

## 2. COMMERCIAL PRAWN CATCHES IN TORRES STRAIT

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### 2.1 Introduction

Records of prawn catches in Torres Strait were poorly recorded during the developmental years of the prawning industry. Information collected by officers of the Northern Fisheries Unit in Cairns shows that in 1973-74 about ten prawn trawlers regularly fished Torres Strait, producing an annual catch of between 100 and 120 t. Catches consisted of mainly *Penaeus esculentus*, brown tiger prawns, and also *Metapenaeus endeavouri*, endeavour prawns. Prices at this time averaged \$1.20 kg<sup>-1</sup> for tiger prawns and \$1.00 kg<sup>-1</sup> for endeavour prawns. These vessels fished mainly from June to December in Torres Strait, after the end of the *P. merguensis*, banana prawn, season in the Gulf of Carpentaria.

Following ratification of the Torres Strait Treaty between Australia and Papua New Guinea in 1985 a management area, the Torres Strait Protected Zone (TSPZ), was defined under the jurisdiction of the Protected Zone Joint Authority (Section 1 - Figure 1). Although legally distinct from the two adjacent prawn fisheries, the Northern Prawn Fishery (NPF) and the Queensland East Coast Prawn Fishery, management of the Torres Strait Prawn Fishery has been run as part of the East Coast Prawn Fishery.

With the introduction of joint management of Torres Strait fisheries with Papua New Guinea it became important to examine existing catch data for historical trends. The introduction of prawn catch quotas required by the Torres Strait Treaty relied on past catch records. This section collates historical catch data and examines trends in catch and effort.

### 2.2 Materials and Methods

Records of commercial catch unloadings, from export inspection records obtained from the Australian Quarantine Inspection Service, were used to provide details of the catch of each species (kg) and the numbers of vessels fishing. Other records were obtained from TSPZ compulsory monthly catch reports (total weight of catch), and the NPF compulsory logbook (catch of each species (kg) and effort (hr)) provided by the Australian Fisheries Service. Statistical results reported are the outcomes of one-way analysis of variance tests.

### 2.3 Results and Discussion

#### 2.3.1 Data sources

Statistics on the Torres Strait Prawn Fishery are available since 1978 from three main sources.

**Unloading data.** These are vessel unloading records, compulsory catch reports and logbook returns (Table 1). Each time a prawn trawler unloads product, whether at sea or at a shore-based facility, details of the quantity of product unloaded are recorded. In Torres Strait these records provide a continuous measure of the total catch of the fishery, by each month and by each species as well as a crude measure of effort (Table 1(a), Figure 1).

**NPF logbook data.** Many of the prawn trawlers that fish in Torres Strait also have an endorsement to fish in the NPF. The degree of participation of NPF endorsed vessels in the Torres Strait Prawn Fishery can be determined by the proportion of the total catch from unloadings data which is reported in NPF logbooks (Table 1(b)). From 1982 to 1985 inclusive, trawlers with NPF endorsements landed an average of 53% of the total Torres Strait prawn catch. This proportion has been decreasing since 1984, and by 1987 was only 32%.

