

Fishing club activities on the Great Barrier Reef

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Introduction

Recreational fishing is a pastime enjoyed by many Australians. The combined nation wide harvest by recreational fishers was estimated to be 30 943 tonnes of seafood for the year ending April 1992 (Australian Bureau of Statistics 1994). State by state, Queenslanders accounted for the highest proportion (23.5%) of the national recreational catch, with total landings of 7284 tonnes (Australian Bureau of Statistics 1994). Just over one third (34.5%) of the catch was landed by residents in Brisbane, the State's capital city. Although recreational line fishing is by far the most important extractive recreational activity within the Great Barrier Reef World Heritage Area (GBRWHA), there have been relatively limited attempts at quantifying the importance of the activities (Blamey and Hundloe 1993; Hundloe 1985), and their associated impacts. The GBRWHA recreational fisheries have traditionally been classified by the way anglers access the marine resource. Fishing access is provided by: 1) privately owned and operated vessels, 2) the charter boat fleet, 3) the club boat fleet; and 4) shore based fishing activities from island resorts operating within the GBRWHA. By far the most significant potential increase in recreational fishing effort exists in the recreational small boat fleet, with the number of registered vessels adjacent to the GBRWHA increasing 5 fold from 1968 to 1994. Even with this rapid increase in potential fishing effort, research into this section of the recreational fisheries has been limited to two GBRWHA wide surveys (Blamey and Hundloe 1993; Hundloe 1985) that utilised different sampling methodologies to estimate recreational fishing effort and fish catch. Higgs (1996) provides a critical review of the sampling methodologies utilised in these two surveys, and suggests that a precautionary approach should be used before the results are compared between the two surveys.

Although anglers associated with fishing clubs only represent a small fraction of the fishing community, historically, the activities of these anglers are well documented through the records fishing clubs maintain for competition purposes. Analysis of recreational fishing club catch records have been used to monitor trends in many of Queensland's inshore recreational fisheries. In southern Queensland, club catch records have been used to monitor the recreational fisheries for bream from 1923 to 1991 (Thwaites and Williams, in prep.) and whiting from 1959 to 1991 (Pollock and Williams 1983; Thwaites and Williams 1993). Club records have also been used to monitor the tropical shore based line fishery in the Mackay region over the period 1952 to 1984 (Quinn and Pollock 1992). Fishing clubs have generally accessed the Great Barrier Reef using either commercial charter vessels, or one of four vessels owned and operated by individual fishing clubs. The analysis of catch records maintained by fishing clubs that operate in the GBRWHA therefore provides a history of the activities of clubs that operate from the charter and club boat fleet.

The Great Barrier Reef Marine Park Authority (GBRMPA) has collected club competition records on a number of occasions from the fishing clubs that access the GBRWHA. This information was used to create a relational database, the REEF FISH database. The fishing club information has been used in a number of publications (Craik 1989; Craik 1981; Craik 1979; Zann Schuster 1991) and forms the only long term history of recreational fishing activities from club and charter boats operating in the GBRWHA. This paper summarises the research results presented in the most recent detailed analysis of the database by Higgs (1993). The aim of this paper is to present catch trends depicted in the REEF FISH database system. Trends in

catch rates, species composition and average weights of landed fish are presented for each of the four regions of the GBRWHA.

Methods

Competition records were collected from the recreational fishing community on four separate occasions. On the first two occasions information spanning the years 1957 to 1979 was collected by Craik from clubs from Cairns to Maryborough (Zann Schuster 1990). Zann Schuster made a third collection in 1989 to update most of the original sources first collected by Craik. The final collection of data was initiated by the author in 1992 using an augmentative grant funded by the GBRMPA. The extent of the REEF FISH database is shown in Table 1. The majority of information collected recorded amateur angling club competitive fishing activities, with some information provided by charter boat operators and individual recreational anglers. Quality and type of information varied with each source of information. A total of 1807 trips had sufficient information to calculate average fish weight and catch per unit effort information. Catch per unit effort (CPUE) was calculated as mean catch rate per trip on an annual basis, with units measured in number or kilograms of fish caught per angler day.

