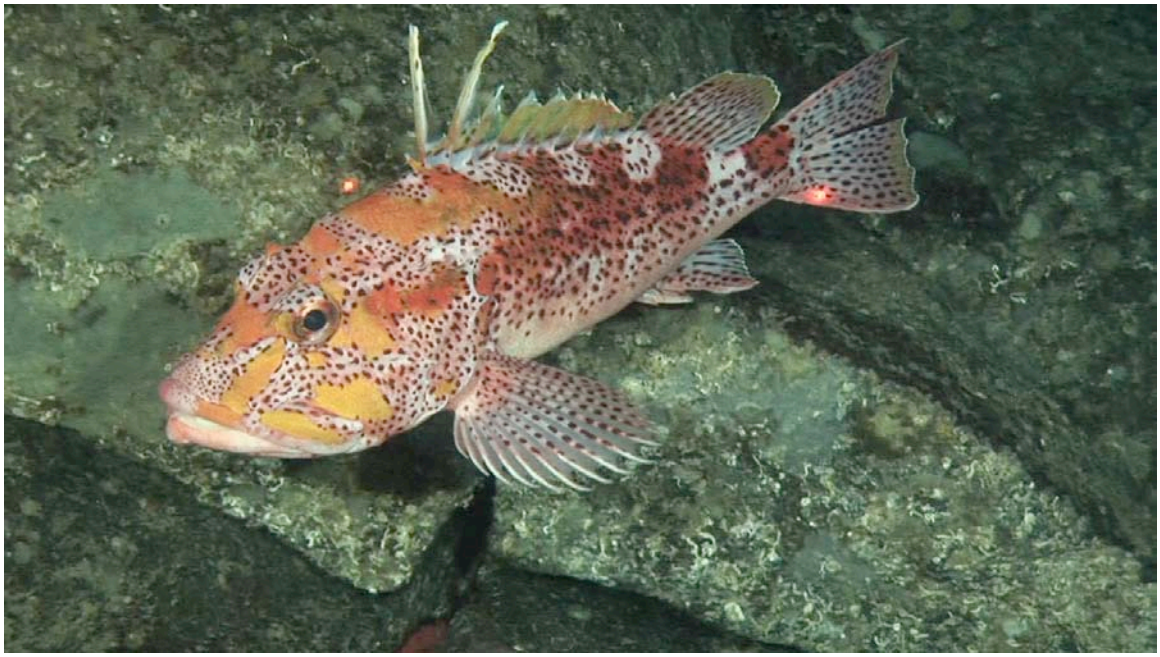
FISHES OF

LAS GEMELAS SEAMOUNTS AND ISLA DEL COCO

Preliminary Findings of September 2009 Submersible Surveys



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26 February 2010

Executive Summary

In September 2009 we surveyed the deep habitats and fish assemblages of Las Gemelas seamounts and Parque Nacional Isla del Coco, as part of the National Geographic expedition. We conducted four submarine dives at the Las Gemelas seamounts and 18 dives around Isla del Coco, using a combination of quantitative video transects and general observations to characterize fish communities at each study site. We surveyed habitats in depths ranging from 50 – 402 m, but are reporting only the data obtained from dives in rocky habitats that were deeper than 150 m, to facilitate a comparison of deepwater communities at Las Gemelas seamounts and Isla del Coco.

Habitats we surveyed at Isla del Coco included vertical rock walls and steep slopes comprised of volcanic rock outcrops and sand. Habitats surrounding Isla del Coco were often highly fragmented and contained many cracks and crevices for small fishes to hide. The edge of the shelf, at about 180 – 220 m deep contained the highest density of fishes; we often saw schools of hundreds of small fishes covering rock outcrops. These fishes in turn provide food for larger fishes such as groupers and sharks. We encountered unusually large schools of groupers, but they were observed outside of the area covered by the video transects hence not included in our quantitative analysis of the video transects.

Habitats we surveyed at Las Gemelas contained a larger number of encrusting and structure-forming invertebrates than at Isla del Coco, including glass sponges, octocorals, black corals, stony corals, and calcified hydroids. Importantly, we encountered different habitats in each of our dives at Las Gemelas, suggesting that habitat diversity and number of species at Las Gemelas seamounts is potentially much greater than we were able to determine with the available submersible dives. The benthic habitats at Las Gemelas are intact, since there have been no trawling activities.

