



coastline newsletter



Coastal Zone Management Authority and Institute celebrates its 20th Anniversary of service to Belize

By Ariese Briceno, Sales and Marketing Assistant

Coastal Zone Management Authority and Institute (CZMAI) is proud to announce its 20th year as the leading authority on the sustainable use and planned development of Belize's coastal and marine resources. CZMAI has achieved two decades of being charged with the responsibility of policy development and coordination, research, monitoring and assessment of human use activities that impact the coastal zone of Belize. The organization will commemorate this important milestone with a series of public education and awareness events in the months ahead leading up to the 4th Annual Coastal Awareness Week set to take place in October 22- 27 2018.

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Special Points of Interest

- Education and Outreach
- GIS Advancement
- Sportfishing
- Youth and the Environment
- Marine Litter
- Science and Technology

The official launch of CZMAI's 20th Anniversary Commemoration took place on Thursday, June 21 2018 at 2:00 p.m. at the CZMAI Training Room in Belize City. Dr Silvana Birchenough, a Marine Ecologist from the Centre for Environment, Fisheries and Aquaculture Science (CEFAS); will be the keynote speaker at the launch and will comment on CEFAS' partnership with CZMAI.



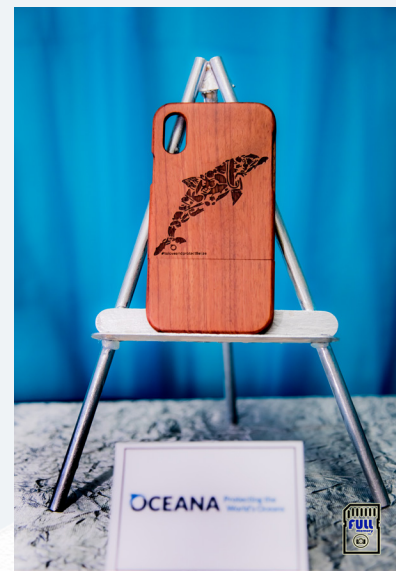
In light of our theme "Celebrating 20 years of promoting sustainable use and management of Belize's coastal zone" we had unveiled CZMAI's 20th Anniversary special edition wooden phone cases, in collaboration with OCEANA Belize, World Wildlife Fund and A & S Covers in support of the Government of Belize's decision to promote the phasing out of single use plastics by April 2019. A portion of the

proceeds from this initiative will serve as an endowment towards CZMAI's Scholarship Program.



Phone case designed by the WWF highlighting mangrove conservation in Belize

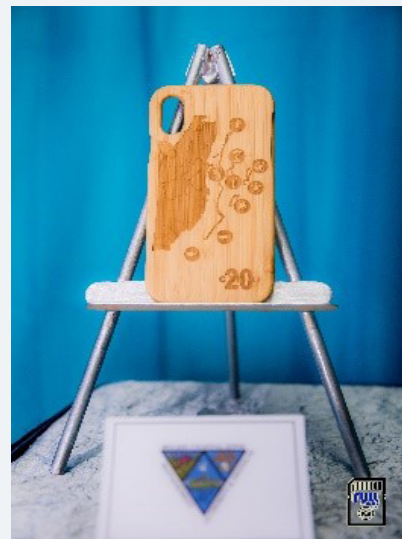
The phone case, created by World Wildlife Fund depicts mangroves. Mangroves signify resiliency, and coastal protection. The importance of mangroves lining our shores are innumerable. It acts as coastal buffers against storms and as nursery to juvenile marine life.



Phone case designed by the Oceana highlighting conservation of Belize's Marine Biodiversity.

The phone design is by Oceana signifies the theme, "To love and protect". Oceana represents ocean advocacy and graphic is centred around one of their slogans; save the oceans, feed the world. It features their trademarked dolphin graphic in an underwater mosaic. It encompasses their love for Belizean marine life which is dependent on a healthy reef for survival.

Both cases, from WWF and Oceana are made of exotic rosewood. Rosewood is highly valued and known for its richly hued timber and it is especially abundant in the southern part of the count.



Phone case designed by the CZMAI highlighting important coastal resources in Belize

CZMAI's phone case design promotes an integrated approach to informed management and sustainable development by emphasizing land to sea connectivity while paying tribute to the wealth of resources and marine biodiversity. For us at CZMAI, this design portrays our vision for a sustainable coast. It represents a sustainable future that we can achieve for Belize.

While CZMAI celebrates the past 20 years and its accomplishments, the organization is looking to the future with great anticipation as it strives to embrace more innovative and practical solutions to address the anticipated management challenges and changes in the coastal and marine regions of Belize. As we move through the months leading up to our special 20th Anniversary edition of Coastal Awareness Week 2018, CZMAI will be providing timely information and updates on the schedule of other activities to commemorate its 20th Anniversary. CZMAI strongly encourages the general public to join us in celebrating Belize's future of a sustainable coast!

For more details, call the CZMAI at tel: 223-5739/0719 or email info@coastalzone-belize.org.

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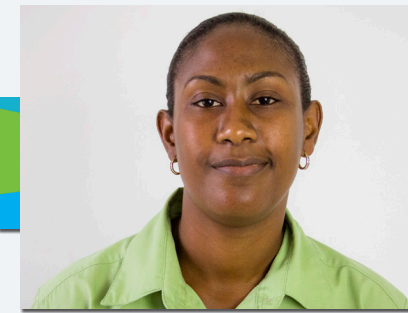
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Message from the CEO

Dear Partners, Colleagues, Friends:

I am pleased to share the first issue of CZMAI's semi-annual Coastline Newsletter with you for 2018. Through this medium, we have the opportunity and distinct privilege to communicate our accomplishments and share the outlook for the foreseeable future as we continue to deliver on our mission and purpose. We are working continuously and diligently to strengthen the Authority and Institute so that we can improve upon our capacity to effectively fulfill our mandate for improved coastal area management in this country.

This year marks the 20th anniversary of CZMAI's establishment. On April 16th 1998, the Coastal Zone Management Act was enacted by the Government of Belize. The passage of the Act established the institutional arrangements for coastal zone management in Belize, and the required legislative framework for CZMAI's mandate of promoting the sustainable development of coastal areas through policy development, coordination of existing legislation and policies affecting coastal resources, research and monitoring, capacity building and increased public participation in management activities for Belize's coastal resources.

