National Oceanic and Atmospheric Administration

U. S. DEPARTMENT OF COMMERCE • NOAA-Fisheries
Southeast Fisheries Science Center • 75 Virginia Beach Drive • Miami, Florida 33149

CRUISE REPORT

Meso-American System Transport & Ecology Research Cruise

Cruise 0601: NOAA Ship GORDON GUNTER

March 14 - April 4, 2006

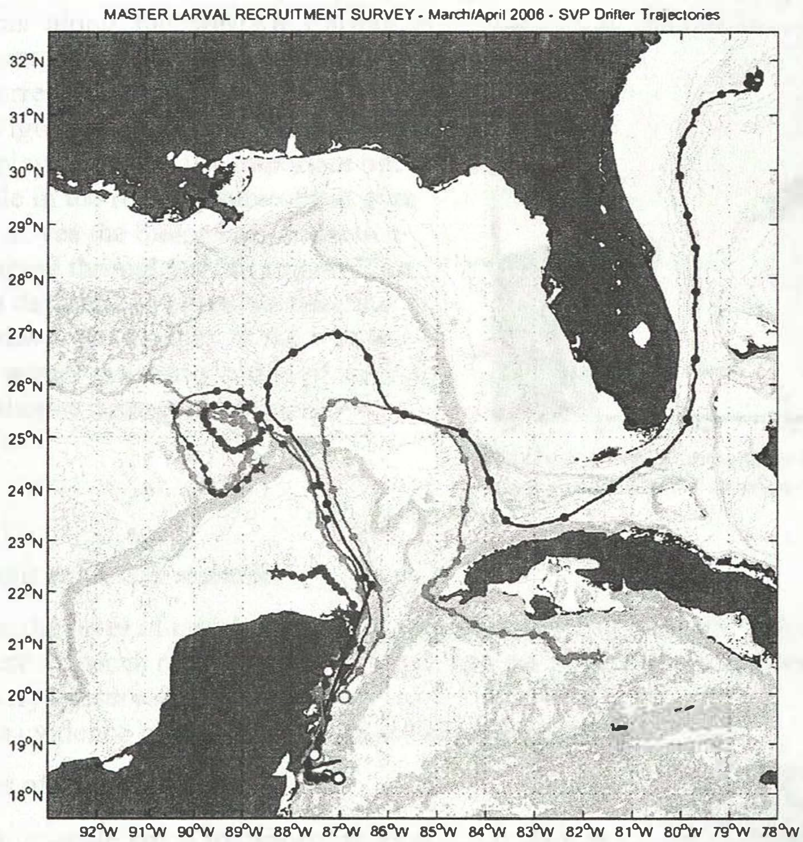


Figure 1. Tracks of WOCE drifters deployed during MASTER Cruise.

Introduction

The NOAA Ship Gordon Gunter departed Pascagoula Mississippi on March 14, 2006 for the Larval Fish and Physical Oceanography Survey of the Mesoamerican Reef System Cruise (MASTER Cruise). This cruise was a joint international effort between NOAA's Southeast Fisheries Science Center and the Atlantic Oceanographic and Meteorological Laboratory, El Colegio de La Frontera Sur (ECOSUR) in Chetumal, and Centro de Investigacion y de Estudios Avanzados (CINVESTAV) in Merida, Mexico. The cruise was directed at surveying the larval distribution and physical oceanography of the western Caribbean coast from the Yucatan Channel south to the border of Belize (Figure 1.).

Reef fish populations are part of one of the most complex ecosystems in the marine environment. They are also the most heavily exploited part of the ecosystem and have been pushed to extremely low levels throughout South Florida and the wider Caribbean. Despite the importance of these populations, relatively little is known about most stages of their life cycles or their interaction with small and mesoscale oceanographic patterns. Important information such as adult spawning behavior, location, and depth of spawning aggregations and recruitment is mostly unknown. Little is known about the status of these fish populations in the western Caribbean along the Meso-American reef system, though stocks there are generally considered to have suffered less exploitation. There are also significant gaps in our understanding of the complex circulation patterns along the western Caribbean Sea's Yucatan coast where the Caribbean Current and the Loop Current connect and flow into the Gulf of Mexico (Figure 2).

This area plays a potentially important but still un- known role in the route of subtropical gyre circulation which drives the biological production and transport of larvae throughout this region. This research project is designed to provide a baseline study of the fisheries oceanography of the western Caribbean during winter spawning and to provide a basis for future fisheries management decisions.

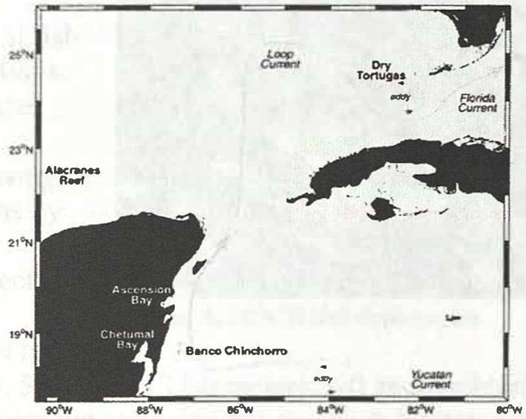


Figure 2. Circulation patterns of the Yucatan coast and the Gulf of Mexico.

<u>Objectives</u>

Two broad questions drive this research:

1. What is the level of larval dispersal and recruitment connectivity within and amongst the Mesoamerican reef, the Dry Tortugas, and the Florida Keys National Marine Sanctuary's reserves?
2. Is there evidence of self-recruitment within these marine reserves?

Specific objectives of this cruise:

- Map large-scale larval transport/export and distribution using a one- and ten-meter MOCNESS;
- Map currents and eddies along the Yucatan Peninsula and Quintana Roo with shipboard ADCP and lowered ADCP;
- Map temperature/salinity fields from Yucatan Channel south to the northern border of Belize and collect ichthyoplankton samples at known spawning aggregation sites of snapper and grouper;
- Collect light and settlement trap samples from Bancho Chinchorro atoll;

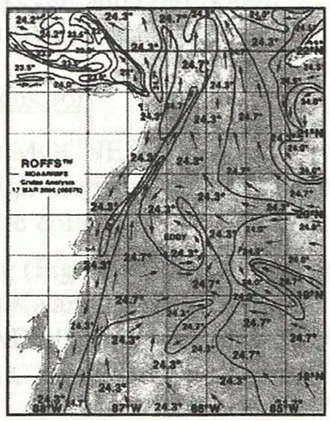


Figure 3. ROFFS Fishing Forecast data

Objectives (continued)

- Collect light, settlement trap, and tidal net samples from the inshore areas of Xcalak;
- Measure depth of chlorophyll maximum and map surface chlorophyll;
- Use these data to model the major flow-regime along the Yucatan Peninsula and the physical processes affecting larval transport and/or retention onto and along the reefs;
- Deploy satellite-tracked drifters to measure current flow and identify gyre circulation patterns;
- Ground-truth satellite imagery provided by ROFFS – Roffer's Ocean Fishing Forecasting Service, Inc. (Figure 3).

Materials and Methods

Stations were selected to provide a map of larval fish distribution and to resolve dynamic oceanographic features. ROFFS provided daily updates of oceanographic features and fronts. Ichthyoplankton tows were conducted by Multiple Opening and Closing Net Environmental Sensing System (MOCNESS). Initial plans called for collections by both a one- and ten-meter net. However, the ten-meter MOCNESS failed to operate and ichthyoplankton collections were limited to the one-meter system (Figure 4).

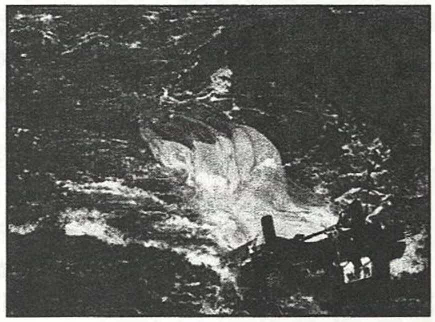


Figure 4. MOCNESS deployment.

Each ichthyoplankton station consisted of a tow to 100 meters with discrete sampling depths of 100-75, 75-50, 50-25, and 25-0 meters. All zooplankton samples were preserved in ethanol. Neuston samples were not collected due to winch limitations.