Table 1. Summary of the REEF FISH database records used by Higgs (1993)

Region	Annual coverage	Number of fishing trips*	Effort in angler days	Total weight of fish (kg)	Total number of fish
Cairns	1971-1992	349	8879	57303	21029
Townsville	1961-1992	715	18463	233894	140940
Mackay	1971-1989	172	4184	64117	42903
Rockhampton	1956-1989	571	10358	126291	130896
TOTAL		1807	41884	481605	335768

* Number of trips that recorded effort in number of people on board, trip duration in days, and recorded the fish catch in number and weight of fish.

To facilitate analysis and to comply with previous publications of this work, the GBRWHA region was divided into four regions similar to the economic zones used by Hundloe (1985). The regions were Cairns in the north, Townsville, Mackay, and Rockhampton in the south.

In 1992 on board observations were made during seven amateur fishing club trips in the Townsville region in an attempt to estimate the accuracy of the clubs records provided to the REEF FISH and to document the contemporary fishing activities of the clubs. The author recorded spatial and temporal distributions in fish catch and fishing effort, and compared the actual total catch with the landings recorded in the fishing club competition records.

Results

Results from on board observation of fishing club competition activities suggest that major suppliers of information in the Townsville region recorded 75.4% of their fish catch into the club records. A further 13.7% of the total catch was released alive and 8.2% was used for bait. The remaining fish were retained for scientific samples. Fishing activity occurred predominantly in water deeper than 30 m (Fig. 1) with 52% of the total fishing effort occurring at night (6 p.m. to 6 a.m.) (Fig. 2).

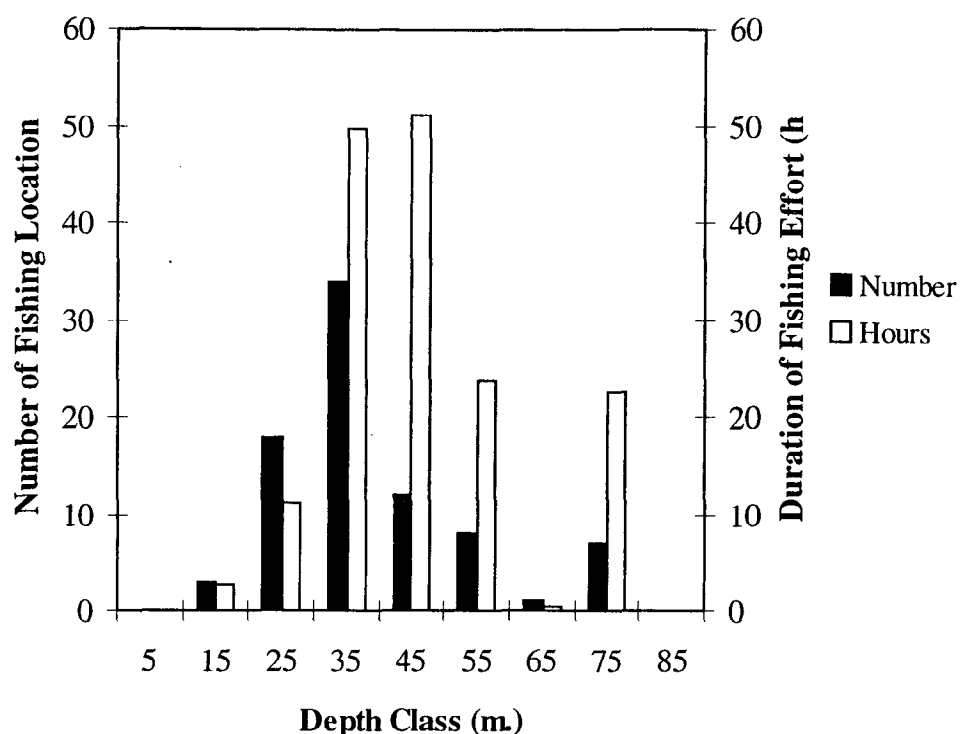


Figure 1. Depth distribution of fishing effort in terms of number of fishing locations and actual fishing time during observed fishing club activities

