

Annual status report 2007

East Coast Trawl Fishery



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Introduction

The Queensland East Coast Trawl Fishery (ECTF) comprises the East Coast Otter Trawl Fishery (ECOTF)¹, the Moreton Bay Trawl Fishery (MBTF) and the River and Inshore Beam Trawl Fishery (RIBTF). Target species include prawns, scallops, bugs and squid. Various by-product species are also retained by the fleet. The ECTF is the largest fishery in Queensland, both in terms of the volume of product caught and economic value of the product.

The Queensland Fisheries (East Coast Trawl) Management Plan 1999 (Qld) (the Trawl Plan) was introduced in 1999 and amended in 2000. During the transition period for management arrangements, significant changes occurred to fishing operations, 2001 is therefore considered to be the first typical effort year in the post-Trawl Plan period. It is also the historical limit for comparative analysis between years in this report. Data for the years prior to introduction of the Trawl Plan can be found in previous fisheries annual status reports.²

This report covers otter and beam trawl fishing in the ECTF in the 2006 calendar year.

Fishery profile 2006

Total harvest from commercial sectors: 7948 t (trawl caught species)

Principal species otter trawl harvest: 6717 t (5635 t prawns, 522 t scallops, 470 t bugs, and 90 t squid)

Permitted species otter trawl harvest: 276 t (139 t Balmain bugs, 59 t blue swimmer crabs, 22 t red spot crabs, 21 t cuttlefish, 14 t octopus, 9 t barking crayfish, 8 t pinkies, 2 t mantis shrimp, 0.5 t pipefish)

Principal species beam trawl harvest: 379 t (377 t of prawns, 2 t of squid)

Permitted species beam trawl harvest: <1 t

Commercial non-trawl harvest: 757 t blue swimmer crab, 17 t red spot crab, 8 t banana prawn, 6 t squid

Recreational harvest 2005 (non-trawl): 200 t of banana prawns, 140 t of blue swimmer crabs and 50 t of squid

Indigenous harvest (non-trawl): uncertain but considered negligible

Charter harvest (non-trawl): uncertain but considered negligible

Commercial Gross Value of Production (GVP): approximately \$90 million

Number of otter trawl licences: 498 in June 2006 (38 restricted to Moreton Bay)

Number of beam trawl licences: 153 in June 2006

Commercial boats accessing ECOTF: 422 in 2006 (91 in Moreton Bay)

Commercial boats accessing RIBTF: 92 in 2006

Effort in the fishery: 46 400 (nights) in 2006 (6246 nights in Moreton Bay)

Fishery season: 1 January–31 December

* Harvest tonnages are best available estimate based on fisher logbooks

¹ For the purpose of this report, references to the ECOTF include the MBTF.

² Available online at: www.dpi.qld.gov.au/fishweb

Description of the fishery

Fishing methods

East Coast Otter Trawl Fishery

Demersal otter trawling is used to harvest prawns, scallops, bugs, squid, and several by-product species in the ECTF. Variations to the standard prawn trawl are allowed under the Trawl Plan. For example, heavier net and ground gear is permitted when targeting scallops to reduce shell cuts; and to account for the larger size of scallops compared to prawns.

Triple and quad net arrangements (three or four towed nets) (Figure 1) are frequently used in the fishery depending on the species targeted, fishing conditions and length of the net allowed under the Trawl Plan. Headrope height varies according to target species, as does the detailed configuration of nets.

Queensland east coast otter trawlers have traditionally used flat, rectangular 'otter' boards to spread their nets, but there is an increasing tendency to use more streamlined and smaller boards. While holders of 'T1' licences³ are also able to use a beam trawl, no 'T1' licence holder has reported using a beam trawl as their main fishing gear.⁴

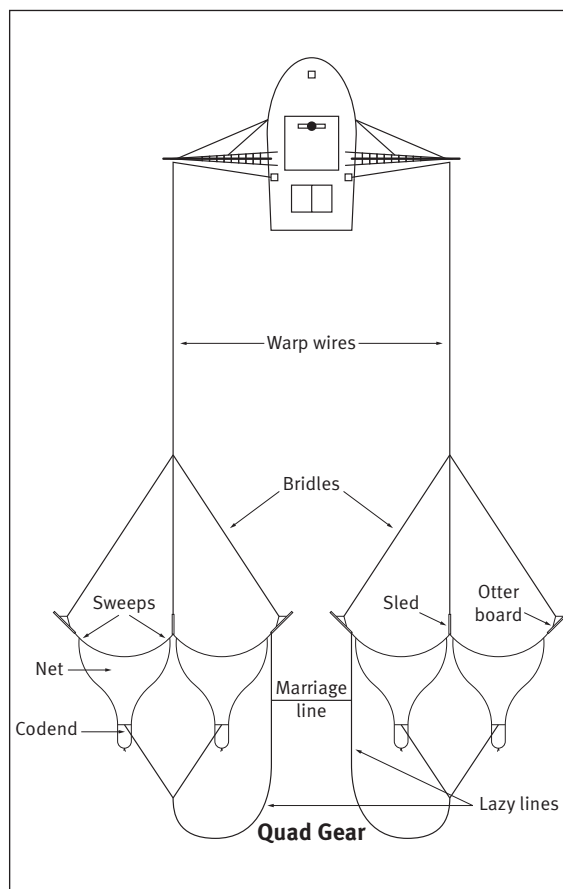


Figure 1: Quad otter trawl gear used in the ECOTF.

River and Inshore Beam Trawl Fishery

River and inshore beam trawling is effectively confined to an estuarine and inshore operation involving vessels under 9 m in length. These vessels are entitled to work in specified areas in rivers and creeks, towing a single 5 m headrope trawl made of mesh no smaller than 28 mm. A maximum combined net length of 10 m, with mesh size no less than 38 mm and no greater than 60 mm is specified for use on inshore fishing grounds. The only exception is Laguna Bay (near Noosa), where a small otter trawl net with a maximum head rope of 8 m may be used.

³ 'T1' licences allow trawling in areas open to trawling along the whole east coast excluding Moreton Bay; 'T2' licences allow otter trawling south of the GBRWHA; 'M1' licences allow otter trawling in the 'T1' area and in Moreton Bay; 'M2' licences allow otter trawling in Moreton Bay only.

⁴ The small 'try-net' used to locate commercial quantities of product is commonly a beam trawl.

Fishing area

The ECTF covers all tidal waters (excluding estuaries) east of longitude 142°31.89'E out to the East Coast Offshore Constitutional Settlement (OCS) Boundary⁵ between Cape York and the Queensland/New South Wales (NSW) border (Figure 2).

Otter trawling

The type of fishery symbol attached to a commercial fishing licence dictates the area that can be fished:

- Licence holders with a 'T1' fishery symbol can operate in the whole area excluding closed waters, estuaries and Moreton Bay.
- Licence holders with a 'T2' fishery symbol are only permitted to operate south of the Great Barrier Reef World Heritage Area (GBRWA).
- Licence holders with a 'M1' fishery symbol are permitted to otter trawl in the 'T1' area and in Moreton Bay during weekdays provided the vessel is not greater than 14 m in length.
- Licence holders with a 'M2' fishery symbol are permitted to otter trawl only in Moreton Bay during weekdays provided their vessel is not greater than 14 m in length. Licence holders are not limited by the number of nights they can fish, as is the case with the other fishery symbols.

Beam trawling

Under the Trawl Plan, the use of the beam trawl gear is permitted between Cape York and the Queensland/New South Wales border. River and inshore beam trawl operations use T5, T6, T7, T8, and T9 licence symbols (Figure 3).

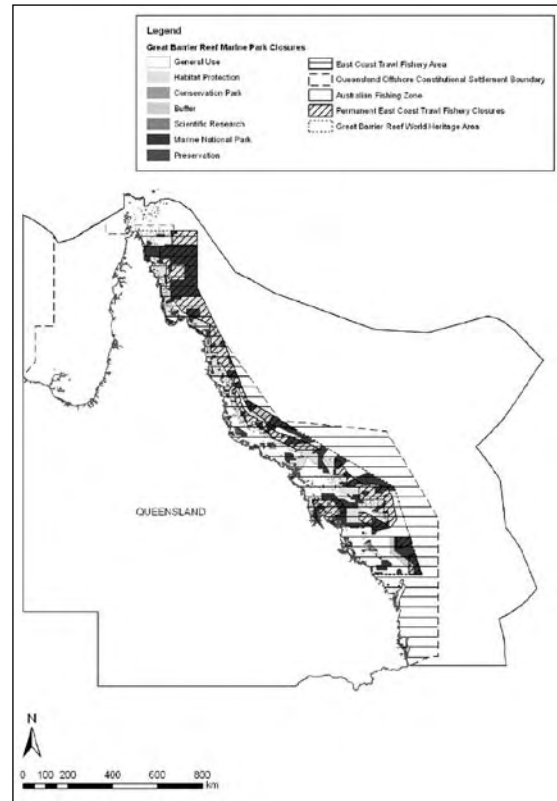


Figure 2: Fishing area of the ECOTF. Note: 66 per cent of the Great Barrier Reef Marine Park (GBRMP) is closed to trawling

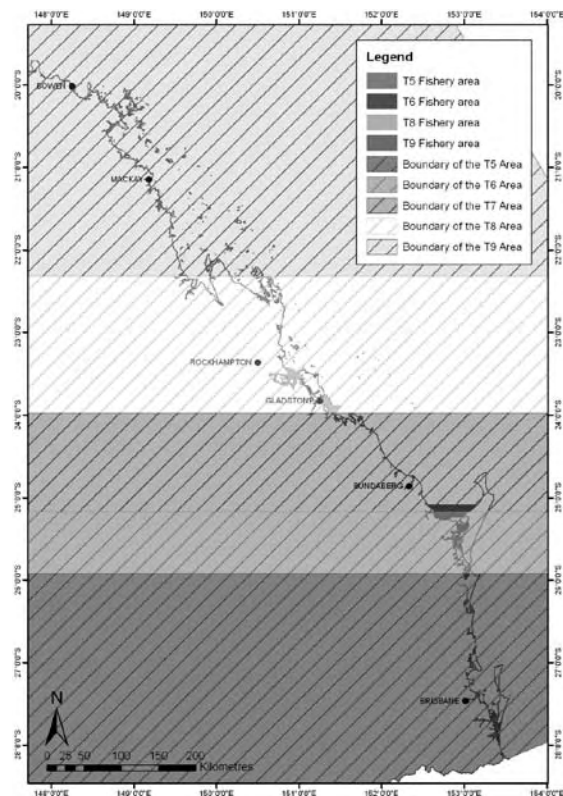


Figure 3: Fishing area of the River and Inshore Beam Trawl Fishery.

⁵ The OCS agreement between the Commonwealth and Queensland Governments extends management of fisheries resources under Queensland legislation seaward of state waters to the 400 m isobath.

Main management methods used

The Trawl Plan

The Trawl Plan provides the management regime for the ECTF.

The Trawl Plan lists principal species that may be targeted using trawl fishing gear and by-product (permitted) species that are captured incidentally during trawling. Permitted species may be retained subject to in-possession limits based on size, quantity, gender and other criteria depending on the species.

Management methods

The fishery is managed by a range of input (effort) and output (harvest) controls directed at ensuring the ecologically sustainable harvest of target and by-product species whilst minimising the impacts on bycatch and the environment. These include:

- Limited entry: restrictions in the number and size of boats which can operate in the fishery.
- Quota management: Licence holders are allocated only a certain number of nights they can fish each year in the form of tradeable effort units.
- Effort capped at the 1996 level less 5 per cent.
- Gear restrictions: vessel length, net head rope length and mesh restrictions apply depending on the areas of operation.
- Numerous and extensive permanent area closures apply to the fishery, particularly in waters of the GBRWHA, Woongarra, Hervey Bay and Moreton Bay Marine Parks.
- Seasonal closures: in place during summer and autumn north of 22°S latitude and during spring and summer south of this latitude.
- Daytime and weekend closures: apply to trawling in estuaries and some inshore areas (e.g. Moreton Bay) to reduce any interactions with recreational users.
- Mandatory use of turtle exclusion devices (TEDs) and bycatch reduction devices (BRDs).
- A range of by-product harvesting protection arrangements (Table 1).
- Logbooks, surveillance by fisheries enforcement officers (the Queensland Boating and Fishing Patrol) and remote tracking of otter trawl vessel movements are used to monitor effort and compliance of fishing operations.

Table 1: Output controls on permitted species harvested in the East Coast Trawl Fishery.

Species	Trawl Management Arrangements	Desired Outcomes
Blue swimmer (BS) and red spot (RS) crabs	Minimum legal carapace width (BS—11.5 cm; RS—10 cm) Total ban on harvesting females In possession limit (BS—500; Moreton Bay—100)	Protect spawners Enhance egg production Limits total harvest and targeting
Barking crayfish	Total ban on harvesting egg bearing females.	Enhance egg production
Mantis shrimp	In possession limit (max 15 l)	Limits total harvest
Balmain bugs	Minimum legal carapace width (10 cm) Total ban on harvesting egg bearing females	Protect spawners Enhance egg production
Octopus & cuttlefish	In possession limit (max 66 l)	Limits harvest & targeting
Pinkies	In possession limit (max 198 l)	Limits harvest & targeting
Pipefish	Trip limit of 50 individuals in total	Limits harvest & targeting

Approximate allocation between sectors

The ECTF is a commercial fishery. The majority of species are taken most effectively with trawl gear. Trawl species which are caught commercially using alternative fishing methods include: blue swimmer crabs, red spot crabs, banana prawns and squid. The estimated take of these species by non-trawl commercial fisheries in 2006 was 757 t, 17 t, 8 t and 6 t respectively, which corresponds to 1283 per cent, 77 per cent, 2 per cent and 7 per cent of the commercial take by trawlers.

Recreational fishers also harvest banana prawns, blue swimmer crabs and squid. The estimated take of these species by recreational fishers in 2005 (the most recent recreational survey) was 200 t, 140 t, and 50 t respectively, which corresponds to about 40 per cent, 240 per cent and 56 per cent of the commercial take by trawlers in 2006.

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

Otter trawling

The ECOTF was granted a Wildlife Trade Operation (WTO) approval on 18 November 2004 under Part 13A of the EPBC Act. The approval expired on 1 December 2007 and new approvals for this fishery are in place until 29 November 2010. This approval acknowledges that the ECOTF is being managed in an ecologically sustainable manner and allows the export of the catch. The WTO approval covers the following operations:

- Harvesting specimens of species other than those listed under Part 13A of the EPBC Act taken in the ECOTF, as defined in the management regime for the fishery made under the Fisheries Regulation 2008 (Qld) and the Trawl Plan in force under the *Fisheries Act 1994* (Qld)
- For the incidental harvesting of pipefish (*Solegnathus hardwickii* and *Solegnathus dunckeri*) taken in the ECOTF, as defined in the management regime for the fishery.

Beam trawling

The RIBTF was granted a WTO approval on 17 February 2006 under Part 13A of the EPBC Act. This approval acknowledges that the RIBTF is being managed in an ecologically sustainable manner and allows the export of the catch. The approval expires 15 February 2009. The WTO covers the harvesting of species other than those listed under Part 13A of the EPBC Act taken in the RIBTF, as defined in the management regime for the fishery made under the *Fisheries Regulation 2008* (Qld) and the Trawl Plan in force under the *Fisheries Act 1994* (Qld).

Catch statistics

Otter trawling

Principal species

Annual catch statistics for the principal species harvested by otter trawlers in the ECTF are reported in Table 2.

