

# MAN LAND & SEA

*a publication by Guam Coastal Management Program*



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## **ANGEL HAIR ALGA ON THE RISE**

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← *Angel hair algae abundance  
at the Merizo Pier on August 1,  
2015. Photo by Edwin Reyes.*

## MAN, LAND and SEA NEWSLETTER

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**H**afa Adai! Improving the quality of living through environmental protection, advocacy, and stewardship is a goal for many states and especially islands like ours. The protection of Guam's natural resources – our lands, rivers, streams, and coral reefs – is essential for healthy marine and terrestrial ecosystems. In this issue, we feature

# Message from the Director

environmental and educational information ranging from simple everyday tips for a healthy watershed to understanding invasive plants that have become a nuisance to our natural resources.

The community also plays a vital role in the protection of Guam's natural resources and without groups such as the Humatak Community Foundation, the Guam Nature Alliance, and civic organizations actively participating in

these efforts, our work as government officials positioned in resource management would be difficult.

Also featured are new employees who will be working with the community in managing Guam's natural resources.

Kudos to all environmental stewards who are making a difference for a green Guam and we hope you enjoy this issue.

Si Yu'us Ma'ase,  
**WILLIAM M. CASTRO**

## BSP welcomes new director and deputy director

William "Wil" Castro is the Director for the Bureau of Statistics and Plans and serves on Governor Calvo's Senior Staff as Special Assistant for Research, Planning and Technology. He currently leads the administration's efforts on developing mobile apps to improve customer service. The Bureau is poised to explore and pursue the establishment of a Guam Research & Planning Data Center.



**William Castro**

Wil served in both the public and private sectors. His experiences include having served as the acting Chief Technology Officer for GovGuam; Director, Chief Planner, and educator in a K-12 environment; Director of Institutional Effectiveness and Special Assistant to the President and Chairman in a college setting; senior policy analyst at the Guam Legislature and as General Manager and Webmaster for an e-commerce company. Wil attained doctoral candidacy status at Columbia University and holds a Master's Degree from Harvard University with additional graduate credits from the Massachusetts Institute of Technology.

Wil volunteers over 200 hours a year in combined volunteer service to Guam as a 4th degree Member of the Knights of Columbus (Santa Teresita Council-13373), as Public Affairs Officer and Co-Chairman for the Centennial Committee with the

Young Men's League of Guam, and most recently as volunteer I.T. coordinator for the Rigalu Foundation's 2015 'Gift of Love' Telethon.

Wil is engaged to Dr. Debra T. Cabrera, Faculty & Department Chair for Social Sciences at St. John's School and adjunct Faculty at the University of Guam. Together, Wil and Debra raise four children, Ashley (19), Cameren (17), Liam (10), and Mariana Jesusa (5).



**James Thomas McDonald**

James Thomas McDonald is the new Deputy Director for the Bureau of Statistics and Plans bringing about 34 years of public service to the agency. He currently chairs the Guam Crime Stoppers Program and has served as director for Guam Customs and Quarantine Agency.

James has an Associate of Arts Degree in Criminal Justice and Law Enforcement Administration. He began his career in public service in the late 70's working for Senator Edward Ramirez Duenas and the late Senator Edward McDonald Calvo for two years. He was a staff assistant, handling concerns about the youth and senior citizens and at the same time he attended the University of Guam studying Criminal Justice and Public Administration. He later became a police officer completing the Guam Police Academy's 21st Police

Cycle. James later transferred to the Guam Customs and Quarantine Agency where he worked for 21 years and worked his way up from the rank of Lieutenant to the rank of Major. He spearheaded the separation of Customs and Quarantine from Department of Commerce with the assistance of the late Senator Ben Pangelinan and Speaker Joe T. San Agustin. In 2001, James was appointed by then Governor Carl T.C. Gutierrez to serve as Director of Guam Customs and Quarantine and later retired in September 2003.

