

## 4. Monitoring and Research in the East Coast Trawl Fishery

The Commonwealth “**Guidelines for the Ecologically Sustainable Management of Fisheries**” require that:

1. for assessing the impact of the fishery on the stock levels of target and by-product species, “*there is a reliable information collection system in place appropriate to the scale of the fishery*” and that “*the level of data collection should be based upon an appropriate mix of fishery independent and dependent research and monitoring*” [**Guideline 1.1.1**]; and
2. for the assessment of the impact of the fishery on the wider ecosystem, “*reliable information appropriate to the scale of the fishery, is collected on the composition and abundance of bycatch*” [**Guideline 2.1.1**], that “*reliable information is collected on the interaction with endangered, threatened or protected species and threatened ecological communities*” [**Guideline 2.2.1**] and that “*information ... is collated and/or collected covering the fisheries [sic] impact on the ecosystem and environment generally*” [**Guideline 2.3.1**].

Adopting an ecosystem-based management approach requires that an information system is implemented to allow for the collection of baseline data to detect changes in a fishery at an appropriate level of resolution. These data then need to be reviewed and analysed to determine how well the management arrangements meet the performance indicators specified for the fishery. The following section of the Audit Report is an appraisal of the ECTF monitoring and research processes, which provide these data.

### 4.1 Monitoring and Research Providers and Funding

The QDPI has primary responsibility for obtaining the information needed for the assessment of its fisheries. However, several research organisations (described below) contribute to the necessary monitoring and research work. While it is beyond the scope of this report to comment on the institutional and funding arrangements of each of these contributors, a few are mentioned because of their particular relevance to the ECTF and the collaborative nature of their research.

#### 4.1.1 The Queensland Department of Primary Industries

Research within the QDPI is carried out primarily by the AFFS. The two marine fisheries research centres are based at Deception Bay (the Southern Fisheries Centre - SFC) and Cairns (the Northern Fisheries Centre - NFC). Fisheries monitoring and assessment are done primarily by the QFS. Notwithstanding this demarcation of responsibilities, scientists from both the AFFS and QFS are situated at the SFC and NFC. There is a degree of overlap in fisheries research and stock assessment between the two groups but duplication of work does not occur.

In 2001/02, the AFFS annual fisheries research and monitoring budget was some \$2 million. Of this, about 51% was sourced from State government funds and 49% was sourced from what is termed “soft” funds or research grants (Mike Potter, QDPI AFFS, *pers. comm.*). Of the AFFS professional and technical staff, 62% are funded through short-term research grants. In 2001/02, trawl-related research by AFFS depended heavily on external (i.e. non-government) revenue, which was used to fund about eight full time staff<sup>14</sup> and a significant proportion of the operational costs of the research projects. The Queensland Government supported the positions of four full-time scientists at about \$300,000 per annum on ECTF-related research.

<sup>14</sup> These figures relate to November 2001. Some of the temporary staff have left AFFS employment with the completion of their externally-funded projects.

Recognising the need for fisheries stock assessment, AFFS was granted, on a once-off basis, an additional \$250,000 in 2001/02. In the case of the ECTF, this amounted to about \$50,000 of additional fishery assessment funds. These funds were renewed in 2002/03. However, the funds are granted on a year-to-year basis and there is no guarantee of their future availability.

In 2001/02, the QFS committed about \$375,000 of consolidated revenue and industry funding to fisheries monitoring and assessment work, employing about five full time staff. Its Logbook Section is responsible for maintaining the Queensland Fisheries Information System (QFISH) and the Assessment and Monitoring Unit produces regular fishery status reports, as required by legislation. This includes publication of the Condition and Trends Report, the ecological assessment of Queensland's export fisheries for EA under EPBC legislation<sup>15</sup>, annual surveys of North Queensland prawns and scallops through the LTMPs and various reports required under the Queensland Environmental Protection Act and the Queensland Fisheries Act. These reports provide information to the public on how Queensland fisheries are managed.

#### **4.1.2 The Fisheries Research and Development Corporation**

The FRDC is a rural research and development corporation within the portfolio of the Commonwealth Minister for Agriculture, Fisheries and Forestry. It is the leading agency concerned with planning, funding and managing fisheries research and development in Australia. The FRDC is a major contributor to fisheries research in Queensland and much of the ECTF research conducted in the past has been funded (at least in part) by the Corporation (and its predecessor).

The corporation has three funding programs, entitled "Natural Resources Sustainability", "Industry Development" and "Human Capital Development". Most of the ECTF research has been funded from the first of these programs and several stock assessment workshops have been financed from the last of the programs.

The FRDC's revenue base is made up of three primary sources. Firstly, the Commonwealth Government provides unmatched funds to the value of 0.5% of the average gross value of production (AGVP) of Australian fisheries<sup>16</sup>. Secondly, each State, the Northern Territory and Commonwealth provide contributions of at least 0.25% of AGVP of their respective fisheries<sup>17</sup>. Thirdly, the Commonwealth Government matches each of the State, Northern Territory and Commonwealth contributions up to a maximum of 0.25% of AGVP. Therefore, industry may expect a 3:1 return on any research contributions made on their behalf to FRDC.

In 2001/02, the FRDC had a revenue base of around \$22.9 million, which was made up primarily from unmatched Commonwealth Government funds (\$11.4 million), industry contributions (\$4.5 million) and matched Commonwealth Government funds (\$4.4 million). The remainder of the revenue was derived from sources such as investments, royalties and sales<sup>18</sup>.

In 2000/01, the Gross Value of Production (GVP) of Queensland's wild fisheries was estimated at around \$302 million<sup>19</sup>. In 2000/01 and 2001/02, Queensland contributed to FRDC some \$530,000 per annum. This figure was well short of 0.25% of the AGVP and, consequently, Queensland did not attract the maximum matchable sum from the Commonwealth. With respect to the ECTF, the Queensland contribution amounted to about \$270,000 per annum. Notwithstanding the general

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<sup>15</sup> AFFS staff also provide significant input into the condition and trend reports.

<sup>16</sup> The average gross value of Australian fisheries production is calculated on a three-year average.

<sup>17</sup> However, this level of contribution has not always been met by the contributors.

<sup>18</sup> See the Fisheries Research and Development Corporation's Annual Report 2000-2001.

<sup>19</sup> This figure was cited in the 2000/01 "Australian Fisheries Statistics" produced annually by the Australian Bureau of Agriculture and Resource Economics (ABARE). The 2001/02 GVP were not available at the finalisation of the Audit Report.

funding situation, ECTF research in recent years has been relatively well supported by the FRDC at a 4:1 return ratio<sup>20</sup>.

