



<p>TASK NO. T2.1</p>	<p>Mapping and Characterisation of Key Biotic & Physical Attributes of the Torres Strait Ecosystem Start Date: 01-Jul-03, End Date: 30-Jan-07</p>
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Task Contacts

Task Leader: Pitcher, Roland (CSIRO)

Task Associate: Jackson, Steve (NOO)

Research Summary

An important precursor to this project was the Torres Strait Seabed & Water-Column Data Collation, Bio-physical Modeling and Characterization, project supported by the National Oceans Office and CSIRO Marine Research. This project compiled data from a variety of sources on seabed and water column characteristics to provide a preliminary characterization of the non-reefal marine ecosystems of Torres Strait. The information was then used to design a cost-effective and optimized stratified sampling design for the current CRC task.

A total of 54 days of field work were conducted, comprising two voyages. The first, conducted on the QDPI research vessel FRV Gwendoline May in Jan/Feb 2004, sampled seabed fish and other mobile bottom species using an 8 fthm prawn net and successfully sampled 149 sites. The second voyage, conducted on the JCU vessel RV James Kirby, sampled benthos and substrate with a 1.5m epi-benthic sled, towed remote video and digital still cameras and sediment pipe-dredge. During this voyage 184 sites were visited, with the sled being successfully deployed on 167 and video and still cameras deployed on 173 of these.

The samples have almost all been sorted and specimens identified, vouchered, counted and weighed and entered into a database. Different groups of biota have been sorted by different agencies according to their expertise. Crustaceans and fish by CMAR, echinoderms by MTQ, seagrasses by QDPI, sediments by GA and all other invertebrates by QM. Because of this each agency has been entering data into their own copy of the database and periodically the master database at CMAR has been updated by the respective agencies. The most recent update was in early May 2006 and so the details on sorting progress reported here reflect the status at that time. Based on this 44% of the QM invertebrates had been sorted, all the MTQ echinoderms have been sorted, all of the CMAR crustaceans and 75% of the CMAR fish have been sorted and entered. Although the data has not been transferred onto the master database at this stage most of the agencies have now completed sorting most of the remaining samples. The exception to this is the sediment samples, which have not yet been processed, but will be done by September 2006.

A real-time characterisation of biohabitat and substrates was undertaken as the video data was being recorded and this data has been checked and entered onto a database, however, the detailed analysis of the video footage has not yet begun. This will get underway once the video analysis for the GBR Mapping project is completed towards the end of July 2006.

Maps of preliminary data have been prepared, distributed, and up-loaded onto the Project's webpage on the CRC-TS website.

Task Associates Comments

Outcomes/Achievements against each Specific Objective

The overall objective is to deliver comprehensive baseline maps and other information needed for managing for sustainability of the TS-PZ and planning for conservation of biodiversity by AFMA and other Regional, State & Commonwealth Government Agencies — for much of the TSPZ region, particularly that which surrounds the trawl fishery for ecological assessment. Specific outcomes to date are noted below; however it is emphasized that the Project is not due to deliver final outputs until late 2006.

Objective 1: Develop comprehensive inventories and maps of the distribution and abundance of physical & biological seabed habitats, seagrasses and benthos assemblages — in central-eastern TS — as a benchmark of their current status, and provide these to Regional Managers for future planning.

The Project has completed comprehensive sampling of the distribution and abundance of seabed habitats & benthos assemblages at a total of 173 different sites across the central and eastern Torres Strait – an area of >50,000 km². Two surveys were conducted; one focused on prawn trawl bycatch and fish on the QDPI's FRV Gwendoline May during January – February 2004; the second was conducted on the JCU's RV James Kirby during March – April 2005

The Bycatch/fish sampling completed by the FRV Gwendoline May (GM) included:

- Night time operations at sea over 26 days
- Successfully sampled 149 sites, yielding 1270 fish/bycatch samples
- Preliminary sorting of prawns, fish and other bycatch species, and preservation
- Entry of on-deck sorting data into a database.

The occurrence of the major groups of fish/bycatch at sites sampled during the GM trip was:

Group	Number of Sites	Number of Samples
Crustacea	21	23
Fish	144	330
Invertebrates	144	679
Marine Plants	59	73
Prawns	133	162
Sea Snake	1	1
Turtles	2	2

Most fish/bycatch samples were preserved by freezing although some reference specimens were preserved directly into formalin.

The benthic sampling completed by the RV James Kirby (JK) included:

- Deployment of the towed drop-video camera at 173 sites, yielding 23 tapes of video
- Deployment of the epibenthic sled at 167 sites, yielding 2,485 samples
- Deployment of the sediment scoop at 167 sites, yielding 167 grain size and 167 infaunal samples
- Sorting and preservation of benthic invertebrate and sediment samples
- Entry of summary video and deck sorting data into a database.

The occurrence of the major groups of epibenthos at sites sampled during JK trips was:

Group	Number of Samples	Number of Sites
Annelida	62	58
Ascidia	149	141
Biological conglomerates (+ sponge)	36	33
Biological conglomerates (no sponge)	18	16
Brachiopoda	1	1
Bryozoa	153	142
Cnidaria	332	155
Crustacea	170	164
Echinodermata	382	163
Fishes	167	137
Marine Plants	252	124
Mollusca	174	161
Nemerteans	73	72
Porifera	185	146
Sediment For Grain Size	167	167
Sipuncula	1	1

Samples were preserved either frozen, or in formalin or ethanol as appropriate.

