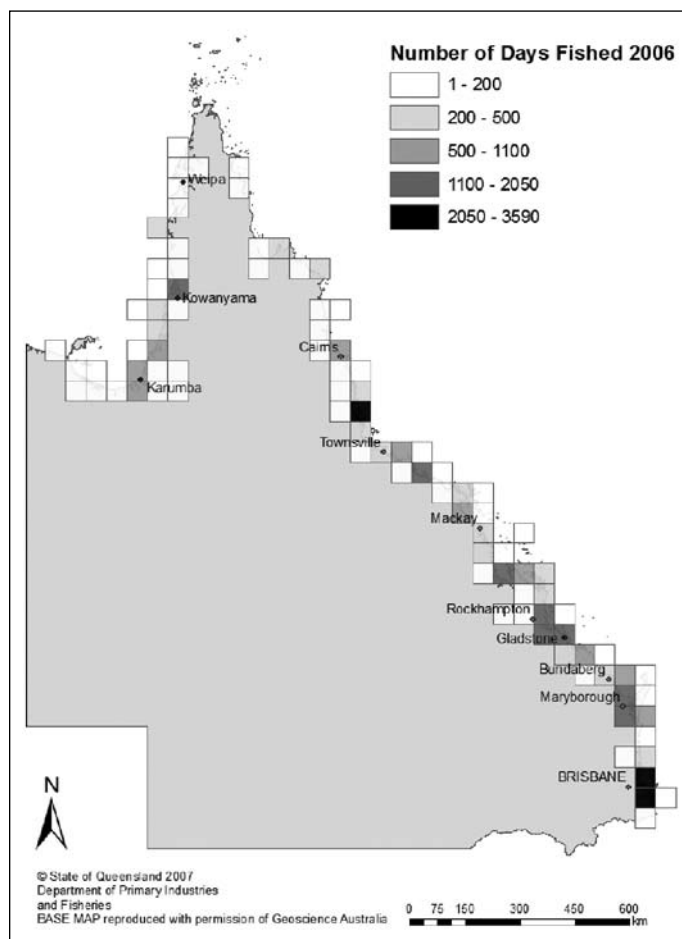


Figure 7: Distribution of effort (days fished) in the Mud Crab Fishery (2006).

The Australian Government marine park legislation, which applies below low-water mark, had little impact on mud crabbing operations. However, under Queensland legislation administered by the Environment Protection Agency (EPA) complementary zoning arrangements were introduced in waters between low- and high-water mark, which effectively closed areas to mud crab fishers. Despite this there is still a large amount of effort expended in the GBR region, along the east coast—north of Bundaberg to the tip of Cape York (Figure 7).

Mud crab effort in the Gulf of Carpentaria region (Karumba, Weipa) has been recently transferred to other, more lucrative species, such as barramundi, by licence holders that have dual endorsement¹⁰. Abundance, market forces, weather and several other factors determine whether or not mud crabs will be targeted.

Socio-economic characteristics and trends

Mud crabs are sold to local and interstate markets and are a particularly important 'icon' species to the tourist and hospitality trade. There is a small live export trade to Asia from northern centres. The dominant product form is whole crab, live or chilled.

⁹ N Taylor-Moore, *Great Barrier Reef: A Case Study of the Socio-Economic Impacts of the Representative Areas Program for the Great Barrier Reef Marine Park on the Queensland Seafood Industry*, Sharing the Fish Conference 2006, Perth, Australia, 2006.

¹⁰ N Gribble (Department of Primary Industries and Fisheries) phone conversation, 12 April 2007.

Prices for mud crabs fluctuate between \$10–14/kg, depending on the available supply of the product, the time of year and the product form. In 2006 the average per kilogram price fishers received for mud crabs increased by approximately two dollars¹¹.

Figure 8 indicates that predominantly, income sourced from mud crab harvest in 2006 was less than \$60 000. Approximately 25% of the fleet made less than \$2000 from the Mud Crab Fishery in 2006, an increase from 2005. Many fishers operating in the Mud Crab Fishery are endorsed for several fisheries and fishing may only account for part of their income.

