

Fisheries Long Term Monitoring Program

Summary of tiger and endeavour prawn survey results: 1998–2006



April 2007



Australian Government
Fisheries Research and
Development Corporation



Queensland Government
Department of Primary Industries and Fisheries

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**Summary of tiger and endeavour
prawn survey results: 1998–2006**

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Acronyms

AFMA	Australian Fisheries Management Authority
CFISH	Commercial Fisheries Information System, DPI&F
CL	Carapace length (mm)
DPI&F	Department of Primary Industries and Fisheries, Queensland
ECTF	East Coast Trawl Fishery
FNQ	Far North Queensland
FRDC	Fisheries Research and Development Corporation
GBRMPA	Great Barrier Reef Marine Park Authority
LTMP	Long Term Monitoring Program, DPI&F
Northern Queensland	Northern section of the ECTF targeting tiger and endeavour prawns
Reef CRC	Cooperative Research Centre for the Great Barrier Reef World Heritage Area
TSPF	Torres Strait Prawn Fishery

Summary

There are two distinct tiger and endeavour prawn fisheries that extend along the northern Queensland east coast and into Torres Strait: the Torres Strait Prawn Fishery (TSPF) and the northern segment (north of 22° S) of the East Coast Trawl Fishery (ECTF). This document reports on the Torres Strait, and a section of the northern Queensland segment of the ECTF (defined as the section of the Queensland east coast from Cape Flattery 16° S to the tip of Cape York 10.4° S. This section will be referred to as Far North Queensland). The prawn trawl fishery in this Far North Queensland (FNQ) region mainly targets tiger, endeavour and king prawns. These three prawn groups consist of six main species: the brown tiger prawn (*Penaeus esculentus*), the grooved tiger prawn (*Penaeus semisulcatus*), the blue endeavour prawn (*Metapenaeus endeavouri*), the red endeavour prawn (*Metapenaeus ensis*), the redspot king prawn (*Melicertus longistylus*), and the western king prawn (*Melicertus latisulcatus*).

The average annual catch (from 1998–2004) of the tiger and endeavour prawn sector of the northern Queensland ECTF (north of 22° S) is approximately 1700 t of tiger prawns, 1200 t of endeavour prawns and 900 t of king prawns (CFISH data, 1998–2004). For the Torres Strait the average annual catch (from 2000–04) is 675 t of tiger prawns, 1018 t of endeavour prawns and 77 t of king prawns (Taylor *et al.* 2006). The annual value of the northern Queensland and the Torres Strait prawn fisheries is approximately A\$40m (Williams 2002) and A\$22m, respectively (McLoughlin 2002).

The initial annual prawn surveys (1998–2000) were a component of the Fisheries Research and Development Corporation project 97/146, conducted by Department of Primary Industries and Fisheries (DPI&F). The project developed a fishery independent sampling procedure for tiger and endeavour prawn stocks in northern Queensland and Torres Strait waters. The DPI&F Long Term Monitoring Program continued the annual prawn surveys, using the same survey procedures and sites. The key objective of the annual prawn surveys is to monitor prawn species, size, distribution and relative abundance in order to contribute to assessments of the status of tiger, endeavour and king prawns in northern Queensland and Torres Strait waters. The surveys also document bycatch in the fishery area to enhance understanding of the fishery's potential impacts on the ecosystem.

The survey results for FNQ indicate that 1999 and 2005 were years of higher than average tiger prawn recruitment while 2000 was a year of lower than average recruitment. Similarly, for Torres Strait, 2000 was a year of low tiger prawn recruitment whereas 1998, 2005 and 2006 were years of above average recruitment.

The results presented in this report, a previous summary of survey results (Turnbull *et al.* 2004), and a detailed analysis of both the 1998 to 2002 surveys and commercial catch data (Turnbull *et al.* 2005) indicate that these surveys are a cost effective tool in providing the data needed to monitor prawn stocks, especially in multi-species fisheries such as the northern Queensland east coast tiger prawn fishery. The survey catch rates can be compared with, and provide confidence in, the trends observed in the commercial harvest data (Turnbull *et al.* 2005, O'Neill and Turnbull 2006, O'Neill and Leigh 2006) especially for tiger prawns which are considered susceptible to overfishing. It is recommended that the LTMP prawn surveys be continued as they provide an important time-series of fishery independent data that complements the analysis of the commercial fishery data. The survey data complements the commercial harvest data and will assist with the development of species-based assessment and monitoring of the northern Queensland tiger prawn fishery.

Long Term Monitoring Program background

The Department of Primary Industries and Fisheries (DPI&F), Queensland, manages the state's fish, mollusc and crustacean species and their habitats. As part of this commitment, DPI&F monitors the condition of, and trends in, fish populations and their associated habitats. This information is used to assess the effectiveness of fisheries management strategies and helps ensure that the fisheries remain ecologically sustainable. DPI&F also uses the information to demonstrate that Queensland's fisheries continue to comply with national sustainability guidelines, so that they may remain exempt from export restrictions under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999*. DPI&F initiated a statewide Long Term Monitoring Program (LTMP) in 1999, in response to a need to collect enhanced data for the assessment of Queensland's fisheries resources. The LTMP is managed centrally by a steering committee with operational aspects of the program managed regionally from the Southern and Northern Fisheries Centres located at Deception Bay and Cairns respectively. The regional teams are responsible for organising and undertaking the collection of data to be used for monitoring key commercial and recreational species, and for preparing data summaries and preliminary resource assessments. A series of stock assessment workshops in 1998 identified the species to include in the LTMP.

The workshops used several criteria to evaluate suitability including:

- the need for stock assessment based on fishery independent data
- the suitability of existing datasets
- the existence of agreed indicators of resource status
- the practical capacity to collect suitable data.

Species currently monitored in the LTMP include saucer scallops, spanner crabs, stout whiting, mullet and tailor in southern Queensland, and tiger and endeavour prawns and coral reef fish in northern Queensland. Species with statewide monitoring programs include mud crabs, barramundi, spotted and Spanish mackerel and freshwater fish. Various sampling methodologies are used to study each species. The incorporation of fishery independent techniques is preferred, with combinations of fishery dependent and independent techniques being used where appropriate. Data collected in the monitoring program are maintained in a central database in Brisbane. The primary aim of the LTMP is to collect data for resource assessment (ranging from analyses of trends in stock abundance indices to more complex, quantitative stock assessments) and management strategy evaluations. The greatest value of the growing datasets for each of the species and associated habitats is in the long time series generated by continued sampling, something that is usually required for accurate assessments but is rarely available. Stock assessment models have already been developed for saucer scallops, spanner crabs, stout whiting, mullet, tailor, barramundi, tiger and endeavour prawns, and spotted and Spanish mackerel. In some cases management strategy evaluations have also been carried out. The data collected in the LTMP have been integral to these activities.

The assessments and evaluations have, in turn, allowed options for improvements to the management of Queensland's fisheries resources to be considered. Enhancements to ongoing monitoring have also been identified, particularly to address the increasing demand for high quality data for dynamic fish population models. Through the ongoing process of collecting and analysing LTMP data and incorporating these data into regular assessments and refining monitoring protocols as required, DPI&F is enhancing its capacity to ensure that Queensland's fisheries resources are managed on a sustainable basis.

Introduction

There are two distinct tiger and endeavour prawn fisheries that extend along the northern Queensland east coast and into Torres Strait: the Torres Strait Prawn Fishery (TSPF) and the northern segment (north of 22° S) of the East Coast Trawl Fishery (ECTF). This document reports on the Torres Strait, and a section of the northern Queensland segment of the ECTF (defined as the section of the Queensland east coast from Cape Flattery 16° S to the tip of Cape York 10.4° S. This section will herein be referred to as Far North Queensland). The prawn trawl fishery in this Far North Queensland (FNQ) region mainly targets tiger, endeavour and king prawns. These three prawn groups consist of six main species: the brown tiger prawn (*Penaeus esculentus*), the grooved tiger prawn (*Penaeus semisulcatus*), the blue endeavour prawn (*Metapenaeus endeavouri*), the red endeavour prawn (*Metapenaeus ensis*), the redspot king prawn (*Melicertus longistylus*), and the western king prawn (*Melicertus latisulcatus*).

These species are all members of the family Penaeidae and have a wide geographic distribution that extends along the coasts of New South Wales, Queensland, Northern Territory and Western Australia. Species composition changes with latitude and with distance from the coast.

Most penaeid prawns inhabit shallow inshore tropical and subtropical waters. The generalised life cycle of tiger and endeavour prawns starts with female prawns spawning in offshore waters usually less than 50 m in depth. After approximately two weeks, prawn-like post larvae settle on estuarine inshore seagrass nursery areas (Dall et al. 1990). The juveniles feed and grow in the nursery grounds for three or four months and then migrate back to the open sea. In the tropics many species become sexually mature within six months of spawning. Although spawning in tiger and endeavour prawns occurs throughout the year there is a seasonal pattern with peaks of spawning activity in January to March and August to October (Keating et al. 1990, Robertson et al. 1985, Buckworth 1985). The later spawning peak results in the main recruitment of prawns into the fishery in February to March. Although most penaeid prawns migrate relatively short distances (30–60 km) their movement is significant to the development of management strategies such as area and seasonal closures.

The species distribution of tiger and endeavour prawns extends along the entire Queensland east coast but the high catches occur along the northern section of the Queensland coastline. O'Neill and Leigh (2006) define the tiger and endeavour prawn sector of the ECTF as being largely in waters north of 21° S (Figure 1) with the majority of the catch occurring north of Cape Flattery. The stock of tiger and endeavour prawns harvested by the Torres Strait fishery is considered to be separate from the stock harvested by the Northern Queensland fishery.

The average annual catch (from 1998–2004) of the tiger and endeavour prawn sector of the northern Queensland ECTF (north of 22° S) is approximately 1700 t of tiger prawns, 1200 t of endeavour prawns and 900 t of king prawns (CFISH data, 1998–2004). For the Torres Strait the average annual catch (from 2000–04) is 675 t of tiger prawns, 1018 t of endeavour prawns and 77 t of king prawns (Taylor et al. 2006). The annual value of the northern Queensland and the Torres Strait prawn fisheries is approximately A\$40m (Williams 2002) and A\$22m, respectively (McLoughlin 2002).