On the occasion of its 20th Anniversary, CZMAI is reflective of its accomplishments over the years but also of its ultimate purpose, the reaffirmation of its mandate, and improved delivery of service to the people and country of Belize. CZMAI remains steadfast as it looks to the future with great anticipation recognizing that there will be new management challenges arising from the utilization and development of the coastal zone. As these new threats to the viability of the coastal zone emerge, CZMAI recognizes that there will also be new opportunities to lead the charge towards the identification of more innovative and practical solutions relevant to coastal zone management in Belize.

CZMAI remains deeply grateful for your continued support, interest and commitment. I encourage you to stay in touch with us, especially during this special anniversary year, via our semi-annual Coastline Newsletter, and by connecting with us on our website and social media.

With very best wishes,

Chantalle Samuels (Mrs.)
Chief Executive Officer



CZMAI's Data Center host Drone Training Workshop

by Andria Rosado, Jessamyn Ramos (CZMAI), & Lain Graham (UCF)

As drones gain recreational and professional popularity, regulations and restrictions are proving to be critical to ensure safe and effective drone operation in Belize. On January 10th, 2018 Coastal Zone Management Authority and Institute (CZMAI) in collaboration with Citizen Science GIS at University of Central Florida (UCF) and with support from the Marine Conservation and Climate Adaptation Project (MCCAP), hosted a Drone Training workshop in Belize City.

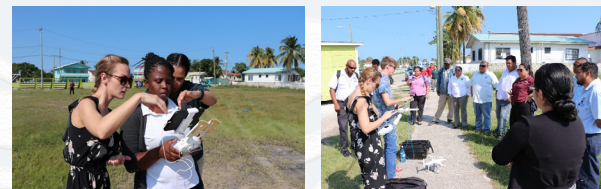
The training brought together 30 participants, representing 15 government, non-government and private sector agencies from across Belize. Agencies such as the Belize Civil Aviation, CZMAI, WWF- Belize, the Belize Port Authority, the University of Belize, The Department of the Environment, the Fisheries Department, the Belize City Council, the Lands Information Centre and Total Business Solutions Ltd were represented.



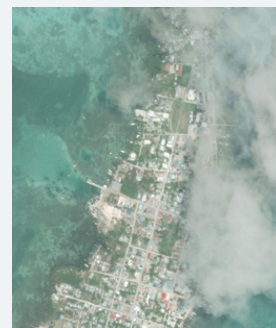
Participants not only learned how to operate drones safely and to be in compliance with emergent regulations, they also engaged in a conversation about the applications for drone technology in their respective industries. They also received hands-on-training with DJI Phantom 4 drones to put theory into practice.

Dr. Hawthorne has been working in Belize since 2011, and shared lessons learned from his Citizen Science GIS research, and his Open Reef drone mapping work. Open Reef is an initiative of Citizen Science GIS in partnership with Coastal Zone and the University of Belize, has a mis-

sion to drone map every island in the Belize Barrier Reef and to share the data openly with the public, researchers and the people of Belize. He was joined by his team, PhD student, Lain Graham and MA student Nicholas Altizer, studying Sociology and GIS under Dr. Hawthorne, and Christine Munisteri, who graduated from Skidmore College with a BS in Environmental Studies.



Dr. Hawthorne spoke about the challenges of working with satellite imagery in Belize. The clarity of the publicly available data is insufficient to map key features on the island such as structures, docks and seawalls that contribute to our understanding of human development and resiliency. Environmental changes are also impossible to monitor with the current satellite imagery. The hope is that this collaborative drone mapping work on the cayes will ignite national and international interest in these treasured ecological, cultural and economic resources. Consequently, this initiative can work towards sustainable solutions to ensure they are there for generations to come.



Coral reefs: the cradle of bonefish

By Addiel U. Perez, Bonefish & Tarpon Trust and Juan Jacobo J. Schmitter-Soto, ECOSUR

In the tropical country of Belize, coastal habitats are important as they provide refuge, nursery and reproduction needs for many fish. In fact, shallow water fish such as bonefish (*Albula vulpes*), use multiple habitats during their adult life stage. Although refuge and nursery habitats can be largely extended within several hundreds of miles along our coastal zone, bonefish often reutilize the same habitats for reproduction. Discovering and conserving the areas used for reproduction are important for the survival of bonefish. The reproductive stage is essential for new born bonefish to repopulate and increase the size of their population.



To determine those sites we used a method known as tag-recapture to track their movement. The method consisted of searching for bonefish in sandy, muddy, rocky and sea grass flats of the west side (bay) and the east side (Caribbean coast) of Ambergris Caye and also of Xcalak area, Mexico, north of the Belize border.

Once a school was spotted, a 300 feet seine net with small mesh was used to encircle the bonefish. Each fish was scooped out and tagged below the dorsal fin of the bonefish with a plastic spaghetti tag (Figure 1) containing a specific number. The bonefish were placed to recover in a small pen and then released in small groups to avoid predation. For newly tagged fish this was their tag site and for an already tagged fish this was the recovery site. These procedures were repeated for 4 days in each country and every month, for two years.

Our results were interesting, as we found two pre-spawning sites, tagged over 8000 adult bonefish, and recovered about 500 tagged fish. Some of the tagged bonefish from the bay were recovered in the Caribbean coast. This indicated bonefish left their home and then moved to sandy, muddy and seagrass flats of the reef lagoon, less than a quarter mile from the barrier reef. We found this movement occurred during the cold front season known as "nortes". They moved to an area approximately 1 mile north of Boca del Rio, San Pedro Town, and also to a second site over 25 miles north of Ambergris Caye. In those sites, there were several schools of thousands of bonefish, full of milt in males and eggs in females, ready to spawn. The view was unbelievable! Bonefish were so abundant and in a site that was still pristine, only one dock, very little human activity, as quiet that only birds' chirping could be heard, no dredged bottom, and mangroves still along the shoreline.

In each site, all schools joined together to form a massive pre-spawning school and we were able to document their movement, all together towards the only fringing reef, where the reef meets the land, of Belize! This massive number of bonefish were heading towards the fore reef to spawn, where males and females release milt and eggs into the open sea through a process known as broadcast spawning. We were also able tag some bonefish in the pre-spawning schools and were then recovered the bay flats. This indicated bonefish also made a return to their home.