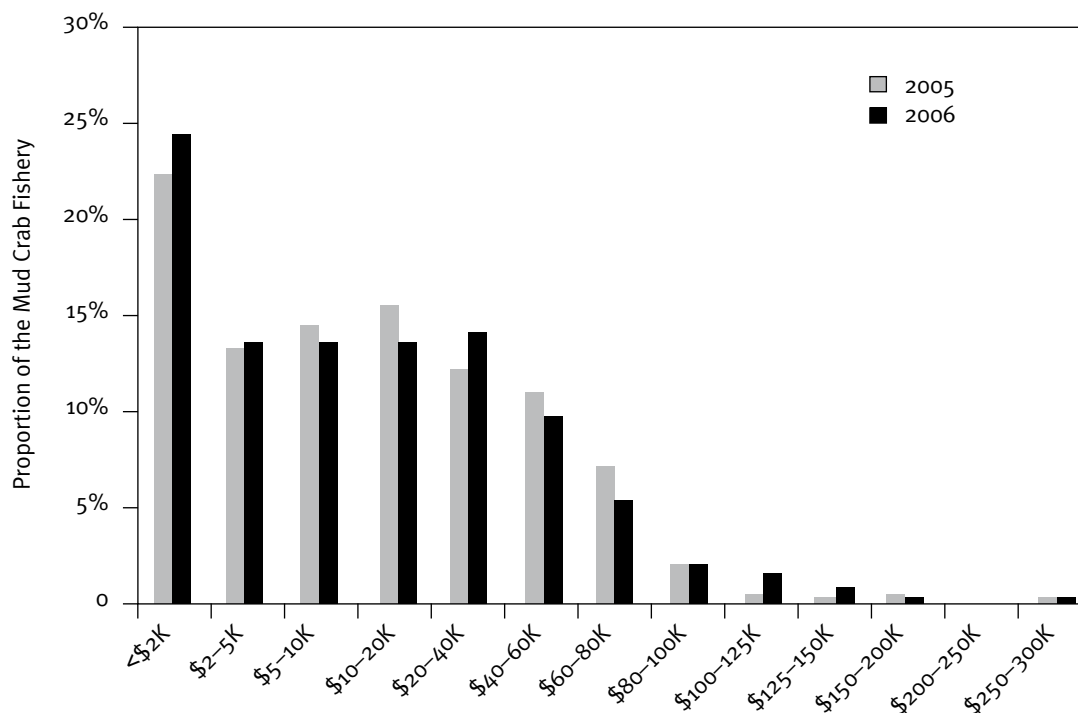


Figure 8: Income distribution in the Mud Crab Fishery (pot) for 2005 and 2006.

Fishery performance

Appraisal of fishery in regard to sustainability

The Queensland Mud Crab Fishery is managed in a more precautionary manner than any other Australian mud crab fishery—this produces confidence in its sustainability. The prohibition on taking female and undersized crabs protects the spawning capacity of the stock from increases in effort.

A decline in the number of days fished and boats operating in the commercial fishery was matched by a subsequent decline in total annual catch in the 2006 season (see Catch statistics, Table 1). RFISH surveys conducted in 2002 and 2005 indicate that recreational harvest has also decreased over this period (see Catch statistics, Table 2).

The assessment of the performance measures recently developed for this fishery identified a review event for total annual catch in the Northern Gulf of Carpentaria region being triggered (see Management performance, Figure 10), which is currently being investigated by DPI&F. Despite this, reported logbook data suggests that, although the total catch has decreased, CPUE has remained fairly stable, indicating that mud crab stocks are healthy.

¹¹ Based on prices obtained from the Sydney Fish Markets (www.sydneyfishmarket.com.au).

Progress in implementing the Department of the Environment and Water Resources (DEW) recommendations

Recommendation	Progress	Improvements to management regime
<p>DPI&F to inform DEW of any intended amendments to the management arrangements that may affect sustainability of the target species or negatively impact on bycatch, protected species or the ecosystem.</p>	<p><i>Ongoing</i></p> <p>No changes to management arrangements occurred in the 2006 fishery season.</p>	<p>N/A</p>
<p>DPI&F to continue to actively engage with the Northern Territory and New South Wales in pursuit of collaborative or complementary management and research of shared mud crab stocks.</p>	<p><i>Ongoing</i></p> <p>DPI&F meet with the New South Wales Department of Primary Industries and Northern Territory Fisheries on an annual basis to pursue opportunities for collaborative or complementary management and research of shared stock. In June 2007 DPI&F research staff will be meeting with Northern Territory Fisheries staff in Darwin at a Fisheries Research and Development Corporation (FRDC) funded workshop to formulate a strategy for mud crab research in tropical Australia over the next 5–6 years. The workshop will be focusing on alternative methods for tracking changes in population size and recruitment success.</p>	<p>Continue to meet on an annual basis. Current resources are allocated to developing collaborative/complementary management and research for shared shark and red snapper stocks as these species are considered higher priorities at present.</p>
<p>As part of the management planning process, DPI&F to develop fishery specific objectives linked to performance indicators and performance measure for target, bycatch, protected species and impacts on the ecosystem.</p>	<p><i>Complete</i></p> <p>DPI&F held a workshop with fisheries managers, researchers and industry representatives in May 2006 to develop operational objectives and performance measures for the Mud Crab Fishery. Outcomes of this process were reviewed by the Crab Management Advisory Committee (CrabMAC) and the final version will be implemented as policy and provided to DEW in 2007.</p>	<p>The effectiveness of fisheries management in ensuring the sustainable use of mud crab stocks and minimising any impacts on the broader ecosystem is being measured.</p>