There has been a change in the type of fisheries research supported by the FRDC in recent years. Historically, the Corporation (and its predecessors) have funded fishery monitoring and stock assessment work throughout Australia. However, the FRDC now has adopted a more strategic research direction and focus. Routine types of fishery monitoring and stock assessment work generally does not attract research funding. The FRDC aims to concentrate the research efforts that it funds towards environmental, economic and social components of nationally significant issues.

#### **4.1.3 The Cooperative Research Centre for the Great Barrier Reef World Heritage Area**

The Cooperative Research Centre (CRC) for the Great Barrier Reef World Heritage Area (hereafter referred to as “CRC Reef”) is a company limited by guarantee, supported by its members<sup>21</sup> and the Commonwealth Government’s CRC Program. The Centre undertakes an integrated program of applied research and development, training and extension, which promotes the ecologically sustainable development of the Reef’s resources. The Reef CRC manages four major research programs<sup>22</sup> and an education and communication program, aimed at achieving practical outcomes.

The total Reef CRC budget in 2001/02 was about \$11.5 million, of which \$5.912 million was cash-based and \$5.583 million was in-kind contributions from the members. In 2001/02, the Centre undertook 105 research projects<sup>23</sup>. Of these, two were of direct relevance to the ECTF at a cost of \$118,771<sup>24</sup>.

#### **4.1.4 Other Relevant Research Providers**

In addition to the QDPI, FRDC and Reef CRC, other research institutions provide research and monitoring information for Queensland fisheries (including the ECTF). Amongst these are the Australian Institute of Marine Sciences (AIMS), the Commonwealth Scientific and Industrial Research Organisation (CSIRO), James Cook University, Griffith University and State/Territory-based fisheries institutes. Much of the research carried out by these institutions is done under FRDC or Reef CRC funding and may be undertaken cooperatively with other research organisations. Where the funding is external, there is usually an “in-kind” contribution from the institutes conducting the research.

#### **4.1.5 Comments on the Funding Environment**

It is difficult to determine the precise level of financial commitment to research and monitoring in the ECTF because these functions are spread across several fisheries and carried out by several agencies using a diverse range of funds. In any case, it could be misleading to review such expenditure for one fiscal year only. Most research projects are conducted over a three to five year period and research expenditure needs to be reviewed over such a period to get a realistic funding picture. An accepted benchmark for research and monitoring expenditure in a developed fishery is about 5 - 10% of the AGVP. Although the average monitoring and research expenditure for the ECTF was not available for this audit, it appears to be well below 5-10% of the AGVP (more like 1%).

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<sup>20</sup> *Pers com* from the FRDC.

<sup>21</sup> The Reef CRC members are the Association of Marine Park Tourism Operators (AMPTO), the Australian Institute of Marine Sciences (AIMS), the Great Barrier Reef Marine Park Authority (GBRMPA), the Queensland Seafood Industry Association (QSIA), the State of Queensland through its Department of Primary Industries (QDPI), SUNFISH Queensland and the Great Barrier Reef Research Foundation.

<sup>22</sup> The CRC Reef’s four research programs are: Conserving World Heritage Values; Sustainable Industries; Maintaining Ecosystem Quality and Reef Futures

<sup>23</sup> Of these 105 projects, the GBRMPA had direct involvement in 57 by being defined as “task associate “.

<sup>24</sup> “A Conceptual and Operational Understanding of Resource Dependency” by Ms Nadine Marshall and “Coastal Fisheries Resource Monitoring in the GBRWHA” by Mr R. Garrett.

As with other Queensland-managed fisheries, a major impediment to funding research and monitoring in the ECTF at a level appropriate for the scale of the fishery is the current lack of recovery of the fisheries management costs from industry. For example, in Commonwealth-managed fisheries all management costs (including those for research and monitoring) are levied to industry as part of the annual licence fee. For most licence types, this amounts to several thousand dollars per licence.

#### ***Recommendation 1***

- ***That the QFS identifies the “true” management costs for the ECTF in terms of the monitoring and research costs and continues to pursue adequate funding for its fisheries as a matter of priority.***

In light of a greater public awareness of environmental issues, the call for fisheries management agencies to demonstrate that fisheries activities are ecologically sustainable is increasing in Australia. However, this requirement generates a growing demand on research and monitoring funds. In an environment of increased competition for research dollars and a general tightening of criteria under which such research is funded, research expenditure based largely on external funding is a high-risk strategy for any fisheries management agency to adopt. Firstly, there is a risk that high priority or essential projects will not receive funding. Secondly, the control over such projects, if they are externally funded, rests primarily with the funding body.

Much of the ECTF research to date has been at least part-funded through external (primarily FRDC) monies. A reliance on external funding to conduct core activities generates funding uncertainty from year to year. The move by FRDC away from supporting routine research and stock assessment work increases the chances that some essential activities will not be funded. It is anticipated that information demands in the ECTF will increase in light of increasing scrutiny of the ecological sustainability of the fishery. Therefore, it is crucial that alternative funding sources are identified for routine monitoring and assessment work.

#### ***Recommendation 2***

- ***That the QFS, via Trawl MAC, identifies the core monitoring and research activities for the ECTF and considers strategies through which these can be met on a continued basis.***

## **4.2 Monitoring and Research Processes**

Research and monitoring are crucial information sources for the assessment and management of the ECTF. This section of the Audit Report discusses the monitoring and research processes for the fishery.

### **4.2.1 Queensland Fishing Industry Research Advisory Committee**

The Queensland Fishing Industry Research Advisory Committee (QFIRAC) provides advice on research for Queensland’s fisheries to the FRDC. The Committee meets regularly to review its strategic research and development (R&D) plan for Queensland’s fisheries and aquaculture, call for research proposals in line with the research plan, evaluate research applications and make recommendations to FRDC on the funding of these projects. All ECTF-related research applications seeking FRDC funding are considered by the QFIRAC.

The QFIRAC has a secondary role as the research advisory committee to the Fishing Industry Development Council (FIDC), which provides advice on fisheries policy to the Minister for Primary Industries and Development.

#### 4.2.2 Trawl MAC and its Scientific Advisory Committee

At the fishery level, Trawl MAC is responsible for making ECTF-related research recommendations to the QFS' Chief Executive. Research issues are dealt with in more detail by Trawl MAC's SAG (Section 3.6.2.2), which meets about three times a year to consider research and stock assessment issues.

Trawl MAC and its subcommittees were suspended for nearly 15 months during 2000 and 2001, while the revised Trawl Management Plan was being developed. This suspension has created a delay in the work program of the SAG.

