Australia's Fisheries Research in the Torres Strait Protected Zone

Geoff C. Williams and Derek J. Staples
Bureau of Rural Resources

Abstract

Fisheries in Torres Strait constitute the most important industry of the area, with a commercial value of approximately $21.5 million (excluding pearls). The main commercial resources are prawns and lobsters. The $15 million prawn fishery is fished mainly by boats operated from outside the straits, while the lobster fishery forms the basis of a Torres Strait Islander dive fishery. Other commercial fishery resources include mackerel, pearl shell and trochus. Traditional fishing for reef fish, dugongs and green turtles provides an important food source and a way of life for Torres Strait Islanders. The Torres Strait Fishery Scientific Advisory Committee (TSFSAC) provides scientific advice to the Projected Zone Joint Authority (PZJA) through the Torres Strait Fisheries Management Committee (TSFMC).

The TSFSAC is responsible for a large research effort into Torres Strait fisheries resources. These include biological research into lobsters (CSIRO), prawns (QDPI) effects of fishing (CSIRO), seagrass (CSIRO), dugongs (JCUNQ) and monitoring of traditional fishing (CSIRO). The National Residue Survey (NRS) is also investigating heavy metal contamination of prawn stocks. In general, these projects tend to be strategic research aimed at the longer term sustainable development of the fisheries resources of the Torres Straits. For example, seagrasses which provide the essential food and shelter to a large number of important resources such as prawns, turtles and dugongs have been mapped and their changes over time are being monitored. Surveys on lobster stocks and prawns have led to assessments of their current stock status. Management of prawn fisheries by such techniques as seasonal closures requires detailed knowledge of the prawn's life history and timing of migration which is being provided by scientists. Future priorities of the TSFSAC include monitoring of both commercial

and traditional fisheries, further research on lobsters, prawns, dugongs and turtles, assessment of fishery habitats and the impacts of environmental changes on the fishery resources.

Background

The Torres Strait Treaty and the Fisheries

The Torres Strait Treaty between Australia and Papua New Guinea was signed on 18 December 1978 and ratified on 15 February 1985. The Treaty establishes the jurisdictions and responsibilities of both countries in the Torres Strait border area. While the principal purpose of the Treaty is to define the limits of the two countries' maritime jurisdictions where they overlap, the fact that fisheries are the most important natural resources in the region makes the Treaty as important for fisheries management as it is for delimitation.

Establishment of the Torres Strait Protected Zone (TSPZ)

The establishment of the Torres Strait Protected Zone confers both rights and responsibilities on the two countries (Haines 1986). The principal purpose of the Protected Zone, as stated in article 10 of the Treaty, is to protect the traditional way of life and livelihood of the traditional inhabitants, including traditional fishing. As well as recognising the importance of traditional fishing, the Treaty acknowledges the contribution of valuable commercial fisheries in the Protected Zone to the Torres Strait economy.

Joint Management of Fisheries

The most important fisheries relationship that Australia has with Papua New Guinea is joint fisheries management in the Torres Strait Protected Zone. Articles 20 and 21 of the Treaty require Australia and PNG to cooperate and consult on the conservation, management and optimum utilisation of Protected Zone commercial fisheries. In other words, the objective is to achieve an agreed level of sustainability in those fisheries.

Article 22 of the Treaty provides for Australia and PNG to manage particular fisheries jointly if either country considers this necessary or desirable. Under the provisions of this article, the two countries have entered into joint management arrangements for the tropical rock lobster, prawn, Spanish mackerel, dugong, turtle and pearl shell fisheries in the Protected Zone, and a defined "outside but near area" surrounding the Protected Zone that is considered to be the actual extent of each fishery. In addition, the Commonwealth and Queensland Governments have entered into a formal legal arrangement whereby the above fisheries, traditional fishing and the barramundi fishery around Australian islands near the PNG coast, are managed under Commonwealth law. This is done under the auspices of the Protected Zone

Joint Authority (PZJA), whose members are the Queensland and Commonwealth Ministers for Primary Industries. The remaining fisheries, (e.g. trochus, reef fish, beche-de-mer), in the Protected Zone are managed by Queensland.

