



Contents lists available at ScienceDirect

Continental Shelf Research

journal homepage: www.elsevier.com/locate/csr

Harvest patterns and effort dynamics of indigenous and non-indigenous commercial sectors of the eastern Torres Strait reef line fishery

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ARTICLE INFO

Article history:

Accepted 10 March 2008

Available online 8 April 2008

Keywords:

Catch statistics
Fishing effort
Reef fisheries
Fishery resources
Fishery management
Indigenous fisheries
Torres Strait
Australia

ABSTRACT

The reef line fishery (RLF) in eastern Torres Strait (ETS) is unique in that it has both a commercial indigenous sector and a commercial non-indigenous sector. Recently, concerns have been expressed by all stakeholders about the long-term sustainability of the fishery. These concerns have been exacerbated by the lack of detailed catch and effort information from both sectors, which has precluded any formal assessment of the fishery. In this paper, we characterise the harvest patterns and effort dynamics of the indigenous and non-indigenous commercial sectors of the ETS RLF using a range of data sources including commercial logbooks, community freezer records, voluntary logbooks and observer surveys. We demonstrate that bycatch is a significant component of the catch for both sectors and identify substantial differences in harvest patterns and effort dynamics between the sectors. Differences between sectors were observed in species composition and spatial and temporal patterns in catch, effort and catch per unit effort. These results highlight the inherent variation in catch and effort dynamics between the two commercial sectors of the ETS RLF and provide valuable information for the development of future assessments and appropriate management strategies for the fishery. The more reliable estimates of harvest patterns and effort dynamics for both sectors obtained from observer surveys will also assist in resolving issues relating to allocation of reef fish resources in Torres Strait.

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1. Introduction

Catch and effort data have long formed the basis of most stock assessments of exploited fish populations where catch per unit effort (CPUE) is used as an indicator of relative abundance (Beverton and Holt, 1957; Hilborn and Walters, 1992). Problems associated with the use of CPUE as an indicator of stock abundance have been well documented (e.g., Beverton and Holt, 1957; Paloheimo and Dickie, 1964; Harley et al., 2001) and are typically associated with a lack of fundamental information about the stock and behaviour of fishers. For example, variation in catchability due to spatial and temporal variation in fishing patterns or schooling behaviour of fish can decouple the relationship between CPUE and abundance (Hilborn and Walters, 1992). Commercial fishing logbooks are often the primary source of catch and effort data for stock assessments, but in many cases the information recorded in logbooks is reported at broad spatial and temporal scales and, in multi-species fisheries, catch is often reported in species groups (Mapstone et al., 1996). Such data can

be insufficient for reliable estimates of catch and effort and may lead to serious biases in estimates of CPUE (Walters, 2003). Gaining an understanding of the catch and effort dynamics of a fishery at spatial and temporal scales relevant to the stock and fishery is a fundamental step towards reliable stock assessments and a sustainable fishery.

For centuries, there has been an indigenous Islander subsistence fishery for reef fish in Torres Strait (Johannes and MacFarlane, 1991). Traditionally, subsistence harvest of reef fish was concentrated on fringing island reefs around the inhabited islands (Mapstone et al., 2003), using a variety of traditional methods and gears (Fuari, 1991; Johannes and MacFarlane, 1991; Poiner and Harris, 1991; Harris et al., 1994). Today, however, reef fish are harvested by indigenous fishers for both subsistence and commerce using both modern and traditional fishing methods and gears (Mapstone et al., 2003). Commercial fishing for reef fish by indigenous fishers is thought to have begun in the late 1980s (Mapstone et al., 2003), and has since become the most economically important industry for indigenous Islanders in Torres Strait (TSPZJA, 2003). Indigenous Islanders have gained the capacity and economic incentive to fish further afield, and reef fish are now harvested by indigenous fishers from reefs beyond their home island reefs (Mapstone et al., 2003; Begg and Murchie, 2004).

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Commercial harvest of demersal reef fish in the reef line fishery (RLF) of eastern Torres Strait (ETS) is shared between indigenous and non-indigenous fishers (Begg and Murchie, 2004). A commercial fishery for reef fish by non-indigenous fishers has existed in Torres Strait since the 1950s (Haysom, 2001). Commercial fishing by non-indigenous fishers was previously done from vessels travelling to Torres Strait from ports on the east coast of Queensland. More recently though, non-indigenous commercial fishing operations have been able to remain in Torres Strait almost year round (Mapstone et al., 2003) by offloading product and replenishing supplies from barges that service Torres Strait from ports on the east coast for most of the year (Begg and Murchie, 2004). Non-indigenous commercial fishing operations for reef fish are similar to the line fishing operations on the Great Barrier Reef (GBR), whereby fishing is done from a number of powered dories (typically 4–6 m long), which are tendered to a larger (15–20 m) primary vessel (Mapstone et al., 1996; Scott and Mulrennan, 2003). Unlike the fishery on the GBR, however, reef fish caught in Torres Strait are currently not permitted to be sold alive.