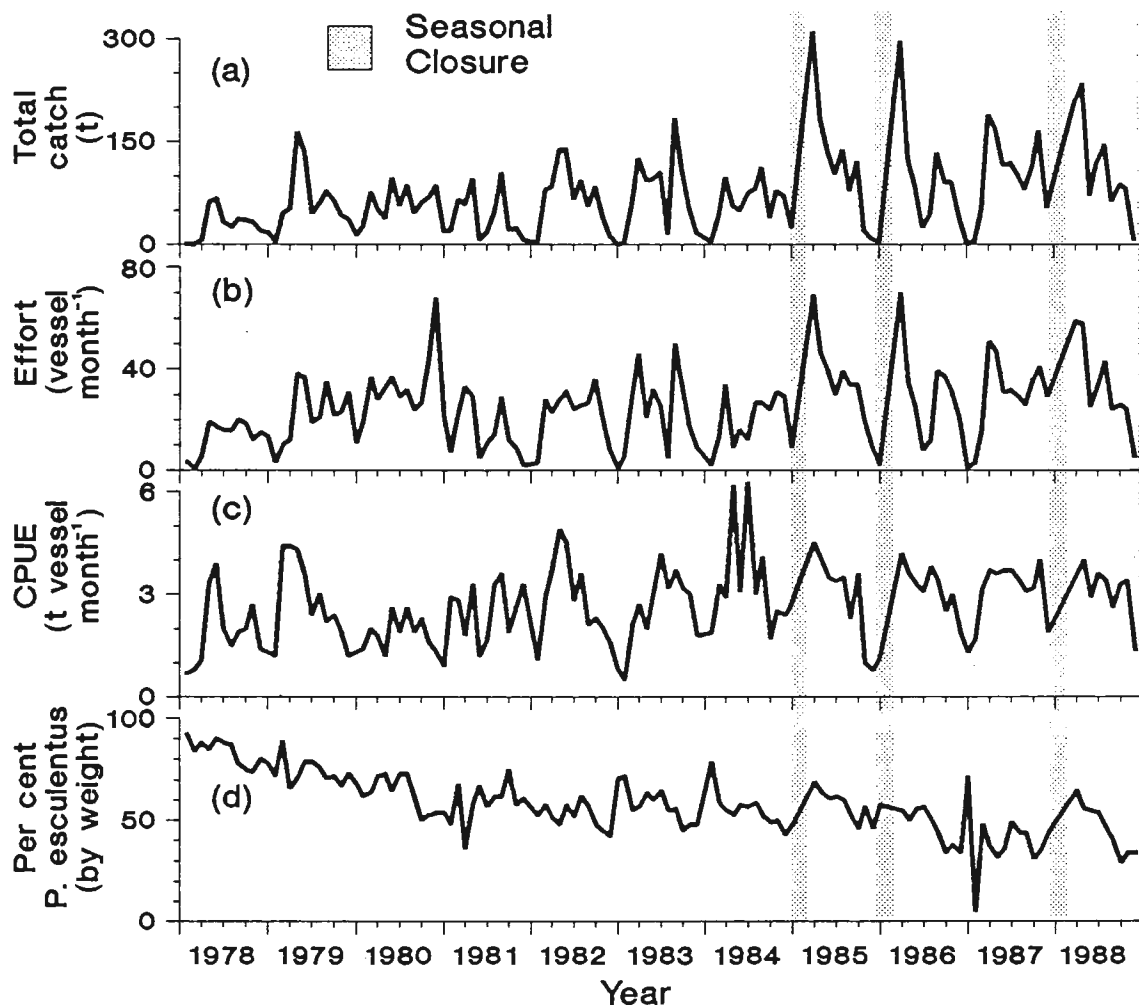
Masters of prawn trawlers with NPF endorsements are required to keep a fishing logbook, even when fishing in areas outside the NPF area. These logbooks are a major source of information on the Torres Strait Prawn Fishery. The logbooks also provide detailed data on areas fished, effort, species composition and catch per unit effort (CPUE) for the area since 1980 (Table 1(b)).

**Table 1.** Annual summaries for the Torres Strait prawn fishery on catch, effort and CPUE for (a) unloadings data, (b) NPF logbook data and (c) TSPZ catch report data