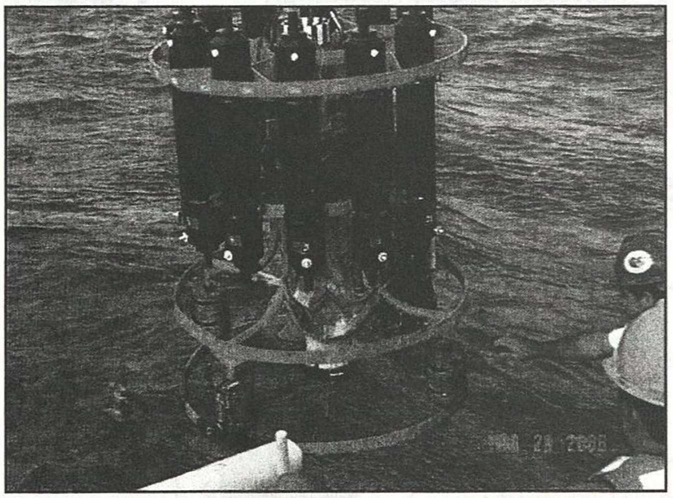


Figure 5. CTD deployment.

CTD's were conducted using a standard 24 bottle rosette with dual Temperature, Conductivity, and Oxygen sensors, a Fluorometer and lowered Acoustic Doppler Current Profiler (Figure 5). CTD casts were made to the bottom or 1800 meters. Casts were limited to this depth by the amount of cable on the hydro-winch. Oxygen and chlorophyll samples were measured at each cast.

Results and Discussion

Fifty-six MOCNESS tows, 62 CTD casts, 16 light trap and 16 settlement trap samples were collected by the NOAA Ship Gordon Gunter. The cruise was divided into two legs. The first leg (Figure 6) focused on the area from the Yucatan Channel south to the Biosphere Reserve of Sian Ka'an Currents were measured by the hull mounted ADCP and the self-contained lowered ADCP attached to the CTD frame. Temperature, salinity, and chlorophyll fields were derived from CTD casts as well as the flow-thru system on the Gordon Gunter.

Preliminary ADCP data-derived flow fields indicated a strong generally northward flow, throughout the first leg (Addendum I – Figures 1-2). Of particular interest is the area southeast of Cozumel where there were indications of a westward flow at depths >75 meters. A strong northward flow was also found in the Cozumel channel, and a southward flow along the coast though at decreasing velocities. A southward flow was also noted southwest of Cozumel. South of the Sian Ka'an Biosphere Reserve, northward flow decreased significantly and at depths >400 meters the flow direction was to the south and southwest. (Addendum I – Figure 3).

The second leg focused on the area around Bancho Chinchorro and the channel separating the atoll from the Yucatan Peninsula (Figure 7). A small boat was used to deploy light and settlement traps at Bancho Chinchorro. MOCNESS and CTD stations were conducted in a line to the north and south of Bancho Chinchorro and covering both the east and west sides as well. In addition light traps and settlement traps were deployed along the eastern edge of the atoll reef surrounding Banco Chinchorro.

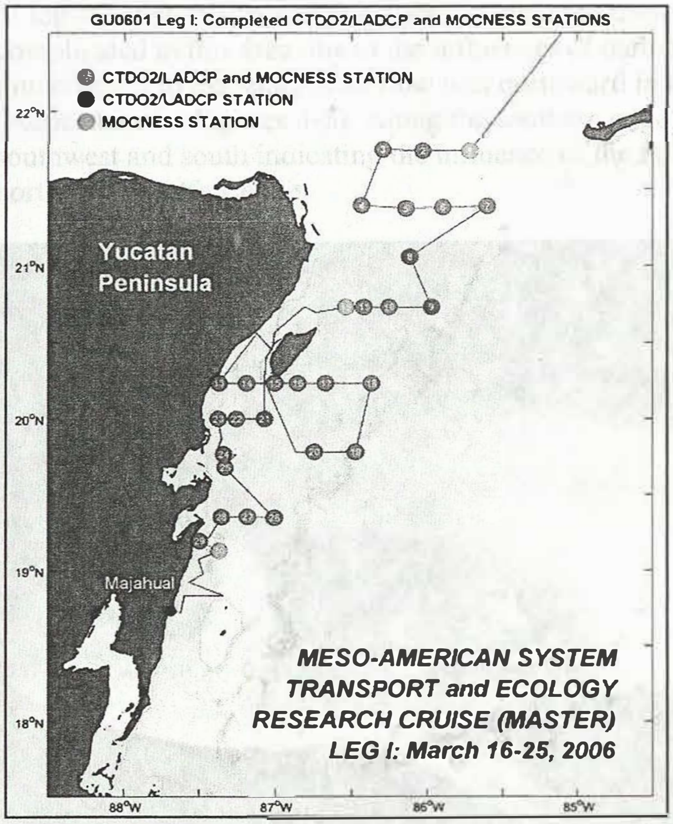
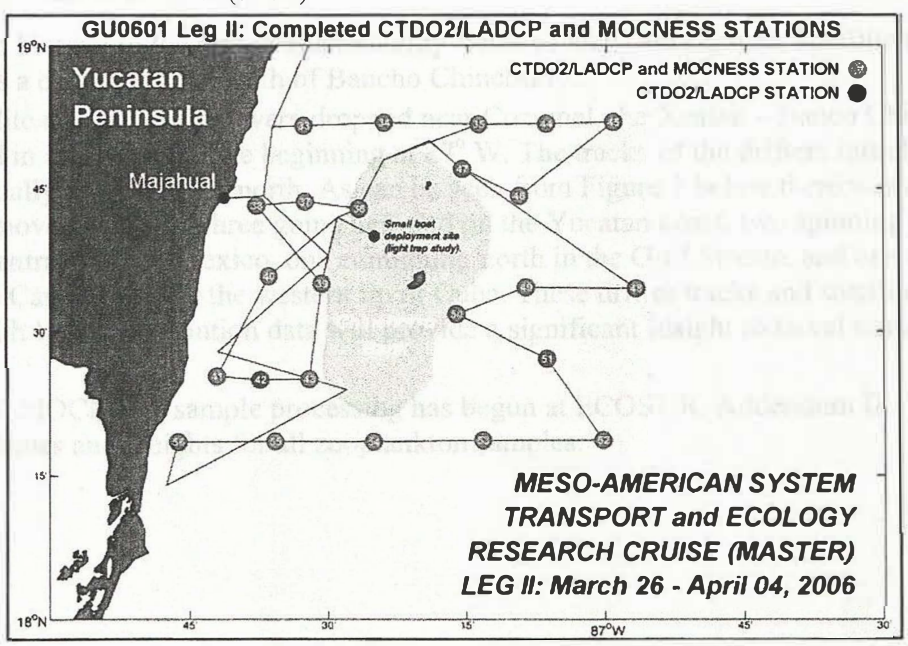


Figure 6. Leg I – MASTER Cruise (above)

Figure 7. Leg II – MASTER Cruise (below).



A list of species is attached (Addendum II – Table 1). Newly settled grouper larvae were collected on the last night which appeared to coincide with a current reversal (Figure 8) Because of logistical problems sampling was restricted to three nights. The flow regime was much more complicated in this area due to the influences of bathymetry and the cyclonic gyre located immediately to the south. The flow was northward in the upper 100 meters in the channel (Addendum I – Figures 4-5). Along the southern edge of the study area the flow shifted to the southwest and south indicating the influence of the northern edge of a anticyclonic gyre located north of Truneffe Belize.

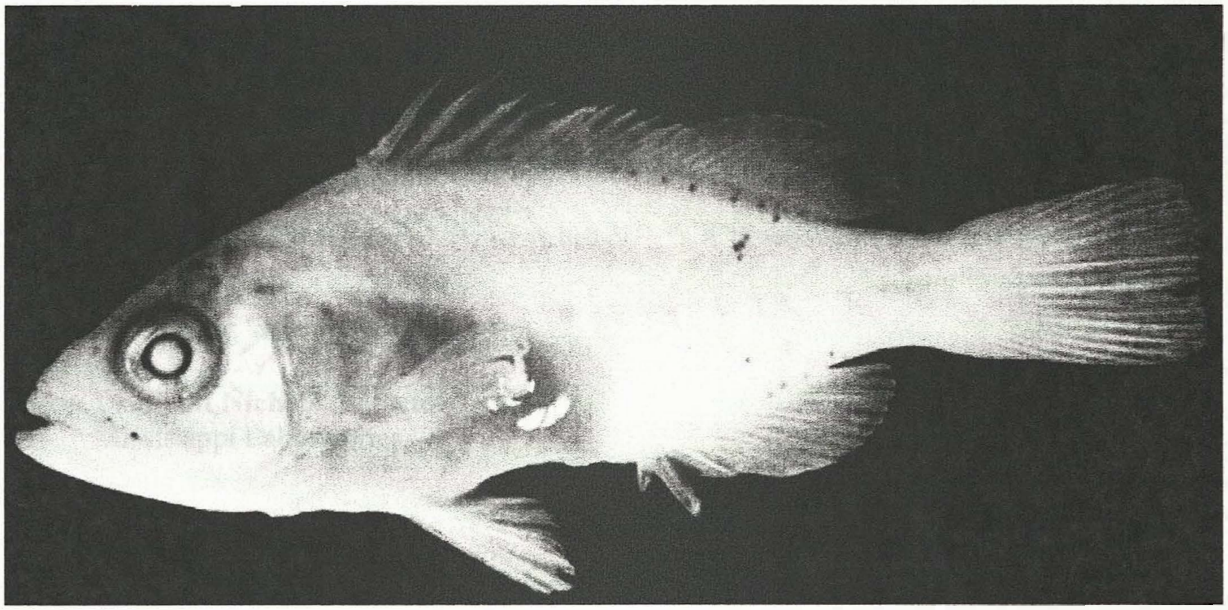


Figure 8. Serranidae; *Mycteroperca tigris.*

This gyre can be seen in the temperature/salinity fields as well (not shown). Satellite imagery also indicates a cyclonic flow south of Bancho Chinchorro.