The fish assemblages at Las Gemelas were different than at Isla del Coco, although total fish biomass was not significantly different between the two areas. Fishing pressure was higher at Las Gemelas, as we observed fishing lines on the bottom on every dive (30 out of 33 observations of deep fishing lines during submersible surveys). We observed no sharks at Las Gemelas, and less large predatory fishes in our submersible dives at las Gemelas than at Cocos. Large fishes (>50 cm) accounted for a greater proportion of the total fish biomass at Isla del Coco, while small serranids accounted for most of the biomass (80%) at Las Gemelas (basslets were larger and more abundant). Although grouper biomass within transects was not significantly different between both areas, we observed large aggregations of groupers outside transects at Isla del Coco but not at Las Gemelas. Anecdotes provided by local fishermen indicate that historically, 1000 groupers a day were caught at certain times of the year by a group of 20 fishing boats using hook and line fishing gear at the seamounts. The above suggests that populations of large predators have been reduced by fishing at Las Gemelas, and that that may have caused a population boom of smaller fishes upon which groupers may prey.

Our surveys also suggest that Las Gemelas contain species that have not yet been described in the scientific literature, and thus are important for the maintenance of biodiversity,

including at least one new species of Anthiinae, and several species of Batfishes and Scorpionfishes that we observed during our submersible surveys.

The major implications of our findings are two. First, if Las Gemelas are fished by bottom trawling, an extraordinary deep sea habitat will be destroyed alongside all of its rich biodiversity, including several new species of fishes and probably new species of invertebrates. Second, if fishing using longlines continues, the grouper populations will likely be further depleted, which could create more imbalances on the fish populations. Without fishing pressure at Las Gemelas, we would expect the numbers of large groupers to increase, given the linkages between the pristine benthic habitats, and the presence of large numbers of prey fishes.

Introduction

From 11 – 22 September 2009, scientists from the National Geographic Society, Universidad de Costa Rica, Moss Landing Marine Laboratories, Monterey Bay Aquarium Research Institute, Ocean Research & Conservation Association, and the University of California conducted an exploration of the deepwater areas near Cocos Island (Table 1). We used the Undersea Hunter's *DeepSee* submersible to explore the water column and seafloor habitats to a depth of 400 m. The goal of the exploration was to characterize the habitats and biota and conduct quantitative surveys of the deepwater portions of Cocos Island and Las Gemelas seamounts, located about 50 kilometers southwest of Cocos Island. The objectives of the cruise were to gather information about demersal fishes and macroinvertebrates, evaluate zonation of fishes and invertebrates, conduct observational surveys of macroplankton, collect images of habitats and species, and collect octocorals, black corals, echinoderms, crustaceans, other invertebrates, and rocks. With respect to fishes, our objectives were to gather quantitative information about species composition, density, biomass, distribution and habitat associations of demersal fishes, and to compare the fish community between Cocos Island and Las Gemelas seamounts (Fig. 1).

Table 1. List of primary personnel associated with deep-water submersible surveys of Cocos Island and Las Gemelas seamounts.

Jorge Cortés, Chief Scientist	CIMAR, University of Costa Rica
Odalisca Breedy	CIMAR, University of Costa Rica
Shmulik Blum	Undersea Hunter Group
Sylvia Earle	National Geographic Society
Kristen Green	Moss Landing Marine Laboratories
Avi Klapfer	Undersea Hunter Group
Bruce Robison	Monterey Bay Aquarium Research Institute
Richard Starr	University of California and Moss Landing Marine Labs
Edith Widder	Ocean Research & Conservation Association

We completed a total of 22 successful submersible dives (Appendix 1). During the cruise, rough weather limited our opportunity to launch the submersible at Las Gemelas seamounts, and we were only able to conduct four dives there. We were able to launch the submersible on 12 days at Cocos Island and conduct 18 dives. Maximum depths of dives ranged from 50 – 402 m, and dive duration averaged 3.7 hours. Total duration of visual observations during dive surveys was more than 80 hours.

We collected more than 30 hours of video documentation of fishes, macroinvertebrates, and gelatinous species in the water column over the course of the study. We are reviewing the videotapes to identify species observed, species-habitat associations, length distributions of fishes, relative abundances and depth distributions of fishes and macroinvertebrates, and potentially new species or those that are unreported from this region. Initial field notes indicated that we observed 76 species of fishes from our surveys (46 of which were deeper than 150 m, Appendix 2), 45 taxa of water column organisms, and more than 100 species of benthic invertebrates. This number will likely increase as we fully analyze the videos. We expect that the species list will grow because we know that we observed several species that are new or not previously reported from this region. In this report, we describe the results of initial analyses of fishes observed on the quantitative transects.