Post field-trips, specimens were freighted to several destination laboratories where detailed sorting, identification and curation is now almost complete. During lab sorting of samples, data on OTUs and site details were entered into a computer database. A wide range of invertebrate taxa have been sorted at QM by QM staff; crustaceans and bycatch fishes have been sorted at CSIRO by CSIRO staff; seagrasses have been sorted at QDPIF in Cairns; echinoderms have been sorted at MTQ. Approximately 2039 site-samples of a wide variety of biota collected during both the GM and JK trips have been sorted and identified as at early-May 2006, and comprehensive reference collections of voucher specimens have been established and recorded into the database.

James Kirby Benthos samples as at early-May 2006:

Group	Number of Samples		% Sorted
	Collected	Sorted	
Algae	149	98	66
Annelida	62	1	2
Ascidia	149	2	1
Biological conglomerates	54	34	63
Brachiopoda	1	0	0
Bryozoa	153	97	63
Cnidaria	332	206	62
Crustacea	170	156	92
Echinodermata	382	55	14
Fishes	167	145	87
Mollusca	174	166	95
Nemerteans	73	1	1
Porifera	185	129	70
Seagrass	103	103	100

Since early-May, most of these groups have been completed. Geoscience Australia will have the sediment for grain size samples processed by September 2006.

Gwendoline May fish & bycatch samples as at early-May 2006:

Group	Number of Samples		% Sorted
	Collected	Sorted	
Alcyonaria	4	4	100
Algae	59	1	2
Ascidians	13	10	77
Asteroids	45	14	31
Corals	17	4	24
Crustacea	185	174	94
Fish	330	301	91
Gastropods	7	0	0
Gorgonacephalidae	1	1	100
Gorgonians	57	51	89
Holothurians	57	28	49
Hydroids	4	4	100
Other Invertebrates	201	188	94
Porifera	208	166	80
Rays	42	1	2
Sea Snake	1	1	100
Seagrass	14	0	0
Sharks	23	1	4
Turtles	2	2	100

Since early-May, most of these groups have been completed. Algae and seagrasses will be represented by their JK samples rather than the GM samples, as the sled is a superior sampling device for these flora.

Preliminary maps of broad seabed habitat types observed during towed-video transects have been produced, as have maps of the biomass of biota sampled by both the JK and GM — based on data entered at sea following primary sorting into major groups — and provided to end-user agencies. Detailed maps of fish and benthos distribution & abundance await completion of sorting and analyses. These preliminary maps and selected example seabed video and still photos have been loaded onto the Project's CRC-TS website.

<http://www.crctorres.com/research/T2-1.html>

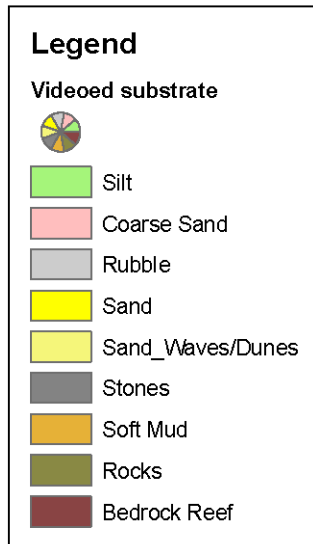
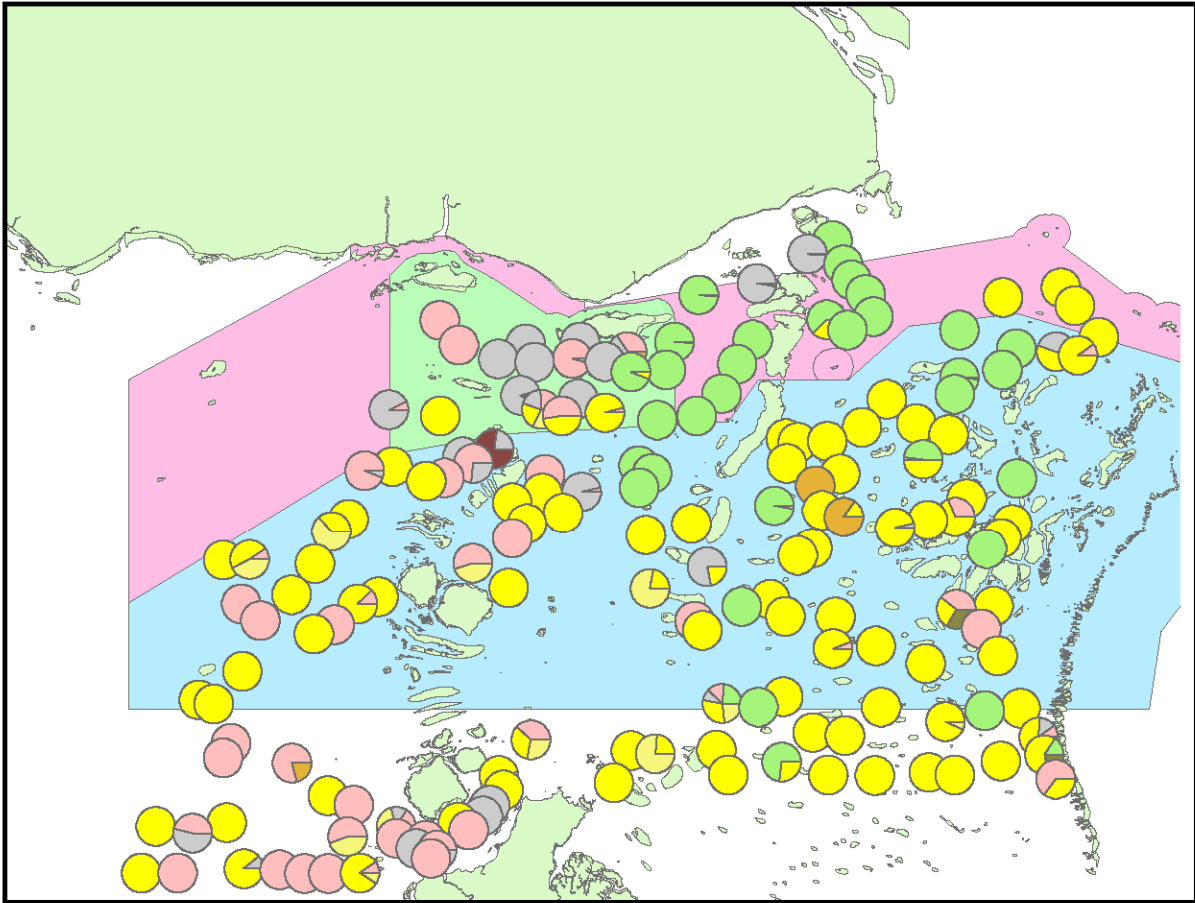