James has an extensive knowledge in homeland security. In January 2013, he attended the Naval Postgraduate School Center for Homeland Defense and Security in Hilo Hawaii as well as the United States Department of Defense (DOD) exercises in the Pacific Area Command Headquarters (PACOM) in Honolulu Hawaii. In 2011, he was appointed by Governor Eddie Baza Calvo to serve as the Guam Homeland Security Advisor. James was also appointed to be the Mariana Regional Fusion Center Director. James was instrumental in making sure that our All Hazard Warning System (siren) be a priority for all hazards and threats. In late January 2013, the MRFC received recognition from the US Department of Homeland Security as the 78th Fusion Center of the United States. James also attended New Mexico Tech Executive Managers Training in Socorro New Mexico for Incident Response to Terrorist Bombing and Suicide Bombing. →

# New faces in the BSP Family

The Bureau of Statistics and Plans is delighted to welcome five new employees to the team! Tina Mafnas, Christian Paul Benitez, Esther Marie Camacho, Anna Simeon, and Andrea Hersberger.



**T**ina E. Mafnas graduated from the University of Guam with a bachelor of science in Public Administration in 1998. She was previously the Program Manager at the Guam Energy Office. Since Tina started with GEO in 2009, she started up and managed the Weatherization Assistance Program for Low-income Persons that serviced close to 1,000 clients which continues to provide energy measures for homes. Through her years with GEO, she acquired a background on grants and project management and learned an extensive amount on energy savings and energy conservation. Tina is excited to join BSP in her new capacity as a Planner III and she will be one of the representatives for BSP in the Application Review Committee (ARC) for all land use development and seashore clearance applications. Tina has been a long time resident of Talofofo and her favorite pastime is spending time with her family and baking.

Joining the Socio-Economic Planning Program is Christian

Paul Benitez as a Planner I. He is a recent graduate from the University of Guam with a degree in Business Administration with a concentration in Entrepreneurship. Christian is learning the ropes under Planning Supervisor Lola Leon Guerrero and Senior Planner Millie Erguiza. "I am still learning a lot about my role here as a planner, but I'm grateful to have a job that broadens my perspective of the state of our island and to learn about how our community comes together to achieve our goals." Outside of work, Christian enjoys going to the beach to snorkel or skim board, skateboarding at the skate park, and cleaning or cruising in his Nissan 370z.



**E**sther Marie Masga Camacho is a 2012 graduate from the University of Guam with a bachelor's degree in Business Administration with a Concentration in Finance & Economics. She currently holds a position as a Planner I at Bureau of Statistics & Plans with Planning Information Program. She is tasked to assist with the annual Guam Statistical Yearbook, Guam's Facts & Figures, Quarterly Planners Bookshelf and reporting for the Impact of the Compacts of Free Association on Guam under the supervision of Monica Guerrero. She is a member of the Non-



Communicable Diseases Control Program of the Action Surveillance Team. She hopes to help strengthen the data collection and assist in monitoring the community's health improvement in Guam. During her leisure time, she enjoys a day at the beach spending quality time with her three children. She is an enthusiastic paddler in the Achagigu team under the Outrigger Guam Canoe Club.

**A**нна Simeon graduated from the University of California, San Diego in 2009 with a degree in Environmental Systems focusing on ecology, behavior, and evolution. After earning her degree, she worked as a research assistant on the Caribbean island of Curaçao studying the effects of contaminated groundwater runoff on reef communities before moving to Guam in 2011. Anna is currently pursuing her MS in biology from the University of Guam's Marine Lab, which she will finish this semester. Her work there took her throughout Micronesia to study and document the region's marine plants, the results of which helped inform the recently-published Micronesian Biosecurity Plan about Guam's risk of marine invasive species. As a biologist, Anna brings a wealth of diverse experience to BSP's Watershed Coordinator position. She is excited to help manage Guam's watersheds and resources through restoration efforts and public outreach. In her



free time Anna is an avid outdoorswoman spending countless days paddling, diving, hiking, and sailing. She also performs frequently in theatrical and musical productions around the island.