Satellite tracked drifters were dropped near Cozumel, the Xcalak – Banco Chinchorro Channel, and in an east-west line beginning at 87° W. The tracks of the drifters initially varied but all eventually moved to the north. As can be seen from Figure 1 below there was a wide variation in movement, with three going aground on the Yucatan coast, two spinning off into a gyre in the central Gulf of Mexico, one continuing north in the Gulf Stream, and one circling back into the Caribbean near the western tip of Cuba. These drifter tracks and satellite imagery combined with larval distribution data will provide a significant insight to larval transport in the region.

Initial MOCNESS sample processing has begun at ECOSUR. Addendum II– Table 2 shows plankton volumes and weights for all zooplankton samples.

Submitted by:

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Approved by:

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Cruise Participants

Tables 1-2 list the MASTER CRUISE participating researchers by first and second legs. Figure 9 shows the research team for Leg II.

Table 1. MASTER CRUISE- Leg 1. March 12 – 24, 2006; Key West, Florida to Majahual, Mexico.

NAME	SEX	ORGANIZATION	TITLE	CITIZENSHIP
Lt. Gildardo Alarcon Daowz	M	SRE Mexico	Observer	Mexico
Keith Martin	M	UM	MOC Technician	USA
Kim Williams	F	SFU	Biologist	USA
Elizabeth Johns	F	AOML	Physical Oceanographer	USA
Ryan Smith	M	AOML	Physical Oceanographer	USA
John Lamkin	M	SEFSC	Biologist	USA
Monica Lara	F	SEFSC	Biologist	USA
Natasha Davis	F	SEFSC	Biologist	USA
Estrella Malca	F	SEFSC	Biologist	USA
Rob Ruzika	M	FIU	Biologist	USA
Eloy Sosa Cordero	M	Mexico	Biologist	Mexico
Edgar Tovar	M	Mexico	Biologist	Mexico
Laura Carrillo Bireiezca	F	Mexico	Physical Oceanographer	Mexico
Anna Ramirez Mangilar	F	Mexico	Physical Oceanographer	Mexico
Ivan Castellanos	M	ECOSUR	Biologist	Mexico

Table 2. MASTER CRUISE - Leg 2. March 27 – April 3, 2006; Majahual to Bancho Chinchorro, Mexico

NAME	SEX	ORGANIZATION	TITLE	CITITZENSHIP
Lt. Gildardo Alarcon Daowz	M	SRE Mexico	Observer	Mexico
Keith Martin	M	UM	MOC Technician	USA
Elizabeth Johns	F	AOML	Physical Oceanographer	USA
Ryan Smith	M	AOML	Physical Oceanographer	USA
John Lamkin	M	SEFSC	Biologist	USA
Monica Lara	F	SEFSC	Biologist	USA
Dave Jones	M	SEFSC	Biologist	USA
Lt. Natasha Davis	F	NOAA Corps	Officer	USA
Estrella Malca	F	SEFSC	Biologist	USA
Uriel Ordonez	M	CINVESTAV	Biologist	Mexico
Elsa Falfan Vasquez	F	CINESTAV	Biologist	Mexico
Ivan Castellanos Osorio	M	ECOSUR	Biologist	Mexico
Laura Carrillo Bireiezca	F	Mexico	Physical Oceanographer	Mexico
Anna Ramirez Mangilar	F	Mexico	Physical Oceanographer	Mexico
Maria De Carmen	F	Mexico	Reserve Manager	Mexico

Recommendations for Improved Scientific Support

In general, scientific party of cruise 0601 agrees that the *NOAA Ship Gordon Gunter* is a solid research platform and has great potential for improved oceanographic data gathering capabilities. Given the current resources, we were able to accomplish a great deal during the current cruise. Below is a list of suggestions we think are important for future cruises as well as for general upgrading of the ship's capabilities. We believe that implementation of these suggestions would strengthen this valuable NOAA asset and raise its capabilities to the level of comparably sized UNOLS research vessels.

1) There are not enough winches available for collecting gear. With both MOCNESS and CTD we could not deploy a neuston net. This is a significant problem when sampling for tuna and billfish. There needs to be at least one additional winch available. The neuston net does not require large amounts of cable. A small electric winch with hydro wire would be sufficient
2) Upgrade the small oceanographic winch to a 6000 meter capable winch designed to take loads associated with standard 24 bottle frame and rosette with ADCP. Otherwise overhaul and move small winch to centerline facing aft to use for deploying MOCNESS via A-frame (fantail deployment) freeing up the Desh-5 for CTD.
3) Spool Desh-5 with at least 6000 m of .322 conductor cable. Load winch under tension and gear winch for use at speeds of 60 meters per minute. Slow winch speeds significantly increase time on station and increased difficulties for vessel station keeping
4) Install larger diameter turning block on J-frame for use with CTD.
5) Regarding all winches used for scientific purposes (CTD, MOCNESS, trawl, etc.), route wire tension, speed, and meters out readings to all winch control stations and to SCS data stream.
6) Upgrade ship's depth sounding capabilities. Knowing the depth of the bottom is critical to CTD operation. Vessel must be able to sound full ocean depth (5000 m) without difficulty. On all shipboard sounders, log depth and data quality flag to SCS data stream.
7) Install cleats (2) inside railing on either side of port quarterdeck CTD deployment area for leading CTD deployment and recovery lines. These cleats may be removable.
8) Correct air lock troubles with TSG flow-through system seawater inlet. This has been an ongoing problem for years. AOML engineers would be happy to aid in suggesting most the desired route and design for scientific flow-through plumbing.
9) Add remote inlet temperature sensor to TSG flow-through system. The internal TSG temperature recorded to SCS is over one degree higher than the ambient SST. Log flow rate of flow-through system to SCS data stream.
10) Repair and recalibrate the ship's CTD, CTD pylon, and associated CTD sensors.

11) This cruise has demonstrated the need for a backup CTD and sensors. Ship should have a second CTD and spare sensors aboard and available.

12) Install a working XBT system on the ship. The *Gunter* may be able to work with AOML to upgrade their existing AMVER SEAS system to include XBT launching capabilities. XBT data would then be transmitted directly via the AMVER SEAS data stream in near real-time (with meteorological and oceanographic observational data).

13) Cut a canvas cover for the ship's CTD package to protect this valuable equipment from UV radiation, salt spray, and deck generated debris (rust, scale, paint). Store the ship's CTD on the boat deck when not in use.

14) Repair and rebuild the ship's folding crane.

15) Modify hydraulics and reposition inboard stops on the ship's A-frame to allow for extended inboard range. This would simplify deployment and recovery of scientific instrumentation on the fantail (e.g. at present, use of the ship's crane is required, in addition to the A-frame, for every MOCNESS deployment and recovery).

16) If a spare transducer well is available, install 12kHz transducer with associated line scan recording equipment for tracking acoustic pingers (attached to lowered equipment) and for communicating with moored acoustic releases.

