U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Center for Coastal Fisheries and Habitat Research
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Comparative analysis of the functioning of disturbed and undisturbed coral reef and seagrass ecosystems in the Tortugas: Phase I- Establishing a baseline & Phase II- Measuring the effect of establishing a reserve

August 12, 2002

Cruise and Progress Report for Legs I, II, & III of
NOAA Ship FERREL Cruise FE-02-14-BL
June 17, 2002 - July 6, 2002

Submitted By:

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August 19, 2002

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INTRODUCTION

In July 2001, the Tortugas Ecological Reserve (TER) was established. It included two components: Tortugas North and Tortugas South. Tortugas North is approximately 91nm^2 and covers the northern half of Tortugas Bank, Sherwood Forest, the pinnacle reefs north of the bank, and extensive low relief areas in the 15-40 m depth range. The latter low relief areas have received little assessment yet the comprise ~70% of the reserve area. Tortugas South is approximately 60 nm^2 and encompass Riley's Hump as well as deep water habitats to the south which are reported to provide critical habitat for several snapper species, snowy grouper, tilefish, and golden crab. The implementation of this reserve has provided an excellent opportunity for NOAA to investigate the effects of human disturbance (e.g., elimination of consumptive sampling and physical impacts) on the functioning of coral reef and deepwater algal and seagrass ecosystems.

As part of an ongoing comparative examination of the physical and biological resources within and beyond the TER, NOAA Ship FERREL arrived in Key West, FL on 16 June 2002 to support research objectives of the CCFHR and collaborators (CCMA, CSC, FMRI, NURC, USF) in the TER. A total of fourteen scientists representing three federal and state institutions and two summer college interns participated. This was the eighth cruise in support of this mission.

OBJECTIVES

Programmatic: Over the five year period of this work, we have proposed:
1) a preliminary characterization and inventory of the benthic habitat and fish communities in the extreme depths of the Tortugas South reserve component;
2) characterization of spawning aggregations and initiating the development of a probabilistic model of the fate of snapper larvae, focusing on Riley's Hump;
3) beginning comparative characterization of shallow and deepwater seagrass communities and their contribution to fishery resources in disturbed (outside the reserve) and undisturbed sites (inside the reserve);
4) establishment of a baseline for benthic nutrient composition and flux in disturbed and undisturbed sites;
5) determination of the accuracy of existing habitat delineations within the proposed ecological reserve as a function of depth and disturbed and undisturbed sites;
6) examination of how high resolution ecological data of a given habitat type can be scaled to the larger spatial context of the proposed ecological reserve;
7) determine the effect of location on coral settlement within Dry Tortugas National Park (DTNP).
Cruise FE-02-14-BL: Here, our objectives were to:
1) conduct sidescan sonar transects at permanent stations not visited in April (Figure 1, Table 1);
2) return to co-ordinate (24.81515333N, 82.87444333W) where deepwater seagrass was video recorded by the Deepworker manned submersible as part of the cruise aboard NOAA Ship GORDON GUNTER in July 2001. A series of sweeps will be made through this area with ROV to validate the presence of seagrass, to record a maximum depth of occurrence, and to possibly collect a grab sample of the grass via Ponar;
3) conduct ground truthing for aerial photography using drop cameras around DTNP;
4) return to the 30 permanent stations to conduct extensive diver-based surveys, including fish visual censuses, habitat transect videos, coral presence/absence surveys, lobster surveys, and sediment extractions;
5) conduct light profiles and collect water column samples for chlorophyll analysis at selected stations;
6) continue coordinated drop camera work and beam trawling at the northern boundary of the TER in search of evidence for trawling impacts;
7) deploy coral larvae settlement racks at selected stations;
8) deploy herbivory rigs at selected stations;
9) faunal collections for stable isotope analysis.

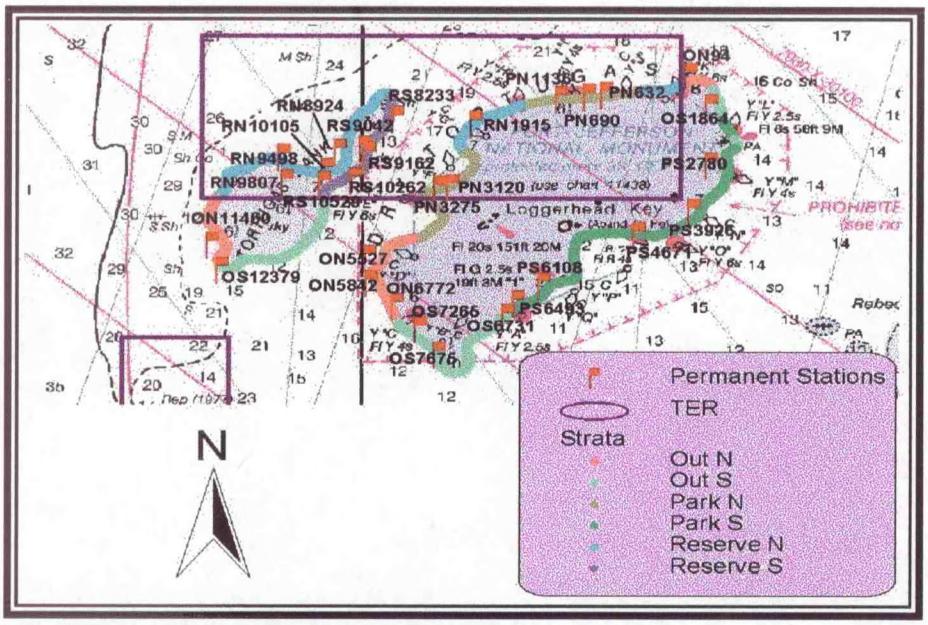

Figure 1. Location of the 30 permanent stations.

Cruise Component (leg 1):

17 June 2002	Departed Key West, FL
22 June 2002	Arrived Key West, FL

During Leg I, our worked was focused primarily on objectives 1, 4, and 5 as outlined above. A total of fourteen stations were mapped along pre-defined transects ~1000 m in length using the Sport Scan® sidescan sonar and MiniBAT® towed operated vehicle (TOV) equipped with a downward facing video camera. Diver surveys were completed at the same fourteen stations. Six randomly selected sites were chosen for water column samples.

Participants:

Mark Fonseca	Chief Scientist	NOS, Beaufort, NC
Amy Uhrin	Field Party Chief	NOS, Beaufort, NC
Craig Bonn	Chief Diver	NOS, Beaufort, NC
John Brewer	Biological Technician	NOS, Beaufort, NC
Donna Berns	Biological Technician	FMRI, St. Petersburg, FL
Jitka Hyniova	Biological Technician	FMRI, St. Petersburg, FL
Sean Meehan	Biologist	DAC, FKNMS
Kevin Kirsch	Biologist	DAC, FKNMS
Erin Carter	CCFHR Summer Intern	Smith College, MA

Cruise Component (leg 2):

24 June 2002	Departed Key West, FL
29 June 2002	Arrived Key West, FL

On Leg II we continued to focus on objectives 1, 4, and 5. In addition, a number of samples were taken in support of objectives 3, 6, and 9. Thirteen permanent stations were mapped using the Sport Scan® and

these same stations were subjected to diver surveys and water column extractions. Seventeen random coordinates were visited for ground truthing exercises. Beam trawl tows were made at twenty-one random stations located within and outside TER North. Several specimens for stable isotope analysis were obtained from beam trawl hauls, divers armed with sling spears, and via hook and line from the FERREL. Herbivory rigs were deployed and retrieved on two occasions in test trials as we are considering use of this technique to improve our examination of trophic status.

Participants:

Mark Fonseca	Chief Scientist	NOS, Beaufort, NC
Amy Uhrin	Field Party Chief	NOS, Beaufort, NC
Craig Bonn	Chief Diver	NOS, Beaufort, NC
Christine Addison	Biological Technician	NOS, Beaufort, NC
John Burke	Fisheries Biologist	NOS, Beaufort, NC
Don Field	Geographer	NOS, Beaufort, NC
Greg Piniak	Post-Doctoral researcher	NOS, Beaufort, NC
Jitka Hyniova	Biological Technician	FMRI, St. Petersburg, FL
Abigail Poray	CCFHR Summer Intern	University of Massachusetts

Cruise Component (leg 3):

01 July 2002	Departed Key West, FL
06 July 2002	Arrived Key West, FL

Mapping and diver surveys at the remaining permanent stations were completed on Leg III. Another major focus of this leg was the deployment of 6 coral recruitment racks (objective 7) and continued ground truthing efforts (42 random coordinates visited).