Figure 1. Pie-charts summarising the substrate characteristics of the seabed at sites sampled during the second sampling trip in March-April 2005. These data were derived from real-time summaries of the video transects.

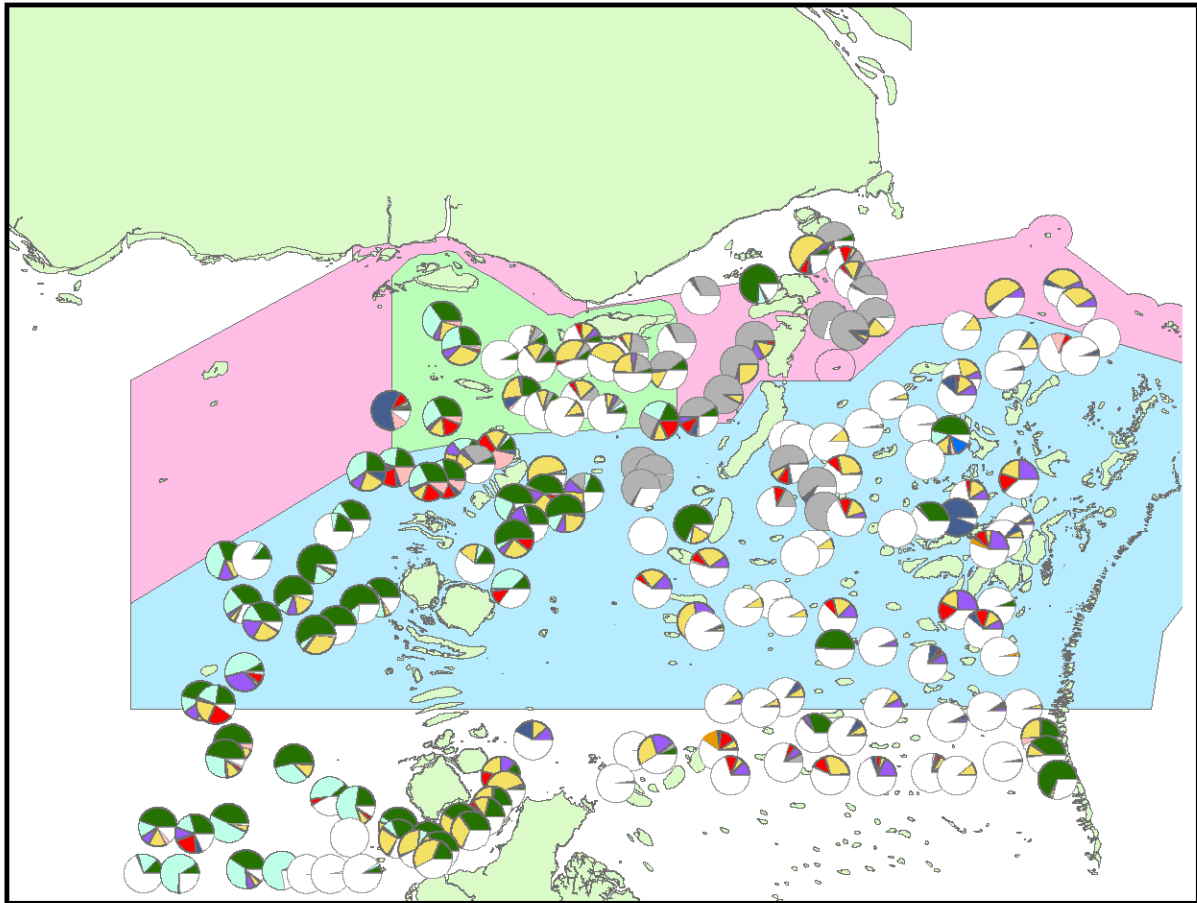


Figure 2. Pie-charts summarising the biohabitat characteristics of the seabed at sites sampled during the second sampling trip in March-April 2005. These data were derived from real-time summaries of the video transects.