The involvement of Trawl MAC and its SAG in the research review process is limited to receiving intermittent verbal reports on current research projects and being provided with written reports as they become available. The committees also comment on the fisheries status and stock assessment reports, review performance indicators in the Trawl Plan and respond to *ad-hoc* research requests on ECTF matters.

Given a limited budget and the infrequency and short duration (usually half a day) of SAG meetings, it is not surprising that the committee has only a cursory role in ECTF-related research. In contrast, several other Australian fisheries at both Commonwealth and State levels, have scientific subcommittees which meet regularly to peer review research on a real-time basis and provide in-depth advice on its implications to management<sup>25</sup>. A number of ECTF research projects are guided by project steering committees made up of stakeholder representatives. This approach ensures greater acceptance of research results and wider stakeholder input. The costs of these steering committees are funded by the individual projects.

#### 4.2.3 Comments on the Monitoring and Research Process

As described earlier, several agencies conduct research on the ECTF. It is acknowledged that funding agencies generally evaluate research results and subsequent publications to varying degrees, as part of their own internal processes. However, there is no formal, peer-reviewed process for the monitoring and research work at an ECTF-wide level. Specifically, there are no structured, regular workshops with suitably qualified scientists and other relevant experts to synthesise research and monitoring results and assess their implications for management. The last systematic research review on species of major commercial importance (including some ECTF species) occurred in August 1998.

There are numerous published articles by the QDPI scientists on ECTF-related research in well-established fisheries journals (see bibliography). However, information is not always readily available in a published format for those Trawl MAC and SAG members involved in research and assessment. A significant portion of the research information remains unpublished or recorded only in the grey literature. For example, there are several final FRDC reports, which have not been published yet in the scientific literature<sup>26</sup>. Similarly, much of the fishery monitoring work undertaken by the QDPI has not been documented formally.

In advocating a better scientific publications record, it is not suggested that the scientists concerned are producing low-quality research, which is not acceptable for publication in the scientific literature. It is recognised that some research (such as the long-term survey work) has only 3 - 4 years of data and may not show any long-term trends, which can be published in the scientific literature. However, the absence of a formalised research review process, together with a lack of publication of some current relevant research, casts doubt on the quality of the research results. Publication in peer-reviewed journals ensures that research is of a standard that is accepted by other scientists as being at an

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<sup>25</sup> Examples of fisheries where scientific advisory committees play an integral role in research review are the Commonwealth-managed Northern Prawn Fishery and the Western Australian prawn trawl fisheries.

<sup>26</sup> Final FRD reports are considered "grey literature" even though they have been internally reviewed.

appropriate level. This requires that the research work is reviewed critically to ensure that it meets this standard. The endorsement of other scientists is achieved by such publication. Results published in the grey literature carry only a limited endorsement and are viewed with some scepticism by other scientists.

### **Recommendation 3**

- *That a formalised process of regular peer review of monitoring and research results be developed for the ECTF through Trawl MAC.*

In an era of limited research funding and greater public accountability, it is essential that strategic research plans be developed for fisheries. Ideally, such plans need to be specific and adopt a medium-term (3–5 year) approach. This would ensure that monitoring and research work remains focussed on priority areas and that information gaps are addressed. Also, it would create greater transparency in the decision-making process underpinning funding decisions.

At present, there is only a brief list of key research areas identified for the ECTF. The SAG, through Trawl MAC, aims to formalise these into research priorities and develop a longer-term strategic research plan for the ECTF. It is expected that this process will provide input into QFIRAC's annual review of its R&D Plan, thereby ensuring that only research identified as high priority by Trawl MAC will be recommended for FRDC funding in 2003/2004. It is recognised, that frequently strategic or innovative projects are not regarded as "high priority" because of their long-term benefits and pioneering approach.

The immediate development of a strategic research plan for the ECTF is strongly supported. Given the several research providers and funding sources, it is essential that research is coordinated through such a plan. Specific issues and interests have driven past ECTF research. Greater coordination and transparency in the decision making process is needed.

### **Recommendation 4**

- *That a strategic R&D Plan, which identifies and prioritises the information gaps for monitoring and research in the ECTF and which provides input into external R&D processes, be developed through Trawl MAC.*

## **4.3 Information Systems**

Having described how research and monitoring are provided and funded and how they are conducted within an institutional framework, in this section a critique is provided on the information systems in place for the ECTF.

### **4.3.1 The Vessel Monitoring System**

The revised Trawl Plan requires otter trawl operators to carry a functioning automatic location communicator aboard their vessels whilst fishing in the ECTF<sup>27</sup>. This VMS reports the precise GPS location of a vessel at specific time and, therefore, is an important monitoring and compliance tool. Section 7 considers the use of the VMS as a management tool. This section of the report discusses the system's limitations as a data source.

When the VMS was first introduced, there were a number of technical difficulties with the operation of the system. These problems included shadow areas for satellite reception, errors in the extrapolation of speed and problems due to faulty power supplies. The incidence of technical malfunctioning is reported to have decreased substantially after the first year of operation. The GBRMPA did not gain access to the VMS data until early 2003 and, therefore, was not in a position to verify these reports.

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<sup>27</sup> The Trawl Plan exempts Moreton Bay and inshore beam trawl operators from the use of VMS.

The value of the VMS data clearly lies in its spatial and real-time information. In this regard, the system provides a level of detail that is not available from logbooks. However, a major limitation is the system's inability to determine whether a vessel is steaming or trawling. Decision rules have been built into the VMS software that assume a vessel is steaming if its estimated travelling speed is at or above 5 knots. If the VMS detects a drop below this speed, the vessel is assumed to be trawling. As has been demonstrated by the review into steaming days in August 2001<sup>28</sup>, this assumption is not always correct. Smaller vessels have difficulty attaining a travelling speed of 5 knots during rough seas.

A three-year FRDC-funded project (No. 2002/056) entitled "*Innovative stock assessment and effort mapping using VMS and electronic logbooks*", hereafter referred to as "the VMS Mapping Study", was started in January 2003 by Hoyle (QDPI, AFFS). This project's aim is to develop precise maps of trawl tracks and trawl effort distribution by examining VMS-generated trawl tracks and then to develop trawl signatures, trawl tracks and catch distribution functions for each sector of the ECTF. It is hoped the results of this study will enable a more precise analysis of trawl effort and catch distribution in the fishery and when a vessel is actually trawling.

Notwithstanding the outcomes of this FRDC project, it is noted that the benefits of the VMS could be augmented with the introduction of gear sensors, which could record the length and time of each trawl shot. Accurate information on fishing time in turn allows scientists to calculate the area swept by the net for fishery assessments purposes. The importance of accurate effort analysis in an input-managed fishery is discussed further in Section 5.