The indigenous and non-indigenous commercial sectors of the ETS RLF share the same resource and target the same suite of species (Begg and Murchie, 2004), with coral trout (*Plectropomus* spp.) being the main target species (Williams, 2002; Mapstone et al., 2003; AFMA, 2005a). Both sectors also operate using similar hook-and-line fishing gears and methods. Indigenous fishers primarily operate from the islands using small powered dories similar in size to non-indigenous fishers' dories, and sell the commercial portion of the catch to island community freezers (Mapstone et al., 2003; Begg and Murchie, 2004). Both sectors are subject to the same regulations, with the exception that indigenous Islanders are not restricted by size or bag limits on fish retained for subsistence use (Mapstone et al., 2003). This dual commercial sector nature of the ETS RLF has led to conflict in the past between the sectors over the allocation of the resource (Begg and Murchie, 2004).

Despite the apparent similarities between the two sectors, little is known about the harvest patterns and effort dynamics of each sector. Until recently, existing data about the RLF in Torres Strait were scarce and limited to catch and effort information on a coarse spatial and temporal scale from compulsory commercial logbook data for the non-indigenous sector (Mapstone et al., 2003). A recent review of the indigenous catch reported in island community freezer records (Begg and Murchie, 2004) provided some insight into the catch and effort dynamics of the indigenous sector of the ETS RLF. However, the spatial and temporal resolution of existing data from both sectors was too coarse to obtain accurate estimates of catch and effort for the fishery, even for the target species (Mapstone et al., 2003; Begg and Murchie, 2004). The lack of sufficient resolution in the data has precluded the development of a formal stock assessment for the ETS RLF, which has led to uncertainty about the current status of reef fish stocks in Torres Strait and the sustainability of the fishery.

Detailed information on the resource use for both the indigenous and non-indigenous commercial sectors of the ETS RLF is needed to develop an initial stock assessment for the fishery and to assist in sustainable management of the fishery. In particular, sector-specific details on the spatial and temporal harvest patterns, harvested species composition, bycatch composition and distribution and level of effort are needed. Given that the current management arrangements are likely to change imminently, with individual transferable catch or effort units being the proposed management regime (AAP, 2006), this information will be particularly useful in defining and standardising effort units between the two sectors and will assist in the allocation of any such units. Such information will also be useful

in achieving federal legislative requirements for sustainable use and management of Australian fisheries (Fletcher, 2003).

The aims of this study were to characterise the harvest patterns and effort dynamics of the indigenous and non-indigenous commercial sectors of the RLF in the ETS using a range of data sources including commercial logbooks, community freezer records, voluntary logbooks and observer surveys. In doing so, we provide more reliable estimates of catch, effort and CPUE for the fishery, identify differences between sectors and provide information that is useful for resolving issues related to allocation of reef fish resources in Torres Strait.

2. Methods

The research was done over 4 years (2003–2006) in the ETS (east of 142°30'19"E) (Fig. 1). Several data sources were used including: (i) non-indigenous commercial logbooks, (ii) indigenous island community freezer purchase records, (iii) voluntary indigenous catch composition research logbooks, and (iv) observer surveys on indigenous and non-indigenous commercial vessels.

2.1. Non-indigenous commercial logbook data

Compulsory logbook programs for non-indigenous commercial fishers operating in Torres Strait were introduced in 1988 by the Australian Fisheries Management Authority (AFMA) and in 1989 by the Queensland Department of Primary Industries and Fisheries (QDPI&F). Non-indigenous commercial fishers were required to report in one of these concurrent logbooks, although occasionally data were recorded in both. In 2003, a general line fishing logbook for all finfish harvested in Torres Strait was introduced by AFMA, and reporting in QDPI&F logbooks ceased. Accordingly, we obtained catch and effort data from the QDPI&F for 1988–2003 and from the AFMA for 1989–2004. These datasets were initially analysed to allow the two datasets to be combined and duplicate records to be removed. All catch and effort records were then standardised to the same units and assigned to reefs (see Section 2.6) to allow spatial and temporal estimates of catch, effort and CPUE for the non-indigenous commercial sector.

2.2. Island freezer records

The main islands involved in commercial reef line fishing in Torres Strait are Murray, Darnley and Yorke Islands (Fig. 1) (Begg and Murchie, 2004). Data collected from island community freezers on these islands between 2003 and 2005 were used to estimate catch and effort for the indigenous commercial sector (see Begg and Murchie, 2004 for details). These data included catch and effort information from purchase records for individual indigenous fishers from 1988 to 2005. Catch and effort were standardised to the same units (see Section 2.6) to allow spatial and temporal estimates of catch, effort and CPUE for the indigenous commercial sector.

2.3. Research logbooks

Research logbooks were placed at the island community freezers on Murray, Darnley and Yorke Islands (Fig. 1) from March 2004 to December 2005 to record species level catch composition information for the commercially harvested catch. Staff from the community freezers voluntarily filled out the logbooks by recording the number of each commercially saleable species

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