Recommendation	Progress	Improvements to management regime
<p>DPI&F to monitor the status of the fishery in relation to the performance measures once developed. Within three months of becoming aware of a performance measure not being met, DPI&F to finalise a clear timetable for the implementation of appropriate management responses.</p>	<p><i>Ongoing</i></p> <p>Performance measures will be regularly assessed and reported against in the timeframes specified within the Performance Measurement System (PMS) itself.</p>	<p>PMS to be implemented in 2007.</p>
<p>DPI&F to develop a compliance strategy for the Mud Crab Fishery. The strategy will explicitly address the following issues and provide for the periodic review of the effectiveness of the strategy:</p> <ul style="list-style-type: none"> • catch and effort data validation • compliance with commercial pot number restrictions • compliance with restrictions on the take of female and undersize crabs • the potential for Queensland harvested female and undersize crabs to be laundered in other jurisdictions with different management measures • the appropriateness and effectiveness of existing recreational bag and size limits • the 'black market' sale of recreationally caught crabs • the occurrence of crab pot 'drying'/stranding. 	<p><i>Complete</i></p> <p>DPI&F conducted a compliance risk assessment for the Queensland Mud Crab Fishery in November 2006 in order to determine compliance priorities and allow for the most effective targeting of Queensland Boating and Fisheries Patrol (QBFP) resources to higher risk issues.</p> <p>Outcomes of the risk assessment have been incorporated into QBFP district operational plans from 2007.</p>	<p>A compliance risk assessment is used by the QBFP in undertaking operational planning activities associated with management the fishery. Through identification and prioritisation of compliance risks associated with the fishery, planning and operational processes at the district level may be improved and risks mitigated.</p>

Recommendation	Progress	Improvements to management regime
<p>From 2005, DPI&F to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure once developed.</p>	<p><i>Ongoing</i></p> <p>The 2007 annual status report will be the third to be completed for the Queensland Mud Crab Fishery.</p>	<p>Public reporting on the status of Queensland's fisheries is an important aspect of managing fisheries on behalf of the Queensland community. These reports provide an important catalogue of historical information on the status of Queensland fisheries, links to ecological assessments demonstrating to the Australian Government that fisheries meet sustainability guidelines, assessment of management effectiveness against performance measures and the most up-to-date information on Queensland's fisheries.</p>
<p>DPI&F to develop a system to ensure that catch data collected in compulsory logbooks is validated on an ongoing basis and to investigate methods for documenting and validating effort in the fishery.</p>	<p><i>In progress</i></p> <p>Fishery-independent catch rate trends for 17 estuarine areas are available from the fisheries Long Term Monitoring Program (LTMP) annual surveys which commenced in 1999. DPI&F will use LTMP data in future fishery assessments. DPI&F are currently investigating any other cost-effective means to validate catch and effort data collected through logbooks.</p>	<p>DPI&F will use LTMP data in future fishery assessments, along with investigating the use of commercial fisher research logbooks to provide a reliable source external to the LTMP on commercial catch rates and the level of bycatch associated with the Mud Crab Fishery.</p>

Recommendation	Progress	Improvements to management regime
<p>DPI&F to develop and implement separate management arrangements for the Gulf of Carpentaria mud crab stock by 30 June 2005.</p>	<p><i>In progress</i></p> <p>As a step towards implementation of separate management arrangements, an allocation method using catch history is currently being considered by DPI&F. Allocation is subject to industry and community consultation, with consultation subject to government approval and other management priorities. East Coast and Gulf of Carpentaria fishery management arrangements will not be separated until the Mud Crab Fishery management plan is implemented. Under the GBRMP RAP, DEW purchased and surrendered 77 C1 crab fishing symbols, which will not be available for reallocation.</p>	<p>N/A</p>
<p>DPI&F to develop a strategy to remove or substantially reduce the amount of latent effort in the fishery, which includes clearly defined management actions linked to specific timeframes, by 31 December 2004. DPI&F to implement the strategy prior to the introduction of the management plan.</p>	<p><i>In progress</i></p> <p>The new licensing and fees policy introduced from 1 July 2006 is anticipated to result in a reduction in latent effort. It is expected that the policy will considerably reduce the retention of unused licences.</p>	<p>Impact of the new licensing fee structure in terms of latent effort removal will be assessed after July 2007 (1 year after implementation). If ineffective, DPI&F will investigate another strategy prior to the introduction of the management plan.</p>
<p>As part of the management planning process, DPI&F to review existing management measures designed to control mud crab harvest by recreational fishers to ensure that these measures are appropriate, adequately constrain recreational effort and minimise impacts on bycatch and protected species. Should the review indicate that existing measures are not appropriate; DPI&F will develop new measures in a timely manner.</p>	<p><i>Not started</i></p> <p>Management planning process for mud crab has not yet commenced due to priority being given to other fisheries such as the East Coast Inshore Fin Fish Fishery.</p>	<p>The 2005 RFISH survey indicated that estimated retained catch in the recreational mud crab fishery has declined by 21% since 2002.</p>