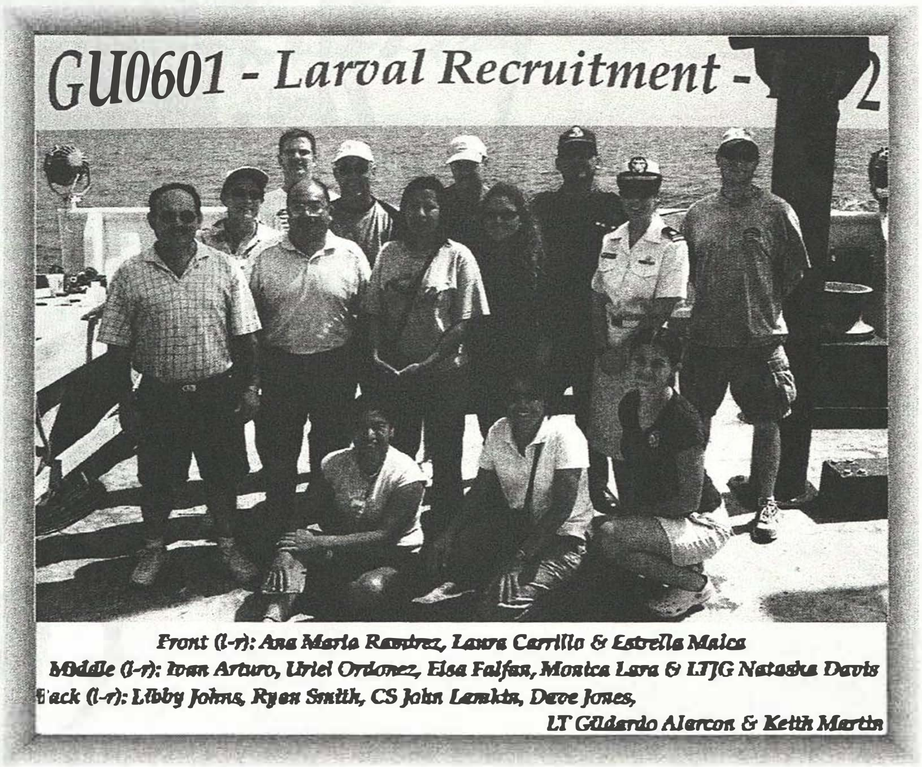

Figure 9. MASTER Cruise research team for Leg II.

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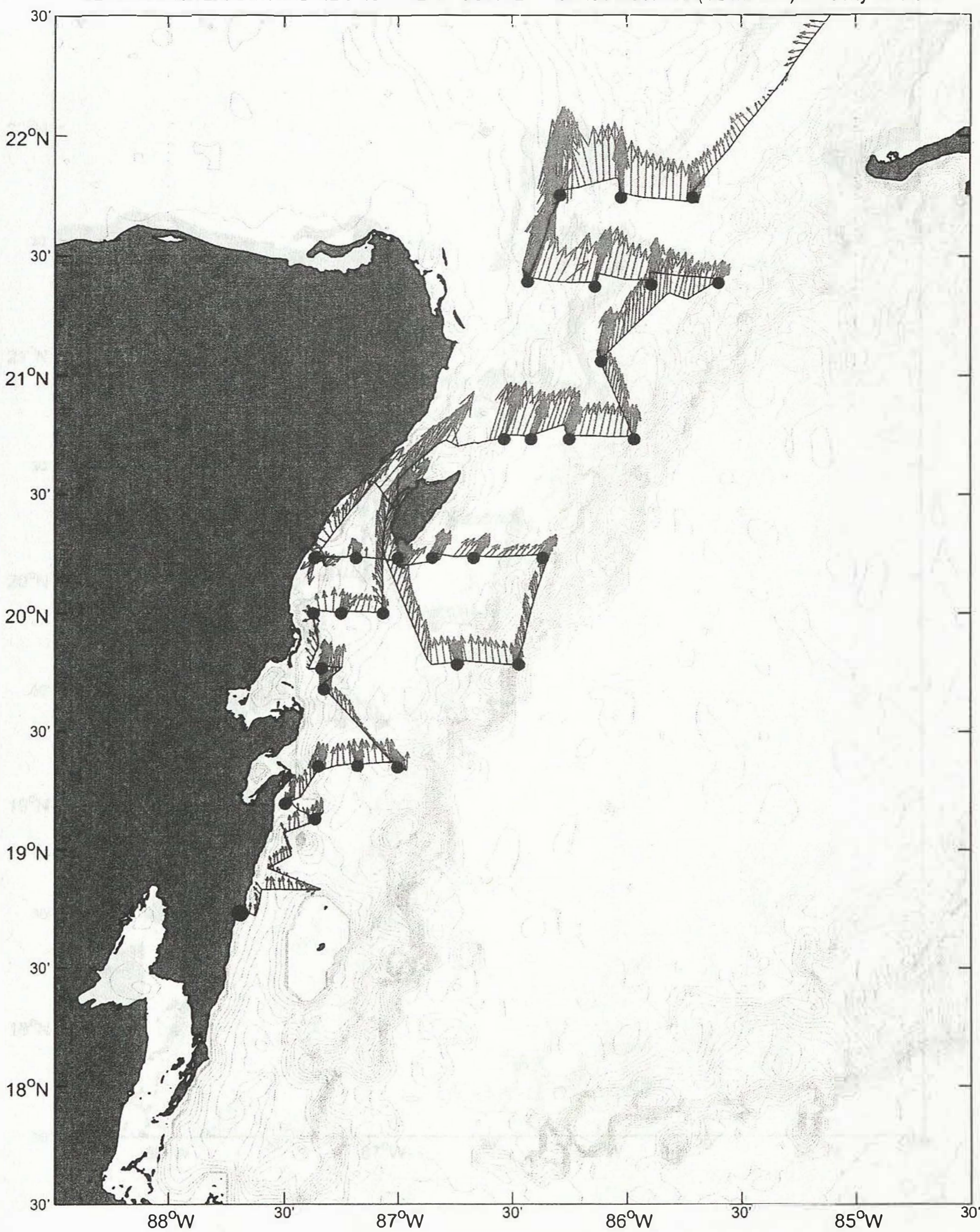
Addendum I

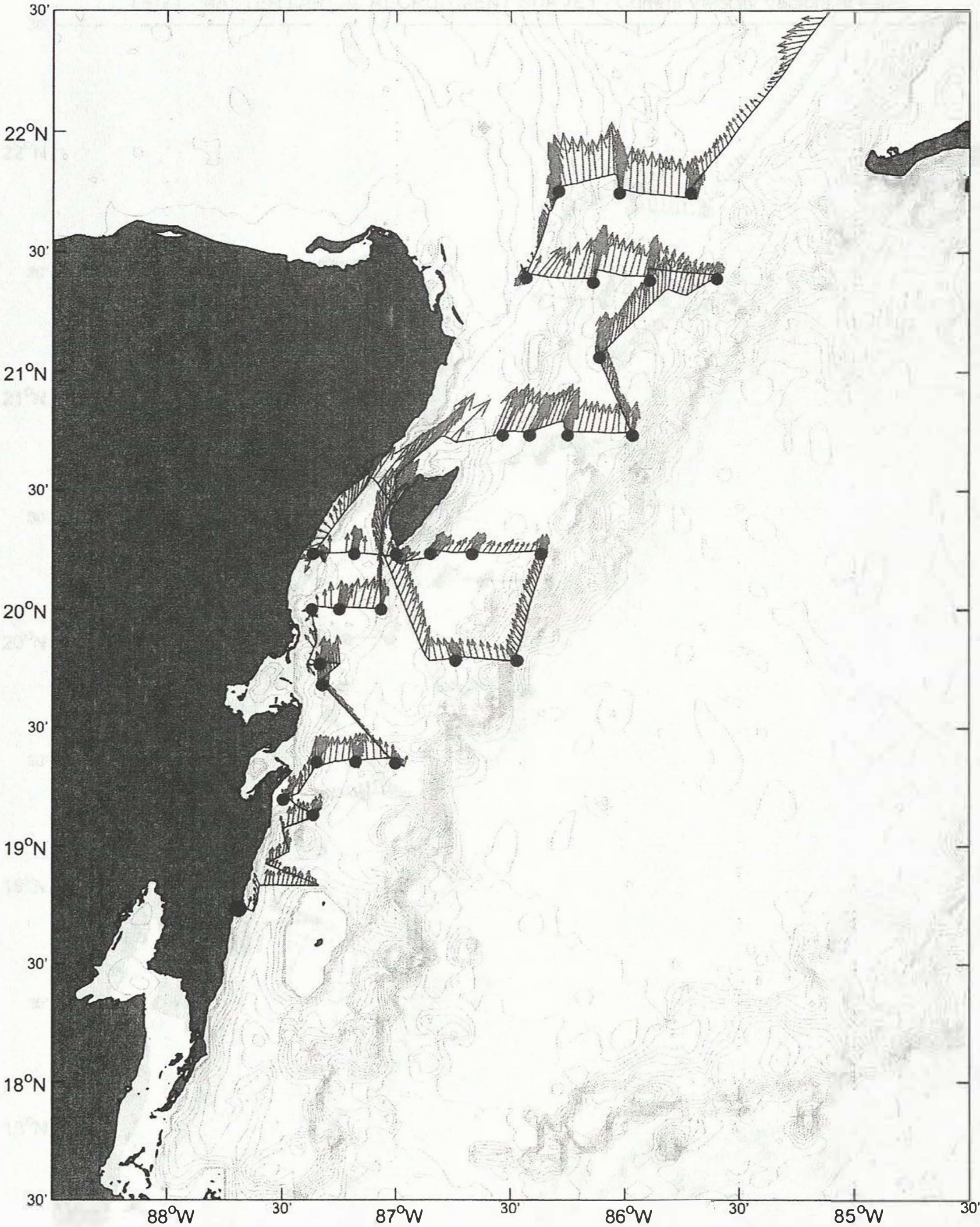
Addendum I – Figure 1.

