Marine and Tropical Sciences Research Facility Milestone Report, March 2009

Program 8: **Sustainable Use and Management of Marine Resources of the Great Barrier Reef**

Project 4.8.4: **Evaluation of the impacts from industry and community uses on inshore biodiversity**

Project Leader: **Dr Andrew Tobin, James Cook University**

1. Summary of milestone report

The project continues to track smoothly with all milestones achieved in the last period. The project will ultimately produce a risk assessment for inshore ecosystems in the GBRWHA. The project continues to collect data appropriate for ecosystem risk assessment. The preliminary definition of life history characters for some shark species has begun. Processing biological samples for defining life history characters for fin-fish has begun in earnest through a combination of staff and student work. Some preliminary data available for defining spawning seasons for fin fish has produced some surprising results; namely, some species (blue threadfin and barred and small-spotted grunters) have a more protracted spawning season than previously documented.

2. Milestone deliverables

1. Preliminary report (with appropriate attribution to MTSRF funding) on estimates of life history parameters for key inshore shark and fish species.
2. Summary of any communication activities undertaken to date, including minutes of meetings / workshops if applicable.

3. Project results

SHARKS – Life History Parameter Estimation

The collection of enough biological samples to begin estimating preliminary life history characters has been achieved. The collection of most samples has been facilitated by the commercial fishery observer program, and thus the variant sample sizes reflect the relative abundance of each species in the commercial fishery catch. Some specific targeting may be required to fill some data gaps for some species as relying on commercial fishers for the collection of samples can bias the length, age and sex ranges of samples due to the selectivity of fishing gears and methods used.

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Table 1: A summary, by sex, of the samples collected to date for shark species frequent within the inshore waters of the Great Barrier Reef World Heritage Area. The highlighted species are those for which PhD candidate Alastair Harry has begun defining life history characters.

Family	Species	*n* samples	
		Male	Female
Carcharhinidae	*Carcharhinus amoboinensis*	31	34
	Carcharhinus brevipinna	37	35
	Carcharhinus cautus	6	12
	Carcharhinus dussumieri	26	29
	Carcharhinus fitzroyensis	20	35
	Carcharhinus leucas	4	11
	Carcharhinus macloti	14	8
	Carcharhinus sorrah	141	153
	Carcharhinus tilstoni/limbatus	278	293
	Galeocerdo cuvier	8	3
	Negaprion acutidens	4	4
	Rhizoprionodon acutus	164	74
	Rhizoprionodon taylori	30	66
Hemigaleidae	*Hemigaleus australiensis*	11	0
	Hemipristis elongatus	10	7
Sphyrnidae	*Eusphya blochii*	5	4
	Sphyrna lewini	180	107
	Sphyrna mokarran	34	45
Pristidae	*Anoxypristis cuspidata*	4	12
Rhynchobatidae	*Rhynchobatus australidae*	3	37
Rhinobatidae	*Glaucostegus typus*	15	20

SHARKS – Preliminary Characters

The definition of life history characteristics has been initially focused on those species most commonly recorded in the east coast commercial gill net fishery (see Table 1). PhD candidate Alastair Harry will complete definitions of growth, maximum age and size, and reproductive traits for four of the most common sharks captured by the fishery. These include: black-tip sharks (*Carcharhinus tilstoni* and *Carcharhinus limbatus*), milk shark (*Rhizoprionodon acutus*) and scalloped hammerhead shark (*Sphyrna lewini*). Some preliminary results for defining the growth characters of these species are presented in Figures 1-3, with Appendix 1 including some of the preliminary reproductive biology.

