2020 | JULY | AUGUST | SEPTEMBER

Kilo iʻa

Quarterly Membership Publication of the Friends of the Waikīkī Aquarium

Waikiki Aquarium
University of Hawai'i

Friends of the Waikiki Aquarium

WAIKĪKĪ **AQUARIUM** MESSAGE

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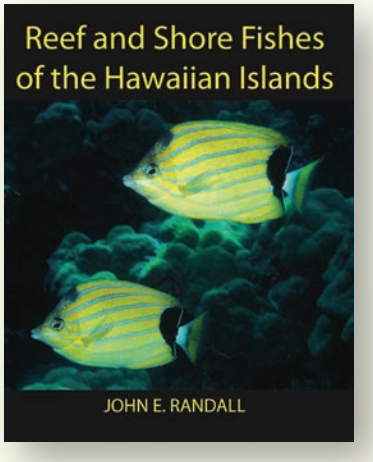
MANA'O
Traditionally, the kilo i'a was an expert of fish and marine life. He studied the behaviors and movements of i'a. The kilo stood at a high point of land overlooking the ocean to watch for an expected school of fish and steered the fishermen in the school's direction. The success of surrounding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

On April 26, 2020, we lost one of the greatest marine taxonomists of our time. John "Jack" Randall, a pioneering ichthyologist who described over 830 fish species during his lifetime, was widely regarded as the most productive marine researcher in the world and earned the nickname "Dr. Fish." He passed away at the age of 95, leaving behind decades of critical research on fish taxonomy and over 900 scientific publications.

Dr. Andrew Rossiter, Helen Au, Jack Randall, Gordon Grau, Cindy Knapman. *Photo courtesy of Hawai'i Sea Grant*

Born in California in 1924, Jack served in World War II before earning his undergraduate degree in zoology from the University of California, Los Angeles and a PhD in ichthyology from the University of Hawai'i at Mānoa. It was here where he found both his home and his calling, and he spent the next 40-plus years working at Bishop Museum while building a beautiful life for his wife Helen Au, two children, and four grandchildren.

Jack dedicated over 70 years of his life to fish taxonomy, examining and describing the physical features of fish that separate one species from another, and published more scientific papers than any ichthyologist in history. As part of this work, Jack has dived on some of the most spectacular reefs in the world, and his research has led him to lands as diverse as the Isles Marquesas and Easter Island.



Complementing his extensive research, Jack authored several major scientific books, including *Reef and Shore Fishes of the Hawaiian Islands*, a remarkable 560-page volume that covers the 612 species of fishes found in the Hawaiian Archipelago from the shore to 200 meters' depth. Jack regards this as his finest publication, the result of 47 years of study of the Hawaiian fish fauna. Whether you are a seasoned ichthyologist, a beginning snorkeler, or simply someone with an interest in Hawai'i's varied and colorful marine life, this is an essential addition to your library and available for purchase at the Aquarium Gift Shop or through Hawai'i Sea Grant.

Jack's contribution to science is incalculable. I will miss hosting Jack at the Aquarium. Every exhibit held a fish about which he had an interesting or amusing anecdote. The last time he was here, Dr. Phil Helfich was with him, and they were seeking fish species that Jack had named in Phil's honor.

Whether you knew him as a friend, a colleague, as "Dr. Fish," or as the trailblazing ichthyologist, you were lucky to know Jack Randall. On behalf of the entire Waikīkī Aquarium, we offer our condolences to Jack's family and friends. He may be gone, but he will certainly never be forgotten.

Dr. Andrew Rossiter
***Director,** Waikīkī Aquarium*

AS SEA LEVEL RISES, MULTIPLE FACTORS THREATEN HONOLULU

By Marcie Grabowski, *Outreach Specialist for the University of Hawai'i at Mānoa's School of Ocean & Earth Science & Technology (SOEST)*

The Waikīkī Aquarium, as its name implies, is located in the heart of Waikīkī, one of Hawai'i's bustling urban centers. And while most people immediately think of the Waikīkī Aquarium as home to diverse and beautiful marine life (which is true), they may not think of the many ways it's vulnerable to the threat of sea level rise.

Photo courtesy of Hawai'i and Pacific Islands King Tides Project

As sea level continues to rise, extremely high tide events are causing Honolulu, Hawai'i's primary urban center and the larger city in which Waikīkī and the Aquarium are located, to experience flooding not only from water washing directly over the shoreline, but also from groundwater inundation as the water table is pushed toward the surface and reverse flow through the municipal drainage system.