**A**ndrea J. Hersberger moved to Guam in 2007, where she worked as an Aquarist at UnderWater World. Taking care of the fish and animals in the aquarium enhanced her passion and love for the oceans and all marine life. In 2011 she began studying at the University of Guam towards a Masters Degree in Biology from the Marine Lab, focusing on fisheries management. Her desire to protect and preserve marine life, as well as her love for Guam's reefs and marine life, grew much stronger. As the new Reef Resilience Coordinator, she will be leading the development of Guam's Reef Resilience strategy to address impacts from coral bleaching, coral disease, ship groundings and other threats to Guam's reefs. She will be coordinating the Response Team to address these types of disturbances. She will also be conducting education and outreach related to reef resilience.



Andrea loves outdoor activities – both in and out of the water – she is an avid scuba diver and a member of the Guam Women's Beach Volleyball National Team. She is also a yoga instructor, and has been teaching yoga at Synergy Studio Guam since 2008. ▲

*(Deputy director continued)*

James is currently serving as a member of the Maritime Domain Awareness Taskforce, the Area Maritime Executive Committee, Joint Terrorism Task Force, Emergency Medical Services Commission, the

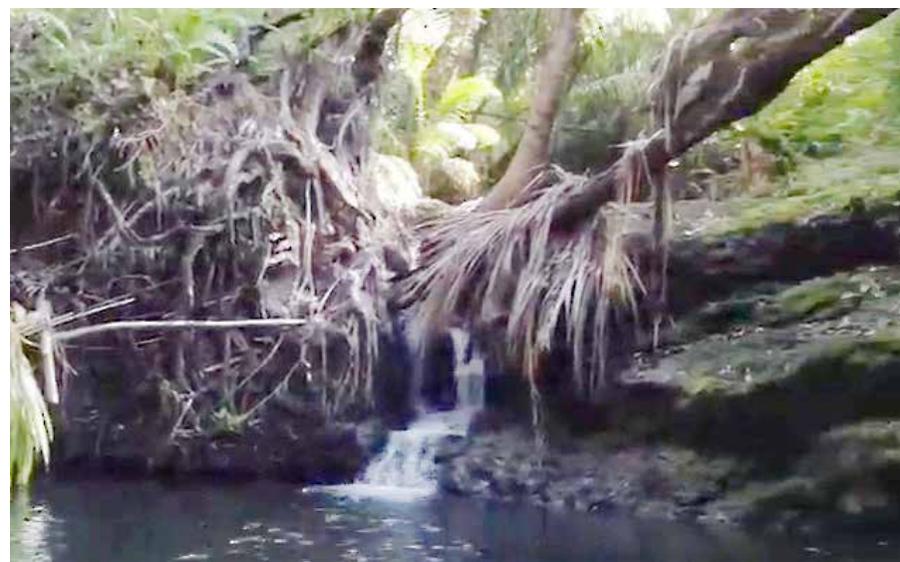
Oceania Regional Response team, Task Force and Mass Care and Emergency Assistance, and Peace Officers Security Training (POST) Commission. He is also serving as the Vice Chair for the Port Readiness Committee, a member for the Invasive Species Council and an active member of

Guam's Catholic Parish.

James is married to Mrs. Sallie Lorraine Toves McDonald and they have two lovely children, Mia-Ashlee Elizabeth Toves McDonald who is attending Our Lady of the Lake in San Antonio Texas on her last semester, Majoring in Criminal Justice. Michael

James Charles Toves McDonald is a freshmen attending George Washington High School and is a member of the ROTC armed drill team and the US Naval Sea Cadet Program. James' brother, Paul McDonald is the current mayor of the beautiful village of Agaña Heights. ▲

# Toguan Watershed: The Bridge to Preservation



**We all live in a watershed! Watersheds come in all shapes and sizes and even cross villages or state boundaries. Watersheds have natural borders separated by their high points of their upper boundaries.**

Unfortunately, activities such as fires, deforestation, agriculture, development, natural disasters, and invasive species have altered the natural flow of watersheds, putting natural resources at risk. By preserving and maintaining healthy

watersheds, we can protect the health of our island and its people.