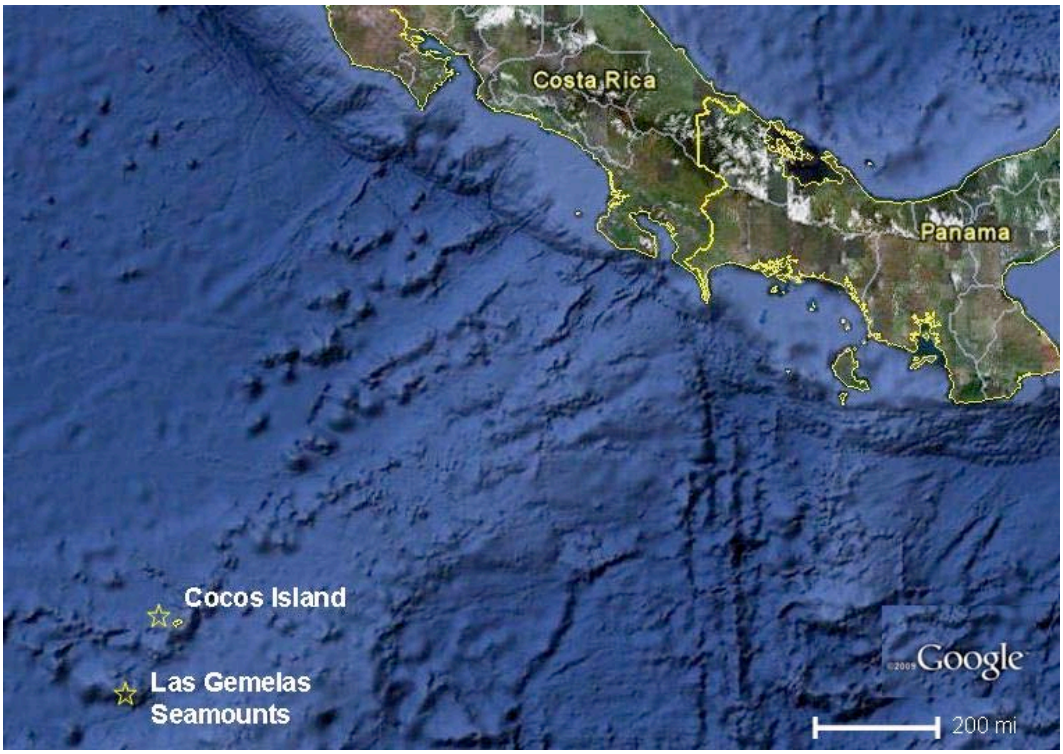

Figure 1. Map of the study area.

Methods

Quantitative data were available from 16 submersible dives. Four of these dives occurred at Las Gemelas seamounts, and 12 dives occurred around Cocos Island. During each submersible dive, two to four transects were conducted to record species composition, species-habitat associations, length distributions of fishes, and relative abundances and depth distributions of fishes. A total of 38 quantitative transects were completed in this study. Submersible transects were patterned after strip transect surveys that have been commonly used to evaluate fishes in temperate environments. During these quantitative transects, observers looked forward and downward through the submersible dome, and identified and counted every fish observed in a swath that was 1 m wide, for a set time period (usually 10 minutes). Lasers that were mounted 33 cm apart, on either side of the camera housing, shined parallel beams of light and allowed us to establish transect width. Pilots maneuvered the submersible and/or adjusted the camera so that the camera's field of view was as close to 1 m wide as possible. Observers in the submersible used the paired lasers as a reference for scale and identified fishes within the 1 m strip transect (Fig 2). The lasers were also used to estimate the lengths of fishes observed on and off transect. Transect lengths were determined by distance traveled as measured by a Doppler velocity log attached to the sub. In addition to direct observations, a video record of the transect swath was recorded by the submersible's high-definition digital camera on mini-DV tape. We reviewed all video to record fishes missed by observers, to verify the identification of species, to describe and classify habitats, and to verify that the observer only counted fishes within the transect width.

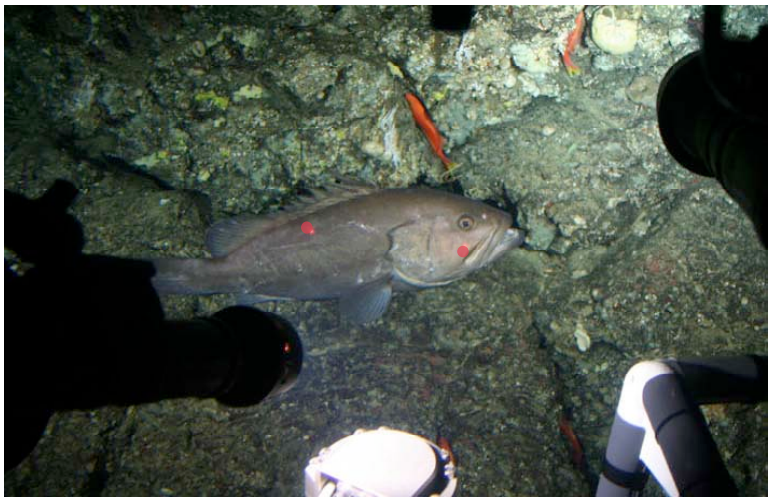

Figure 2. Using parallel lasers to estimate the length of a grouper on a Cocos Island submersible survey.

