CRC Reef Research Centre

FISHING & FISHERIES

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SPECIAL EDITION

Student - Stakeholder Workshop

Scientists and stakeholders alike declared an initiative undertaken by Effects of Line Fishing (ELF) Students a fresh new approach to post graduate research, following a workshop held in March. Eight students wanted to get their research out to the stakeholders and held the first of what hopefully will be a series of student – stakeholder workshops.

Representatives of a wide range of stakeholder groups, including fishers, scientists, conservationists and managers, attended the day of presentations by students. A feature of the day was that there was a lot of time allowed for discussion following each presentation. Everyone at the workshop participated enthusiastically in those discussions and the result was a win for all involved.

Stakeholders and students get together to discuss student research projects carried out as part of the ELF Project.

The students would like to thank all those who participated so willingly in this new venture and also thank CRC Reef for their financial support that ensured the day was a success.

Proceedings from this workshop, with comprehensive reports of each of the students presentations will be available soon for those interested. In the mean time, this special edition of the ELF Newsletter provides short outlines of the presentations given at the workshop. Contact details for each student are provided if you have any questions for them.

BOMMIE COD

by Bob Mosse

In regions such as the Great Barrier Reef (GBR) where fishing of bommie cod, (*Cephalopholis cyanostigma*), is minimal it may seem that this species is of little importance to scientists or managers. However, quite the opposite may be the case for many reasons.

Their position in the reef ecosystem as both a predator of small reef fish, and prey of a number of commercially important species, such as coral trout, may make them an important biological signpost for management of commercial exploited fish. Also, bommie cod are currently fished by both artisanal and commercial fishers in other countries following declines of larger groupers such as coral trout and barramundi cod in those areas. There is now emerging evidence that bommie cod could become a target for Queensland line fishers in the future, and therefore, exploitation of these little fish could become a reality.

ELF research confirmed that bommie cod is not just one of the oldest-living groupers (up to 46 years), but it also has an extended spawning season, lasting around 7 months. One of the many questions this research raised was “how does such a little fish which grows so slowly survive for such a long time?” There are certainly a number of factors contributing to this high survivorship. It may be that their strategy of growing quickly in early life (to around 10 yrs), late onset of sexual maturity and extended spawning seasons could be seen as an energy saving strategy extending their life span. However, these characteristics could also make them extremely vulnerable to overfishing. It also appears that there is some regional variability in growth rates and possibly other characteristics of bommie cod collected from throughout the GBR.

A further characteristic of bommie cod revealed from this research is that they undergo sex change from female to male during their lifetime. Males usually make up only a small proportion of the population (ratio: 0.4:1 males to females), and are generally larger than the females. If fishing reduces the number of males, the ability to fertilise eggs could be diminished with potential disruption to the long term sustainability of the population. This strongly suggests that proper management of this small grouper may be necessary to maintain this species if they become a commercially viable target for Queensland line fishers.

inside

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Fishing for samples

by Dave Welch

We take samples from fish populations for the purpose of increasing our knowledge of that species, including monitoring species abundance, and estimating average sizes and ages etc. Ultimately, this is some of the information that determines the strategies used by fisheries managers and, therefore, is of critical importance, as is how these samples are collected.

How we sample a fish population depends largely on the species and the standard method for harvesting them as used in the fishery. For reef fish, the simplest and most cost-effective method to get samples is from catches taken by line fishers. However, we know from experience that the gear used to sample fish are biased to some extent, meaning that fish of a certain size are more likely to be caught than fish of a different size. Therefore, the sample of fish will not be representative of all the sizes of fish in the population.

It is the estimates of age and size that are used to calculate other information such as how big and old fish eventually get, and how fast they grow. This information can tell us how resilient fish are to fishing, and how quickly stocks recover from fishing. Therefore, it is critical that the estimates be as accurate as possible and we understand any bias in that estimate.