In a study published in *Scientific Reports*, researchers at the University of Hawai'i at Mānoa School of Ocean and Earth Science and Technology found in the next few decades, sea level rise will likely cause large and increasing percentages of land area to be impacted simultaneously by the three flood mechanisms. Further, they found that groundwater inundation represents the most extensive flood source, while direct marine inundation represents the least extensive—only three percent of the predicted flooding.

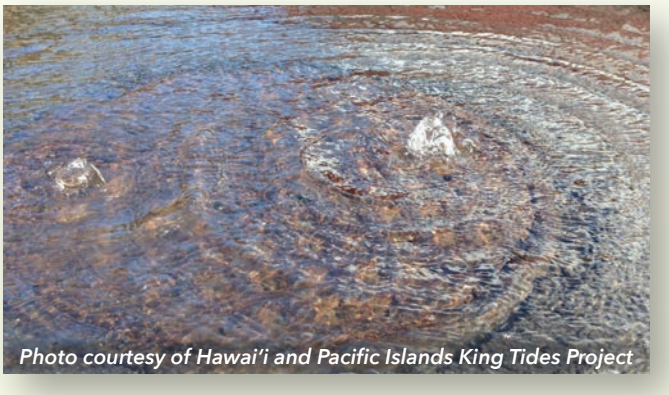


Photo courtesy of Hawai'i and Pacific Islands King Tides Project

"This is significant because many people think that sea level rise can be mitigated by seawalls," said Shellie Habel, lead author of the study and coastal geologist and extension agent with the University of Hawai'i Sea Grant College Program and UH Coastal Geology Group. "But a seawall will not stop groundwater inundation. Our results highlight the need to readjust our thinking regarding the flooding that accompanies sea level rise. We want to be sure to implement flood management strategies that will be effective at mitigating flooding."

This requires that all types of flooding be thoroughly assessed.

Habel and co-authors developed a method that identified the various flood types and their extent. Flood maps were produced by simulating flood locations and depths generated by each of the three mechanisms and by overlapping the simulations to identify areas vulnerable to combined flooding over the coming decades.

Colleagues at the UH Sea Level Center then developed a statistical model that considers predicted tide and projected magnitudes of local sea level rise to establish the frequency with which flooding is likely to occur in given locations.

Photo courtesy of Honolulu Police Department

With these flood simulations, the research team assessed critical infrastructure that is likely to fail and cause direct impacts, such as dangerous or impassable roadways, storm drainage inlets likely to fail or act as pathways for additional flooding, and non-functional or flooded cesspools.

The impacts were found to be widespread among Honolulu's heavily densified primary urban center.

"Because each type of flooding infiltrates through unique pathways, they will require unique engineering strategies to manage," said Habel. "The design of flood management strategies required to mitigate these impacts necessitate site-specific consideration of each mechanism to avoid being ineffective."

In partnership with the Honolulu Board of Water Supply, the University of Hawai'i, Hawai'i Sea Grant, and other stakeholders, the authors plan to develop a real-time coastal groundwater monitoring network. Data collected through the monitoring network will help improve the capabilities of the modeling such as the ability to incorporate the effects of extreme rainfall. The network would also provide information that could inform the development of short-, mid- and long-term flood management strategies.

HOW PROTECTING ʻŌHIʻA MEANS PROTECTING CORAL REEFS

By Kim Rogers, *Kauaʻi ROD Outreach Specialist*

Imagine an ocean reef bursting with color and life. Now imagine a forest exploding with greenery and life. At first, the two don't seem to have much in common. But upon closer examination, ocean reefs and forests are intricately connected.

According to a study by lead author Dr. Kuʻulei Rodgers with the Hawaiʻi Institute of Marine Biology's Coral Reef Ecology Lab, a significant positive relationship exists between the health of watersheds and their adjacent reef environments, especially for southerly-facing locations.

The land area through which water moves or drains to reach streams, rivers, and sea is called a watershed, and it's usually characterized by a bio-diverse forest. Healthy forests protect coral reefs by decreasing pollutants and sediment in runoff. The tree that knits Hawaiʻi's native forest whole is ʻōhiʻa (primarily *Metrosideros polymorpha*), our state's most abundant and revered native tree. Along with the dozens of native plants it supports, ʻōhiʻa serves as a sort of sponge in the forest, absorbing rain, refilling our aquifers, and holding sediment in place.