Participants:

Jud Kenworthy	Chief Scientist	NOS, Beaufort, NC
Christine Addison	Field Party Chief	NOS, Beaufort, NC
Jitka Hyniova	Chief Diver	FMRI, St. Petersburg, FL
John Burke	Fisheries Biologist	NOS, Beaufort, NC
Don Field	Geographer	NOS, Beaufort, NC
Greg Piniak	Post-Doctoral researcher	NOS, Beaufort, NC
Paula Whitfield	Biological Technician	NOS, Beaufort, NC

DRY TORTUGAS ECOLOGICAL RESERVE (NORTH)

Station Location and General Survey Work: Benthic mapping at previously established permanent stations was conducted using the Sport Scan® sidescan sonar system, with verification of substrate characteristics via MiniBAT® TOV equipped with a downward facing video camera. Divers were deployed at each permanent station to conduct fish visual censuses, habitat transect videos, coral presence/absence surveys, lobster surveys, and faunal collections for stable isotope analysis, as well as deploy coral larval settlement racks and perform sediment extractions. Random points from the area around DTNP were selected for drop camera verification of substrate as a means of ground truthing aerial photography. Beam trawl samples were taken at selected stations along the northern boundary of the TER. In conjunction with beam trawls, ROV and drop camera drifts were made to search for trawl impacts to the benthos. See the complete listing of all data/samples collected given in Appendix II for site locations.

Approach (Specific):

Habitat Mapping:

Coarse Scale Mapping: We continued with the sampling protocol that had been adopted beginning with the February 2001 cruise aboard NOAA Ship OREGON II (OT-01-01). To reiterate, based upon previous extensive habitat characterizations, six categories of habitat had been established: Out North (outside the reserve/park, north of the prevailing current) Out South (outside the reserve/park, south of the prevailing current), Park North (inside the park, north of the prevailing current), Park South (within the park, south of the prevailing current), Reserve North (within the reserve, north of the prevailing current), and Reserve South (within the reserve, south of the prevailing current; Figure 1). Five random sample points were selected from the assumed boundary of the sand-coral interface within each of the six categories (Figure 1). These 30 stations had been previously mapped during 2001 cruises (OT-01-01, FE-01-07-BL, FE-01-10-BL, and FE-01-11-BL) using the MiniBAT® TOV equipped with a downward facing camera, and QTC VIEW seafloor classification system simultaneously run with a ROXANN® sonar system. In April (FE-02-10-BL), we began mapping the stations using the Sport Scan® sidescan sonar unit. A list of the 30 permanent stations is given in Appendix I (see also Figure 1). For this cruise, we continued mapping the 30 permanent stations with the Sport Scan®, which performed admirably at distances out to ~ 60 m (Figure 2). A maximum of three parallel tracks (~ 500-1000 m long) were made at each of the remaining

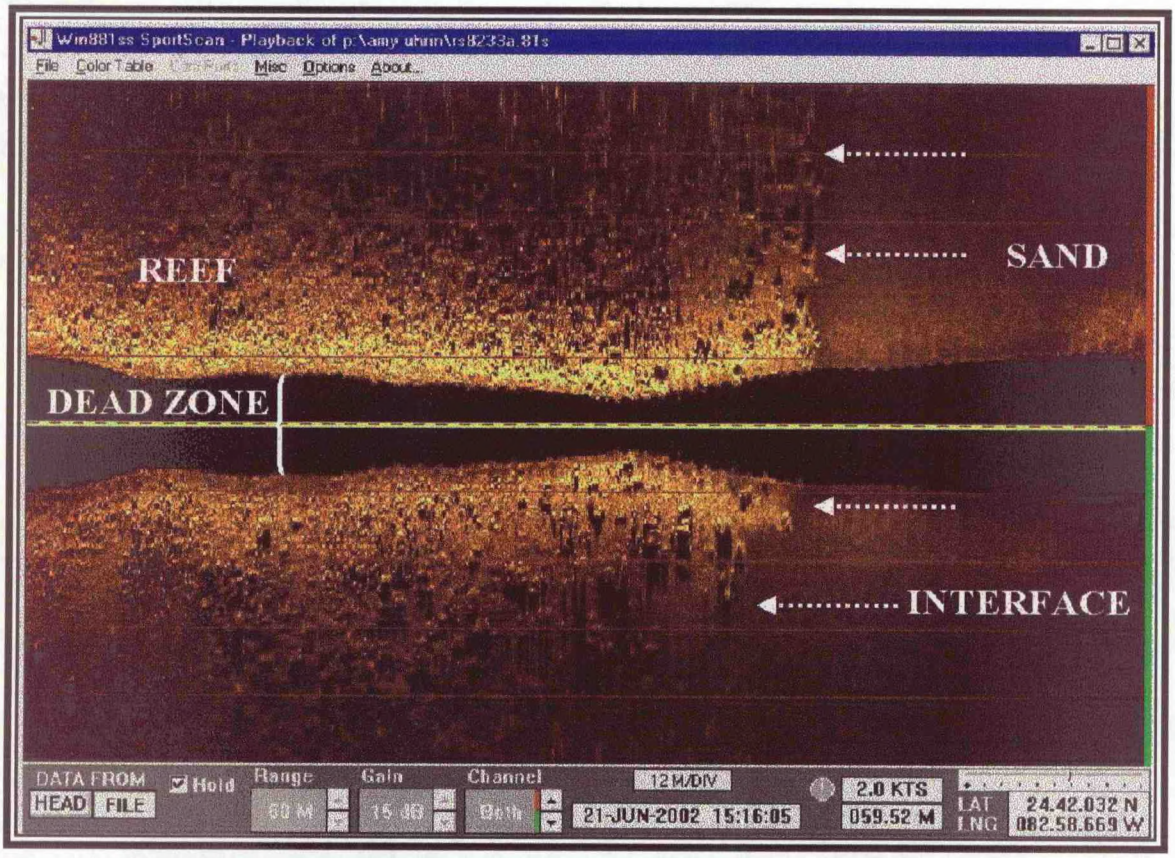

Figure 2. Computer readout of the Sport Scan sonar image. Note the clear delineation of the interface. The "dead zone" is a blind spot that extends out at a 40° angle from directly beneath the tow body.

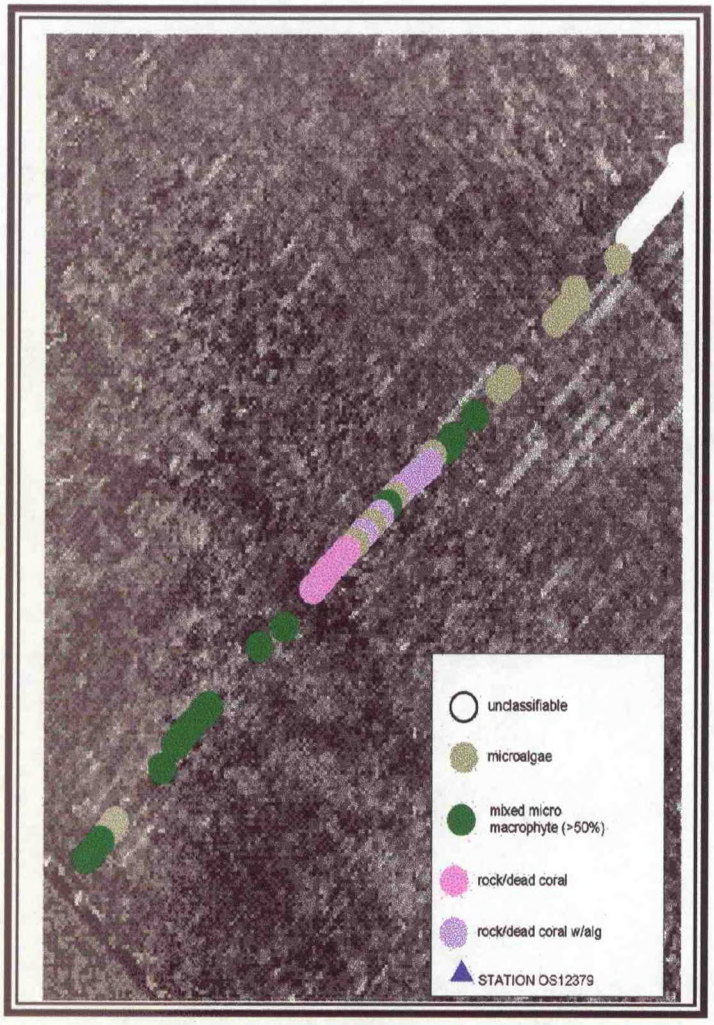

Figure 3. Section of a Sport Scan sonar image (gray scale) with video classification points overlaid.

stations. On several occasions, the MiniBAT® was run simultaneously with the Sport Scan® as a means of video-calibrating the sonar images (Figure 3). Although the Sport Scan® is equipped with GPS capabilities, on occasion, track lines were recorded using Trimble® ASPEN Field software.

Fine Scale Mapping: Divers were deployed at each station to conduct video transects of benthic habitat and coral presence/absence surveys. When previously installed markers were not located at the specified drop point, divers searched the area for approximately five minutes. If the marker was found to be > 20 m from the drop point, a pop float was deployed at the marker and a new coordinate was recorded by personnel at the surface using a Trimble® Pro XR/XRS unit. If the search revealed no marker, a temporary marker (rebar stake) was installed and removed at the end of dive activities.