During the years 1988 to 2003, fishing effort in the FNQ section of the Queensland tiger prawn fishery ranged from 11 800 to 21 300 days, tiger prawn catch varied between 770 t and 1430 t and endeavour prawn catch varied between 627 t and 1147 t. Since 2000 (which had the lowest catch rate in the whole time series) the annual tiger prawn catch rate has steadily increased (Turnbull et al. 2005). The TSPF tiger prawn catch has ranged from 396 t to 965 t per year and endeavour prawn catch has ranged from 435 t to 1511 t. The fishing effort in Torres Strait has ranged from a low of 5700 days in 1990 to a high of 11 900 days in 1992 (Turnbull et al. 2005).

The ECTF is managed by DPI&F under the provisions of the *Fisheries (East Coast Trawl) Management Plan 1999* and its amendments. The TSPF is jointly managed by Australian Fisheries Management Authority (AFMA) and DPI&F under the Torres Strait Protected Zone Joint Authority, and in accordance with the provisions of the *Torres Strait Fisheries Act 1984*.

The Torres Strait prawn fishery was originally an extension of the northern Queensland fishery for tiger and endeavour prawns; it has been managed as a separate fishery since 1985 under the Torres Strait Treaty between Australia and Papua New Guinea (Watson and Mellors 1990).

Since 1991, the Torres Strait and the FNQ prawn fisheries have been subject to a seasonal closure during the months of December, January and February. The implementation of amendments to the *Fisheries (East Coast Trawl) Management Plan 1999* extended the northern seasonal closure (Queensland east coast) from Cape Tribulation (16°S) to waters south of Mackay (22°S) (Figure 1). The FNQ fishery for tiger and endeavour prawns is located in the relatively narrow corridor formed by the inshore coastal lagoon of the Great Barrier Reef. The Great Barrier Reef Marine Park Authority (GBRMPA) zoning further restricts commercial trawling to the 'General Use' zone (Figure 2). The Torres Strait prawn fishery is also subject to a suite of spatial and seasonal closures aimed at maximising the commercial value of the harvest by restricting the harvest of smaller prawn grades (Figure 1).

The collection of an appropriate mix of fishery independent and fishery data is recommended under the Guidelines for ecologically sustainable management of fisheries—developed by the Australian Government Department of the Environment and Heritage to implement the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The timing of the seasonal closures in the FNQ and Torres Strait tiger prawn fisheries provides an ideal opportunity in late February to conduct fishery independent recruitment surveys for these fisheries before the start of the commercial fishing season (1 March).

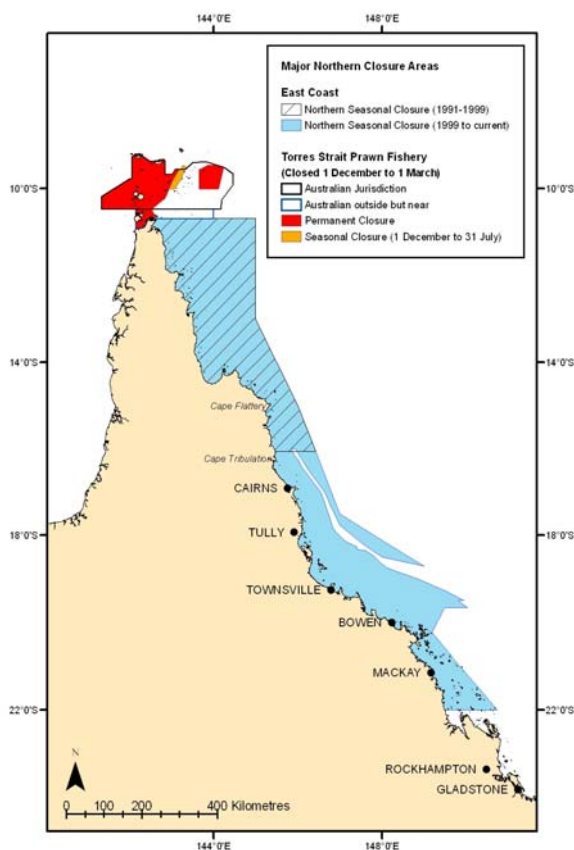


Figure 1. Fishery closure areas for northern Queensland and Torres Strait.

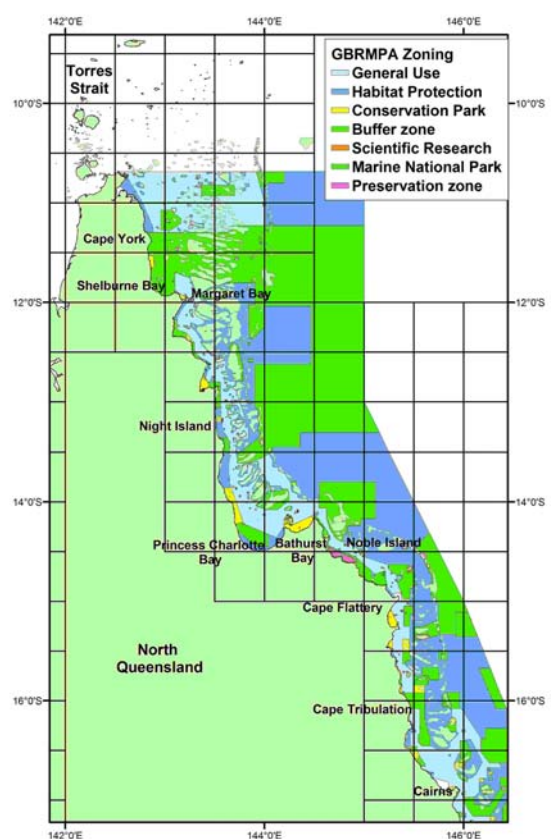


Figure 2. Permanent zoning areas under the Great Barrier Reef Marine Park Authority's Representative Areas Program in the northern section of the East Coast Trawl Fishery.

The initial annual prawn surveys (1998–2000) were a component of the Fisheries Research and Development Corporation (FRDC) project 97/146, conducted by DPI&F. The project developed a fishery independent sampling procedure for tiger and endeavour prawn stocks in northern Queensland and Torres Strait waters. Following the completion of the FRDC project, the DPI&F Long Term Monitoring Program (LTMP) continued the annual prawn surveys using the same survey procedures and sites. In 2002, a prawn survey was also conducted on the commercially important fishing grounds between Townsville and Cairns using funding from the Cooperative Research Centre for the Great Barrier Reef World Heritage Area project Coastal Fisheries Resource Monitoring in the Great Barrier Reef World Heritage Area (Hyland 2003). The information collected in the program is used in fishery stock assessments to assist in the evaluation of the effectiveness of fisheries management arrangements. The surveys provide, when statistically analysed, standardised indices of prawn abundance by species at the start of the commercial fishing season.

A summary of bycatch information collected during the annual prawn surveys (between 1998 and 2002) is available in the 2004 Summary of tiger and endeavour prawn survey results (Turnbull *et al.* 2004).

Objectives

The key objectives of the LTMP annual prawn surveys are

- record species, length, distribution and relative abundance of tiger, endeavour and king prawns in northern Queensland and Torres Strait waters
- document bycatch in the fishery area.

The surveys provide catch rates (abundance and weight per sample) of the commercial prawn species at the start of each fishing season. These catch rates, when standardised, serve as indices of annual recruitment to the fishery and provide a comparison with the commercial catch rates of the main catch species groups (tiger and endeavour prawns). In addition, information is obtained on length distribution and sex ratios of commercial prawns and bycatch composition. The survey data are being used to improve the current tiger prawn stock assessment models which are largely based on commercial catch and effort data.

The objective of this report is to provide a summary of the annual survey results from 1998 to 2006 for length and relative abundance of commercial target prawn species for FNQ and Torres Strait.

Methods

The LTMP annual prawn surveys were conducted just prior to the opening of the northern Queensland and Torres Strait commercial prawn trawl seasons to provide fishery independent information on length and abundance of prawns (by species and gender) available to the fleet at the start of each fishing season (recruits to the fishery). The design of the annual prawn surveys aims to calculate the catch rates between surveys (years) by using, where possible: the same fixed sites, vessel, trawl nets, time of the season and moon phase for each survey. This strategy is to ensure that variations in survey catch rates between years reflect annual variations in the recruitment to the fishery.

Detailed protocols for the collection of this information are documented in the Fisheries LTMP sampling protocols (DPI&F 2006).

Sites

About 70 fixed trawl survey sites (Figure 3) were established in waters between Cape Flattery (15°S) and Papua New Guinea (PNG) in Torres Strait (9.5°S). The stratification and location of sites in Torres Strait and FNQ were selected to obtain the highest survey catch rates and reduce sample variance. This was achieved by locating sites over a range of depths in areas that were known to be frequently fished by the commercial fishing fleet. The strategy of trawling as near as possible over the same piece of seabed during successive surveys removes the variability in catch rates that is associated with the position of the sites. Trawl catch rates are highly variable and shifting a site even just a few nautical miles could change the average catch rate for that site due to slight changes in the seabed (Turnbull *et al.* 2005).

Most of the FNQ sites were located in areas subject to high or moderate fishing pressure and are representative of commercial tiger and endeavour prawn fishing areas. Sites within the Torres Strait were chosen to represent both the areas open to commercial fishing and the closure areas around Warrior Reef that harbour juvenile prawns.