Bridging conservation efforts along the southern villages will help restore landscape connectivity and natural flow that is essential in maintaining healthy environments. The Toguan watershed makes a unique conservation bridge to tie-in ongoing studies and work conducted in its two neighboring watersheds.

The Toguan watershed is located within the Southern villages of Umatac and Merizo and is between the Umatac and Geus watersheds. Landmark demarcations

begin at Mamatgun Point and go through Jesus Quinata Court and Jesus Quidachay Street in Umatac and go up into the hills at the edge of Mt.Schroeder and wraps down pass Dometro Meno Street and ends at the Merizo Catholic Cemetery. The Toguan watershed is 903 acres with the highest elevation at about 1043 feet (318 meters) in the eastern boundary of the watershed at the edge of Mt.Schroeder. The total perimeter is 4.1 miles. The watershed is →

*One of many mini-falls in the Toguan River is shown above.*

## 10 Tips for a Healthy Watershed and Healthy Environment

**STOP FIRES.** Forest fires greatly deteriorate watershed quality by contributing to loss of vegetation (especially native species), flooding, erosion, destruction to coral reefs, and threaten fish stocks.

**PLANT NATIVE TREES.** A healthy forest canopy can reduce storm water runoff by as much as 7% in a neighborhood, according to American Forests (1999).

**START COMPOSTING.** Yard, recyclables, or food waste composting is a green alternative to burning at

home. Composting offers economic benefits to homeowners by enriching poor soils and reducing the need for water, fertilizers, and pesticides for home landscaping.

Composting can also aid as erosion deterrent and can prevent pollution in stormwater runoff. Be sure to cover your compost with the UOG approved Rhino Beetle net to trap and stop the spread of this invasive species.

**LANDSCAPE WITH NATIVE PLANTS.** Landscaping is not only attractive for your home and helps increase the value of your property, it also absorbs heat and helps reduce pollution of groundwater. Natural landscaping creates a natural seed bank of native plant species in watersheds; and can prevent the spread of invasive non-native plant species.

**REDUCE, REUSE, RECYCLE.** The less you consume or purchase the less waste you create. If you must buy an item reuse the item as much as possible. Recycle, please visit Guam Environmental Protection Agency's website at <http://epa.guam.gov/activities/recycling-guide> to see the most recent recycle guide. →



*Volunteers spend their Saturday picking up trash and marine debris along the coast and roads of Umatac*

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## Tips for a Healthy Watershed



**POLLUTION PREVENTION.** Preventing pollution in our communities is much easier and cost effective than cleaning it up. Never put grease, fats, or oils (FOG) down the drain. However, as trash is prevalent on island, cleanups are necessary and rewarding for both the participant and our island. Participating in community cleanup events can provide an easy way to get involved.

**MAINTAIN SEPTIC SYSTEMS.** For homes that rely on septic systems for sewage disposal: Regularly inspect and maintain septic systems, make repairs as needed, and prevent disposal of household chemicals through the leach field. The accepted practice is to inspect the tank and leach field once every two years to make sure it is working properly, and to pump out the tank.

**REDUCE FERTILIZER AND PESTICIDE USE.** Practice natural lawn care by using low inputs or slow release fertilizers and safer chemical pesticides. Use proper timing and targeted application methods.

**DO NOT RELEASE PETS INTO THE WILD.** Guam has a high number of feral animals such as dogs, cats, pigs, and deer which have caused native flora and fauna loss and has contributed to the extinction of some species.