One way to estimate the relative bias of line fishing is to compare the information obtained from line fishing with that obtained by other potentially less biased methods, such as carefully designed spear fishing. This technique was used in the ELF research to determine the amount of bias in line caught samples of coral trout from the ELF Experiment.

What this study clearly demonstrated was the extent to which line fishing missed small, young fish that make up a large proportion of the population. These small fish are critical for information on age and size at maturity, as well as accurate estimates of age structures of the population. Furthermore, they are extremely useful for monitoring recruitment history and identifying year classes (cohorts) of fish before they reach legal size and become available to the fishery. Information on strong or weak cohorts in the population allows managers to predict, in advance, poor or good fishing years.

The information from this research has already been put to good use in outputs from the ELF Project and has played an important role in ensuring fisheries information from the ELF Project is as accurate as possible.

Size limits for coral trout

by Samantha Adams

Cods, trout and groupers, members of the epinepheline serranid group, are important targets of tropical and subtropical fisheries worldwide. Many members of this group change sex to male after reproducing initially as a female, requiring additional considerations for their management. Failure to do so may severely compromise reproduction in these fish species and affect sustainability of their stocks.

ELF researchers have been investigating the reproductive strategies of three of the most abundant and prized coral trout species in the Queensland reef line fishery; common coral trout (*Plectropomus leopardus*), bar-cheek trout (*P. maculatus*) and blue-spot trout (*P. laevis*). All three species currently share the same minimum size regulations. Prior to this research, however, it was unclear what proportion of mature fish would be protected by current size limits, and if this was consistent across species.

Appropriate minimum size limits are an important factor in ensuring adequate protection of spawning individuals. However, if the size limit is set below the size at which sex change occurs, one sex may not be protected. For coral trout this could reduce reproductive output if there is not enough males to fertilise eggs during spawning.

Results show that for females of both common and bar-cheek trout, the current size limit of 38cm (total length) protects individuals until they have spawned at least once, and some possibly twice. However, for blue-spot females, less than 5% are likely to have spawned before reaching 38cm (figure 1).

For the males, there is even more variation. The size at which common coral trout and bar-cheek trout change sex to male is very flexible, and a large number have already changed sex to being male and spawned as a male before reaching 38cm. However, for blue-spot trout, very few or none have changed sex to male before reaching legal size.

This research clearly indicates that for common and bar-cheek coral trout current legal size limits seem to provide adequate protection for both males and females. However, for blue-spot trout a minimum size limit of 38cm may not be adequate protection, especially in heavily fished populations. A size limit of 60cm for blue-spot trout as proposed in the Draft Management Plan for the Queensland reef line fishery would protect the females of this species, allowing them to spawn at least once prior to reaching legal size. However, only small numbers would have made the sex change to male before reaching this size.