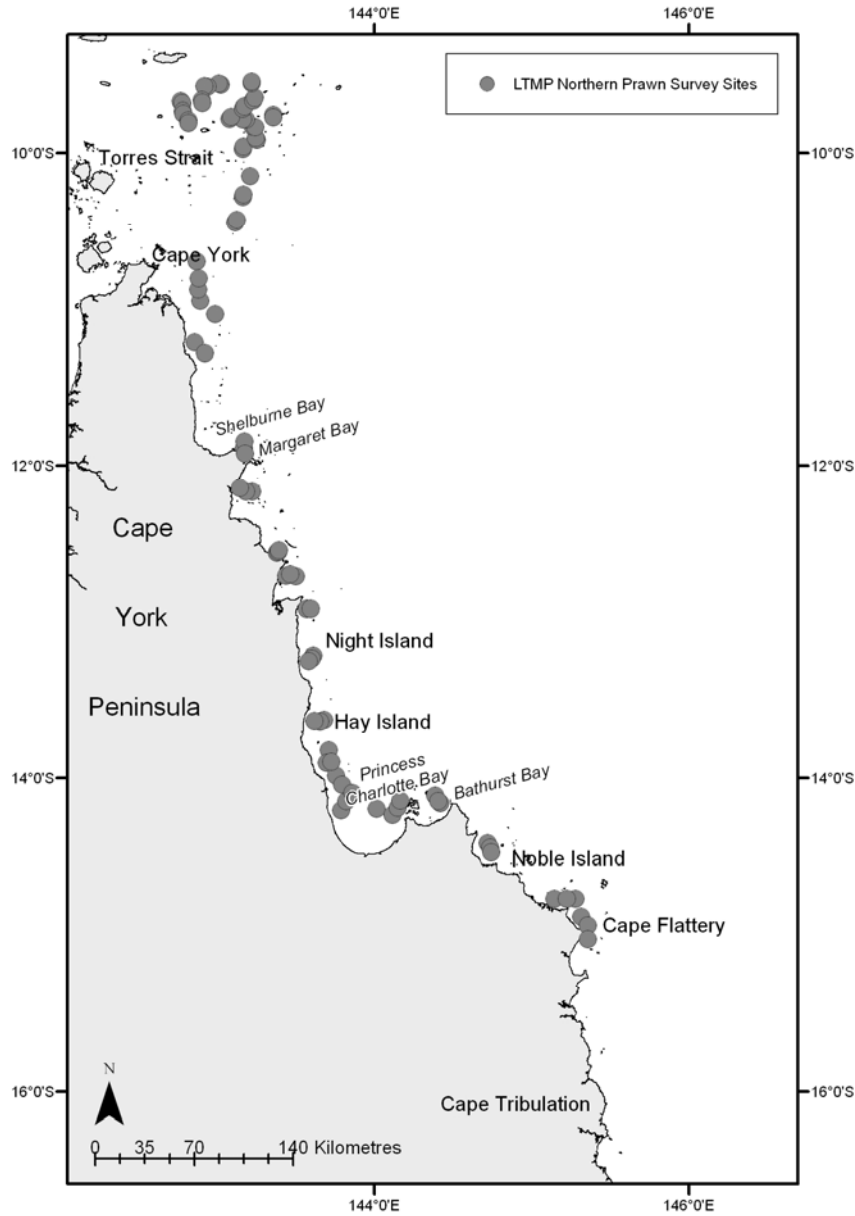


Figure 3. Survey sites sampled between Cape Flattery to Torres Strait during LTMP annual prawn surveys within the Far North Queensland section of Queensland's East Coast Trawl Fishery and the Torres Strait Prawn Fishery between 1998 and 2006.

Times

The LTMP annual prawn surveys are conducted between the period of the new moon and (as close to) the start of the commercial fishing season (1 March) as possible. Analysis of commercial catch rate data for tiger and endeavour prawns indicates a small interaction between catch rates and moon phase (O'Neill and Turnbull 2006, O'Neill and Leigh 2006). Therefore, the surveys were planned where possible to coincide with the February new moon. Sampling prior to early February was also avoided as many of the prawn recruits to the fishery may still be in shallow inshore areas that are inaccessible to the research vessel.

Timing of surveys conducted between 1998 and 2006, including those surveys that were a part of the FRDC project 97/146 (1998 to 2000), are provided in Table 1. There were some delays experienced in 1999 and 2000 due to cyclones along the north Queensland coast. The 2003 surveys were cancelled due to a vessel breakdown just prior to the commencement of the surveys.

Table 1. Timing of LTMP annual prawn surveys completed between 1998 and 2006.

Year	Start date	End date	Date of new moon
1998	17 Feb	02 Mar	26 Feb
1999	15 Feb	01 Mar	15 Feb
2000	23 Feb	07 Mar	05 Mar
2001	20 Feb	05 Mar	22 Feb
2002	05 Mar	20 Mar	12 Mar
2003	<i>No surveys conducted</i>		
2004	16 Feb	27 Feb	20 Feb
2005	08 Feb	23 Feb	08 Feb
2006	18 Feb	05 Mar	28 Feb

Sampling gear

The annual surveys were conducted using DPI&F's 18 m research trawler 'Gwendoline May'. A quad gear configuration consisting of four four-fathom nets was used to trawl one nautical mile at each survey site. A standardised trawl speed of approximately 3.2 knots was used at an engine speed of 1500 rpm. This speed is similar to commercial prawn operators and takes in account tidal and current movements.

Modifications to the trawl gear since 1998 have been necessary due to changes in the fisheries regulations, i.e. compulsory use of turtle exclusion devices and bycatch reduction devices (TEDs and BRDs), and to improve the reliability of the trawl gear. Observations were conducted on comparisons between trial gears to estimate the potential impact of the modifications on the fishing efficiency of the nets. These observations showed no difference in the catch between gears. Further detail of the trawl gear used during the surveys is documented in the Fisheries LTMP sampling protocols (DPI&F 2006).

Sample processing

Where possible the samples were processed on board while travelling between survey sites; samples not processed on board were taken back to the DPI&F laboratory for later processing). The species, gender and carapace length (mm) of all commercial prawn species in each net (sample) were recorded.

Data summaries and analysis

Stratification of the data

For the purpose of this report, the survey results have been divided into the two fishery sectors—Torres Strait and FNQ. Results from the 2002 Townsville to Cairns survey are not presented in this report, and are summarised in Turnbull *et al.* (2004).

Catch rates

Catch rates have been calculated as the average number and weight of prawns per site. A quad gear net configuration is used and the content of each net is defined as a sample, therefore there are generally four samples from each trawl. Occasionally the contents of a net are discarded or classified as a non-quantitative sample due to problems with the operation of the net. For example, a net becomes bogged in a patch of soft sediment resulting in the net filling with mud; or a large sponge becomes jammed in the turtle exclusion device escape opening resulting in a loss of prawns from the net. To account for the missed samples the catch rate per site is standardised by making an adjustment to the data for the sites where samples have been lost or classified as non-quantitative. The error bars displayed on the plots show the 95 percent confidence intervals (95% C.I.) for the species average catch rate over all sites for each year.

Length frequency data

The length frequency plots are presented as a catch rate, as average numbers of prawns per sample (net), within each length class to show both the distribution of sizes and any differences in relative catch rates between sexes and between years. The number of prawns in each 1 mm carapace length (CL) class for each species, gender, region and year were calculated by dividing by the number of trawl samples for each region and year combination (Table 2). As the catches of grooved tiger, red endeavour and western king prawns in Torres Strait are very small there is insufficient data to generate length frequency plots. As male and female prawns of most species have different growth rates they are presented as separate length frequency plots for each sex. The total number of prawns for each species, gender and year combination that were measured were used to generate the number of prawns on the length frequency plots.

Table 2. Number of net samples by year and region

Year	Far North Queensland	Torres Strait
1998	181	71
1999	203	60
2000	200	71
2001	201	70
2002	198	68
2004	200	66
2005	203	72
2006	198	78

Results

Catch rates

Tiger prawn

The tiger prawn survey catch rates both as numbers per site and weight per site, for FNQ indicate that 1998, 1999 and 2005 were years of higher recruitment levels while 2000 was a year of low recruitment and the remaining years were average (Figure 4). In contrast the years of higher survey catch rates in Torres Strait were 1998 and 2005 and 2006. The Torres Strait survey catch rate for tiger prawn steadily increased from a low in 2000 to a high in 2005 (Figure 4). Although lower than for 2005 the 2006 survey catch rates for tiger prawns were still above average for Torres Strait.

The stacked bars in Figure 4 indicate that the FNQ tiger prawn catch at the start of the season, is comprised of approximately two thirds brown tiger prawn and one third grooved tiger prawn with the highest catch rate for the later species occurring in 1999. In contrast the Torres Strait tiger prawn catch consists almost entirely of brown tiger prawn.

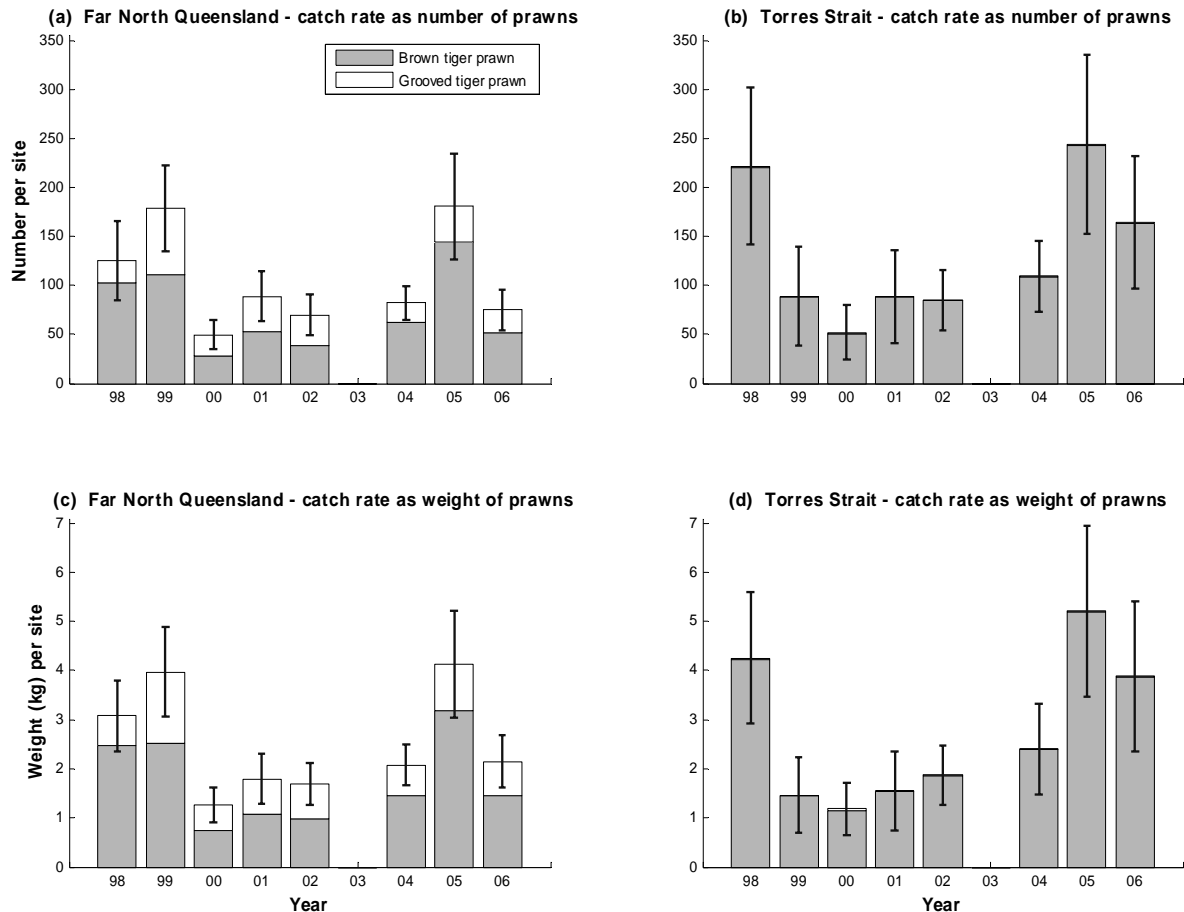


Figure 4. Annual average survey catch rates (as number and weight of prawns per site) of grooved and brown tiger prawns in Far North Queensland and Torres Strait. The error bars indicate the 95% C.I. of the tiger prawn catch rate.

