

Kilo iā



Quarterly Membership Publication of the Friends of the Waikiki Aquarium

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Samantha Tome



AQUARIUM MESSAGE

Kilo i'a

Issue Number 206
2019 | APRIL | MAY | JUNE

EDITOR
Becker Communications

ART DIRECTOR
Becker Communications

PHOTOGRAPHERS
Waikiki Aquarium

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Friends of the Waikiki Aquarium
PO Box 15518
Honolulu, HI 96830
PHONE (808)923-9741
FAX (808)923-1771
www.waikikiaquarium.org

WRITE TO US AT kiloia@waikikiaquarium.org
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MANA'O

Traditionally, the kilo i'a was an expert of fish and marine life. He studied the behaviors and movements of i'a. The kilo stood at a high point of land overlooking the ocean to watch for an expected school of fish and steered the fishermen in the school's direction. The success of surrounding the school was entirely up to the kilo.

Celebrating our 115th birthday is the perfect opportunity for our team at the Waikiki Aquarium to reflect on the many remarkable milestones we've experienced since our humble beginnings in March 1904. What began as an aquarium with just 35 tanks has grown to encompass more than 3,500 marine specimens, and we open our doors to more than 280,000 visitors every year. The Waikiki Aquarium has a long and venerable history of providing public exhibits, education programs and invaluable research focused on the unique aquatic life of Hawaii, and we're proud to welcome visitors and kamaaina alike for many years to come.

In line with our mission to inspire and promote understanding, appreciation, and conservation of



Pacific marine life, we're thrilled to share some of our recent community outreach efforts. At the beginning of the year, Aquarium staff and volunteers donated nearly 400 pounds of food to Hawaii Foodbank in an ongoing effort to feed Hawaii's hungry families. In order to distribute nearly 1 million pounds of food each month, the Hawaii Foodbank relies on a wide network of people doing good for others in the community, and the Waikiki Aquarium is proud to serve as a vital link in this process.

In February, we also had the privilege of receiving a Good

Neighbor Award at the City and County of Honolulu's Storm Water Quality Programs' Good Neighbor and Environmental Hero Awards. This biennial awards program celebrates citizens, businesses, community groups and other organizations that foster positive changes in their communities to protect the environment. The Waikiki Aquarium's Good Neighbor Award recognizes our volunteer service for the betterment of the local community through participation in the City's Adopt-A-Block and Adopt-A-Stream programs. We're grateful to the City and County of Honolulu's Storm Water Quality Programs for this wonderful recognition!

In an ongoing effort to keep our waters clean and free of debris, we actively coordinated and hosted numerous cleanups at Sand Island Beach Park, Lanikai Beach, Baby Makapuu Beach, and Ala Moana Beach Park. We've also spearheaded invasive algae pulls around Oahu in order to protect Hawaii's coral reefs.

Looking to the future, we're excited to welcome even more visitors to experience the beauty and diversity of Pacific marine life through our exhibits, special events, classes and activities and other new initiatives. On behalf of the Waikiki Aquarium, thank you to all of our valued members for your ongoing support. We look forward to sharing the splendors of Hawaii's underwater world with you for years to come!

Dr. Andrew Rossiter,
Director, Waikiki Aquarium



Pictured (left to right): Dr. Michael Bruno, Dr. Andrew Rossiter, Dr. Celia Smith, Beth Churchill, Chris Cole, Robin Burton-Gates, Dr. Zac Forsman

FRIENDS OF THE WAIKĪKĪ AQUARIUM



The Friends of the Waikiki Aquarium (FOWA) is the membership organization of the Waikiki Aquarium. Its purpose is to support the mission of the Waikiki Aquarium to inspire and promote understanding, appreciation, and conservation of Pacific marine life. The members of FOWA are individuals and organizations interested in the purposes of the Waikiki Aquarium.

FOWA's Board of Directors is the governing body of this support organization made up of committed and generous individuals who support the Waikiki Aquarium in numerous ways.

Board of Directors

Christopher Cole - Chair
Dirk Yoshizawa - Vice Chair
Charles Kelley - Secretary
Jennifer Isobe - Treasurer
Dr. Andrew Rossiter - Ex-Officio
Elizabeth Churchill
Tim Guard
Charlie Loomis
Monica Salter
Nancy Taylor
Dave White

Dear friends,

We've enjoyed such a wonderful and eventful start to 2019! From celebratory events to the launch of our Distinguished Lecture Series to the grand opening of a new exhibit, we've certainly been keeping busy, and we're thrilled to share our updates with you in this month's newsletter.

In February, the Waikiki Aquarium had the pleasure of opening its new Living Reef Exhibit, providing visitors and kamaaina alike an opportunity to view the majesty of coral life in one of the most diverse areas on the planet—the Pacific Ocean. Complete with 12 live coral displays, an interactive kiosk, a 3-D educational polyp structure and more, the new exhibit is an impressive achievement showcasing one of the most abundant and bio-diverse coral areas in the world, and the Friends of the Waikiki Aquarium is proud to be a part of its inception.