Recommendation	Progress	Improvements to management regime
<p>DPI&F to identify fishery areas at risk of overfishing within two years. DPI&F to undertake independent surveys in these areas with a view to detecting any significant changes in crab abundance and take appropriate management action to address resource sustainability concerns.</p>	<p><i>Ongoing</i></p> <p>DPI&F commissioned a review of the Mud Crab Fishery monitoring program in 2005, which identified higher risk areas in the commercial and recreational fisheries. A revised monitoring strategy to better target higher risk areas and resource assessment needs will be developed for implementation in 2007. Areas at higher risk from overfishing were assessed in a review of commercial and recreational catch and effort data¹².</p>	<p>In 2005–06 DPI&F undertook a comprehensive review of the current Mud Crab LTMP. As a result of the review DPI&F were able to assess if the 17 sites monitored were still appropriate and reflected regions of high harvest and regions in close vicinity to a large resident population.</p>
<p>DPI&F to develop a system for the collection and monitoring of information on discarded undersize female mud crabs and key bycatch species sufficient to enable identification of long-term trends in bycatch and discards. In the event that catch levels of any bycatch species or discards change, DPI&F will investigate suitable management responses.</p>	<p><i>Complete</i></p> <p>The mud crab LTMP, implemented in 1999 partially meets this recommendation. This matter is being investigated as part of the review of the Mud Crab LTMP. DPI&F are investigating opportunities for commercial and recreational fishers to provide information on discarded female and undersize crabs and other bycatch. The DPI&F RFISH survey collects information from participants regarding why crabs were released.</p>	<p>In 2005–06 DPI&F undertook a comprehensive review of the current Mud Crab LTMP. The review aimed to reassess the program objectives to ensure the data being collected was appropriate to monitor mud crab stocks in Queensland. As a result of the review, DPI&F is currently considering the implementation of commercial fisher research logbooks.</p>
<p>Within one year, to support the implementation of the Species of Conservation Interest logbooks, DPI&F to ensure that an education program for fishers, both recreational and commercial, is developed and implemented, to promote the importance of protected species protection and accurate incident reporting.</p>	<p><i>Complete</i></p> <p>A comprehensive education program was released to commercial and recreational fishers in September 2005. This information is available through DPI&F on 13 25 23.</p>	<p>DPI&F and the Queensland fishing industry are committed to minimising the impacts of fishing on protected species. The education package has increased the level of confidence in the data obtained from SOCI logbooks.</p>

¹² J Webley, Fisheries Long Term Monitoring Program – Addressing the Department of the Environment and Heritage's recommendations for monitoring Queensland's Mud Crab and Blue Swimmer Crab fisheries, Department of Primary Industries and Fisheries, Brisbane, Australia, 2005.

Recommendation	Progress	Improvements to management regime
<p>DPI&F to conduct a risk assessment to determine the likely impact of protected species interactions in the fishery (including the recreational sector) within two years. In the event that a species is found to be at risk, DPI&F will investigate measures to mitigate interaction with the species, to ensure that any risks to protected species can be minimised.</p>	<p><i>Complete</i></p> <p>DPI&F undertook an Ecological Risk Assessment (ERA) in May 2006. The outcomes of this process were presented to the CrabMAC for review, finalised and are to be provided to DEW in 2007. The outcomes from the ERA will be incorporated into ongoing management planning processes.</p>	<p>Completion of an ERA is one of many aspects of DPI&F's commitment to progress sustainable fisheries management. The ERA identified the following issues as high risk (with consequence scores of three or above):</p> <ul style="list-style-type: none"> • capture of TEP species through fishing activity • direct impact without capture of TEP species through gear loss • addition of non-biological material through gear loss • capture of TEP species through other capture fishery methods • impact of coastal development on TEP species. <p>DPI&F are currently developing management responses to issues identified as high risk issues.</p>
<p>DPI&F to investigate the effects of ghost fishing by lost or discarded mud crab apparatus within two years.</p>	<p><i>Complete</i></p> <p>The issue was specifically addressed as part of the ERA process in 2006. All potential impacts associated with ghost fishing in the Mud Crab Fishery were assessed as either low (2) or negligible (1).</p>	<p>Based on the analysis undertaken and results of the ERA, no immediate management arrangement action is required and further investigation of the effects of ghost fishing are not considered warranted.</p>

Management performance

Performance measures for the Queensland Mud Crab Fishery (Table 4) were developed in collaboration with the CrabMAC and other stakeholders, including members of the commercial fishing sector, fishery managers, researchers and assessment and monitoring staff. Input from a broad range of stakeholders was sought to ensure the performance measurement system (PMS) was meaningful, defensible and precautionary, taking into account data limitations but incorporating the most appropriate information available. The performance measurement system was approved by a delegate of the Chief Executive and it is a formal instrument for measuring performance of this fishery.