Year	(a) Unloadings data			% NPF catch of Unloadings	(b) NPF logbook data				(c) TSPZ catch report data		
	Catch (t)	Effort (boat months)	Est* (hr 10 <sup>3</sup> )		Catch (t)	Effort (boat months)	CPUE (hr 10 <sup>3</sup> )	kg hr <sup>-1</sup>	Catch (t)	Effort (boat months)	Est* (hr 10 <sup>3</sup> )
1978	337.6	156	--	--	--	--	--	--	--	--	--
1979	729.5	262	--	--	--	--	--	--	--	--	--
1980	715.6	400	31.8	13	90.1	39	4.0	22.5	--	--	--
1981	469.1	174	27.8	15	68.3	34	4.1	16.7	--	--	--
1982	797.9	256	41.1	46	368.2	143	19.0	19.4	--	--	--
1983	858.2	273	59.7	47	401.7	197	27.9	14.4	--	--	--
1984	732.6	233	43.7	69	508.1	198	30.3	16.8	--	--	--
1985	1 100.3	322	58.4	52	571.0	181	30.3	18.8	1 201.1	355	63.8
1986	930.2	278	52.9	40	367.3	151	21.4	17.1	707.3	243	41.3
1987	1 164.0	341	56.8	32	372.7	153	18.2	20.5	1 096.8	338	53.5
1988	1 020.5	298	54.9	13 <sup>A</sup>	128.4 <sup>A</sup>	80 <sup>A</sup>	6.9 <sup>A</sup>	18.6 <sup>A</sup>	1 147.6	374	61.7

\* Estimated by dividing mean annual CPUE from logbook data into the respective total catches

<sup>A</sup> Complete records for this year were not available



**Figure 1.** Commercial prawn unloading in Torres Strait, 1978-88 showing: (a) total catch (t), (b) effort (vessel month<sup>-1</sup>), (c) CPUE (t vessel month<sup>-1</sup>) and the per cent of the total catch formed of *P. esculentus*, brown tiger prawns, by weight.

**Catch form data.** Compulsory catch reporting was established for the TSPZ prawn fishery in 1985 with the ratification of the Torres Strait Treaty. The system requires the master of any licensed fishing vessel catching prawns in Torres Strait to furnish total monthly catch figures to the Commonwealth Department of Primary Industries and Energy. These records give a measure of the total prawn catch, by month, since 1985 (Table 1(c))

### 2.3.2 Catch and effort data

Analysis of all the available data revealed several trends. Total annual landings or unloadings have significantly increased ( $p < 0.05$ ) at an average rate of  $63 \text{ t yr}^{-1}$  since 1978 (when 338 t were landed) (Table 1(a)). Unloadings vary considerably between months from less than one t to about 300 t (Figure 1a), with an average over the past 11 years of 67 t.

The number of individual fishing vessels recorded each month is only a crude indication of fishing effort and varied considerably from zero to 70 (Figures 1a and 2b). It is not discernable how many hours a vessel fished during the month. No significant trend could be observed in boat months since 1980 for either unloadings or NPF logbook data (Table 1(a) and (b)). Effort, measured in vessel hours from unloading records, increased significantly ( $p < 0.01$ ) at an average rate of  $3\,360 \text{ hr yr}^{-1}$  from 1980 until 1988 (Table 1(a)). This trend, based on catch ratios was not reflected in NPF effort figures after 1985 as the proportion of the total effort in Torres Strait expended by NPF endorsed vessels began to decrease at that time (Table 1). Effort has also increased due to improvements in gear and improved knowledge of vessel operators.