Belize is a country blessed in having healthy habitats. The major threat continues to be development related activities such as dredging of sand, mud and rocks to fill-in properties. Other threats are excessive docks along the coastal areas and an increase in water activities that chase away bonefish while taking refuge from weather changes, avoiding predators, looking for food and avoiding changes in water temperature and salinity. The country is still fortunate that at least one of these two pre-spawning sites is still free of these threats.

Continued from previous page

Resource managers and political leaders are urged to seek a balance between development and conservation. These habitats are important to have healthy fish populations and also a bonefish fishery! Let's appreciate mangrove and associated bottom habitats. Help us gather more data by removing any algae to read, recorded the number, site, date, size and report the information to: addieluperez@yahoo.com or send a message to 661-2694.

Note:
A full version of the study entitled "Connectivity mediated by seasonal bonefish (*Albula vulpes*) migration between the Caribbean Sea and a tropical estuary of Belize and Mexico" is under review for publishing in the scientific journal of Environmental Biology of Fishes.

Acknowledgements:
Funding from Mexican Consejo Nacional de Ciencia y Tecnología (project 242558) and the Bonefish & Tarpon Trust. We thank fishers, students, and guides, especially Roberto Herrera, Omar Arceo, Jose Polanco, Geovanni Ortega, Jon-Pierre Windsor and many more. Also supported by fishing lodges: Omar's Freelance Fishing, El Pescador and Costa de Cocos, Acocote Inn and Flats Fly-Fishing Guides Services. Research permits PPF/DGOPA-053/15 in Mexico and 000008-16 in Belize.



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Parties
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Depending on seating

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Vulnerability of commercial species to ocean acidification in Belize

By Dr. Silvana Birchenough, CEFAS



The project "vulnerability of commercial species to ocean acidification" funded under the Commonwealth Marine Economies Programme (CME) organised a high-level workshop on the 20th June at the Belize Coastal Zone Management Authority and Institute (CZMAI).



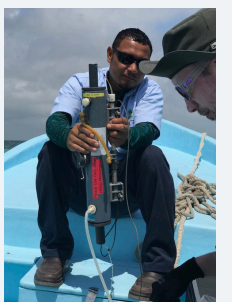
The workshop focussed on the impact of ocean acidification on marine species, including valuable commercial species (mainly the spiny lobster and conch shell). Several presentations of ongoing work were delivered by Paul Nelson (chemistry), Matthew Sanders (aquaculture developments under CME), Ella Howes (climate change adaptation) and Silvana Birchenough (overview of CME and ocean acidification effects on commercial species).

Several organisations were represented at the workshop, including representatives from the Belize Coastal Zone Management Authority and Institute (CZMAI), Fisheries Department, Belize Ministry of Environment, UK High Commission, University of Belmopan, and the Caribbean Regional Fisheries Mechanism. The workshop provided the opportunity to showcase our project and to speak live to national TV, Channel5Belize.

Silvana Birchenough, Principal Cefas Scientist, said:
"Our project is concentrated in Belize, we work with the spiny lobster and conch shell and the idea is to document changes in water to inform how fisheries will change under future conditions. We also conducting economic assessments, mainly to assess the consequences of the distribution of these species under a changing climate."



The results from this research will help to inform stakeholders and fisheries managers on the current state of these two valuable commercial species, helping to support their local monitoring activities, long-term studies, and enabling sustainable economic development in Belize and the wider region. A great example of Cefas collaboration with colleagues at CZMAI combing a strong set of multidisciplinary science.



20 yrs. of CZMAI



1989

International Coastal Resources Management Workshop.
 - San Pedro, Ambergris Caye, 23-25 August, 1989
 - 51 participants from Belize, USA, Caribbean, Australia, Costa Rica, Saba, etc.

1990

Coastal Zone Management Unit (CZMU)
 - Formed in March, 1990
 - Under Fisheries Department
 *Coordinated implementation of Integrated Coastal Zone Management

1993

Coastal Zone Management Project (CZMP)
 - Five year project initiated in March, 1993
 - Funded by GEF
 - Implemented by UNDP

1989

1990

1993



1998

2003

2016

2014

2004

The Belize Integrated Coastal Zone Management Plan adopted by the Government of Belize on August 31st 2016.

State of the Belize Coastal Zone 2003 - 2013 prepared in 2014

Coastal Zone Management Act 1998

The NICZM Strategy accepted by Government in 2003

Cayes Development Guidelines completed in 2004

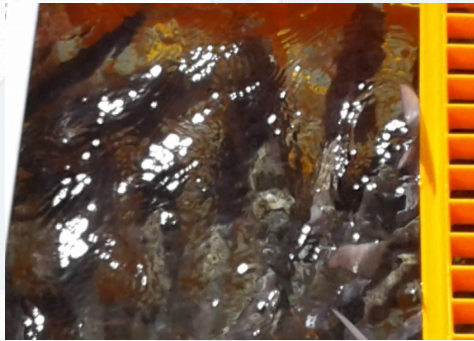
★ CZMAI Established with the passage of the CZM Act

Since our last newsletter, CZMAI has made some great progress in helping to sustainably manage Belize's coast; for this segment, we will focus on the progress within the sport fishing program area. So let's set sail.

In the latter part of 2017, I had the opportunity to represent CZMAI and Belize at the Bonefish and Tarpon 6th Annual Science Symposium. It was a 3 day event in which researchers presented on the findings of their research. During the symposium the I was exposed to many ongoing research being carried out and the preliminary findings of such. One major finding is that Belize shares our tarpon stocks with Florida, the Bahamas and Mexico- this means that management should be done on a regional scale in order to have the greatest impact. If tarpon is a shared stock, what another sport fishing fish stock do we share? Well, Mr. Addiel Perez, a Belizean researcher, who conducted a study on the migration patterns of Bonefish in Belize, said that our Bonefish stock is shared with Mexico. His research also shed light on the possible migration routes that the Bonefish use as well as which locations are used at which life stage. I had the pleasure of working with Mr. Perez in San Pedro to do bonefish tagging and recapture as part of his research. For more information on his research please read the article submitted by Mr. Perez in this issue of our newsletter entitled "*Coral reefs: the cradle of bonefish*".