LEG I - MASTER LARVAL RECRUITMENT SURVEY - Surface Current (12 meters) Velocity Vectors



Addendum 1 - Figure 2.

LEG I - MASTER LARVAL RECRUITMENT SURVEY - Current Velocity Vectors at 100m



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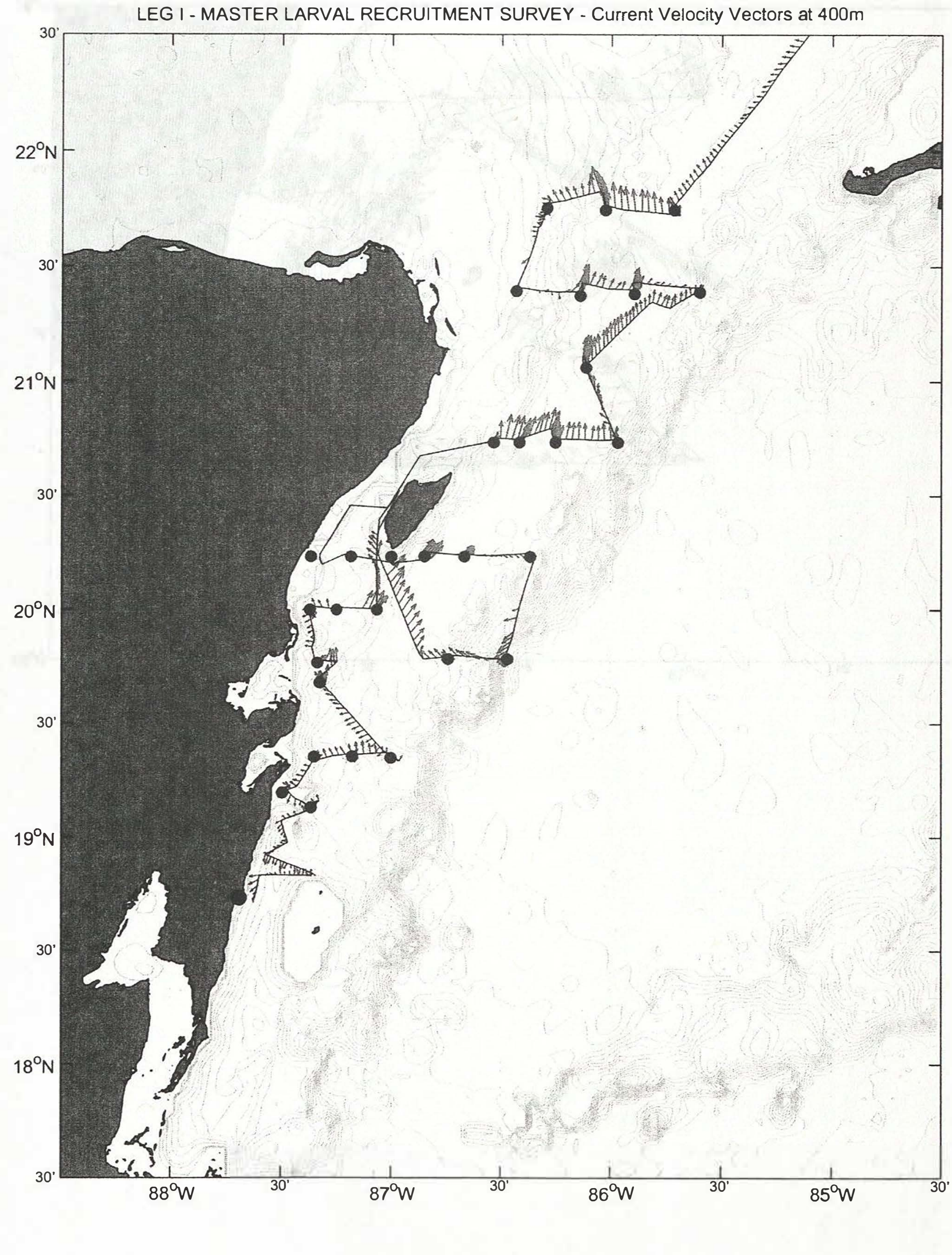
Addendum I

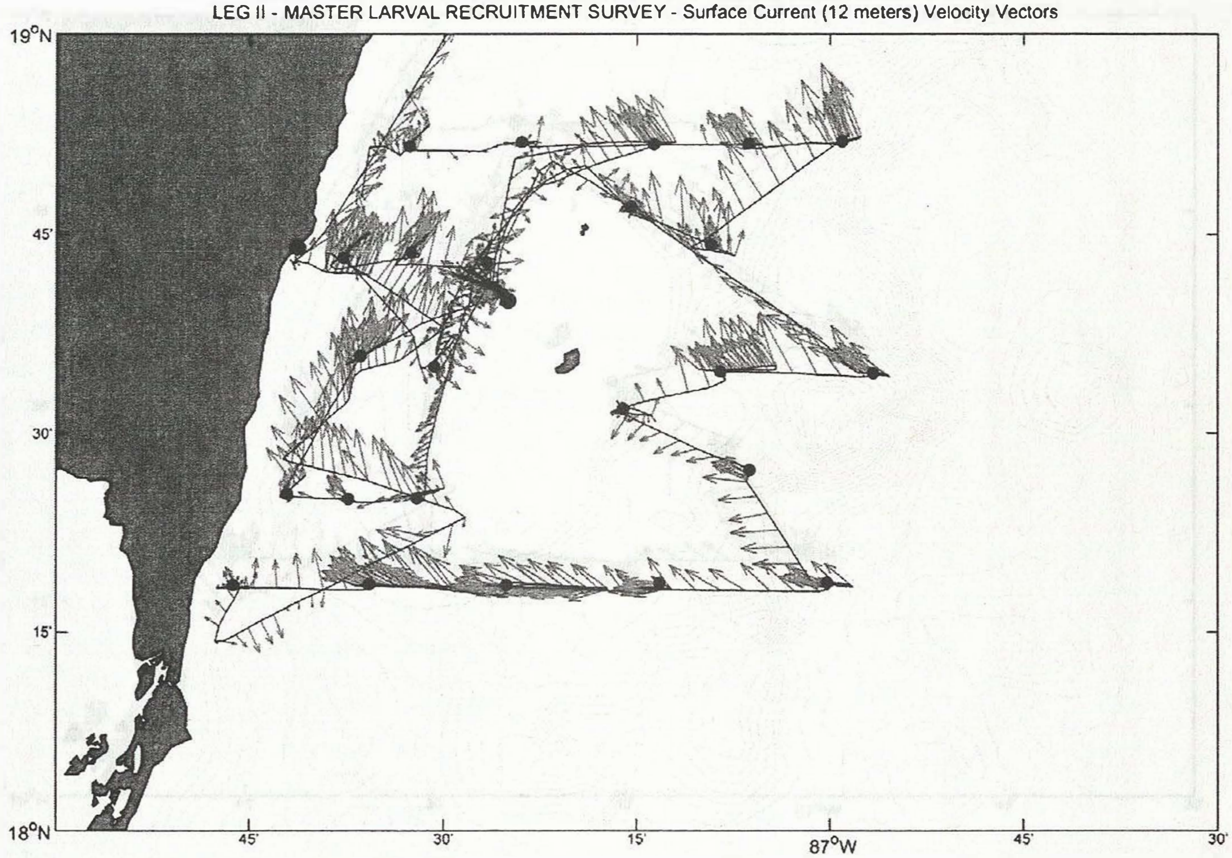
Addendum 1 - Figure 3.