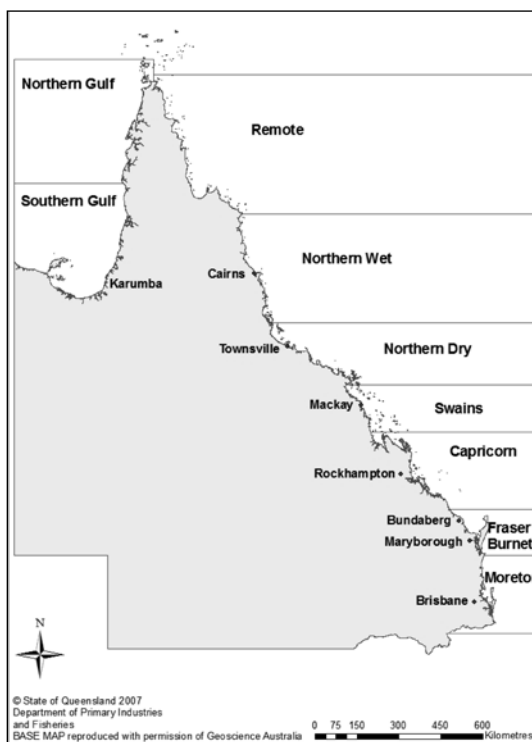


Figure 9: Queensland regional boundaries.

Table 4: Performance measures and outcomes for the Mud Crab Fishery in 2006.

Performance Measures	Measured	Performance
An annual limit reference point (LRP) of 30% above or below the average commercial catch and catch rate for the previous five years in the following regions (Figure 9): <ul style="list-style-type: none"> • Whole fishery • East Coast (Remote, Northern Wet, Northern Dry, Swains, Capricorn, Fraser Burnett, Moreton) • Gulf region (Northern Gulf, Southern Gulf) 	Measured	Triggered The Northern Gulf of Carpentaria region total annual commercial catch for 2006 was more than 30% below the annual limit reference point. Not triggered for the remaining regions.
The risk ranking assigned to bycatch species in the ERA process increases from the previous assessment.	N/A	Bycatch issues in the Mud Crab Fishery were not addressed in the initial ERA. Once developed and revised this performance measure will be implemented.
Interactions with turtles or crocodiles do not exceed the highest historical number of interactions reported through SOCI logbooks (2003–05).	Measured	Not triggered.
The risk ranking assigned to protected species in the ERA process increases from the previous assessment.	N/A	A revision of the ERA has not been undertaken for the Mud Crab Fishery. Fishery performance against this measure could not be assessed.

Management response to performance measures

For the 2006 season a performance measure was triggered for the Northern Gulf of Carpentaria region (Figure 9) for target species, as the total annual catch for 2006 was more than 30% below the limit reference point. DPI&F became aware of the trigger in April 2007.

Catch and effort in the Northern Gulf of Carpentaria region of the Mud Crab Fishery indicates that stable catches were recorded until 2002, when a significant drop in catch and effort was observed. This reduction has been maintained throughout the period 2002–06 inclusive (Figure 10).

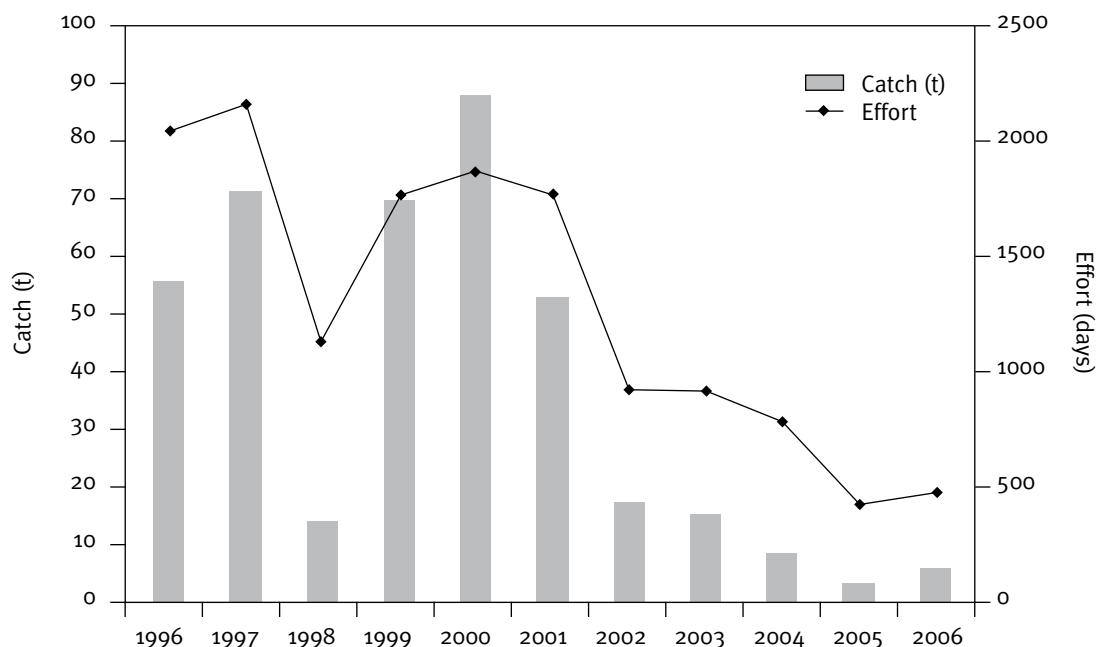


Figure 10: Catch (t) and effort (days) in the Northern Gulf of Carpentaria region (Source: DPI&F CFISH database, 29 March 2007).