Sharing Commercial Catches

With the benefit of joint ownership of the Protected Zone fisheries comes the responsibility of sharing the catch on an equitable basis. The Treaty stipulates that this should be done by apportioning a Total Allowable Catch (TAC) according to geographic criteria, to be determined at the beginning of each fishing season. However, although we have almost ten years of catch monitoring data and extensive biological research information, it is still difficult to provide accurate yield assessments on which to base the TAC. This is partly due to the large natural fluctuation in stock numbers which are difficult to predict. Sharing of catches in the jointly managed fisheries, therefore, is based on input, (i.e. boat numbers, rather than output or quota). This is described in detail in the paper by Elmer (this volume).

The Role of the Torres Strait Fisheries Scientific Advisory Committee (TSFSAC)

The Torres Strait Fisheries Scientific Advisory Committee was established as a subsidiary body to the Protected Zone Joint Authority and the Torres Strait Fisheries Management Committee. Its broad objectives are to identify and investigate key biological parameters of fish and fish stocks, and provide advice on which to base rational and effective fisheries management programs. The consultative structure (Figure 1) reflects the aim of the PZJA to involve the Islanders and industry in establishing the most appropriate management and research priorities and strategic directions. Formal lines of communication and a schedule of regular meetings exist between the respective bodies. Informal communication links are equally well-developed and information flow is encouraged.

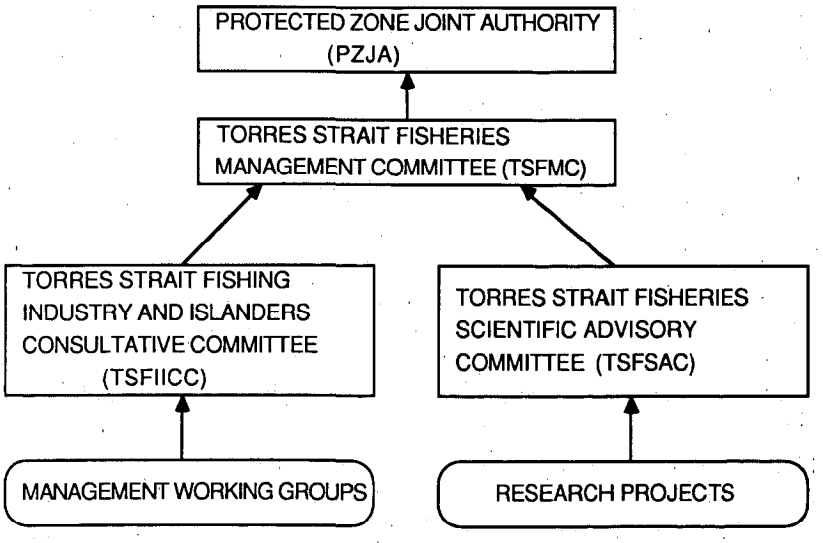

Figure 1. Consultative structure of the Protected Zone Joint Authority

The terms of reference under which the Torres Strait Fisheries Scientific Advisory Committee operates are as follows:

- Coordinate research into Torres Strait Protected Zone fisheries;
- Provide the Torres Strait Fisheries Management Committee and PZJA with scientific advice from research programs for the management, conservation and development of the commercial fisheries and the management and conservation of traditional fishing in the TSPZ;
- Provide analyses of fisheries data and data collection systems and refine procedures for monitoring the resources and evaluating the effectiveness of management action.

The consultative process referred to above provides several fora for communication between managers, scientists, Islanders, fishermen and other interested people. It is therefore important that Islanders and industry take the opportunity to make their views known when the chance arises so that resources can be directed in the most appropriate and cost-effective manner.