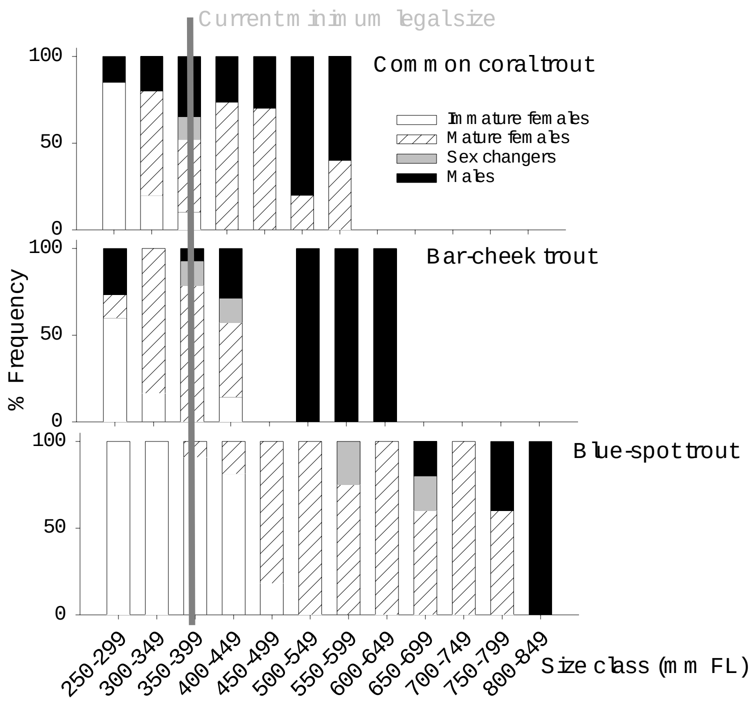

Figure 1. Distribution of females and males at different sizes. There are quite a few mature common and bar-cheek coral trout smaller than 38cm, but few male blue-spot trout mature before reaching legal size.

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Red-throat Emperor

by Ashley Williams

Red-throat emperor is the second most important reef fish species in the GBR line fishery, contributing up to 1000 tonnes annually to the combined commercial and recreational catch.

Current management strategies for red-throat emperor are uniform throughout Queensland. They include a minimum size restriction of 35cm (total length) for all fishers and a bag limit of 10 fish for recreational fishers. These restrictions assume red-throat emperor are a single uniform population throughout the GBR. Results from previous research, however, suggest populations in different areas may be quite different, and raises the question, “How similar are fish from different areas of the GBR?”. We have been investigating biological characteristics of red-throat emperor throughout their distribution of the GBR to look into this question.

The red-throat emperor is commonly found on mid and outer shelf reefs between Cairns and the Capricorn Bunkers. They live to approximately 20 years of age and grow to about 60cm total length. Recently we have confirmed that they change sex from females to males at some stage during their life and it is thought that the process of sex change is quite rapid. Unfortunately the juvenile habitat of red-throat emperor has yet to be located and as such we have no information on the early life history of this species.

The spawning season for red-throat emperor on the GBR was found to occur between July and October, and was very similar throughout the GBR. This is in contrast to many other reef fish species such as coral trout that tend to spawn earlier in the north and later in southern regions. There appears, however, to be regional differences in the spawning potential of red-throat emperor. There seems to be a higher proportion of spawning females in the northern margin of their distribution of the GBR around Townsville, than in southern regions (Mackay and Swains regions). Hence, potentially more larvae may be produced in these northern regions. It is worth noting that proposed spawning season closures in the Draft Management Plan for the Queensland reef line fishery will not encompass the spawning season for red-throat emperor.

A further important difference in the characteristics of red-throat emperor from the GBR, was that fish in the northern regions tended to be older than those from southern regions. However, this difference was not reflected in fish size, as fish tended to grow to a similar length in both regions, although they were heavier in the southern regions (figure 2).

These results suggest that there may be two or more separate populations of red-throat emperor on the GBR with different characteristics, possibly resulting in different responses to increased fishing pressure. It could also mean that the effectiveness of current management strategies in protecting this species may vary between populations. Genetic analysis of red-throat emperor from throughout the GBR shows no genetic differences, indicating that the differences we see in population characteristics may be due to environmental effects or perhaps differences in historical levels of fishing pressure. But, despite what is actually causing the difference, there are some important implications for management.

These differences between populations of red-throat emperor in different regions of the GBR suggest consideration of tailored management strategies on a regional scale may be required if fishing pressure on this important species increases.

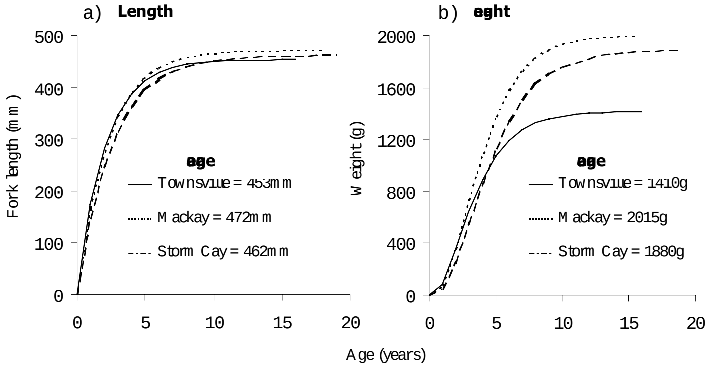

Figure 2. Growth of red-throat emperor. There is little difference in the maximum size reached by fish from the various regions, however, the average maximum weight shows quite a lot of variation.

