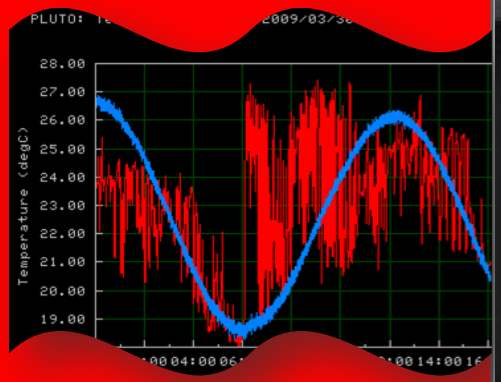


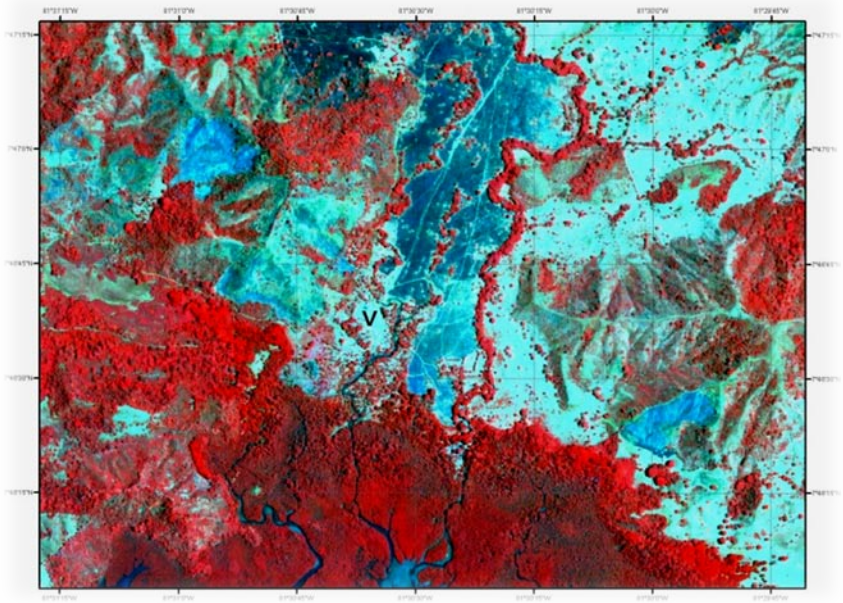
Liquid Jungle Laboratory Research 2010

Luis Camilli

Science Director

The research program at the Liquid Jungle Lab (LJL) has broadened and attracted the attention of a diverse group of scientists in 2010.

Some of the highlights of the ongoing research this year include a multi - institutional collaboration headed by the Woods Hole Marine Biological Lab (MBL) which is executing a detailed 3 year study of mangrove ecology in local estuaries funded by the National Science Foundation. In this particular study, satellite imagery is obtained to compare forest cover among different watersheds along the coast adjacent to Isla Canales de Tierra (ICT) and is coupled with intense, month long, bi-annual field studies to assess nutrient levels, forest canopy cover, photosynthetic rates, marine and terrestrial biodiversity, chemical activity in sediments, and changes in isotopic levels in communities of organisms in key estuaries. The ultimate goal of this study is to characterize the natural variability (differences between wet and dry seasons) and investigate human impacts (such as upland deforestation and pollution) on the ecosystem function in these Pacific Mangroves and the adjacent coral reefs.



Groundtruthing the satellite imagery for the MBL – WHRC mangrove ecosystem project at LJL. In-stiu field observations verify and geo-reference ground cover and terrain to document land use changes like those shown in the satellite imagery (to the right) of the water sheds and riparian areas that empty into the mangrove estuaries near the Liquid Jungle Lab.

Researchers from neighboring Central American universities have also been in residence at LJL in 2010. One particular study examines the role of a cosmopolitan sea urchin *Diadema mexicana* in the bio-erosion and health of coral reefs in the Coiba National Park compared with other regions of the Eastern Tropical Pacific such as the Cocos Islands, Southern Mexico, Nicaragua, Costa Rica and El Salvador.

Collecting sea urchins near Jicarita Island in the Coiba National Park for comparison with other countries in the Eastern Tropical Pacific.

In February, a team of researchers working in Utila, Honduras and Mafia Island, Tanzania began laying the initial ground work in an attempt to understand global migration patterns of the Whale Shark *Rhincodon typus* . A proposal for a comparative tagging study planned at LJL in 2011 aims to understand the behavior and movement patterns of these large fish which are also seasonally present in the Eastern Tropical Pacific, particularly in the nearby Gulf of Chiriquí.

Whale shark swimming on the surface in the Gulf of Chiriqui, Panama. Each whale shark has unique patterns that are used to distinguish it from other individuals Photo ID: (right pectoral fin)

Repeat visitors and long term studies are becoming more common each year. A group of (WHOI) scientists from the Biology Department who visited LJL circa 2004 are planning to visit again this December to study the perceived resilience of certain coral species of the Eastern Tropical Pacific in relation to the measured increase in global ocean acidification which is thought to be attributed to excess anthropogenic Carbon emissions into the atmosphere. Physical Oceanographers from Woods Hole also revisited LJL in April to collect more data used to verify a new model of tidal circulation and water mass mixing in the channels between ICT, Coiba Island, and Bahia Honda. A third return group studying the bioenergetics and propulsion of the gelatinous marine plankton commonly known as Salps, revisited the lab in February and conducted night time "blue water dives" (tethered dives in the open ocean) and used underwater HD video and lasers to track and quantify the movement of these animals, live in the water column.