I want to wish a special mahalo to all of the Waikiki Aquarium staff, volunteers and partners who were instrumental in the creation of the Living Reef Exhibit, including PDT Technologies.

As FOWA members, I highly encourage you all to take advantage of this invaluable opportunity to learn more about these diverse coral communities with a visit to the new Living Reef Exhibit. It's only through your membership dues and generous contributions that we are able to see this exhibit come to fruition.

Since its inception, FOWA has shared the Aquarium's mission to foster the appreciation and conservation of Pacific marine life, including the coral reefs that play such a significant role in our lives here in Hawaii. As chairman of the FOWA Board of Directors, I'm proud to be a part of an

organization that supports the Waikiki Aquarium, in partnership with the University of Hawaii, and its track record of standing at the forefront of research on coral propagation. Now more than ever, scientists are compelled by the triple threats of pollution and runoff, overfishing and climate change to stay ahead of the curve and build on the discoveries and research spearheaded by the late Dr. Ruth Gates, in whose memory the Living Reef Exhibit has been dedicated.

As stewards of the ocean, we can all do our part to preserve our beautiful coral reefs. Simple and easy ways to make a difference include volunteering at local beach or coral reef cleanup events, using reef-safe sunscreen without the chemicals oxybenzone or octinoxate, and preventing the flow of chemicals into our waterways. Let's work together to protect our coral reefs for Hawaii's future generations.

I'd like to conclude this message with exciting news—we are pleased to welcome Lee Higa-Okamoto as the new executive director of the Friends of the Waikiki Aquarium! She previously worked extensively with NOAA's Coral Reef Ecosystem Division and received her degree from the University of Hawaii at Manoa with an emphasis in Environmental Studies. A fun fact about Lee is that her interest in marine conservation and education actually stems from the Waikiki Aquarium, after participating in the Blue-Water Marine Laboratory peer education program in both high school and college. It seems fortuitous, then, that we should have the privilege of welcoming her to the Friends of the Waikiki Aquarium ohana.

Chris Cole
Friends of the Waikiki Aquarium Board of Directors



Living Reef Exhibit Now Open!



On Friday, February 15, we had the pleasure of introducing Waikiki Aquarium guests to the majesty of coral communities with the opening of our new Living Reef Exhibit. This interactive and constantly evolving exhibit showcases the beauty and diversity of both soft and stony corals, and is dedicated to the late Dr. Ruth Gates, director and researcher at the Hawaii Institute of Marine Biology (HIMB).

Located directly to the right of the Aquarium's galleries entrance, the Living Reef Exhibit includes 12 wall tanks featuring representative coral species from throughout the South Pacific, where over 600 different species have been found to date. The exhibit incorporates a highly advanced life support system that uses energy-efficient LED lights as well as the Aquarium's first water-to-water heat exchanger. In addition to the tanks, an interactive kiosk offers detailed information on coral ecology and physiology, marine ecosystems, and much more. A 3-D educational polyp sculpture showing the smallest building block of a coral colony complements the exhibit and gives visitors an

in-depth look into the structure of a coral colony.

The exhibit highlights the most recent coral research conducted at the University of Hawaii at Manoa, which centers on Hawaii-based coral reef ecosystems. Prominent researchers whose work contributed to the exhibit include the late Dr. Ruth Gates (1962-2018), Dr. Zac H. Forsman, Dr. Ku'ulei Rodgers, Dr. Celia M. Smith, Dr. Rober Toonen, Dr. Tim Tricas and Dr. Les Watling. To provide timely insights into coral communities, we also partnered with the NOAA Office of Coastal Resource Management.

The Living Reef Exhibit would not have been possible without the support of numerous individuals. A special mahalo goes out to our contractor PDT Technologies for their invaluable work to make our innovative exhibit a reality. Staff from throughout the Aquarium joined together in a collaborative, team effort to see this project through, from conception to completion.

We invite everyone to explore the new Living Reef Exhibit and bask in the majesty of diverse and abundant coral! Entry to the exhibit is free with Aquarium admission.

Mahalo to Matson®

We're shining the spotlight on Matson, Hawaii's leading public shipping company and a longtime Waikiki Aquarium partner. We are so grateful to Matson for its many years of supporting our mission to inspire and promote understanding, appreciation, and conservation of Pacific marine life.