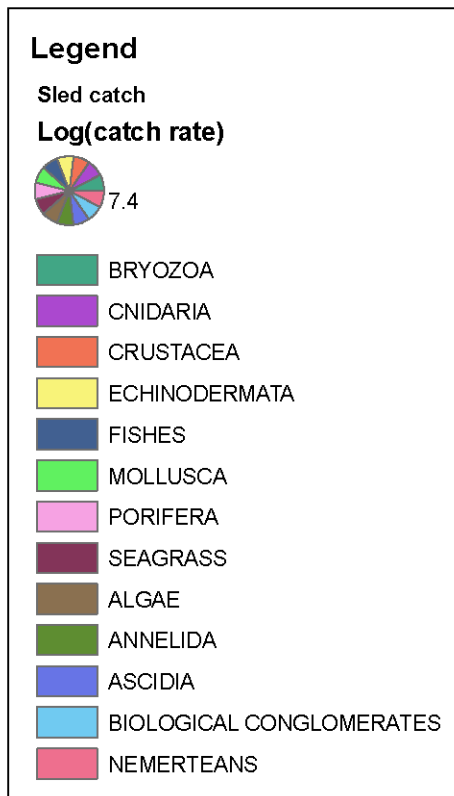
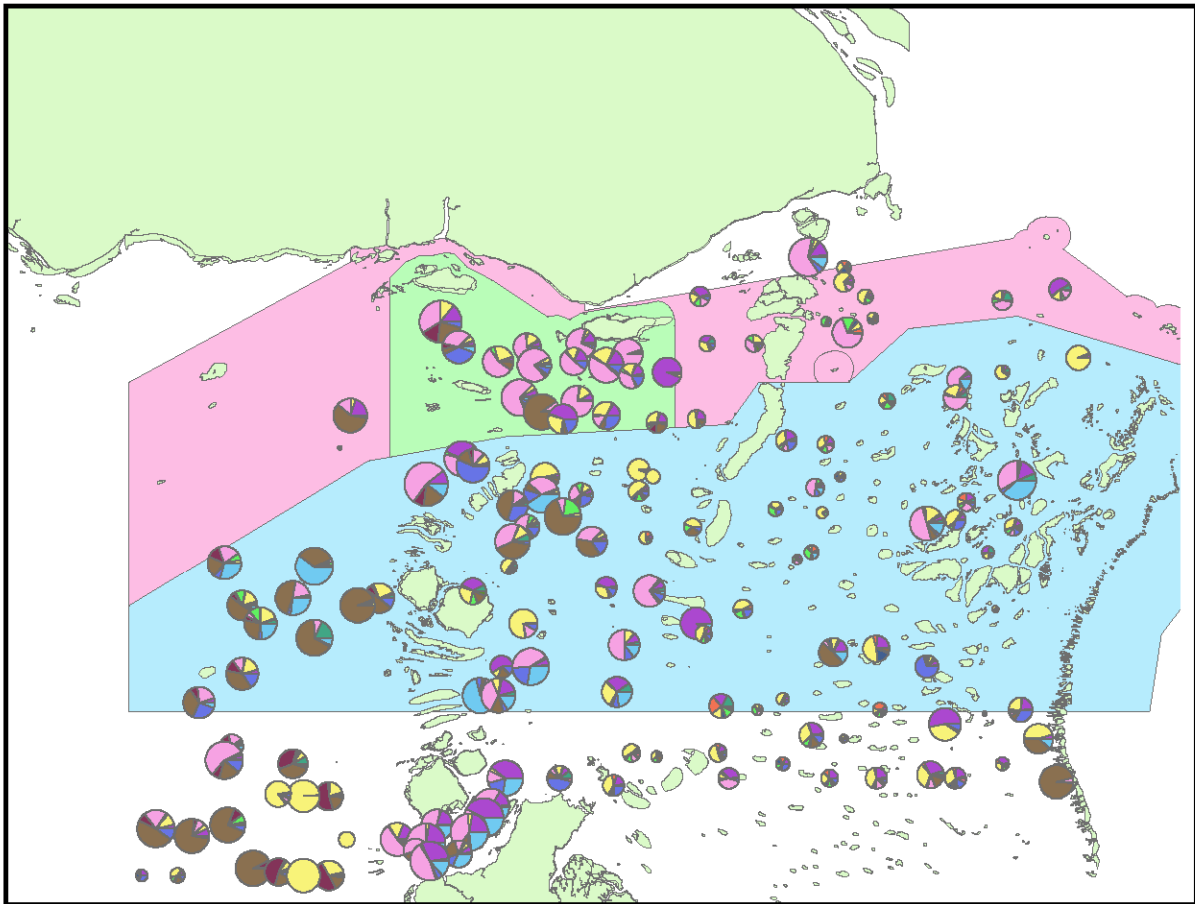


Figure 3. Pie-charts summarising the catches of the benthic sled at sites sampled during the second sampling trip in March-April 2005.