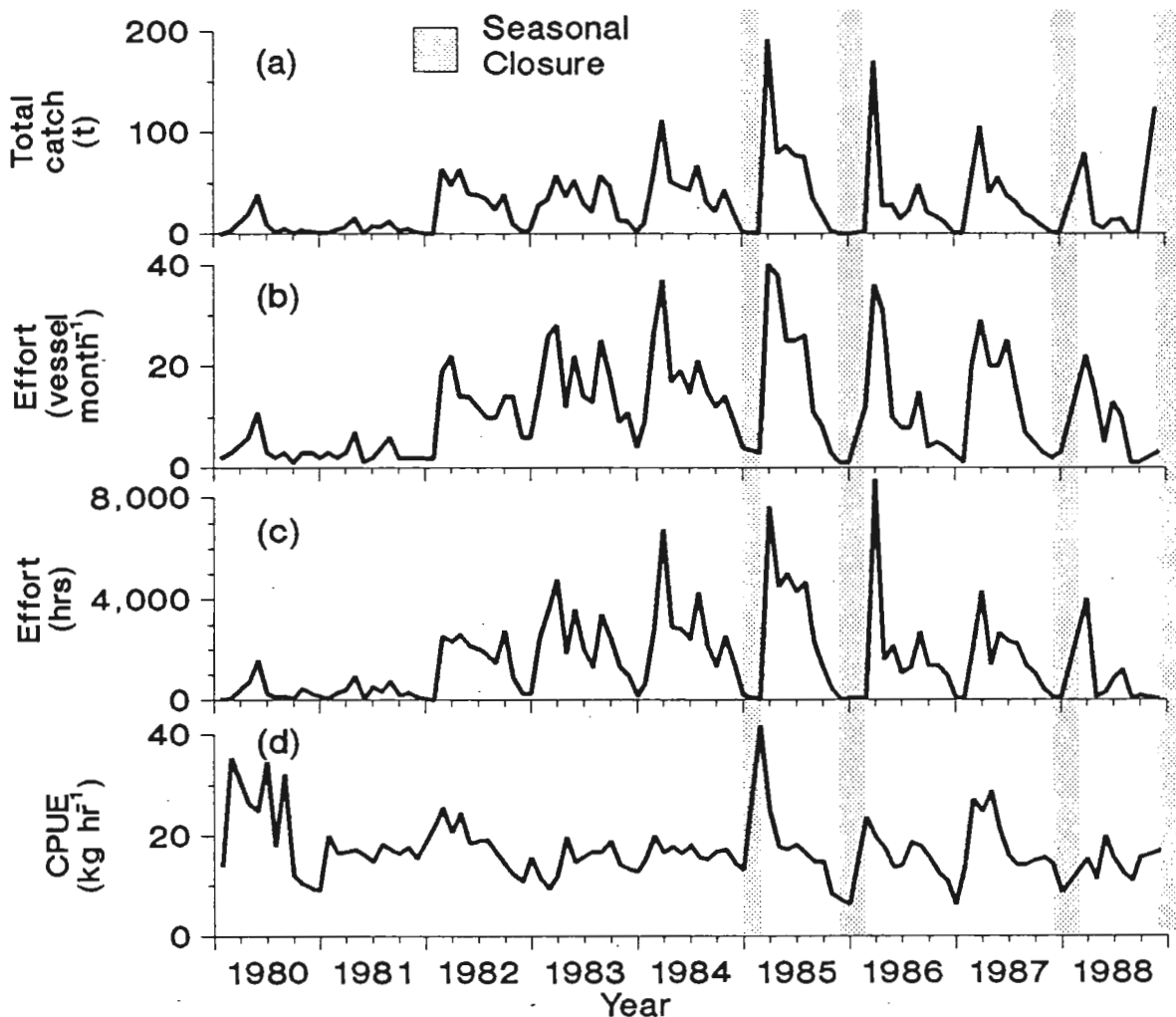


Figure 2. Records from NPF endorsed vessels in Torres Strait, 1978-88 showing: (a) total catch (t), (b) effort (vessel month<sup>-1</sup>), (c) effort (hours) and (d) CPUE (t vessel month<sup>-1</sup>).

CPUE could be calculated as t vessel-month<sup>-1</sup> or as kg vessel<sup>-1</sup> hr<sup>-1</sup>. The former CPUE measure relies on the number of individual vessels recorded each month as an effort measure. This value was variable and largely mirrored catch values (Figure 1c). The mean CPUE from NPF logbook records from 1980-88 was 18 kg hr<sup>-1</sup> and there was no significant trend (Table 1(b), Figure 2d). As effort has not been standardised to correct for increasing-gear efficiencies the rate of reduction in CPUE would be underestimated, so a stable CPUE should be interpreted as a reducing CPUE.

There is evidence to suggest that the sediment preferences of prawn species can limit their distributions (Somers 1987). If prawn stocks are continually concentrated on fishing grounds because suitable sediment is not available elsewhere, then CPUE figures can be misleading, and high catch rates can persist until stocks are greatly depleted. Under these circumstances CPUE figures may not be correlated to prawn stock size and overfishing would not be revealed by CPUE values.