Coordination of the Fisheries Research Program

The Commonwealth and Queensland governments have provided an average of 0.8 million dollars per year for fisheries research and monitoring in Torres Strait since 1985. The Commonwealth component of these funds has been allocated to several organisations, mainly the CSIRO, which has undertaken work on behalf of the Department of Primary Industries and Energy. All the fisheries research programs funded under the Protected Zone Joint Authority report through TSFSAC at biannual meetings where the results, progress and direction of the research is assessed. Any changes in direction or updates to research priorities are then determined with the combined expertise of project leaders, senior scientists and managers with direct experience of the important issues facing Torres Strait fisheries. Research proposals are solicited by the TSFSAC to address priority issues, and funds are allocated on a competitive basis.

Setting Priorities

Because there will always be more scientific and management issues than there is funding to support research, it is necessary to determine realistic and achievable priorities and to develop an overall program that will provide answers to the most important questions in a reasonable time-frame and at reasonable cost. It is not practical or cost-effective to develop the complete program in advance and it is essential that the program has the flexibility to institute additional research as priorities change. The present program is based on a triennium cycle of research planning which is reliant on annual funding from the governments' budgetary processes. Fisheries research priorities in Torres Strait are largely determined on the basis of the importance of the resource to the traditional inhabitants and to the Torres Strait economy. The lobster fishery is therefore the most important fishery in terms of Islander participation and value and consequently has attracted the majority of research effort.

Research Projects

Tropical Rock Lobster

Like other palinurid lobsters, the ornate or tropical rock lobster, *Panulirus ornatus* is characterised by a long larval life, a time to maturity of several years and breeding that occurs in deeper offshore waters. The lobster is distributed throughout the Indo-west Pacific, but reaches its greatest concentrations in Torres Strait where it supports a dive fishery that yields an average of 250 tonnes per year (Figure 2) (Channells *et al.* 1987) worth around 5 million dollars to the Torres Strait economy.