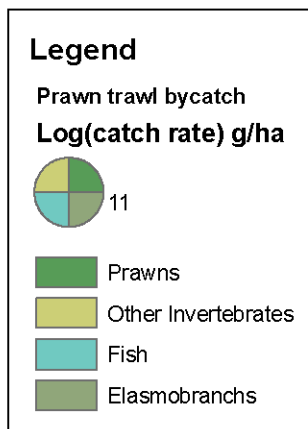
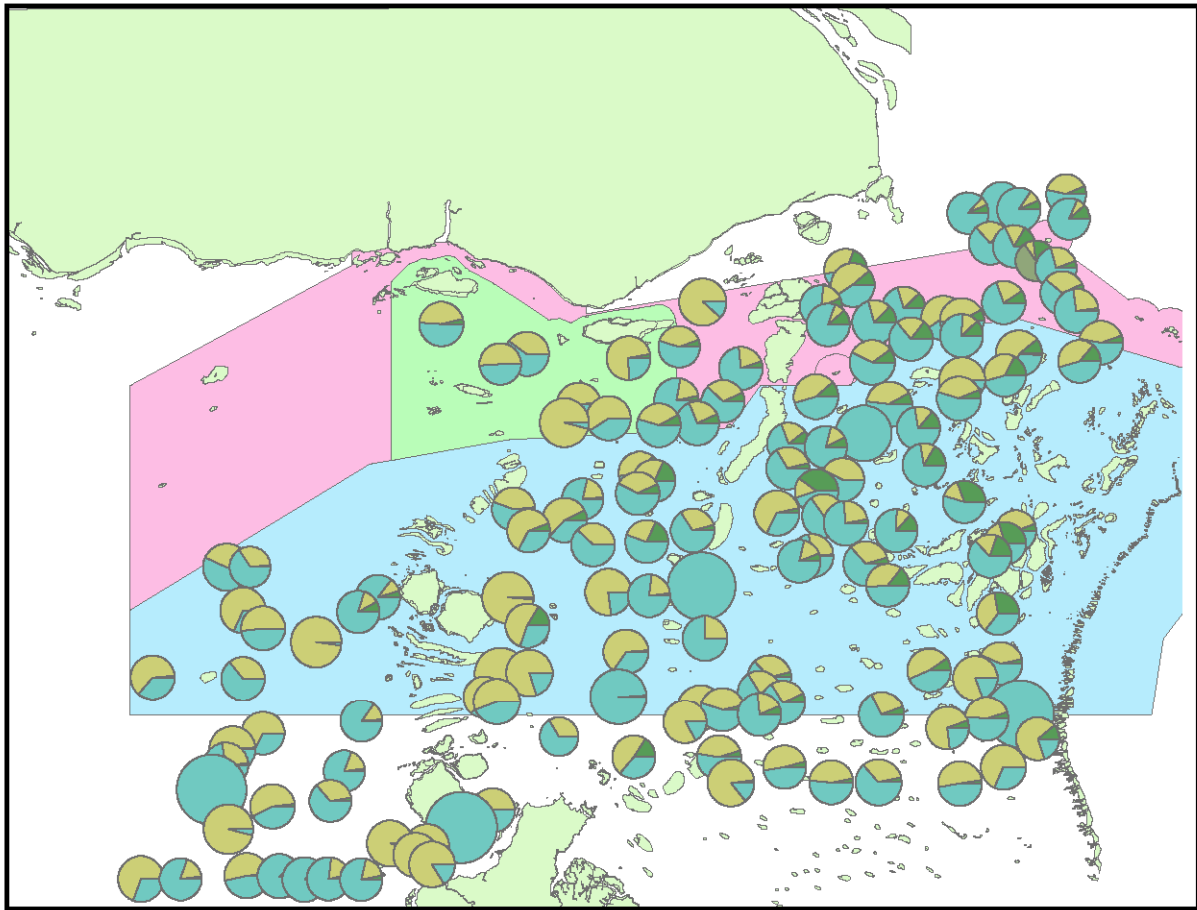


Figure 4. Pie-charts summarising the catches of major groups of prawn trawl bycatch from the first trip during Jan – Feb 2004.

Objective 2: Analyse bio-physical relationships for the sampled area and assess the utility of environmental correlates for spatial prediction of (as surrogates for) assemblages of biodiversity.

Analysis of the TS assemblages has not yet commenced. However, as a pre-requisite for an in-depth GBR technical workshop in mid-Dec 2005 to examine data & analysis details, biophysical analyses of about 200 individual seabed species, assemblages and communities were conducted on a preliminary dataset from the GBR Seabed Project. The techniques developed during the workshop will be applicable to the TS data once sorting and data entry are complete.

Objective 3: Develop attributes (eg. biomass, species richness, rarity, uniqueness, condition, potential vulnerability to impact etc.) for seabed habitats & assemblages for the sampled area.

Attributes for seabed habitats and assemblages require the completion of sorting and biophysical analyses, and will become available in late 2006.

Objective 4: Develop maps of the distribution of fauna vulnerable to trawling and provide these to industry, Islanders & managers to facilitate development of fishery management strategies that reduce impacts

Final maps of the distribution of fauna vulnerable to trawling require the completion of sorting and data analyses, and will become available in late 2006.

Objective 5: Develop ecological risk indicators for species caught in trawl bycatch, by estimating the proportion of these populations exposed to and caught by trawling in relation to their life-history characteristics, thus contributing to & facilitating ecosystem-based management of the fishery.

Preliminary indicators have been developed by overlaying maps of the historical trawl effort with indices of abundance of substrate types and biological habitat (derived from towed video), trawl bycatch groups (derived from the GM trawl catches), and benthos (derived from the JK sled catches). Plots of the proportion of each category overlying the range of trawling intensities observed in the Torres Strait have been produced (see below) as an indicator of exposure to trawling and potential risk. In most case, the majority of habitat or biota has proportionally low exposure to trawling. Exceptions include muddy seabeds and prawn biomass, which is not unexpected given the target of the fishery.

Note that these indicators are preliminary in that they are based only on the data from the sample sites. More sophisticated indicators will be developed once the models of species distributions are available and so information will be available at a much finer scale both in terms of species/taxon and spatial resolution. These analyses will also include estimated catchability and thus will enable progress from exposure indicators to risk indicators, and where possible/available estimates of productivity/recovery will be included to develop sustainability indicators. Trawl effort data (including VMS for recent years) has been obtained, analysed and mapped which will be used to update the trawl effort distribution used to develop these indicators.