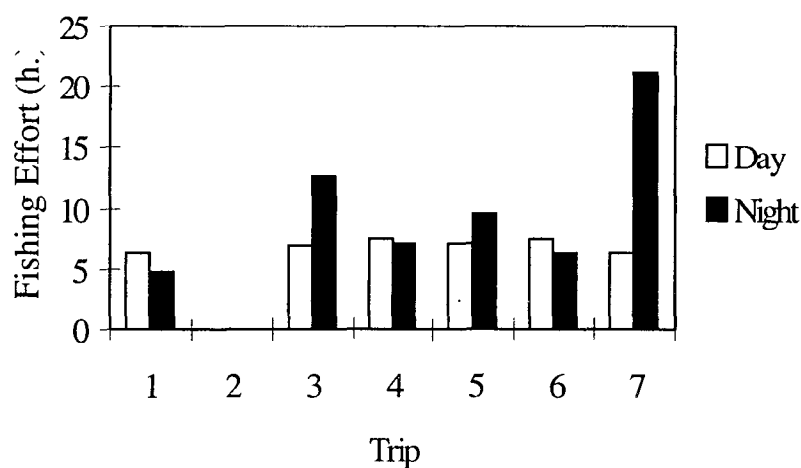


Figure 2. Temporal distribution of fishing effort between 'Day' (6 a.m. to 6 p.m.) and 'Night' (6 p.m. to 6 a.m.) fishing activities during observed fishing club activities

Clear latitudinal changes in fish weight and catch rates can be seen in the regional summaries of information. Cairns, Townsville, Mackay and Rockhampton recorded average catch rates of 2.9, 7.4, 11.3, 15.6 fish per angler day (Fig. 3), or 7.4, 12.5, 16.0 and 15.0 kg per angler day (Fig. 4), and average fish weights of 2.7, 1.7, 1.5, and 1.0 kilograms clean weight respectively (Fig. 5). Differences in catch rate and average size of landed fish are related to the species composition of the catch (Fig. 6) which largely reflects targeting of certain species by anglers and the demographic characteristics of the target species. Average catch rate had remained constant in the Rockhampton region (1956-1989) and Townsville regions (1961-1992), increased in the Cairns region (1975-1992) and decreased in the Mackay region (1971-1989) (Fig. 7).

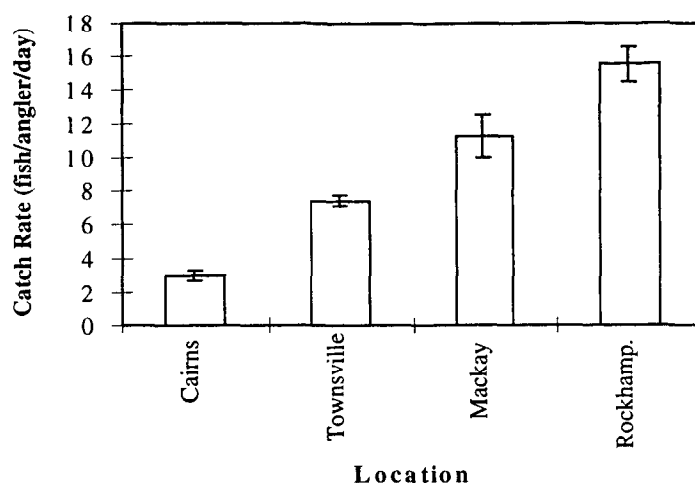


Figure 3. Regional summaries of mean total catch rate measured in number of fish caught per angler day (mean \pm 95 % confidence intervals)

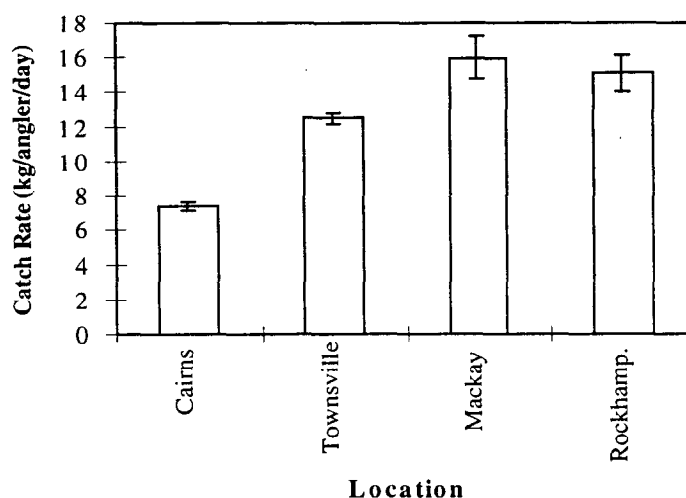


Figure 4. Regional summaries of mean total catch rate measured in kilograms of fish caught per angler day (mean \pm 95 % confidence intervals)