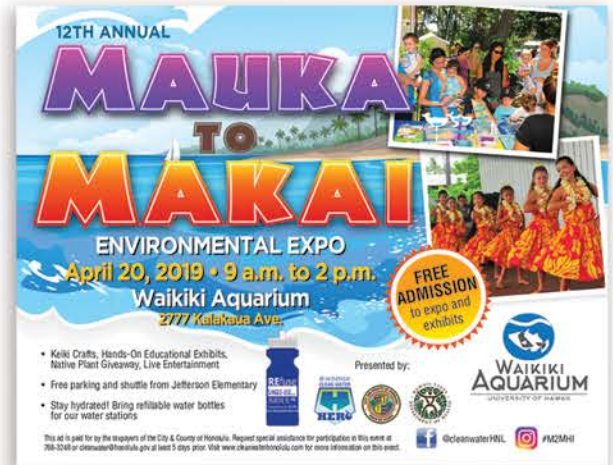
Over the years, Matson has proven an invaluable partner by

supporting a variety of Aquarium initiatives, including our beach cleanup events, coral research, and our ongoing Distinguished Lecture Series. We're so proud to collaborate with a company that also serves as a respectable corporate citizen and strives to improve the health and well-being of our oceans. We look forward to many more years of this fruitful partnership!

12th Annual Mauka to Makai Environmental Expo

Swim on down to the Waikiki Aquarium for the 12th Annual Mauka to Makai Environmental Expo on Saturday, April 20! Presented in partnership with the City and County of Honolulu's Department of Facility Maintenance and the Hawaii State Department of Health Clean Water Branch, this free family-friendly expo celebrates Earth Month and promotes keeping Hawaii protected and free of pollution, from the mountaintops to the sea.

From 9 AM to 2 PM, enjoy interactive booths, live entertainment, a fish release with fish donated by the Oceanic Institute, native plant giveaway, and a variety of hands-on learning activities that showcase the preservation and protection of Hawaii's land and sea. Food will be available for purchase, and complimentary water stations will be situated throughout the Aquarium (guests are encouraged to bring refillable water bottles).



Seasons and the Sea

Hosted in partnership with the Honolulu Mayor's Office of Culture and the Arts, Seasons and the Sea takes place on Thursday, May 2, 2019 from 2 PM to sunset (around 7 PM). The community is invited to celebrate the official changing of the seasons with a unique sunset ceremony led by cultural advisor Sam 'Ohukani'ōhi'a Gon III and featuring chant, hula and mo'olelo (storytelling). From 2 to 5 PM, guests can take part in Hawaiian crafts and cultural activities, free with admission to the Aquarium.



Ke Kani O Ke Kai 2019, the Waikiki Aquarium's popular annual summer concert series, is just around the corner! We'll be making announcements on this year's lineup soon, but for now, mark your calendars for this year's five-concert series dates:

- **June 13, 2019**
- **June 27, 2019**
- **July 11, 2019**
- **July 25, 2019**
- **August 8, 2019**



Who Was Isabella Aiona Abbott?

By Celia Smith, Department of Botany,
University of Hawai'i at Mānoa

It's difficult to capture the many dimensions of Isabella Abbott in words. How many firsts can you have before you are no longer just superlative and become googol-famous?

As we reflect on the lifetime of this remarkable Hawaiian woman, educator and scientist, it's easy to feel both inspired and overwhelmed by her accomplishments:

- Isabella Kauakea Aiona Abbott was the first Native Hawaiian to be awarded a PhD. Dr. Abbott trained at UC Berkeley and graduated in 1950 to become a leader in the taxonomy and systematics of Pacific algae as well as in the ethnobotany of her Hawaiian culture.
- Dr. Abbott was the first female Full Professor in Stanford's Biological Sciences, hired as Full Professor with automatic tenure in 1972. She was also the first minority Full Professor and first female minority Full Professor hired by Stanford.
- Dr. Abbott was the first female to hold the GP Wilder Endowed Chair in Botany, appointed in 1976 at her undergraduate alma mater University of Hawaii (Class of 1941). She was honored as a Distinguished Alumna from Manoa; Order of Ke Ali'i, Ka Pahaui Foundation; Living Treasures of Hawaii, Honpa Honwangi Mission of Hawaii; Darbaker Award, Botanical Society of America; Prescott Award, Phycological Society of America; and the Gilbert Morgan Smith Medal, National Academies of Science. But even before the numerous awards and long career, it was clear early in her career that Izzie Abbott was special.





== Celebrate with us! ==

WORLD OCEANS MONTH

This year's international theme is "Together We Can Protect and Restore Our Ocean." Join us as we clean neighboring beaches, host educational activities, remove invasive algae, and highlight individuals in the community who are making an effort to protect the ocean.

Spanning 71 percent of the earth's surface, the ocean is critical to our climate, sustenance and recreation and helps to generate most of the oxygen we breathe, regulates our climate, and provides endless inspiration. Every June, we recognize World Oceans Month, which provides us with a unique opportunity to protect and conserve our shared ocean for future generations. Join the Waikiki Aquarium and Outrigger Hotels and Resorts for a variety of events that help spread awareness of ocean conservation.