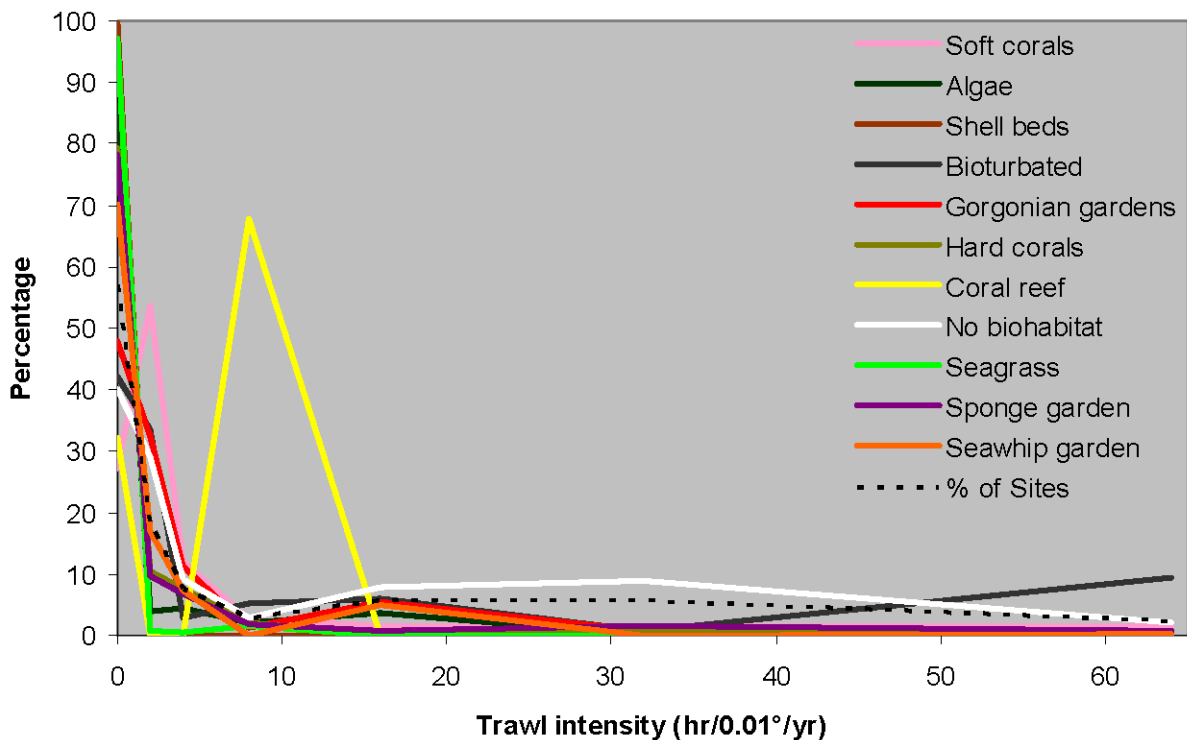


Figure 5. The proportion of various classes of videoed biohabitat overlying the range of trawling intensity found throughout Torres Strait (note that the estimate for the "Coral Reef" habitat reflects spatial error in mapping older trawl logbook data, not that coral reefs are exposed).

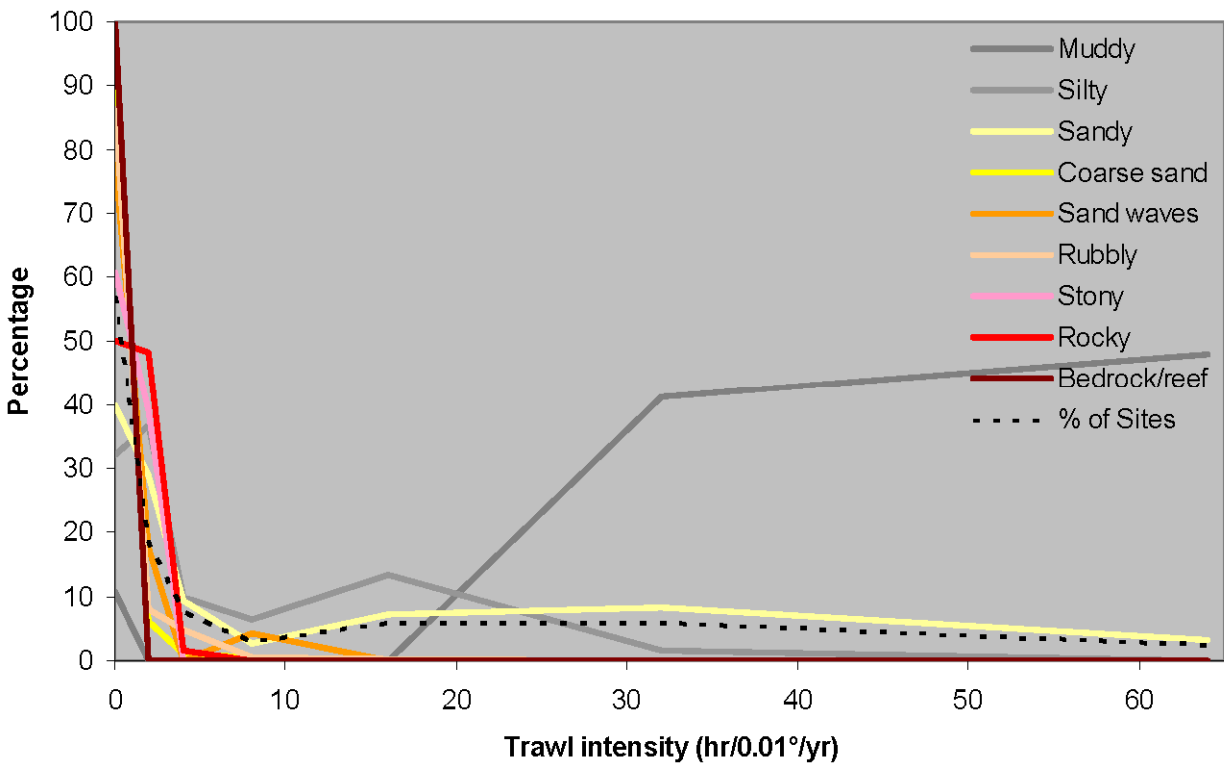


Figure 6. The proportion of videoed substratum overlying the range of trawling intensities found throughout Torres Strait.