Table 2: Annual catch (tonnes) of principal fish species (otter trawl).

	2001	2002	2003	2004	2005	2006
Prawns	6153	7017	7402	7392	6129	5635
Scallops	992	560	436	673	735	522
Bugs	317	476	476	486	467	470
Squid	117	126	139	157	186	90

Following the introduction of the Trawl Plan in 1999 and its amendments in 2000, annual prawn catches increased until 2003. Since 2004, prawn catches have declined by almost one-quarter (Table 2). This is likely to be a result of effort reduction due to the Department of the Environment, Water, Heritage and the Arts (DEWHA) buy-back under the Structural Adjustment Package, increased fuel prices, competition with lower priced imported prawns and additional trawl closures through the GBRMP Representative Areas Program (RAP) rezoning process.

From 2001 to 2006 annual catches of scallops varied but have declined overall to almost half the scallop catch of 2001. The annual catches of bugs have remained relatively stable since 2002. Squid catches increased steadily from 2001 to 2005 before declining by half the 2005 catch in 2006.

Prawns

Total prawn landings comprise approximately 35 per cent eastern kings, 25 per cent tigers, 15 per cent endeavours, and 10 per cent each of red spot kings, banana and bay prawns. Five per cent of prawn landings are reported under other catch categories.⁶

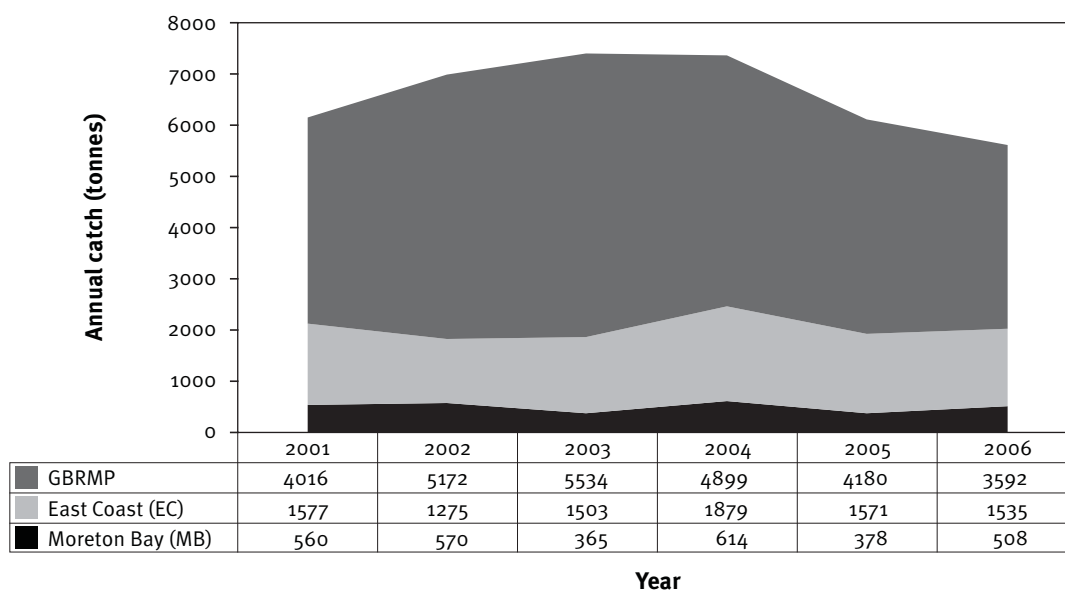


Figure 4: Annual reported catch of all prawns by region 2001–06 (Source: DPI&F CFISH database, 18 July 2007).

Annual regional prawn catches have decreased in the GBRMP but vary between years in Moreton Bay in post-Trawl Plan years (Figure 4). Following an increase in catch by 25 per cent between 2003 and 2004, the annual catches on the East Coast outside Moreton Bay and south of the GBRMP (i.e. between the GBRMP and the Queensland–New South Wales border) have stabilised at levels occurring prior to the GBRMP RAP.

⁶ Department of Primary Industries and Fisheries, 2003, Coastal Habitat Resources Information System (CHRIS), available: www.chrisweb.dpi.qld.gov.au/chris.

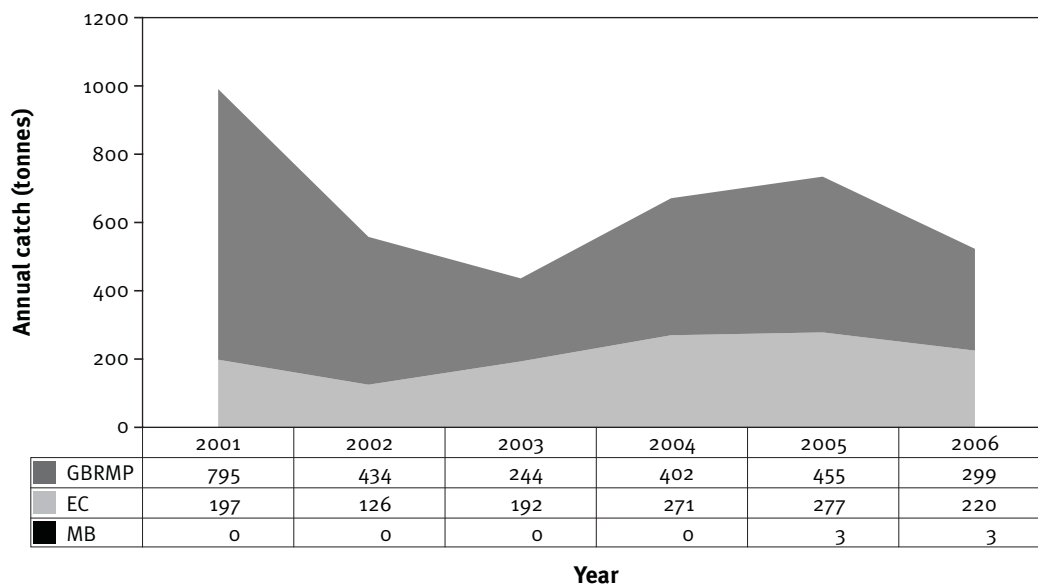


Figure 5: Annual reported catch of scallops by region 2001–06 (Source: DPI&F CFISH database, 18 July 2007).

Scallops

During 2001–05, annual scallop catches decreased in the GBRMP but have been variable in the east coast fishing area (Figure 5). Scallop catches in Moreton Bay were negligible over this period.

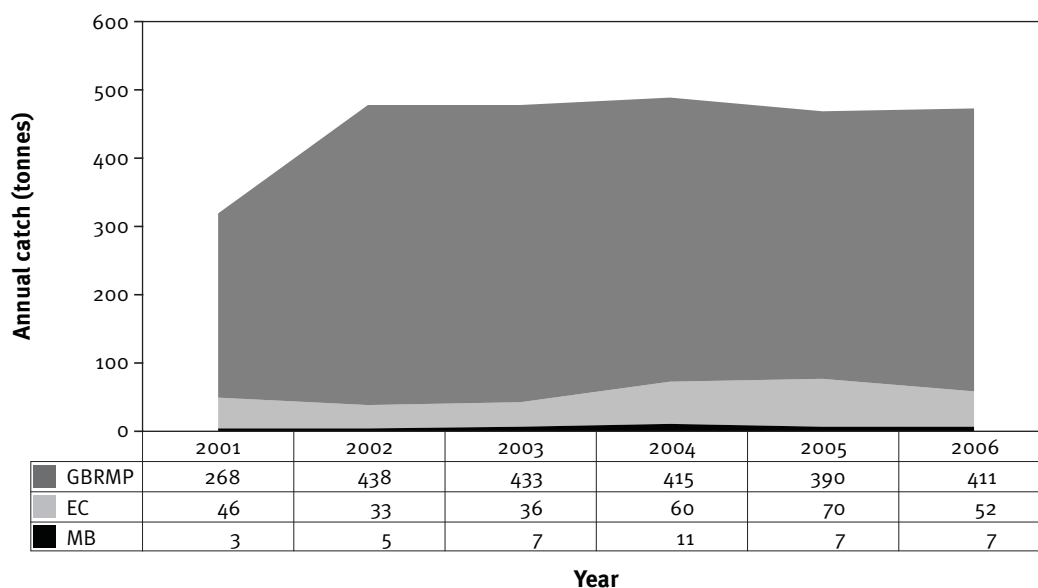


Figure 6: Annual reported catch of bugs by region 2001–06 (Source: DPI&F CFISH database, 18 July 2007).

Moreton Bay Bugs

The majority of Moreton Bay bug (*Thenus*) catches are reported from within the GBRMP where annual catches have remained steady (Figure 6). Annual bug catches in the east coast fishing area are variable. Bug catches in Moreton Bay have been maintained at a low level during 2001–06.

Squid

Squid catches are predominantly reported from within Moreton Bay. Moreton Bay catches increased steadily from 2001 to 2005, but declined to less than half the 2005 catch in 2006. During 2001–06 GBRMP squid catches also declined by half, while the east coast squid catch has been variable (Figure 7).

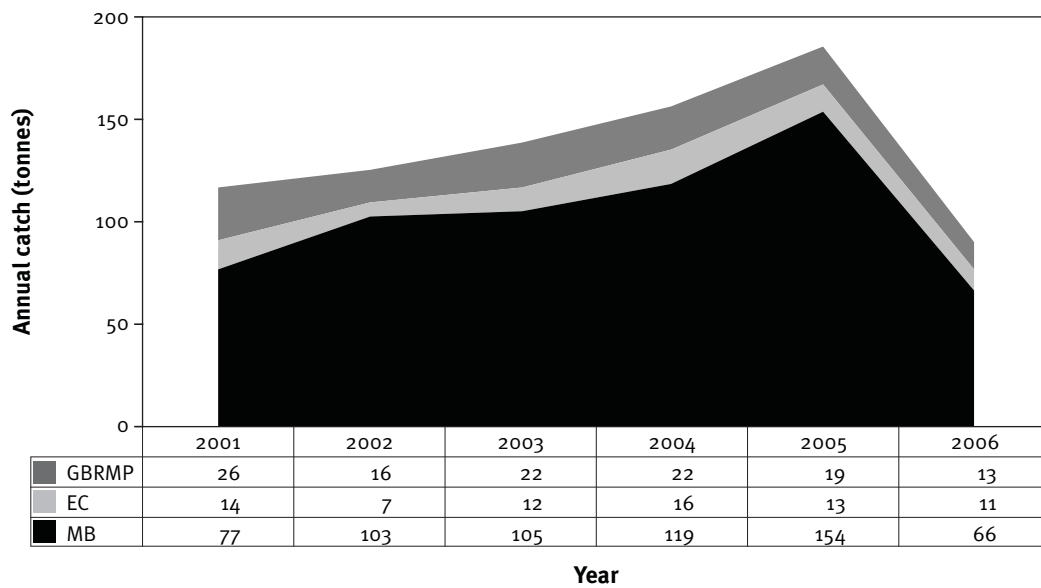


Figure 7: Annual reported catch of squid by region 2001–06 (Source: DPI&F CFISH database, 18 July 2007).

Annual changes in catch per unit effort⁷ (CPUE)

Otter trawl CPUE trends have increased gradually from 2001 to 2005 for prawns, bugs and squid. From 2005 to 2006 prawn and bug CPUE continued to increase while scallop CPUE has declined slightly (Figure 8).

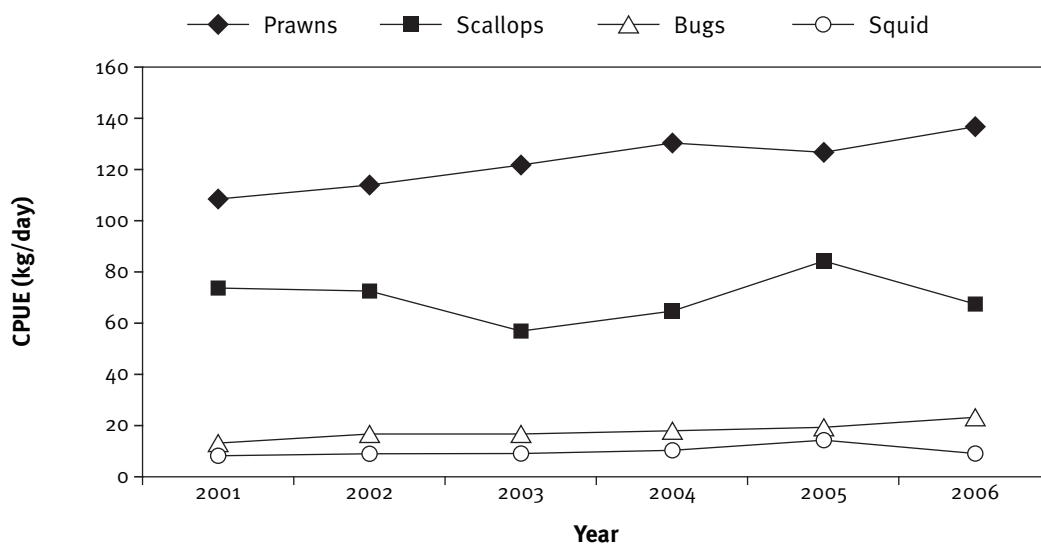


Figure 8: Average annual CPUE trends 2001–06 (Source: DPI&F CFISH database, 18 July 2007).

⁷ For the purposes of this report, otter trawl effort was calculated including only days when catch was reported for each target species.

Permitted species

Any trends in catches of permitted species are difficult to interpret since the introduction of in-possession limits which were introduced in 2000.

Reported Balmain bug catches increased from 2001 to 2006 (Table 3). The blue swimmer crab catch has declined further since implementation of otter trawl in-possession limits in 2000. Lower otter trawl crab catches in 2005 and 2006 paralleled a wider decline in blue swimmer crab pot fishery catches. The commercial pot catch decreased from 1053 t to 722 t during 2001–06 and the recreational catch decreased from 160 t to 140 t in the 2002–05 period.⁸

The red spot crab catch has stabilised at similar levels to the pre-2004 and 2005 catch. The reported catch for 2004 was well above that for other years in the 2001–06 period (Table 3). Cuttlefish and octopus catches have declined since 2001, probably due in part to the in-possession limits introduced in 2000. Barking crayfish catches have declined since the main offshore fishing grounds were closed in the 2004 GBRMP RAP and fuel price increases have made it less economical to trawl grounds located well offshore. Catches of species inhabiting offshore areas (e.g. barking crayfish) may have also decreased as a result. Since 2001 the annual catch of pinkies (threadfin bream) and mantis shrimp have been maintained at low levels while the syngnathid catch has been similar over the past three years.

Table 3: Annual reported catch (tonnes) of permitted species (otter trawl) 2001–06 (Source: DPI&F CFISH database, 23 July 2007).

Species Group	2001	2002	2003	2004	2005	2006
Balmain bugs	63	56	94	116	119	139
Blue swimmer crabs	145	95	87	107	76	59
Red spot crabs	17	29	22	38	27	22
Cuttlefish	62	33	37	32	26	21
Octopus	29	22	13	13	14	14
Barking crayfish	50	15	30	37	10	9
Pinkies	12	8	10	6	10	8
Mantis shrimp	3	3	2	2	2	2
Syngnathids*	8310	5863	10551	8189	8678	8515

*Syngnathids (pipehorses) are reported as number of individuals retained.