Transect lengths varied from 23 to 169 m. The total area surveyed equaled 3003 m^2. At Cocos Island, we conducted 25 quantitative transects on 12 dives, and surveyed 1999 m^2. At Las Gemelas seamounts, we completed 13 video transects on 4 dives, and surveyed about half (1004 m^2) of the area that was surveyed at Cocos Island. A total of 4,544 fishes were observed on the quantitative transects. Thus far, we have identified at least 30 different species of fishes. For this report, species have been placed into taxonomic groups to make it easier to compare the fauna of Las Gemelas seamounts with the fauna at Cocos Island (Table 2). We know that some of the fishes we saw are either new species or are species that have not been reported for this region. To gather more information about species composition and length frequencies of fishes, we also evaluated video from the parts of the sub dives that were not on transect.

In addition to conducting submersible surveys, we used the echosounder on the Undersea Hunter's *Argo* vessel to map one seamount at Las Gemelas (Fig. 3).

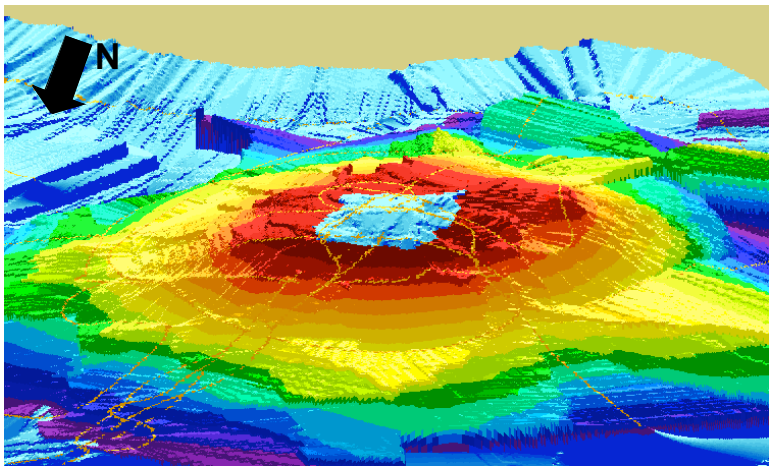

Figure 3. Topography of one of the seamounts at Las Gemelas as created by an echosounder. The top of the seamount is about 170 m deep, and the base of the seamount is > 1000 m deep.

Table 2. Scientific and common names of species and taxonomic groups observed on quantitative transects.

Scientific Name	Common Name
Brotula ordwayi	Brotula; Spotted
Moridae	Codlings
Anguilliformes	Eels
Aulopus sp.	Flagfins
Pleuronectiformes	Flatfishes
Lophiodes sp.	Goosefish
Opistognathidae	Jawfishes
Guentherus altivelis	Jellynose fish
Dermatolepis dermatolepis	Leather bass
Cookeolus japonicus	Longfinned bullseye
Caulolatilus princeps	Ocean whitefish
Ogocephalus porrectus	Rosy-lipped batfish
Scorpaenidae	Scorpionfishes
Triglidae	Searobins
Serranidae (Anthiinae)	Serranids; Basslets
Serranidae (Groupers)	Serranids; Groupers
Pronotogrammus multifasciatus	Serranids; Threadfin bass
Labridae	Wrasses

In order to compare fish communities at Las Gemelas seamounts and around Cocos Islands, we used only data from submersible dives that occurred at similar depths and covered similar habitats at each site. The dives and associated transects at Las Gemelas seamounts covered primarily rocky habitats at depths greater than 150 m. Thus, for comparison purposes, we used only the 9 submersible dives at Cocos Island that contained transects covering similar depths and habitats to contrast with the 4 submersible surveys at Las Gemelas seamounts. The comparisons included species composition, density in terms of numbers of fish and biomass (i.e., standing stock), and size composition of species or taxonomic group. We also recorded the number of times submersible observers saw fishing gear on a transect.

To evaluate species composition, we calculated species richness (the number of species) and diversity (Shannon-Wiener Index) at each site. We then calculated species density for each transect by summing the number of fish observed on a transect or counted on the videotapes and dividing that number by the area of that transect (i.e., transect length x 1 m width). Transect densities were averaged to provide an overall estimate of density for each taxonomic group. We then estimated biomass for taxonomic groups at each site by converting fish length to biomass, using length-weight relationships obtained from the scientific literature. When a conversion was not available for a particular species, we used a conversion factor from a similar species. Biomass was calculated for each transect and transects were averaged at each site to provide an estimate of standing stock (biomass per unit area). Finally, we estimated mean sizes of each taxa and evaluated size frequency distributions at each site.