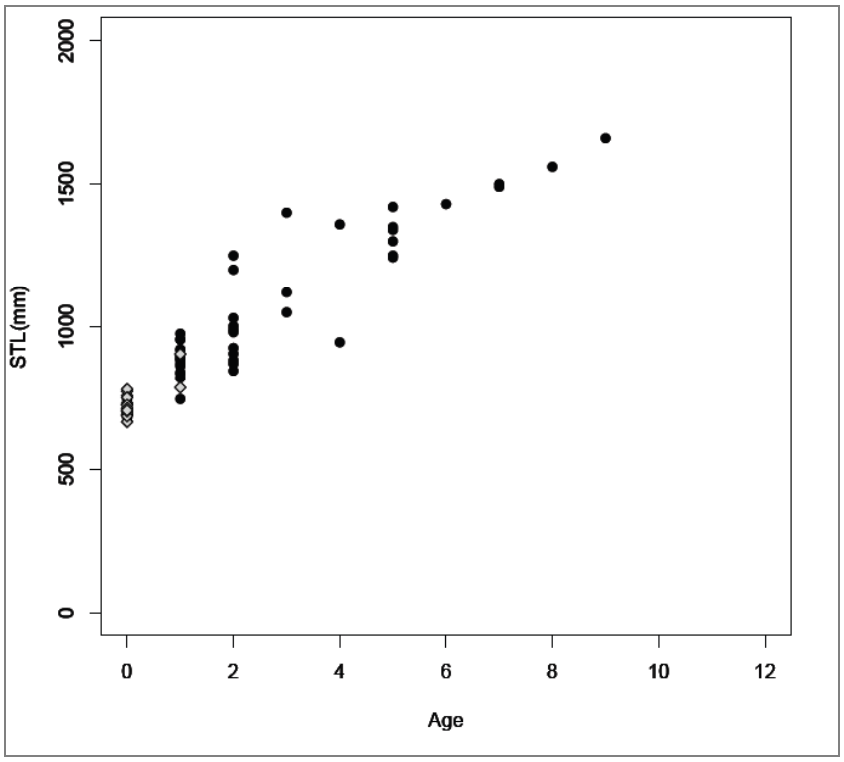

Figure 1: Size at age of *Carcharhinus tilstoni* collected from the northern (black circles) and southern (grey diamonds) regions of the Great Barrier Reef World Heritage Area.

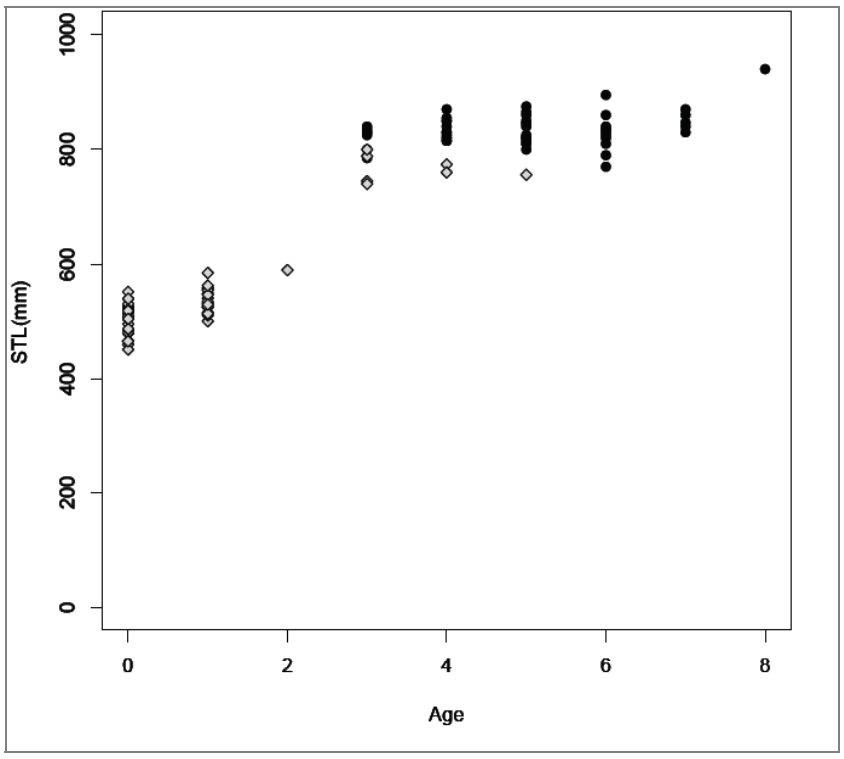

Figure 2: Size at age of *Rhizoprionodon acutus* collected from the northern (black circles) and southern (grey diamonds) regions of the Great Barrier Reef World Heritage Area.