One characteristic of the Torres Strait Prawn Fishery that protects it from overfishing is the high mobility of the fleet, as shown by the variability in the number of vessels fishing Torres Strait at any one time (Figure 1b). The mobility of vessels with multiple licences between the NPF, Torres Strait Prawn Fishery and the East Coast Prawn Fishery allows for the dispersion of effort from areas where and when prawn catches are low.

### 2.3.3 Species composition

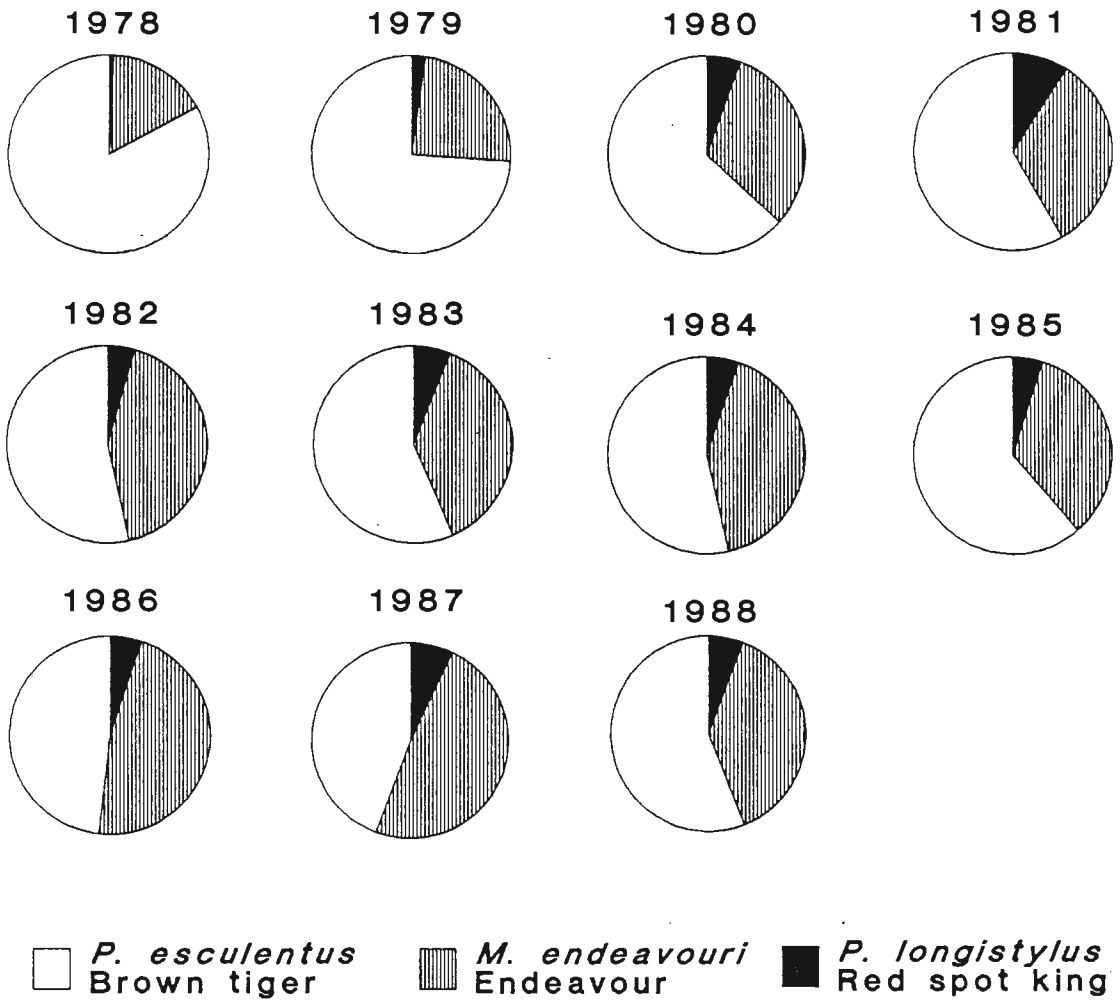
Representatives of three groups of commercial prawns are caught in Torres Strait. These are tiger, endeavour and king prawns. Each group is dominated by a single species as follows: tiger prawns, *P. esculentus* (99.6%); endeavour prawns, *M. endeavouri* (100%); and king prawns, *P. longistylus* (97.5%) (Somers *et al.* 1987).