Photo courtesy of J.B. Friday

A flowering tree in the myrtle family, ʻōhia is endemic to Hawaiʻi. As an early colonizer after a new lava flow, it's known to break down rock into soil and serve as a foundational species of the forest. ʻŌhiʻa produce a dizzying display of flowers, made up of a myriad of stamen that range in color from fiery red to bright yellow. Growing to 100 feet and often living for hundreds of years, different species and varieties of ʻōhia have evolved over millennia to adapt to the numerous micro-climates found in Hawaiʻi, from sea level to as high as 9,000 feet elevation. ʻŌhiʻa grow as a stunted bush in bogs, on windswept hillsides, on lava flows, and as a tall canopy tree in lush rainforest habitats.

An estimated 350 million ʻōhiʻa grow across more than 800,000 acres in Hawaiʻi. Its prevalence is the likely reason how ʻōhiʻa embedded itself into Hawaiʻi's culture, both practically and spiritually, in traditional as well as modern times. Celebrated through chants, song and dance, the ʻōhiʻa wood is used for carving statuary and building, while the flowers and leaves are woven into lei.

Unfortunately, in 2014, a disease known as Rapid ʻŌhiʻa Death (ROD) was reported to be killing ʻōhiʻa. First detected on Hawaiʻi Island, ROD has killed an estimated one million trees across more than 175,000 acres of ʻōhiʻa forest. More recently, the disease was confirmed in more than 100 trees across Kauaʻi, in a scattering of trees on Oʻahu, and in one tree on Maui.

Photo courtesy of Kim Rogers

Two different species of previously unknown-to-science microscopic fungi are responsible for Rapid ʻŌhiʻa Death. The fungi grow in a layer of wood beneath the bark, clogging the tree's flow of water, turning leaves reddish-brown, and causing the tree to die. Burrowing beetles then arrive, boring into the dying wood and excreting a sawdust-like substance that can contain live fungal spores. This material easily blows in the wind and moves around the island via mud that's spread by humans and animals, entering other healthy trees through any wounds they may have.

You can help save ʻōhiʻa by cleaning your shoes and gear of mud before and after entering the forest; washing your vehicle of mud; avoiding the injury of ʻōhiʻa; and not moving ʻōhiʻa wood or ʻōhiʻa parts, including adjacent soil.

By protecting Hawaiʻi's native forests, particularly ʻōhiʻa, you can help to save corals, fish, and other marine life that make their homes in and around our ocean reefs.

Photo courtesy of J.B. Friday

NATIVE GARDENS AT THE AQUARIUM

The Waikīkī Aquarium is where Hawai'i's land meets the sea, and this is truly evident in our self-guided Hawaiian Plant Tour featuring endemic and indigenous coastal plants. We unveiled the self-guided tour in 2016 to enhance the visitor experience while showcasing just how vital native plants are not only to the Aquarium, but also to the land and sea.

Available either at the Aquarium or online, the tri-fold guide includes a map of where plants are located within the Aquarium, as well as descriptions of and various facts about each species. Among the 15 highlighted species are the native 'ōhi'a lehua (*Metrosideros polymorpha*), the kukui or candle nut tree (*Aleurites moluccana*), a large tree with nuts rich in oil and used to clear the ocean waters for fishing; 'ākia, (*Wikstroemia uva-ursi*), a native shrub with bark, roots and leaves that are used to release a narcotic for stunning fish; and milo or portia tree (*Thesesia populnea*), a canoe plant with flowers that resemble the open mouth of the puhi lau milo or undulated moray eel. You can access the plant guide at www.waikikiaquarium.org/experience/plants-seaweeds/hawaiian-plant-guide.

In addition to the Hawaiian Plant Guide, you can learn more about the beautiful native plants around the Aquarium—and how to draw them—by following talented Hawai'i nature artist Patrick Ching on Facebook @PatrickChingArtist. Archived on his page are numerous live drawing lessons that feature a variety of native plants like the dazzling 'ōhi'a lehua.

Photo courtesy of Patrick Ching

Native Hawaiian Plant Gardens Guided Tours

The Aquarium is pleased to offer a guided tour of our native Hawaiian plant gardens, presented every first and third Thursday of the month by volunteer Alice Roberts. Visit our website to learn more about the guided tour and when the next one is taking place!