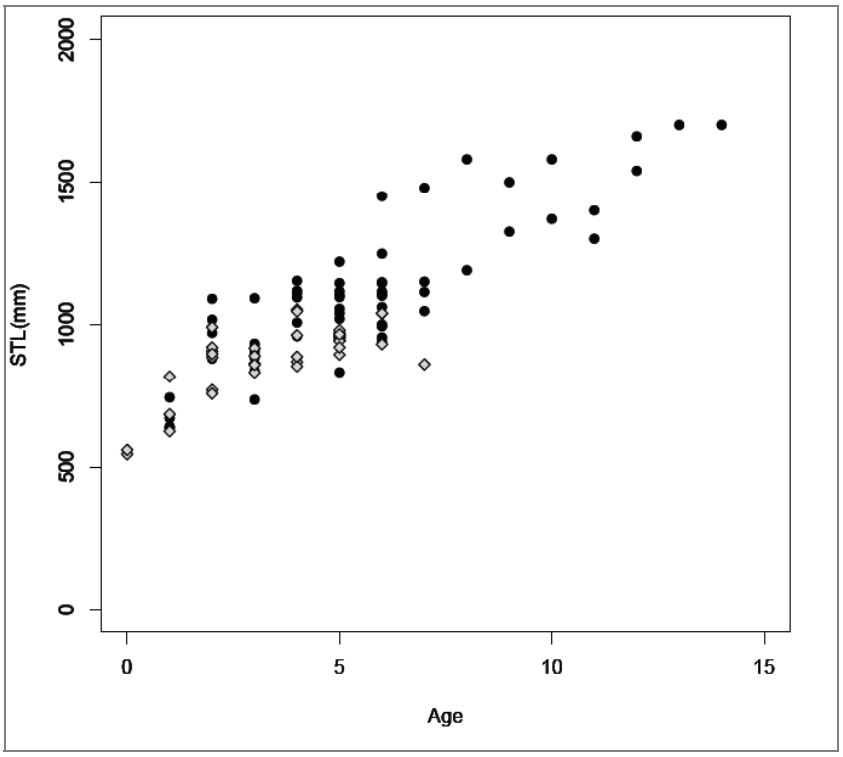

Figure 3: Size at age of *Sphyrna lewini* collected from the northern (black circles) and southern (grey diamonds) regions of the Great Barrier Reef World Heritage Area.

FIN FISH – Life History Parameter Estimation

The definition of life history characteristics for fin fish species of interest is also progressing well. Two PhD candidate students have produced some preliminary data for king (Brad Moore) and blue (Aaron Ballagh) threadfins.

Four Master of Science students have recently joined the Fishing and Fisheries Research Centre team and will be tasked with defining the life history traits of fin fish species of importance – two grunter species (banded and small-spotted), two species of gar fish and two species of whiting.

Blue Threadfin – an example of progress. Of interest is that preliminary data has indicated a more protracted spawning period for this species than previously recorded (Figure 4). Regular samples collected from the Townsville district have identified fish in spawning condition in months September through to February. Previous research on spawning periodicity of this species was limited to Gulf of Carpentaria waters, where spawning activity was limited to the months of September and October only.

Blue threadfin have also been previously reported as a protandrous hermaphrodite (male to female sex change), and again only for Gulf of Carpentaria (GoC) waters. Defining sex change where it occurs (Figure 5) and at what size is important information particularly where minimum legal size limits (MLS) are imposed (Figure 6). Setting an MLS for a sex changing species needs to be based on sound information to avoid an MLS promoting sex selective harvesting. Preliminary macroscopic and microscopic (histological) investigations of blue threadfin gonads (Figure 5) has confirmed male to female sex change occurs for blue salmon within the GBRWHA.

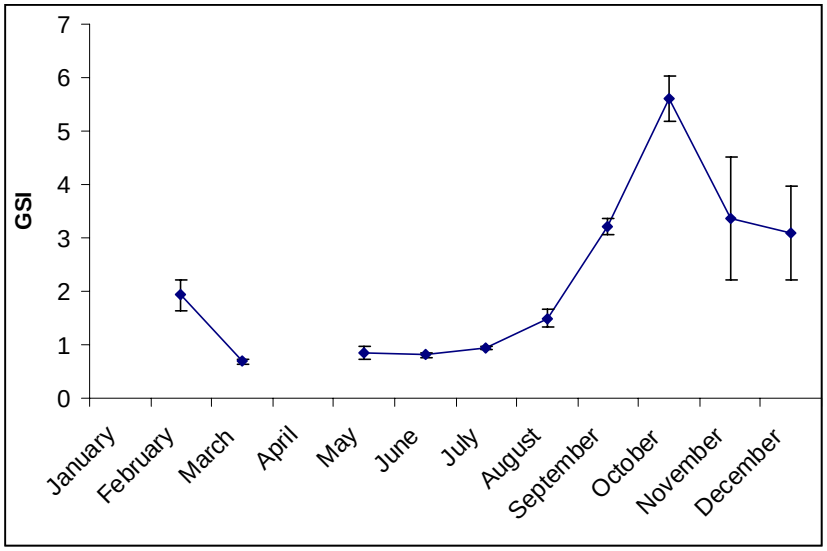

Figure 4: Blue threadfin spawning periodicity in the Townsville region as defined by PhD candidate Aaron Ballagh. Spawning period has been identified by those months when the weight of the gonad increases relative to the whole-of-fish weight, here defined as GSI – gonadosomatic index.