Divers followed transect lines beginning from the permanent / temporary marker at the interface and running 30 m out in either direction, perpendicular to the interface (sand plain vs reef). One diver recorded the substrate along the length of each transect using a SONY 900 digital video camera, contained in an underwater housing, at 40 cm above the substrate. The camera unit was equipped with laser pointers and a measuring device that allowed the video image to span a fixed 0.4 m^2 area. The second diver completed a coral presence/absence survey along the length of the reef transect out to 1 m on either side of the transect line. In addition, presence of lobsters was noted. Habitat cover along each transect will be determined using Point Count for Coral Reefs software. Video analysis and analysis of coral presence/absence data are currently underway at CCFHR.

Fish Visual Census: Paired band transect visual censuses were made by divers over the reef and soft bottom habitat along the 30 m transects as described above. Band transects were 6 m in width. Analysis of census data is ongoing at CCFHR. Our preliminary observations made in the Tortugas in June of 2002 and the benthic samples processing done in the lab indicate differences from our previous, pre-impact, observations. The source of these differences could generally be attributed to the considerable natural variability of such systems. For example in 2002 both large red and black grouper, on the order of five year olds, were conspicuous parts of the fish assemblage at the reef soft bottom interface. In 2001 only

large red grouper were abundant. This may have occurred from increasing grouper density at interior reef sites or may represent movement, with growth of an exceptional year class of black grouper to productive though risky feeding habitat.

Diving: A total of 165 dives were logged on this cruise, mostly with divers breathing NITROX II. A complete listing of all dive statistics is presented in Appendix IV. Average dive depth was 78.8 feet.

Gear Impact: As part of a comparative analysis of the effects that exclusion of shrimp trawling has had in the TER, the following methods were employed:

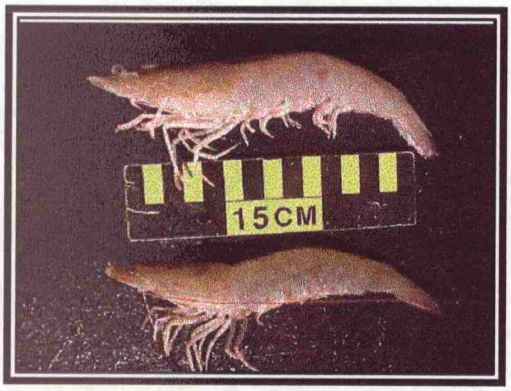

Figure 4. Jumbo pink shrimp collected from soft-bottom habitats are, appear to be more abundant in the reserve than on adjacent unrestricted bottom.

Beam Trawl: Along the northern boundary of TER North, pairs of randomly selected coordinates were chosen for beam trawl samples. The coordinates served as starting points for the trawl tow path. One coordinate of each pair was located ~ 2 km due south of TER North's northern boundary (within the reserve), and the other, ~ 2 km due north of the boundary (outside the resrve). One set of coordinates spanned the eastern boundary of TER. In this case, one coordinate was located ~ 2 km due west of the TER North's eastern boundary (within the reserve), and the other ~ 2 km due east of the boundary (outside the resrve). We conducted 3-5 minute tows at each coordinate using a modified 2 m beam trawl with a 3 mm mesh cod end. Samples were sorted and initially preserved in formalin (24 h) and then transferred to ethyl alcohol. The path of each trawl was recorded using Trimble® ASPEN Field software. Starting points of trawls are given in Appendix II. Sample processing is currently underway at CCFHR.

Our faunal collections from trawled and protected softbottom habitat near the northern boundary of the reserve strongly suggest that relaxation of trawling pressure has increased benthic biomass and diversity in the reserve. The reserve acts as a refuge for the large pink shrimp (Figure 4) targeted by the fishery and their density as well as biomass and diversity of smaller crustaceans was obviously higher in paired protected vs open bottom samples. Although not as obvious, differences in the fish and echinoderm assemblages between trawled and protected bottom are likely to become clear with the detailed analysis of our samples. It appears that these soft bottom communities respond quickly to relaxation of the disturbance of trawling and we hypothesize that further changes will occur over time with development of a more stable assemblage of attached invertebrates that should develop in the more physically stable parts of the shelf. I believe that an increase in fishes and other benthic animals can be assumed to be occurring in protected habitats within the ecological reserve. Clear evidence of direction of the management affect on the ecosystem in general and on the target large long-lived reef predators will require continued assessment of faunal communities of the Tortugas.

Drop Camera Drifts: In conjunction with the beam trawls, drop camera and ROV drifts were made in an effort to capture a video record of trawl disturbance. Fifteen minute drifts were made using the same coordiante pairs as the beam trawls. The path of each drift was video recorded and the track was recorded using Trimble® ASPEN Field software. Trawl tracks were evidenced on several occasions (Figure 4). Video processing is currently underway at CCFHR.

Coral Settlement Racks: A recent addition to our sampling repertoire is the deployment, by divers, of coral settlement racks. A settlement rack consists of 4 (2 horizontal, 2 vertical) grooved, unglazed terra cotta tiles (Metropolitan Ceramics Ecoquarry tiles, 15.25 x 15.25 x 0.95 cm) attached to a PVC tree (Figure 5). The PVC is mounted on a 12-inch galvanized stake, hammered into nonliving reef substrate with a 2-lb sledgehammer and fixed in place with underwater cement. A total of 60 racks were installed--10 racks at each of 6 sites (3 protected, 3 unprotected). The objective is to determine how coral settlement varies with location in the DTNP. Locations of racks are given in Appendix II. Racks will be recovered in April 2003. Data generated from this study could be combined with other studies using identical methodology that are underway elsewhere in the Florida Keys.

Figure 5. A coral recruitment rack established on a reef in DTNP.

Ground Truthing: Three hundred random points were generated in the area surrounding DTNP, for use in ground truthing activities (Figure 6). Using a small launch, we navigated to each point and lowered a drop camera. Notes were made on the habitat type encountered and the depth was recorded. A total of 59 points were visited. The location of these points is given in Appendix II. An additional 25 points were visited at later dates aboard cruise FE-02-15-FK. These observations will serve as accuracy assessment data for aerial photography of the DTNP to be flown in the near future.

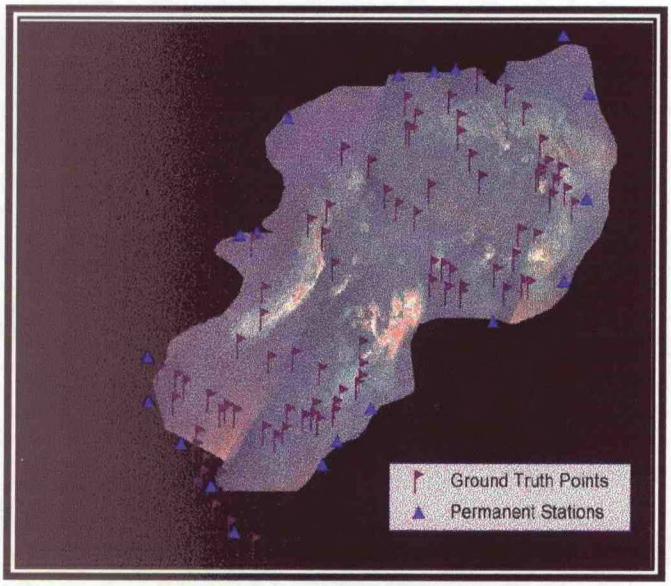

Figure 6. Aerial photograph (circa 1991) of Fort Jefferson National Monument (east Tortugas Bank) with ground truth points overlaid.

Light Profiles: Water column light profiles and water column clarity measurements were performed at randomly selected stations (cloud cover permitting). Light profiles were collected using a LI-COR® 4 pi sensor and data logger. The sensor was lowered over the side of the ship at 1 m intervals from the surface down to 15 m. Three replicate profiles were made at each station. Water clarity was obtained using secchi disks. In addition, incident radiation was continuously recorded using a LI-COR® 2 pi sensor mounted on an elevated surface on the deck. The datalogger was downloaded each night. Sample locations are given in Appendix II.

Stable Isotope: We also collected samples for use in a multiple stable isotope analysis of the food web supporting fish production in the TER. Samples collected from within the permanent stations included primary producers (phytoplankton, benthic microalgae, benthic macroalgae, and seagrasses) and secondary consumers (fish, crabs, shrimp). Several methods of collection were employed including hook and line from the FERREL, divers armed with sling spears, beam trawls, hand collection by divers, and bucket/Niskin Bottle

Figure 7. Blades of *Thalassia testudinum* attached to the downline of the herbivory rig (left); deployment of the anchored line (right).

casts. This sampling targeted specific species from different levels of the food web to provide comprehensive data of the stable isotope composition of the fishes of the banks.

Herbivory Detection: We deployed small, anchored, buoyed lines baited with seagrass (Figure 7) from launches on transects running offshore from the reef - sand interface. Lines were deployed at sunset and retrieved 24-36 h later. Locations of herbivory rigs are given in Appendix II.