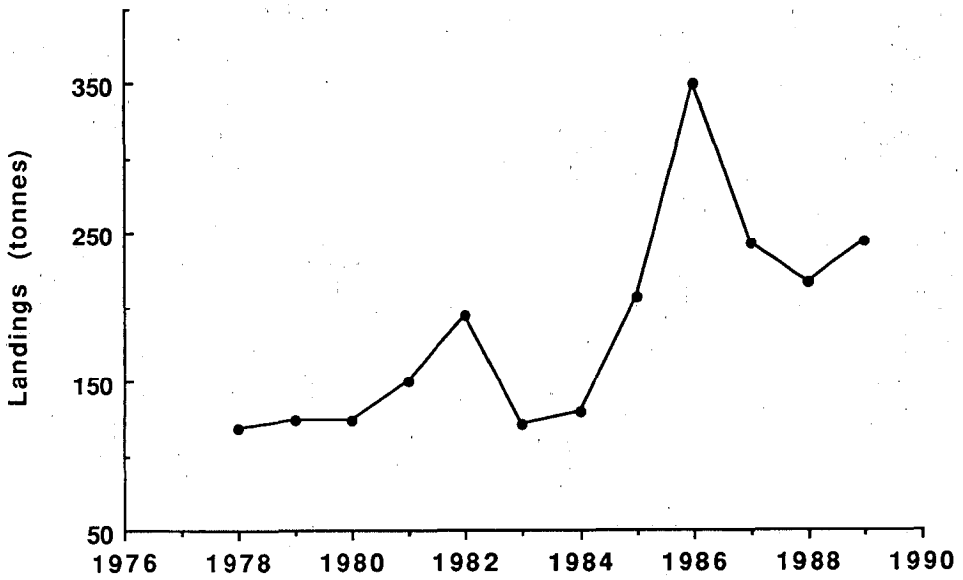

Figure 2. Tropical rock lobster catch by Australian divers 1978-1989

Tropical rock lobster research has been funded by PNG and Australia as far back as 1960, and by the Commonwealth government continuously since 1980. The first three years of the current program concentrated on documentation of the fishery, including landings, areas fished, and methods of operation. Biological studies which were initiated at the same time included an extensive tagging program to determine migration paths, reproductive biology, puerulus settlement, growth rates, food and feeding, genetic variation between geographically separated stocks and nocturnal movements. The results of these studies were used to determine whether Australia and PNG share the same stock, to institute arrangements to protect the annual breeding migration from excessive exploitation by trawling, and to set preliminary Total Allowable Catches for both the Australian and PNG fisheries.

The direction of research into the fishery for the triennium 1984-87 was determined jointly by Australia and PNG, and joint studies were initiated. Priority research concentrated on the effect of the dive fishery on reef populations, prediction of the timing and size of the annual beeding migration, the fate of lobsters that have completed the migration, exploration for additional breeding grounds and continued tagging and stock discrimination studies.

In 1988 the project underwent a review to synthesise the large amount of information collected to that date and to respond to the issues then considered by the Australian Fisheries Service and the TSFSAC to be most important for management (i.e the danger of the stock being over-exploited by divers, and the potential for the stock to sustain heavier exploitation and therefore increase income from the fishery). The major new research directions which resulted included stock assessment (a task previously considered impossible for this fishery), measurement of post larval recruitment and the possibility of predicting future catches. The results of this work are reported by Pitcher (this volume).

Prawns

The prawn fishery in Torres Strait is the most valuable Torres Strait fishery in monetary terms. It yielded an average catch over the past five years of over 1000 tonnes per year (Figure 3), worth around $15 million at first sale.

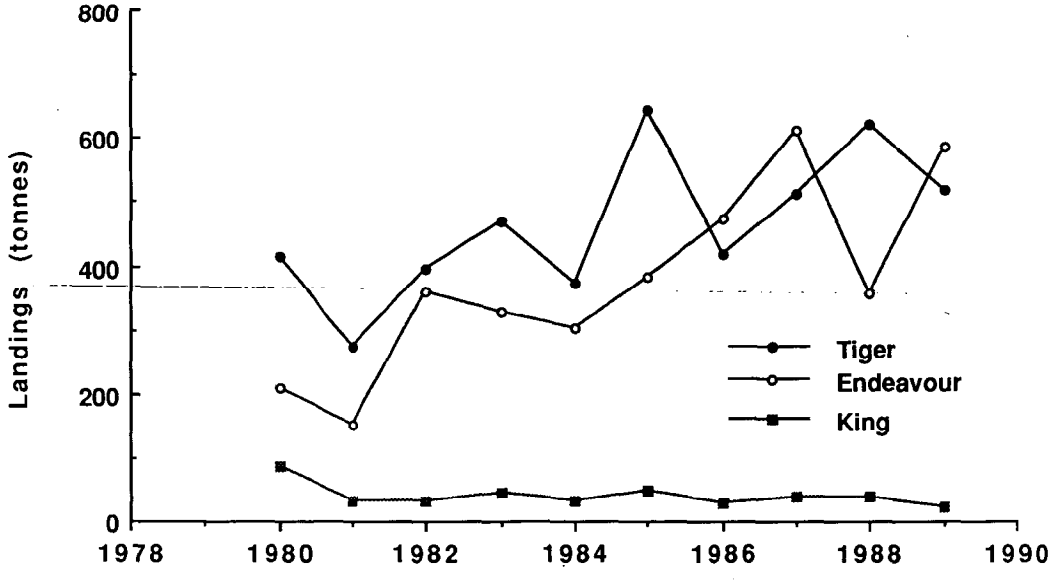

Figure 3. Torres Strait prawn catches 1980-1989

In July 1985, a Queensland government-funded research project was initiated to determine the recruitment patterns, movement and distribution of the tiger and endeavour prawns which make up the Torres Strait prawn fishery (Watson and Mellors 1990). Provision of information on prawn growth and movement was the primary objective of the study, so that the effectiveness of spatial and seasonal closures, that in some cases had been in place for several years, could be assessed. To date, this work has formed the basis for fine-tuning the management measures to achieve the Treaty's fishery management aim of optimal utilisation of the stock, and also to provide advice for catch-sharing of stocks between Australia and PNG.