Results

Species Composition

Species richness was greater at Cocos Island than at Las Gemelas seamounts. We encountered 28 species on quantitative transects at Cocos Island and 16 species at Las Gemelas. Because we encountered several fishes that have not yet been reported in the scientific literature, we grouped species into higher taxonomic levels for our analyses. Flagfins, scorpionfishes, and serranids were the dominant species groups at each site (Table 3). Flagfins (Aulopidae) were relatively common at Cocos Island, but this taxon was absent from the Las Gemelas dives. The diversity index (H') calculated for Cocos Island was 1.79 and species evenness (J) was 0.54. At Las Gemelas, the Shannon diversity index equaled 0.66 and species evenness was 0.24. These values include only species on quantitative transects and assumes that the several different morphological versions of the Anthiinae species we observed are only one species. The differences we found may be due to the greater depth range and variety of habitats surveyed at Cocos Island, the larger number of transects conducted at Cocos Island, or it may be an effect of the island biogeography typical of tropical islands. Until more surveys are conducted to enable an analysis of species-area curves, we will not able to determine the reason for the observed differences. One important qualitative observation is that we saw a larger number of encrusting and structure-forming invertebrates at Las Gemelas seamounts (Fig. 4); this very rich invertebrate community composition indicates that habitats at Las Gemelas may be able to harbor a greater diversity and biomass of fishes than at Cocos Island.

Figure 4. Example of rich invertebrate fauna at Las Gemelas seamounts, including octocorals, black corals, stony corals, calcified hydroids, and sponges.

Table 3. Species and taxonomic groups of fishes observed during quantitative transects at Cocos Island and Las Gemelas seamounts. The Number of Fish (# Fish), Density (# fish/100 m^2), and Biomass (kg/100 m^2) are reported for each location. The Biomass ratio is the biomass of each species (kg/100 m^2) observed at Las Gemelas seamounts divided by the biomass of each species at Cocos Island, only for those groups for which we detected statistically significant differences (* $p<0.05$, t-test).

	Cocos Island			Las Gemelas			
Common Name	**# Fish**	**Density (#/100m^2)**	**Biomass (kg/100m^2)**	**# Fish**	**Density (#/100m^2)**	**Biomass (kg/100m^2)**	**Biomass Ratio**
Brotulas	2	0.2	0.03				
Codlings	30	2.3	0.98	7	0.7	0.19	
Eels	5	0.4	0.03	32	3.2	0.18	5.98*
Fish, unidentified	83	6.5	N/A	54	5.4	N/A	
Flagfins	203	15.9	5.26				
Goosefishes				1	0.1	0.01	
Jellynose fish	1	0.1	0.01				
Ocean whitefish	9	0.7	1.73				
Scorpionfishes	126	9.9	0.90	34	3.4	0.96	
Serranids:							
Basslets	422	33.0	2.10	1995	198.9	21.60	10.26*
Groupers	7	0.5	4.94	3	0.3	5.42	
Threadfin Bass	872	68.2	10.18	407	40.6	5.08	
Wrasses	9	0.7	2.12	5	0.5	0.06	
Total	**1769**	**138**	**28**	**2538**	**253**	**33**	

Fish Density and Biomass

The combined density of all fish species was higher at Las Gemelas seamounts (253 fish/100 m^2) than at Cocos Island (138 fish/100 m^2). One reason for this difference is the extremely high density (almost 200 fish/100 m^2) of Anthiinae fishes (Serranids: Basslets) that we observed on submersible dives at Las Gemelas seamounts. These fish were distributed throughout all transects, as evidenced by the 100 % occurrence on all dives (Table 4). Threadfin bass and Basslets were commonly seen at Cocos Island (58.0% and 41.7% of the dives, respectively), but occurred in larger aggregations than at Las Gemelas seamounts. Higher densities of Scorpionfish were observed at Cocos Island than Las Gemelas, but Scorpionfish diversity was greater at Las Gemelas. Scorpionfish were present on every Las Gemelas dive, yet only on 75% of Cocos Island dives (Table 4). Similarly, eels were present on every Las Gemelas dive, but on only 50% of Cocos Island dives. Flagfins (Aulopidae) were relatively common at Cocos Island, but this taxon was absent from the Las Gemelas dives.