Beam trawling

Principal species

Annual catch statistics for the principal species harvested by the RIBT sector of the ECTF are reported in Table 4. Squid catches are very low compared to prawn catches. Annual catches of bugs and scallops are negligible (0–1 t).

The increase in prawn catch that occurred immediately after the implementation of the Trawl Plan in 2000 has reversed since 2004 (Table 4).

⁸ Recreational blue swimmer crab catch estimates are only available from voluntary DPI&F fisher diary surveys in 2002 and 2005.

Table 4: Annual reported catch (tonnes) of principal fish species (beam trawl) (Source: DPI&F CFISH database, 23 July 2007).

Species Group	2001	2002	2003	2004	2005	2006
Prawn	374	400	425	560	385	377
Squid	1	1	1	1	2	2

Prawns

Prawns dominate the RIBT harvest. Greasyback prawns, banana prawns and school prawns are the main prawn species caught.

The beam trawl fleet is split into five fishery symbols that determine the area where the vessels can operate—T5, T6, T7, T8 and T9 (Figure 3)⁹.

Since 2000, the highest proportion of the RIBT fishery catch has been taken in the T5 fishery symbol area—Brisbane River, Logan and Noosa Rivers and Laguna Bay—which in 2006 produced three-quarters of the RIBT harvest (Figure 9). In order of decreasing harvest, the remaining one-quarter of the 2006 harvest was taken in:

- the T8 symbol area—rivers and creeks between Richards Point (Rodds Peninsula) and Reef Point, south of Townshend Island, Keppel Bay and Facing Island areas - accounting for 15 per cent of the RIBT fishery harvest
- the T7 symbol area—all tidal waters of rivers and creeks between the northern bank of the Burrum River and Richards Point (Rodds Peninsula) - accounting for 9 per cent of the RIBT fishery harvest
- the T6 symbol area—rivers and creeks between Double Island Point and the northern bank of the Burrum River, Hervey Bay and the Great Sandy Strait area and T9 symbol area—rivers and creeks between Reef Point, south of Townshend Island, and the northern tip of Cape York Peninsula, and the Llewellyn, Repulse, Cleveland and Sinclair Bay areas— together accounting for 1 per cent of the RIBT fishery harvest.

The 30 per cent decline in the RIBTF total prawn catch between 2004 and 2005 stabilised in 2006 (Figure 9). A decline in prawn catch was observed for all fishery symbols in 2005 and continued to a lesser extent into 2006 with the exception of the T7 fishing area where catches doubled.

⁹ More detailed definitions for the fishery symbol areas are documented in the Trawl Plan

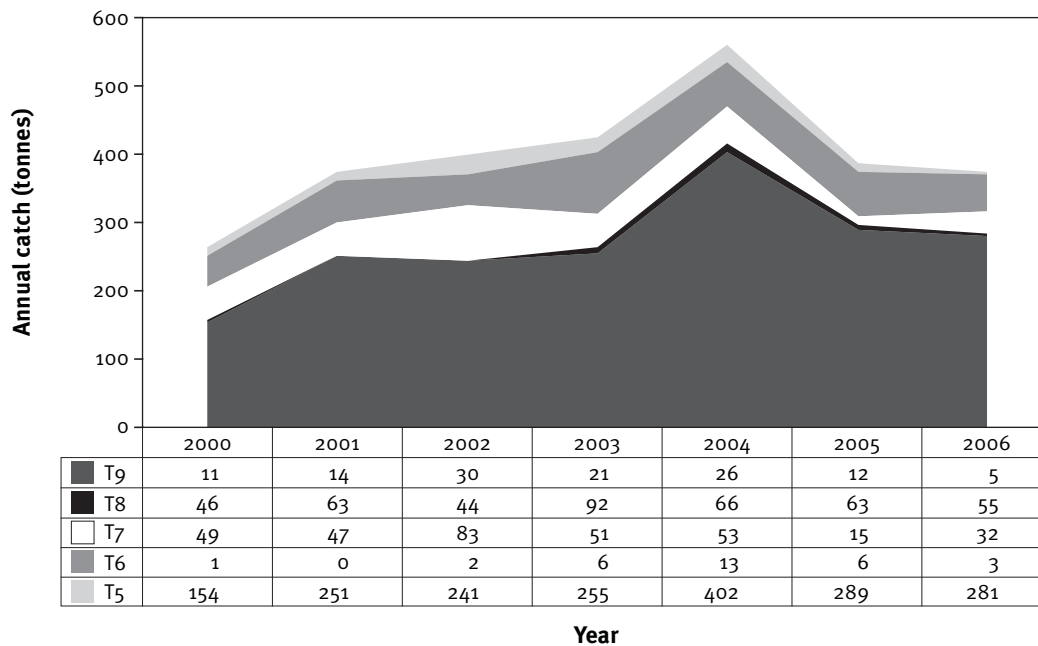


Figure 9: Annual reported catch of prawns by fishery symbol 2001–06 (beam trawl) (Source: DPI&F CFISH database, 23 July 2007).

CPUE¹⁰

In 2006, the average annual CPUE for prawns increased slightly from the 2005 level (Table 5). Very low catches of squid and bugs caught in the RIBT fishery translate into very low CPUE estimates for these species (e.g. an average catch of 0 to 20 kg of bugs per day for the entire fishery in the period 2004–06). Identification of trends is difficult when CPUE is very low. Because only a minor part of these stocks are harvested in the RIBT fishery, greater significance is attached to monitoring the otter trawl CPUE. Recent research indicates that environmental factors such as extreme stream flow events during summer¹¹ have a strong influence on the CPUE of banana prawns—one of the main target species in the RIBT (see Other ecosystem impacts).

Table 5: Average annual CPUE (kg/day) trends 2000–06 (beam trawl) (Source: DPI&F CFISH database, 23 July 2007).

Species Group	2001	2002	2003	2004	2005	2006
Prawns	53.00	59.00	52.00	72.00	58.00	65.00
Squid	0.13	0.11	0.08	0.18	0.28	0.41
Bugs	0.02	0.01	0.05	0.00	0.01	0.02

Permitted species

The combined annual harvest of permitted (non-target) species in the RIBT fishery is typically less than 1 tonne and is negligible compared to the otter trawl harvest of these species and the RIBT fishery prawn harvest. There has been a slight increase in annual RIBT fishery harvest of some permitted species from 2004 to 2006 (Table 6), but this trend is insignificant as the harvest of each species group remains very low.

¹⁰ For the purposes of this report, beam trawl target species effort was calculated based on the entire effort of the fleet.

¹¹ M Tanimoto, AJ Courtney, MF O'Neill and GM Leigh, Stock Assessment of the Queensland (Australia) east coast banana prawn (*Penaeus merguensis*) fishery, Department of Primary Industries and Fisheries, Brisbane, Australia, 2006.

Table 6: Annual reported catch (tonnes) of permitted species (beam trawl) (Source: DPI&F CFISH database, 23 July 2007).

Species Group	2000	2001	2002	2003	2004	2005	2006
Balmain bugs	0.02	0.00	0.00	0.00	0.00	0.01	0.00
Moreton Bay Bugs	0.09	0.16	0.09	0.38	0.02	0.03	0.10
Blue swimmer crabs	0.06	0.06	0.13	4.25	0.07	0.17	0.04
Cuttlefish	0.00	0.02	0.03	0.00	0.02	0.36	0.29
Mantis shrimp	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Octopus	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Red spot crabs	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.77	0.56	0.08	0.22	0.00	0.00	0.00

Fishing Effort

Otter trawling

Historical annual fishing effort statistics for otter trawling in the ECOTF are reported in Figure 10. Since the Trawl Plan, actual fishing effort has reduced by 30 per cent. The number of licences active in the fishery has decreased by one-quarter over the same period.

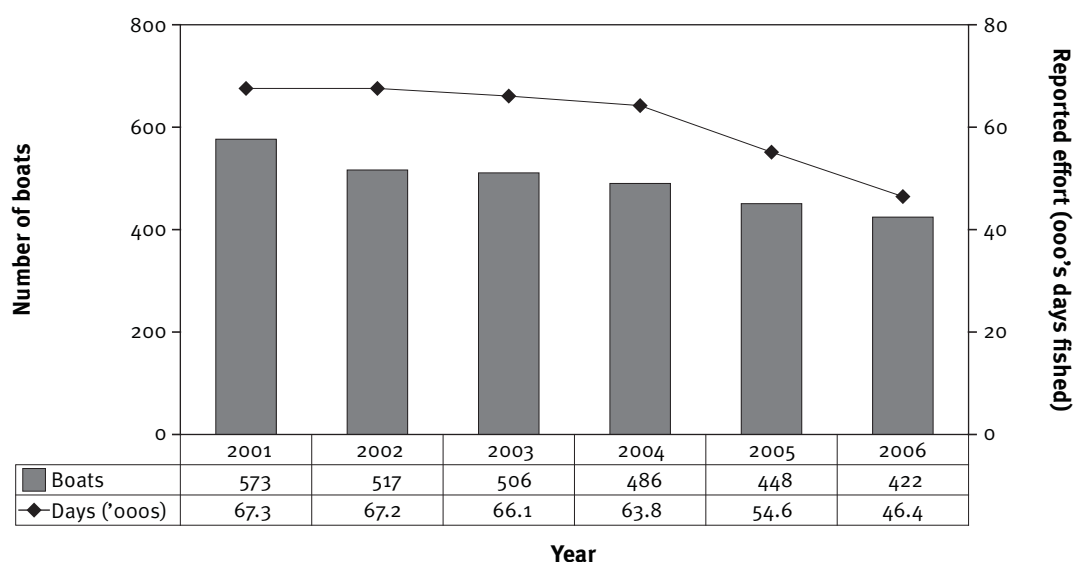


Figure 10: Annual number of reported otter trawl days fished and number of reporting licences in the ECOTF 2001–06 (Source: DPI&F CFISH database, 24 July 2007).

Effort in 2006 was the lowest on record and continues a trend in declining effort in the ECOTF and a 20.6 per cent reduction in the number effort units used since 2004 (Figure 11). While the number of licences has continued to decrease, there has been a decline over the past three years in the rate of licences surrendered.¹² As of 30 June 2006, there were 498 otter trawl licences in the ECTF (Table 7, page 15)¹³, 21 of which have been subsequently purchased by DEWHA under the GBRMP Structural Adjustment Scheme and are no longer active in the fishery.

¹² Trade and surrender provisions were removed from the Trawl Plan in July 2006.

¹³ Thirty-eight of these were Moreton Bay only ('M2') otter trawlers

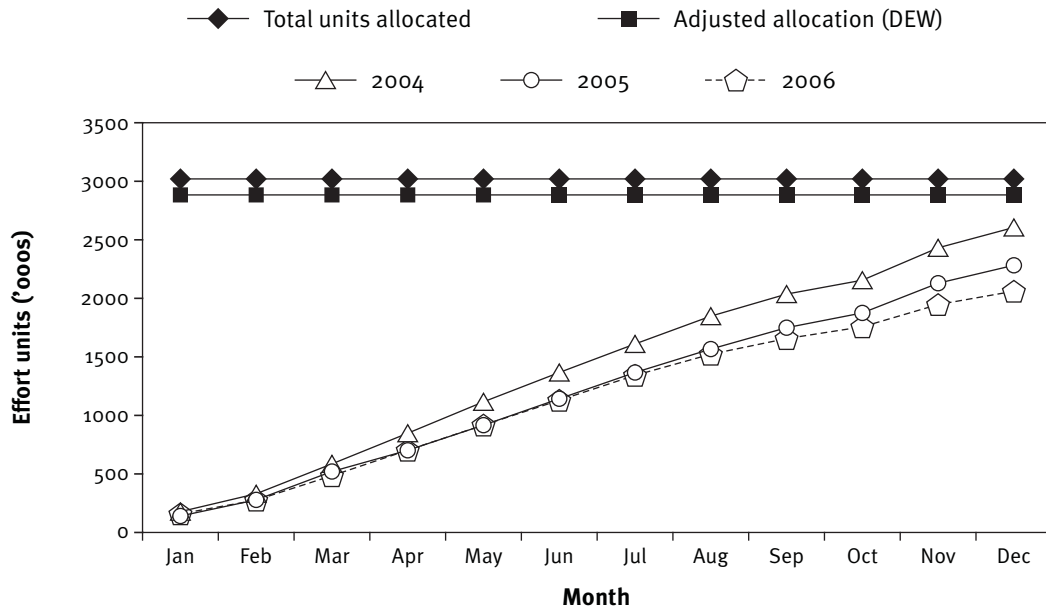


Figure 11: Cumulative monthly use of fishing effort units in the ECOTF 2004–06 (Source: DPI&F CFISH database, 24 July 2007).

Table 7: Number of otter trawl licences (T1/T2/M1/M2) (Source: DPI&F CFISH database, 24 July 2007).

Year	2001	2002	2003	2004	2005	2006
Licences	665	578	535	511	501	498

From 2002 to 2006, trawling effort in the GBRWHA declined significantly (Figure 12). The trigger point for effort in the GBRWHA has been adjusted downward following the allocation of effort units in 2001 and held at 2003 levels in view of the continuing steady decline in effort.

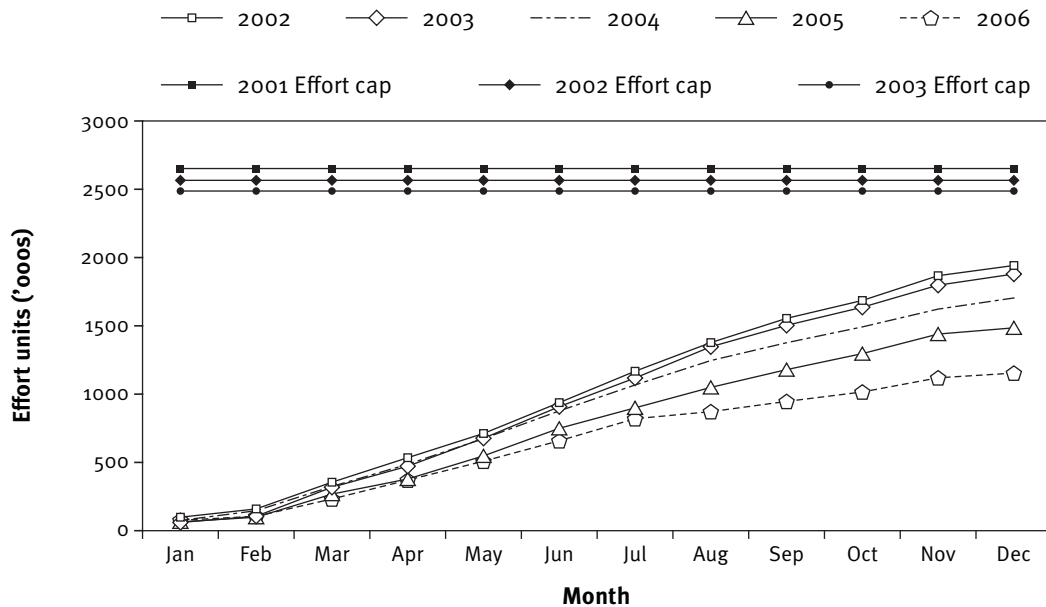


Figure 12: Cumulative monthly use of fishing effort units in the GBRWHA 2002–06 (Source: DPI&F CFISH database, 24 July 2007).

Effort in the GBRWHA was 54 per cent below the set trigger point for effort in 2006 (Table 8). This was consistent with overall low effort unit usage observed for the ECOTF, and continues a four-year trend in declining effort. The current trigger point of 2 492 303 effort units will change at the end of the 2007. A series of lower effort limits are proposed for 2008 on in the GBRWHA which will reduce annually and will be introduced through legislative amendment in the near future.