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Red Bass

By Ross Marriott

Most who fish the outer reefs of the GBR will be familiar with the red bass, a large tropical snapper (a “lutjanid”) closely related to other snappers such as the stripey bass, red emperor and mangrove jack. However, unlike these other tropical snappers, the large red bass is usually not eaten because it has a reputation for causing ciguatera poisoning throughout the Indo-West Pacific, including the GBR. Nevertheless, more recently some commercial operators have been keeping the smaller, safer fish.

While fishers do not generally keep red bass in Queensland this is not the case everywhere. For example, in the Seychelles red bass are one of the main target species, highlighting an important consideration for the Australian populations of this snapper. Interest in this species in Australia could increase. Currently, there are few management strategies to protect red bass, and there is very little information available to managers to determine what management strategies would be suitable if required. ELF research is now aiming to investigate some of the basic biological aspects of this mainly overlooked snapper that would aid in its effective management.

The first interesting point to come to light from this research is that these fish can live for over 50 years! Secondly, it takes a long time for the red bass to reach their maximum size of 70-80cm. These trends suggest that the red bass is an exceptionally long-lived, slow growing fish.

What this means is that the red bass could be vulnerable to adverse impacts from fishing as they are likely to take a long time to mature, and may not be as efficient in replenishing their stock numbers as faster-growing species. The harvest of smaller red bass, because of their perceived reduced risk for causing ciguatera, might impact on red bass populations if most of these smaller fish are immature.

This research is now continuing, and will be extended to investigate when these fish become sexually mature and other reproductive characteristics to help fill in some of the gaps in our knowledge. It is particularly important that the issues highlighted in this research are investigated to ensure that red bass are adequately protected from any potential increases in fishing pressure on the Great Barrier Reef.

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Live fishing

By Geoffrey Muldoon

The prospect of higher returns for reef fish is seen as a strong incentive for Queensland fishers to enter into the live fish industry. Anecdotal information suggests that this incentive has already resulted in increased numbers of people entering into the industry, either by those already in the reef line fishery or those previously not. This has raised concerns that increased fishing pressure may have detrimental effects on the GBR and its line fishing industry.

Most live reef fish sold for food find their way to Hong Kong, the major live fish trade centre. Between 21000 to 32000 tonnes of live fish pass through the markets each year. A wide variety of species are sold live in Asia with gropers and cods being the most popular. In recent years total imports of species such as maori wrasse and barramundi cod have declined while the demand for coral trout has increased considerably. Australian suppliers have met much of this increased demand for coral trout with exports increasing from 97 tonnes in 1995 to 721 tonnes in 2000.

Figure 3: Price for live and frozen/fresh coral trout product. The price for dead product has remained stable for many years, while live fish prices have fluctuated.

The price for live fish has consistently exceeded the price for frozen or fresh fish by between 40-300% providing considerable incentive for commercial fishers to keep their fish alive (figure 3). While the prices for dead product has remained fairly stable over the years, live fish prices have fluctuated widely. Despite these price fluctuations and fishing costs being 20-30% higher for live operations, gross revenues for live fishing operations were generally greater than for dead operations.

Effort in the commercial reef line fishery has increased on the GBR in recent years, as has the days on which live fish were recorded. Live fishing effort has increased from less than 100 days in 1993 to nearly 7400 days in 1999. The contribution of the live fish industry to the overall effort increase is ambiguous, although there is some evidence for live fishing pushing this increase in the strong link between the price of live fish and the amount of effort directed at live fishing.