Well, Mr. Addiel Perez, a Belizean researcher, who conducted a study on the migration patterns of Bonefish in Belize, said that our Bonefish stock is shared with Mexico. His research also shed light on the possible migration routes that the Bonefish use as well as which locations are used at which life stage. I had the pleasure of working with Mr. Perez in San Pedro to do bonefish tagging and recapture as part of his research. For more information on his research please read the article submitted by Mr. Perez in this issue of our newsletter entitled "*Coral reefs: the cradle of bonefish*".



I also had the pleasure of meeting Mr. Lincoln Westby at the symposium; he was one of the panelists during the "permit clinic" - an event designed to allow young anglers the opportunity to converse with more experienced, internationally recognized anglers and guides. Mr. Westby showcased his wealth of knowledge on the permit - one of the most elusive sport fish, which he amassed over years of fishing in Belize and catching thousands of permits. The knowledge gained from the symposium is being used to influence the management of the sport fishing industry. So you may ask, what has improved since then? Well CZMAI Board of Directors has approved an enforcement budget for the 2018/2019 fiscal year. CZMAI is now reaching out to enforcement partners who have similar goals to collaborate on improving the enforcement of the species designation and protection regulations (S.I. #114) and the sport fishing regulations (S.I. #115) this is intended to deter the harvesting of the protected species which are; bonefish, tarpon and permit. Bonefish in particular, is a slow growing fish in Belize- as discussed earlier so it will benefit from this initiative.

CZMAI is also working on increasing its education and awareness campaigns, since we believe that the vast majority of stakeholders that part take in the sport fishing industry are compliant with the regulation and controls that affect it. CZMAI will work to try to ensure that all Belizeans understand both what regulations apply to the industry and the rationale for the regulations being necessary. To this end we are working with the stakeholders to form a National Sport Fishing Stakeholder Association- the association will be independent of CZMAI. However we will collaborate with our stakeholders to carry out education and outreach activities among other things. The Association will also allow us to better communicate with stakeholders across the country, thus sending and receiving clear concise messages resulting in improved understanding of each other as we move forward.

A GOFF'S CAYE EXCURSION

UNWIND

BOARDING AT THE RADISSON'S DOCK at 8:30 am
AUGUST 19, 2018

RATES (ROUND TRIP)

\$35- REGULAR (AGES 10 & OVER)

\$25- KIDS DISCOUNT (AGES 2-9)

\$30- GROUP DISCOUNT (5 OR MORE REG.)

\$60- VALUE PACK
(INCLUDES: 4 LANDSHARKS, 2 SODAS & 1 FOOD)


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Recreational fishing is one of the most popular outdoor activities in the world. Anglers seek out the best fishing locations with an aim to have prime fishing experiences. Here in Belize, our waters are renowned for its abundance in the most valuable fish species and anglers travel to the jewel for this invaluable fishing experience. Safeguarding this industry is very important and Coastal Zone Management Authority and Institute (CZMAI) continues its work in building public knowledge about the three species designated for catch and release (Bonefish, Tarpon and Permit) and also the legal requirement of all anglers to carry a valid Belize Sport Fishing License while they are participating in sport fishing activities. With this regard, CZMAI embarked on a public sensitization campaign targeting anglers with stickers that highlighted three main communication objectives: 1) the legal requirement of all anglers conducting recreational fishing in Belizean waters to have a Belize Sport Fishing License, 2) notifying sport fishers of the three species protected by law that should only be catch and released; Bonefish, Tarpon and Permit, and 3) providing all prospective license holders with information on how the can obtain a Belize Sport Fishing License.



Branded as the “Sport Fishing Licenses Sticker Campaign”, this activity is being out by CZMAI’s Marketing Unit of CZMAI. The sticker which featured the above mentioned communication elements also provided a quick response (QR) code for CZMAI’s sport fishing licenses portal and contact information for the organization. CZMAI’s online portal gives sport fishers the opportunity to access licenses via the internet. Through this portal, CZMAI only offers its short term licenses options (1 day and 1 week).

The pilot and this campaign started in October 2017 and ended in December 2017. The stickers were distributed in three main locations, Placencia Village, San Pedro Town and Caye Caulker Village. In total 86 entities received at least one sticker, which represented 82% of the targeted recipients by CZMAI. Places that received stickers included: CZMAI’s Sport Fishing Agents, hotels and resorts, dive shops, tour companies, service stations, and golf cart rentals. The distribution objective was to have placement of the sticker in locations that anglers are likely to visit, therefore the choice to use the selected entities was to ensure that the sticker would have had an impact on the intended audience.



As a part of the distribution exercise, the work team who travelled to hand out the stickers delivered a short presentation to the recipients about CZMAI’s current sport fishing activities and encouraged the recipients to include CZMAI’s online License Portal on their website. Likewise, visits were conducted with current CZMAI’s Sport Fishing Agents to specifically deliver a revised Sport Fishing Agent Memorandum of Agreement and to go over accounting and license sales procedures.



This year, the Marketing Team of CZMAI plans to continue this activity and invites all stakeholders or interested businesses who wishes to have our stickers placed in their establishment to contact us via email at marketing@coastalzonebelize.org .

WOODEN DESIGN

Limited Edition

OCEANA DESIGN CZMAI DESIGN WWF'S DESIGN

Only \$60.00

Proceeds will go towards the CZMAI Endowment Fund which will assist one Natural Resource Management Student at the University of Belize with tuition and expenses during their final semester .

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The Coastal Zone Management Authority & Institute (CZMAI) is celebrating its 20th Anniversary in 2018 and, to commemorate this important milestone, is conducting several activities throughout the year. One of the major activities completed was a collaboration with Oceana Belize and the World Wildlife Fund (WWF) to implement a national marine litter campaign. The campaign targeted primary and secondary schools located within coastal communities across Belize and aimed to raise awareness about the growing problem of marine litter and microplastics.