Table 8: Percentage of effort below the GBRWHA effort trigger point (Source: DPI&F CFISH database, 24 July 2007).

2001	2002	2003	2004	2005	2006
28	22	25	31	40	54

Beam trawling

The beam trawl effort in 2006 continues a significant (30 per cent) decline in effort since the 2003 effort year (Figure 13). The 2005 to 2006 effort reduction is associated with fewer boats active in the fishery.

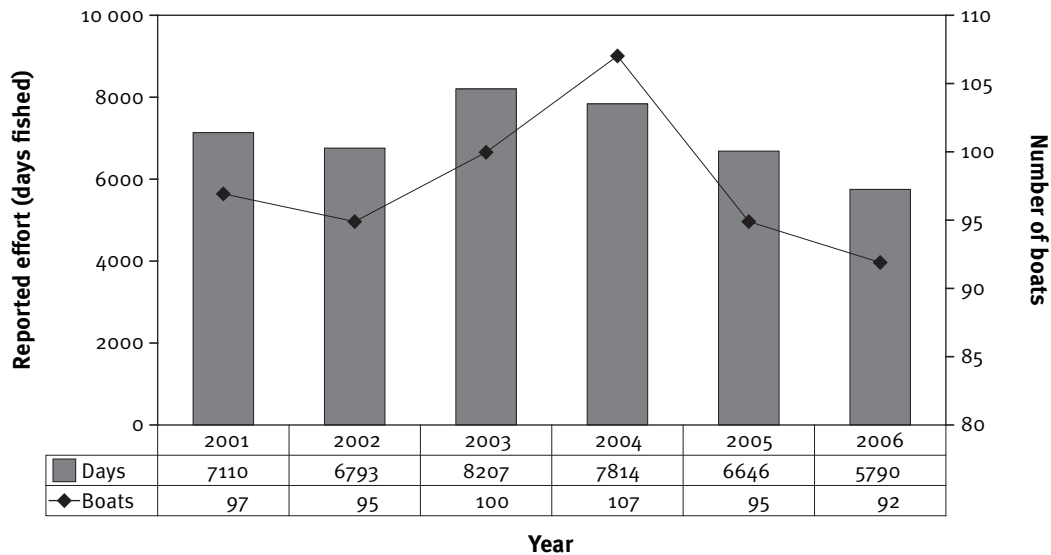


Figure 13: Annual number of reported beam trawl days fished and number of reporting licences in the ECTF (including Moreton Bay) (Source: DPI&F CFISH database, 24 July 2007).

Spatial issues/trends

The GBRMP Authority (GBRMPA) introduced a new zoning plan for the Great Barrier Reef on 1 July 2004 following the RAP, which increased the extent of closures to all forms of commercial fishing from 4 per cent to 33 per cent¹⁴. This has effectively displaced only a minor part of the effort from areas that were closed under rezoning into areas that remain open to trawling.¹⁵ The majority of the higher effort areas open to trawling are highly productive in terms of retained species (e.g. prawns, scallops and bugs). Maintaining access to these areas will be critical to the continued viability of the fishery into the future.

Socio-economic characteristics and trends

The annual GVP for the 2006 fishing season decreased from 2005 and is the lowest since records were started in 1990 (Figure 14). The observed reduction in GVP can be attributed to a number of factors. Firstly to a large reduction in the amount of effort in the fishery over the last ten years. Secondly operational costs of fishing have increased (i.e. high fuel prices and equipment), particularly since 2004, and thirdly the high availability of prawns on the international market as a result of aquaculture production which has depressed the price of prawns on domestic and international markets.

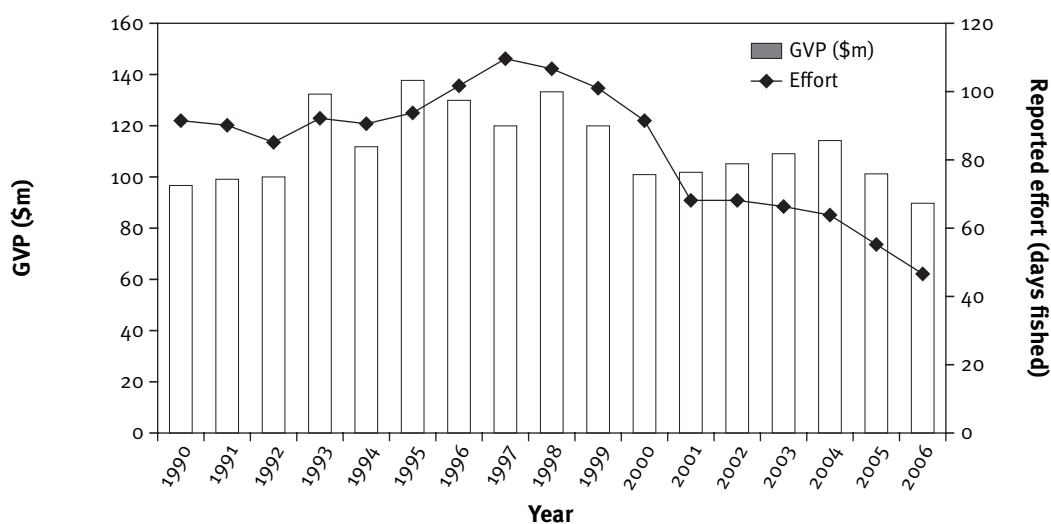


Figure 14: Annual GVP 1990–2006 (Source: DPI&F CFISH database, 3 August 2007).

Figure 15 graphs the income distribution for the ECTF fleet in 2005 and 2006. Income in the ECTF is sourced mostly from prawn catches. The majority of licence holders have gross earnings of between \$100 000 and \$400 000 a year.

14 L Fernandes, J Day, A Lewis, S Slegers, B Kerrigan, D Breen, D Cameron, B Jago, J Hall, D Lowe, J Innes, J Tanzer, V Chadwick, L Thompson, K Gorman, M Simmons, B Barnett, K Sampson, G De'ath, B Mapstone, H Marsh, H Possingham, I Ball, T Ward, K Dobbs, J Aumend, D Slater and K Stapleton. *Establishing representative no-take areas in the Great Barrier Reef: large-scale implementation of theory on marine protected areas*. Conservation biology, 2005, 19(6), pp. 1733–1744.

15 R Coles, A Grech, K Dew, B Zeller, and L McKenzie, (in prep.), *A preliminary report on the adequacy of protection provided to species and benthic habitats in the east coast otter trawl fishery by the current system of closures*, Department of Primary Industries and Fisheries, Cairns, Queensland.

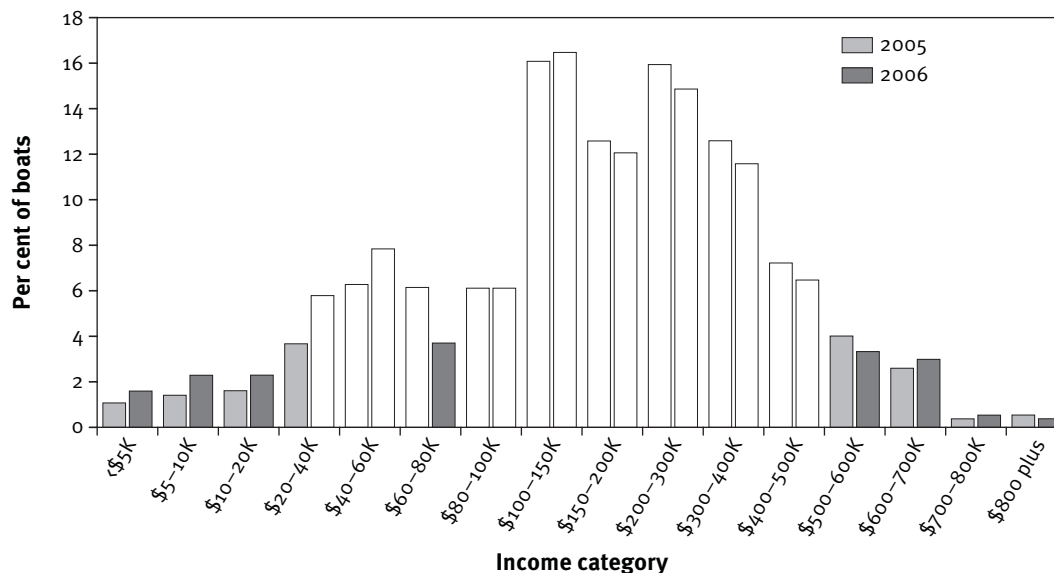


Figure 15: Income distribution in the trawl fishery for 2005 and 2006 (Source: DPI&F CFISH database, 6 August 2007).

Fishery performance

Appraisal of fishery in regard to sustainability

The ECOTF fleet has undergone major changes since the introduction of the Trawl Plan and the closure to fishing of additional areas in the GBRMP in 2004. Reductions in effort, catch rates and overall harvest in the fishery are directly related to the fishery adjusting to such changes. In 2006, the ECOTF experienced the lowest fishing effort year recorded, with associated reductions in catch and GVP. In addition to management changes, increasing fuel prices and high availability of low cost imported prawns on the local market continue to impact upon the fishery.

In 2006, review events¹⁶ to have been triggered for bugs and bay prawns (see Management performance). The lower CPUE for bugs in October 2006 establishes a trend of short-term CPUE reduction for bugs in October since 2004. Lower than usual bay prawn catches in February 2006 are likely to have been influenced by ongoing drought conditions.

Stock assessments undertaken on principal species over recent years suggest that stocks are being fished at sustainable levels. The continuation of the Fisheries Observer Program (FOP), Commercial Fishing Information System (CFISH) Logbook, Vessel Monitoring System (VMS), the Long Term Monitoring Program (LTMP) and the bycatch monitoring program will add to data and information available to fishery managers to ensure that the ECOTF continues to be managed in a sustainable manner.

DPI&F's progress against the recommendations attached to the initial ECOTF (which expired 1 December 2007) and RIBT WTO approval are detailed in Tables 9 and 10. The ECOTF fishery was reassessed in November 2007 and a set of revised recommendations were attached to the new three year WTO approval. The number of recommendations reduced from 18 to 8, indicating that DPI&F has substantially improved the management regime for this fishery to achieve long-term sustainable outcomes. Reporting progress on further requirements of the current WTO approval will occur in the 2008 Annual Status Report.

16 Review events are defined under the Trawl Plan (see Management performance).

Progress in implementing the Department of the Environment, Water, Heritage and the Arts (DEWHA) recommendations

Table 9: Otter Trawling

Recommendation	Progress	Improvements to management regime
DPI&F to inform DEWHA of any intended amendments to the management arrangements that may affect sustainability of the target species or negatively impact on by-product, bycatch, protected species or the ecosystem.	<i>Ongoing</i> No changes to management arrangements occurred in the 2006 fishery season.	N/A
DPI&F to monitor the status of the fishery in relation to the performance measures (review events and/or reference points) specified in the Trawl Plan. Within three months of becoming aware that a performance measure has not been met, DPI&F to finalise a clear timetable to the implementation of appropriate management responses.	<i>Ongoing</i> DPI&F reports annually on review events currently in the Trawl Plan (see Management Performance).	Annual monitoring of performance measures specified in the Trawl Plan provide an early alert of potential problems with sustainable harvesting of the main species retained by the fishery and interactions with protected species (turtles), bycatch and benthic species. A review of relevant management arrangements is the outcome of monitoring where a performance measure has not been met. Since the mandatory introduction of TEDs and BRDs in 2003, the performance measures for sea turtles and other non-retained bycatch and benthic species are no longer considered appropriate for sustainability and will be replaced by alternate performance measures in the 2007 effort year annual status report.
From 2005, DPI&F to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure specified in the Trawl Plan.	<i>Ongoing</i> This annual status report represents the third to be completed under the current WTO approval.	Public reporting on the status of Queensland's fisheries is an important aspect of managing fisheries on behalf of the community. These reports provide an important catalogue of historical information on the status of the fisheries, links to ecological assessments demonstrating to the Australian Government that fisheries meet sustainability guidelines, and the most up-to-date information on Queensland's fisheries.
By end of 2005, DPI&F to review the adequacy of the current Long Term Monitoring Program (LTMP) for the ECOTF in terms of survey design and the value of the survey data for fishery assessment purposes. DPI&F to implement changes to the LTMP based on the results of this review and within available resources.	<i>Completed</i> CSIRO Marine Research reviewed the survey design and value of data for fishery assessment purposes for the LTMP northern prawn, and scallop surveys in early 2006. The proposed recruitment survey design for eastern king prawns (EKP) developed by DPI&F in 2002 ¹⁷ was also reviewed by CSIRO.	The outcomes from this review are being considered by an implementation team and recommendations progressively introduced where appropriate and as resources are available. Findings of the review have already resulted in the implementation of LTMP surveys of EKP recruitment from 2007 which will assist in providing additional information for use in stock assessments. The main findings of the review are included in the Research and monitoring section of this report.

¹⁷ AJ Courtney, MG Cosgrove, D Mayer and DJ Vance, 'Developing indicators of recruitment and effective spawner stock levels in eastern king prawns (*Penaeus plebejus*)', Fisheries Research and Development Corporation (FRDC) Final Report Project 97/145, 2002.