Get Into Your Sanctuary Day Photo Contest

In celebration of Get Into Your Sanctuary Day on July 31, the Waikīkī Aquarium presents a special photo contest in partnership with the National Marine Sanctuary, featuring prizes from Pro Camera Hawaii and Huish Outdoors. Visit www.waikikiaquarium.org for contest details and information on how to enter.

LIFE ON THE EDGE – COASTAL PLANT RESILIENCE IN THE FACE OF SEA LEVEL RISE IN HAWAI'I

By Dr. Kasey Barton, School of Life Sciences, University of Hawai'i at Mānoa ////////////////////////////

Many people spend their time at the beach looking out at the waves, fascinated by marine life. But where the sea meets the land offers some of the most complex, dynamic, and stressful environments, fostering high biodiversity of species found nowhere else. Focusing on these tidal zones, the plants that grow on the terrestrial side, in the sandy dunes, become readily noticeable. Although these sandy dune environments are very narrow in distribution and area, they provide the habitat for some of the most diverse native plant communities.

On the island of O'ahu, coastal dunes are one of the few remaining places where plant communities are largely dominated by native species. Most other lowland habitats now include only invasive species, with native plants limited to high-elevation ridgetops. Some coastal dune plants like naupaka (*Scaevola taccada*) are probably recognizable to many as they are commonly used for landscaping in urban and suburban areas. Other common dune plants include pōhuehue, an indigenous morning glory (*Ipomoea pes-caprae*); pā'ūohi'iaka (*Jacquemontia sandwicensis*); and 'aki'aki grass (*Sporobolus virginicus*). Some coastal dunes in Hawai'i are also increasingly invaded by noxious species such as the thorned kiawe (*Prosopis pallida*) and the allelopathic ironwood (*Casuarina equisetifolia*).

Sandy dune plants play key roles in coastal ecosystems. They provide a critical habitat for coastal animals such as nesting seabirds and yellow-faced bees (*Hylaeus genus*). Coastal dune plants stabilize beaches, providing resistance during big storm and wave events, and they are culturally and aesthetically important for island people. Conserving native coastal dune plants is thus a conservation priority.

Coastal environments are inherently stressful for plants. High solar radiation, intense winds, and trampling from human activities pose persistent challenges to plant survival and growth. In addition, periodic and unpredictable events such as big storms and king tides can devastate dune habitats. These are routine stressors that coastal dune plants face and, as a consequence, they have evolved traits and growth strategies to maximize stress tolerance. However, coastal environments are changing, and dune plants are increasingly threatened by climate change and habitat loss due to coastal erosion. For low-lying coastal zones, sea level rise poses a serious threat, leading to increasing salt water intrusion below the sand where roots access freshwater lenses. A crucial question is whether coastal dune plants can tolerate increasing salinity, at least well enough to migrate inland as the sandy beaches erode due to sea level rise.

Globally, we know surprisingly little about salinity tolerance in coastal dune plants. It has been predicted that coastal dune plants are likely to be tolerant to high salinity given their proximity to the sea, but to test this, we must conduct experiments to compare plant performance (growth, survival, and reproduction) in high versus low salinity conditions.

My lab's research program in the School of Life Sciences at the University of Hawai'i at Mānoa focuses on the ecology of native Hawaiian plants. In particular, we investigate how plants cope with various stressors, measuring suites of traits involved in photosynthesis,

'Ilima seedling at Kaiwi Beach
(photo credit: Tiffany Lum)

leaf morphology, and biochemistry for insights into the mechanisms underlying stress tolerance. Since 2016, we have been investigating salinity tolerance in Hawaiian coastal dune plants with the goal of identifying species tolerant of increasing salinity that will be robust to climate change and ideal for restoration actions as well as vulnerable species that will need to be carefully managed and translocated to be conserved under future climates.

Using an experimental approach in the greenhouse, we have examined salinity tolerance in two widespread Hawaiian plant species: pā'ūohi'iaka (*Jacquemontia sandwicensis*) and 'ilima (*Sida fallax*). Plants were grown in pots filled with sand, and were either watered daily with tap water or seawater collected from the Ānuenue Fisheries Research Center. We assessed salinity effects throughout the life cycle of the plants to determine if developmental stage influences salinity tolerance. Surprisingly, neither species was fully tolerant of high salinity, and plants were particularly vulnerable during young stages (seeds and seedlings). Susceptibility during seed germination and seedling establishment could limit population persistence under future climate change, due to a failure of seedling establishment to replace dying plants.