Special Beach Cleanup

June 2

In celebration of Isabella Abbott's 100th Birthday, join the Aquarium from 9 to 11 a.m. at Baby Makapu for a special beach cleanup.

World Oceans Day at the Aquarium

June 8

In partnership with Matson's Ka Ipu Aina program and Duke's Waikiki, we're kicking off our month-long celebration with a day of ocean appreciation, educational activities, and a beach cleanup at Baby Makapuu.

Ke Kani O Ke Kai Summer Concert Series

June 13, 2019 • June 27, 2019

Tickets required. Visit our website for ticket info:
www.waikikiaquarium.org.

AQUARIUM UPDATES

Waikiki Aquarium and Sig Zane Collaborate to Honor Isabella Ainoa Abbott

In celebration of Isabella Aiona Abbott's 100th birthday, the Waikiki Aquarium and acclaimed Hawaii designer Sig Zane have teamed up to sell limited-edition prints inspired by this trailblazing educator and scientist at the Waikiki Aquarium Gift Shop, Sig Zane retail locations and online.



The first print is the 'Alaonaona, or "Alluring Fragrance," and will be available as both an aloha shirt and dress. The design is inspired by the unique smells and fragrances that waft throughout the islands, including the Limu Lipoa about which Abbott knew so much. The fragrant Limu Lipoa often washes up on the sand and dries out in the sun, and the 'Alaonaona print beautifully captures its distinctive scent and appearance.

The second print is the Kula Pae, printed on Cornflower fabric with Riviera ink, and will be available as a pareu. This beautiful design reflects life in the area directly across from the Kanaka'ole Homestead, where one can witness the tides, the limu and the fishes. The art on the pareu features the complexities of a fish net, with an original block print design by Luka Kanaka'ole.

All products will be available starting in June of 2019. Stay tuned for more information on this exciting partnership!

Outrigger Resorts OZONE Day • June 29

Outrigger's OZONE Day event at the Waikiki Aquarium will take place from 11 AM to 3 PM on Saturday, June 29, 2019. We're opening our doors for the public to enjoy a fun-filled day of hands-on activities for the whole family, including live Hawaiian music, educational exhibits, games and fantastic prizes. OZONE, which stands for Outrigger's ZONE, is a global conservation initiative focused on protecting the health of coral reefs and the oceans surrounding the iconic beach destinations of Outrigger Resorts—including our very own Waikiki Beach!

For more information, visit our website at www.waikikiaquarium.org.



Tyrone Wilson

Tyrone is a volunteer and intern for the Waikiki Aquarium's Live Exhibits Department Johnathan Casey.

I'm from Washington and moved to Hawaii in 2010 through the military. Shortly after retiring from the military, I started school and transitioned from my background in nuclear engineering to studying marine biology. To complete my schooling and gain work experience in the field of study that I wanted, the US Department of Veterans Affairs provided me with a vocational rehabilitation program that allowed me to find a job field that was completely different from what I did during my time in the military.

My volunteer experience ranges from training service dogs for Hawaii Fi-Do to helping with AccesSurf. I'm also currently

volunteering with the Marine Mammal Stranding Program, performing necropsies on deceased cetaceans, lending a hand with facility maintenance and repair, and spearheading a variety of studies that identify animal conditions from photographs. I came to the Waikiki Aquarium looking to gain additional experience in caring for live marine creatures.

At the Waikiki Aquarium, I take care of the Living Reef, Golden Cuttlefish, Hunters on the Reef, South Pacific Diversity, North-west Hawaiian Islands, Ornamental Planted Tank, and the Quarantine Tanks for new or sick animals. The most valuable experience I've had here has been learning to identify a disease or parasite on an animal, then determining the best treatment route. I've loved working with the animals and seeing them exhibit new behaviors every time I feed them.

Mahalo to Hawaiian Airlines

Mahalo to the volunteer team at Hawaiian Airlines! Select employees came down to the Aquarium to kokua by weeding and supporting a project behind the scenes. We appreciate all your hard work!



Bioluminescence

By Megan Porter,
Department of Biology, University of Hawaii at Manoa

Animals structure their lives around the rising and setting of the sun. Because light is such an important cue for life, many species living in dark environments make their own light, a phenomenon called bioluminescence. Bioluminescence has evolved independently in more than 40 groups of organisms, including bacteria, comb jellies, jellyfish, sea stars, fireflies, shrimps, squid, fish, sharks, worms, and even fungi. New bioluminescent species are discovered regularly, with a new species of bioluminescent lanternshark (*Etmopterus lailae*) discovered in the waters off the Northwestern Hawaiian Islands just last year. While most species, like the new lanternshark, produce the chemicals to make light themselves, some species like the Hawaiian bobtail squid culture bacteria in special internal organs, and use those bacteria to produce bioluminescence for them.