Endeavour prawn

In the FNQ fishery the years of higher survey catch rates were 1999, 2002, 2005 and 2006 while 2000 was a year of low survey catch rates. In contrast 1998 and 2005 were the years of highest endeavour prawn survey catch rates and 2004 was the year with the lowest catch rate.

The endeavour prawn survey catch rates (Figure 5) indicate that the blue endeavour prawn is more abundant in Torres Strait than in the FNQ fishery at the start of the season. In addition there is a small percentage of the red endeavour prawn present in the FNQ catch whereas the Torres Strait catch consists almost entirely of the blue endeavour prawn.

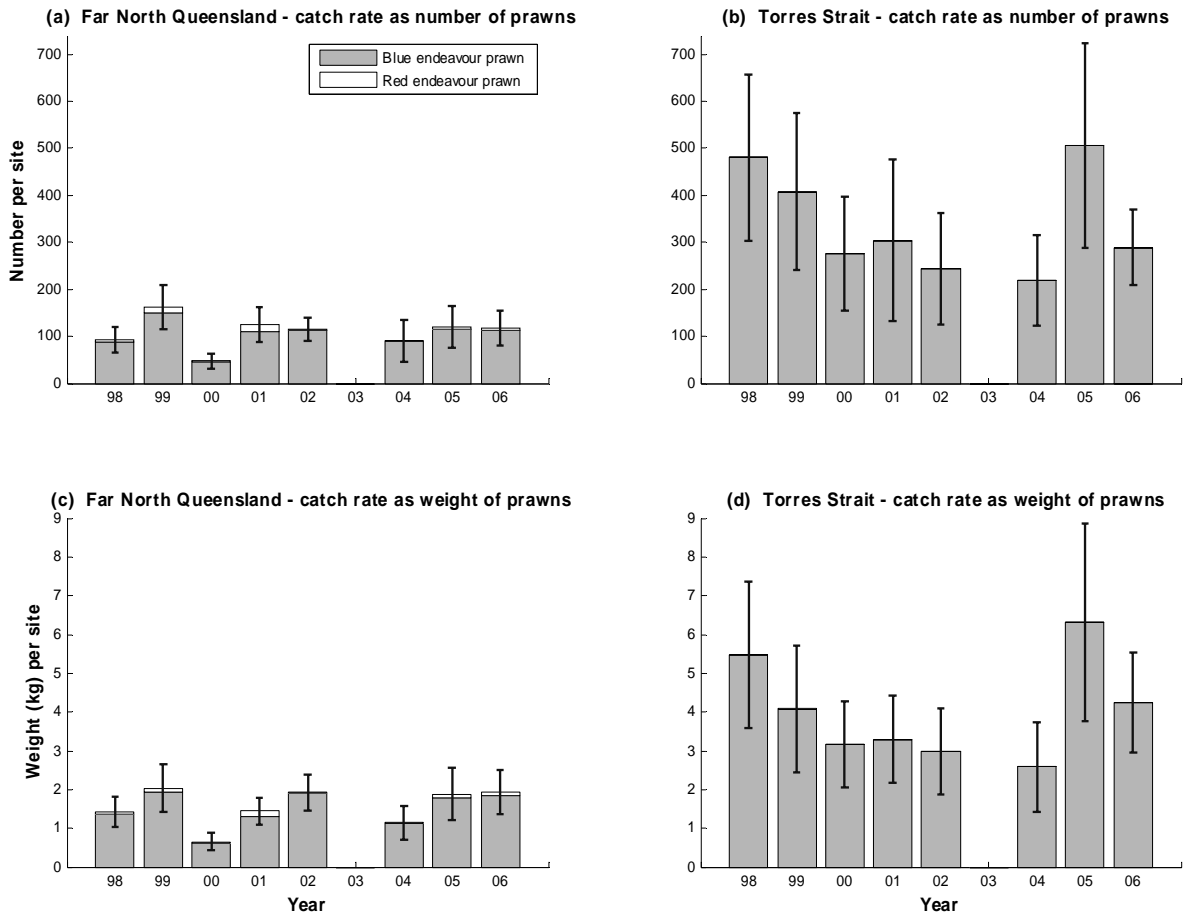


Figure 5. Annual average survey catch rates (as number and weight of prawns per site) of blue and red endeavour prawns in Far North Queensland and Torres Strait. The error bars indicate the 95% C.I. of the endeavour prawn catch rate.

King prawn

The survey catch rates for FNQ indicate that the commercial king prawn harvest at the start of the season was composed of roughly equal numbers of redspot king and western king prawns and that the highest catch rate occurred in 1999 and the lowest in 2000 (Figure 6). The proportion of western king prawn by weight is larger than for redspot king because the latter species are generally of a smaller size and weight at the start of the season (Figure 11 and Figure 12). The low FNQ king prawn catch rates in 2000 and 2004 were due to lower catches rates for both king prawn species.

The Torres Strait commercial king prawn catch consisted mainly of the redspot king prawn. There were large variations in the Torres Strait king prawn catch rates between years with the highest catch rate occurring in 1998 and the lowest 2001. The 2006 catch rate was about average.

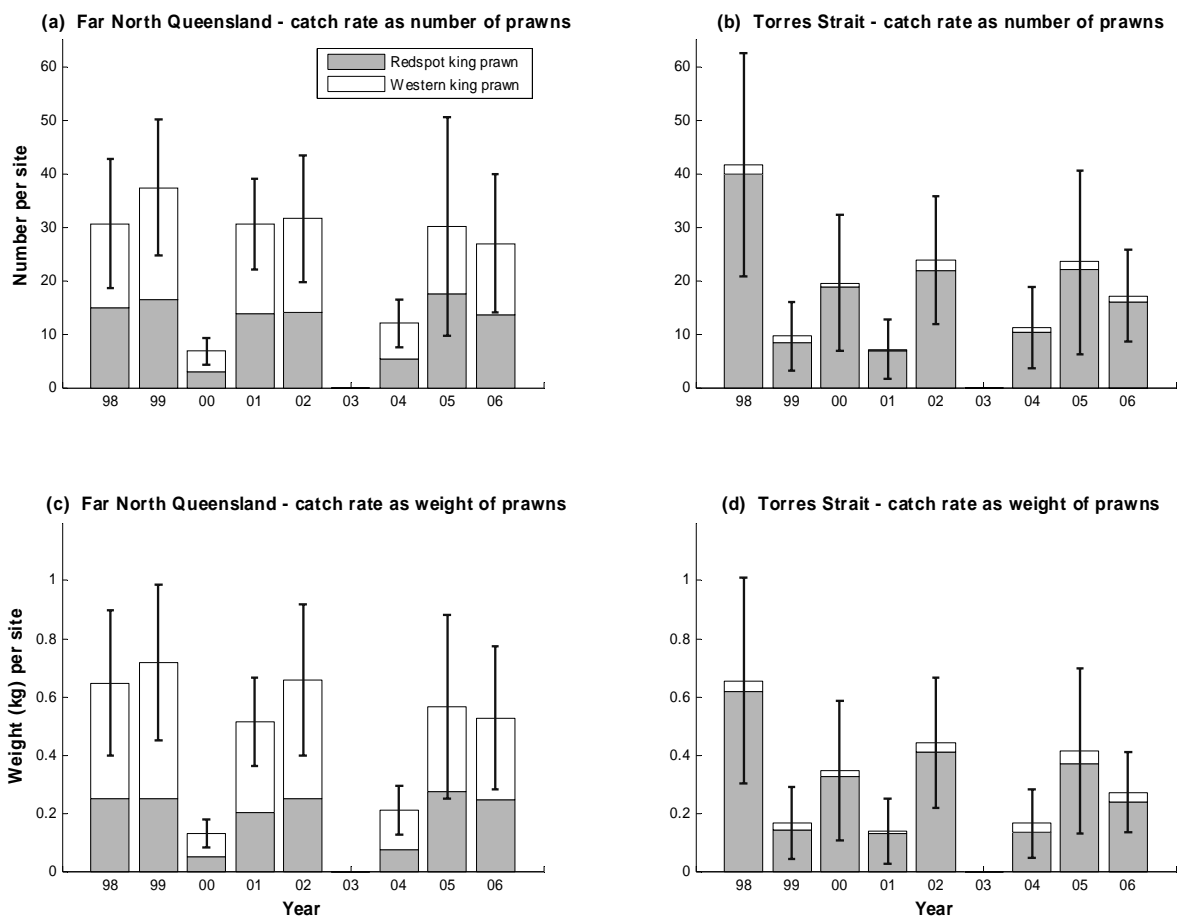


Figure 6. Annual average survey catch rates (as number and weight of prawns per site) of redspot and western king prawns in Far North Queensland and Torres Strait. The error bars indicate the 95% C.I. of the king prawn catch rate.

Length frequency

Far North Queensland

Brown tiger prawn

The brown tiger survey catches consist of a wide range of sizes but most of the catch is comprised of large juvenile prawns (25–28 mm CL) and small adult prawns (29–36 mm CL) (Figure 7). The size distributions are similar although the catch rates vary between surveys.