Average weight of landed fish had remained constant in the Rockhampton region (1956-1989) and increased in the Cairns and Mackay regions for the periods 1971-1992 and 1971-1988 respectively (Fig. 8). After an initial rapid decline from 2.3 kg in 1961, the average size of fish captured in the Townsville region declined gradually from 1.6 kg CW in 1967 to 1.4 kg CW in 1985. Average weight of captured fish increased progressively after 1986 for the Townsville region (Fig. 8), presumably as effort was directed towards the night fishery, targeting lutjanids which has a heavier average weight than coral trout (*Plectropomus* spp.) and red throat sweetlip (*Lethrinus miniatus*) that were traditionally targeted. Catch rates for coral trout and red throat sweetlip remained consistent in the Townsville region during the period 1961-1986. A shift in angler motivation to target lutjanids (mainly red emperor - *Lutjanus sebae*, large mouthed nannygai - *L. malabaricus*, small mouthed nannygai - *L. erythropterus*) was suggested by anglers to be responsible for the reduction in coral trout and red throat sweetlip catch rates in the last three years of records for the Townsville region. Catch rates for lutjanids increased substantially during this period (Fig. 9).

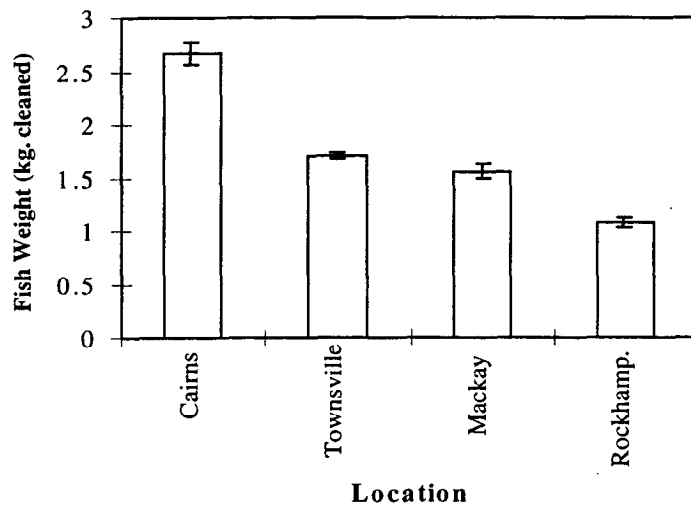


Figure 5. Regional summaries of mean cleaned weight of landed fish in kilograms (mean \pm 95 % confidence intervals)

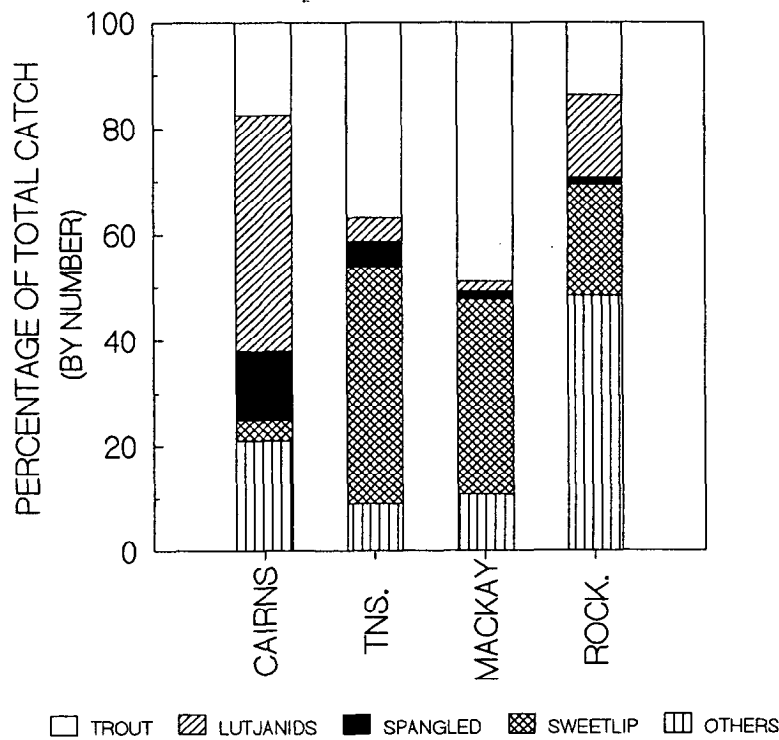


Figure 6. Regional species composition of catch calculated over the history of available records for each region