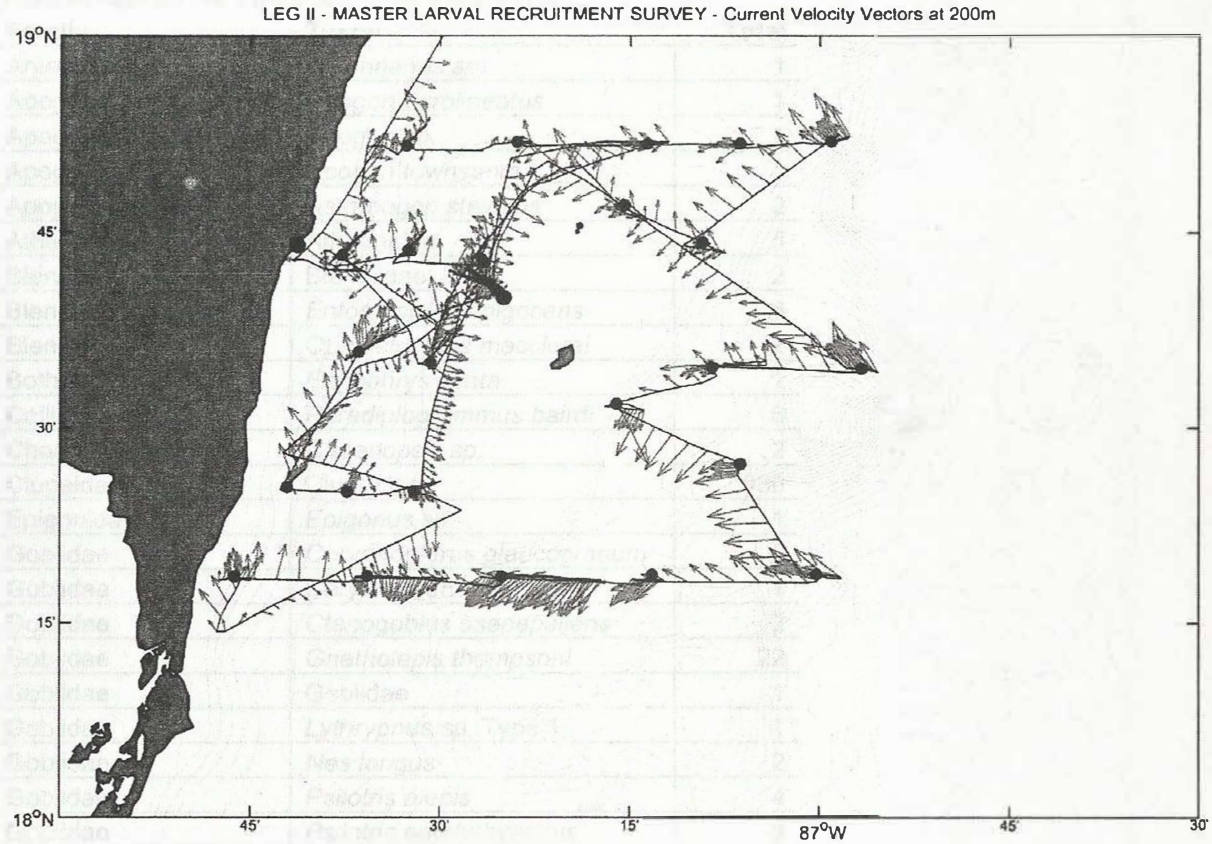
Addendum I

Addendum I - Figure 4.

LEG II - MASTER LARVAL RECRUITMENT SURVEY - Surface Current (12 meters) Velocity Vectors



Addendum I - Figure 5.



Addendum II

Addendum II - Table 1. Taxa collected from the light traps; (4 stations collected over 3 nights at 2 depths: 1 m and 15 m).

Family	Taxon	Total
Antennariidae	*Antennarius sp.*	1
Apogonidae	*Apogon aurolineatus*	1
Apogonidae	*Apogon sp.*	1
Apogonidae	*Apogon townsendi*	1
Apogonidae	*Astrapogon stellatus*	2
Atherinidae	Atherinidae	5
Blenniidae	Blenniidae	2
Blenniidae	*Entomacrodus nigricans*	3
Blenniidae	*Ophioblennius macclurei*	2
Bothidae	*Engophrys senta*	1
Callionymidae	*Paradiplogrammus bairdi*	6
Chaenopsidae	*Chaenopsis sp.*	2
Clupeidae	Clupeidae	930
Epigonidae	*Epigonus sp.*	1
Gobiidae	*Coryphopterus glaucograeum*	2
Gobiidae	*Coryphopterus sp.* Type 1	1
Gobiidae	*Ctenogobius saepepallens*	2
Gobiidae	*Gnatholepis thompsoni*	22
Gobiidae	Gobiidae	1
Gobiidae	*Lythrypnus sp.* Type 1	1
Gobiidae	*Nes longus*	2
Gobiidae	*Psilotris alepis*	4
Gobiidae	*Psilotris amblyrhynchus*	3
Gobiidae	*Psilotris batrachodes*	13
Haemulidae	*Haemulon sp.*	30
Labridae	*Xyrichtys sp.*	2
Labrisomidae	*Malacoctenus sp.* Type 2	1
Labrisomidae	*Malacoctenus sp.* Type1	2
Labrisomidae	*Malacoctenus triangulatus*	3
Labrisomidae	*Starksia occidentalis*	1
Lutjanidae	*Lutjanus apodus*	1
Monacanthidae	*Monacanthus tuckeri*	95
Mullidae	*Pseudupeneus maculatus*	2
Ophidiidae	Ophidiidae	1
Opistognathidae	*Opistognathus aurifrons*	3
Pempheridae	*Pempheris schomburgkii*	1
Pomacentridae	*Chromis cyanea*	18
Pomacentridae	*Chromis multilineata*	1
Pomacentridae	*Stegastes diencaeus*	3
Pomacentridae	*Stegastes leucostictus*	5
Pomacentridae	*Stegastes partitus*	19
Scaridae	*Scarus sp.*	1
Scaridae	*Sparisoma sp.*	31

Addendum II - Table 2. Taxa collected from the light traps; (4 stations collected over 3 nights at 2 depths: 1 m and 15 m).

Family	Taxon	Total
Scorpaenidae	*Scorpaena plumieri*	3
Scorpaenidae	*Scorpaena sp.* Type 1	1
Scorpaenidae	*Scorpaena sp.* Type 2	8
Scorpaenidae	*Scorpaena sp.* Type 3	2
Scorpaenidae	*Scorpaena sp.* Type 4	1
Serranidae	*Epinephalus afer*	1
Serranidae	*Epinephalus itijara*	1
Serranidae	*Mycteroperca tigris*	8
Serranidae	*Serranus sp.*	2
Sphyraenidae	*Sphyraena barracuda*	1
Synodontidae	*Saurida suspicio*	16
Synodontidae	*Synodontidae*	1
Synodontidae	*Synodus poeyi*	1
Synodontidae	*Synodus synodus*	1
Synodontidae	*Trachinocephalus myops*	3
unknown	unknown_1	1
unknown	unknown_2	1
unknown	unknown_3	1

Addendum II – Table 2.

STATUS OF GORDON GUNTER SAMPLES (GG0601)
Initial Report from ECOSUR Sorting Center

Box	Date	Station	Tow	No. sample	Net	Alcohol or formalin	Displacement volume (ml)	Dry weight (g)
CAJA 01	3/16/2006	0	1		MOC-10	A	14	12.3
	3/16/2006	0	2		MOC-10	A	4	5.7
	3/16/2006	0	3		MOC-10	A	5	7.7
	3/16/2006	0	4		MOC-10	A	5	5.4
	3/16/2006	0	5		MOC-10	A	1	1.4
	3/16/2006	0	1		MOC-1	A	22	21.1
	3/16/2006	0	2		MOC-1	A	5	5.4
	3/16/2006	0	3		MOC-1	A	9	3.4
	3/16/2006	0	4		MOC-1	A	12	9.5
	3/16/2006	0	5		MOC-1	A	60	68.3
	3/18/2006	1	1		MOC-1	A	30	24.4
	3/18/2006	1	2		MOC-1	A	20	20.6
	3/18/2006	1	3		MOC-1	A	18	12.8
CAJA 02	3/18/2006	1	4		MOC-1	A	30	28.2
	3/18/2006	1	5		MOC-1	A	37	34.4
	3/18/2006	2	1		MOC-1	A	36	31.2
	3/18/2006	2	2	1/2	MOC-1	A	33	32.4
	3/18/2006	2	2	2/2	MOC-1	A	1	2.6
	3/18/2006	2	3		MOC-1	A	22	21
	3/18/2006	2	4		MOC-1	A	19	21
	3/18/2006	2	5		MOC-1	A	30	30.3
	3/18/2006	3	1		MOC-1	A	14	14.5
	3/18/2006	3	2		MOC-1	A	12	10.9
	3/18/2006	3	3		MOC-1	A	4	6.9
	3/18/2006	3	4		MOC-1	A	18	17.4
CAJA	3/18/2006	3	5		MOC-1	A	10	10.4
	3/18/2006	4	1		MOC-1	A	18	16.9
	3/18/2006	4	2		MOC-1	A	5	6
	3/18/2006	4	3		MOC-1	A	8	7.5
	3/18/2006	4	4		MOC-1	A	19	17.1
	3/18/2006	4	5		MOC-1	A	29	28.1