Sediment Characterization: Divers collected four sediment cores (3 cm diameter) along the interface at each permanent station. Three of the cores were used for benthic chlorophyll analysis and the fourth for sediment particle size. Sediment analysis is ongoing at CCFHR.

Water Column Chlorophyll: At randomly selected coordinates, surface water samples were collected using bucket casts. Near-bottom water samples were collected using Niskin Bottle casts. Water from the casts was filtered and the filters were transported back to CCFHR for chlorophyll and phytoplankton stable isotope analysis. Sample locations are given in Appendix II.

Future Plans: In the next FY (03) we plan to expand our sampling strategy to focus not only on the maintenance of the extant sampling, but to include several short-term avenues of investigation that augment those underway. For example, we plan to conduct more extensive surveys of the soft bottom areas out from the coral-sand interface; we observed the existence of very large *Halophila* beds at many locations, running out and away from the end of the 30m transect established at each permanent station. The extent of this highly productive habitat will be linked with preliminary, diel telemetry studies of reef fishes to document their movement pattern and geographic range. These data will provide significant context to the stable isotope survey and assist in the definition of biological boundaries. Moreover, we are considering expanding herbivory studies in concert with our focus on energy flow as a means of discriminating functional boundaries. Finally, we will attempt to continue our funding support from National Marine Fisheries Service to track changes in the soft bottom communities as the result of excluding shrimp trawling.

APPENDIX I. Thirty permanent stations.

Station ID	Latitude	Longitude	Depth (ft)
RN1915	24.703150000	82.92815	100
RN9807	24.660900000	83.0467	63
RN10105	24.668816667	83.021566664	83
RN9498	24.683433333	83.013583333	75
RN8924	24.679250010	83.048716673	92
RS8233	24.706733333	82.97748333	104
RS9042	24.685183331	83.997466668	82
RS9162	24.680633333	82.995100001	87
RS10262	24.662299999	83.003666667	91
RS10529	24.659585389	83.023301312	85
ON5842	24.589099995	82.993966667	85
ON94	24.737799622	82.793482367	97
ON5527	24.607116670	82.994816667	100
ON6772	24.572633330	82.977850002	72
ON11460	24.616700000	83.093316667	79
OS1864	24.715007833	82.780514994	61
OS6731	24.564866183	82.908384117	80
OS7265	24.555500000	82.9628	79
OS7675	24.537416660	82.951066667	79
OS12379	24.598416667	83.08708333	103
PN632	24.723883994	82.846429714	96
PN690	24.722817989	82.856984239	97
PN1136	24.721195739	82.874649469	99
PN3120	24.657728508	82.942727	87
PN3275	24.656763525	82.950820475	96
PS2780	24.673361295	82.780903483	54
PS3926	24.640229853	82.791548761	68
PS4671	24.623451044	82.825840933	79
PS6108	24.587854058	82.885310917	72
PS6493	24.574495475	82.901414336	78

APPENDIX II. Sample log.

Initials	Date	Station #	Strata	Sample Code
AU	6/17/02	1864	OS	SPORT
AU	6/17/02	1864	OS	SPORT
AU	6/17/02	1864	OS	SPORT
AU	6/17/02	1864	OS	WPT
AU	6/17/02	1864	OS	DIVE
AU	6/17/02	1864	OS	FVC
AU	6/17/02	1864	OS	SED_PART
AU	6/17/02	1864	OS	SED_PART
AU	6/17/02	1864	OS	BEN_CHL
AU	6/17/02	1864	OS	BEN_CHL
AU	6/17/02	1864	OS	DIVE
AU	6/17/02	1864	OS	HABTRAN
AU	6/17/02	1864	OS	CORAL
AU	6/17/02	northern boundary		BEAM
AU	6/17/02	northern boundary		ASP
AU	6/17/02	northern boundary		DROP/DV
AU	6/17/02	northern boundary		ASP
AU	6/17/02			LGT_CONT
AU	6/18/02			COL_CHL
AU	6/18/02			COL_CHL
AU	6/18/02	6108	PS	WPT
AU	6/18/02	6108	PS	DIVE
AU	6/18/02	6108	PS	FVC
AU	6/18/02	6108	PS	SED_PART
AU	6/18/02	6108	PS	SED_PART
AU	6/18/02	6108	PS	BEN_CHL
AU	6/18/02	6108	PS	BEN_CHL
AU	6/18/02	6108	PS	SI_FISH
AU	6/18/02	6108	PS	SI_FISH
AU	6/18/02	6108	PS	DIVE
AU	6/18/02	6108	PS	HABTRAN
AU	6/18/02	6108	PS	CORAL
AU	6/18/02	6108	PS	LGT_STAT
AU	6/18/02	6108	PS	SECCHI
AU	6/18/02	6493	PS	WPT
AU	6/18/02	6493	PS	DIVE
AU	6/18/02	6493	PS	FVC
AU	6/18/02	6493	PS	SED_PART
AU	6/18/02	6493	PS	SED_PART
AU	6/18/02	6493	PS	BEN_CHL
AU	6/18/02	6493	PS	BEN_CHL

AU	6/18/02	6493	PS	DIVE
AU	6/18/02	6493	PS	HABTRAN
AU	6/18/02	6493	PS	CORAL
AU	6/18/02			LGT_STAT
AU	6/18/02			SECCHI
AU	6/18/02	6731	OS	WPT
AU	6/18/02	6731	OS	DIVE
AU	6/18/02	6731	OS	FVC
AU	6/18/02	6731	OS	SED_PART
AU	6/18/02	6731	OS	SED_PART
AU	6/18/02	6731	OS	BEN_CHL
AU	6/18/02	6731	OS	BEN_CHL
AU	6/18/02	6493	PS	SPORT
AU	6/18/02	6493	PS	SPORT
AU	6/18/02	6731	OS	DIVE
AU	6/18/02	6731	OS	HABTRAN
AU	6/18/02	6731	OS	CORAL
AU	6/18/02	6108	PS	SPORT
AU	6/18/02	6108	PS	SPORT
AU	6/18/02	6108	PS	SPORT
AU	6/18/02	6731	OS	SPORT
AU	6/18/02	6731	OS	SPORT
AU	6/18/02			COL_CHL
AU	6/18/02			COL_CHL
AU	6/18/02	northern boundary		BEAM
AU	6/18/02	northern boundary		DROP
AU	6/18/02	northern boundary		DV
AU	6/18/02			LGT_CONT
AU	6/19/02	9162	RS	WPT
AU	6/19/02	9162	RS	DIVE
AU	6/19/02	9162	RS	FVC
AU	6/19/02	9162	RS	SED_PART
AU	6/19/02	9162	RS	SED_PART
AU	6/19/02	9162	RS	BEN_CHL
AU	6/19/02	9162	RS	BEN_CHL
AU	6/19/02	9162	RS	DIVE
AU	6/19/02	9162	RS	HABTRAN
AU	6/19/02	9162	RS	CORAL
AU	6/19/02	8924	RN	WPT
AU	6/19/02	8924	RN	DIVE
AU	6/19/02	8924	RN	FVC
AU	6/19/02	8924	RN	SED_PART
AU	6/19/02	8924	RN	SED_PART

AU	6/19/02	8924	RN	BEN_CHL
AU	6/19/02	8924	RN	BEN_CHL
AU	6/19/02	8924	RN	DIVE
AU	6/19/02	8924	RN	HABTRAN
AU	6/19/02	8924	RN	CORAL
AU	6/19/02			COL_CHL
AU	6/19/02			COL_CHL
AU	6/19/02	8924	RN	SPORT
AU	6/19/02	8924	RN	SPORT
AU	6/19/02	10105	RN	SPORT
AU	6/19/02	10105	RN	SPORT
AU	6/19/02	10105	RN	WPT
AU	6/19/02	10105	RN	DIVE
AU	6/19/02	10105	RN	WPT
AU	6/19/02	10105	RN	TEMP
AU	6/19/02	10105	RN	FVC
AU	6/19/02	10105	RN	SED_PART
AU	6/19/02	10105	RN	SED_PART
AU	6/19/02	10105	RN	BEN_CHL
AU	6/19/02	10105	RN	BEN_CHL
AU	6/19/02	10105	RN	DIVE
AU	6/19/02	10105	RN	HABTRAN
AU	6/19/02	10105	RN	CORAL
AU	6/19/02			COL_CHL
AU	6/19/02			COL_CHL
AU	6/19/02	9498	RN	WPT
AU	6/19/02	9498	RN	DIVE
AU	6/19/02	9498	RN	DIVE
AU	6/19/02	9498	RN	WPT
AU	6/19/02	9498	RN	SPORT
AU	6/19/02	9498	RN	SPORT
AU	6/19/02			LGT_CONT
AU	6/20/02	3120	PN	WPT
AU	6/20/02	3120	PN	DIVE
AU	6/20/02	3120	PN	FVC
AU	6/20/02	3120	PN	SED_PART
AU	6/20/02	3120	PN	SED_PART
AU	6/20/02	3120	PN	BEN_CHL
AU	6/20/02	3120	PN	BEN_CHL
AU	6/20/02	3120	PN	DIVE
AU	6/20/02	3120	PN	HABTRAN
AU	6/20/02	3120	PN	CORAL
AU	6/20/02	3120	PN	COL_CHL