Regardless of the type of bioluminescence, many species can produce dazzling light displays. The particular color of the light display depends on the species and the chemicals they produce and are in many cases tuned to the environments the organisms inhabit, from the yellow-greens of firefly flashes to the blue light produced



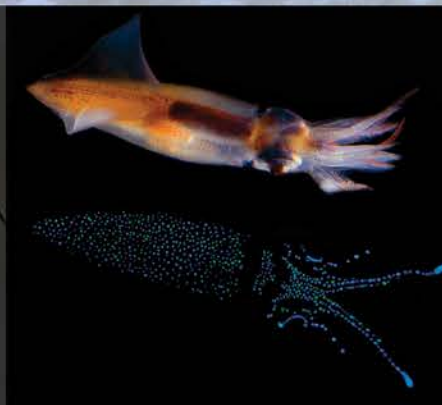
Linophryne: Dante` Fenolio / DEEPEND Project



Rossia pacifica: Dante` Fenolio




Georgia Firefly: Dante` Fenolio



Firefly Squid (*Watasenia scintillans*): Dante` Fenolio



Argyrops melanocephalus & photophores: Dante` Fenolio

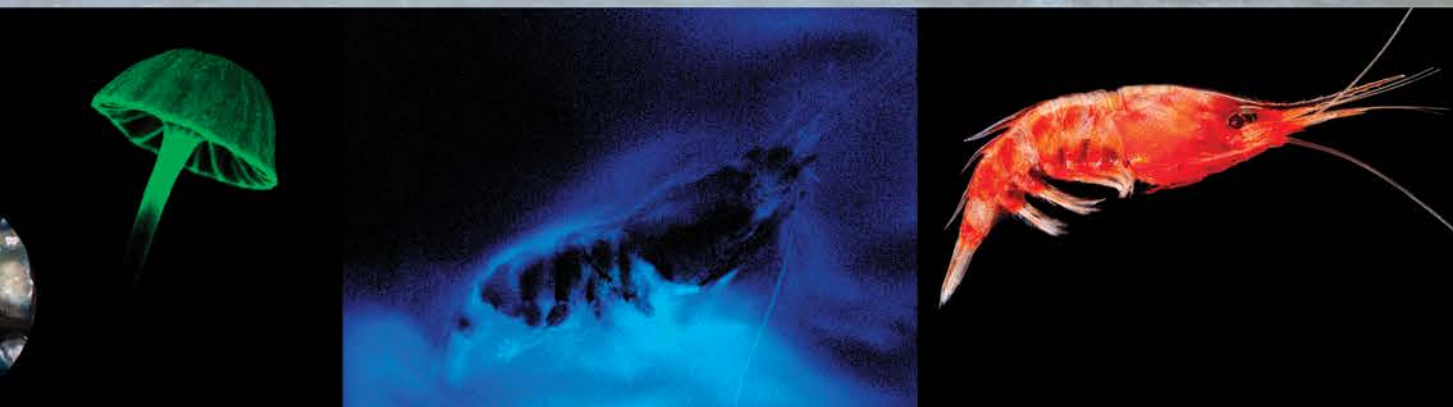


by different marine species. Some species such as the deep-sea dragonfish can even produce red light. In nature, animals use this rainbow of bioluminescent colors for a wide variety of functions, including to camouflage in open water, defend themselves against predator attacks, find or attract prey, and identify those of the same species in order to find mates. In particular, the use of bioluminescence for communication and courtship seems to have increased the rate at which new species form within certain groups of animals.

Although bioluminescent animals can be found both on land and in the ocean, animal light production is much more prevalent in the marine realm. One study estimated that over 75 percent of individual animals encountered in the ocean from surface waters down to the deep sea are capable of producing light. This dominance of bioluminescence in marine animals highlights the significance of light to animal communication and behavior, particularly in the pitch black of the deep sea where sunlight no longer penetrates the ocean waters. Yet, due to the prevalence of bioluminescent animals, the deep sea isn't a completely dark place. The deep sea might be seen as more similar to a meadow filled with lightning bugs at night: full of dim but constant flashes of light, rather than the pitch black of complete darkness.

My lab is interested in the evolution of bioluminescence, and particularly the evolution of molecules animals use to produce and to detect light. For the last few years we have been investigating the chemicals crustaceans like shrimp and copepods use to produce light, how they detect and regulate the light they are producing, and what they are using the light for. This type of research will help us understand the diversity of bioluminescence in the deep sea, and the importance of light for life.

***Visit the Aquarium on Tuesday, April 9 at 3:30 PM
to learn more from Megan Porter at a special seminar!***



ollio Pysome Composite: Dante` Fenolio

Oplophorus: Dante` Fenolio / DEEPEND Project

Oplophorus: Dante` Fenolio / DEEPEND Project

THE FUTURE OF SUSTAINABLE PRACTICES

**By Dani Chu,
Honolulu Fish
Company**



Blue Ocean Mariculture



Honolulu Fish Company



Opah

To visualize the future of our oceans and of sustainable fish, one should ask the following questions: What are the possibilities? What might be possible with fisheries management? What will the associated future technologies accomplish? Is sustainability a destination, or a never-ending quest?