**BUILD IN ACCORDANCE WITH LOCAL ORDINANCES.** To help maintain water quality, follow local building codes from Guam's permitting agencies, ensure the development is inline with the guidance from the North and Central Land use Plan, and follow GCMP's storm water design specifications for new projects. ▲

Above: Twenty-five volunteers participated in keeping their watershed beautiful. The Toguan Watershed Cleanup was conducted on Saturday, February 7th in coordination with the Bureau of Statistics and Plans and the Humatak Community Foundation (HCF). The HCF is an outstanding community partner and leader in the village of Umatac, educating young children to young adults about their heritage and guiding them to be a proactive member in the community. Volunteers also participated in data collection on the types of trash collected at the cleanup. Beverage cans were the majority of trash collected followed by plastic bags, and cigarette butts. This data is comparable to the trash collected during in the annual International Coastal Cleanup.

### TOGUAN CLEANUP TOP THREE COLLECTED TRASH

Item	Total	Total Percentage
<b>Beverage Cans</b>	184	27.75%
<b>Plastic Bags</b>	109	16.44%
<b>Cigarette Butts</b>	78	11.76%
	<b>371</b>	<b>55.95%</b>



comprised of diverse vegetation such as badlands, savanna, scrub forest, ravine forest, and so forth. There are three main rivers: Toguan, Bile, and Pigua.

Traditional activities still occur such as fishing in the Toguan and Bile Bays, shrimping in the rivers, and hunting for deer and pigs. Additionally, recreational activities are prevalent such as diving, swimming, and hiking. A popular hike is to Priest Pools which is in Merizo and a part of the Pigua River. Priest Pools are naturally formed basalt lava-rock formations with several pockets that are filled by freshwater creating several pools.

Toguan watershed is home to native animals such as the Endangered Mariana Common Moorhen (*Gallinula chloropus gaumi*) which are known to use the wetland and river habitats in the Toguan River and bay area. Endangered hawksbill sea turtle (*Eretmochelys imbricate*) and threatened green sea turtle (*Chelonia mydas*) have been documented to use the beaches north of Umatac, and both sea turtles may nest or forage in the Toguan Bay and Bile Bay area as well. Other large sea creatures documented on both bays are: Sharks, Dolphins, Manta Rays, and Whales.

Toguan similar to the rest of the watersheds on the island face issues of concern such as invasive species, pollution and degrading natural resources. Toguan is just one of the many watersheds that are in the process of revitalizing the health of our island through the ridge to reef approach study and application.

GCMP's work in Toguan will be summarized in a watershed characterization study expected to be completed in April 2015 and will be shared with the mayors of Merizo and Umatac, natural resources partners, and the community. ▲

Over the last three years extensive outbreaks of angel hair algae have affected large stretches of Guam's southeastern shores as evidenced by dense algal strands smothering reef flats and piles of dislodged beach-cast algae.

These green algal blooms have altered the biological composition of reef flats, clog up fishing nets and affect recreational beach use. The spatial extent of these blooms along Guam's shoreline has expanded from a localized event in Pago Bay in 2012 to a phenomenon that now impacts about one-fourth of the island's coastline. The bloom, however, has not ceased to spread and recently the alga has intruded Guam's western shores. In addition to its increasing spatial footprint, the growth season of the angel hair alga has been extended and it now occurs year-round in Guam's nearshore waters. Although natural bloom and bust events are common in the marine environment (e.g., seasonal or interannual variation in population density, sometimes in response to major disturbance events like typhoons and volcanic eruptions), the observed trend of an increased and more persistent algal cover for three successive years is very unusual and causes concern among resource users, reef managers and scientists.

#### Which Hairdo?

Given the prominent presence of these bright green tides for the past three years, it is remarkable that the angel hair alga went practically unnoticed for decades. Fishermen claim that before 2012 they had never seen this alga for at least three generations. Such anecdotes are consistent with the available scientific observations. Monitoring surveys, impact assessments and taxonomic collections are void of



Thick piles of dislodged angel hair algae lining the eastern shores of Cocos Island (June 4, 2014). Photo courtesy of Tom Schils.