After significant discussions with stakeholders, DPI&F believes that the cause of the significant decline in catch and effort after the 2001 season can be attributed to the loss of the major air cargo carrier from Weipa and the subsequent movement of crabbers to alternative regions that allow for improved transport of product to east coast markets. DPI&F's response to the measure being triggered is that low annual catch in the Northern Gulf region can be attributed to extrinsic factors. Notwithstanding this, DPI&F will continue to closely monitor catch and effort in this region.

Resource concerns

As a result of the DEW ecological assessment¹³ of the Mud Crab Fishery in 2004, latent effort in the fishery was identified as a risk to the long-term sustainability of Queensland's crab stocks. DPI&F intends to monitor the effects of the new licensing and fee arrangements, which were implemented on 1 July 2006, to determine whether C1 licence holders surrender previously unused fishery symbols. If this does not result in the removal of latent effort, alternative approaches will be investigated. It should be noted that the GBRMP Structural Adjustment Package removed 77 crab licences from the fishery. Despite this, DPI&F considers that the latent effort in the fishery poses minimal risk to the sustainability of mud crabs given the precautionary minimum legal size limit in place and the prohibition on taking females—which, in theory, effectively caps the proportion of the population that may be harvested to approximately 25%.¹⁴

¹³ Available online at: www.environment.gov.au/coasts/fisheries/qld/index.html

¹⁴ M Doohan (Department of Primary Industries and Fisheries), discussion, October 2006.

There are concerns that turtle interactions occurring in the Mud Crab Fishery may be being underreported. The DPI&F CrabMAC is currently investigating funding through the Australian Government EnviroFund¹⁵ to trial modified entrance tunnels on crab pots, to reduce the likelihood of turtle mortality related to interactions with crab fishing gear. Funding is also being sought to run a concurrent community awareness program to promote use of the modified apparatus.

DEW has highlighted concern regarding recreational harvest pressure on a species that is already affected by pressures from coastal population growth. DPI&F acknowledges that expanding coastal populations may lead to an increased recreational fishing pressure on mud crabs, and therefore regularly monitors recreational fishing participation. In 2005, the total recreational harvest of mud crabs was estimated at 638 t, a reduction from the 2002 estimate of 874 t. However, the precautionary management arrangements that protect all female and undersize male mud crabs from harvest theoretically ensures that approximately 75% of the Queensland mud crab population is protected.¹⁶

There is also concern regarding potential loss of mangrove habitat, damage to burrows and the potential impact this may have on mud crab stocks, particularly as Queensland coastal areas continue to be developed to meet the demands of human population growth. DPI&F has undertaken comprehensive baseline coastal habitat mapping to facilitate long-term monitoring of changes in these habitat areas.¹⁷

Ecosystem

Non-retained species/bycatch

The Mud Crab LTMP has collected information on the bycatch species (numbers and species name) since the program began in 1999. The available fishery-independent and -dependent data suggest that discards associated with the fishery are predominately undersize or female mud crabs, with other species only occasionally present in pots; survival of released crabs is believed to be high.¹⁸ Mud crab pots are a non-destructive fishing apparatus as they function by trapping; crabs are enticed into the pots with bait and their escape is restricted. Considered in combination with the general practice of daily pot checking, mud crab pots impart little physical damage to either mud crabs or bycatch, resulting in high survivability in released undersize and female mud crabs and bycatch species.

¹⁵ The Australian Government EnviroFund is the local action component of the Australian Government's \$3 billion Natural Heritage Trust. It aims to help communities undertake local projects aimed at conserving biodiversity and promoting sustainable resource use.

¹⁶ M Doohan (Department of Primary Industries and Fisheries), discussion, October 2006.

¹⁷ C De Vries, KF Danaher & MC Dunning, 'Assessing and monitoring Queensland's fish habitats using Landsat TM and ETM+ imagery', *Proceedings of the 11th Australasian Remote Sensing and Photogrammetry Conference*, Brisbane, Australia, 2002.

¹⁸ C McCormack, *Post-Release Survival in Crab Pot Fisheries – A compilation of historical data*, Department of Primary Industries and Fisheries, Brisbane, Australia, 2005.

Interactions with protected species

In 2006, no interactions with protected species were reported by crab fishers in Queensland.

Fishery impacts on the ecosystem

The fishery's impact on the ecosystem is considered to be negligible. The lightweight and stable structure of crab fishing apparatus is considered to have little, if any, impact on the muddy/sandy substrates of the estuaries or foreshore areas in which they are set. Daily pot checks and frequent pot repositioning, which is the standard practice in both the commercial and recreational fisheries, further reduces the potential for long-term impacts to benthic habitats and communities, or to water quality in general.