The notion of a Marine Litter Campaign for in Belize began in October 2017, when Caribbean countries such as: Antigua, Barbados, Belize, Guyana, Jamaica, Saint Lucia, St Kitts and Nevis, Suriname and, Trinidad and Tobago, were invited to participate in a workshop entitled “Major aspects of coastal environmental management” in Kingston, Jamaica. The hosted by the Chilean Directorate General of the Maritime Territory, Merchant Marine and the “Fondo Chile” (CHILE/UNDP). The overall objective of this workshop was to promote technical cooperation within the Caribbean Community (CARICOM) in relation to conservation and the sustainable use of the oceans, seas and marine resources.

Representing Belize were three members of the technical staff from Belize CZMAI, namely Mr. Gilbert Andrews, Environmental Lab Technician; Mr. Samir Rosado, Coastal Planner; and Mr. Victor Sho, Sportfishing Programme Coordinator. The workshop was composed of both theoretical and practical sessions to assist in identifying the main sources of marine pollution in each participating country. A secondary objective of the workshop was to develop a concept note for an environmental management instrument intended to improve the knowledge of the general public on the marine environmental conditions of the participating countries, as a result CZMAI developed a concept for a pilot project to assist in establishing baseline data on marine litter in Belize. In December 2017, the CZMAI team implemented the Pilot Project entitled, “Concentration of Marine litter along the Coast of Belize City, Belize.”



The pilot study was carried out over a two (2) week period at two locations (coastal mainland & island). Samples were collected using 1m2 and 50cm2 quadrants to determine the density of Macro and Micro litter respectively. The methodology was the one introduced during the workshop which can be found in the “Litter Sampling in the Environment: Field Guides for Citizen Scientists.” For both, the methodology involved quantifying the amount of litter within the quadrants along a transect within a sample site, the average of which will give the amount of litter per m2/cm2. Both locations had relatively low density of both macro and micro marine litter. However; the coastal location had a higher density of both macro and micro marine litter in comparison to the island location.



The factors that may have influence the difference in densities between both locations are; differences in human traffic, ocean current, accretion vs. erosion zones, wave movement and anthropogenic activities. The results of the pilot project was shared in Phase II of the Major Aspects of Coastal Environmental Management workshop which took place in early 2018 in Santiago, Chile.

During phase II, participants developed an implementable education campaign for their home countries. This was big for Belize because at the time very little education and outreach campaigns were done in Belize to educate primary and secondary school students on the effects of marine litter and plastic pollution in our waters. The CZMAI team decided that a national campaign geared towards these students would be the best target audience to begin with, taking into account financial and human resources. The team put pen to paper and fleshed out the idea into a concept note titled Belize's National Marine Litter Campaign. The goals of the national marine litter campaign were as follows:

1. Increase the awareness of the global marine litter issue in primary and secondary schools across Belize's coast.
2. Increase the capacity of secondary school students to perform macro-litter sampling.
3. Spread awareness about world ocean's day Action focus for 2018: Preventing plastic pollution and encouraging solutions for a healthy ocean #KeepOceansBlue

The campaign was added to CZMAI 20th Anniversary calendar of activities and scheduled to be implemented within the months of May and June 2018. CZMAI then reached out to Oceana and WWF as potential partners for the campaign. The both organizations agreed to collaborate with us to implement the campaign. A total of 14 schools (10 Primary, 4 Secondary) were visited within 9 of Belize's coastal communities.

Coastal Communities and Schools Visited during Belize's Marine Litter Campaign

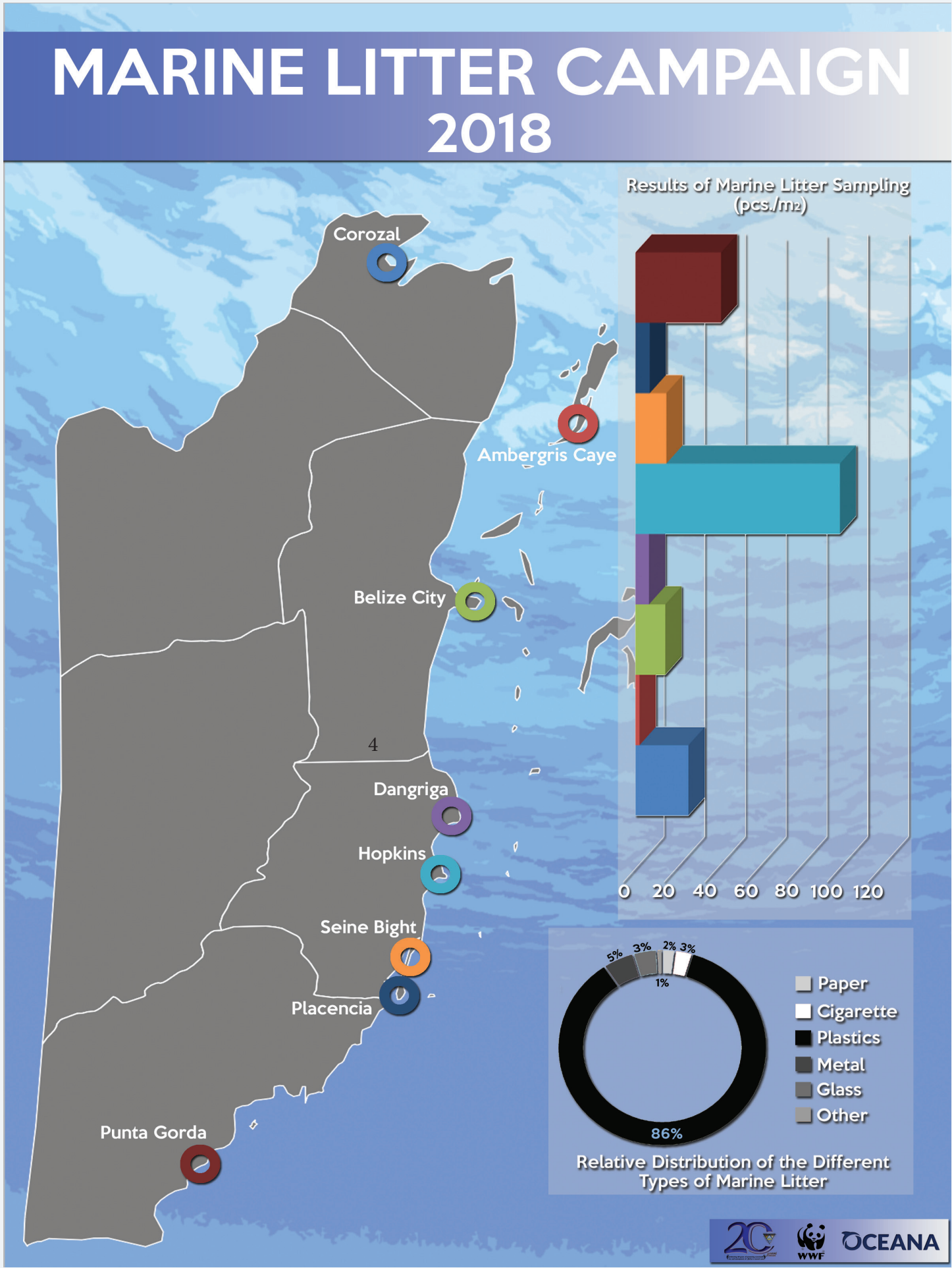
Coastal Community	School
Corozal	St. Paul's Primary School Corozal Community College Escuela Secundaria Tecnica Mexico
Sarteneja	Sarteneja Roman Catholic Primary School Sarteneja Baptist High School
San Pedro	La Isla Bonita Elementary School San Pedro High School
Belize City	St. John's Anglican Primary School St. John's Vienne Primary School
Dangriga	Solid Rock Christian Academy
Hopkins	Holy Family RC School
Seine Bight	St. Adolphus Primary School
Placencia	St. Johns Memorial Primary School
Punta Gorda	St. Peter Claver RC School