However, total fish biomass was not significantly different between Las Gemelas and Cocos Islands. The only two groups that showed differences were eels and *Anthias* (basslets), whose biomass was significantly greater at Las Gemelas than at Cocos Island. The standing stock of Basslets was 21.6 kg/100 m^2 at Las Gemelas seamounts and the threadfin bass comprised the largest component of biomass at Cocos Island (10.18 kg/100 m^2) (Table 3).

Table 4. Frequency of occurrence (percentage of dives) in which a taxonomic group was observed on either quantitative transects or at other times during a submersible dive.

	Cocos Island	Las Gemelas
Common Name	**% of Dives Present**	**% of Dives Present**
Batfishes	8.3	0.0
Brotulas	8.3	0.0
Codlings	50.0	50.0
Eels	58.3	100.0
Fish, unidentified	83.3	100.0
Flagfins	58.3	0.0
Flatfishes	16.7	0.0
Goosefishes	8.3	25.0
Jawfishes	8.3	0.0
Jellynose fish	8.3	0.0
Leather bass	16.7	0.0
Longfinned bullseye	16.7	0.0
Ocean whitefish	33.3	0.0
Scorpionfishes	75.0	100.0
Searobins	16.7	0.0
Serranids: Basslets	41.7	100.0
Serranids: Groupers	33.3	75.0
Serranids:Threadfin Bass	58.3	25.0
Wrasses	41.7	75.0
Total Dives	**12**	**4**

Size Frequency Distributions

We were able to estimate the lengths of 2,040 fish (Table 5). In addition to being more abundant, Basslets were significantly larger ($p < 0.001$) at Las Gemelas seamounts than at Cocos Island. Conversely, Threadfin bass, were more abundant and significantly larger ($p < 0.001$) at Cocos Island than at Las Gemelas seamounts. As a group, Scorpionfishes were larger at Las Gemelas seamounts, but this is due to the presence of larger species of Scorpionfishes at that site.

A plot of the percentage of total biomass by size class at each site indicates that larger fishes provide a higher proportion of the biomass at Cocos Island than at Las Gemelas seamounts (Fig. 5). At Cocos Island, fishes greater than 50 cm long provide 28% of the total biomass, whereas at Las Gemelas, fishes longer than 50 cm comprise only 16% of the biomass. The difference is due to the lower numbers of medium-sized groupers and much larger numbers of small fishes at Las Gemelas seamounts. We observed the largest groupers at the seamounts, but relatively more groupers at Cocos Island. Also, the difference is caused by the density of the Basslets and Threadfin bass, the two most dominant groups at each site. These small Serranids provide almost 80% of the biomass at Las Gemelas seamounts but only 44% of the biomass at Cocos Island.

Table 5. Mean length and SE of fishes observed on quantitative submersible transects.

	Cocos Island			Las Gemelas		
Common Name	**Mean Length (cm)**	**Number**	**SE**	**Mean Length (cm)**	**Number**	**SE**
Batfishes	15.0	1				
Brotulas	30.0	1				
Codlings	18.5	23	1.0	16.3	4	2.4
Eels	35.0	2	0.0	30.6	8	2.0
Flagfins	25.9	184	0.5			
Flatfishes	9.0	29	0.5			
Goosefishes	15.0	1		15.0	1	
Jellynose fish	25.0	1				
Leather bass	30.0	4	0.0			
Longfinned bullseye	57.5	2	2.5			
Ocean whitefish	47.3	13	2.1			
Scorpionfishes	17.6	111	0.7	27.4	17	2.4
Searobins	9.1	16	0.5			
Serranids: Basslets	15.5	143	0.4	18.6	637	0.2
Serranids: Groupers	75.0	2	5.0	85.0	2	5.0
Serranids: Threadfin Bass	20.8	619	0.1	19.0	215	0.3
Wrasses	20.0	2	0.0	20.0	2	0.0
Total		**1154**			**886**	