Recommendation	Progress	Improvements to management regime
<p>By the end of 2006, DPI&F to develop and implement a robust system to validate catch logbook and Species of Conservation Interest (SOCI) logbook data.</p>	<p><i>Completed</i> DPI&F's logbook validation strategy encompasses a range of activities that may be undertaken across different fisheries. Validation of trawl logbook data and computer records held on the CFISH database against VMS data for 2001 to 2005 was completed in September 2006. Results of the logbook validation exercise demonstrated that discrepancies between DPI&F's CFISH and VMS data sources are negligible. The percentage of total errors in misreporting the location of a day of fishing effort and reporting fishing as non-fishing activity collectively averaged around 2 per cent (much less than 5 per cent as expected). In 2006, the FOP began operating in the fishery. Validation of fisher reports of SOCI interactions against the small number of observer records indicated some discrepancies in fisher reports of SOCI interactions. Discussions have been held with industry to identify ways to improve fisher compliance with SOCI interaction reporting.</p>	<p>The high level of agreement between logbook and VMS data sources indicates that location and fishing/non-fishing reporting errors in the logbook data are few and that logbook effort data can be relied upon as accurate in the vast majority of instances. DPI&F has confidence in the veracity of analytical outputs using these data to the extent that the data are used appropriately. In response to the noted SOCI data discrepancies, consultation has been undertaken with industry to maximise reporting of SOCI interactions, including the publication of an article in the June 2007 edition of the <i>Queensland Fisherman</i> magazine raising industry awareness of legal responsibilities for reporting SOCI interactions when they occur.</p>
<p>DPI&F to develop, and make publicly available, a strategic research plan within one year. The research plan will identify information gaps in the knowledge required to manage the fishery sustainably, priorities for future research, and consider strategies through which research needs can be met on a continued basis.</p>	<p><i>Completed</i> A Five Year Research Plan (2006–11) has been developed for the ECTF. The research plan is available to the public through the DPI&F internet website.¹⁸</p>	<p>The research plan provides information to the public and research organisations on the DPI&F research priorities for the 2006 to 2011 period in the ECTF.</p>

18 Available online at: www.dpi.qld.gov.au/fishweb

Recommendation	Progress	Improvements to management regime
<p>DPI&F to develop a robust and regular fishery assessment process that provides a basis for management decisions, which are precautionary and recognise the uncertainty and level of risk. The assessment process will examine the ecological sustainability of the principal and permitted species and bycatch, within three years, using stock or risk assessments. Appropriate management responses will be developed to reduce risks to the high-risk species or groups.</p>	<p><i>Ongoing</i></p> <p>In 2004–05, stock assessment of the main target stocks in the fishery indicated that EKP, saucer scallops and tiger-endeavour prawns were being fished to the limit of maximum sustainable yield.</p> <p>Assessments of EKP and saucer scallops were subject to uncertainties in the spawner-recruitment relationships, estimates of annual increases in fishing power and accuracy of logbook catch data¹⁹. The monitoring of recruitment in EKP through the DPI&F LTMP is expected to provide data to reduce the uncertainty in future assessments for that species. Results from the 2004 stock assessment of the northern tiger prawn and northern endeavour prawn stocks indicated that both stocks were fully exploited but that the data lacked contrast i.e. catch and effort for the whole 1988 to 2003 time series was centred on the top of the yield curve.</p> <p>Since 2005, DPI&F has made an ongoing commitment to undertake regular stock assessments for the principal species harvested in the fishery and risk assessments for permitted and bycatch species. Stock assessments of each of the principal species are planned to occur annually.</p> <p>A stock assessment for banana prawns has recently been completed²⁰. Results of the age-structured model showed that the current exploitable biomass levels (biomass in 2004) were about 50 to 70 per cent of B_0 (virgin biomass). The biomass trends were relatively stable in the Tully, Mackay and the Fitzroy areas, but significant declines were observed during the late 1990s in the Townsville and Moreton areas, falling below 40 per cent of B_0.</p>	<p>DPI&F has responded with improved and updated estimates for incremental increases in fishing power and identified the major sources of error in catch and effort logbook data. In addition, fishery independent survey data collected in the period from 1997 are available to test stock assessment model assumptions based on fishery logbook data. For example, annual pre-recruit species abundance (tiger /endeavour prawn species) and standardised survey catch rate (scallops). More accurate and robust reference points by which to guide future sustainable management of the trawl target species may also be developed using these data²¹.</p> <p>Quantification of changes to fishing power in the period 1988 to 2003 set against long-term changes in catch rates²² have alerted management to priority stock assessment needs. Stock assessments for EKP, tiger and endeavour prawns, red spot king prawns and saucer scallops are proposed for completion by end of 2008.</p> <p>The banana prawn stock assessment recommended that standardised catch rates be monitored annually and that the biologically-based limit reference point of B_{MSY} (biomass at maximum sustainable yield) be adopted as a precaution against overfishing.</p> <p>This and other sustainability reference points developed for the other east coast trawl fishery target species have been integrated into a draft Performance Measurement System (PMS) that sets out the requirements for regular assessment, monitoring and reporting of the status of these stocks (see below). A situation report based on existing information on the sustainability risk from current effort levels to retained and non-retained species in the fishery is pending, expected to be completed by early 2008.</p>

19 MF O'Neill, AJ Courtney, NM Good, CT Turnbull, KM Yeomans, J Stauton-Smith and C Shootingstar, *Reference point management and the role of catch-per-unit effort in prawn and scallop fisheries, FRDC Project 1999/120 Final Report*, Department of Primary Industries and Fisheries, Queensland QO 05001, 2005.

20 M Tanimoto, AJ Courtney, MF O'Neill and GM Leigh, *Stock Assessment of the Queensland (Australia) east coast banana prawn (Penaeus merguensis) fishery*, Department of Primary Industries & Fisheries, Brisbane, Australia, 2006.

21 *ibid.*

22 MF O'Neill and GM Leigh, *Fishing power and catch rates in the Queensland east coast trawl fishery*, Department of Primary Industries and Fisheries, Brisbane, Australia, 2006.

Recommendation	Progress	Improvements to management regime
DPI&F to implement an effort cap in the Great Barrier Reef World Heritage Area (GBRWHA), which changes periodically in line with the most current estimates of effort creep. DPI&F to implement appropriate management arrangements to account for effort creep across the fishery.	<i>Ongoing</i> DPI&F research estimates of annual effort creep have been established. Proposals to implement a new system for reducing the GBRWHA cap in effort are being prepared for public comment and legislative amendment.	The Queensland Government recognises a need to ensure that effort levels in the GBRWHA remain at sustainable levels to preserve the unique values of the area.
DPI&F to manage effort in the ECOTF at ecologically sustainable levels. DPI&F to identify appropriate management issues and options flowing from the General Effort Review (GER), make the findings publicly available, and implement any necessary management changes before the end of 2005.	<i>Completed</i> The GER Final Report—a comprehensive analysis of spatial and temporal changes in effort in the ECTF—was released to the public in September 2004. It reported that from 1996 to 2003, significant reductions in effort were achieved in terms of fishing days (40 per cent) and effort units (32 per cent). The number of otter trawlers in the fishery declined by 45 per cent between 1990 and 2003, while the number of beam trawlers declined by 30 per cent between 1996 and 2003.	The majority of stakeholder responses received to the GER (87 per cent) confirmed there was community support that effort in the fishery was being sustainably managed. ²³ The GER Final Report found that recent changes in management of the fishery introduced through the Trawl Plan have been beneficial to ecological sustainability in the fishery. A preliminary analysis of bycatch mitigation measures put in place under the Trawl Plan was also conducted in the GER, indicating that impacts on bycatch in the fishery were sustainable. Results from two major DPI&F/FRDC research projects recently completed (see Recent research and implications) and an assessment of the adequacy of closures for protection of species and benthic habitats within the GBRWHA support this finding.
DPI&F to investigate the feasibility of implementing finer scale spatial management in the ECOTF.	<i>Proposed</i> DPI&F will be considering finer scale spatial management options for target stocks prior to the remaking of the Trawl Plan.	DPI&F currently has limited mechanisms by which to reduce total effort or to partition effort across the different sectors of the fishery if required for ecological sustainability purposes. These will be reviewed in the General Review of the Trawl Plan.
As part of the Review of the Trawl Plan (to be completed and changes implemented before November 2006), DPI&F to revise current review events and develop appropriate limit and target reference points for principal and permitted species by the end of 2005.	<i>In progress</i> In December 2006, the Scientific Advisory Group (SAG) to Trawl Management Advisory Committee (Trawl MAC) endorsed a draft Performance Measurement System (PMS) for the ECTF. When finalised, approval by the Chief Executive DPI&F will be sought for the PMS to be the formal instrument for measuring performance against sustainability targets in the fishery.	During 2008, the proposed limit and target reference levels for principal and permitted species harvest in the draft PMS will be finalised and integrated into the management regime for the fishery. Performance will be monitored against the reference points reported in the 2008 Annual Status Report. Current review events will be repealed from the legislation subsequent to the Review of the Trawl Plan proposed to be undertaken during 2008.

23 S Gaddes and B Zeller, *Queensland East Coast Trawl Fishery*, Department of Primary Industries and Fisheries, Brisbane, Australia, 2005.

Recommendation	Progress	Improvements to management regime
<p>DPI&F to continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks for all principal and permitted species, which may be affected by cross-jurisdictional issues. In particular, DPI&F will cooperate with AFMA, WA and NT fisheries management agencies in relation to squid and with NSW in relation to eastern king prawn.</p>	<p><i>Ongoing</i> Processes are in place, such as the Northern Australian Fisheries Managers Forum (NAFM), the Australian Fisheries Managers Forum (AFMF) and the Protected Zone Joint Authority (PZJA), that allow discussion of complementary management arrangements for shared stocks (e.g. tiger and endeavour prawns).</p>	<p>EKP catch data have been obtained from NSW and utilised in formal assessments of the shared stock in the past. It is proposed to continue to collaborate with NSW DPI in future eastern king prawn assessments. Annual fishery manager meetings between Queensland and NSW are proposed to continue.</p>
<p>By the end of 2006, DPI&F to develop and implement a system sufficient to identify changes in the composition and quantity of bycatch in the ECOTF over time.</p>	<p><i>In progress</i> In early 2006 the DPI&F FOP began monitoring bycatch taken onboard trawlers. Observers record total bycatch weight and species composition data, including numbers of protected species caught. DPI&F is developing a three-year rolling program for bycatch monitoring in the fishery. The program seeks to document the composition and quantity of bycatch characteristic of high and low effort areas in each of the trawl sectors that make up the fishery on a triennial basis. A draft version of the ECTF Bycatch Monitoring Strategy was developed during 2006 and finalised in early 2007. The strategy sets out the protocols for sampling, selection of sampling sites and reporting procedures for bycatch monitoring in the fishery and will be made publicly available in 2008.</p>	<p>Since 2006, the DPI&F FOP has embarked upon a long-term monitoring program for bycatch in the fishery. The ECTF Bycatch Monitoring Strategy identifies and consolidates current best practice to meet objectives of the program with limited resources. Review procedures have been included in the strategy to ensure the program continues to meet data requirements for sustainable outcomes.</p>
<p>DPI&F to continue to pursue a reduction in the amount of bycatch taken in the ECOTF through the refinement of bycatch mitigation technology and to support the investigation of methods for increasing the survivability of bycatch species. Any effective and appropriate methods identified should be implemented in the Trawl Plan within 18 months.</p>	<p><i>In progress</i> DPI&F is encouraging industry to investigate alternative, more effective BRDs and has recently received proposals from industry members. DPI&F is undertaking research into the impact of the fishery and effectiveness of specific BRD designs on sea snakes (including assessment of survivability) (see Recent research and implications). The project is expected to be completed by mid-2008.</p>	<p>DPI&F will continue to monitor trends in the exclusion of bycatch species and the BRD types in use in the fishery validated through the FOP. DPI&F is developing options to mitigate risk associated with sea snake bycatch.</p>

Recommendation	Progress	Improvements to management regime
<p>DPI&F to develop sustainability risk indicators for bycatch based on the Seabed Biodiversity Mapping Project (FRDC Project number 2003/201). In the interim, DPI&F to, by the end of 2005, implement precautionary performance measures related to bycatch.</p>	<p><i>In progress</i> In late 2005, the Trawl SAG developed precautionary bycatch performance measures for bycatch. The interim performance measure for bycatch is that non-compliance with BRD and TED regulations should not exceed 5 per cent. Between 2005 and 2007, DPI&F has collaborated with researchers on development of sustainability risk indicators for bycatch based on the joint FRDC/CRC Reef Great Barrier Reef Seabed Biodiversity Mapping Project. It is expected that final outputs this project will be available to guide development of other bycatch performance measures in 2008.</p>	<p>A PMS to ensure the fishery management regime minimises risk to the sustainability of ecosystem components within the fishery area is under development using recent information from the joint FRDC/CRC Reef Great Barrier Reef Seabed Biodiversity Project. It is expected that the project final report will provide estimates of per centage area of distribution of benthic habitats, assemblages, species groups and numerous individual species and estimates of biomass of each species group and individual species inhabiting the inter-reefal habitats of the GBRWHA. DPI&F is currently developing risk profiles (i.e. ranking risk to the sustainability) of inter-reefal benthic habitats and assemblages, relatively homogeneous species groups and the more commonly occurring individual species subject to trawling in the GBRWHA. When completed, this will establish benchmarks for monitoring future changes in the trawling risk exposure of these ecosystem components with changing patterns of trawl effort.</p>
<p>DPI&F to promote research into the impact of the fishery on protected species including syngnathids and sea snakes, and to take all responsible steps to reduce protected species interactions. Each year, the DPI&F to report publicly on interactions with protected species, incorporating the latest research findings.</p>	<p><i>In progress</i> Pipehorses DPI&F assessed the biology, distribution and abundance of pipehorses in southeast Queensland trawl grounds. This report found little correlation between abundance as assessed by research surveys and commercial catch data. Indeed, higher catches of pipehorses were found in areas subjected to only light trawl effort. Seasnakes DPI&F is currently investigating the distribution, abundance and vulnerability of seasnakes to trawling. Survivability of seasnakes to various trawl durations is also being assessed. This project commenced in early 2005 and is due for completion by mid-2008 (see Recent research and implications section).</p>	<p>Pipehorses The 2005 LTMP pipehorse assessment report²⁴ noted that further work was required to investigate the relationships between syngnathids distribution and abundance and benthic habitat and species assemblage characteristics. Too few pipehorses were recorded from research samples in the GBR Seabed Biodiversity Mapping Project to make this possible inside the GBRMP. It would therefore appear unlikely that this would be possible in the near future outside the GBRMP. When they become available, data collected in the complementary seabed biodiversity mapping project of the Tweed-Moreton bioregion will be assessed for the level of risk to the sustainability of a range of species—including syngnathids—that are caught incidentally in the fishery. Seasnakes DPI&F are considering management options to reduce sea snake bycatch and maintain acceptable sea snake catch and release reporting compliance in the fishery.</p>

24 N Dodt, *Fisheries Long Term Monitoring Program—Syngnathids in the East Coast Trawl Fishery: a review and trawl survey*, Department of Primary Industries & Fisheries, Brisbane, Australia, 2005.

Recommendation	Progress	Improvements to management regime
<p>Within 12 months, DPI&F to amend the definition of “recognised Turtles Exclusion Devices” (TEDs) in the Trawl Plan to ensure that TEDs used in the ECOTF allow the effective escape of those turtle species caught in the fishery. DPI&F to undertake sufficient and effective enforcement activities, including at-sea and in-port inspections, to monitor the compliance with the TED provisions of the Trawl Plan.</p>	<p><i>In progress</i> It is intended that legislative amendment for the definition of TEDs will be progressed as a proposed amendment to subordinate legislation in the near future. Operators are being encouraged to adopt revised TED requirements that have been endorsed by Trawl MAC prior to them being included in legislation. A Compliance Risk Assessment was completed for the Queensland east coast trawl fisheries in 2005 and compliance with effective TEDs was assessed to be a high risk issue for the sustainability of marine turtles. Compliance with legislative requirements for TEDs is addressed through Queensland Boating and Fisheries Patrol (QBFP) operational planning processes.</p>	<p>Measurable performance criteria have been developed for the fishery through the PMS and are in place to monitor TED compliance starting 2008.</p>
<p>DPI&F to, within three years, initiate a review and provide a preliminary report on the adequacy of protection provided to species and benthic habitats in the ECOTF by the current system of closures within and outside the Great Barrier Reef Marine Park (GBRMP), and whether additional closures are required outside GBRMP.</p>	<p><i>In progress</i> Within the GBRMP DPI&F is investigating this issue incorporating the findings of the 2004 DPI&F General Effort Review Permitted Species Risk Assessment, GBR Seabed Biodiversity Mapping and trawl bycatch composition projects. Outside the GBRMP Following discussions between DPI&F, CSIRO and regional NRM bodies a project commenced in 2007 to extend investigations of marine biodiversity south of the GBR and into southern Qld and northern NSW shelf waters. DPI&F is leading stage 1 of the project that will extend over the 2007-08 period and includes collation and synthesis of current information on marine benthic habitats and biodiversity for southern Queensland and northern New South Wales and preparation of field methodologies. The methods will be refined and applied to obtain new data in Stage 2 of the project from 2009 to 2011 (subject to funding).</p>	<p>A preliminary assessment of the adequacy of protection provided by trawl closures to benthic habitats, protected species and higher risk species as determined by the GBR Seabed Biodiversity Mapping Project is under way and will be completed in 2008. While 33 per cent of the GBRWHA is permanently closed to trawling, trawl closures in southern Queensland cover only a small part of the fishery area. Research under way the SEQ Seabed Biodiversity Mapping Project, will improve management in the fishery through reduced environmental impacts (reduced time that trawl gear needs to be on the seafloor, reduced spatial extent of trawling, improved avoidance of sensitive areas). The project will also enhance the potential for spatial management by:</p> <ul style="list-style-type: none"> • Identification of most appropriate areas for protection; • Enhanced allocation and design of marine protected areas and <p>Increased information available to fishers and managers to enhance ecologically sustainable fishing practices.</p>