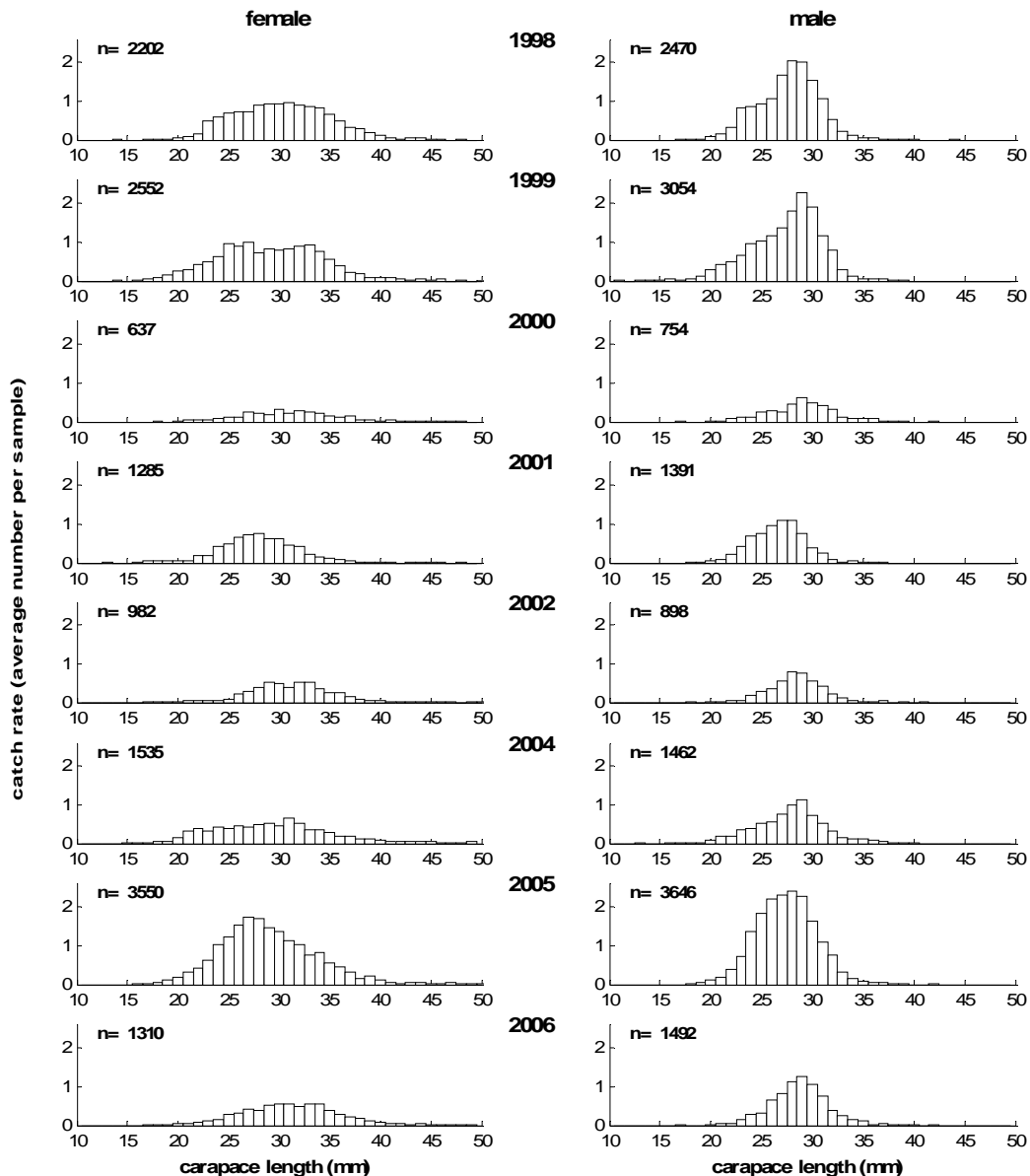


Figure 7. Survey length frequency distributions for the brown tiger prawn in Far North Queensland (n = number of prawns).

Grooved tiger prawn

The majority of the grooved tiger prawns in the survey catches are juveniles (<28 mm CL) and small adults (29–37 mm CL) however there are significant numbers of large female grooved tiger prawns (>37 mm CL) in the catches for 1998, 2004, 2005 and 2006 (Figure 8).

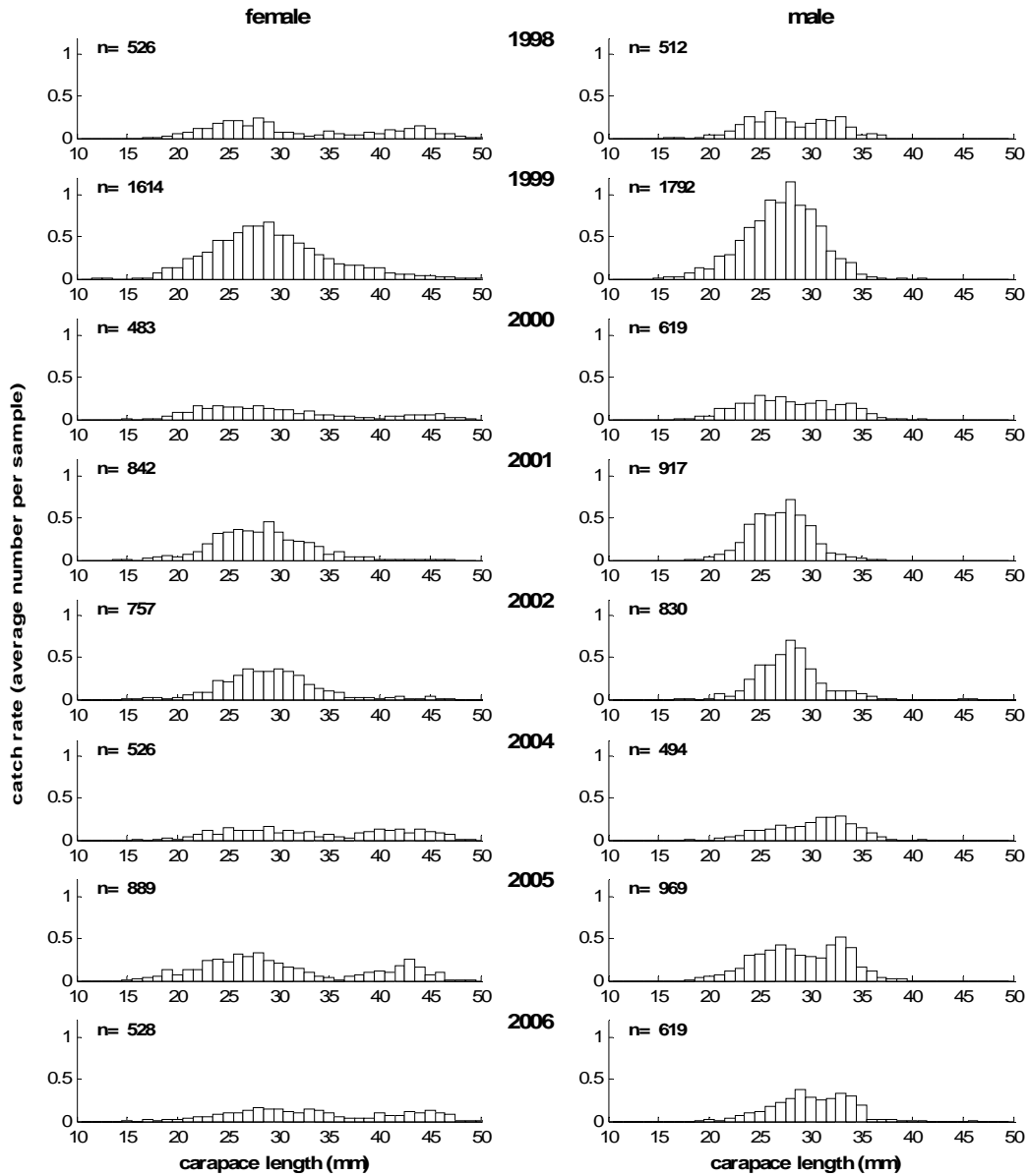


Figure 8. Survey length frequency distributions for the grooved tiger prawn in Far North Queensland (n = number of prawns).

Blue endeavour prawn

Most of the blue endeavour prawns, especially the males, are juvenile and small in terms of commercial size grading. A blue endeavour prawn less than 30 mm CL equates to a commercial weight grading of greater than 21 count per pound. A significant proportion of the catch is less than 26 mm CL which equates to a commercial grading of 30+ count per pound. This size grade is too small for export.