The relative catch of these three species has changed since 1980. An examination of the species composition data (Figure 3) shows that from 1978 the annual catch of *P. esculentus*, as a percentage of the total weight of catch, has declined and that of *M. endeavouri* has increased. Analysis of commercial catch samples has revealed that *M. endeavouri* were more numerous than *P. esculentus* (Watson 1986).

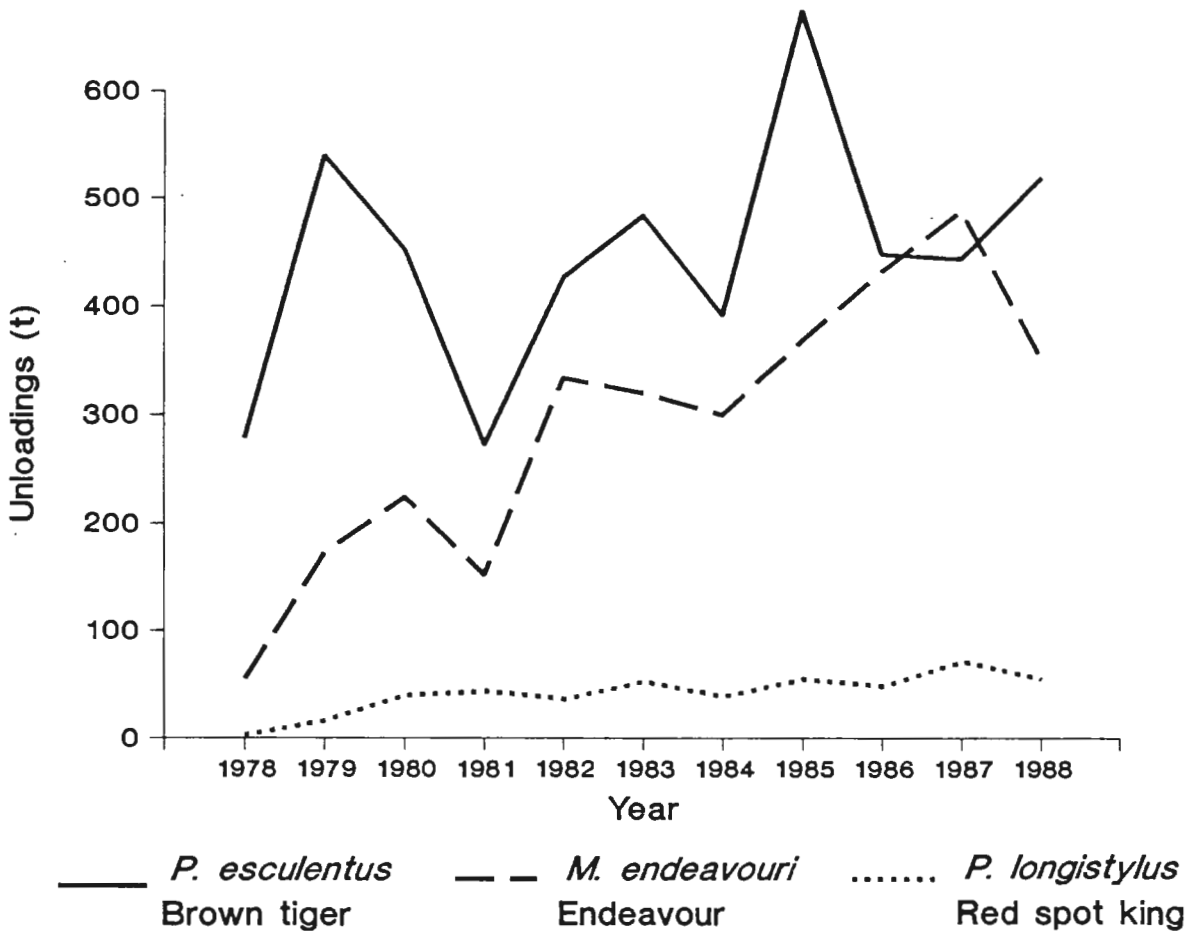
From 1978 to 1988 the catch of *M. endeavouri* unloaded increased by over six times while the catch of tiger prawns fluctuated markedly (Figure 4). *P. esculentus* landings in 1988 were less than twice those of 1978. One possible explanation is that when exposed to heavy fishing *M. endeavouri* prawns may achieve a competitive advantage over *P. esculentus*. Williams (1986) reported that there has been an increase in the areas of Torres Strait fished in the years immediately preceding 1985. These newer areas included may be predominantly *M. endeavouri* grounds.