The profit incentive to enter the live fish industry in concert with increased effort in the Queensland reef line fishery has raised concern over the amount of latent effort in the fishery. Latent effort is the difference between actual fishing effort and the potential effort if all fishers fished to their maximum capacity. Currently, of the 1800 registered commercial line fishing endorsements (licences) in the reef line fishery, less than 30% report catches of any reef fish within the GBR, and many of these catch very little (65-85% of the catch is caught by only 15-20% of the fleet). Clearly there is room for substantial further increases in effort in the reef line fishery.

As the demand for live fish continues to grow, Australia is likely to play an increasingly important role in supplying the live market and potentially further increases in effort. This highlights the need for better understanding of the implications of such effort on the future sustainability of the GBR fishery. Information on the effectiveness of current management strategies such as size limits, closed areas, and consideration of alternative strategies, if current ones are inadequate, will be essential to protect Queensland fish stocks. Pro-active management on an informed basis will assist Australian managers to avoid the problems of habitat degradation and fish stock declines seen overseas.

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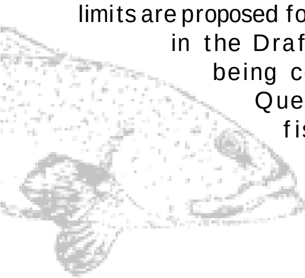
Snappers on the GBR

By Jake Kritzer

Fishes of the family Lutjanidae, commonly known as 'snappers', represent a diverse and abundant group of predators on tropical reefs worldwide. Species within the family on the GBR vary widely in body size and ecology, with the large deepwater 'reds' such as the red emperor being prized targets of commercial and recreational fishers alike. However, several smaller, shallow-dwelling species also play a role in the GBR line fishery.

Despite the presently low commercial catch levels of smaller snappers such as stripey bass, hussar, and black spot snapper, future increases in the harvest is likely. Increased interest in Asian cuisine in Australia has already seen demand for small tropical snappers increase, and this could increase further if more valuable species become severely depleted, both overseas and in Australia, or unavailable to domestic markets.

Currently no recreational bag limits exist for any species of small snapper, and only three have minimum size limits (hussar, moses perch and stripey bass). New bag limits are proposed for a number of species in the Draft Management Plan being considered for the Queensland reef line fishery. A potential problem with the proposed size and possession limits is that the regulations differ for different species, some of which are quite similar in appearance and are known by a variety of common names. What isn't known, however, is information on the biological characteristics of this large group of fish, making it unclear how suitable these proposed restrictions will be.



Research to date indicates that lutjanids tend to prefer inshore and mid shelf reefs and do not tend to move from reef to reef as adults, except for moses perch that move to coral reefs from estuaries. Snappers also tend to be long lived fish, for example the five-line snapper can live up to 32 years (figure 4). Maximum size, however, is reached fairly early in life, by which time most are reproductively mature. These fish tend to spawn from late spring to early summer, but it is unclear if they aggregate to spawn.

That small snappers are long lived fish has some indication that these fish may be vulnerable to overfishing. This clearly highlights the need for more information on the reproductive characteristics of these small snappers if management regimes are to be appropriate. This information may be needed sooner rather than later, if fishing pressure increases.

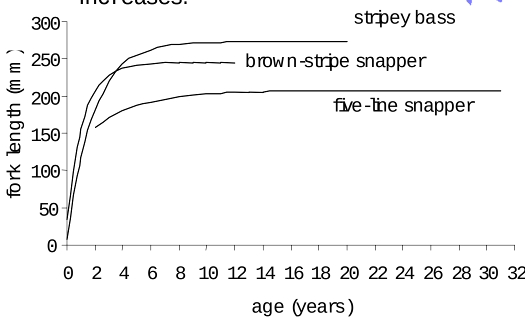


Figure 4: Growth rates for some of the small snappers. It is clear that there are big differences between different species of snappers, both in their maximum size, age and rate of growth.

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