AU	6/20/02	3120	PN	COL_CHL
AU	6/20/02	3275	PN	WPT
AU	6/20/02	3275	PN	DIVE
AU	6/20/02	3275	PN	FVC
AU	6/20/02	3275	PN	SED_PART
AU	6/20/02	3275	PN	SED_PART
AU	6/20/02	3275	PN	BEN_CHL
AU	6/20/02	3275	PN	BEN_CHL
AU	6/20/02	3275	PN	DIVE
AU	6/20/02	3275	PN	HABTRAN
AU	6/20/02	3275	PN	CORAL
AU	6/20/02	3275	PN	SPORT
AU	6/20/02	3275	PN	SPORT
AU	6/20/02	6772	ON	WPT
AU	6/20/02	6772	ON	DIVE
AU	6/20/02	6772	ON	FVC
AU	6/20/02	6772	ON	SED_PART
AU	6/20/02	6772	ON	SED_PART
AU	6/20/02	6772	ON	BEN_CHL
AU	6/20/02	6772	ON	BEN_CHL
AU	6/20/02	6772	ON	SI_FISH
AU	6/20/02	6772	ON	DIVE
AU	6/20/02	6772	ON	HABTRAN
AU	6/20/02	6772	ON	CORAL
AU	6/20/02	7265	OS	SPORT
AU	6/20/02	7265	OS	SPORT
AU	6/20/02	7265	OS	SPORT
AU	6/20/02	7265	OS	WPT
AU	6/20/02	7265	OS	DIVE
AU	6/20/02	7265	OS	FVC
AU	6/20/02	7265	OS	SED_PART
AU	6/20/02	7265	OS	SED_PART
AU	6/20/02	7265	OS	BEN_CHL
AU	6/20/02	7265	OS	BEN_CHL
AU	6/20/02	7265	OS	SI_FISH
AU	6/20/02	7265	OS	SI_FISH
AU	6/20/02	7265	OS	SI_FISH
AU	6/20/02	7265	OS	DIVE
AU	6/20/02	7265	OS	HABTRAN
AU	6/20/02	7265	OS	CORAL
AU	6/20/02	6772	ON	SPORT
AU	6/20/02	6772	ON	SPORT
AU	6/21/02	7265	OS	SPORT

AU	6/20/02	northern boundary		BEAM
AU	6/20/02	northern boundary		DROP
AU	6/20/02	northern boundary		DV
AU	6/20/02			LGT_CONT
AU	6/21/02	9042	RS	SPORT
AU	6/21/02	9042	RS	SPORT
AU	6/21/02	9162	RS	SPORT
AU	6/21/02	9162	RS	SPORT
AU	6/21/02	8233	RS	WPT
AU	6/21/02	8233	RS	DIVE
AU	6/21/02	8233	RS	FVC
AU	6/21/02	8233	RS	SED_PART
AU	6/21/02	8233	RS	SED_PART
AU	6/21/02	8233	RS	BEN_CHL
AU	6/21/02	8233	RS	BEN_CHL
AU	6/21/02	8233	RS	DIVE
AU	6/21/02	8233	RS	HABTRAN
AU	6/21/02	8233	RS	CORAL
AU	6/21/02	8233	RS	SPORT
AU	6/21/02	8233	RS	SPORT
AU	6/21/02	9042	RS	WPT
AU	6/21/02	9042	RS	DIVE
AU	6/21/02	9042	RS	FVC
AU	6/21/02	9042	RS	SED_PART
AU	6/21/02	9042	RS	SED_PART
AU	6/21/02	9042	RS	BEN_CHL
AU	6/21/02	9042	RS	BEN_CHL
AU	6/21/02	9042	RS	SI_FISH
AU	6/21/02	9042	RS	SI_FISH
AU	6/21/02	9042	RS	DIVE
AU	6/21/02	9042	RS	HABTRAN
AU	6/21/02	9042	RS	CORAL
AU	6/21/02	690	PN	SPORT
AU	6/21/02	690	PN	SPORT
AU	6/21/02	690	PN	HERB
AU	6/21/02			ROV
AU	6/21/02			DV
AU	6/21/02			ASP
AU	6/21/02			DV
AU	6/21/02			ASP
AU	6/21/02			LGT_CONT
AU	6/22/02	690	PN	WPT

AU	6/22/02	690	PN	DIVE
AU	6/22/02	690	PN	FVC
AU	6/22/02	690	PN	SED_PART
AU	6/22/02	690	PN	SED_PART
AU	6/22/02	690	PN	BEN_CHL
AU	6/22/02	690	PN	BEN_CHL
AU	6/22/02	690	PN	DIVE
AU	6/22/02	690	PN	HABTRAN
AU	6/22/02	690	PN	CORAL
AU	6/22/02			COL_CHL
AU	6/22/02			COL_CHL
AU	6/22/02			LGT_CONT
END LEG I				
AU	6/24/02	2780	PS	SPORT
AU	6/24/02	2780	PS	SPORT
AU	6/24/02	3926	PS	WPT
AU	6/24/02	3926	PS	DIVE
AU	6/24/02	3926	PS	FVC
AU	6/24/02	3926	PS	SED_PART
AU	6/24/02	3926	PS	SED_PART
AU	6/24/02	3926	PS	BEN_CHL
AU	6/24/02	3926	PS	BEN_CHL
AU	6/24/02	3926	PS	DIVE
AU	6/24/02	3926	PS	HABTRAN
AU	6/24/02	3926	PS	CORAL
AU	6/24/02	3926	PS	SPORT
AU	6/24/02	3926	PS	SPORT
AU	6/24/02			COL_CHL
AU	6/24/02			COL_CHL
AU	6/24/02	northern boundary		BEAM
AU	6/24/02	northern boundary		ASP
AU	6/24/02	northern boundary		BEAM
AU	6/24/02	northern boundary		ASP
AU	6/24/02	northern boundary		BEAM
AU	6/24/02	northern boundary		ASP
AU	6/24/02			LGT_CONT
AU	6/25/02	12379	OS	SPORT
AU	6/25/02	12379	OS	SPORT
AU	6/25/02	12379	OS	WPT
AU	6/25/02	12379	OS	DIVE
AU	6/25/02	12379	OS	FVC

AU	6/25/02	12379	OS	SED_PART
AU	6/25/02	12379	OS	SED_PART
AU	6/25/02	12379	OS	BEN_CHL
AU	6/25/02	12379	OS	BEN_CHL
AU	6/25/02	12379	OS	DIVE
AU	6/25/02	12379	OS	HABTRAN
AU	6/25/02	12379	OS	CORAL
AU	6/25/02	11460	ON	SPORT
AU	6/25/02	11460	ON	SPORT
AU	6/25/02			COL_CHL
AU	6/25/02			COL_CHL
AU	6/25/02	9807	RN	SPORT
AU	6/25/02	9807	RN	SPORT
AU	6/25/02	11460	ON	WPT
AU	6/25/02	11460	ON	DIVE
AU	6/25/02	11460	ON	FVC
AU	6/25/02	11460	ON	SED_PART
AU	6/25/02	11460	ON	SED_PART
AU	6/25/02	11460	ON	BEN_CHL
AU	6/25/02	11460	ON	BEN_CHL
AU	6/25/02	11460	ON	DIVE
AU	6/25/02	11460	ON	HABTRAN
AU	6/25/02	11460	ON	CORAL
AU	6/25/02	11460	ON	LGT_STAT
AU	6/25/02	11460	ON	SECCHI
AU	6/25/02	11460	ON	COL_CHL
AU	6/25/02	11460	ON	COL_CHL
AU	6/25/02	9807	RN	WPT
AU	6/25/02	9807	RN	DIVE
AU	6/25/02	9807	RN	FVC
AU	6/25/02	9807	RN	SED_PART
AU	6/25/02	9807	RN	SED_PART
AU	6/25/02	9807	RN	BEN_CHL
AU	6/25/02	9807	RN	BEN_CHL
AU	6/25/02	9807	RN	DIVE
AU	6/25/02	9807	RN	HABTRAN
AU	6/25/02	9807	RN	CORAL
AU	6/25/02	9807	RN	SI_FISH
AU	6/25/02	9807	RN	SI_FISH
AU	6/25/02	9807	RN	SI_FISH
AU	6/25/02	9807	RN	SI_FISH