## Restyling Guam's Reef Flats: Angel Hair Alga on the Rise

By Tom Schils

Marine Laboratory and Sea Grant Program, University of Guam

records of the angel hair alga. The only available archived records of a similar looking alga from Guam date back to the early summer of 1968, when several specimens of the angel hair alga from different collectors were deposited in the University of Guam Herbarium.

On one of these herbarium sheets, Dr. Roy Tsuda – the then resident marine botanist in Guam – noted that the angel hair alga was abundant in a single locality. When inquired about this collection, Dr. Tsuda vividly recalled discovering these specimens as they represented the largest and longest angel

hair algae he had ever encountered. The only algal stand observed in 1968 measured about nine square meters, which is an order of magnitude less than the acres of reef flat habitat the angel hair alga covered during the peak of its growth season in 2014.

Other sightings of angel hair algae were reported during a Marine Botany field trip in 2005 but the general habit and cell size measurements differ from the alga that currently proliferates on Guam's reef flats. Thus, historical records suggest that an angel hair alga look-alike previously occurred in Guam

but at much lower population densities than those currently witnessed. The attentive reader will have noticed that in the above section, the bloom-forming alga was only identified by its colloquial name and that an accurate and unique scientific species name is not provided. Analogous to the rapid turnover of pop divas and their coiffure in the music scene, the scientific naming of algae is currently in a state of flux as the biological (genetic) diversity exceeds the amount of available (described) species names.

This is particularly relevant for the angel hair alga, a member of →

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the green algal genus *Chaetomorpha*, which exhibits few morphological features (i.e., characters that describe the shape, form or structure of an organism) to adequately identify all its species.

Until recently, many *Chaetomorpha* species from the tropical Indo-Pacific were identified to be species described from temperate Europe. Genetic studies have since demonstrated that angel hair algae from the Indo-Pacific are composed of a number of species, all distinctly different from their Atlantic counterparts.

To better understand the sudden green algal blooms in Guam it is imperative to obtain an accurate species identification of the angel hair alga that causes these blooms and to compare its genetic code with those of past collections from Guam and other Micronesian islands.

If genetically different from the pre-2012 collections, the blooms could represent a recently introduced alga that is colonizing newly available habitats. The tropical Pacific is replete with textbook examples of similar algal invasions. For example, the red alga *Acanthophora spicifera* arrived in Pearl Harbor in the early 1950's as a stow-away on a heavily fouled barge originating from Guam. Now, *Acanthophora spicifera* has become the most abundant alien alga in the Hawaiian Islands displacing native algae.

If the bloom-forming *Chaetomorpha* is invasive to Guam, comparative genetic analysis with samples from throughout the Indo-Pacific could provide a clue on the alga's geographic origin. Conversely, if the bloom-forming *Chaetomorpha* is a Micronesian native