Other ecosystem impacts

Mangrove habitats play an important role in mud crab life cycles, and as such the species can be susceptible to impacts from habitat modification or pollution. Recent research¹⁹ indicates that estuaries throughout the world are increasingly subjected to anthropogenic impacts that result in changes in land cover, including mangrove clearing. These changes can affect organisms at various stages of their life cycles and thus compromise ecosystem functions and services.

DPI&F has completed baseline coastal habitat mapping at a regional scale for all of Queensland²⁰. This information can be used to assess associations between mud crabs and specific habitats as well as to monitor changes within these habitat areas.

Hydrological drought is associated with periods of low flow of coastal rivers²¹ and previous research has found that high river flow into marine environments can have positive effects on productivity of commercial fisheries.²² It is possible that the drought conditions that Queensland has been experiencing in recent years may have an impact on mud crab stocks.

Research and monitoring

Recent research and implications

A joint post-graduate study between James Cook University and DPI&F was recently undertaken to assess optimal soak time of munyana crab pots. Currently, soak time used by DPI&F LTMP researchers differs from region to region based on logistical considerations. The outcomes of this research will be considered in the current review of the mud crab LTMP.

19 Y Zharikov, GA Skilleter, NR Loneragan, T Taranto & BE Cameron, 'Mapping and characterising subtropical estuarine landscapes using aerial photography and GIS for potential application in wildlife conservation', *Biological Conservation*, vol. 125, pp. 87–100, 2005.

20 C De Vries, KF Danaher & MC Dunning, 'Assessing and monitoring Queensland's fish habitats using Landsat TM and ETM+ imagery', *Proceedings of the 11th Australasian Remote Sensing and Photogrammetry Conference*, Brisbane, Australia, 2002.

21 P Humphries & DS Baldwin, 'Drought and aquatic ecosystems: an introduction', *Freshwater Biology*, vol. 48, pp. 1141–1146, 2003.

22 NR Loneragan & SE Bunn, 'River flows and estuarine ecosystems: Implications for coastal fisheries from a review and a case study of the Logan River, south-east Queensland', *Australian Journal of Ecology*, vol. 24, pp. 431–440, 1999.

Monitoring programs and results

Long Term Monitoring Program

Since 1999, the DPI&F Long Term Monitoring Program (LTMP) has undertaken fishery-independent monitoring of Mud Crab Fishery resources.

The primary objectives of the program are to collect length, sex and catch rate data to be used in determining the population status of the species.

A total of 17 rivers and estuaries throughout the state (including the Gulf of Carpentaria) are monitored annually. These rivers/estuaries were chosen for sampling based upon high average catches and/or effort, either commercial, recreational or both. Bycatch species are identified, counted and returned to the water.

The 2000–06 summary report for all years, currently being developed, will be finalised in late 2007.

DPI&F will utilise these data, collected through the LTMP to undertake fishery assessments, to provide a better understanding of the resource and ensure that DPI&F continues to manage the Mud Crab Fishery in a sustainable manner.

In 2005–06 DPI&F undertook a comprehensive review of the current Mud Crab LTMP. The review aimed to reassess the program objectives to ensure the data being collected were appropriate to monitor mud crab stocks in Queensland. The review enabled DPI&F to assess whether the 17 sites monitored were still appropriate and reflected regions of high harvest and regions in close vicinity to a large resident population. Preliminary outcomes of the review indicate that the existing program provided enough confidence for DPI&F to detect a 20% change in catch rate between years within each river sampled. As a result, minimal changes to the program will be implemented in 2007–08 when the program recommences.

DPI&F is currently considering a proposal to implement a commercial fisher research logbook in the mud crab fishery. Volunteer commercial fishers would be required to collect information on catch of legal and regulated crabs²³ and bycatch species, providing a reliable source external to the LTMP on commercial catch rates and the level of bycatch associated with the Mud Crab Fishery.

Collaborative research

DPI&F continues to work with the Northern Territory on mud crab research projects. DPI&F scientists are co-investigators in a proposed Fisheries Research and Development Corporation (FRDC) Northern Territory mud crab project to develop research priorities and a strategy for mud crab research over the next ten years.

A joint DPI&F and Northern Territory Mud Crab Fishermen's Association research project is currently investigating the survival of mud crabs during post-harvest transportation, and subsequently, developing procedures to maximise survival. Stress biomarkers have been identified using haemolymph (blood) parameters throughout the storage phases of the transport chain, from harvest to live market. Currently, critical stress levels are being determined to identify target handling areas for minimising stress to crabs. The outcomes of this research will be applicable across all mud crab fisheries.²⁴

²³ Regulated crabs include undersize and female mud crabs and spanner crabs, which cannot be retained in the Mud Crab Fishery.

²⁴ S Poole (Department of Primary Industries and Fisheries), email, 28 March 2007.

CrabMAC has proposed selecting specific commercial fishers to provide information on incidental catch of female crabs and bycatch. The implementation of this monitoring will be subject to further stakeholder consultation.

Fishery management

Compliance report

Compliance and enforcement in the Queensland Mud Crab Fishery is the responsibility of the DPI&F, Queensland Boating and Fisheries Patrol (QBFP).