CZMAI and Oceana both gave presentations during school visits. Oceana's presentation touched on general information about plastics and how Oceana works with communities to solve the problems and gave information about ongoing campaigns. CZMAI's presentation focused on how important it is not to litter and the ways marine litter can slowly become a part of our food chain. It also touched on what marine litter is, the effects on the environment, the biggest contributors, where plastics end up, and what they can do to help.

After classroom presentations CZMAI and Oceana representatives also collected macro litter samples from beaches. This data will be used to infer the average density of marine debris along Belizean beaches, help identify hotspots where the litter density is highest and also highlight the need to make a cultural shift in Belize as it relates to our use of single-use plastics. The data will also be shared with DIRECTEMAR in Chile who are developing a marine litter database; thus, filling data gaps for Belize. Figure 1 shows the results of the marine litter campaign.

In Belize we need to cherish our country more to reduce plastic can be control. Plastic pollution may gradually become less of a problem if waste is considered a valuable resource for recycling, reuse or energy-generation, and if people should take more responsibility for the waste they generate. It also requires political commitment and investment and an integrated approach from all of us.



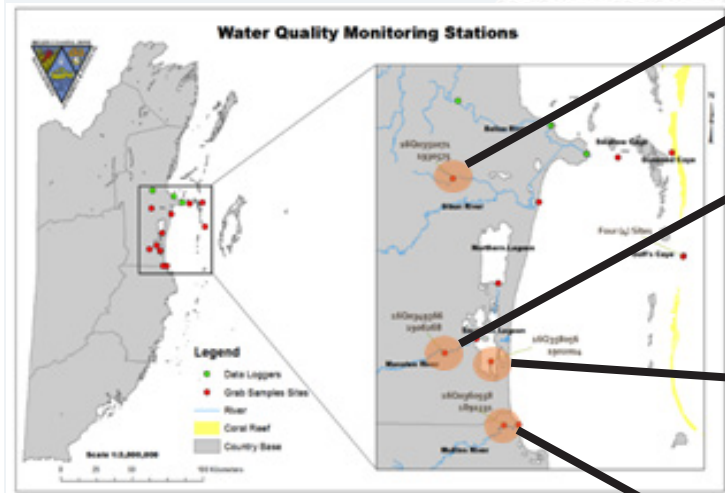
Update: Pilot Belize River Study

The data collected from Pilot Belize River Watershed study was sent to our partners at the National Oceanography Center in Southampton, UK. The data that was collected will be used to calibrate remote sensors that will be created for use in the Belize River. This is part of a project to be conducted in partnership with the NOC over the next two years. The purpose of the project is to examine the extent to which sediment transported from the Belize River in to the coastal environment. From the data collected from the Pilot study we see that there was no significant nutrient loading occurring in the water itself. Therefore, it was hypothesized that excess nutrients must either be absorbed by riverine mangroves or is present in the sediment. Therefore, this collaboration would allow us to build upon data collected during the pilot.

CZMAI will redeploy the EXO II Sondes in another watershed that will be identified following the establishment of sediment sampling protocols to be utilized during the CZMAI/NOC collaboration.

Update: Central Coastal Region Sampling

The CZMAI WQM Unit conducted monthly water quality sampling trips in the Central Coastal Region from January to June 2018. The averages from our sample sites are as follows:



Hector Creek:
Nitrite: 0.32 mg/L (Norm: 1mg/L, Excess: 10mg/L)
Nitrate: 0.49mg/L (Norm: 1 mg/L, Excess: 10mg/L)
Phosphorous: 0.031mg/L (Norm: 0.05mg/L, Excess: 1mg/L)
Fecal Coliforms: 101 col./L (Excess: Above 200 col./L)

Manatee River:
Nitrite: 0.18 mg/L (Norm: 1mg/L, Excess: 10mg/L)
Nitrate: 0.27mg/L (Norm: 1 mg/L, Excess: 10mg/L)
Phosphorous: 0.011mg/L (Norm: 0.05mg/L, Excess: 1mg/L)
Fecal Coliforms: 47 col./L (Excess: Above 200 col./L)

Gales Point:
Nitrite: 0.23 mg/L (Norm: 1mg/L, Excess: 10mg/L)
Nitrate: 0.31mg/L (Norm: 1 mg/L, Excess: 10mg/L)
Phosphorous: 0.019mg/L (Norm: 0.05mg/L, Excess: 1mg/L)
Fecal Coliforms: 61 col./L (Excess: Above 200 col./L)

Manatee River:
Nitrite: 0.18 mg/L (Norm: 1mg/L, Excess: 10mg/L)
Nitrate: 0.27mg/L (Norm: 1 mg/L, Excess: 10mg/L)
Phosphorous: 0.011mg/L (Norm: 0.05mg/L, Excess: 1mg/L)
Fecal Coliforms: 47 col./L (Excess: Above 200 col./L)

For the first half of the year (Jan-June) the averages of the parameters being measured are within the range for normal aquatic ecosystems. It was observed that sample sites near populated areas showed slightly higher averages, however none of them were over the threshold that would trigger eutrophication/algal bloom events.