While it seems counterintuitive for coastal dune plants to lack tolerance to the likely high salinity they experience regularly from salt spray and storms, these results reveal that salt tolerance is not necessarily a feature of coastal plants. Instead, it is likely that these species take advantage of regular rainfall that reduces salinity from the sandy substrate, providing windows of low salinity for high growth and reproduction rates, and then maintaining low metabolic activity during dry periods when salinity is high. Periods of low salinity will become increasingly rare in the future, which is likely to constrain dune plant performance.

Our current work continues to investigate salinity tolerance in Hawaiian coastal dune plants in collaboration with the Hawai'i Sea Grant Program, the National Tropical Botanical Garden, and Maui Nui Botanical Garden. We are also initiating field experiments to assess the effects of simulated coastal flooding on seed germination and seedling establishment when plants also face the other challenges of coastal habitats. Through these investigations, we hope to gain new insights into coastal plant ecology while contributing to coastal management efforts to conserve these captivating native ecosystems.

'Ilima and pā'ūohi'iaka in greenhouse salinity tolerance experiment *(Photo credit: Kasey Barton).*

MS Botany student, Kari Bogner, collecting photosynthetic data on pōhuehue at Bellows Beach *(Photo credit: Kasey Barton).*

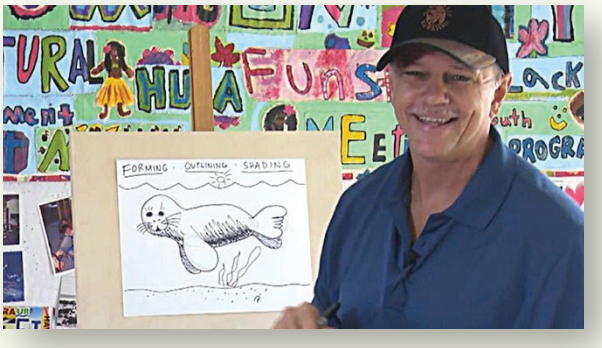
VIRTUAL EXPERIENCES AND ACTIVITIES

LEARNING REIMAGINED AT THE WAIKĪKĪ AQUARIUM

In an effort to keep keiki, parents, and educators engaged during the stay-at-home order, the Waikīkī Aquarium developed and launched a variety of free virtual experiences and online educational resources, allowing both residents and visitors to explore the rich ocean resources the Aquarium has to offer. The following new online experiences, live classes, and education videos are still accessible on our website and social media profiles @waikikiaquarium:

Marine Animal Drawing Lessons with Patrick Ching

This five-part series features 15-minute-long drawing sessions with talented nature artist Patrick Ching. The lessons were previously streamed live on Facebook Live and are now archived on the Aquarium website and social media pages. During the virtual lessons, Ching instructs keiki on how to draw a Hawaiian monk seal, shark, kilikili, dolphin, and turtle. The Marine Animal Drawing Lessons with Patrick Ching are sponsored by the Friends of the Waikīkī Aquarium.



The Aquarium Director

Also previously streamed live on Facebook Live, users were encouraged to submit questions in advance to ask Waikīkī Aquarium Director Dr. Andrew Rossiter. The videos are now archived on the Aquarium website and social media pages.

Ocean Spotlight Video Series

This three-segment series featured 15-minute spotlight talks with a variety of educational partners, including:

- Hawaiian Islands Humpback Whale National Marine Sanctuary
- University of Hawai'i Sea Grant
- NOAA Papahānaumokuākea Marine National Monument
- National Oceanic and Atmospheric Administration (NOAA) Fisheries
- Hawai'i Institute of Marine Biology

Waikīkī Aquarium Webcams

For the ultimate immersive experience, we installed three webcams, sponsored by FOWA, throughout our facilities to showcase our diverse marine life. Current Aquarium webcams can be accessed on our website and showcase the Hawaiian monk seal Hō'ailona, the south shore of Waikīkī, and the Aquarium Galleries.

Visit www.waikikiaquarium.org/experience/virtual to access these amazing online resources!