03	3/18/2006	5	1		MOC-1	A	28	25.6
	3/18/2006	5	2		MOC-1	A	23	18.8
	3/18/2006	5	3		MOC-1	A	14	15.9
	3/18/2006	5	4		MOC-1	A	24	24.6
	3/18/2006	5	5		MOC-1	A	42	36.2
	3/19/2006	6	1		MOC-1	A	29	26.8
CAJA 04	3/19/2006	6	2		MOC-1	A	25	23.7
	3/19/2006	6	3		MOC-1	A	24	25.5
	3/19/2006	6	4		MOC-1	A	24	22.8
	3/19/2006	6	5		MOC-1	A	24	23.5
	3/19/2006	7	1		MOC-1	A	15	16.1
	3/19/2006	7	2		MOC-1	A	15	16
	3/19/2006	7	3		MOC-1	A	20	21.7
	3/19/2006	7	4		MOC-1	A	15	15.9
	3/19/2006	7	5		MOC-1	A	21	21.9
	3/19/2006	10	1		MOC-1	A	39	36.5
	3/19/2006	10	2		MOC-1	A	20	19.1
	3/19/2006	10	3		MOC-1	A	19	15.8
CAJA 05	3/19/2006	10	4		MOC-1	A	32	27
	3/19/2006	10	5		MOC-1	A	31	24.2
	3/20/2006	11	1		MOC-1	A	23	19.9
	3/20/2006	11	2		MOC-1	A	16	12.7
	3/20/2006	11	3		MOC-1	A	12	9.4
	3/20/2006	11	4		MOC-1	A	17	13.1
	3/20/2006	11	5		MOC-1	A	32	28.7
	3/20/2006	12	1		MOC-1	A	24	21.4
	3/20/2006	12	2		MOC-1	A	17	15.9
	3/20/2006	12	3		MOC-1	A	17	13
	3/20/2006	12	4		MOC-1	A	13	11.6
	3/20/2006	12	5		MOC-1	A	13	10.4
	3/20/2006	13	1		MOC-1	A	60	63.8
CAJA 06	3/20/2006	13	2		MOC-1	A	32	27.9
	3/20/2006	13	3		MOC-1	A	57	53.1
	3/20/2006	13	4		MOC-1	A	57	51.9
	3/20/2006	13	5		MOC-1	A	41	38.7
	3/21/2006	14	1		MOC-1	A	29	25.2
	3/21/2006	14	2		MOC-1	A	33	28.7
	3/21/2006	14	3		MOC-1	A	29	23.2
	3/21/2006	14	4		MOC-1	A	21	17.3
	3/21/2006	14	5		MOC-1	A	21	16.1
	3/21/2006	15	1		MOC-1	A	21	16.2
	3/21/2006	15	2		MOC-1	A	17	13.6
	3/21/2006	15	3		MOC-1	A	24	21.2
	3/21/2006	15	4		MOC-1	A	17	14
	3/21/2006	15	5		MOC-1	A	18	13.8

CAJA 07	3/21/2006	16	1		MOC-1	A	19	19.8
	3/21/2006	16	2		MOC-1	A	28	28.7
	3/21/2006	16	3		MOC-1	A	13	15
	3/21/2006	16	4		MOC-1	A	19	16.6
	3/21/2006	16	5		MOC-1	A	14	15.2
	3/21/2006	17	1		MOC-1	A	32	33.6
	3/21/2006	17	2		MOC-1	A		
	3/21/2006	17	3		MOC-1	A		
	3/21/2006	17	4		MOC-1	A	8	9.2
	3/21/2006	17	5		MOC-1	A	12	12.9
	3/21/2006	18	1		MOC-1	A	34	34
CAJA 08	3/21/2006	18	2		MOC-1	A	29	16.8
	3/21/2006	18	3		MOC-1	A	17	12.4
	3/21/2006	18	4		MOC-1	A	31	28.7
	3/21/2006	18	5		MOC-1	A	24	22
	3/22/2006	19	1		MOC-1	A	25	21.2
	3/22/2006	19	2		MOC-1	A	27	15.6
	3/22/2006	19	3		MOC-1	A	20	16.9
	3/22/2006	19	4		MOC-1	A	34	29.2
	3/22/2006	19	5	1/2	MOC-1	A	26	21.6
	3/22/2006	19	5	2/2	MOC-1	A	27	22.2
	3/22/2006	20	1		MOC-1	A	27	19.8
	3/22/2006	20	2		MOC-1	A	19	12.8
CAJA 09	3/22/2006	20	3		MOC-1	A	26	27.9
	3/22/2006	20	4		MOC-1	A	30	30.4
	3/22/2006	20	5		MOC-1	A	29	31.4
	3/23/2006	22	1		MOC-1	A	28	29.9
	3/23/2006	22	2		MOC-1	A	33	31.6
	3/23/2006	22	3		MOC-1	A	22	22
	3/23/2006	22	4		MOC-1	A	32	31.4
	3/23/2006	22	5		MOC-1	A	19	21
	3/23/2006	23	1		MOC-1	A	30	29.7
	3/23/2006	23	2		MOC-1	A	29	33.4
	3/23/2006	23	3		MOC-1	A	23	23
	3/23/2006	23	4		MOC-1	A	25	24.7
CAJA 10	3/23/2006	23	5		MOC-1	A	15	13.4
	3/23/2006	24	1		MOC-1	A	17	17.9
	3/23/2006	24	2		MOC-1	A	18	13.2
	3/23/2006	24	3		MOC-1	A	18	14.3
	3/23/2006	24	4		MOC-1	A	11	11.9
	3/23/2006	24	5		MOC-1	A	17	16.1
	3/23/2006	25	1		MOC-1	A	50	43.1
	3/23/2006	25	2		MOC-1	A	27	23.1
	3/23/2006	25	3		MOC-1	A	19	15.6
	3/23/2006	25	4		MOC-1	A	35	31.9

	3/23/2006	25	5	1/2	MOC-1	A	22	19.4
	3/23/2006	25	5	2/2	MOC-1	A	22	18.8
	3/24/2006	26	1	1/2	MOC-1	A	29	28.1
	3/24/2006	26	1	2/2	MOC-1	A		
C	3/24/2006	26	2		MOC-1	A	38	34.8
A	3/24/2006	26	3		MOC-1	A	46	43.7
J	3/24/2006	26	4		MOC-1	A	58	51.8
A	3/24/2006	26	5	1/2	MOC-1	A	35	35.4
	3/24/2006	26	5	2/2	MOC-1	A	20	23
	3/24/2006	27	1		MOC-1	A	30	30.5
1	3/24/2006	27	2		MOC-1	A	17	19.3
1	3/24/2006	27	3		MOC-1	A	25	25
	3/24/2006	27	4		MOC-1	A	35	34.8
	3/24/2006	27	5		MOC-1	A	29	29.6
	3/24/2006	28	1		MOC-1	A	15	14.5
	3/24/2006	28	2		MOC-1	A	31	30.5
C	3/24/2006	28	3		MOC-1	A	15	16.7
A	3/24/2006	28	4		MOC-1	A	25	15.1
J	3/24/2006	28	5		MOC-1	A	20	19.6
A	3/24/2006	29	1		MOC-1	A	21	21.7
	3/24/2006	29	2		MOC-1	A	11	13.3
	3/24/2006	29	3		MOC-1	A	17	16.1
1	3/24/2006	29	4		MOC-1	A	33	28.7
2	3/24/2006	29	5		MOC-1	A	28	25.3
	3/24/2006	30	1		MOC-1	A	37	34.8
	3/24/2006	30	2		MOC-1	A	16	15.8
	3/24/2006	30	3		MOC-1	A	11	9.9
	3/24/2006	30	4		MOC-1	A	28	16.9
C	3/24/2006	30	5		MOC-1	A	31	24.4
A	3/26/2006	33	1		MOC-1	A	27	21.2
J	3/26/2006	33	2		MOC-1	A	9	6.9
A	3/26/2006	33	3		MOC-1	A	15	11.6
	3/26/2006	33	4		MOC-1	A	27	23.2
	3/26/2006	33	5		MOC-1	A	28	21.6
1	3/26/2006	34	1		MOC-1	A	39	32.2
3	3/26/2006	34	2		MOC-1	A	22	19.3
	3/26/2006	34	3		MOC-1	A	25	21
	3/26/2006	34	4		MOC-1	A	31	25.3
	3/26/2006	34	5		MOC-1	A	43	34
	3/27/2006	35	1	1/2	MOC-1	A	45	39.7
C	3/27/2006	35	1	2/2	MOC-1	A	27	24.4
A	3/27/2006	35	2		MOC-1	A	26	23.4
J	3/27/2006	35	3		MOC-1	A	34	29
A	3/27/2006	35	4		MOC-1	A	51	41.9
	3/27/2006	35	5		MOC-1	A	30	24.9