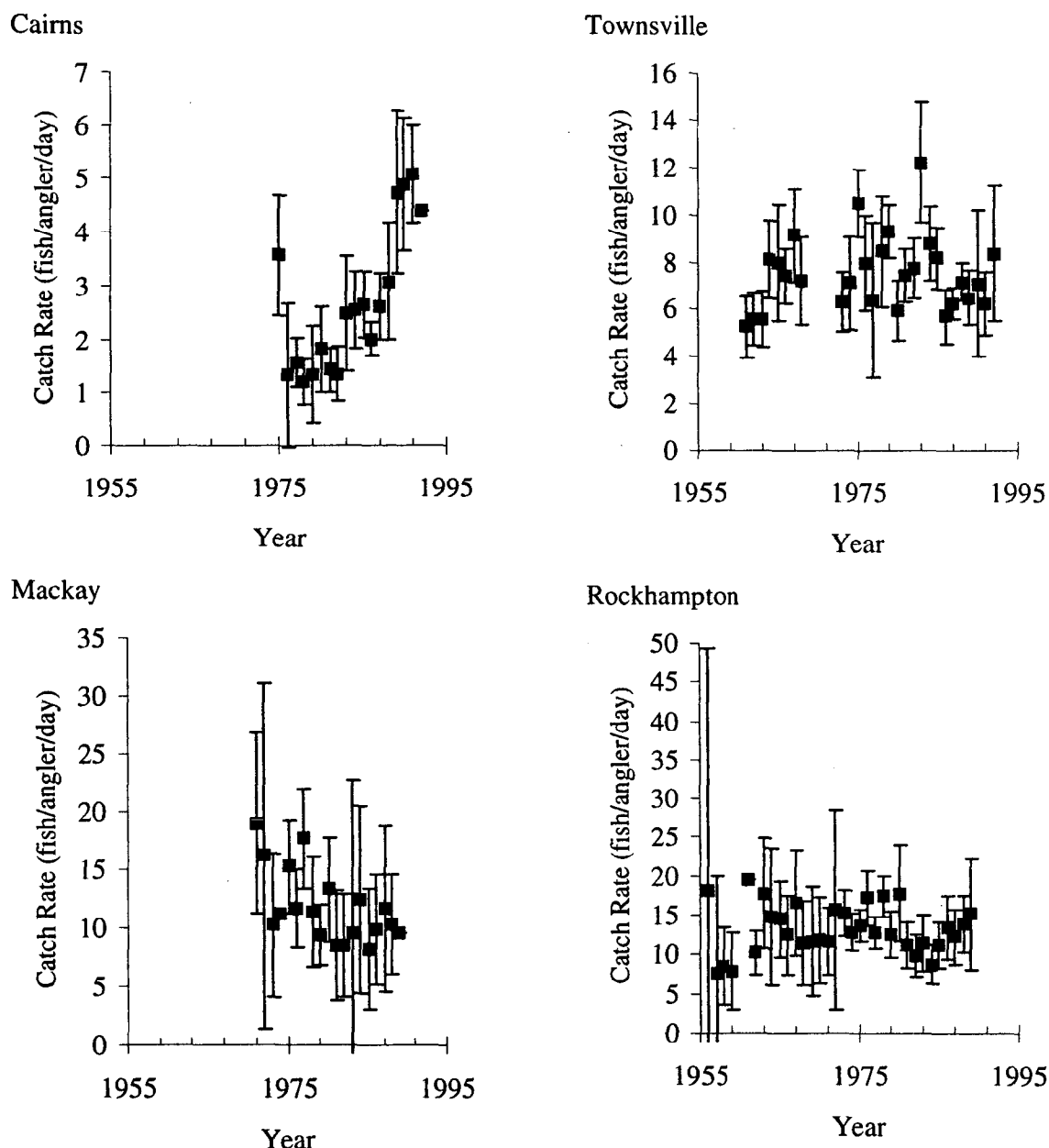


Figure 7. Annual summaries of mean total catch rate (fish/angler/day \pm 95% CI)