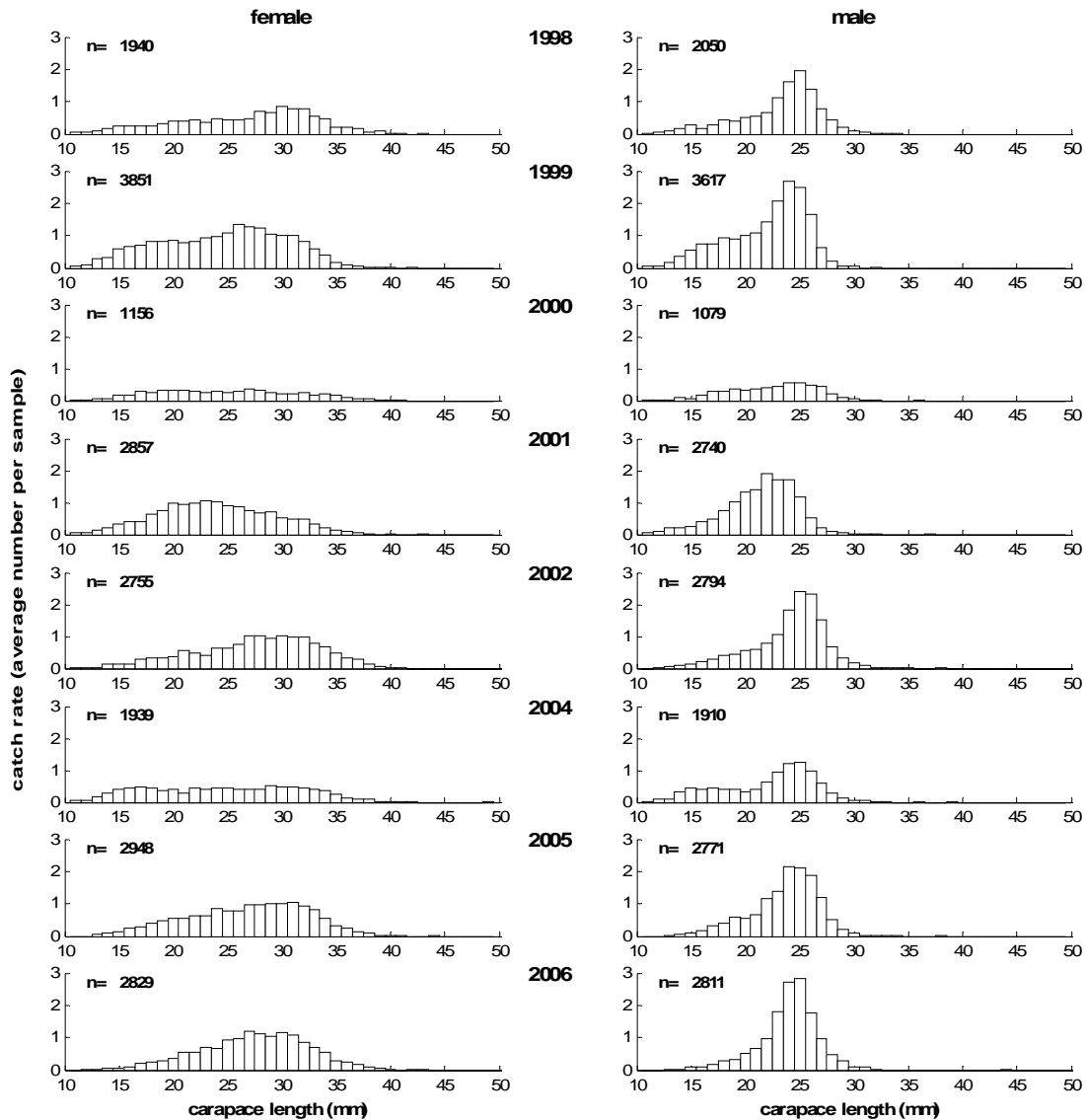


Figure 9. Survey length frequency distributions for the blue endeavour prawn in Far North Queensland (n = number of prawns).

Red endeavour prawn

The lower abundances of red endeavour prawns make it difficult to compare length distribution between years. The highest abundances occur in 1999 and 2001 and are mainly small prawns (<28 mm CL), particularly the males. The majority of the larger prawns (>28 mm CL) are females and there is a higher proportion of these in the 2005 and 2006 survey catches.

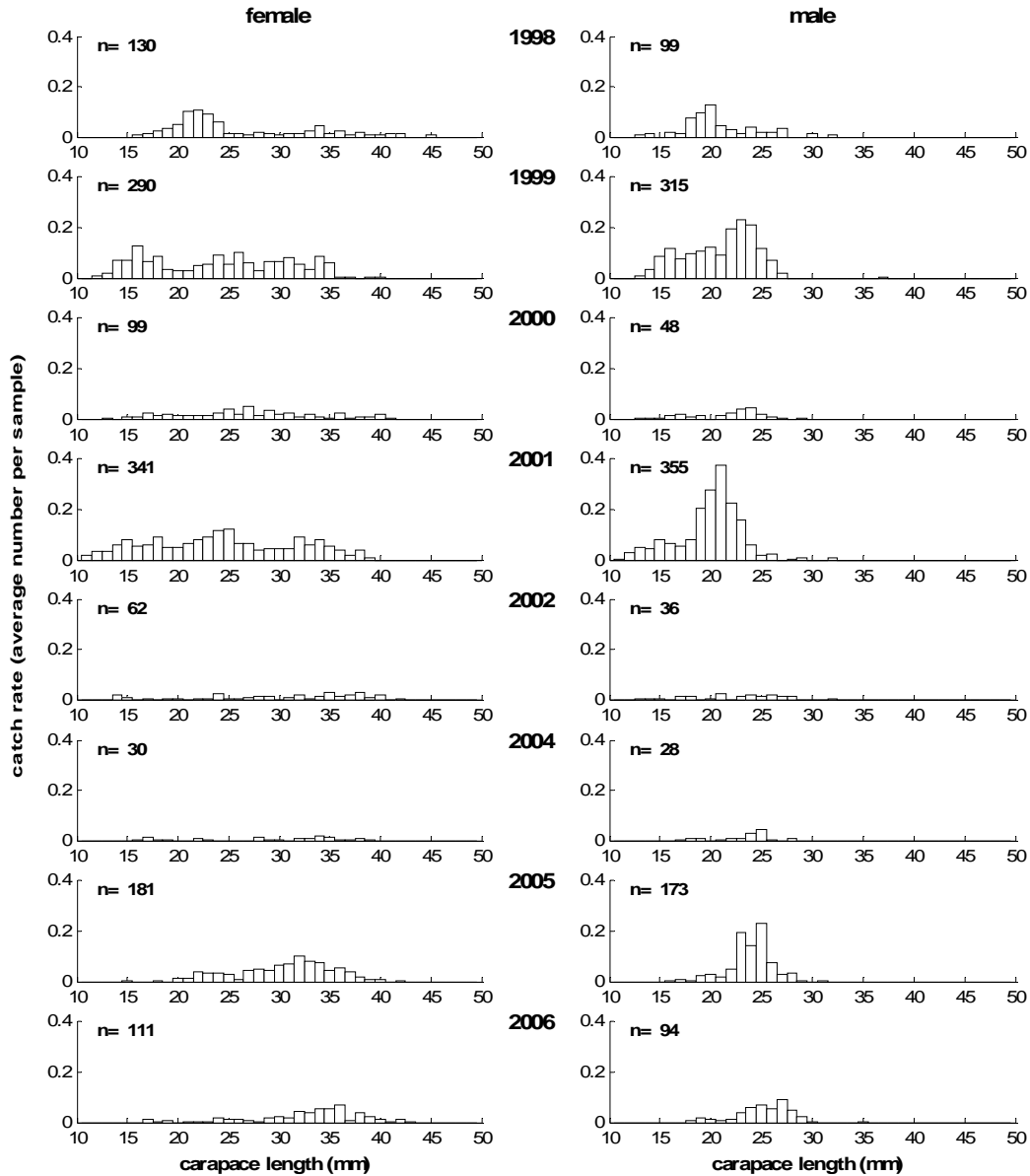


Figure 10. Survey length frequency distributions for the red endeavour prawn in Far North Queensland (n = number of prawns).

Redspot king prawn

The length distributions for redspot king prawns show that the survey catches consist of a wide range of sizes from small juveniles to a few large adults.

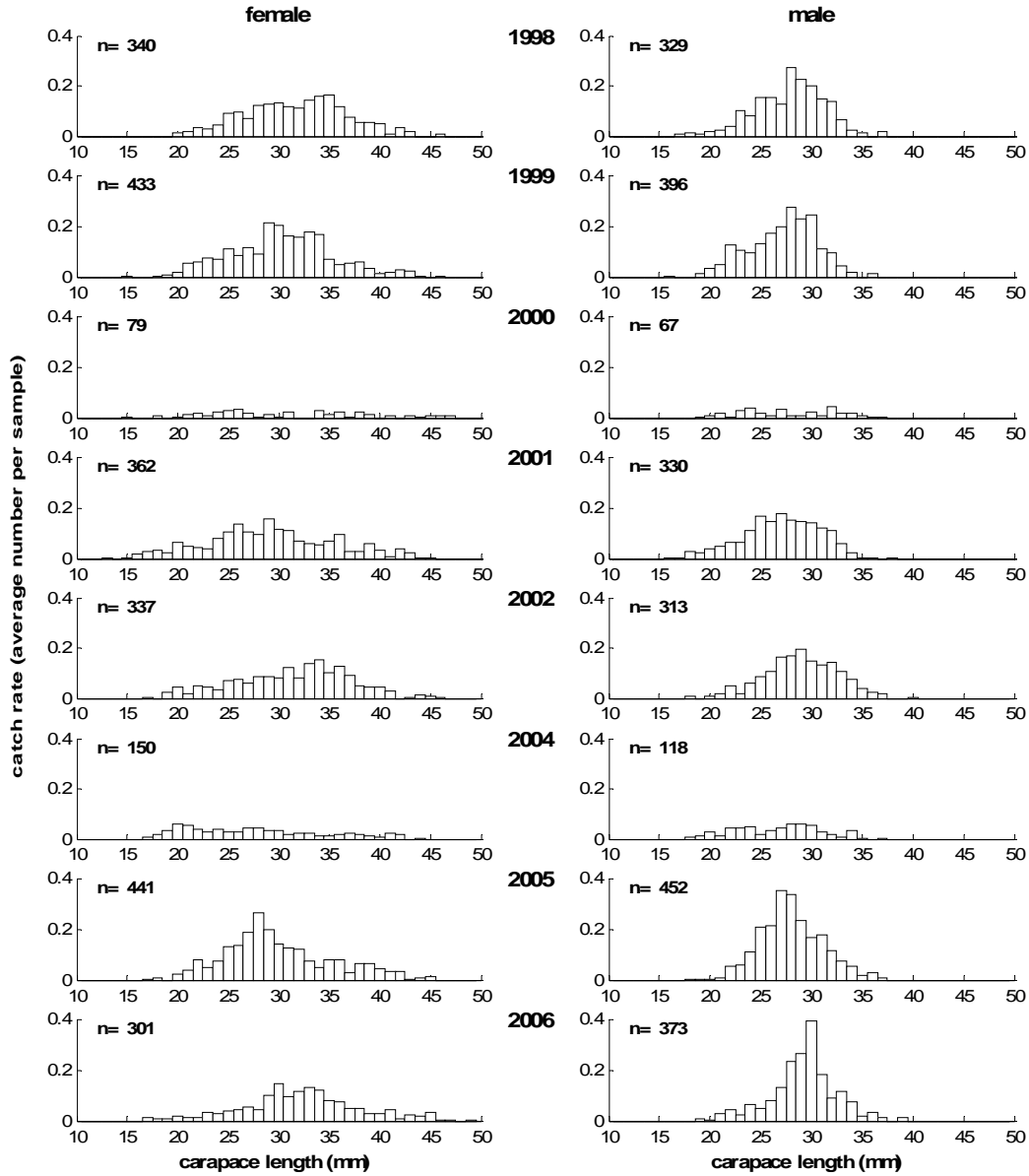


Figure 11. Survey length frequency distributions for the redspot king prawn in Far North Queensland (n = number of prawns).