Other advanced technology visiting the LJL enabled high resolution mapping of the morphology and structure of coral reefs surrounding Isla Canales de Tierra. This project, a collaboration between the WHOI Deep Submergence Lab and the University

of Sydney was conducted using a newly developed SCUBA diver operated optical imaging system and a boat based acoustic multibeam 'echo-sounder' to recreate seamless 3-D models of the of the seafloor structure. The biological information contained in these images are then quantitatively analyzed using computer algorithms which help to automate the extraction of 'features of interest' which are then used for input into ecologic statistical models. Critical coral reef habitats surrounding Isla Canales de Tierra and along the coast from Bahia Honda to Pixvae were surveyed and permanent monitoring stations were established in order to provide an unequivocal ecological baseline to detect subsequent habitat change in these local reefs.

Top view of SCUBA divers using a novel optical imaging device (SCUBA COP II) to image the coral reefs along the coast from Pixvae to Bahia Honda. Permanent underwater monitoring stations were set up to conduct future comparisons of the reef health in these areas.

The LJL has begun a critical transformation from its initial role as an isolated research outpost into becoming a perennial base of operations for advanced scientific research and education. Undergraduate Students from Rhode Island USA visited in early January to learn about tropical marine seascapes and marine ecology as part of complementary course work in marine science at Roger Williams University.

Pan Latin American International students analyzing and preparing specimens as part of the mangrove and estuarine bio diversity studies at LJL.

Similarly, graduate and undergraduate students from Argentina, the USA, and Panamá interacted with the project P.I.'s and participated in data collection and created individual thesis topics as part of the MBL - Mangrove Ecosystem Project. A major advancement in expanding educational capacity will be realized in January 2011 when the first WHOI –MIT PhD Joint Program field course in tropical marine ecology will be taught at the Liquid Jungle Laboratory.

Looking forward to 2011 and beyond,

Luis Camilli

LJL Science Director

Month **2010**	Discipline	Organization	Scientists / Visitors	Collaborating Institutions	Project Description
January	Phycology	Roger Williams University	B. Wysor, D.Taylor	RWU	Marine Ecology Undergraduate Field Course - emphasis on marine algae
February	Bio Engineering	California Institute of Technology	K. Rakow-Sutherland, A. Techet, E. Abbot, A. Gray	M.I.T., Univ Rhode Island	Propulsion and Community Dynamics of Salps (gelatinous zooplankton)
February	Icthyology – Population Dynamics	Shark Research Institute	M. Potenski, L. Camilli, B. Becker	Rutgers, Bay Island College of Diving	Whale Shark population study comparison between Caribbean, Indian Ocean and Pacific Ocean populations
March	Estuarine Ecology	Marine Biological Lab (MBL), Woods Hole	I. Valiela, T. Stone, A. Giblin, S. Fox, J.Cruscius, P. Martinetto, L. Camilli, R. McHorney, R. Montiero	W.H.Research Center, USGS, U. Mar de Plata, U. de Panamá, WHOI, State Univ. New York	Long term interdisciplinary study of effects of mangrove deforestation on nutrient flux to coastal watersheds (Pixvae to Bahia Honda)
April	Oceanography	Woods Hole Oceanographic Institution (WHOI)	R. Limeburner, J.Rubao, J. Schanze	AOPE	Characterizing Tidal and Deepwater Circulation at LJL and offshore
April	Robotic & AUV Engineering	Woods Hole Oceanographic Institution (WHOI)	O. Pizarro, R. Camilli, A. Mallios, L.Camilli	WHOI DSL, University of Sydney ACFR, Universitat de Girona, España	Optical, Chemical, and Acoustic Imaging of Coral Reefs to create ecological baselines for high resolution habitat change detection
May	Invertebrate Marine Biology	Universidad Autónoma de Baja Cal Sur, Mexico	J. J. Alvarado, C. Cortez	CIMAR, Universidad de Costa Rica	Study of Diadema Mexicana - Sea Urchin impacts on Coral Reef Health across the Eastern Tropical Pacific
July	Marine Ecology	Smithsonian (STRI)	C. Gomez, C. Cortez, H. Guzman	STRI	Ongoing Coral Biodiversity Study at Coiba National Park, Panamá

August	Paleo Climatology	Florida Institute of Technology	L. Toth		Coring and analysis of Holocene coral reef carbonate deposits in the Gulf of Chiriquí radiocarbon reconstruction of climate change
September	Coral Reef Ecology	Woods Hole Oceanographic Institution (WHOI)	A. Cohen, D. McKorkle,A. Tarrant, J. Pineda	Dept. Marine Biology	Study of Coral Reef Calcification and Ocean Acidification processes on Eastern Pacific Reefs - LJL and Gulf of Chiriquí case study
Jan 2011	Marine Biology	Woods Hole Oceanographic Institution (WHOI)	J. Pineda, A. Tarrant	Dept. Marine Biology	WHOI – MIT Joint Program Field Course for PhD students
Jan 2011	Phycology	Roger Williams University	B. Wysor, S. Fredericq, J. Norris, F. Wilson	Lousiana State, Smithsonian Institute, UNC Wilmingtion	Comparison of Algal Communities between Western Caribbean and Eastern Pacific