It is acknowledged that gear monitors in the ECTF are untested. However, a feasibility study by Terravision on possible gear sensors, entitled "*Scoping study to determine a method to remotely monitor trawler operations*"<sup>29</sup>, was presented to the GBRMPA and QFS in June 2002. The study concluded that while there are some operational difficulties to overcome, gear sensors in the ECTF would be both feasible and of benefit. To date, the QFS and industry have been reluctant to consider the development of this technology.

### **Recommendation 5**

- *That the development of gear monitors in the ECTF be pursued to a prototype stage and that a cost-benefit analysis be undertaken on the use of this system as a fisheries management and monitoring tool.*

## **4.3.2 Commercial Fisheries Logbook Program**

A legal requirement for commercial fishers to fill in logbooks has been in place in Queensland since the beginning of 1989. In order to process the information derived from these commercial logbooks, a database called the "*Commercial Fisheries Information System*" (CFISH) was implemented in 1992 by the then QFMA. The "*East Coast Trawl Fishery (ECTF) Logbook*", and the information derived from it, is part of this commercial fishery-wide information system.

The ECTF logbook format has been revised several times since 1988. The logbook in use for the period of the audit was the seventh version (i.e. the OT07). This version was in force from March 2000 to December 2002 and subsequently was replaced by the OT08. The latest logbook has addressed several of the shortfalls identified in the OT07 throughout this audit.

As a general observation, information fields in the ECTF logbook have become more detailed over time. Earlier logbooks requested only basic catch and effort information on major product groups (i.e.

<sup>28</sup> "Fisheries (East Coast Trawl) Management Plan 1999 Review Paper - Permitted Fish (other than principal fish) and Steaming Day Review", prepared by QFS (August 2001).

<sup>29</sup> The Terravision study was jointly funded by the GBRMPA and the QFS.

primarily prawns). No information was collected on either minor target species or by-product. While this shortfall had been rectified in the OT07 (and its successor), time series records on by-product spanned only two years at the writing of the Audit Report. Such a lack of historical information on the take of by-product was a major limitation in reviewing possession limits for permitted species (other than principal species) in late 2001<sup>30</sup>.

As outlined in Section 3, the ECTF is a multi-species fishery, with different sectors targeting different species mixes throughout the fishery. In an attempt to keep the logbook user-friendly and to ensure compliance by industry with the information demands, certain species were grouped together in the OT07<sup>31</sup>. However, from a stock assessment perspective it is important to have more detailed information on species composition (this is discussed further in Section 5). The OT08 now provides separate columns for each of the permitted species, but given that catch frequently is not separated at a species level, the accuracy of this information is questionable.

In the ECTF, several target species may co-occur in one trawl habitat type (such as tiger and endeavour prawns in the Great Barrier Reef lagoon). The ECTF logbooks have not recorded targeting information. Arguably, targeting data are of limited value, as such information frequently is entered after the shot has been completed and the catch has been sorted. However, from a stock assessment perspective, it is important to record fully all details of the attributes of the fishing operation and the location of capture, which contribute (together with the abundance of the species) to the species composition of the catch. With these data, statistical analysis may permit a determination of the way in which the various factors influence the catch composition of the different species (this is discussed further in Section 5).

As outlined in Section 6, the level of bycatch in trawl fisheries is of major concern both to the general public and to the GBRMPA. Although generally high, the amount of bycatch in the ECTF varies with season, location and target species composition. No trawl logbooks to date have recorded information on the amounts, species composition and status (live/dead) of discards. From a logistical point of view, this is understandable. If such information is required, it would add to the complexity of logbook design and, in any case, the data provided could not be verified. However, this highlights the need for bycatch information being derived through an alternative source.

Having outlined the major areas where the trawl logbook cannot provide adequate information on the fishing operations to enable more detailed fishery assessment, greater use of specific, statistically well-designed, monitoring programs (such as at-sea observer programs or fishery-wide surveys) is advocated. It is recognised that annual surveys are being conducted in the ECTF for certain key species (see Section 4.3.4). However, it is recommended that these programs be extended to provide fishery-wide coverage.

Surveys and observer programs are frequently the only way to obtain accurate and detailed fishing information. For example, such monitoring would provide data on the entire catch composition (including bycatch). Detailed operational information for the analysis of species abundance also can be obtained, as well as relevant biological data such as size composition data for age and growth analysis.

The strength of an at-sea observer program is that it allows for the verification of commercial logbook data. However, it is recognised that in order to obtain a statistically representative coverage of commercial activity, such a program would need to be extensive and hence be quite costly. As current work by Courtney *et al.* (FRDC Project No. 2000/170) has shown, there can considerable variation in

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<sup>30</sup> “Fisheries (East Coast Trawl) Management Plan 1999 Review Paper - Permitted Fish (other than principal fish) and Steaming Day Review”, prepared by QFS (August 2001).

<sup>31</sup> Species assemblages that are grouped for the principal and permitted species included Grooved/Brown Tiger Prawns, Blue/Red Endeavour Prawns, Saucer/Mud Scallops, Greasy/Bay/Coral/ School/ Other Prawns, Reef/Mud Bugs, Squid, Octopus, Cuttlefish, Whiptails, Pinkies and Goatfish.

the performance of fishing gear between boats. This leads to uncertainty in the analysis of the monitoring data (see Table 21).

These fishery-wide monitoring programs should be designed in a way that can detect changes in species abundance or fishing practices, should these occur. Estimates of the uncertainty or precision should be available for the amount of catch and bycatch taken and for the biological data that are collected, if the information is to be assessed appropriately.

#### **Recommendation 6**

- *That the QFS determines and implements specific and statistically well-designed fishery-wide monitoring programs, which supplement the existing programs and provide essential fishery assessment information currently not provided through the trawl logbook.*

Once the Trawl Plan is accredited under Sections 208A, 222A, 245 and 265 of the *EPBC Act*, licence holders must report all interactions with listed marine species, migratory species, threatened species and cetaceans<sup>32</sup>. The onus clearly is on the operator to report to EA on this matter. The OT07 requested information on incidental turtle captures by trawlers, but was silent on the other species listed under environmental legislation, such as seahorses and pipefish, sea snakes, listed sharks (great white, grey nurse and whale shark), dolphins, whales and dugong. This inconsistency has now been addressed, with the QFS providing a separate logbook for the recording of interactions with species of conservation interest. In terms of assessing the impact of the ECTF on associated species, it would be of assistance to have this information monitored and made available on a regular basis.