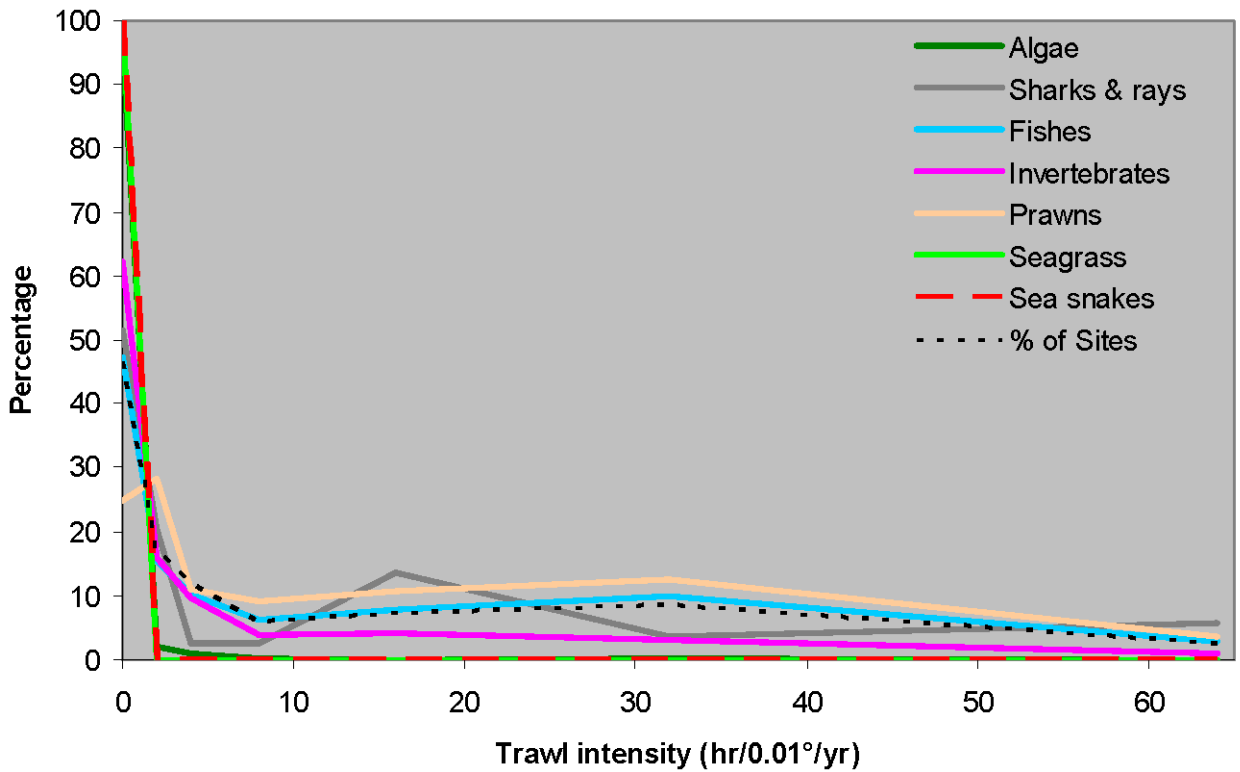


Figure 7. The proportion (biomass) of various groups of sled-caught benthos overlying the range of trawling intensities found throughout Torres Strait.

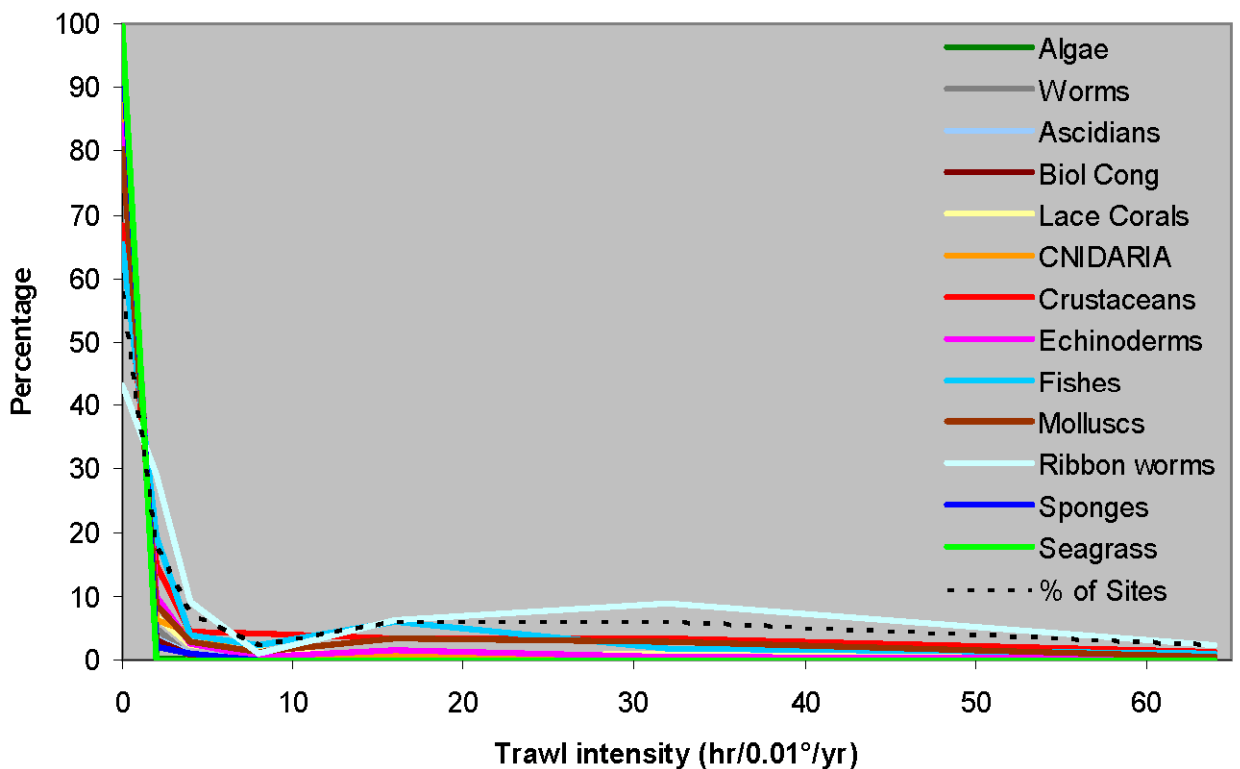


Figure 8. The proportion of various groups of prawn trawl Bycatch overlying the range of trawling intensities found throughout Torres Strait.