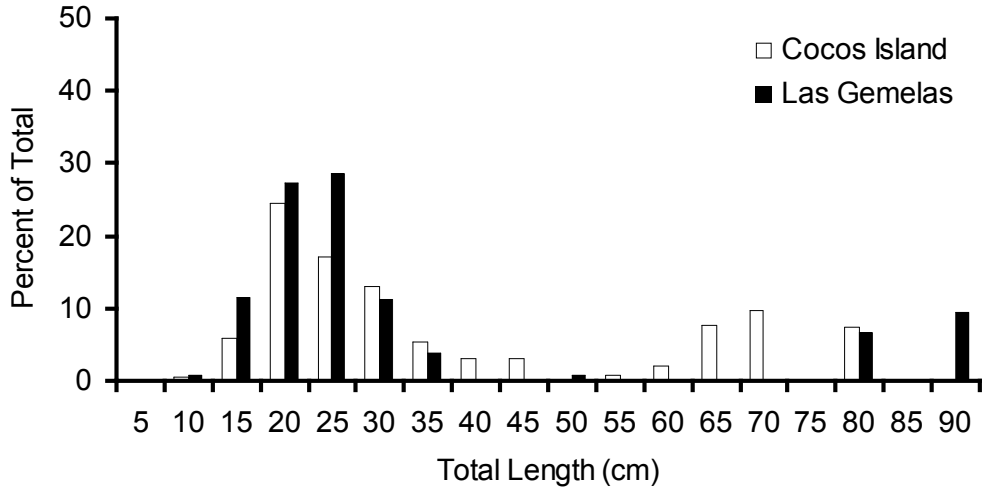

Figure 5. The contribution of biomass of all species combined as a function of the size class of fishes observed at Cocos Island and Las Gemelas seamounts.

Basslets and Threadfin bass probably play the same role in the ecosystem (as predators of small fishes, prey of larger fishes such as groupers), and were somewhat stratified by depth, thus providing prey to larger fishes at a wide variety of depths (i.e., 150 – 300 m). Threadfin bass occurred at depths of 160 – 225 m (Fig. 6), and were most often observed in large schools around large rock boulders, usually at depths of about 180 – 200 m. Basslets, however, occupied generally deeper depth zones, and were most frequently observed in or near the bottom, often lodged in cracks and crevices of rock habitats (Fig. 7).

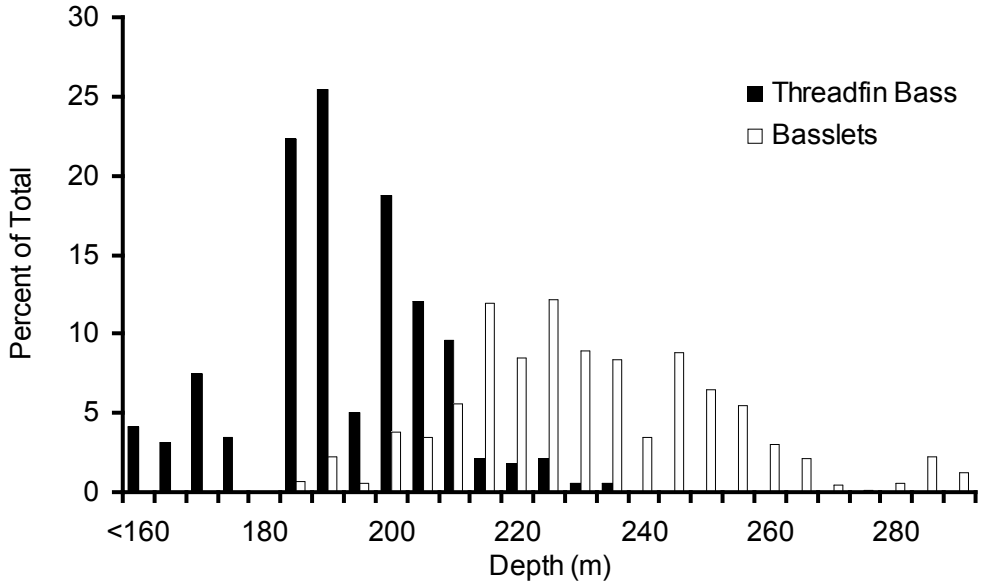

Figure 6. Frequency histogram of observed depths for Threadfin bass (*P. multifasciatus*) (n=575) and Basslets (Anthiinae) (n=2409). Data were used from all quantitative transects for which depth data were available at Cocos Island and Las Gemelas seamounts.

Figure 7. Basslets hiding in crevices at Las Gemelas seamounts.

Occurrence of Fishing Gear

Lost fishing gear was observed on all submersible dives at Las Gemelas seamounts and on 50% of the dives at Cocos Island. On 6 submersible dives, discarded fishing line was noted on 33 occasions, during 9 of the 38 quantitative transects. Aside from the observations of fishing line during quantitative transects on those dives, the presence of fishing line was noted by observers when the submersible was off transect on 8 additional dives. Presence of fishing line was greatest at Las Gemelas seamounts; 30 of the 33 observations of fishing line occurred at Las Gemelas.

Appendix 1

Date, time, science personnel, depth, and location of submersible dives completed at Las Gemelas seamounts and Cocos Island. Locations names are based on Undersea Hunter Group's dive sites.