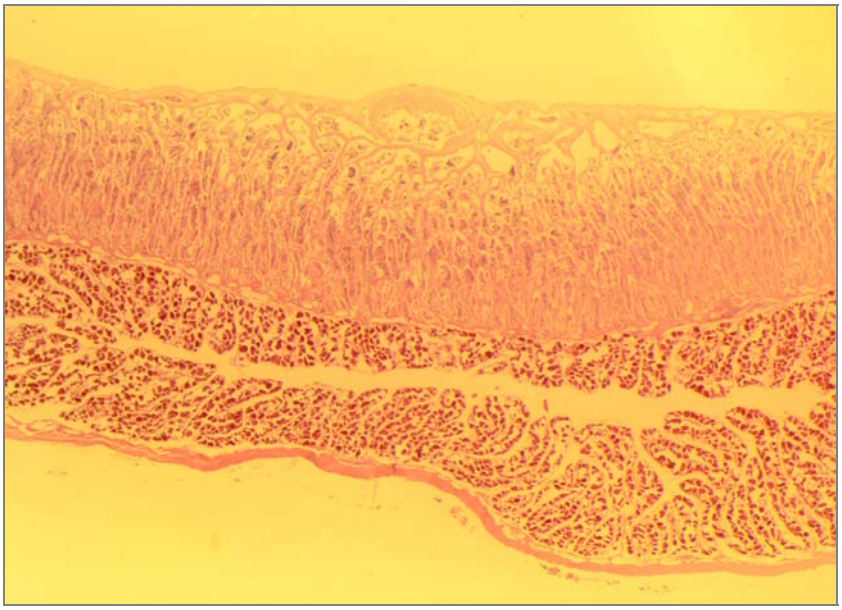

Figure 5: Preliminary histological investigations of blue threadfin gonads have defined this species as a protandrous hermaphrodite. This transverse section taken from a functionally active male threadfin displays dorsal testicular tissue (active) and ventral ovarian tissue (dormant).

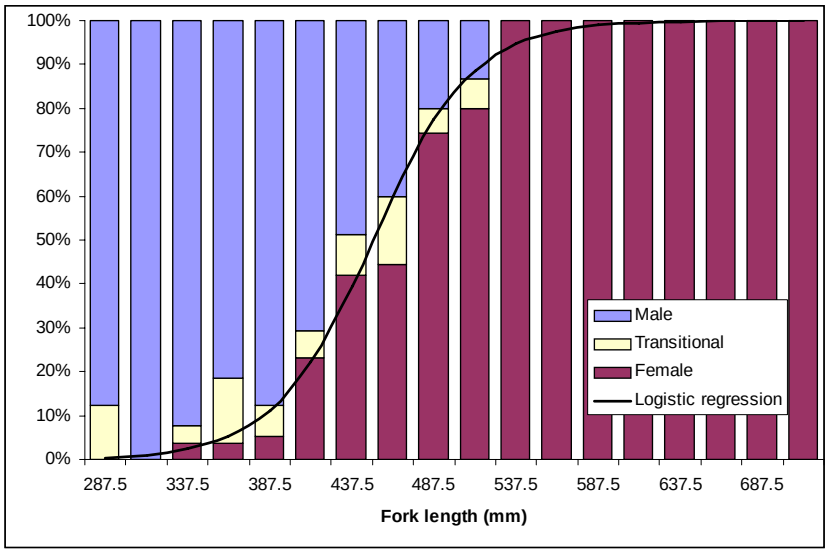

Figure 6: Defining the length and rate at which sex change occurs is important for implementing ecologically sustainable minimum legal size limits (MLS) to avoid fishing mortality being preferentially skewed to one sex. The current 40cm total length (ca. 33cm FL) MLS for blue salmon preferentially protects mature males and may need to be revisited.

4. Explanation of activity changes

Problems and opportunities

As flagged in the previous milestone, initial project methodology relied heavily on commercial fish processors and wholesalers for biological samples, a tactic which was failing. This situation continues, however has been appropriately remedied by project staff.

Problem: Disappointing success with sourcing fin fish biological samples from commercial fish wholesalers has resulted in the project team adopting two new approaches to gathering biological samples for key fin fish species.

Solution/Opportunity: In order to overcome the lack of biological samples for some fish species, the project team has adopted two additional sampling methods to complement commercial fisher and processor sampling. Firstly, in collaboration with boat ramp surveys, project staff members are collecting biological samples from recreational fishers' catches in the Hinchinbrook area through the helpful assistance of the Wanderers Caravan Park. Secondly, project staff members are conducting a monthly fishery independent sampling trip in the greater Townsville region to maintain a consistent monthly sampling of biological samples for major target species. These two activities combined are adding significant value particularly to the monthly collection of biological samples.

5. Communications, major activities or events

Project briefings have been given to the CapRef Steering Committee; SUNFISH North Queensland; Queensland Seafood Industry Association; and Queensland Primary Industries and Fisheries (QPIF).

Project Leader Andrew Tobin briefed a shark industry working group (including fishery and management representatives) at QPIF on project progress and the timetable for expected outcomes. Project staff member David Welch recently attended an 'Offshore Net ERA Workshop' in Darwin.