Update: Central Reef Region:

The CPMU conducted intermittent sample trips to the Central Reef region during the period of January to July. This was mainly due to problems with the vessel engines. During this time period two high pressure pumps as well as one low pressure pump had to be replaced. This problem was caused by the low-quality fuel available in Belize. Additionally, the tilt/trim switch had to be replaced for the engine as it had an electrical short and the fuel gauge was disconnected because, due to electrical fault, it was constantly draining the batteries. As a result of vessel problems, the data collected is not sufficient for reporting.

Update: Coastal Advisory Committee Meetings

During the period, January to June, the Coastal Planning Unit held meetings with Village Council representatives from 4 villages in southern Belize, Placencia, Independence, Seine Bight and Hopkins. The purpose of these meetings was to discuss the Community Warden's Program and to receive feedback from the stake holders. Overwhelmingly, all the village council representatives were in favor of the program and committed themselves and their council to participate. They saw it as an opportunity for the villagers to have greater oversight on coastal resource use and as well for them to "keep an eye out" in their community.



Meeting with stakeholders in Placencia



Meeting with Independence Village Chairman

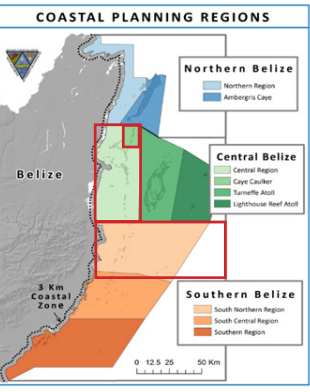


Meeting with Hopkins Village Chairman and councilor



Meeting with Seine Bight Village councilor

During the start of this year, the Coastal and Marine Data Centre determined that it would be best to reevaluate and restructure the scope of the areas that was initially planned to be completed under the MCCAP project. Initially, it was anticipated that during year one & two of the MCCAP project, CMDC was to focus their efforts on three (3) of the nine (9) Planning Regions: Ambergris Caye, Belize Central Region & Caye Caulker. However, due to time constraints, lack of human and material resources as well as financial constraints of the entire scope of the project, the planning regions proposed to be completed have not being met. Therefore, during year three, four and five of the MCCAP, the CMDC intends to complete the following regions: Caye Caulker Region, Belize Central Region, and South North-ern Region.

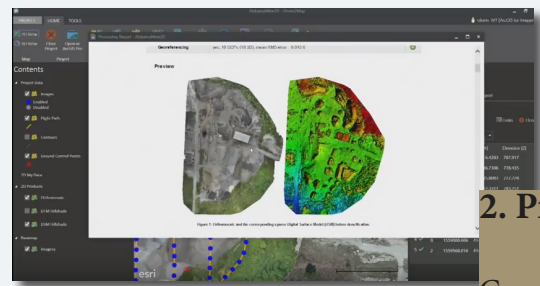


The CMDC has identified that the inventory platform to be used for developing the baseline database would be a Geospatial database. This will allow a more organized structure to store spatial information in one large file. It can store multiple point, polygon, polyline layers that are spatially referenced along with its attributes that can easily facilitate monitoring and evaluation of the guidelines.

Methodology:



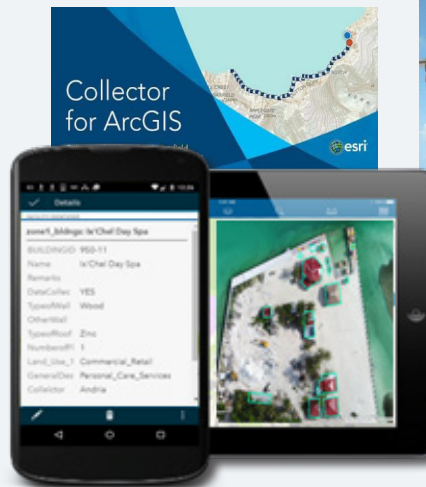
1. Acquire aerial imagery using drone technology
Conduct drone mapping to capture the most recent high resolution, aerial imagery for the area of interest



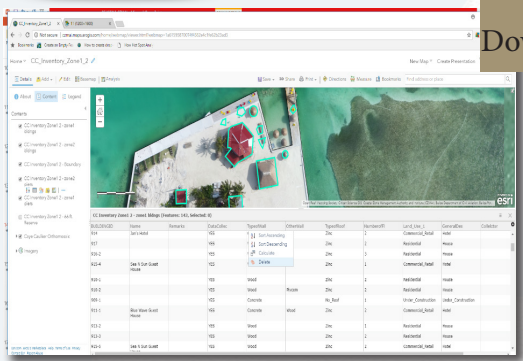
2. Process imagery using Drone 2 Map for ArcGIS Desktop Application
Convert the raw, still images into orthorectified mosaics



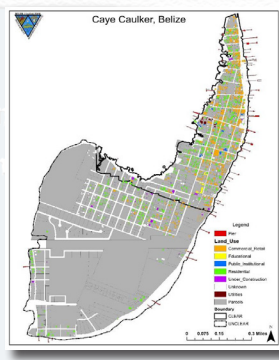
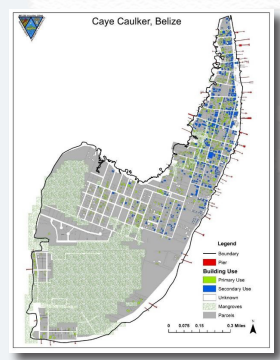
3. Create Geodatabase and Shapefiles for Land Use Inventory using ArcGIS Desktop
Digitize features such as buildings, fences, piers, mangroves, forest cover etc.



4. Conduct Ground-truthing Exercise to populate the inventory database
Use Collector for ArcGIS and ArcGIS Online to collect data for features eg. BUILDINGS: Land Use (Commercial, Residential), Number of Floors, Type of Wall, Type of Roof, etc.