ANNOUNCING OCEAN CLASSROOM

In an effort to provide educators and parents with meaningful and engaging content for their keiki in the summer months, we partnered with NOAA's Hawaiian Islands Humpback Whale National Marine Sanctuary to launch Ocean Classroom, a five-part interactive series with educator Patty Miller that began on June 24 and continues every Wednesday through July 22.

Patty Miller is a widely regarded Hawai'i educator who currently serves as educational specialist of NOAA's Hawaiian Islands Humpback Whale National Marine Sanctuary. During the Ocean Classroom series, Miller presents fascinating scientific content while sharing hands-on activities for students. The following Ocean Classroom session will broadcast live at 9:30 a.m. on the Waikīkī Aquarium Facebook page @waikikiaquarium and will be accessible via the Waikīkī Aquarium website:

Oceanography 101: July 22, 2020

Learn about what makes ocean currents, why the ocean is salty, and where sand comes from.

Previous lessons covered topics such as "Humpback Whales 101," "Threats and Adaptations," and "Survival in a Coral Reef." You can view all past Ocean Classroom lessons with Patty Miller on the Waikīkī Aquarium Facebook page @waikikiaquarium and on the Waikīkī Aquarium website at www.waikikiaquarium.org.

SCAVENGER HUNT

Living Reef

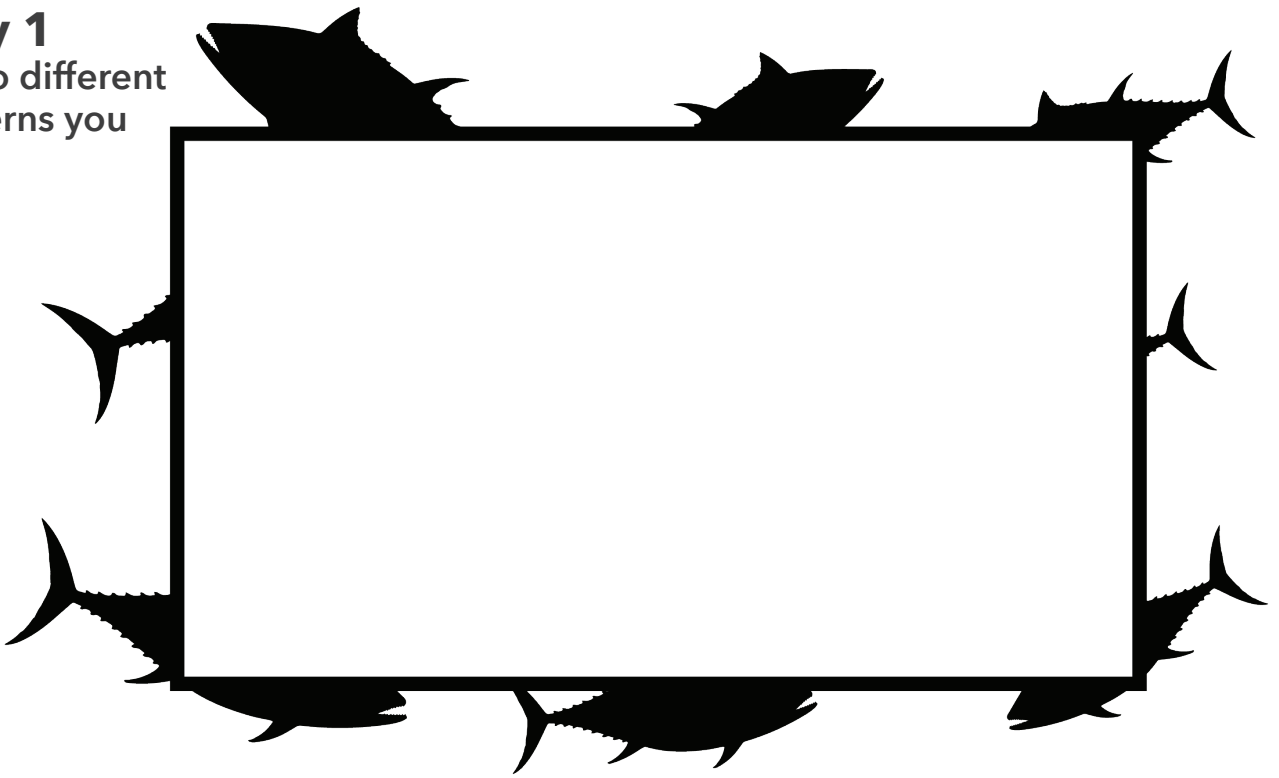
Name 3 types of coral structure.