#### **Recommendation 7**

- *that the interaction of trawl operations with species of conservation interest (as listed under the EPBC Act) be reported annually in the Status Report for the ECTF.*

Earlier versions of the trawl logbook permitted operators to nominate fishing activity within a 30'x30' grid. The OT07 improved the geographical information on the fishery by requiring that the location of fishing operations be recorded to the nearest 6' x 6' grid or by precise latitude and longitude. Due to the highly localised nature of trawl operations, this change is a significant improvement in the spatial resolution of trawl data. As outlined in Section 5, detailed spatial analysis is important from a stock assessment point of view, especially with respect to assessing localised depletion or determining habitat-associated abundance of species (such as syngnathids) within the area of the fishery.

As was shown by a preliminary analysis of VMS data, even within a 6nm square area, fishing is likely to be restricted to only a small portion of that grid (Williams, 2002). A comparison of the logbook data with the finer-scale VMS data would provide a more spatially resolved picture of the extent of trawling. The VMS Mapping Study by the Hoyle (QDPI ADFS) has begun integrating VMS and logbook data. At this stage, there were only two years of VMS data available at the end of 2002 and the pattern of operation by the fleet after the fishery restructure may not be indicative of its longer-term pattern. However, the project will determine a process for monitoring fishing effort changes, which can be applied to future trawl data.

#### **Recommendation 8**

- *That, as the results of the VMS interpretation study become available, a fine-scale analysis of VMS data be integrated with the logbook data analysis in the fishery assessment process.*

As in other prawn fisheries, there have been significant improvements in gear and vessel performance over time. This is due to the introduction of improved fishing and navigation technology. O'Neil *et al.* (QDPI, ADFS) have documented "effort creep" in the ECTF in a three-year FRDC-funded study

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<sup>32</sup> The requirement for the reporting of these species technically does not begin until EA assesses the ECTF and accredits the management arrangements by issuing a Wildlife Trade Operation Approval under Section 303FN of the *EPBC Act*.

entitled “*Reference point management and the role of catch-per-unit effort in prawn and scallop fisheries* (FRDC Project No. 1999/120), hereafter referred to as the “Effort Creep Study” (See Section 5.2.3).

With the introduction of the revised Trawl Plan in early 2001 (and in particular with the easing of vessel upgrade restrictions), further (and potentially significant) changes are expected in effort creep across the fleet. The OT07 and its successor record gear information on an annual basis. However, the accuracy of these data and the compliance with the reporting requirement are unknown. As demonstrated in the Northern Prawn Fishery, the determination of effort creep in a fishery generally warrants a separate and well-designed study, which can determine the often confounding effects of miscellaneous technological factors. The type of data collected through logbooks can serve as a valuable basis to plan such a study.

#### **Recommendation 9**

- *That the information provided on the logbook gear sheets be reviewed annually as part of the fishery assessment process and that this information be used in the planning of on-going assessments of effort creep.*

Having described the limitations of the ECTF logbook data in terms of coverage, the audit also questions the general accuracy of the information provided. The QFS conducts a number of checks during data entry to test the logbook information for “normality”. However, there are no processes in place to validate the logbook data. Anecdotal reports suggest that there is some justification for concern over this matter.

The effort unit allocation process in 2000 highlighted numerous disputes over recorded fishing history and daily activity records, highlighting the fact that the historical logbook information is open to challenge. Furthermore, a three-year FRDC-funded study by Connolly *et al.* on “*Trawl bycatch of syngnathids in Queensland: catch rates, distribution and population biology of Solegnathus pipehorses (seadragons)*” (FRDC Project No. 1999/124), hereafter referred to as the “Syngnathid Study”, indicated a significant under-reporting of syngnathids by operators when compared to processor records.

The impact of this uncertainty over the quality of the logbook data is discussed further in Section 5. However, it is noted that the assessment of the ECTF relies predominantly on the catch and effort data derived from the trawl logbook. Therefore, it is of concern that the assessment of the fishery is based on non-validated data. The audit recommends that there be a “ground-truthing” of the logbook data through an at-sea observer program aboard the commercial fleet. Validation of the logbook data through secondary sources (such as processor records and at-sea boarding reports by compliance officers) would also assist.

An added advantage of such an observer program is that it would not only validate, but also supplement, the logbook data. As outlined above, there are major gaps in the information provided in the logbooks. Observers aboard the commercial fleet could fill in these gaps, thus providing base line data that assist in the planning of such fishery-wide monitoring programs.

#### **Recommendation 10**

- *That the QFS determines and implements an at-sea observer program, which validates the information provided in the trawl logbooks.*

### **4.3.3 Electronic Catch and Effort Recording System**

An Electronic Catch and Effort Recording System (ECERS) has been developed for the ECTF, which allows operators to transmit their logbook data electronically. This is a voluntary arrangement at

present. Operators, who avail themselves of this service, need on-board computers and C-plot software. According to QFS reports, ECERS is used only by the larger vessels, which operate in the northern part of the fishery. Some 50 operators currently forward logbook information electronically. This number is expected to increase with the development of more user-friendly software.

The obvious advantage of ECERS is the speedy transmission of catch and effort data, allowing real-time monitoring of the fishery. It may also reduce some of the management costs associated with the processing of hard copy returns, thereby freeing up valuable resources. However, no cost-benefit analysis has been done to date on the introduction of the ECERS in the ECTF.

During the period of the audit, there was a six-month delay in summarising the logbook data<sup>33</sup>. This delay was in part caused by late and erroneous logbook returns. Such delays are of concern with respect to the fishery in the GBR World Heritage Area. As outlined in Section 3, an effort cap applies to the number of days that may be fished in this area. Once that level is reached, the fishery is closed in the GBR World Heritage Area. In 2001, fishing effort was well below the effort cap. However, in 2002 it came close to the cap. This demonstrated the need for real-time data in the ECTF. It is recognised that the VMS could be used as a tool to monitor fishing days on a real-time basis, but the ability of operators to apply for the reinstatement of fishing days (see Section 7.3.2.) introduces uncertainty in the effort data.

#### ***Recommendation 11***

- *That a feasibility study be undertaken on the introduction of an ECERS throughout the ECTF, specifically with a view to monitoring the level of fishing activity in the GBR World Heritage Area on a real-time basis.*

### **4.3.4 Fishery-independent Surveys**

Section 4.3.2. of the Audit Report argues for fishery independent-surveys in the ECTF, because of the information gaps contained by the logbook data. This section discusses the fishery-independent surveys currently in place for the ECTF. These surveys are known as Long Term Monitoring Programs (LTMPs) and have been conducted by the QFS on a number of key fisheries. With respect to the ECTF, LTMPs are carried out for the scallop and North Queensland prawn fisheries.