Table 10: Beam Trawling

Recommendation	Progress	Improvements to management regime
DPI&F to inform the DEWHA of any intended amendments to the management arrangements that may affect sustainability of the target species or negatively impact on by-product, bycatch, protected species or the ecosystem.	<i>Ongoing</i> No changes were made to management in 2006.	N/A
As part of the review of the Fisheries (East Coast Trawl) Management Plan 1999, DPI&F to, by the end of 2006: <ul style="list-style-type: none"> • Incorporate RIBTF data into the development of review events and performance measures being undertaken for the East Coast Otter Trawl Fishery principal and permitted species; and • Revise current review events and develop appropriate performance measures, including limit reference points, for those inshore species predominantly harvested by the RIBTF. 	<i>In progress</i> Development of performance measures for Queensland's trawl fisheries was undertaken as a priority in 2006. Preliminary performance criteria for bycatch and principal species have been developed for the ECOTF and with the exception of permitted (by-product) species also apply to the RIBTF.	In the 2006 stock assessment, target and limit reference points have been developed as sustainability measures for east coast banana prawn stocks using catch and effort data from the RIBTF and the ECOTF and recreational catch estimates. ²⁵ Banana prawn stock assessments using data from these sources are proposed to continue at regular intervals. Performance criteria for bycatch reduction have been developed for the ECTF. Satisfactory performance in bycatch reduction requires a very high level (95 per cent) of compliance with approved BRDs and TEDs in the RIBTF and the ECOTF.
DPI&F to monitor the status of the fishery in relation to the performance measures (review events and/or reference points) specified in the <i>Fisheries (East Coast Trawl) Management Plan 1999</i> . Within three months of becoming aware that a performance measure has not been met, DPI&F to finalise a clear timetable for the implementation of appropriate management responses.	<i>Ongoing</i> DPI&F reports annually on review events currently in the Trawl Plan (see Management Performance).	Through the draft PMS the contribution of the RIBTF to the ecologically sustainable development of east coast trawl resources is regularly assessed and reported in annual status reports.
By the end of 2007, DPI&F to develop a system to ensure that catch and effort data collected in compulsory logbooks is validated on an ongoing basis.	<i>Complete and ongoing</i> The logbook validation exercise for this fishery was completed in January 2008.	Validation of logbook catch and effort data has recently been undertaken using observer data. Regular validation will ensure that issues of reporting accuracy and data quality are identified and managed.

25 M Tanimoto, AJ Courtney, MF O'Neill and GM Leigh, *Stock Assessment of the Queensland (Australia) east coast banana prawn (Penaeus merguensis) fishery*, Department of Primary Industries & Fisheries, Brisbane, Australia, 2006.

Recommendation	Progress	Improvements to management regime
<p>DPI&F to incorporate RIBTF research priorities into the strategic research plan being developed for the East Coast Otter Trawl Fishery within one year. The research plan will identify information gaps in the knowledge required to manage the fishery sustainably, priorities for future research, and consider strategies through which research needs can be met on a continual basis.</p>	<p><i>In progress</i> There is significant overlap with research needs for the RIBTF and ECOTF, however, the draft strategic research plan has also incorporated specific beam trawl issues where appropriate. The strategic research plan has been publicly released and is available on the internet at: www.dpi.qld.gov.au</p>	<p>The research plan provides information to the public and research organisations on the DPI&F research priorities for the 2006 to 2011 period in the ECTF.</p>
<p>DPI&F to include RIBTF catch estimates of juvenile East Coast Otter Trawl Fishery target species, where relevant, in future stock assessments undertaken for these species.</p>	<p><i>In progress</i> Observers have been introduced into the fishery with the aim of collecting information on catch composition, bycatch and interactions with protected species. The contribution to the RIBTF catch of juvenile ECOTF target species will be estimated through observer data.</p>	<p>Stock assessment of banana prawns explicitly incorporates RIBTF banana prawn catch data with otter trawl catch and effort data and recreational catches for banana prawns. More than 95 per cent of the total eastern king and tiger prawn harvest is assessed in regular stock assessments using otter trawl catch data. Only a minor part (5 per cent) of the catch of these species is taken in the RIBTF. It is expected that the stock assessment models will continue to acknowledge the otter trawl catch of these species as the primary focus of regular assessments and the most significant fishery impact in their sustainable use.</p>
<p>By the end of 2007, DPI&F to implement a system to collect data on the composition (species and life-stage) of bay prawn catches in the RIBTF for use in species specific stock assessments.</p>	<p><i>In progress</i> Catch composition data will be collected by fishery observers and may be used in future stock assessments.</p>	<p>DPI&F is collecting “Bay prawn” and other major prawn catch category data in the RIBTF to validate the fisher logbook data on the major species retained and to monitor species discarded from the catch. An updated estimate of species catch composition will be made when adequate observer data are available.</p>

Recommendation	Progress	Improvements to management regime
<p>In conjunction with work being undertaken on the East Coast Otter Trawl Fishery principal and permitted species, DPI&F to develop a robust and regular fishery assessment process for the RIBTF, which provides a basis for management decisions, which are precautionary and recognise the uncertainty and level of risk. The assessment process will examine the ecological sustainability of the target and permitted species within three years, using stock or risk assessments. Appropriate management responses will be developed to reduce risks to any high-risk species or groups.</p>	<p><i>In progress</i> DPI&F has an ongoing commitment to undertake regular stock assessments for the principal species harvested in the fishery and risk assessments for permitted and bycatch species. A three year rolling program of stock assessments is currently being developed. An ecological risk assessment is planned for the ECOTF and RIBTF for 2007, and may help identify high risk species or groups that should be added to the three year rolling program of stock assessments.</p>	<p>See improvements to management regime for otter trawling</p>
<p>By the end of 2007, DPI&F to develop and implement a system sufficient to identify changes in the composition and quantity of bycatch in the RIBTF over time.</p>	<p><i>In progress</i> Bycatch monitoring in the RIBTF is being addressed as part of the strategy for the ECOTF. A large component of the monitoring strategy will be data collection by fishery observers.</p>	<p>See improvements to management regime for otter trawling</p>
<p>DPI&F to continue to pursue a reduction in the amount of bycatch taken in the RIBTF through the refinement of bycatch mitigation technology and to support the investigation of methods for increasing the survivability of bycatch species. Any effective and appropriate methods identified should be implemented under legislation within eighteen months.</p>	<p><i>Ongoing</i> Operators in the RIBTF are currently required to have BRDs fitted when trawling. Two new BRDs have recently been added to the list of recognised BRDs—the popeye fish excluder and the v-cut and bell codend. In certain areas, TEDs must also be used. However, the small size of the nets used precludes the use of TEDs in certain areas such as rivers and creeks. Because of the short shot times, the risk to turtles is considered low compared to the ECOTF.</p>	<p>See improvements to management regime for otter trawling</p>
<p>DPI&F to, by the end of 2008, implement precautionary performance measures related to bycatch in the RIBTF. In the interim, DPI&F to develop bycatch related performance measures based on the best available information by the end of 2006.</p>	<p><i>In progress</i> In late 2005, the Trawl SAG developed interim precautionary performance measures for bycatch—that non-compliance with BRD and TED regulations should not exceed 5 per cent. <i>Proposed</i> Development of additional performance measures is proposed for the fishery, scheduled for mid-2008.</p>	<p>See improvements to management regime for otter trawling</p>

Recommendation	Progress	Improvements to management regime
DPI&F to continue to take all reasonable steps to reduce protected species interactions. Each year, DPI&F to report publicly on interactions with protected species, incorporating the latest research findings.	<i>Ongoing</i> A comprehensive protected species education program was released in September 2005 and included information on how operators can minimise interactions with protected species. See also Interactions with protected species for the number of recorded interactions.	See improvements to management regime for otter trawling

Management performance

Assessment of the 2006 data against the review events described in Schedule 2, parts 2, 3 and 4 of the Trawl Plan²⁶ are reported below. In summary, three review events have been triggered for principal species listed in the Trawl Plan and one review event was triggered for reduction of allocated effort unit in the fishery (Table 11, page 30). Details of DPI&F's response/proposed response to the triggered review events are also provided.

Review events Schedule 2, Part 2 of the Trawl Plan

Principal species CPUE

Otter trawl catch and otter trawl effort have been considered for the purposes of monitoring the principal species review events in the Trawl Plan, based on a CPUE performance measurement index. A review event is triggered if the CPUE of a species drops below 70 per cent of the average CPUE baseline for that species taken over the 1988–97 period. The CPUE for each principal species is calculated on a monthly basis for the whole year. Specific reference periods during the year are recognised as important for each principal species and these are critical times at which CPUE must meet the performance criteria. Where this is not the case, a review of the management arrangements applicable to that species would be considered.

Monthly changes in CPUE

Increased fishing power estimates adjusting for vessel gear and technology specifics and regional data have been used in this analysis. Extrapolation from an annual fishing power estimate time series developed by O'Neill & Leigh (2006)²⁷ is used to monitor standardised CPUE for the principal species performance measure/ review events currently in the Trawl Plan.

A summary of the principal species review events triggered/not triggered under the Trawl Plan is provided in Table 11 and details of DPI&F's proposed response to the triggered review events provided in the text.

²⁶ Available online at: www.legislation.qld.gov.au.

²⁷ MF O'Neill and GM Leigh, *Fishing power and catch rates in the Queensland east coast trawl fishery*, Department of Primary Industries and Fisheries, Brisbane, Australia, 2006.

Table 11: Summary results of Schedule 2 of the Trawl Plan review event monitoring for 2006

Review events

Review event	Measured	Performance
Bay prawns CPUE from 1 November to the end of February, is less than 70 per cent of the average CPUE for the species from 1988–97	<i>Triggered</i>	The ongoing drought and lack of freshwater outflows into Moreton Bay, the main grounds where bay prawns are taken, may have contributed to decreased CPUE in February 2006. DPI&F will continue to monitor bay prawn CPUE to assess the status of risk to the sustainability of the stocks.
Eastern king prawns CPUE from 1 November to the end of February and 1 May to 31 August, is less than 70 per cent of the average CPUE for the species from 1988–97.	<i>Not Triggered</i>	In 2006 CPUE for eastern king prawns did not trigger a review event. CPUE remained above the reference level for the entire season.
Moreton Bay bugs CPUE from 1 November to the end of February and 1 May to 31 October is less than 70 per cent of the average CPUE for the species from 1988–97.	<i>Triggered</i>	CPUE for bugs was above the reference level for all months except September/October 2006. In most years, lower CPUE is expected in October because the annual southern closure (20 September to 1 November) tends to restrict access to bug stocks—this is also evident in 2004 and 2005 data).
Red spot king prawns CPUE from 1 June to 30 September, is less than 70 per cent of the average CPUE for the species from 1988–97.	<i>Not Triggered</i>	In 2006 CPUE did not trigger a review event. In December CPUE fell to slightly above the reference level. In most years, a decrease in fishing effort occurs during the annual northern closure (15 December to the end of February).
Scallops CPUE from 1 November to end February, is less than 70 per cent of the average CPUE for the species from 1988–97.	<i>Triggered</i>	During February 2006, CPUE fell slightly below the reference level and a review event was triggered. In October CPUE also fell but rebounded quickly to be above the reference level during the peak November – December catching period. Consequently, a review event did not trigger in October. A recent change made to the minimum legal size is likely to increase scallop CPUE in future. ²⁸

28 See 'Changes to management arrangements in the reporting year' section of the report

Review event	Measured	Performance
Northern tiger prawns ²⁹ CPUE between 1 March to 30 June and 1 September to 31 December, is less than 70 per cent of the average CPUE for the species from 1988–97.	<i>Not Triggered</i>	In 2006 CPUE did not trigger a review event. CPUE was below the reference level in January & February during the annual northern closure (15 December to the end of February).
Northern endeavour prawns CPUE from 1 March to 30 June and 1 September to 31 December is less than 70 per cent of the average CPUE for tiger prawns from 1988–97.	<i>Not Triggered</i>	In 2006 CPUE did not trigger a review event. CPUE was below the reference level only in January & February during the annual northern closure (15 December to the end of February).
Compliance More than 5 per cent of boats in the ECTF are used to commit an offence	<i>Not Triggered</i>	As at June 2007, 27 boats were breached or successfully prosecuted for offences under the Trawl Plan. This corresponds to 4 per cent of ECTF boats used to commit an offence. As such, a review event was not triggered by a lack of compliance with the Trawl Plan. Prosecutions against a further 14 boats were pending for alleged offences. ³⁰
Effort units (EUs) The number of EUs has not decreased by: (i) 13 per cent or more in the first effort year of the Trawl Plan (ie 2000) (ii) 1 per cent or more in any subsequent effort year (iii) 2 per cent or more during 2 consecutive effort years	(i) N/A (ii) N/A (iii) <i>Triggered</i>	The review events in Schedule 2, Section 8 (e) (i) and (ii) of the Trawl Plan were made redundant following regulatory amendment of the ECTF management and licensing regime removed the effort unit surrender provision from the Trawl Plan on 1 July 2006. This was in recognition that the surrender provisions placed on the trawl fleet were no longer necessary given the significant reduction in effort since the Trawl Plan's introduction. ³¹ In 2006, the review event in Schedule 2, section 8(e) (iii) of the Trawl Plan was triggered. However a review of effort management in the fishery will not be necessary given that actual effort in the fishery since 2004 was 20.6 per cent. ³² A decline of this magnitude far exceeds the two per cent reduction over 2 consecutive year performance measure stipulated by the review event.

29 Tiger and endeavour prawns have been split into northern and southern sections, based on fishing grid location. The northern section is defined as the waters less than 16°S and southern is defined as waters greater than or equal to 16°S (the split falls between Cairns and Cooktown).

30 These data will be assessed in future ECTF compliance monitoring when legal proceedings are finalised

31 See Figures 9 and 10

32 See the 'Fishing effort' section of the report for details

Review event	Measured	Performance
Engine power Average engine power for boats in the ECTF is increasing	<i>Not Triggered</i>	No review event has been triggered under Schedule 2, Section 8 (f) (ii) of the Trawl Plan. There is no significant difference in the average engine power of the trawl fleet between 2005 and 2006 ($p > 0.05$).
Ecosystem By 1 January 2005: (i) benthos is not reduced by 25 per cent (ii) the amount of fish taken other than principal fish (bycatch) is not reduced by 40 per cent (iii) turtle capture or mortality for any turtle species is more than 5 per cent of the average level of turtle capture or mortality as reported in Robins 1995 ³³	(i) <i>Not Triggered</i> (ii) <i>Not Triggered</i> (iii) <i>Not Triggered</i>	No review events have been triggered under Schedule 2, Section 12 of the Trawl Plan. In order to meet the ecosystem performance measures in the Trawl Plan, a range of mitigations have been put in place, including BRDs, TEDs, permanent and temporal closures, and effort reductions, all of which have contributed to a significant reduction in overall quantities of benthos, bycatch & protected species interacting with the fishery. Reduction in the take of benthos by 25 per cent since the implementation of the Trawl Plan has been achieved ³⁴ . Reduction in the take of bycatch by 40 per cent by since the implementation of the Trawl Plan has been achieved. Only 14 turtle interactions were recorded in 2006—all live releases. At this level captures were much less than the 5 per cent of 1991–92 turtle catch reference level (295 turtles) specified by the Robins report. In addition, no review event has been triggered for any individual turtle species, indicating that TEDs are effective at ensuring that the vast majority of turtles are able to successfully escape from a trawl.
Effort in Moreton Bay A study shows that a total of more than 15 000 fishing days under 'M1' and 'M2' licences have been used in the review year.	<i>Not Triggered</i>	The fishing effort for Moreton Bay in 2006 was 6246 fishing days, a slight (6 per cent) increase on the effort in 2005. The level of effort in Moreton Bay has decreased since the Trawl Plan was introduced and is considerably less than the 15 000 days reference level in the Trawl Plan, therefore no review event has been triggered.