1. _____
2. _____
3. _____

Answer: pate-like, branching, encrusting, free-living, columnar, massive, foliaceous

Gallery 1

Draw two different fish patterns you see



Gallery 4

The eggs of the _____ hatch in Native Streams and the hatchlings are carried downstream to the ocean. They later migrate upstream to return to their adult habitats.

Answer: Hawaiian Sleeper Goby

Outside exhibits

What is the name of the monk seal at the Aquarium?

_____

Answer: Ho'ailona

NEW & RENEWING MEMBERS

Amanda O'Kelly
Arthur & Susan Randell
Robert & Kaily Smitson
William & Maureen Kilcoyne
Angela Avicolli
Sharon Sussman
Travis Arita
Erik & Christina Wierschem
Gary Hashiro
Robert & Jessica Zahn
Andrew & Barbara Endo
Clinton & Kristen Ono
Jean-Pierre & Lynn Cercillieux
Joseph & Valerie Chang
Kimberli & Steve Pearman
Mr. & Mrs. Scott C. Rolles
Mr. & Mrs. Reggie Yamada
Terry Klenske
Alan Obara
Kelli & Jack Miller
Antonia & Francis Papica
Dr. Frank Lutz
Giovanni Sclarandis
Michael Yoneshige
Robert & Chansy Hail
Mr. & Ms. Kenika Terlep
Cliff & Tamara Montgomery
Edison & Jamie Mow
Frank & Virginia Jordan
Jeffrey & June Watanabe
Kris Robison
Robert & Tara Oda
Thomas & Ami Yamachika
Dr. & Mrs. Wayne B. Batzer
Aaron & David Parks
Aaron & Rose Buelow
Alan & Jennifer Condor
Alana Enos
Allen & Emily Jones
Alyssa MacDonald
Andrew & Marie Alt
Andrew & Teri Le
Angelica Dumlao
Angie Baldwin
Antony Tam
Ashley Edwards
Barbara Gearen
Brahma & Michelle Furtado
Caitlin Yamamoto
Cavan Loughran
Chad & Varissa Pata
Cherie-Lyn Delima
Christian Mendez
Colleen Yoshino
Corinne & Angela Bousquet
Dale Namduang
Daniel & Samantha Kunimura
Daniel Ichikawa
David & Christie Ansdell
Derek Mito
Dingyi & Devon Wu
Don Minnis
Douglas & Charlene Oshiro
Duane & Mei Shikiya
Dylan & Jillian Bird
Elvar & Claire Esrason
Emmanuel David & Jillian Amy Anderson
Gabriel Motonaga
Gary & Carolyn Weaver
Gary Dymally
Herbert & Ashley Dietrich
Howard Wolff
Huanqi & Hongping Chen
Jack Long
Jackie Moore
James & Jangeun Oh
Jason & Cherilyn Polliard
Jeff Phung
Jeffrey & Colette Lee
Jessica McBride
John & Elyse Korth
John & Kristin Cunningham
Jon Patterson Gates
Josh & Kiko Krzyzewski
Justin & Keiko Kong
Justin Gideon
Kara White
Kathleen & Jason Makiaokalani
Katie Uehara
Keith & Hope Hashimoto
Kenneth Shimabukuro
Lars Tanaka
Lauren Danner
Maegan Ruggles
Mark & Charlene Sagapolutele
Mark Forgach
Mark Tarone
Mary Calantoc
Mason & Diane Drew
Melanie Munns
Michael & Jessica Caracciolo
Michael & Staci Jane Maeda
Michael China
Michelle Gonzalez
Motoki & Yuki Matsuura
Ms. Iris Dowson & Mr. Ryan Chang
Nathan Noonan
Nerolie McDonald
Raymond Ho
Renee & Andrew Burke
Ricky Kiyuna
Ronald & Jillian Galindo
Russell & Lauren Rolland
Samuel & Leslie Tsappidi
Shane & Jaime Perry
Sid & Sarah Yee
Stan & Sandra Staunton
Suzanne & Heather Rempfer
Ted & Marjorie Mala
Tomoyuki Okawa
Travis Hong
Valentin Dooley
William & Kristina McMullin
William Kaminski