AU	6/25/02	9807	RN	SI_FISH
AU	6/25/02	northern boundary		DROP/DV
AU	6/25/02	northern boundary		ASP
AU	6/25/02	northern boundary		DROP/DV
AU	6/25/02	northern boundary		ASP
AU	6/25/02	northern boundary		DROP/DV
AU	6/25/02	northern boundary		ASP
AU	6/25/02	northern boundary		BEAM
AU	6/25/02	northern boundary		ASP
AU	6/25/02	northern boundary		BEAM
AU	6/25/02	northern boundary		ASP
AU	6/25/02	northern boundary		LGT_CONT
AU	6/25/02	northern boundary		SI_INV
AU	6/25/02	northern boundary		SI_INV
AU	6/25/02	northern boundary		SI_INV
AU	6/25/02	northern boundary		SI_INV
AU	6/25/02	northern boundary		SI_INV
AU	6/25/02	northern boundary		SI_INV
AU	6/25/02	northern boundary		SI_INV
AU	6/25/02	northern boundary		SI_INV
AU	6/26/02	8233	RS	WPT
AU	6/26/02	8233	RS	DIVE
AU	6/26/02	8233	RS	WPT
AU	6/26/02	8233	RS	FVC
AU	6/26/02	8233	RS	SED_PART
AU	6/26/02	8233	RS	SED_PART
AU	6/26/02	8233	RS	BEN_CHL
AU	6/26/02	8233	RS	BEN_CHL
AU	6/26/02	8233	RS	DIVE
AU	6/26/02	8233	RS	HABTRAN
AU	6/26/02	8233	RS	CORAL
CA	6/26/02	8233	RS	COL_CHL
CA	6/26/02	8233	RS	COL_CHL
AU	6/26/02	monument area		TRUTH
AU	6/26/02	monument area		TRUTH
AU	6/26/02	monument area		TRUTH
AU	6/26/02	monument area		TRUTH
AU	6/26/02	monument area		TRUTH
AU	6/26/02	monument area		TRUTH
AU	6/26/02	monument area		TRUTH

AU	6/26/02	monument area		TRUTH
AU	6/26/02	monument area		TRUTH
CA	6/26/02	10262	RS	SPORT
CA	6/26/02	10262	RS	SPORT
CA	6/26/02	10262	RS	SPORT
CA	6/26/02	10262	RS	COL_CHL
CA	6/26/02	10262	RS	COL_CHL
AU	6/26/02	10529	RS	SPORT
AU	6/26/02	10529	RS	SPORT
AU	6/26/02	10529	RS	COL_CHL
AU	6/26/02	10529	RS	COL_CHL
AU	6/26/02	10262	RS	WPT
AU	6/26/02	10262	RS	DIVE
AU	6/26/02	10262	RS	FVC
AU	6/26/02	10262	RS	SED_PART
AU	6/26/02	10262	RS	SED_PART
AU	6/26/02	10262	RS	BEN_CHL
AU	6/26/02	10262	RS	BEN_CHL
AU	6/26/02	10262	RS	DIVE
AU	6/26/02	10262	RS	HABTRAN
AU	6/26/02	10262	RS	CORAL
AU	6/26/02	10529	RS	COL_CHL
AU	6/26/02	10529	RS	COL_CHL
AU	6/26/02	10529	RS	LGT_STAT
AU	6/26/02	10529	RS	SECCHI
AU	6/26/02	10529	RS	WPT
AU	6/26/02	10529	RS	DIVE
AU	6/26/02	10529	RS	SI_FISH
AU	6/26/02	10529	RS	FVC
AU	6/26/02	10529	RS	SED_PART
AU	6/26/02	10529	RS	SED_PART
AU	6/26/02	10529	RS	BEN_CHL
AU	6/26/02	10529	RS	BEN_CHL
AU	6/26/02	10529	RS	DIVE
AU	6/26/02	10529	RS	HABTRAN
AU	6/26/02	10529	RS	CORAL
AU	6/26/02	9498	RN	WPT
AU	6/26/02	9498	RN	DIVE
AU	6/26/02	9498	RN	SI_FISH
AU	6/26/02	9498	RN	FVC
AU	6/26/02	9498	RN	SED_PART

AU	6/26/02	9498	RN	SED_PART
AU	6/26/02	9498	RN	BEN_CHL
AU	6/26/02	9498	RN	BEN_CHL
AU	6/26/02	9498	RN	DIVE
AU	6/26/02	9498	RN	HABTRAN
AU	6/26/02	9498	RN	CORAL
CA	6/26/02	northern boundary		BEAM
AU	6/26/02	northern boundary		ASP
CA	6/26/02	northern boundary		BEAM
AU	6/26/02	northern boundary		ASP
CA	6/26/02	northern boundary		SI_INV
CA	6/26/02	northern boundary		SI_INV
CA	6/26/02	northern boundary		SI_INV
CA	6/26/02	northern boundary		SI_INV
CA	6/26/02	northern boundary		SI_INV
CA	6/26/02	northern boundary		SI_INV
CA	6/26/02	northern boundary		BEAM
AU	6/26/02	northern boundary		ASP
CA	6/26/02	northern boundary		SI_FISH
CA	6/26/02	northern boundary		SI_FISH
CA	6/26/02	northern boundary		SI_FISH
CA	6/26/02	northern boundary		SI_FISH
CA	6/26/02	northern boundary		SI_FISH
CA	6/26/02	northern boundary		BEAM
AU	6/26/02	northern boundary		ASP
AU	6/27/02	1136	PN	DIVE
AU	6/27/02	1136	PN	FVC
AU	6/27/02	1136	PN	SED_PART
AU	6/27/02	1136	PN	SED_PART
AU	6/27/02	1136	PN	BEN_CHL
AU	6/27/02	1136	PN	BEN_CHL
AU	6/27/02	1136	PN	DIVE
AU	6/27/02	1136	PN	HABTRAN
AU	6/27/02	1136	PN	CORAL
CA	6/27/02	632	PN	SPORT
CA	6/27/02	632	PN	SPORT
CA	6/27/02	1136	PN	COL_CHL
CA	6/27/02	1136	PN	COL_CHL
CA	6/27/02	632	PN	COL_CHL
CA	6/27/02	632	PN	COL_CHL
CA	6/27/02	690	PN	LGT_STAT

CA	6/27/02	690	PN	SECCHI
CA	6/27/02	1136	PN	SPORT
CA	6/27/02	1136	PN	SPORT
CA	6/27/02	1136	PN	SPORT
AU	6/27/02	632	PN	WPT
CA	6/27/02	632	PN	DIVE
CA	6/27/02	632	PN	FVC
CA	6/27/02	632	PN	SED_PART
CA	6/27/02	632	PN	SED_PART
CA	6/27/02	632	PN	BEN_CHL
CA	6/27/02	632	PN	BEN_CHL
CA	6/27/02	632	PN	DIVE
CA	6/27/02	632	PN	HABTRAN
CA	6/27/02	632	PN	CORAL
CA	6/27/02	690	PN	LGT_STAT
CA	6/27/02	690	PN	SECCHI
CA	6/27/02	94	ON	COL_CHL
CA	6/27/02	94	ON	COL_CHL
CA	6/27/02	94	ON	SPORT
CA	6/27/02	94	ON	SPORT
AU	6/27/02	94	ON	WPT
AU	6/27/02	94	ON	DIVE
AU	6/27/02	94	ON	FVC
AU	6/27/02	94	ON	SED_PART
AU	6/27/02	94	ON	SED_PART
AU	6/27/02	94	ON	BEN_CHL
AU	6/27/02	94	ON	BEN_CHL
AU	6/27/02	94	ON	DIVE
AU	6/27/02	94	ON	HABTRAN
AU	6/27/02	94	ON	CORAL
AU	6/27/02	northern boundary	east	ROV/DV
AU	6/27/02	northern boundary	east	ASP
AU	6/27/02	northern boundary	east	BEAM
AU	6/27/02	northern boundary	east	ASP
AU	6/27/02	northern boundary	east	SI_SG
AU	6/27/02	northern boundary	east	BEAM
AU	6/27/02	northern boundary	east	ASP
AU	6/27/02	northern boundary	east	SI_INV
AU	6/27/02	northern boundary	east	SI_INV
AU	6/28/02	5527	ON	WPT
AU	6/28/02	5527	ON	DIVE