#### **4.3.4.1 The North Queensland Prawn LTMP**

The North Queensland prawn LTMP operates in the northern part of the ECTF, between Torres Strait and Cape Flattery. Tiger, endeavour and northern king prawns are the dominant catch in this region. The need for this monitoring program was first suggested at a stock assessment workshop in August 1998, when tiger prawns were identified as a species that should be monitored using fishery-independent data because of their vulnerability to overfishing.

The aim of the North Queensland Prawn LTMP is to monitor recruitment of juveniles into the fishery and to determine (if possible) the relationship between stock and recruitment.

The survey is carried out in February, prior to the opening of the Northern Closure on 1 March each year. With the inclusions of the Cairns to Townsville sector, more than 70 sites are sampled regularly in the Far Northern Section of the Marine Park. Five years of data have now been collected for the North Queensland Prawn Fishery.

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<sup>33</sup> The 2001 ECTF Status Report was not released until September 2002, although the data had been finalised by mid 2002.

#### **4.3.4.2 The Scallop LTMP**

The Scallop LTMP operates in the southern part of the ECTF, on the major scallop grounds between Yeppoon and Bundaberg. Following concerns over poor recruitment and low catch rates in 1996/97, spatial closures were implemented to protect broodstock in areas of high density. A scallop LTMP was implemented in 1997 to provide monitoring information for stock protection and fishery analysis.

The aim of the scallop LTMP is to assess recruitment levels, size structure and population densities in areas of high fishing activity and in the rotational area closures.

The survey is conducted around the neap tides following the October new moon each year, during the southern seasonal closure. Originally, about 400 sites were sampled within the area of the scallop fishery, using prawn trawl gear and 20-minute shots. The number of sites was reduced to 150 in 2001. The DPI has 5 years of scallop survey data, which will be built into the stock assessment, modelling and predictive assessments as the data base builds over time.

#### **4.3.4.3 General Comments about the LTMPs**

The LTMPs in the ECTF are designed to provide annual snapshots of species abundance and recruitment to the fishery. However, one of the limitations of the current ECTF LTMPs is that they are conducted only in major commercial grounds (i.e. areas of highest commercial value because of high species abundance). Due to the cost of surveys and the difficulties in obtaining access to previously untrawled (i.e. generally closed) areas, coverage is not provided for the species' entire range of distribution. This introduces a bias into the results and makes it difficult to extrapolate about species abundance outside the major trawl grounds. The implications of this are discussed further in Section 5.

The design of fishery-independent surveys is crucial in terms of the future use of the data for fishery analysis. The surveys should be robust to changes that are likely to occur in the fishery and the (as yet unidentified) data that may be required for future analyses. Most importantly, the data need to be accurate and sufficiently precise to enable their use in stock assessment. The Audit Report does not advocate that information is obtained for the sake of "data collection". It is important that the data are analysed and used in integrated assessments as they become available, rather than waiting until a sufficiently long time series of data becomes available.

In addition to collecting information on the target species, each LTMP collects information on the by-product and bycatch of these fisheries. For example, data on the size composition and abundance of a number of other species (including blue swimmer crabs, Moreton Bay bugs and pipefish) are collected during the scallop LTMP. However, as these data are collected on an opportunistic basis, they are not statistically robust and are hence of limited fishery assessment use. It is noted that the LTMP-generated bycatch information may provide a basis for planning future specific bycatch studies.

The value of data from any well-designed fishery-independent survey increases with time, as it allows for the determination of long-term fishery trends. Ideally, data should be collected over many years before stock trends can be assessed with any degree of accuracy and proper stock-recruitment relationships can be modelled. At the time of the preparation of the Audit Report, five years of data had been collected from the scallop and North Queensland Prawn LTMPs. The continuation of this work is supported. However, given the funding concerns discussed in Section 4.1.5, there is uncertainty over the scale of future monitoring work. Any changes to the programs should be evaluated carefully in terms of their impact on the existing data sets.

It is acknowledged that, within the GBR Marine Park, the scallop and North Queensland Prawn LTMPs cover the species of highest commercial value. Species of lesser commercial value (like banana prawns, bugs and bay prawns) and eastern king prawns (which occur predominantly outside the Marine Park) are not targeted by the surveys. It is recognised that fishery-independent surveys are

costly, but if they are properly designed they can yield valuable data generally not provided by logbooks. The extension of the current surveys to cover the entire ECTF on a periodic basis should be considered.

#### **Recommendation 12**

- *That a peer review be conducted on the design of the current ECTF LTMPs, with a view to:*
- (a) identifying the bias in sampling established trawl grounds;*
  - (b) assessing the use of the data in current and future stock assessments; and*
  - (c) extending the spatial coverage of the surveys.*

#### **4.3.5 ECTF-Related Research**

Research is a crucial source of fishery-independent information for the assessment and management of fisheries. Sections 4.1 and 4.2 have described the institutional arrangements and processes for ECTF-related research in general terms. This section specifically discusses the type of research conducted in this fishery.

A list of ECTF-related research in 2001/2002 is provided in Appendix 5. Information on relevant past research is included in the bibliography (Section 8). Historically, research has concentrated on establishing biological parameters for the key target species, developing TED technology and quantifying the environmental effects of trawling (including the composition and spatial distribution of bycatch). In recent times, funding has been sought for projects focusing on reducing environmental impact (such as the assessment of bycatch in trawling and development of bycatch reduction technologies) and projects to supplement the monitoring and assessment function of the managing agency (such as stock assessments based on reference points and risk assessment).

Tables 5 to 8 summarise the research to date on the species taken in the ECTF or its wider ecosystem. As outlined below, some information is available on the principal species (Table 5), but information is more limited on the permitted species (Table 6). As described in a “*Literature Review: The biology and population dynamics of permitted fish species in the Queensland East Coast Trawl Fishery*” (Haddy, 2002), research on permitted species generally is limited to basic biological studies on taxonomy, growth and reproduction. Information is even more scant for bycatch taken in the ECTF (Table 8).