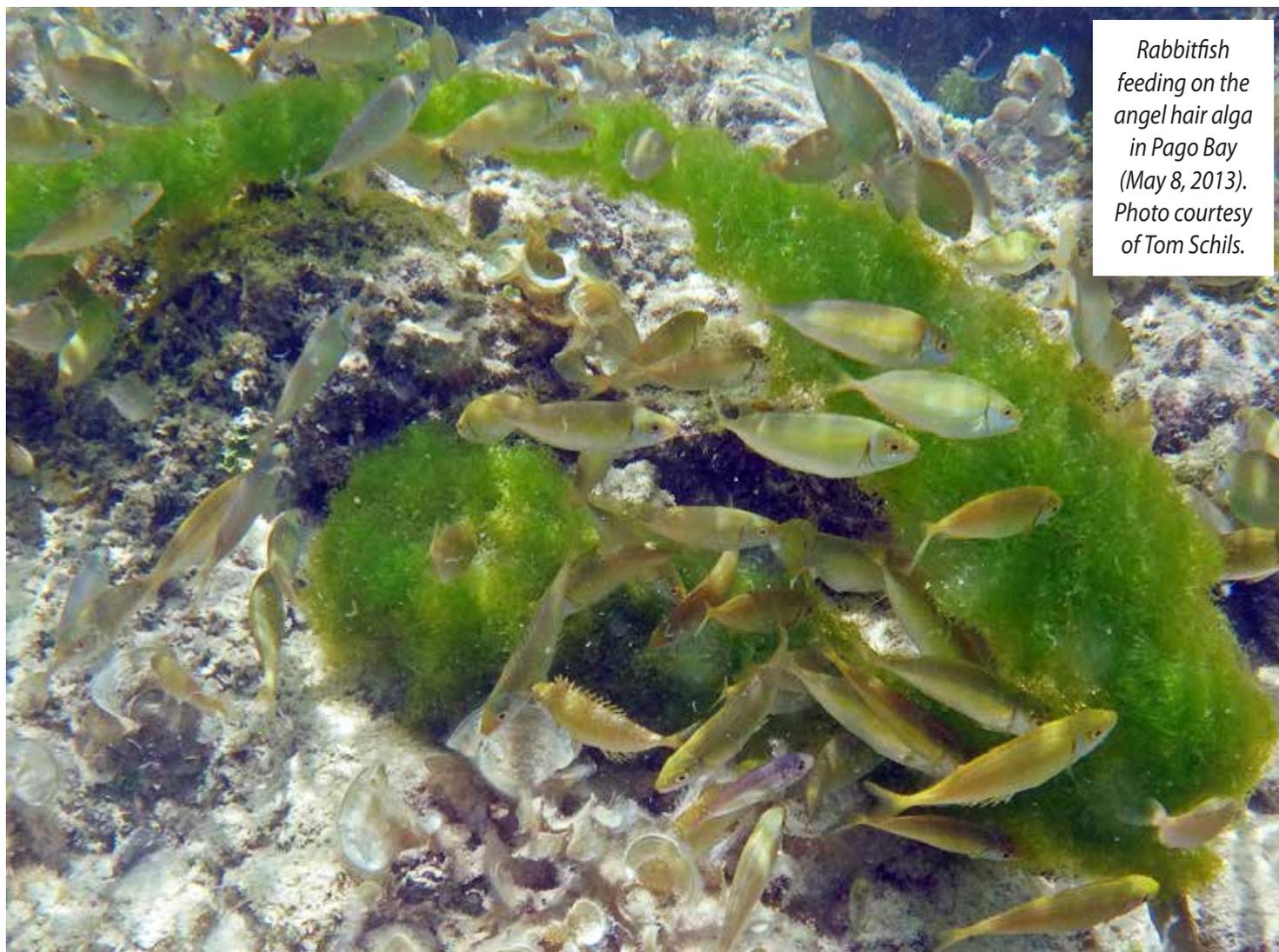
that previously occurred in Guam, other hypotheses to understand and manage these blooms should be explored. Eutrophication (elevated nutrient input) is generally the first culprit accused of triggering algal blooms but the areas affected by the angel hair alga are distant from terrestrial sources of nutrient input and represent some of the most pristine reefs in Guam. Changes in other environmental conditions, however, could be responsible for the *Chaetomorpha* outbreaks. In the last years, the Mariana Islands have experienced periods of unusually high seawater temperatures as evidenced by a very complete archive of high-resolution satellite imagery. These incidences of thermal stress have resulted in the worst coral bleaching events ever recorded for Guam.

#### Go Green, Eat Green!

Unsupported alarmist outcries over unusual biological events do not benefit the island community.