Western king prawn

The length distributions for western king prawns show that the survey catches consist of a wide range of sizes from small juveniles to a few large adults. The majority within this range are adult prawns in the size range 29–42 mm CL which equates to the commercial size grading of 21/30 and 10/20 count per pound, making them suitable for export.

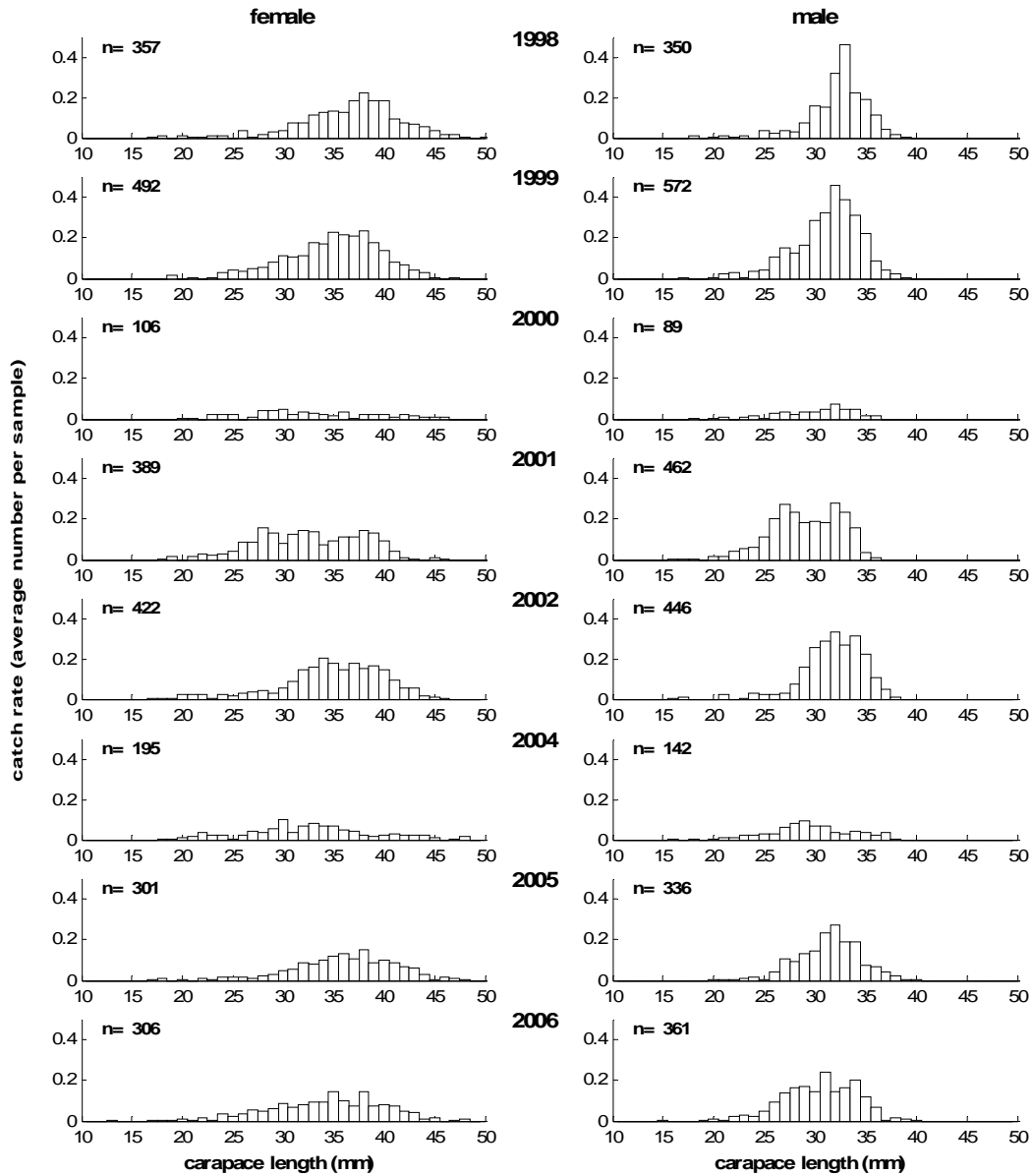


Figure 12. Survey length frequency distributions for the western king prawn in Far North Queensland (n = number of prawns).

Torres Strait

As the Torres Strait catches consist almost exclusively of the brown tiger prawn, the blue endeavour prawn and redspot king prawn, the length frequency data for only these three species are presented.

Brown tiger prawn

The brown tiger prawn survey catches consist of a wide range of sizes. Most of this is comprised of juvenile prawns (<28 mm CL) and small adult prawns (29–36 mm CL). The size distributions are similar although the catch rates vary between surveys.

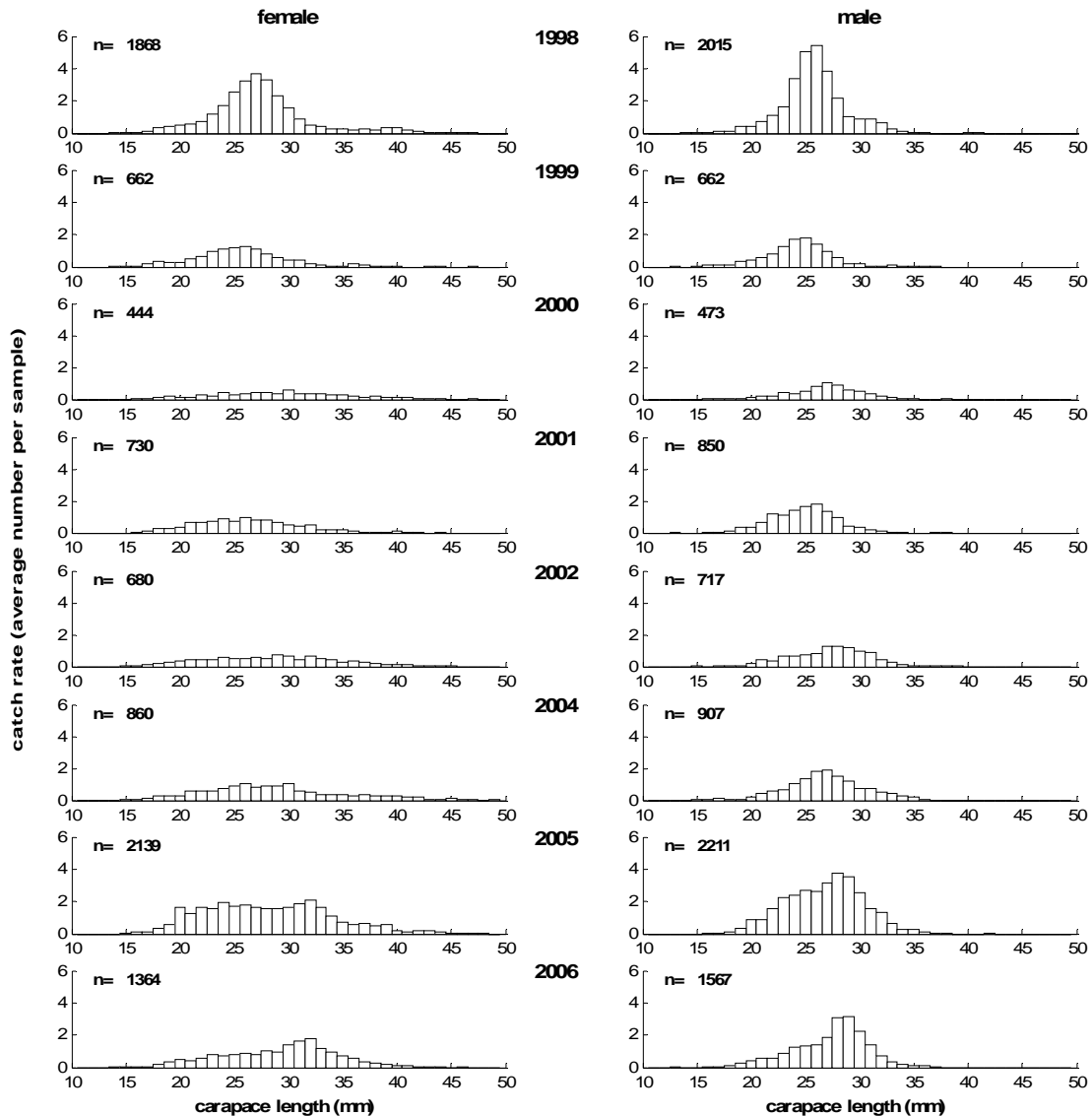


Figure 13. Survey length frequency distributions of the brown tiger prawn in Torres Strait (n = number of prawns).

Blue endeavour prawn

The majority of the blue endeavour prawns, particularly the males, are juvenile and small in terms of commercial size grading. A blue endeavour prawn less than 30 mm CL equates to a commercial weight grading of greater than 21 count per pound. A significant proportion of the catch is less than 26 mm CL which equates to a commercial grading of 30+ count per pound. This size grade is too small for export.