The fact that catches of *M. endeavouri* prawns have increased by more than three times that of *P. esculentus* is perhaps the most significant result of this study. It is even more significant when one considers that *P. esculentus* are preferentially fished because of the higher price they attract.

In ten of the eleven years studied, more *P. esculentus* were caught in the first half of the year than in the latter half. At the start of the season in January, or later in the year if closures have occurred, the catch has been dominated by tiger prawns (Figure 1d). Later in the season, catches of *M. endeavouri* began to equal those of *P. esculentus*. Since 1985, early-season catches were more of an equal mixture of *P. esculentus* and *M. endeavouri* prawns. In 1986 and 1987 catches of *M. endeavouri* equalled or surpassed that of *P. esculentus* during most of the year. This trend was reversed in 1988 (Figures 1d and 4). *P. longistylus* catches, as a percentage of annual landings, have changed very little over this period (Figure 4).



**Figure 3.** Annual species composition (%) of commercial prawn catches in Torres Strait (by weight), 1978-88.



**Figure 4.** Unloadings (t) of *P. esculentus* (brown tiger), *M. endeavouri* (endeavour) and *P. longistylus* (red spot king) prawns in the commercial prawn catch of Torres Strait, 1978-88.

#### 2.3.4 By-catch

The major commercially valuable by-catch component of the Torres Strait Prawn Fishery is *Thenus orientalis*, the Moreton Bay bug. Annual catches of bugs have varied considerably over the period between 1980 to 1986 from 14 to 16 t whole weight, with an average of 30 t. This represents an average annual catch value for bugs from this area of \$200 000.

*Panulirus ornatus*, tropical rock lobsters, have formed a significant part of the trawler by-catch in the past when trawler trawlers targeted on the annual migration of lobsters through Torres Strait. Catches between 1980 and 1983 inclusive ranged from eight to 75 t tail weight, valued at between \$120 000 and \$1.1 million. In 1986 catches amounted to about 10 t yr<sup>-1</sup>, worth about \$250 000, however current legislation prevents trawlers targeting on this emigration, as rock lobsters are not allowed to be kept on board.

Other less economically important by-catch products taken by prawn trawlers include coral prawns (Watson and Keating, in press), squid, octopus, and crabs. It is now common for these products to be retained for sale.

#### 2.3.5 General discussion

There is clear evidence that catch and effort have increased since 1980. There is no evidence to date of a decrease in CPUE. A reduction in the proportion of the catch comprised of *P. esculentus* has been coincident with a rapid increase in the catch of *M. endeavouri*. These changes can only be interpreted if we have an understanding of the biology of the species involved and knowledge of fishing effort patterns and fleet dynamics.

It is mandatory for all vessels fishing in Torres Strait to record catches in the NPF logbook. This will assure the continuation of this valuable data series which began in 1980. It will greatly reduce the reliance of managers and scientists on unloading records as the primary historical data series, a purpose for which it was neither designed, nor well suited. Unloading data lacks specific records of where and when vessels fish, as well as how much effort they expend. This data source will, however, continue to be useful for comparison with the NPF logbook data.

## 2.4 Acknowledgements

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## 2.5 References

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