The abrupt nature of the persistent algal outbreaks and the large geographical scale over which they occur, however, warrant a cautious approach and should stimulate partnerships between resource users, agencies and researchers to evaluate the impact on Guam's natural resources and—if required—propose solutions to mitigate problems. After all, past invasion events in Guam have demonstrated that early intervention is key to successful and cost-effective conservation, management and restoration actions. The scientific literature is riddled with examples on how invasive algae can drastically alter reef scapes (e.g., phase shifts to algal-dominated reefs), hereby outcompeting reef building organisms, changing fish communities, and reducing fisheries production. To date, none of such effects have been investigated for the green tides in Guam. Anecdotal observations of interactions with other reef

organisms suggest that the angel hair alga's chemical defense against herbivory is limited as rabbit fish recruits (*mañahak*) feast on the alga (Fig. 2). Fishermen have been first to apply such observational knowledge to adapt to the changing reef environment and created a new Guam delicacy: crunchy angel hair salads topped with celebrated *fina'denne'* mixes. That said, binge salad-eating will probably not make a dent in the algal cover on reefs. A basic understanding of the alga's seasonal population dynamics and an accurate assessment of its spatial coverage, however, could support site-specific eradication strategies at times when *Chaetomorpha* biomass is naturally low. Only time will tell if Guam is currently experiencing an ecological anomaly or if rapid response actions by natural resource managers were effective in stalling the transformation of our biodiverse reef flats to evergreen reef moats. ▲



*Rabbitfish feeding on the angel hair alga in Pago Bay (May 8, 2013). Photo courtesy of Tom Schils.*

# Fish, Fish, and more Fish

By Jane Dia

**Guam needs more fish. Phase 1 (2012-2014) of The “Piti Pride Tepungan Wide” Campaign brings together fishers, residents, businesses, and resource users to improve fisheries management in the Piti Bomb Holes Preserve, which is one of five marine preserves on Guam, located in the Tepungan Bay, where near shore fisheries was a way of life not too long ago.**

The total area is “Tepungan Wide” which begins from Camel Rock at Asan Point and ending at Piti Channel before the Piti Canal. The target audience were local fishers and all resource users of the Bomb Holes Preserve because they are part of the solution to the main threat to the fish habitat which are others damaging fish habitat by unauthorized removal of animals and purposely walking through sea grass beds. Piti Bomb Holes Preserve needed

a Pride Campaign to begin conversations about fishery management and how to empower the community to protect fish habitat. Two main behavioral change objectives of the campaign were to increase participation in marine preserve activities and to use the new text line number 688-3297(DAWR) for reporting impacts to the preserve.

With an increase in conversations regarding benefits of marine preserve activities, behavior was expected to

change by more people becoming involved in marine preserve’s management. After the end of Phase 1, biological data will be collected to monitor the conservation target, which is the fisheries habitat, with hopes of maintaining the health of its ecosystem to fulfill the purpose of a marine preserve. Through the use of the text line, the campaign has successfully implemented a way to reduce obstacles for people to participate in marine preserve activities. The text line, also referred to as the “Pride Line” was most successfully marketed on screen cleaners for people to stick on their phones to have the number readily available.

A key partner of the campaign was the Fish Eye Marine Park; by allowing Piti Pride training to their staff, collaboration with their security guard, offer

to host a fisher lunch recognition, offer for free admission for school children for Piti Pride campaign, and continual support throughout the campaign by communication, meetings, and sharing of ideas to protect the preserve. Post survey data showed an increase of fishers who have discussed with others about participating in marine preserves and an increase of fishers who have thought about helping in marine preserves. At the end of the campaign, a spear fisher group expressed interest in forming a community-based monitoring group for Phase 2 Pride for Micronesia Campaign. Through their experience in the community-based monitoring group on Guam, hopes are to have them present to the other campaigns in Micronesia to share best practices. ▲

2015 Guam International  
**COASTAL CLEANUP**  
7 a.m.  
Saturday  
Sept. 19

**For More Information Please Call: 475-9647**