The study has looked at the most important aspects of the prawns' life history as they relate to the commercial fishery, including distribution and abundance of juveniles in seagrass beds, pathways of recruitment and migration to and from the fishing grounds, spawning periodicity and fishery catch and effort data. Detailed reports of these studies can be found in Mellors (1990).

The Effects of Prawn Trawling on Fish Abundance

This project was initiated in response to Islanders' concerns that commercial prawn trawling was depleting catches of fish species that are important to the island communities' traditional and artisanal fisheries. In addition, the pearling industry complained that trawlers were doing physical damage to pearl shell habitat.

The aim of the Effects of Trawling project was to determine whether prawn trawling has a significant effect on the fish populations of Torres Strait, particularly those which are used for food by the Islanders. The impact of trawling on turtles and selected invertebrate populations was also studied.

The results of this project demonstrated that prawn trawling has affected the fish and benthic communities on the trawl grounds in Torres Strait, but that there are limited direct impacts on Islander fisheries (Poiner and Harris 1989). Prawn trawling has also altered the species composition of the fish communities on the trawl grounds: the density of bottom fishes is significantly reduced and the density of small predatory and midwater species is significantly increased. Most of the the fish caught by prawn trawlers on the trawl grounds are small non-commercial species, but there are some, though relatively small, catches of commercially important reef fishes such as sweetlips and snappers in prawn trawls. The trawl catch of turtles and commercial mackerel species is relatively insignificant.

Traditional Fishing

A study of traditional fishing was conducted by CSIRO between 1983 and 1987. Its objectives included documenting the the use of fish and fisheries products by traditional inhabitants and identifying existing and potential problems. The project also included a study of the impact of commercial fishing on traditional fishing. Competition among traditional fishermen from different areas in Torres Strait and other socio-economic and biological problems facing traditional fishermen were also examined. In summary, the study showed that Torres Strait Islanders are among the highest seafood consumers in the world, in terms of percentage consumption of seafood in their diet (Johannes and MacFarlane, in press). It also confirmed that the Torres Strait area is an area of exceptionally high seafood productivity. From the islands where statistics were collected, green turtles were the the most important seafood. The study showed that there is a need to improve catch information if future management is to be able to take the protection of traditionally important seafood species into account. The current Australian Fisheries Service data collection program based in Thursday Island is now addressing this need.

Dugong

Torres Strait supports one of the world's largest populations of dugong, a species of sirenian or sea-cow that is classified as vulnerable to extinction.

In November 1987 and again in March of 1988 aerial surveys of dugong were carried out by Dr Helene Marsh and a team of observers from James Cook University of North Queensland. The regional densities of dugongs in the Torres Strait region and adjacent waters of the Great Barrier Reef Marine Park were estimated by sampling 7.4 per cent of the total survey area of 30,533 km^2. A resultant minimum population of around 12500 dugongs was estimated for Torres Strait (see Marsh & Saalfeld, this volume).

The survey and the resulting population estimate highlight the need for reliable dugong catch information. The biological sustainability of the annual Torres Strait dugong harvest depends on whether a population of the present size can support the number of animals harvested, and that number is not known, though various estimates exist. A catch monitoring system for dugong is currently being established by the Australian Fisheries Service in Thursday Island.

Seagrass

The seagrass resources of Torres Strait are very important in the life histories of prawns, dugongs and green turtles. Tiger and endeavour prawns rely on seagrass communities for their nursery grounds, dugongs feed exclusively on seagrass, and green turtles depend on seagrass for a substantial part of their diet (Poiner, Walker and Coles, 1989).