AU	6/28/02	5527	ON	FVC
AU	6/28/02	5527	ON	SED_PART
AU	6/28/02	5527	ON	SED_PART
AU	6/28/02	5527	ON	BEN_CHL
AU	6/28/02	5527	ON	BEN_CHL
AU	6/28/02	5527	ON	DIVE
AU	6/28/02	5527	ON	HABTRAN
AU	6/28/02	5527	ON	CORAL
AU	6/28/02	5842	ON	SPORT
AU	6/28/02	5842	ON	SPORT
AU	6/28/02	5842	ON	SPORT
AU	6/28/02	5842	ON	WPT
AU	6/28/02	5842	ON	DIVE
AU	6/28/02	5842	ON	FVC
AU	6/28/02	5842	ON	SED_PART
AU	6/28/02	5842	ON	SED_PART
AU	6/28/02	5842	ON	BEN_CHL
AU	6/28/02	5842	ON	BEN_CHL
AU	6/28/02	5842	ON	DIVE
AU	6/28/02	5842	ON	HABTRAN
AU	6/28/02	5842	ON	CORAL
AU	6/28/02	monument area		TRUTH
AU	6/28/02	monument area		TRUTH
AU	6/28/02	monument area		TRUTH
AU	6/28/02	monument area		TRUTH
AU	6/28/02	monument area		TRUTH
AU	6/28/02	monument area		TRUTH
AU	6/28/02	monument area		TRUTH
AU	6/28/02	monument area		TRUTH
AU	6/28/02	5842	ON	COL_CHL
AU	6/28/02	5842	ON	COL_CHL
AU	6/28/02	5527	ON	COL_CHL
AU	6/28/02	5527	ON	COL_CHL
AU	6/28/02	7675	OS	COL_CHL
AU	6/28/02	7675	OS	COL_CHL
AU	6/28/02	5527	ON	SPORT
AU	6/28/02	5527	ON	SPORT
AU	6/28/02	7675	OS	SPORT
AU	6/28/02	7675	OS	SPORT
AU	6/28/02	7675	OS	SPORT
AU	6/28/02	northern boundary		DROP/DV

AU	6/28/02	northern boundary	ASP
AU	6/28/02	northern boundary	DROP/DV
AU	6/28/02	northern boundary	ASP
AU	6/28/02	northern boundary	DROP/DV
AU	6/28/02	northern boundary	ASP
AU	6/28/02	northern boundary	DROP/DV
AU	6/28/02	northern boundary	ASP
AU	6/28/02	northern boundary	DROP/DV
AU	6/28/02	northern boundary	ASP
AU	6/28/02	northern boundary	DROP/DV
AU	6/28/02	northern boundary	ASP
AU	6/28/02	northern boundary	BEAM
AU	6/28/02	northern boundary	ASP
AU	6/28/02	northern boundary	SI_FISH
AU	6/28/02	northern boundary	BEAM
AU	6/28/02	northern boundary	ASP
AU	6/28/02	northern boundary	BEAM
AU	6/28/02	northern boundary	ASP
AU	6/28/02	northern boundary	SI_INV
AU	6/28/02	northern boundary	SI_FISH
AU	6/28/02	northern boundary	BEAM
AU	6/28/02	northern boundary	ASP
AU	6/28/02	northern boundary	BEAM
AU	6/28/02	northern boundary	ASP
CA	6/29/02	northern boundary	BEAM
CA	6/29/02	northern boundary	ASP
CA	6/30/02	northern boundary	SI_FISH
CA	6/30/02	northern boundary	SI_FISH
CA	6/30/02	northern boundary	ASP
CA	6/30/02	northern boundary	BEAM
CA	6/30/02	northern boundary	ASP
CA	6/30/02	northern boundary	BEAM
CA	6/30/02	northern boundary	ASP
CA	6/30/02	northern boundary	SI_INV
CA	6/30/02	northern boundary	SI_FISH
CA	6/30/02	northern boundary	BEAM
CA	6/30/02	northern boundary	ASP
CA	6/30/02	northern boundary	BEAM
CA	6/30/02	northern boundary	ASP
CA	6/30/02	northern boundary	SI_FISH
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CA	7/3/02	northern boundary		DROP/DV
CA	7/3/02	northern boundary		ASP
CA	7/3/02	northern boundary		DROP/DV
CA	7/3/02	northern boundary		ASP
CA	7/3/02	northern boundary		DROP/DV
CA	7/3/02	northern boundary		ASP
CA	7/3/02	northern boundary		DROP/DV
CA	7/3/02	northern boundary		ASP
CA	7/3/02	northern boundary		DROP/DV
CA	7/3/02	northern boundary		ASP
CA	7/3/02	northern boundary		DROP/DV
CA	7/3/02	northern boundary		ASP
CA	7/3/02	northern boundary		DROP/DV
CA	7/3/02	northern boundary		ASP
CA	7/3/02	northern boundary		DROP/DV
CA	7/3/02	northern boundary		ASP
CA	7/3/02	northern boundary		DROP/DV
CA	7/3/02	northern boundary		ASP
CA	7/3/02	northern boundary		DROP/DV
CA	7/3/02	northern boundary		ASP
CA	7/3/02	1915	RN	DIVE
CA	7/3/02	1915	RN	FVC
CA	7/3/02	1915	RN	SED_PART
CA	7/3/02	1915	RN	SED_PART
CA	7/3/02	1915	RN	BEN_CHL
CA	7/3/02	1915	RN	BEN_CHL
CA	7/3/02	1915	RN	DIVE
CA	7/3/02	1915	RN	HABTRAN
CA	7/3/02	1915	RN	CORAL
CA	7/3/02	1915	RN	COL_CHL
CA	7/3/02	7675	OS	DIVE
CA	7/3/02	7675	OS	FVC
CA	7/3/02	7675	OS	SED_PART
CA	7/3/02	7675	OS	SED_PART
CA	7/3/02	7675	OS	BEN_CHL
CA	7/3/02	7675	OS	BEN_CHL
CA	7/3/02	7675	OS	DIVE
CA	7/3/02	7675	OS	HABTRAN
CA	7/3/02	7675	OS	CORAL
CA	7/3/02	7675	OS	COL_CHL
CA	7/3/02	7675	OS	LGT_STAT

CA	7/3/02	7675	OS	SECCHI
CA	7/2/02			LGT_CONT
CA	7/3/02			LGT_CONT
CA	7/2/02			LGT_CONT
CA	7/2/02			LGT_CONT
CA	7/2/02			LGT_CONT
CA	7/3/02	4671	PS	SPORT
CA	7/3/02	4671	PS	SPORT
CA	7/3/02	4671	PS	LGT_STAT
CA	7/3/02	4671	PS	SECCHI
CA	7/3/02	4671	PS	DIVE
CA	7/3/02	4671	PS	FVC
CA	7/3/02	4671	PS	SED_PART
CA	7/3/02	4671	PS	SED_PART
CA	7/3/02	4671	PS	BEN_CHL
CA	7/3/02	4671	PS	BEN_CHL
CA	7/3/02	4671	PS	DIVE
CA	7/3/02	4671	PS	HABTRAN
CA	7/3/02	4671	PS	CORAL
CA	7/3/02	4671	PS	SI_FISH
CA	7/3/02	4671	PS	COL_CHL
CA	7/3/02	2780	PS	DIVE
CA	7/3/02	2780	PS	FVC
CA	7/3/02	2780	PS	SED_PART
CA	7/3/02	2780	PS	SED_PART
CA	7/3/02	2780	PS	BEN_CHL
CA	7/3/02	2780	PS	BEN_CHL
CA	7/3/02	2780	PS	DIVE
CA	7/3/02	2780	PS	HABTRAN
CA	7/3/02	2780	PS	CORAL
CA	7/3/02	2780	PS	COL_CHL
CA	7/4/02	northern boundary		ROV
CA	7/4/02	northern boundary		ASP
CA	7/4/02	northern boundary		ROV
CA	7/4/02	northern boundary		ASP
CA	7/4/02	1864	OS	DIVE
CA	7/4/02	1864	OS	DIVE
CA	7/4/02	1864	OS	RECRUIT
AU	7/4/02	monument area		TRUTH
AU	7/4/02	monument area		TRUTH
AU	7/4/02	monument area		TRUTH

AU	7/4/02	monument area		TRUTH
AU	7/4/02	monument area		TRUTH
AU	7/4/02	monument area		TRUTH
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AU	7/4/02	monument area		TRUTH
AU	7/4/02	monument area		TRUTH
AU	7/4/02	monument area		TRUTH
CA	7/4/02	monunment bank		SI_FISH
CA	7/4/02	monunment bank		SI_FISH
CA	7/4/02	monunment bank		SI_FISH
CA	7/4/02	texas rock		DIVE
CA	7/4/02	texas rock		DIVE
CA	7/4/02	texas rock		WPT
CA	7/4/02	texas rock		RECRUIT
CA	7/4/02	bird key		DIVE
CA	7/4/02	bird key		RECRUIT
CA	7/4/02	bird key		DIVE
CA	7/4/02	bird key		WPT
CA	7/4/02	bird key		WPT
CA	7/4/02	monunment bank		LGT_STAT
CA	7/4/02	1915	RN	SPORT
CA	7/4/02	1915	RN	SPORT
CA	7/5/02	northern boundary		SPORT
AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH

AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH
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AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH
AU	7/5/02	monument area		TRUTH
CA	7/5/02	6772	ON	DIVE
CA	7/5/02	6772	ON	WPT
CA	7/5/02	6772	ON	RECRUIT
CA	7/5/02	6772	ON	DIVE
CA	7/5/02	11460	ON	DIVE
CA	7/5/02	11460	ON	RECRUIT
CA	7/5/02	11460	ON	DIVE
CA	7/5/02	11460	ON	WPT
CA	7/5/02	9807	ON	DIVE
CA	7/5/02	9807	ON	RECRUIT
CA	7/5/02	9807	ON	DIVE
CA	7/5/02	9807	ON	WPT
CA	7/5/02	9807	ON	SI_FISH
CA	7/6/02	12379	OS	DROP/DV
CA	7/6/02	12379	OS	ASP
CA	7/5/02	12379	OS	DROP/DV
CA	7/5/02	12379	OS	ASP
CA	7/5/02	12379	OS	DROP/DV
CA	7/5/02	12379	OS	ASP
CA	7/5/02	12379	OS	ASP
CA	7/6/02			LGT_CONT
CA	7/6/02			LGT_CONT
CA	7/6/02			LGT_CONT
END LEG III				

APPENDIX III. Sample codes.