33 JB Robins, *Estimated catch and mortality of sea turtles from the East Coast Otter Trawl Fishery of Queensland, Australia*. Biological Conservation, 1995, 74, 157–67.

34 W Norris, (Draft) *Estimating total bycatch reduction in the east coast trawl fishery using limited data sets*, Department of Primary Industries & Fisheries, Queensland Australia, 2004.

Red spot king prawns

Under Schedule 2, Section 8(a) (iv) of the Trawl Plan, a review event will be triggered if the CPUE for red spot king prawns, between 1 June and 30 September, falls below the 70 per cent reference CPUE level. In 2006, standardised CPUE for predicted effort creep did not trigger a review event. The northern closure is observed over January and February.

Saucer scallops

Under Schedule 2, Section 8(a) (v) of the Trawl Plan, a review event is triggered if the CPUE for scallops, from 1 November to end February, falls below the 70 per cent CPUE reference level. The monthly CPUE trend for scallops in 2006 fell below 70 per cent of the long-term average CPUE during the months of February and October. A review event was triggered during February. In October CPUE also fell but rebounded quickly to be above the reference level during the peak November–December catching period. Consequently, a review event did not trigger in October. A recent change made to the minimum legal size is likely to increase scallop CPUE.³⁵

A quantitative stock assessment of saucer scallop stocks harvested in the ECOTF is currently underway. Results from the assessment are expected to be available to management by mid-2008. DPI&F will review the results of the assessment to determine whether further modification to the management regime for this species is required.

Tiger prawns

Under Schedule 2, Section 8(a) (vi) of the Trawl Plan, a review event will be triggered if the CPUE for tiger prawns, between 1 March to 30 June and 1 September to 31 December, falls below the 70 per cent CPUE reference level. 2006 data for tiger prawns have been split into northern and southern sections, based on fishing grid location. The northern section is defined as the waters less than 16°S and southern is defined as waters greater than or equal to 16°S (the split falls between Cairns and Cooktown).

Northern tiger prawns

No review event was triggered for northern tiger prawns.

Southern tiger prawns

No review event has been triggered for southern tiger prawn catch. The CPUE remains well above the 70 per cent CPUE reference level during the review event periods (Figure 22).

Endeavour prawns – north

Endeavour prawns are not listed in the Trawl Plan but are harvested by boats targeting tiger prawns; DPI&F applies the tiger prawn review to the endeavour prawn stocks. A review event is triggered if between 1 March and 30 June and 1 September and 31 December the CPUE falls below the 70 per cent CPUE reference level. The 2006 northern endeavour prawn CPUE did not trigger a review event. The effects of the first northern closure (see Tiger prawns—north) is a reduced CPUE over the December–February period.

35 See 'Changes to management arrangements in the reporting year' section of the report

Engine Power

Since the Trawl Plan, a continued small increase in average engine size has been observed and has occurred as a result of removing smaller length boats from the fishery, rather than operators significantly increasing their current engine capacity. The 2006 average engine power is not significantly different ($p > 0.05$) from the 2005 levels, indicating no change in average engine power. Therefore, no review event has been triggered under Schedule 2, Section 8 (f) (ii) of the Trawl Plan.

Review Events, Schedule 2, Part 3 of the Trawl Plan

Ecosystem

Ecosystem review events in the Trawl Plan, built on performance measures for benthos, bycatch and sea turtles, are monitored annually.

Benthos

Under Schedule 2, Section 12 of the Trawl Plan, the level of benthos taken must have been reduced by 25 per cent as of 1 January 2005. An analysis of data by DPI&F indicated that a 25 per cent reduction of the take of benthos (seabed associated plants and animals) by the fishery since the implementation of the Trawl Plan had been achieved³⁶. The conclusion was based on reductions in swept area (hectares), nominal effort and the effects of BRDs and TEDs on bycatch rates. Continued enforcement of the use of BRDs and TEDs and seasonal and permanent closures will further reduce the take of benthos from the ECTF.

Results from the recently completed Great Barrier Reef Seabed Biodiversity Project undertaken by CSIRO Marine and Atmospheric Research (see Recent research and implications) are being assessed to determine current risks associated with fishing activities on benthos in the GBRMP. Indicators and methods for monitoring risk to the sustainability of benthos are under development using data from this project.

Bycatch

DPI&F research results indicate that each of the trawl sectors are distinct in terms of bycatch species composition making it necessary to tailor use of specific BRD types that are the most effective in each trawl sector.²⁶ Introduction to the fishery of DPI&F- designed square mesh cod ends as the most effective BRD type for use in the scallop sector is under consideration as a proposed amendment to the Trawl Plan in 2008.

Ecosystem

Non-retained species/bycatch

Species caught incidentally by trawl nets are discarded either because they hold low market value, are not permitted to be retained, or are outside the legal or market size requirements³⁷.

Bycatch consists mainly of small fish, crabs, other penaeid prawns and numerous other bottom dwelling invertebrate species including sponges, sea stars and gastropod shellfish.

³⁶ W Norris, (Draft) *Estimating total bycatch reduction in the east coast trawl fishery using limited data sets*, Department of Primary Industries & Fisheries, Queensland Australia, 2004.

³⁷ D Huber, *Audit of the Management of the Queensland ECTF in the Great Barrier Reef Marine Park*, Great Barrier Reef Marine Park Authority, Queensland, Australia, 2003.

Larger vertebrate species which may enter otter trawl nets include turtles, sea snakes, sharks and rays can usually exit through specially designed excluder or escape devices built into the body of the net (see Interaction with protected species section).

Most species (>70 per cent) are uncommon in the catch³⁸. High zero counts in trawl samples for most species present monitoring problems, that is, low numbers of many bycatch species mean there is low statistical power to detect change in catch rates for these species through monitoring programs.

DPI&F has developed a detailed bycatch monitoring strategy for the entire ECTF. The strategy focuses on data collection through fishery observers and will assist in quantification of levels and composition of bycatch in the ECTF.

Interactions with protected species

TEDs

During the period 1991–96, the average turtle catch was estimated at approximately 6000/year³⁹. Since the introduction of TEDs in 2001, a dramatic reduction in turtle captures has been observed in the fishery. In the period 2001–06 the average turtle interaction reported through the trawl fishing logbooks has been 14 per year. Fisher awareness of reporting requirements for interactions with turtles and other protected species is being enhanced through education by DPI&F onboard observers.

In 2006 the ECOTF reported 14 turtle interactions (Table 12, page 36). Of these, all were released alive. The very low numbers of turtles caught in the fishery indicate that TEDs are very effective in allowing turtles to escape a trawl net and that when on the rare occasions they are caught these turtles are probably captured toward the end of the trawl shot and so have been in the net for a relatively short time compared to the time actually spent fishing. Turtles that do not have enough time to escape through the TED before the net is removed from the water are typically released alive and in good condition.

SOCI

In January 2003, the Species of Conservation Interest Logbook (SOCIO1) was introduced to the fishery. Fishers have since been required to report all interactions with protected species in a separate logbook to the general logbook used for recording retained catch. Any capture of marine species protected under Queensland and Australian Government laws such as sea snakes, turtles, sea birds, dolphins, grey nurse and great white sharks, and dugongs must be recorded in the SOCIO1 logbook. Protected species catch and release data for otter trawl in 2006 are given in Table 12.

Trawl fishers also reported 1526 interactions with sea snakes in 2006 (Table 12). SOCIO1 logbook data indicate that in 2005 and 2006, live releases resulted from 95 per cent of seasnake interactions. Very low numbers of interactions with other protected species were reported in 2006.

38 AJ Courtney, M Tonks, M Campbell, D Roy, S Gaddes and MF O'Neill, *Quantifying the effects of bycatch reduction devices (BRD) in Queensland's shallow water eastern king prawn (Penaeus plebejus) trawl fishery*, Department of Primary Industries & Fisheries, Southern Fisheries Centre, Deception Bay, Australia, 2005.

39 JB Robins and DG Mayer, *Monitoring the impact of trawling on sea turtle populations of the Queensland east coast*, Department of Primary Industries & Fisheries, Brisbane, Australia, 1998.

Table 12: Reported otter trawl interactions with species of conservation interest in 2006 (Source: DPI&F CFISH database, 27 July 2007).

	Numbers		
	Caught	Released Alive	Released Dead
Sea snake	1526	1443	83
Green turtle	7	7	0
Turtle—saltwater unspecified	5	5	0
Flatback turtle	2	2	0
Seahorse unspecified	4	4	0
Sawfish—narrow	3	2	1
Sawfish—green	1	1	0
Sawfish—dwarf	1	1	0
Gull—unspecified	1	0	1
Gannets and boobies	1	1	0
Total	1551	1466	85

Fishery impacts on the ecosystem

The extent of impact from trawling on benthos is dependent on several factors, which includes the type of trawl gear being used, the spatial patterning of the trawl gear, the habitat the gear is being utilised in and the frequency of use.

Studies have found that trawling has the capacity to reduce biomass and abundance of benthic organisms and lead to long-term shifts in benthic species composition.⁴⁰ Trawling activity in the ECTF is heavily focussed on areas of soft seabed (sand, silt, and mud)—the preferred habitat for several major harvestable species. Repeated trawling over the same ground in areas supporting attached sedentary animals may be cause for the depletion of the animals in the region.

The *Great Barrier Reef Marine Park Act 1975* places restrictions on the ECTF through closures to fishing. Under GBRMP legislation, trawling can not occur in: Habitat Protection, Conservation Park, Marine National Park, Buffer, and Scientific Research and Preservation zones. The total area of these zones has increased to approximately 66 per cent of the GBRMP with the introduction of the revised GBRMP Zoning Plan from 1 July 2004, which allows for a minimum of 20 per cent of the area of each of the 70 bioregions to be protected from fishing.⁴¹

⁴⁰ SL Drabsch, JE Tanner and SD Connell, *Limited infaunal response to experimental trawling in previously untrawled areas*, ICES Journal of Marine Sciences, vol. 58, pp. 1261–1271, 2001.

⁴¹ Great Barrier Reef Marine Park Authority 2003, *Why is biodiversity in the Great Barrier Reef Park important?* [Online], available: www.gbrmpa.gov.au/corp_site/management/zoning/rap/rap/pdf/FAQs_3Dec2003.pdf [Accessed 10 July 2006].

Other ecosystem impacts

Drought

Hydrological drought is associated with periods of low-flow of coastal rivers⁴² and previous research has found that high river flow into marine environments can have positive effects on productivity of commercial fisheries.⁴³ It is possible that the observed decreases in reported total catch from the 2004 season to 2006 season may be in part associated with the drought conditions that Queensland has been experiencing in recent years.

Research and monitoring

Recent research and implications

Fisheries Research and Development Corporation, Project No. 2000/170: "Bycatch weight, composition and preliminary estimates of the impact of bycatch reduction devices in Queensland's trawl fishery."

This project was completed in May 2007. It assessed catch rates for some 1300 species (mainly bycatch) taken in the eastern king prawn, tiger-endeavour prawn and saucer scallop otter trawl sectors of the ECTF. It also reports on assessments of the effectiveness of BRD types when used in combination with recognised TEDs in the fishery and makes findings and recommendations that will provide better information and sustainable management of a number of by-product species taken in the fishery.

Based on recommendations from this project, DPI&F is developing proposals to introduce the BRD type that is best suited to the bycatch species composition and that has the greatest effect with regard to maximising bycatch reduction in the scallop sector. Recommendations for minimum legal sizes for barking crayfish and Balmain bugs based on their biology have also been considered. Together, these proposals have been scheduled for 2008 as legislative amendments to the Trawl Plan.

FRDC Project 2003/021: "Mapping bycatch & seabed benthos assemblages in the GBR region for environmental risk assessment & sustainable management of the East Coast Trawl Fishery."

This project was completed in July 2007. The overall objective of the project was to address key issues identified by GBRMPA, DPI&F and the Queensland Seafood Industry Association (QSIA) in relation to biodiversity assessment and provision of information for future Marine Park planning needs, and environmental sustainability assessments of the ECTF. It focussed specifically on the development of sustainability indicators and assessment methods and a risk assessment of the effects of trawling on the sustainability of bycatch, benthic species and assemblages and seabed habitat within the GBRMP.

⁴² P Humphries and DS Baldwin, Drought and aquatic ecosystems: an introduction, *Freshwater Biology*, 48, pp. 1141–1146, 2005.

⁴³ NR Loneragan and SE Bunn, River flows and estuarine ecosystems: Implications for coastal fisheries from a review and a case study of the Logan River, southeast Queensland, *Australian Journal of Ecology*, 24, pp. 431–440, 1999.

Key findings indicated that:

- Trawl effort had a significant (both positive and negative) effect on the biomass of a very small per centage (6.5 per cent) of the 850 species mapped;
- About 70 per cent of the 850 species mapped had low or very low exposure to trawl effort;
- More than 800 species had low or very low estimates of proportion caught annually;
- Only 33 species had relatively high exposure to trawl effort—only about 15 per cent of these species had high catchability by trawling, the other 85 per cent were assessed to have somewhat lower catchability by trawling;
- Indicators based on qualitative recovery ranks showed that about 15 species were possibly at higher relative risk with respect to trawling with considerable uncertainty about the parameters used to quantitatively assess risk in the majority of these species against an experimental biological limit reference point (analogous to maximum sustainable yield); and
- Evaluations of the environmental performance of several recent management interventions showed that generalised depletion trends up until the late 1990s have all been arrested and reversed—the 2001 buyback of fishing licences and subsequent penalties made the biggest positive contributions with the 2004 rezoning of the marine park making a small positive contribution for some species.

The project has enhanced information available on habitats and biodiversity distribution and risks that managers need to address to ensure human activities within the GBRMP are conducted sustainably. DPI&F is currently considering the project findings and their implications for sustainable management in the ECOTF.

FRDC Project 2005/053: “Reducing the impact of trawl fisheries on protected sea snakes”

Depending on location, there is an occasional to likely occurrence of sea snakes in the ECTF bycatch. Anecdotal evidence from this fishery suggests thousands of sea snakes are caught annually. Research from the Northern Prawn Fishery in the Gulf of Carpentaria suggests up to 50 per cent of these snakes could die as a result of their contact with trawl gear.