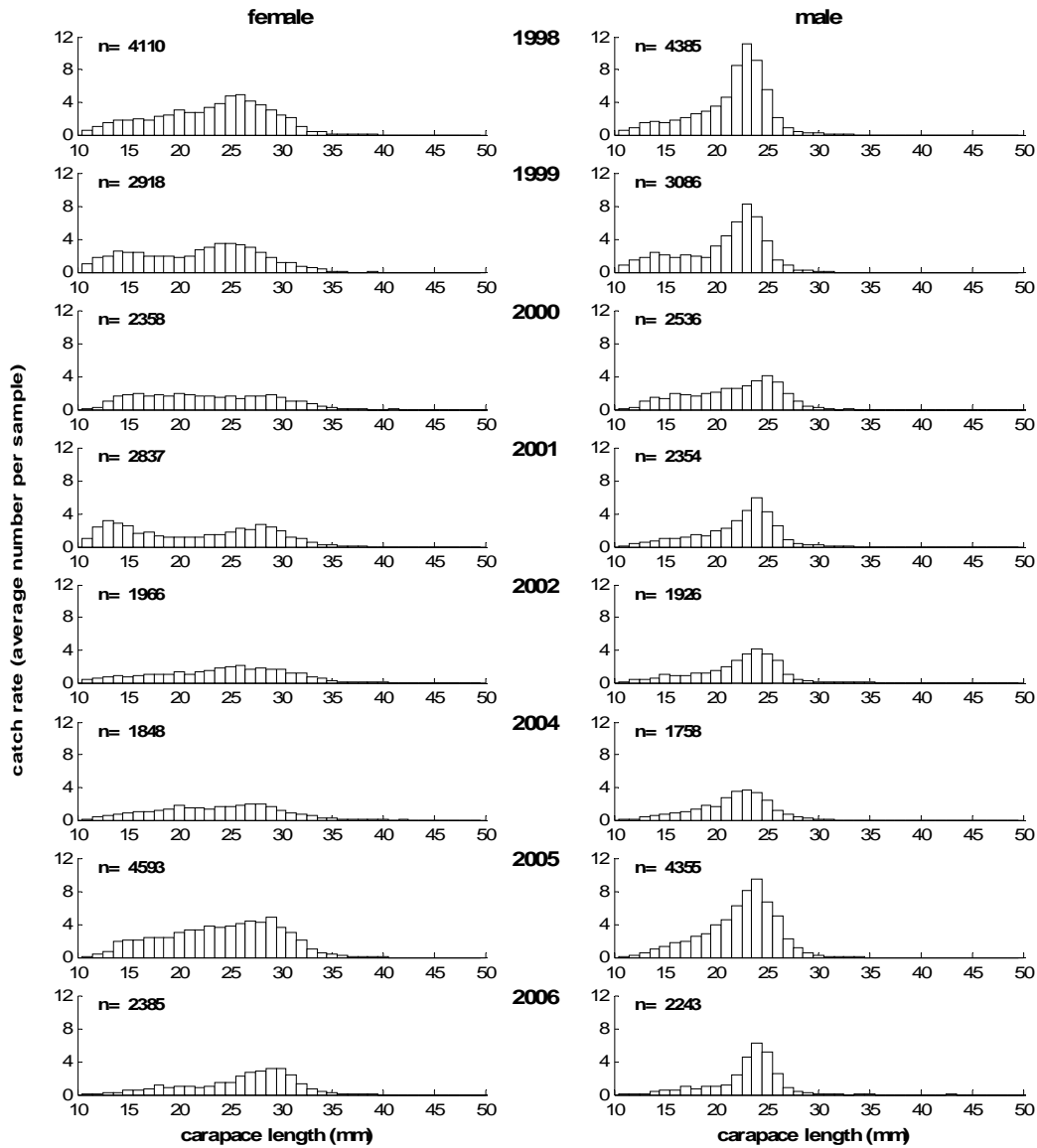


Figure 14. Survey length frequency distributions of the blue endeavour prawn in Torres Strait (n = number of prawns).

Redspot king prawn

The length distribution for redspot king prawns show that the survey catches consist of a wide range of sizes from small juveniles to large adults.

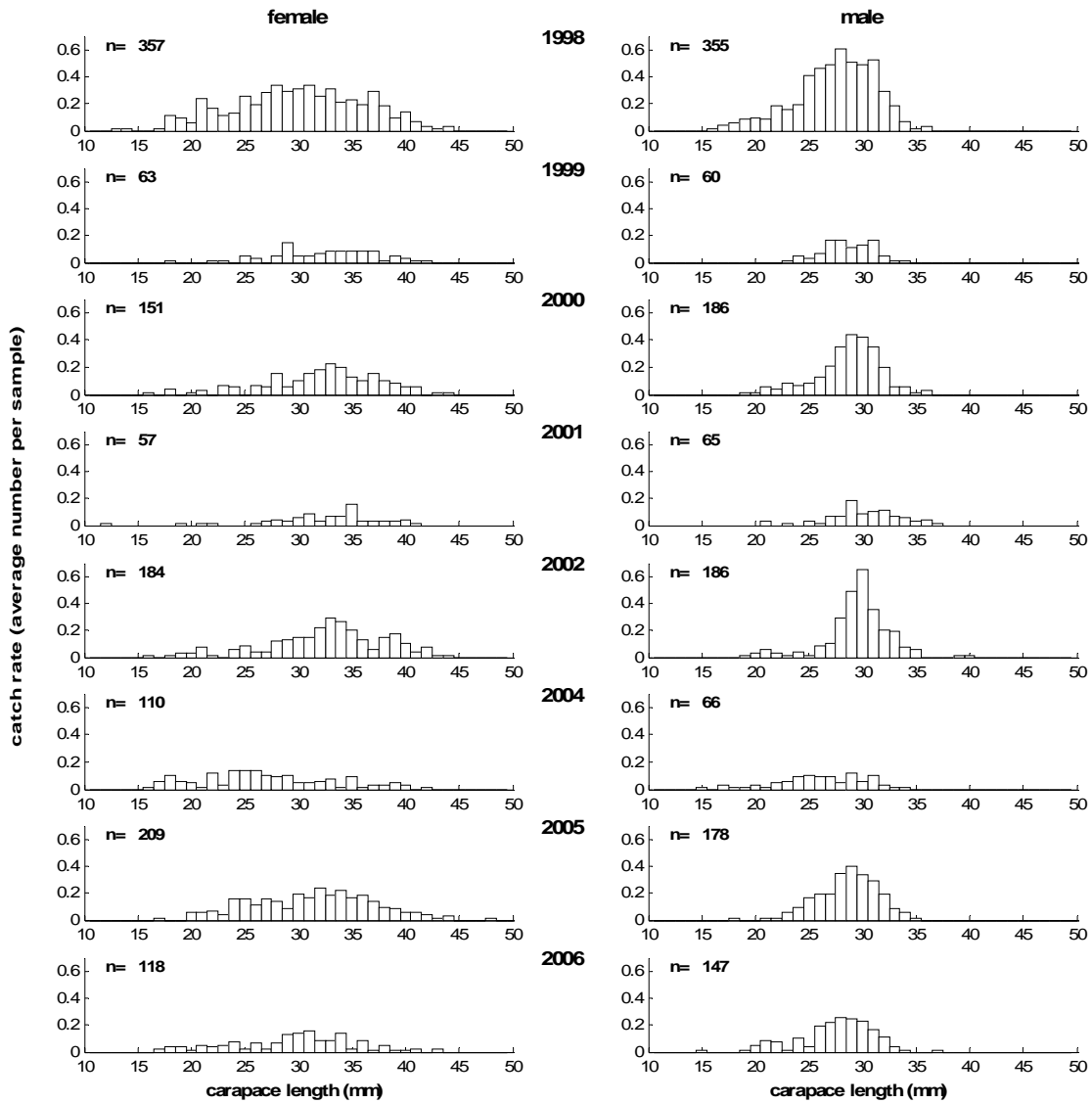


Figure 15. Survey length frequency distributions of the redspot king prawn in Torres Strait (n = number of prawns).

Discussion

General discussion

The survey catch rates provide a fishery independent abundance index for each species at the start of each fishing season. The length frequency data indicate that most of the prawns captured were of a length that indicates they were spawned in the previous August to November and are effectively new recruits to the fishery. Therefore the survey catch rates provide a fishery independent recruitment index for the fishery during the early months of each fishing season. The commercial catch data indicate that for tiger and endeavour prawns the highest levels of recruitment generally occur at the start of the season (March/April) (Turnbull *et al.* 2005). Trends in the survey catch rates collected during the surveys are comparable to trends in the commercial harvest data (Turnbull *et al.* 2005).

Catch rates

Changes in the fishing power of the commercial fleet have traditionally been estimated from the commercial catch and effort data (O'Neill *et al.* 2003, O'Neill and Turnbull 2006, O'Neill and Leigh 2006). The survey data from these LTMP annual prawn surveys provide a fishery independent source of information on trends in abundance which is independent of the fishing power changes in the fleet. The survey catch rates for Torres Strait tiger prawns (O'Neill and Turnbull 2006) and FNQ tiger and endeavour prawns (O'Neill and Leigh 2006) were analysed in a generalised linear model to provide a fishery independent recruitment index that was compared with the fishery-based data. Overall the survey catch rates tended to mirror the fishery standardised catch rates. This provided confidence in the trends produced from the fishery-based data (O'Neill and Turnbull 2006, O'Neill and Leigh 2006).

The survey results for FNQ indicate that, 1999 and 2005 were years of higher than average tiger prawn recruitment while 2000 was a year of lower than average recruitment. Similarly for Torres Strait, 2000 was a year of low recruitment whereas 1998, 2005 and 2006 were years of above average recruitment.

Length frequency

The length frequency distribution for each species and gender, based on pooled data for all surveys, is presented in Turnbull *et al.* (2004). The length frequency for each fishery, year, major species and gender are presented in this report as they provide additional information on recruitment.

The length frequency distribution plots presented in this report are indicative of the age structure of the stocks of each species at the start of each season. As the length frequency plots provided are standardised to average numbers per net sample they show both the average length distribution of the samples for each year and the change in relative abundance (or catch rates) between years.

The length frequency distribution plots for the brown and grooved tiger prawn in FNQ and Torres Strait show that a wide range of sizes of prawns were present at the survey sites. The majority of the prawns were of a size that indicates an age of four to seven months (Turnbull *et al.* 2005) and would have been spawned in the previous winter/spring period (August to November). These prawns are protected from fishing by the seasonal closures that are part of the Queensland ECTF and TSPF management arrangements. The generally larger size of western king prawns captured in the FNQ surveys suggests that this species recruits into the fishery earlier than the brown tiger and blue endeavour prawns.

Conclusions

The results presented in this report, combined with previous LTMP reports (Turnbull *et al.* 2004) and a detailed analysis of both the 1998 to 2002 surveys and commercial catch data (Turnbull *et al.* 2005), indicate that the LTMP annual prawn surveys are a cost effective tool in providing the data needed to monitor prawn stocks. This is particularly the case for multi-species fisheries such as the northern Queensland east coast tiger prawn fishery. The survey catch rates and the information on length structure of the stocks at the start of each fishing season provide a fishery independent assessment of the status of the commercial prawn stocks at a species level. It is recommended that the LTMP prawn surveys continue as they provide an important time-series of fishery independent data that complements the analysis of the commercial fishery catch and effort data.

The pre-season catch rates (or recruitment indices) provided by the surveys can be compared with trends in the commercial harvest data (O'Neill and Turnbull 2006, O'Neill and Leigh 2006), especially for tiger prawns which are considered more susceptible to overfishing. The survey data complements the commercial harvest data and will assist with the further development of species-based assessment and monitoring of the northern Queensland tiger prawn stocks.

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