In all possible futures, the advancement of knowledge is the variable most likely to have the greatest impact on how we see our environment and manage our natural resources. The more people who recognize the importance of oceanic environments will inevitably lead to more research, better resource management, better harvesting and farming, and more thoughtful development.

Future research on the oceanic environment will be as crucial to our civilization as research of the cosmos or the quantum world. It's often said that we know more about the surface of the moon than the depths of our ocean.

A growing global population and increased need to answer questions about natural resources will drive the need to learn more about the potential oceans can have to solve these questions.

Advancements in oceanic technology have a huge potential to bring real-time information collection in research, farming, and harvesting. Sensors, imagery, remote data transmission, and intelligent analytical computing are all technologies that are quickly merging. Fishery science today is filled with gaps in data, data that's difficult to collect with today's technology. It's not a stretch of the imagination to consider future automated data gathering processes that can be left out at sea to collect information with remote-controlled vessels, which track, monitor, and report in real time. Future knowledge will

precipitate a new science based on actual in-field measurements.

Many believe that fish farming will provide the majority of the population's food within a mere decade. This upcoming decade of growth will be unlike any decade before in history; knowledge doubles in shorter and shorter cycles. The future knowledge base will stimulate new and innovative ways to harness the power of nature in ways that are harmonious with the environment.

With all of these ideas in place, our team at Honolulu Fish Company takes the time to thoroughly research the suppliers, fishermen and vendors with whom we work. We also carefully and strategically choose our partners, like Blue Ocean Mariculture. One of the only recognized fisheries by the Seafood Watch Organization, Blue Ocean Mariculture is spearheading advancements in open ocean farming off the coast of Kona, with every aspect of their farming process thoroughly researched and reviewed to minimize impacts on the ocean. Through these partnerships, we can offer sustainable fresh fish across the country, especially in areas where it's not readily available. Visit our retail website at www.honolulufish.com to select a fresh seafood subscription and have it delivered right to your door!

The concept of sustainable practice, whether it's harvesting or farming, will always remain at the forefront of our society's future. While the word sustainable is simply that, a word, it is nonetheless a word that embodies action, and the desire to grow beyond considering the immediate present. The world of tomorrow will need to be beyond merely sustainable—a new knowledge base will emerge and feature improvements for communities, environments and creatures. It will also manifest practices that ensure our many resources endure what's to come.

CLASSES & ACTIVITIES

BEHIND THE SCENES

Mondays at 3:00 PM in April and May

Learn about how our staff and volunteers care for our exhibits and animals with a behind-the-scenes tour! Peek behind the glass to inspect the tanks and explore the exhibits, then visit the Live Feeds Deck and Jelly Hale, where sea jellies are raised. Accessibility is limited. Minimum age: 7 years; youngsters must be accompanied by an adult. Members: \$10 for adults and \$6 for children ages 7-12 (Non-members: \$16 for adults and \$10 for children ages 7-12, plus Aquarium admission).

AQUARIUM'S TOP 5

Tuesdays at 1:00 PM in April and May

What animals are the most interesting to Aquarium guests? Learn more about those weird and wonderful seahorses, cuttlefish, and other fish unique to the Aquarium during this short presentation, followed by a brief visit to the exhibits. Free with Aquarium admission.

HAWAIIAN REEF ANIMALS

Thursdays at 10:30 AM in April and May

Get a sneak peek behind the scenes and learn about Hawaiian reef animals. Hold a sea star, feel a sea cucumber and feed an anemone. This 30-minute program is a great addition to any visit to the Waikiki Aquarium. Perfect for families with children ages 4 and up. \$2 per person, plus Aquarium admission.

CLASSES FOR GROUPS

Waikiki Aquarium offers a variety of classes for community and family groups from eight to 45 people. Book a **Private Aquarium Tour** or a Hawaiian Reef Animals tour for your clan. Or consider an **Aquarium After Dark** or **Fish School** for your club or scout group. Call (808) 440-9007 or email reservations@waikikiaquarium.org for more information.

TEEN INTERPRETER PROGRAM

Applications accepted from April 1 to May 24

Looking for a fun and educational opportunity for your teen this summer? For the last five years, the Aquarium has offered its Teen Interpreter Program. Students age 14 to 17 can learn about Hawaiian marine life and share their knowledge with visitors from around the world. Interested applicants must be available for at least one shift on Tuesday mornings, Wednesday or Thursday mornings or afternoons from July 9 - August 1, 2019. All students must be in or entering high school in Fall 2019.