In July 2005, the DPI&F commenced work on a three-year research project intended to quantify catch and mortality rates of sea snakes and investigate the effects of existing BRDs on sea snake catch rates in the ECTF. The project is funded by the FRDC and has three objectives:

1. Implement a crew-based data collection program to collect information on sea snake catch rates, species composition and distribution.
2. Quantify post-trawling mortality rates of sea snakes by undertaking survival trials at sea on commercial vessels.
3. Test the effect of existing BRDs on sea snake catch rates.

As at July 2007 preliminary results of the project indicate that:

A crew-member observer program (CMO) has sea snake catch and mortality data from 72 vessels and 100 fishing trips across the following sectors of the ECTF:

- scallop
- eastern king prawn
- tiger and endeavour prawn
- banana prawn
- deepwater king prawn
- brood-stock collection fishery (*Penaeus monodon*)
- bay prawn (Moreton Bay)
- river and estuarine prawn (Beam Trawl).

Sea snake catch rate per hectare estimates of trawl swept area for each sector of the ECTF are highest in the black tiger prawn broodstock and banana prawn fisheries (0.57 and 0.38 snakes per hectare respectively) and lowest in the scallop and deepwater king prawn fisheries (0.0004 and 0.0001 snakes per hectare respectively).

The number of dead snakes recorded by the CMO program is low for most sectors and much less than the 0.01 snake per hectare mortality rate observed in the red spot king prawn fishery. No dead snakes have been reported in the black tiger prawn, banana or Moreton Bay trawl fisheries as trawl times are relatively short in these sectors.

Testing the effect of existing BRDs used in the ECTF on sea snake catch rates under commercial conditions indicates that significant reductions in sea snake catch rates are being achieved by commercial fishers with various BRD/TED/distance from the codend drawstring configurations. However recent experimental fisheye and popeye fishbox BRD testing in the ECTF and in the Northern Prawn Fishery indicate higher sea snake catch rate reductions are achievable without significant loss of prawns. The data collected from this project will be used to:

1. Identify sea snake species or populations that are most at risk from trawling.
2. Encourage the use of existing BRDs and practices that help minimise sea snake catch and mortality rates.
3. Provide advice to all interested stakeholders on the sustainability of sea snake populations.

The field component of this research was completed in late 2007. Preliminary project findings were communicated to stakeholders in March 2008. Results of a risk assessment of sea snake species will be made available by the end of the project in mid- 2008.⁴⁴

Stock assessment of east coast banana prawns (Penaeus merguensis)

The banana prawn fishery is characterised by highly variable catches, which are believed to be largely affected by environmental factors including rainfall, salinity, river flow and temperature. This assessment was the first investigation of the status of the banana prawn stock off the Queensland east coast and used a regional, monthly based and age-structured model to represent the prawn stock dynamics.⁴⁵

⁴⁴ T Courtney (Department of Primary Industries & Fisheries) pers. comm., August 2007.

⁴⁵ M Tanimoto, AJ Courtney, MF O'Neill and GM Leigh, *Stock Assessment of the Queensland (Australia) east coast banana prawn (Penaeus merguensis) fishery*, Department of Primary Industries & Fisheries, Brisbane, Australia, 2006.

The results of the age-structured model showed that the current exploitable biomass levels were approximately 50–70 per cent of virgin biomass. River flow generally resulted in an immediate increase in otter trawl catch rates, possibly because the flow promotes the downstream movement of prawns to regions fished by otter trawlers. Temperature effects were less important for the Cairns and Tully area, possibly because the temperature range was less variable in these areas.

Major recommendations resulting from this study include:

- Undertake a formal stock assessment of the Queensland banana prawn fishery once every three to four years to examine the status of banana prawn stock
- Monitor standardised catch rates annually.

Monitoring programs and results

Long term monitoring program (LTMP)

LTMP trawl review implementation

DPI&F has considered the recommendations of the independent evaluation of the LTMP trawl fishery resource surveys undertaken by CSIRO Marine and Atmospheric Research in early 2006.

The review found that the annual tiger and endeavour prawn surveys provided reliable abundance indices for these species, recommended that this information should be incorporated into future stock assessments and that consideration be given to conducting future model-based analysis of both the time series of abundance indices and the recruitment indices. These recommendations are being considered by DPI&F stock assessment scientists for future assessments of these resources. The report also recommended that if funding allowed, the number of sites surveyed should be increased.

Taking into account the positive review of the sampling design proposed in a 2002 FRDC report by DPI&F officers, an additional survey of pre-recruit eastern king prawns based on this design was initiated from late 2006 as part of the LTMP to provide an annual abundance index.

The evaluation highlighted that the scallop survey as undertaken since 2001 to assess the performance of the rotational harvest strategy using scallop replenishment areas was not able to provide a reliable abundance index for use in stock assessment because of the limited area of the fishery currently surveyed. However, the review did highlight the value of the data collected to refining knowledge of the scallop stock recruitment relationship. DPI&F plans to redesign the scallop survey during 2007–08 to provide a more robust abundance index for inclusion in future stock assessments and to potentially serve as a direct indicator of stock status and sustainability.

Monitoring northern prawns (LTMP)

In multi-species fisheries, such as the northern section of the ECOTF, information on the individual commercial prawn species is not captured in daily commercial fishery logbook data. To assess the stocks of the individual species, fishery independent data is needed on the distribution of these species geographically and over time. The annual tiger prawn LTMP surveys provide this information.

The results of the surveys indicate that in far north Queensland 1999 and 2005 were years of higher than average tiger prawn recruitment while 2000 was a year of lower than average recruitment. In 2004 and 2006 there was an intermediate level of recruitment of tiger prawns to the fishery.

The years of higher survey catch rates for far north Queensland endeavour prawns were 1999, 2001, 2002, 2005 and 2006. In contrast 2000 was the year with the lowest catch rate and 2004 was also a year of relatively low survey endeavour prawn catch rates.

The catch rates provided by the surveys compare well with trends in the commercial harvest data, especially for tiger prawns which are considered more susceptible to overfishing. The LTMP prawn surveys provide an important time-series of fishery independent data that complements the analysis of the commercial fishery catch and effort data in quantitative stock assessment for tiger and endeavour prawn species.

Monitoring Saucer Scallops (LTMP)

Since 1997, DPI&F has carried out an annual scallop survey. In its initial phase this survey was a pre-recruitment survey. The objectives were to provide a long-term data series that when combined with existing fishery monitoring programs and historical data would assist in the assessment of the resource status and contribute to assessment of the performance of management strategies. In 2000, the surveys were extended to collect additional information on by-product species (blue swimmer crabs and Moreton Bay bugs).⁴⁶

The objectives of the survey were revised in 2001 corresponding with the introduction of a rotational harvest strategy for the scallop replenishment areas. Current objectives focus on assessing the performance of the scallop rotational harvest strategy and collection of data from blue swimmer crab and Moreton Bay bug catches.

Standardised scallop survey catch rates from 1997 to 2006 indicate there were low scallop catch rates in 2002 and 2003 and 2005. In 2004 both 0+ and 1+ age classes were relatively strong. In 2006 an increase in numbers was largely due to an increased catch of scallops older than one year old (1+). No general long-term trend has been identified in the unstandardised catch rates for blue swimmer crabs and Moreton Bay bugs.

Monitoring protected species

The only species of conservation interest encountered during the LTMP scallop surveys have been syngnathids and sea snakes. Both of these taxonomic groups have been encountered in relatively low numbers.

Initial results of the LTMP survey on the EKP trawl grounds were reported in the 2005 annual status report. A supplementary report⁴⁷ has been prepared and the results reinforce those reported previously in 2005. In brief, LTMP monitoring indicates that:

- syngnathids inhabit rocky benthic habitats not typically targeted by trawling and
- the highest mean abundance of syngnathids occurs in low trawl effort areas.

⁴⁶ E Jebreen, O Whybird, and S O'Sullivan, *Fisheries Long Term Monitoring Program: Summary of scallop (Amusium japonicum balloti) survey results: 1997–2006*. Department of Primary Industries and Fisheries, Brisbane, Australia, 2008.

⁴⁷ N Dodt, *Fisheries Long Term Monitoring Program—Syngnathids and their associated communities. Supplementary report to Syngnathids in the East Coast Trawl Fishery: a review and trawl survey*, Department of Primary Industries & Fisheries, Brisbane, Australia, 2006.

DPI&F is investigating further the spatial distribution of benthic habitats in the shallow water EKP grounds through a collaborative research project. An expected outcome of the project would be a more detailed understanding of the extent of rocky habitats preferred by syngnathids and is required before any conclusions regarding the effect of trawlers on syngnathid populations can be made.

Fishery Observer Program (FOP)

The primary objectives of the Fisheries Observer Program in the ECTF are to collect fishery dependent information to:

- Validate the accuracy of catch and effort data detailed within logbooks
- Detail composition and fate of SOCI, and validate data supplied through SOCI logbooks
- Estimate bycatch amounts and determine composition of bycatch for the fishery.

These objectives are achieved by collecting information on:

- total catch retained (target and non-target species)
- catch per unit effort
- amounts of principle and permitted species discarded (estimated)
- total bycatch discarded (estimated)
- total species catch compositions (target, non-target and bycatch)
- vessel and gear information (number and sizes of nets, net mesh size, type of TED and BRDs used)
- interactions with SOCI.

During 2006, observers conducted a total of 80 sea days onboard vessels in the ECOTF. Observed fishing days onboard vessels were spread among boats targeting scallops, deep and shallow water EKP, tiger and endeavour prawns and red-spot king prawns. Observers recorded 82 days of logbook information which will be used for validation of fisher submitted (catch and effort) logbook data.

From each trawl shot observed, observers take a sub-sample of the catch that is divided into various components. Principal and permitted species are recorded as being retained or discarded. Discarded principal or permitted species include individuals that are under size, damaged, not important for the operator or otherwise non marketable. In addition, observers record information about selected bycatch species for the fishery, mainly in respect to species that have other commercial or recreational fishing importance. From observed trawl shots in 2006, 20 per cent was retained as target product, 19 per cent was discarded as unwanted target product and 61 per cent was discarded bycatch.

The introduction of TEDs into the fishery dramatically reduced turtle bycatch, with no interactions recorded on any observed trip within the ECOTF. All SOCI interactions observed in 2006 involved sea snakes. From 413 observed shots, 90 sea snake interactions were observed, of which 86 per cent were released alive. The FOP is likely to have had a positive effect on the release of sea snakes by educating fishers on better handling techniques.

The East Coast Trawl Fishery Bycatch Monitoring Strategy

In response to a need for more specific data needs for bycatch management in the east coast trawl fisheries, DPI&F has developed a Bycatch Monitoring Strategy reviewed in late 2006 and finalised in April 2007. The Strategy provides detailed information on the DPI&F's approach to monitoring bycatch through the FOP in the ECTF.

The FOP conducts sampling and analysis to determine by catch composition in line with this strategy. The fishery has been divided into sectors (tiger/endeavour prawn, red-spot king prawn, EKP, banana/bay prawn, scallop). During 2006, intensive bycatch analysis effort was directed to the stout whiting finfish trawl. In 2007, bycatch will be analysed from the tiger/endeavour and red-spot king prawn sectors. For each sector, ten replicate samples are analysed to species level from each of nine high effort and three low effort (6 nm) sites. Reporting of FOP findings from this analysis will be reported in the 2008 annual status report.

Collaborative research

DPI&F collaborated with CSIRO, GBRMPA and Queensland Seafood Industry Association to identify key issues in relation to biodiversity assessment and provision of information for future Marine Park planning needs, and environmental sustainability assessments of the ECTF with respect to effects on bycatch, benthic assemblages and seabed habitat, and to support ecologically-based management of the fishery (see 'Recent research and implications'). Preliminary risk indicators for important bycatch species were provided to DPI&F in early 2007. Final results were reported in July 2007. Data from this project are being considered in the proposed ecological risk situation report due in 2008 and for the development of new bycatch performance measures in the ECOTF.

Fishery management

Compliance report

Compliance and enforcement in the ECTF are the responsibility of the DPI&F, QBFP. The Compliance Activity System is a key compliance monitoring tool that records detailed information on activities performed by QBFP.

The system records:

- breach reports issued (including offences and court outcomes)
- unattended breach reports
- fisheries infringement notices (FINS) issued
- all field activities (from new field occurrence logs)
- complaints made via the Fishwatch hotline (including follow up actions).

All offences and field activities are recorded to six nm grids. This allows enforcement activities and offences to be represented spatially and to guide reviews of compliance strategies.

During 2006, 479 commercial vessels were inspected in the ECTF with corresponding compliance rates of approximately 90 per cent in the ECOTF, 70 per cent in the MBTF and 95 per cent in the RIBTF. The majority of the remaining thirty-eight inspections were on marketer premises. While a total of 49 separate offences in the ECOTF were recorded in 2006, only two-thirds of these relate to offences under the Trawl Plan (see below). The other one-third were other fisheries offences, not specific to the ECOTF.

The types of offences recorded in 2006 were similar to those reported in 2005 including: no BRD or TED; closed water incursions; VMS (fail to maintain/fail to remove nets during VMS exemption); regulated fish (take/possess/sell/disfigure to hide identity/remove bug carapace); fail to keep records/logbooks; fail to have a document for immediate inspection; take fish for trade/commerce whilst not a commercial fisher; former authority holder failed to remove boat mark from boat; and fail to remove nets from a vessel during a non-fishing VMS exemption

Changes to management arrangements in the reporting year

As mentioned in the 2005 Annual Status Report, a marked decrease in scallop catches was observed after implementation of the Trawl Plan. A fishery-based trial of an alternative minimum legal size regime for saucer scallops was conducted in Nov–Dec 2004 and Nov–Dec 2005.

An amendment was made to the Trawl Plan in October 2006 based on increased scallop catch rates during November to December in the trial period, to make the minimum legal size 90 mm from 1 November to 31 December each year. Noting the lower scallop catch reported in 2006, DPI&F will continue to monitor the longer-term benefits of this management change to scallop catches.

Bycatch Reduction Devices

BRDs are devices placed in the trawl net to allow the escape of incidentally caught non-target and undersized target species, while minimising the loss of target species.

Based on at-sea trials the Trawl Plan was amended in June 2006 to include two additional devices as recognised BRDs:

- the popeye fish excluder
- the v-cut and bell codend⁴⁸.

Although there are seven recognised BRDs in the Plan that can be used anywhere in the fishery, a proposal is under consideration to match specific BRDs to specific fishery areas to ensure that the most effective device is used in areas best suited to its use. To date compelling evidence for effective bycatch reduction only exists for adoption of the square mesh cod end BRD (SMCE) in the scallop fishery. Proposals under consideration may require the use of SMCEs in scallop gear in the near future. Meanwhile DPI&F will continue to encourage the refinement of other BRD types and practical innovations to minimise bycatch.

Consultation/communication/education

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

Consultation with stakeholders in the fishery mainly occur through Trawl MAC, with meetings generally held twice a year. Trawl MAC provides to DPI&F on management measures for fishery.

⁴⁸ Refer to the 2006 ECTF Annual Status Report for a detailed description of the popeye fish excluder and the v-cut and bell codend.

Complementary management

DPI&F is committed to ongoing consultation with other jurisdictions to ensure sustainable management of shared fish stocks across their native range. DPI&F meets annually on fisheries matters with NSW Fisheries and routinely participates in regional inter-jurisdictional management forums through the Commonwealth Northern Prawn Fishery Management Advisory Committee and the PZJA Torres Strait Prawn Management Advisory Committee.

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Image

Tiger prawn (*Penaeus esculentus*) and saucer scallop (*Amusium japonicum balloti*).