Discussion

Pressure

A state wide survey conducted by the Australian Bureau of Statistics showed that for the 12 months ended October 1985, an estimated 572 000 persons, or 30% of the Queensland population aged 15 years and over, engaged in some form of recreational fishing activity. State wide, an estimated 561 000 people were involved in rod or line fishing, 125 000 in crabbing, 16 000 in spear fishing, and 57 000 in netting in Queensland waters (Australian Bureau of Statistics 1986). Of the 561 000 people involved in rod and line fishing state wide, almost 34 000 people fished

using rod or line in the offshore waters, north of Baffle Creek (approximately the southern extremity of the Great Barrier Reef Marine Park) to the tip of Cape York Peninsula¹ (Australian Bureau of Statistics 1986). An estimated 29 000 people fished 'open reef waters' in the same region. Forty three percent (14 500) of this figure had used the offshore waters 1-2 times, 19% 3-4 times, 22% 5-9 times, 9% 10-19 times and 6% 20 times or more during the preceding 12 months (Australian Bureau of Statistics 1986).

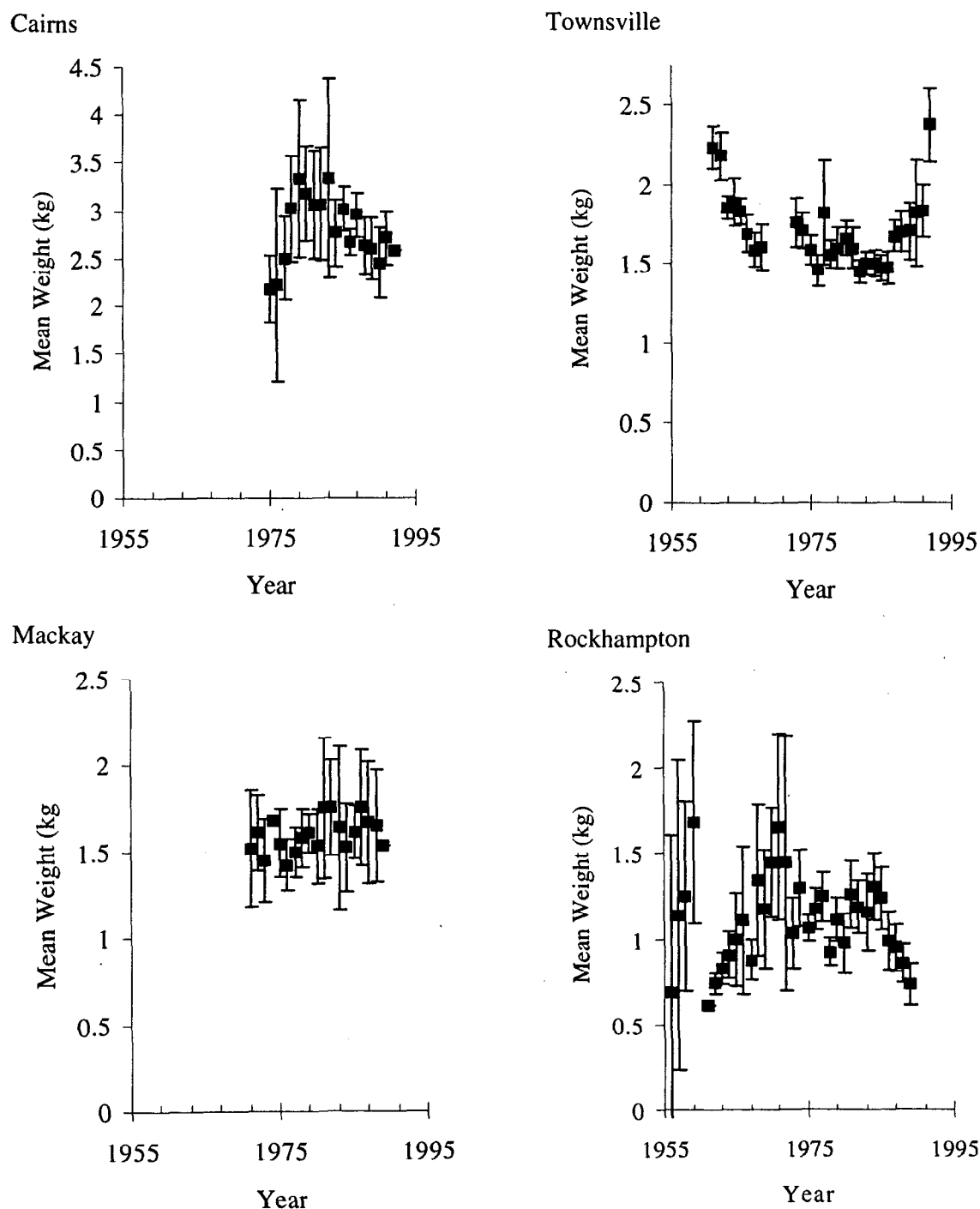


Figure 8. Annual summaries of mean weight of landed fish (cleaned weight in kg \pm 95% CI)