5. Conduct Data Validation and Data Processing
Download ground-truthed data and validate to make meaningful use.



6. Use inventory to monitor the adherence to the ICZMP
Review guidelines for each region and conduct analysis and evaluations of the changes that occurred overtime and compare

During the last, June, 2018 Caye Caulker mission the missing building data (270 buildings) were collected. The region which includes, Caye Caulker, Caye Chapel, Bajo Caye (NE of Caye Caulker) and Caye Lagos (S of Caye Chapel) was completed. As a result, data for 1,654 buildings and 117 piers within the region were compiled and boundaries for each caye were created. Data for missing parcels were collected by five team members within three days using the ArcCollector app Methodology. This data has been cleaned and standardized and has been uploaded on an Arc Online (AGOL) platform which can easily be shared with relevant stakeholders.

Furthermore, after the inventory was completed, the Data Centre held a presentation of Caye Caulker baseline inventory on Wednesday, June 27th, 2018 at the Coastal zone training Room. This presentation was conducted in order to relevant stakeholders together to discuss future collaboration and to display our results and methodology. used thus far.



CZMAI'S Participation in the Commonwealth Marine Science Event in the United Kingdom (UK)

By: Arlene Young, Director

On April 9-10, 2018, CZMAI's Director participated in the Commonwealth Marine Science Event at the National Oceanography Centre (NOC) in Southampton, UK which was a celebration of marine science across the Commonwealth attended by High Commissioners from across the Commonwealth leading up to the Commonwealth Heads of Government Meeting, where member states gathered in London to agree on further global measures to protect our oceans.

On show with participation from a wide section of the UK marine science community was a wide range of displays ranging from litter and plastics, sustained ocean observations, ocean acidification, corals, coastal resilience, the Seaweed Star project focused on safeguarding the seaweed aquaculture, women in science, and the UN Decade of Ocean Science for Sustainable Development 2021-2030. Also, on show involving NOC, was the Commonwealth Marine Economies Programme (CME), a collaborative project between the National Oceanography Centre (NOC), Centre for Environment, Fisheries and Aquaculture Science (CEFAS) and UK Hydrographic Office (UKHO), which aims to help the most vulnerable Small Island Developing States (SIDS) make the most of their natural maritime advantages, to enable sustainable economic growth and alleviate poverty.

The objective of CZMAI's participation was to highlight the ongoing collaboration between various agencies in the UK including the NOC, Cefas and UKHO. Belize's participation in the event also demonstrated how UK Commonwealth Science is helping to strengthen research and monitoring in the Caribbean. Participation in the event also served to bolster the strong levels of cooperation and the effectiveness of our work together in an effort to support future funding to Belize through the Caribbean Marine Economies Programme.



Another important objective of the visit to the NOC was to meet with CME Programme lead and NOC Scientists working in key areas such as ocean biochemistry, ocean acidification, modelling and developing new technologies in order to better define the activities and timeline for the project "Informing integrated coastal zone management in Belize to build resilience and sustainable blue economy, public health and livelihoods." The two-year project is centered around the impacts of land use changes on coastal and marine ecosystems building on the Belize River Pilot Watershed study conducted by CZMAI. Furthermore, the study will feature a terrestrial component (focusing on key catchments along the Belize River watershed) and a marine component.

Overall, the visit was very productive and fostered knowledge sharing that can be used in the Belizean context as well as strengthened ongoing partnerships through support and continued collaboration.



Internship experience at the CZMAI

by Chelsea Frutos, Intern



My name is Chelsea Frutos and I am 18 years old. I am from San Ignacio, Cayo. I am about to graduate from Saint John's College Junior College in June, 2018 with an Associate Degree in Environmental Science. As a part of my studies, I had the privilege of interning at The Coastal Zone Management Authority and Institute (CZMAI) for eight weeks during my last semester.

Before I started this internship, I was very nervous because I had never interned before. However, that nervousness quickly went away on the day I started and that is because of how friendly the staff at CZMAI was. They truly made me feel welcomed. During my time at CZMAI I was exposed to Sport Fishing, Water Quality Monitoring, Coastal Planning and to all the processes that occur at the Coastal and Marine Data Center. So, I can definitely say that I got a taste of everything while at CZMAI!

This internship has not only affected me academically and professionally, but also personally. For example, it has definitely reassured me of what I want to do in the future; which is to have a career in the environmental field. Secondly, from this internship I have gained better communication skills and I also feel much more confident in my work. From my eight weeks at CZMAI, the part that was the most significant for me was definitely working in the data center with the GIS Technician, Ms. Andria Rosado, and the Data Manager, Ms. Jessamyn Ramos. I was able to make very good relationships with the both of them and I was introduced to Geographic Information Systems (GIS) which I have grown to love!

This internship was such a great experience and I am so grateful for all the new information I attained, the new skills I practiced and the new people I met. At CZMAI I felt like I was a part of something great and for someone like me who is just about to get their degree, that is the best feeling! I'm never going to forget this internship experience and I'd just like to say thank you to everyone at CZMAI. You all made my internship something special and unforgettable!



The Management & Staff of the Coastal Zone Management Authority & Institute would like to congratulate Miss Frutos on her accomplishment and wish her all the best in her future endeavours.

MISSION STATEMENT:

Our Mission is to lead the sustainable use and planned development of Belize's coastal resources through increased knowledge and the building of alliances for the benefit of all Belizeans and the global community.



Chantalle Samuels
Arlene Young

Chief Executive Officer
Director

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Whitney Requena
Kachiri Flores
Hazel Oshon
Jason Ferguson
Kashiff Stevens
David Sedasey

Administrative Officer
Accounts Clerk
Administrative Clerk
Janitress
Ranger/Boat Captain
Assistant Boat Captain
Driver

MARKETING

Chad Bowman
Ariese Briceno

Marketing Officer
Sales & Marketing Assistant

SPORTFISHING

Victor Shon *celebrating 20 years of promoting the sustainable use and management of Belize's coastal resources* Sportfishing Coordinator

GIS DATA MANAGEMENT

Andria Rosado

GIS Technician

COASTAL PLANNING

Samir Rosado
Gilbert Andrews
Ellis Requena

Coastal Planner
Water Quality Analyst
Boat Captain/WQ Assistant



Coastal Zone Management
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