A CSIRO study between 1985 and 1990 has provided information on the distribution, quality and quantity of seagrasses in Torres Strait. The study showed that Torres Strait supports a large number of species and a diversity of seagrass communities. Seasonal and interannual variability in these communities, which has important implications for the species which depend on seagrasses, was the main focus of the study.

Within the Protected Zone over 3500 km^2 of seagrass-supporting habitat associated with 295kilometres of coastline or reef have been identified, mapped and sampled (Poiner 1989).

Data Collection Systems

In 1987 a study was undertaken to ascertain the level and content of catch and effort data required to fulfill the needs of research and management and to determine the most appropriate and effective ways of collecting the data.

Fisheries data collection in Torres Strait is complicated by the variety and movement of fishing operations, the diverse cultural background of Torres Strait fishermen and changing fishing technology.

The study drew extensive input from researchers, managers and fishers, and led to the design and development of logbooks for the collection of catch and effort statistics in the tropical rock lobster, mackerel and pearl fisheries. The logbook system that was developed over many years and has been used for data collection in the Northern prawn fishery was implemented in the Torres Strait prawn fishery. Data collected in the various logbooks are available to scientists and managers through the Australian Fishing Zone Information System (AFZIS), but the information's confidentiality is protected so that individual operations cannot be monitored.

Future Research

The conduct of future fisheries research relies on the Commonwealth and Queensland's continued commitment to funding. However, assuming that funding is maintained at present levels, the Torres Strait Fisheries Scientific Advisory Committee has identified the following priority areas for research effort over the next three years:

- continued monitoring of catch and effort in commercial fisheries;
- stock assessment, yield and recruitment studies of tropical rock lobster;
- prawn stock and recruitment studies;
- development of environmental and critical habitat monitoring strategies;
- development of reliable traditional fisheries monitoring strategies that can be carried out at the community level;
- a repeat dugong population survey in 1992/93;
- continued participation in broad environmental issues in Torres Strait, in particular the Baseline Study, oceanographical work and the development of strategies to combat oil spills.

References

Channells, P.W., Phillips, B.F. and Bell, R.S. (1987), *The Rock lobster Fisheries for the Ornate Rock Lobster in Torres Strait and on the NE Coast of Queensland, Australia*, (Fisheries Paper 87/8), Australian Fisheries Service, Canberra.

Haines A.K. (1986), 'Background to management', In AK Haines, GC Williams, and D Coates (eds), *Torres Strait Fisheries Seminar, Port Moresby*, AGPS, Canberra.

Johannes, R.E. and MacFarlane W.J. (in press), *Traditional Fishing in the Torres Strait Islands*, CSIRO Division of Fisheries, Hobart.

Mellors, J.E. (ed) (1990), *Torres Strait Prawn Project: a review of research 1986-88*, Queensland Department of Primary Industries, Brisbane, (Information Series QI90018).

Poiner, I.R. and Harris A.N.M. (1989), 'Effects of Trawling', In *Torres Strait Protected Zone Annual Report 1989*, AGPS , Canberra, 12.

Poiner I.R. (1989), 'Change in Seagrass Communities', In *Torres Strait Protected Zone Annual Report 1989*, AGPS , Canberra, 13.

Poiner I.R., Walker, D.I. and Coles, R.G. (1989), 'Regional studies - seagrasses of tropical Australia', In AWD Larkum, AJ McComb and SA Shepherd), *Biology of Seagrasses*, Elsevier, Amsterdam, 279-303.

Watson, R.A. and Mellors J.E. (1990), 'General Introduction', In JE Mellors (ed), *Torres Strait Prawn Project: a review of research 1986-88*, Queensland Department of Primary Industries, Brisbane, 3-9, (Information Series QI90018).