¹ Fishing areas 18, 15, 13 and 11 (Australian Bureau of Statistics 1986)

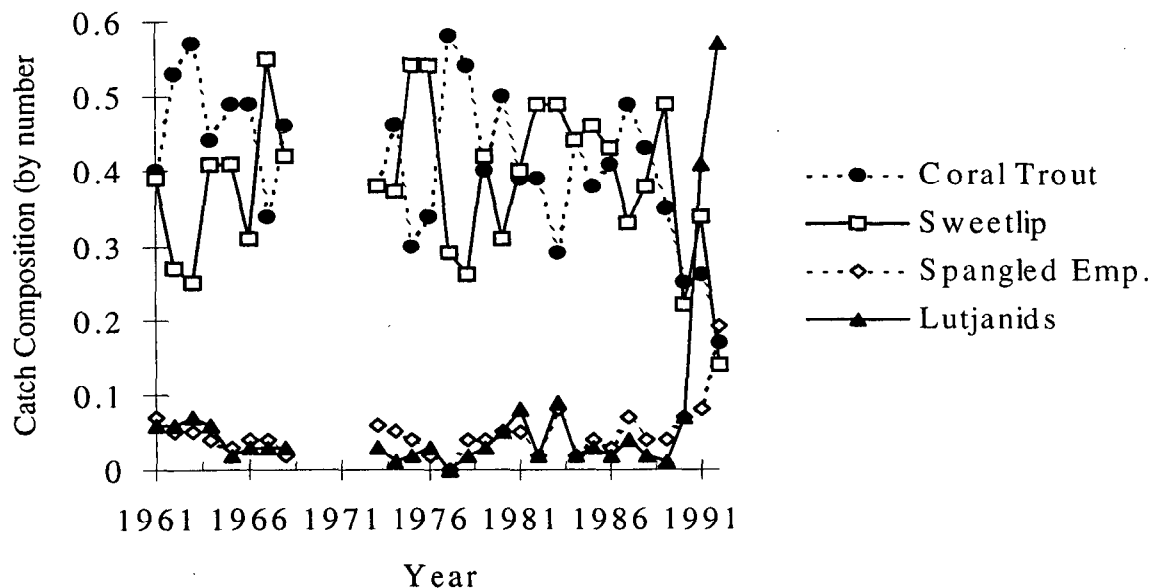


Figure 9. Annual species composition of the fish catch recorded by clubs operating in the Townsville region

There is clear evidence that the *potential* for increasing recreational fishing effort in the GBRWHA exists with the number of privately owned and registered vessels in Queensland increasing 5 fold from 1968 to 1994. It has been widely assumed that the recreational reef line fishing effort has been increasing in proportion to the number of private boat registrations within coastal areas adjacent to the GBRWHA. Craik (1989), for example, suggested that 'on the best figures available the combined fishing effort of recreational fishermen is estimated to be increasing at a rate of about 7% a year. If catch continues to increase at the present rate, it will be about 12 000 tonnes by 1990'. Driml et al. (1982) estimated that the number of boat owners that used their vessels to fish at sea was in the vicinity of 14 800 and they accounted for a landing of between 6572 and 8770 tonnes of fish. Blamey and Hundloe (1993) estimate that the number of motor boats used for fishing or crabbing within the GBRWHA was approximately 24 300 and they accounted for between 3500 and 4300 tonnes of fish. Apart from the information from Hundloe (1985) and Blamey and Hundloe (1993) there is no accurate information that details the true magnitude at which the fishing effort has been increasing, or what the current catch levels are within the GBRWHA.

Information collected during boat ramp surveys implies that the majority of fishing effort in the GBRWHA was focused on the coastal and inshore areas (Blamey and Hundloe 1993). This means that localised areas of high fishing pressure are likely to occur in the coastal areas of the GBRWHA, and not in the mid- and outer shelf reef areas. Although there is no documented evidence to support it, fishing pressure on the mid- and outer shelf reefs may have in fact decreased in recent years with increased vessel operational expenses, competing recreational activities (SCUBA diving, snorkelling, and shore based activities such as supporting national rugby league and basketball teams) and increased environmental awareness of the general community.