**Table 5:** Research on the principal species listed under the Trawl Plan (Information Source: Literature Review).

Common Name	Species	Research Studies
Tiger Prawns	<i>Penaeus esculentus</i> <i>Penaeus semisulcatus</i> <i>Penaeus monodon</i>	<ul style="list-style-type: none"> <li>➤ Studies on spawning and recruitment (Courtney <i>et al.</i>, 1991; Courtney, 1995)</li> <li>➤ Studies on reproductive biology (Die <i>et al.</i>, 1995)</li> <li>➤ Effects of closures (Gribble &amp; Dredge, 1992; Gribble &amp; Dredge, 1994; Gribble &amp; Turnbull, 1996)</li> <li>➤ Stock assessment work (Gribble &amp; Turnbull, 2002);</li> </ul>
Eastern King Prawn	<i>Penaeus plebejus</i>	<ul style="list-style-type: none"> <li>➤ Studies on spawning and recruitment (Courtney, 1995)</li> </ul>

Common Name	Species	Research Studies
		<ul style="list-style-type: none"> <li>➤ Studies on distribution and abundance (Montgomery <i>et al.</i>, 1995)</li> <li>➤ Studies on periodicity and reproductive condition (Courtney <i>et al.</i>, 1991; Courtney <i>et al.</i>, 1995)</li> <li>➤ Stock assessment workshop (Dichmont <i>et al.</i>, 1999)</li> </ul>
Scallops	<i>Amusium japonicum balloti</i> <i>Amusium pleuronectes</i>	<ul style="list-style-type: none"> <li>➤ Studies on reproductive biology (Dredge, 1981; Williams &amp; Dredge, 1981; Sumpton &amp; Dredge, 1990; Robins-Troeger &amp; Dredge, 1993)</li> <li>➤ Stock assessment work (Dredge, 1985; Dredge, 1988; Dredge 1989; Dredge 1992; Dichmont <i>et al.</i>, 1999)</li> <li>➤ Scallop survey results (Dichmont <i>et al.</i>, 2000)</li> </ul>
Endeavour Prawns	<i>Metapenaeus endeavouri</i> <i>Metapenaeus ensis</i>	<ul style="list-style-type: none"> <li>➤ Studies on reproductive biology (Courtney <i>et al.</i>, 1995; Courtney &amp; Dredge, 1988)</li> </ul>
Northern King Prawn	<i>Penaeus longistylus</i> <i>Penaeus latisculatus</i>	<ul style="list-style-type: none"> <li>➤ Studies on reproductive biology (Courtney &amp; Dredge, 1988)</li> <li>➤ Studies on biological parameters (Dredge, 1990)</li> </ul>
Bugs	<i>Thenus</i> spp <i>Ibacus</i> spp <i>Scyllaroides</i> spp	<ul style="list-style-type: none"> <li>➤ Studies on biological parameters and yield optimisation (Courtney, 1995)</li> </ul>
Banana Prawns	<i>Penaeus merguensis</i>	<ul style="list-style-type: none"> <li>➤ Studies on reproductive biology (Dredge, 1985)</li> </ul>
Squid	<i>Photololigo</i> spp <i>Sepioteuthis lessoniana</i> Other species	<ul style="list-style-type: none"> <li>➤ Squid fishery review (Dunning <i>et al.</i>, 2000)</li> </ul>

**Note:** 1 The above literature review was compiled during the writing of the Audit Report. It may not include all relevant references to research publications and workshop proceedings.

2 Bay Prawns were excluded from Table 5 as they are generally taken outside the GBR Marine Park.

**Table 6:** Research on the permitted species listed under the Trawl Plan.

Common Name	Species	Research Studies
Pipehorses	<i>Solegnathus hardwickii</i> <i>Solegnathus dunckeri</i>	<ul style="list-style-type: none"> <li>➤ The two commercial pipehorses in the ECTF were part of a major study, but there is limited information on the other (non-commercial) species (Connolly <i>et al.</i>, 1999)</li> </ul>
Balmain Bugs	<i>Ibacus</i> spp (5)	<ul style="list-style-type: none"> <li>➤ Little information is available on the species' distribution and biology in Queensland</li> <li>➤ Some research has been conducted on the species' distribution and biology in NSW (Stewart &amp; Kennelly, 1998 and Stewart &amp; Kennelly, 2000)</li> </ul>
Barking Crayfish	<i>Linuparus trigonus</i>	<ul style="list-style-type: none"> <li>➤ Little information is available on the species'</li> </ul>

Common Name	Species	Research Studies
		<p>distribution and biology in Queensland</p> <p>➤ Some research has been done on the reproductive capacity and biology of Australian barking crays (Wassenberg &amp; Hill, 1989)</p>
Cuttlefish	<i>Sepia</i> spp (15) <i>Metasepia pfefferi</i>	<p>➤ Information on the species' taxonomy and biology is generally poor, but some research has been conducted on the identification of Australian cuttlefish (Norman &amp; Reid, 2000)</p>
Mantis Shrimp	<i>Squillaidea</i> (8)	<p>➤ Given their Indo-West Pacific-wide distribution, international research has been conducted on Mantis Shrimps (principally in India and Japan)</p> <p>➤ Some research has been done on the taxonomy of the Australian stomatopod fauna (Ahyong, 2001) their biology and reproduction (Ruppert &amp; Barnes, 1994)</p>
Octopus	<i>Octopus</i> spp (8 –10)	<p>➤ Information on the species' taxonomy and biology is generally very poor, but some taxonomic descriptions and biogeographical data are available for Queensland (Norman, 1998)</p>
Pinkies	<i>Nemipterus</i> spp (5)	<p>➤ Given their wider distribution throughout South East Asia, there is some international research conducted on nemipterids</p> <p>➤ Several Australian studies have examined their reproductive biology and diet (Eggleston, 1972, Sainsbury &amp; Whitelaw, 1984 and Samuel, 1990)</p>
Red Spot Crab	<i>Portunus sanguinolentus</i>	<p>➤ Given the wide global distribution of Portunid crabs, information is known about their bycatch throughout the Indo-West Pacific region</p> <p>➤ Some information is also available on their role in ECTF bycatch (Wassenberg &amp; Hill, 1982) and reproductive biology (Sumpton <i>et al.</i>, 1989 and Campbell &amp; Fielder, 1986)</p>

**Note: 1** The above literature review was cited in the QFS' review of permitted species (Haddy, 2000). It may not include all relevant references to research publications and workshop proceedings.

2 No information was presented on goatfish and sharks, as both species groups have been removed from the list of permitted species under the amended Trawl Plan.

**Table 7:** Research on species of conservation interest as listed under the EPBC Act (Information Source: Literature Review).