During 2006, 3471 units were inspected in the Queensland Mud Crab Fishery, including the Gulf of Carpentaria. Of these, 364 were commercial vessel inspections. The majority of the remaining inspections were of recreational fishers, with the remainder comprising camp sites, fishing clubs, charter/tour operators, private property, motor vehicles and marketing premises.

During this period, 339 offences were detected in association with 269 inspections, corresponding to a compliance rate of 92.3% on units inspected. This does not include offences relating to unattended, incorrectly marked equipment.

A summary of offences is provided below, in separate reports for the East Coast (Table 5) and the Gulf of Carpentaria (Table 6).

Offences

Offences are reported as either a Fisheries Infringement Notice (FIN); Caution (FIN Caution or official caution issued by DPI&F legal officers); or Prosecution (to proceed by complaint summons).

The majority of prosecutions recorded in Table 5, below, are still pending. Thirteen of the recorded offences relate to commercial operators.

Table 5: Offences recorded in the Queensland Mud Crab Fishery (East Coast) 2006.

Offence	FIN	Prosecution	Caution
Take, possess or sell mud crabs regulated by size	114	11	14
Take, possess or sell mud crab regulated by gender	42	8	5
Take, possess or sell mud crabs regulated by number	1	8	-
Possession of certain crabs/crab meat (e.g. crab claws, carapace missing)	7	-	3
Recreational fisher use more than the prescribed number of apparatus	19	5	7
Recreational fisher use prohibited fishing apparatus (e.g. incorrectly marked)	46	2	22
Commercial fisher fail to mark crab apparatus in the prescribed manner	4	1	1
Failed to have a document required to be available for immediate inspection	2	-	1
Fail to comply with a requirement to keep documents in the approved form	-	1	-

Offence	FIN	Prosecution	Caution
Unlawful interference with fishing apparatus	2	4	-
Did an act only an authority holder can do	-	1	-
Conduct commercial fishing tour without a valid permit	-	1	-
Provide false, misleading or incomplete documents	-	1	-
Fail to provide name and address when required by inspector	-	1	-
Fail to stop when required by an inspector	-	1	-
Breached Closed Waters	1	-	-
Total	238	45	53

None of the offences recorded in Table 6, below, related to commercial operators.

Table 6: Offences recorded in the Queensland Mud Crab Fishery (Gulf of Carpentaria) 2006.

Offence	FIN	Prosecution	Caution
Recreational fisher use more than the prescribed number of apparatus	1	-	-
Recreational fisher use prohibited fishing apparatus (e.g. incorrectly marked)	1	-	-
Possession of certain crabs/crab meat (e.g. crab claws, carapace missing)	-	-	1
Total	2	0	1

In addition to the above inspections and offences, a total of 622 incorrectly marked crab pots were seized from tidal waters in Queensland, including the Gulf of Carpentaria, during 2006.

Compliance risk assessment

A compliance risk assessment was conducted for this fishery in November 2006 to determine compliance priorities and allow the most effective use of QBFP resources. The assessment identified several activities in the Queensland Mud Crab Fishery as having high or extreme level of risk (below). The QBFP will therefore direct their compliance resources to addressing:

- interference with fishing apparatus
- use of unauthorised gear in the recreational fishery
- leaving fish in fishing apparatus out of the water
- take/possession of regulated fish (undersize male) by recreational and commercial fishers
- take/possession of regulated fish (female) by recreational fishers
- recreational fishers taking crabs for commercial purposes.

There are also a number of activities rated as having moderate risk, which will be addressed, but at a lower priority. It was also recognised that the following issues are important enforcement tools and should also be addressed:

- possession/sale of certain crabs or crab meat
- failure to keep daily logbooks.

Detailed strategies to address the risks identified by this assessment will be developed through

the QBFP strategic and operational planning processes that are reviewed annually.

Changes to management arrangements in the reporting year

There were no changes to management arrangements in 2006.

Outcomes of review processes for management plans/arrangements

There is no specific management plan for the Mud Crab Fishery. DPI&F propose to review management arrangements in 2008.

Consultation/communication/education

Promotion of regulations applying to both commercial and recreational fishers, including those relating to mud crabs, is an ongoing role for DPI&F.

Consultation with stakeholders in the fishery mainly occurs through CrabMAC, with meetings generally held twice a year. CrabMAC provides advice to DPI&F on management measures for the fishery. Consultation with stakeholders also occurred as part of the ERA and PMS development process in May 2006.

Complementary management

DPI&F continues to collaborate with other states on complementary management arrangements to enable a more complete assessment of mud crab stocks. The Queensland, Northern Territory and Western Australia government officers meet annually at the Northern Australian Fisheries Managers Forum to discuss the management of shared stocks, including those of mud crabs.

In early 2007, DPI&F met with the New South Wales Department of Primary Industries to discuss further developing complementary fishery management between the states.

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Image

Mud crab (*Scylla serrata*)