State

Research by Blamey and Hundloe (1993) clearly indicated that anglers perceived that the GBRWHA line fishery was in demise with 58.5% and 40.8%, of interviewed anglers replying

that they believed catch rates and average weight of fish had decreased in the past five years respectively. Results from the analysis of the REEF FISH database did not, however, support this perceived decline in catch rates. Catch rates had remained consistent for regions where constant sources of information had been available for analysis in the REEF FISH database (over 25 years in some cases). This suggested that club fishers, who are often assumed to be more competent fishers, were still capable of obtaining catch rates similar to those reported in the 1960s and 1970s. Average fish weight for the traditional coral trout/sweetlip emperor fishery in the Townsville region had decreased by approximately 1 kg from the high levels recorded in the early sixties. However, there was only a relatively small decrease in average weight of captured fish (0.24 kg) from the late sixties to the mid eighties. Higgs (1993) suggested the decrease in average weight in the early to mid eighties may have been related to an increase in the catch rate of sweetlip emperor since the early eighties in the Townsville region. Average weight of captured fish in the Townsville region had increased rapidly since 1988 and this corresponds to an increase in the percentage of lutjanids in the catch as suppliers of information changed their fishing styles to include fishing deeper water and/or at night, often targeting lutjanids.

Higgs (1993) suggested that significant declines in average fish weights provided evidence that growth overfishing had occurred in the Townsville day fishery for coral trout and red throat sweetlip. He also pointed out that the absence of a significant decline in catch rate on a regional scale suggested that 'recruitment overfishing' had not occurred throughout the Townsville region. Higgs (1993) reported that significant declines in catch rates were observed for a number of individual reefs in the Townsville region, but the 'reliability' of the trends was not always clear because of low sample sizes and high variability in catch rates from year to year.

Higgs (1996) suggested that 'results of the research conducted to date suggest, contrary to public opinion, that there is little evidence of decline in catch rates of the recreational reef line fisheries over a 30 year period. This perception is based on historical catch records dating from the late 1950s, provided by amateur fishing clubs, and the comparison of catch information collected at boat ramps during surveys from the early 1980s and 1990.'

Response

Response of the management agencies over recent years to the assumed increases in fishing effort has been to introduce a number of controls such as bag and size limits for frequently targeted reef fish species. In addition, the ability for recreational anglers to legally sell part of their catch, up until 22 May 1990, under Section 35 of the *Fishing Industry Organisation and Marketing Act* was abolished. The ability for recreational anglers to sell part of their catch up until 1990 does, however, create problems for managers who have traditionally relied on historical trends in angler catch rates to monitor fisheries. The ability to sell fish prior to 22 May 1990 means that catch rates, and volume of catch, prior to this time may have been inflated because of the presence of a 'semi-commercial' attitude in segments of the recreational fishery. As Gwynne (1990) noted, 'the mere existence of Section 35 did infer a right to all unlicensed fishermen to sell product' and this 'semi-commercial' attitude of being able to take large quantities of fish is still retained in some sectors of the recreational fishery. This has enormous implications for analysis of records systems such as the REEF FISH database, where catch rates and average size of fish recorded are modified by management practices.

In response to the lack of a coordinated recreational fishing sampling program the Queensland Fisheries Management Authority (QFMA) and the Queensland Department of Primary Industries have together been developing a state wide data collection system (RFISH) for the Queensland recreational fisheries. The system is designed to 'describe the nature and extent of recreational fishing in Queensland, conditions and trends in fisheries resources targeted by recreational

anglers, and be consistent with national standards for data collection of this type'(QFMA 1995). The RFISH program, as it stands, has six components:

- a comprehensive contact survey to establish participation in recreational fishing in Queensland to be conducted by a reputable agency;
- an individual diary system to be completed voluntarily by recreational fishers identified in a random selection process to obtain sample catch and effort data for key species of recreational interest;
- a data collection system to cover tourist fishers who are not Queensland residents (and consequently not accounted for in the above survey and diary system);
- constant surveys conducted by field officers;
- occasional surveys such as creel surveys; and
- a facility for interested parties to record historical data such as club records, tag and release data, research data and the like (QFMA 1995).

Acknowledgments

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