Register online at:

www.waikikiaquarium.org/interact/activities-classes/



Mushroom Coral

The mushroom coral is one of the most recognizable species of Hawaiian stony corals. This coral is named for its oval shape and the radiating skeletal walls (septa) that give it its mushroom-like appearance. These sharp septa also give rise to another common name: razor coral. This disc-like coral is found on quiet water reefs like those in Kaneohe Bay, where solitary individuals live detached from the reef. Mushroom corals do not form colonies like most other Hawaiian corals, and each mushroom coral is a single polyp.

In a mushroom coral, the central mouth is slit-like and the broad polyp surface is covered with widely spaced, stubby tentacles. Mushroom corals are suspension feeders and have tracts of hair-like cilia on the disc surface that collect particles dropping from the seawater. The cilia carry food particles to the mouth and carry sand and other non-food particles to the edge of the disc for dumping. As in other reef-building corals, there are symbiotic algal cells (zooxanthellae) living inside the mushroom coral's cells. Utilizing nutrients from the water and their coral hosts and sunlight, the zooxanthellae generate energy-rich compounds through photosynthesis. In fact, reef-building corals owe their success as builders to their tiny partners. The zooxanthellae's photosynthetic processing enhances the corals' abilities to produce the massive limestone skeletons that contribute to the reef framework. The formation of extensive reef environments wouldn't be possible without this mutually beneficial relationship.

Unlike most corals, mushroom corals are only attached to the reef when they're small. As larger individuals, they live loose on the seafloor. Young mushroom corals are attached to the reef framework by a limestone pedestal. When the polyp reaches a sufficient size, the pedestal breaks and the mushroom coral then lives unattached with the mouth side up. If overturned, mushroom corals can right themselves. Water taken into the gut cavity expands one side of the body, acting as a wedge to gradually raise the disc up until it tips back over – this righting process may take several hours to complete.

Tissue remaining on the pedestal can grow to create another mushroom coral that will also break off. This is like the budding process that creates colonies in other corals, but in the mushroom coral, the polyps don't remain attached to one another. A single pedestal can generate many mushroom corals. The pedestal arises from an original mushroom coral larva that settles on the reef. When they spawn, adult mushroom corals release eggs or sperm into the seawater, and when these unite in fertilization, a larval stage called a planula develops. Carried by currents, the larva drifts until it settles onto a reef surface and begins the cycle of polyp formation.

Early Hawaiians used the skeleton of the mushroom coral as an abrasive for polishing canoes and other woodwork and for removing bristles from a pig skin before cooking.



NEW & RENEWING MEMBERS

from January 2019 - March 2019

John Aalto
 Stephen Abear Stephen &
 Courtney Abear
 Kelly Acuna Kelly & Cody Acuna
 Kris & Samson Ah Mook Sang
 Nancy Allerston
 Karen & Thomas Ambrosi
 Alton Arakaki and Lisa Fonseca
 Lina Arquero
 Cheryl & Robert Askew
 Raleigh & Judy Awaya
 Bonnie Bailey
 Alice Banks and Andre Boraks
 John Maurer & Kasey Barton
 Mrs. Tammy S. Bautista and
 Mr. Dixon N. Bautista
 Bayne Family
 Susan & Richard Beard
 Paul & Diane Bennett
 David & Maile Berting
 Regine Bishaw and
 Jamieson Mceachran
 Jamie Breneman
 Brandi Cadiz
 Peter & Olga Caldwell
 Robert Calvert & Mary Rydell
 Kristy & Joel Campos
 Shawn Canionero
 Chase & Allissa Carvoeiro
 Wai Ying Chan and Jay Loui
 John & Saori Chang
 Walter & Pamela Xiaolei Chang
 Tiffany & Chris Chin
 Brad & Colette Ching
 Mark Kahi Ching
 Tommy & Paige Clement
 Tony Conjugacion
 Karen Connolly
 Chris & Patricia Cooper
 Penelope Corbett
 Jorge Corona
 Thomas & Karen Cranford
 Allison & Daniel Cromer
 Krystina Cunningham
 Pakalika Cunningham &
 Elke Gebhardt
 Elise DeBoard
 Joan & John Dyer
 Ayako & Taj Elliott
 David & Sydney Fasi
 Elise Fernley
 Stephen Flower
 Gregory & Janet Fong
 John & Nancy Fox
 Nancy & John Fox
 Brad & Angela Freitas
 Mary Jo Freshley
 Doreen & Ronald Fujita-Hino
 Mr. and Mrs. Stephen E. Gainsley
 Gamiao-Furutani and Reid Furutani