	3/27/2006	36	1		MOC-1	A	5	4.6
1	3/27/2006	36	2		MOC-1	A	15	12.6
4	3/27/2006	36	3		MOC-1	A	39	32.5
	3/27/2006	36	4		MOC-1	A	13	11.5
	3/27/2006	36	5		MOC-1	A	14	12.3
	3/27/2006	37	1		MOC-1	A	36	30.8
	3/27/2006	37	2		MOC-1	A	26	20.3
C	3/27/2006	37	3		MOC-1	A	16	13.3
A	3/27/2006	37	4		MOC-1	A	30	24.1
J	3/27/2006	37	5		MOC-1	A	36	30.6
A	3/27/2006	38	1		MOC-1	A	38	33.9
	3/27/2006	38	2		MOC-1	A	24	21
	3/27/2006	38	3		MOC-1	A	27	24.8
1	3/27/2006	38	4	1/2	MOC-1	A	20	27
5	3/27/2006	38	4	2/2	MOC-1	A	19	18.1
	3/27/2006	38	5	1/2	MOC-1	A	21	19.2
	3/27/2006	38	5	2/2	MOC-1	A	17	21.6
	3/28/2006	39	1		MOC-1	A	26	24.5
	3/28/2006	39	2		MOC-1	A	32	29.1
C	3/28/2006	39	3		MOC-1	A	36	30.3
A	3/28/2006	39	5		MOC-1	A	38	32.3
J	3/28/2006	40	1		MOC-1	A	16	15.9
A	3/28/2006	40	2		MOC-1	A	16	17
	3/28/2006	40	3		MOC-1	A	15	14.6
	3/28/2006	40	4		MOC-1	A	23	21.7
1	3/28/2006	40	5		MOC-1	A	18	15.9
6	3/28/2006	41	1		MOC-1	A	19	17.5
	3/28/2006	41	2		MOC-1	A	10	9.8
	3/28/2006	41	3		MOC-1	A	15	13.4
	3/28/2006	41	4		MOC-1	A	24	22
	3/28/2006	41	5		MOC-1	A	32	31.5
C	3/28/2006	43	1		MOC-1	A	48	44.3
A	3/28/2006	43	2		MOC-1	A	17	16
J	3/28/2006	43	3		MOC-1	A	24	23
A	3/28/2006	43	4		MOC-1	A	41	38.8
	3/28/2006	43	5		MOC-1	A	34	30.1
	3/29/2006	44	1		MOC-1	A	22	21.2
1	3/29/2006	44	2		MOC-1	A	24	23.6
7	3/29/2006	44	3		MOC-1	A	30	12.6
	3/29/2006	44	4		MOC-1	A	22	20.7
	3/29/2006	44	5		MOC-1	A	12	11.2
	3/29/2006	45	1		MOC-1	A	35	31.1
	3/29/2006	45	2		MOC-1	A	24	18.4
C	3/29/2006	45	3		MOC-1	A	17	16.3
A	3/29/2006	45	4	1/2	MOC-1	A	24	20.6

J	3/29/2006	45	4	2/2	MOC-1	F		
A	3/29/2006	45	5		MOC-1	A	42	39.5
	3/29/2006	46	1		MOC-1	A	42	39.7
	3/29/2006	46	2		MOC-1	A	36	31.5
1	3/29/2006	46	3		MOC-1	A	30	28
8	3/29/2006	46	4		MOC-1	A	62	57.4
	3/29/2006	46	5	1 de 3	MOC-1	A	40	37.9
	3/29/2006	46	5	2 de 3	MOC-1	F	38	35
	3/30/2006	47	1		MOC-1	A	30	23.7
C	3/30/2006	47	2		MOC-1	A	37	29.2
A	3/30/2006	47	3		MOC-1	A	50	40.5
J	3/30/2006	47	4		MOC-1	A	40	32.8
A	3/30/2006	47	5		MOC-1	A	31	30.2
	3/30/2006	48	1		MOC-1	A	47	38.6
	3/30/2006	48	2		MOC-1	A	22	16.3
1	3/30/2006	48	3		MOC-1	A	24	18.8
9	3/30/2006	48	4	1/2	MOC-1	A	50	46.7
	3/30/2006	48	4	2/2	MOC-1	A	42	36.4
	3/30/2006	48	5	1/2	MOC-1	A	43	30.7
	3/30/2006	48	5	2/2	MOC-2	A	41	31.7
	3/30/2006	49	3		MOC-1	A	38	33.2
C	3/30/2006	49	4		MOC-1	A	33	31.1
A	3/30/2006	49	5		MOC-1	A	40	38.9
J	3/30/2006	50	1		MOC-1	A	28	27.1
A	3/31/2006	50	2	1/2	MOC-1	A	51	52.1
	3/31/2006	50	2	2/2	MOC-1	F		
	3/31/2006	50	3		MOC-1	A	55	43.2
2	3/31/2006	50	4	1/2	MOC-1	A	40	39.1
0	3/31/2006	50	4	2/2	MOC-1	A	35	32.6
	3/31/2006	50	5	1/2	MOC-1	A	44	36.4
	3/31/2006	50	5	2/2	MOC-1	A	31	32.8
	3/31/2006	52	1		MOC-1	A	42	33.3
	3/31/2006	52	2		MOC-1	A	50	42
	3/31/2006	52	3		MOC-1	A	14	12.4
C	3/31/2006	52	4		MOC-1	A	23	21
A	3/31/2006	52	5		MOC-1	A	24	20.6
J	3/31/2006	53	1		MOC-1	A	65	62.3
A	3/31/2006	53	2		MOC-1	A	44	36.8
	3/31/2006	53	3		MOC-1	A	12	13.8
	3/31/2006	53	4		MOC-1	A	19	14.6
2	3/31/2006	53	5		MOC-1	A	21	16.6
1	3/31/2006	54	1		MOC-1	A	35	33.5
	3/31/2006	54	3		MOC-1	A	26	23.9

	3/31/2006	54	4		MOC-1	F	Sample with LULU & URIEL (abyssal fishes)	
			1			F	Samples with IVAN	
C			2			F	Samples with IVAN	
A	4/1/2006	55	3		MOC-1	A	42	40.2
J	4/1/2006	55	4		MOC-1	A	47	43.7
A	4/1/2006	55	5		MOC-1	A	54	43.8
	4/1/2006	56	1		MOC-1	A	37	35.1
	4/1/2006	56	2		MOC-1	A	23	20.9
2	4/1/2006	56	3		MOC-1	A	22	21.4
2	4/1/2006	56	4		MOC-1	A	32	27
	4/1/2006	56	5		MOC-1	A	5	4.1

BOX IVAN

Caja	Date	Station	Tow	No. sample	Net	Alcohol or formalin	Displacement volume (ml)	Dry weight (g)
C	3/30/2006	49	1		MOC-1	F	52	57.8
A	3/30/2006	49	2		MOC-1	F	57	82.4
J	3/31/2006	54	1		MOC-1	F	227	229.7
A	3/31/2006	54	2		MOC-1	F	154	162.5
2	3/1/2006	55	1		MOC-1	F	60	62.3
3	3/1/2006	55	2		MOC-1	F	100	85.5

Caja	Date	Station	Tow	No. sample	Net	Alcohol or formalin	Displacement volume (ml)	Dry weight (g)
	3/31/2006	50	2		MOC-1	F	sorted	
	3/31/2006	52	3		MOC-1	A	bad sample	
	3/31/2006	54	2		MOC-1	F	sorted by sizes	
	3/31/2006	54	2		MOC-1	F	sorted (squid)	
	3/31/2006	54	4		MOC-1	F	sorted (abyssal fishes)	
	3/31/2006	54	4		MOC-1	F	intense red organism	

4/1/2006	55	2	MOC-1	F	**sorted (squid)**
4/1/2006	55	2	MOC-1	F	**sorted**
4/1/2006	56	2	MOC-1	F	**sorted**
4/1/2006	55	5	MOC-1	F	**sorted**
3/31/2006	53	4	MOC-1	F	**sorted**
3/31/2006	52	4	MOC-1	F	**sorted**
3/24/2006	28	5	MOC-1	F	**sorted**