Common Name	Species	Research Studies
Turtles	<i>Chelonia mydas</i> <i>Caretta caretta</i> <i>Natator depressus</i> <i>Eretmochelys imbricata</i> <i>Lepidochelys olivacea</i> <i>Dermochelys coriacea</i>	<p>➤ Voluntary turtle logbook program conducted by QDPI in mid 1990's;</p> <p>➤ Extensive work on TED technology (Robins <i>et al.</i>, 2000), turtle interaction with trawl gear in the NPF (Brewer <i>et al.</i>, 1997) and in the ECTF (Robins, 1995; Robins &amp; Mayer, 1993)</p>

Common Name	Species	Research Studies
		(Robins, 1995; Robins & Mayer, 1993)
Sea Snakes	Miscellaneous spp of the Families Hydrophiidae and Laticaudidae	➤ Susceptibility of sea snakes to trawling (Ward, 2000; Ward, 2001; Wassenberg <i>et al.</i> , 2001, Milton, 2001)
Seahorses & Pipefish	Miscellaneous spp of the Family Syngnathidae, including <i>Solegnathus dunckeri</i> and <i>Solegnathus hardwickii</i>	➤ Population parameters and distribution of syngnathids in trawl bycatch (Connolly <i>et al.</i> , 1999)

**Table 8:** Research on species taken as bycatch and wider ecosystem impact studies in the ECTF.

Area of Research	Research Studies
Effects of trawling	<ul style="list-style-type: none"> <li>➤ Studies on the benthic impact of trawling (Poiner <i>et al.</i>, 1999; Pitcher <i>et al.</i>, 2000)</li> <li>➤ Studies on trawl bycatch species and ecological communities of prawn trawl grounds (Cannon <i>et al.</i>, 1987; Watson <i>et al.</i>, 1989; Watson <i>et al.</i>, 1990; Blaber <i>et al.</i>, 1997; Robins <i>et al.</i>, 1998; Stobutzki <i>et al.</i>, 1997; Robins &amp; Courtney, 1999; Stobutzki <i>et al.</i>, 2001)</li> <li>➤ Studies on the impact of trawling on scallops (Jones &amp; Derbyshire, 1988; Dredge, 1989; Jenkins <i>et al.</i>, 2001)</li> </ul>
Trophic Interactions	<ul style="list-style-type: none"> <li>➤ Studies on the provisioning from trawlers (Blaber &amp; Wassenberg, 1989; Blaber &amp; Milton, 1994; Hill &amp; Wassenberg, 1992)</li> <li>➤ Studies on the demersal fish predators of prawns (Blaber <i>et al.</i>, 1990)</li> </ul>
Alternatives to Trawling	<ul style="list-style-type: none"> <li>➤ Feasibility of prawn trapping (Buckworth, 1992)</li> </ul>

**Note: 1** The above literature review was compiled during the writing of the Audit Report. It may not include all relevant references to research publications and workshop proceedings.

Much of the ECTF research is carried out on an "opportunistic basis". Research on trawl-related species is sometimes the subject of a PhD study (such as Robins' work on turtles and TEDs) or part of a wider institutional research program spanning several fisheries and jurisdictions (such as Stobutzki's work on the ecological sustainability of bycatch and biodiversity in prawn trawl fisheries). Given the large number of ECTF species and limitations on research funding, these approaches clearly maximise research opportunities.

However, an opportunistic approach lends itself to becoming "interest driven" and lacking overall cohesion in the absence of strong research direction through a well-published R&D Plan. The Trawl MAC<sup>34</sup> (through its SAG) identified bay prawns, red spot king prawns, squid and barking crays as "key research issues"<sup>35</sup>. Clearly, these are species (like many others) where there is limited information available to assess the impact of the fishery on their sustainability. It is recommended that

<sup>34</sup> Trawl MAC 2/2002 (2 December 2002);

<sup>35</sup> Stout whiting was also included under the key issues, but since this species occurs outside the Marine Park it is not listed;

Trawl MAC carry out an in-depth analysis of the outcomes of past and current research and, in light of this, identify research priorities for the fishery.

#### **4.3.6 Non-commercial Fisheries Information**

As with the commercial fisheries data, the QFS has implemented an ongoing Recreational Fisheries Information System (RFISH) based on a number of State-wide telephone surveys<sup>36</sup> and a diary program<sup>37</sup>. As mentioned in Section 3.2.1.3, the QDPI conducts a biennial recreational fishing survey. However, the information on the take of ECTF species is limited. All prawn species are listed under the category of “prawns/banana prawns” and there is no geographical or temporal analysis of catches (Higgs & McInnes, 2001).

With respect to the Indigenous take of ECTF species, the ECOTF Assessment Report states that “*the National Recreational and Indigenous Fishing Survey undertaken during 2000/2001 will provide a snap-shot of indigenous take in selected communities of North Queensland. It is anticipated that results will be available in late 2002.*” (Zeller, 2002). This information was not available at the writing of the Audit Report.

### **4.4. The Audit Report’s Assessment against the Commonwealth Guidelines**

#### **With respect to Guideline 1.1.1**

The information systems in place for the ECTF incorporate a mix of fishery-dependent and fishery-independent research and monitoring. However, due to limited funding, the ECTF logbook data have become the primary source of information. Given the reliance on CPUE data for stock assessment in this fishery, it is of concern that the logbook data are not validated. This introduces uncertainty regarding the reliability of these data and, consequently, the validity of any resultant stock assessments is suspect. Furthermore, as there are constraints in the manner with which information is collected for target and by-product species (such as species grouping and a lack of targeting information), sound stock assessment is jeopardised further.

Fishery-independent surveys and research could overcome the limitations of the logbook data. However, because current surveys are spatially and species restricted, they provide an incomplete picture of the fishery. An at-sea observer program for the ECTF would be a useful step to address the question of accuracy of the logbook data and would provide additional fishing information that generally is not recorded by operators.

#### **With respect to Guidelines 2.1.1, 2.2.1 and 2.3.1**

Aside from collecting unverified information on the interaction of prawn trawlers with marine turtles, no other information was collected on the impact of the ECTF on listed marine species, migratory species, threatened species and cetaceans until the end of 2002. The introduction of a separate logbook for the interaction of trawlers with species of conservation concern has provided a basis on which to compare reported interaction data with at-sea observer programs. Consequently, the QFS will be in a better position to monitor and report on the impact of the ECTF.

Reliable information on the impact of the ECTF on ecological communities and the wider ecosystem can be collected only through fishery-independent surveys and specific research programs. While some of this work is or has been conducted (especially with respect to trawl bycatch and the environmental effects of benthic trawling), it does not cover the entire ECTF and needs to be expanded to obtain a comprehensive picture.

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<sup>36</sup> These phone surveys were conducted in 1986, 1996, 1998 and 2000;

<sup>37</sup> The diary programs were run in 1997 and 1999;