ASPEN file		ASP
beam trawl		BEAM
benthic chl		BEN_CHL
bongo tow		BONG
Braun Blanquet		BB
coral recruitment plate		RECRUIT
CTD		CTD
drifter		DRIFT
drop camera		DROP
fish video transect		FVT
fish visual census		FVC
ground truth point		TRUTH
habitat video transect		HABTRAN
herbivory downrigger		HERB
light profile (continuous)		LGT_CONT
light profile (stationary)		LGT_STAT
MiniBat tow		BAT
mini digital video tape		DV
PONAR grab		PONAR
QTC view		QTC
regular VHS video		VHS
ROV		ROV
ROXANN		ROX
SCUBA seine		SS
Secchi disk		SECCHI
sediment particle size		SED_PART
sediment penetration		SED_PEN
sediment torque		SED_TRQ
seed cores		SEED
Smith-Mac grab		SMAC
Sport Scan		SPORT
stable isotope		
	phytoplankton	SI_PHYT
	fish	SI_FISH
	invertes	SI_INV
	macroalgae	SI_MAC
	benthic microalgae	SI_MIC
	seagrass	SI_SG
	coral	SI_COR
Super VHS video		SVHS
temperature logger		TEMP
Tucker trawl		TUCK
VHS video		VHS
video sled		SLED
water column chl		COL_CHL
water column nutrients		COL_NUT
waypoint		WPT

APPENDIX IV. Dive statistics.

Diver Name	Date	%O2	Depth	Total Bottom Time
Bonn	6/17/02	21	61	34
Brewer	6/17/02	21	61	34
Uhrin	6/17/02	21	61	38
Fonseca	6/17/02	21	61	38
Meehan	6/18/02	32	73	34
Berns	6/18/02	32	74	34
Kirsch	6/18/02	32	72	36
Hyniova	6/18/02	32	72	36
Bonn	6/18/02	32	79	35
Brewer	6/18/02	32	77	35
Uhrin	6/18/02	32	79	39
Fonseca	6/18/02	32	79	40
Meehan	6/18/02	32	82	34
Berns	6/18/02	32	82	34
Hyniova	6/18/02	32	80	29
Kirsch	6/18/02	32	80	29
Bonn	6/19/02	32	86	40
Brewer	6/19/02	32	86	40
Fonseca	6/19/02	32	85	37
Uhrin	6/19/02	32	85	36
Meehan	6/19/02	32	92	32
Berns	6/19/02	32	91	33
Hyniova	6/19/02	32	90	30
Kirsch	6/19/02	32	90	30
Bonn	6/19/02	32	85	35
Brewer	6/19/02	32	86	35
Fonseca	6/19/02	32	85	37
Uhrin	6/19/02	32	85	36

Berns	6/19/02	32	76	15
Meehan	6/19/02	32	76	15
Hyniova	6/19/02	32	71	29
Kirsch	6/19/02	32	71	29
Eilers	6/19/02	32	76	15
Bonn	6/20/02	32	86	40
Brewer	6/20/02	32	87	40
Fonseca	6/20/02	32	86	38
Uhrin	6/20/02	32	86	38
Meehan	6/20/02	32	94	26
Berns	6/20/02	32	93	26
Kirsch	6/20/02	32	91	30
Hyniova	6/20/02	32	92	30
Bonn	6/20/02	32	74	34
Brewer	6/20/02	32	74	34
Fonseca	6/20/02	32	74	34
Uhrin	6/20/02	32	74	33
Meehan	6/20/02	32	81	32
Berns	6/20/02	32	81	32
Hyniova	6/20/02	32	79	31
Kirsh	6/20/02	32	79	31
Eilers	6/20/02	32	80	32
Bonn	6/21/02	32	113	30
Brewer	6/21/02	32	112	30
Fonseca	6/21/02	32	113	30
Uhrin	6/21/02	32	111	31
Meehan	6/21/02	32	81	35
Berns	6/21/02	32	81	35
Kirsch	6/21/02	32	79	37
Hyniova	6/21/02	32	80	38
Bonn	6/22/02	32	98	35

Brewer	6/22/02	32	95	35
Hyniova	6/22/02	32	98	29
Uhrin	6/22/02	32	98	29
Burke	6/24/02	21	66	37
Hyniova	6/24/02	21	66	37
Piniak	6/24/02	21	68	34
Addison	6/24/02	21	68	34
Poray	6/24/02	21	68	34
Bonn	6/25/02	32	103	31
Field	6/25/02	32	103	31
Fonseca	6/25/02	32	102	35
Uhrin	6/25/02	32	102	35
Burke	6/25/02	32	80	32
Hyniova	6/25/02	32	80	32
Addison	6/25/02	32	80	37
Piniak	6/25/02	32	80	36
Bonn	6/25/02	32	62	40
Field	6/25/02	32	62	40
Fonseca	6/25/02	32	60	35
Uhrin	6/25/02	32	61	35
Eilers	6/25/02	21	58	35
Poray	6/25/02	21	58	35
Bonn	6/26/02	32	103	33
Field	6/26/02	32	103	33
Uhrin	6/26/02	32	106	40
Fonseca	6/26/02	32	106	40
Burke	6/26/02	32	91	38
Hyniova	6/26/02	32	91	38
Addison	6/26/02	32	90	35
Piniak	6/26/02	32	92	35
Bonn	6/26/02	32	79	33

Field	6/26/02	32	80	33
Fonseca	6/26/02	32	73	34
Uhrin	6/26/02	32	73	34
Burke	6/26/02	32	68	46
Hyniova	6/26/02	32	68	46
Addison	6/26/02	32	68	37
Piniak	6/26/02	32	68	37
Poray	6/26/02	21	68	37
Bonn	6/27/02	32	100	30
Fields	6/27/02	32	100	30
Fonseca	6/27/02	32	100	33
Uhrin	6/27/02	32	100	33
Burke	6/27/02	32	95	41
Hyniova	6/27/02	32	95	41
Addison	6/27/02	32	96	29
Piniak	6/27/02	32	96	29
Bonn	6/27/02	32	99	31
Fields	6/27/02	32	99	31
Fonseca	6/27/02	32	98	30
Uhrin	6/27/02	32	100	30
Burke	6/28/02	32	98	40
Hyniova	6/28/02	32	98	40
Piniak	6/28/02	32	97	37
Addison	6/28/02	32	99	37
Bonn	6/28/02	32	85	43
Field	6/28/02	32	85	43
Fonseca	6/28/02	32	86	34
Uhrin	6/28/02	32	86	34
Addison	7/2/02	21	33	~~13~~
Field	7/2/02	21	33	13

Burke	7/3/02	32	99	39
Hyniova	7/3/02	32	99	39
Addison	7/3/02	32	99	40
Whitfield	7/3/02	32	99	41
Field	7/3/02	32	70	35
Kenworthy	7/3/02	32	78	34
Piniak	7/3/02	32	77	28
Rogers	7/3/02	32	76	28
Burke	7/3/02	32	75	48
Hyniova	7/3/02	32	75	48
Addison	7/3/02	32	79	45
Whitfield	7/3/02	32	78	45
Field	7/3/02	32	55	28
Kenworthy	7/3/02	32	55	28
Piniak	7/3/02	32	54	25
Rogers	7/3/02	32	54	25
Addison	7/4/02	32	60	40
Piniak	7/4/02	32	60	40
Whitfield	7/4/02	32	60	47
Hyniova	7/4/02	32	60	45
Piniak	7/4/02	32	59	43
Addison	7/4/02	32	60	43
Hyniova	7/4/02	32	59	44
Whitfield	7/4/02	32	59	44
Addison	7/4/02	32	61	46
Field	7/4/02	32	61	42
Burke	7/4/02	32	60	46
Piniak	7/4/02	32	63	42
Hyniova	7/5/02	32	56	44
Whitfield	7/5/02	32	56	44

Piniak	7/5/02	32	56	25
Kenworthy	7/5/02	32	55	25
Hyniova	7/5/02	32	60	41
Whitfield	7/5/02	32	60	41
Piniak	7/5/02	32	62	30
Kenworthy	7/5/02	32	62	30
Burke	7/5/02	32	59	47
Addison	7/5/02	32	59	47
Piniak	7/5/02	32	57	35
Field	7/5/02	32	57	35
Whitfield	7/5/02	32	57	35