Dan & Deborah Gardner
 Michael & Pauline Garrison
 Michael Garsva
 Geno Godinet
 Michelle & Christopher Goodin
 Sharon Greene
 Lea Guerrero and George Kuramoto
 Heather & Philip Haas
 Warren Haight
 Warren & Ottina Haight
 Kathy Hallock
 Jay Hanamura
 Rainer Hardtke
 Eric & Bernice Hawkins
 Michael & Stephanie Hayasaka
 Andrew & May Higa
 Lee Higa-Okamoto and Ian Okamoto
 Michael J. Holl
 James Honda
 Ju Hee & Michael Hsia
 Joseph & Chhany Humphry
 Charles & Christina Hunter
 Ryan Hutchison
 Sarah Hutchison and Eamon Jordan
 Kim Huynh
 Daniel Ichikawa
 Aeli Imessaoudene
 Lester & Carolyn Inouye
 Maya Iriondo
 Jakelin & Garrett John
 Tatiana & Dominic Johnson
 Troy & Linda Jones
 Christopher & Mary Jordan
 D. Wayne & Nanette Judd
 Kelvin & Stephanie Jung
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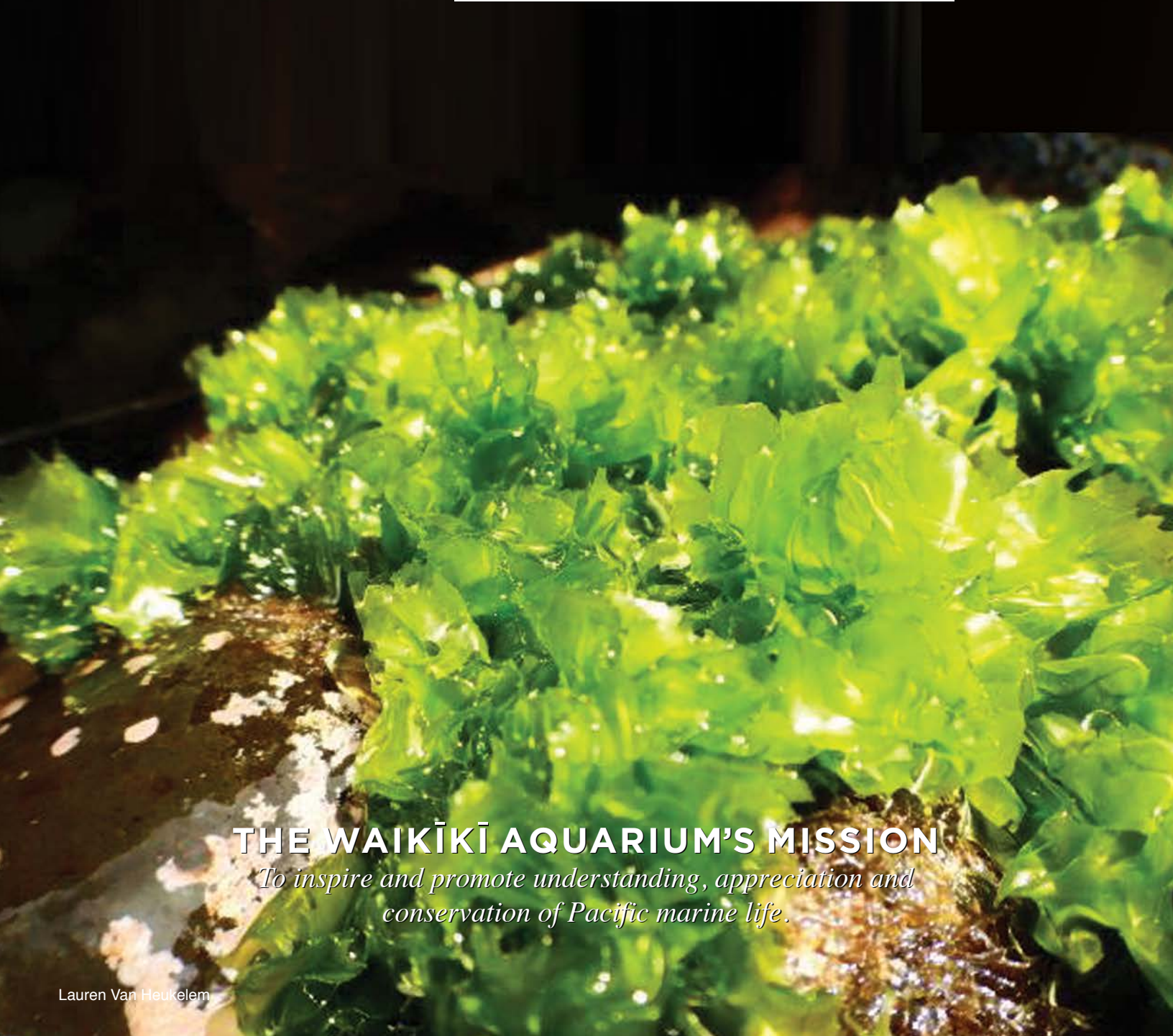
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University of Hawai'i at Mānoa
Waikiki Aquarium
2777 Kalākaua Avenue
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