Date	Dive #	Launch Time	Return Time	Dive Team	Max Depth (m)	Location
9/11/09	910	10:25	12:15	RS/KG	86	Cocos Island, "Everest"
9/11/09	911	15:00	18:30	JC/EW	303	Cocos Island, "Kili Drop"
9/12/09	912	10:30	15:00	BR/SE	300	Cocos Island, NW Wall
9/12/09	913	19:47	23:00	JC/RS	205	Cocos Island, "Kili Drop"
9/13/09	914	16:00	19:30	BR/EW	300	Las Gemelas seamounts
9/14/09	915	9:25	13:13	RS/SE	300	Las Gemelas seamounts
9/14/09	916	16:30	20:30	KG/JC	300	Las Gemelas seamounts
9/15/09	917	9:00	13:15	RS/BR	360	Las Gemelas seamounts
9/16/09	918	8:30	14:30	SE/JC	402	Cocos Island, "Kili Drop"
9/16/09	919	18:20	20:30	KG/EW	100	Cocos Island, Manuelita
9/17/09	920	9:00	13:00	BR/RS	225	Cocos Island, NW Wall
9/17/09	921	18:30	22:30	ES/SE	50	Cocos Island, Manuelita
9/18/09	922	9:00	12:00	JC/SE	90	Cocos Island, Rodolitos
9/18/09	923	15:00	19:00	KG/RS	80	Cocos Island, "Everest"
9/19/09	925	10:30	14:30	EW/BR	175	Cocos Island, NW Wall
9/19/09	926	16:30	18:30	SE/JC	175	Cocos Island, "Groupers"
9/20/09	927	9:00	11:00	JC/BR	90	South Cocos Island
9/20/09	928	18:30	20:30	EW/SE	80	Cocos Island, "Everest"
9/21/09	929	10:00	13:00	KG/RS	270	Cocos Island, "Groupers"
9/21/09	930	16:00	18:30	JC/OB	90	Cocos Island, "Everest"
9/22/09	931	8:00	13:00	BR/EW	300	Cocos Island, "Kili Drop"
9/22/09	932	17:30	18:40	RS/SE	275	Cocos Island, "Boulders"

Appendix 2: Species List

Scientific Name	Common name	Las Gemelas > 150 m	Cocos Island > 150 m
Anguilliformes, unidentified	Conger eel spp. B	x	x
Anguilliformes, unidentified	Conger eel spp. C		x
Antennariidae	Frogfish spp. A	x	x
Antennariidae	Frogfish spp. B	x	x
Antennariidae	Frogfish spp. C	x	x
Anthias noeli	Rosy jewelfish	x	x
Anthiinae, unidentified	Anthias spp.	x	x
Aulopus bajacali	Eastern Pacific flagfin		x
Bellator loxias	Searobin		x
Brotula ordwayi	Speckled bearded cusk eel		x
Brotula spp.	Brotula spp. A	x	x
Carcharhinus falciformis	Silky shark		x
Chlorophthalmidae, unidentified	Chloropthalmus spp.	x	x
Decodon melasma	Blackspot wrasse		x
Epinephelus cifuentesi	Olive grouper	x	x
Epinephelus niphobles	Snowy grouper	x	x
Guentherus altivela	Jellynose	x	x
Kyphosidae	Chub spp. B		x
Labridae, unidentified	Wrasse spp. B	x	x
Labridae, unidentified	Wrasse spp. C		x
Lophiodes caulinaris	Goosefish	x	x
Mobula tarapacana	Mobulid ray		x
Mycteroperca olfax	Sailfin grouper		x
Myrichthys tigrinus	Tiger snake eel		x
Myroconger nigrodantatus	Punch banana eel	x	x
Ogcocephalidae	Batfish spp. A	x	
Ogcocephalidae	Batfish spp. B	x	
Ogcocephalidae	Batfish spp. C	x	
Ophidiidae spp.	Cusk-eel spp		x
Peristedion spp.	Cocos Searobin		x
Physiculus spp.	Cod	x	x
Pleuronectiformes, unidentified	Flatfish spp.		x
Pontinus clemensi	Mottled scorpionfish		x
Pronotogrammus eos	Bigeye bass	x	x
Pronotogrammus multifasciatus	Threadfin bass	x	x
Remora remora	Remora	x	x
Scorpaenidae, unidentified*	Scorpionfish A		x
Scorpaenidae, unidentified*	Scorpionfish B		
Scorpaenidae, unidentified*	Scorpionfish C	x	
Scorpaenidae, unidentified*	Scorpionfish D	x	
Scorpaenidae, unidentified*	Scorpionfish F	x	x
Scorpaenidae, unidentified*	Scorpionfish G	x	x
Scorpaenidae, unidentified*	Scorpionfish H		
Sphyrna lewini	Hammerhead shark		x
Total taxa		**27**	**37**

*We saw at least 7 species of scorpionfish, some are likely to be *Pontinus strigatus, Scorpaena afuerae, Pontinus furcirhinus*; however, voucher specimens are necessary for confirmation.