Objective 6: Contribute to quantifying the large-scale impacts of trawling on benthos and bycatch species, in terms of their abundance across the range of trawl intensities

As for objective 5, final development of the large-scale impacts of trawling on benthos and bycatch species requires the completion of sorting and biophysical analyses, and will become available in late 2006.

Objective 7: Provide input to a biological model of seabed benthos dynamics (the Trawl MSE Task), to develop status & trend indicators for benthos and evaluate the environmental performance of different options for managing the fishery, potentially including effort, time/space closures.

A model framework has been developed and all available data on prawn trawl bycatch, sled caught benthos, real-time semi-quantitative video habitat and substrate classifications have been provided for input. This data will be used as 'rough' input into the model to assist in developing it further; however the final version will rely on the modeled species distributions which will be available late in 2006. The historical trawl effort data required by the model has been input (up until 2003) and fine-scale VMS data has been provided by QDPI and will be incorporated into the model by September 2006.

Objective 8: Recommendations for monitoring trends in the status of key seabed habitats & assemblages

Recommendations for monitoring trends in the condition of seabed habitats and assemblages will be made once the biophysical analyses and outputs from the Trawl MSE task have been completed, late in 2006.

Utilisation and Application of the Research, Commercialisation

The comprehensive inventories & maps of the distribution and abundance of seabed habitats & assemblages will be provided to the Torres Strait CRC in late 2006, following completion of sorting and biophysical analyses, for their future planning, management and status reporting needs. To date, the project has provided information to the CRC on seabed habitat and benthos assemblages observed in a number of specific locations.

Publications

Technical reports

Pitcher, C.R., Condie, S., Ellis, N., McLeod, I., Haywood, M., Gordon, S.R., Skewes, T.D., Dunn, J., Dennis, D.M., Cotterell, E., Austin, M., Venables, W., Taranto, T. (2004). Torres Strait Seabed & Water-Column Data Collation, Bio-physical Modeling and Characterization. Final Report to the National Oceans Office. CSIRO Marine Research. Pp. 117.

Other (videos, CDs etc, brochures)

A brief was circulated to island communities prior to each field trip.

Preliminary maps and selected visual material such as example seabed video and still photos have been loaded on the Project's CRC-TS website and are publicly accessible:

Mapping and characterisation of key biotic and physical attributes of the Torres Strait ecosystem (T2.1)
<http://www.crctorres.com/research/T2-1.html>

Other Outputs

Workshops, information sessions organised for communication of research findings

CRC-TS Seabed Mapping: preliminary results that can be used in second phase of strategy evaluation, presented by CSIRO at the TORRES STRAIT PRAWN FISHERY ALTERNATIVE MANAGEMENT STRATEGY WORKSHOP, Cairns, 26 – 28 July 2005

Media activities

Radio interviews were conducted at the time of the first voyage on GM and in February 2005.

Postgraduate Students

Ian Jacobsen from The University of Queensland is doing a PhD on the ecology and taxonomy of north-east Australian benthic elasmobranches, with particular interest in the family Gymnuridae (Butterfly Rays). Ian participated on the FRV Gwendoline May voyage, assisting with field work and utilizing elasmobranch samples also for his own project. Back in the lab, Ian has identified shark and ray specimens and contributed them to the Projects database.

Grants & Awards

The National Oceans Office provided additional funding to support an increase in the number of field survey days to be completed by this project.

Applicant

Roland Pitcher, CSIRO

Title of Grant

Mapping and Characterisation of Key Biotic & Physical Attributes of the Torres Strait Ecosystem

Source

National Oceans Office

Date From

Start Date 23 May 2003

Date To

End Date 30 June 2006

Amount

\$160,660

Task Associate Comment - Steve Jackson (NOO)

I note that the project finalization date continues to be put back with the revised date now the end of 2006. The reasons for the required extension of time to complete the project are acknowledged as are the efforts of the multi-disciplinary team working on the project. However, any further delays

in finalizing the project may compromise the final wind-up of the CRC and transition to the new MTSRF arrangements which, in turn, may also impact on the outcome of the project. The Task leader and the lead agency are encouraged to make every effort to ensure that the project is finalized before such complications occur. This includes providing adequate resources and expertise to ensure that one of the key features of the project – the development of risk indicators and other information to support the sustainable management of the prawn fishery is successfully completed.

I have reported in the past on the survey work and sampling so will not repeat comments on these components for the project here. The project has now reached the stage where data is to be analysed and outcomes reported. It is imperative that early drafts of text, maps and other supporting information is provided to key users of the information (i.e. DEH/NOO, AFMA/PZJA, Tsra) to ensure that the information is presented in the most useful and understandable way. In this respect I have seen little from the project in recent months. Ideally this would be happening and I would also have metadata records of the data collected to date. Roland has advised that the likely date for the presentation of further products and early drafts to key end-users would be November for feedback into the final report in December. The opportunity is appreciated though earlier feedback on sections of the report is offered.

I am encouraged though by the efforts being made through the working group on information management. To maximize the benefits of this project the baseline data needs to be available for future planning, management and assessment processes undertaken by the key users. Likewise information from across separate tasks needs to be comparable to enable this information to be compared or combined where required. I am confident that this group will successfully tackle this requirement.

This is a major project for future marine resource management in the Torres Strait and considerable funding and resources have been expended to date. The next 6 months are critical in ensuring the project fulfills its considerable promise.