FOWA BOARD SPOTLIGHT: CHRIS COLE

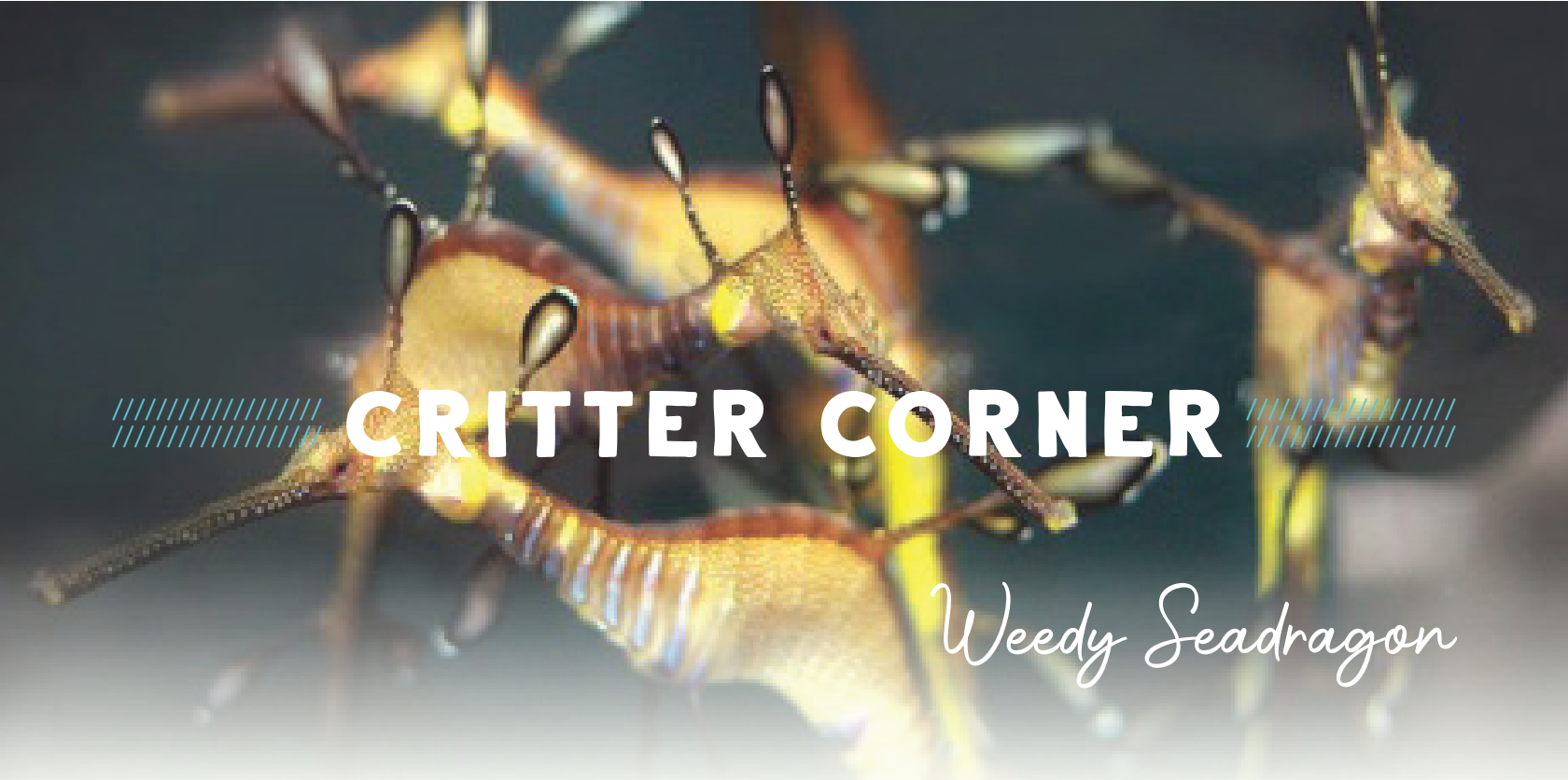
Chris Cole,
Co-Chair of the Friends of the Waikīkī Aquarium Board of Directors

This issue we're shining the spotlight on Chris Cole, Co-Chair of the Friends of the Waikīkī Aquarium Board of Directors. A partner at Marr Jones & Wang, Cole has also been a longtime supporter of FOWA, and we're fortunate to have his leadership at the helm of our non-profit organization.

"I've been enthralled with the Waikīkī Aquarium and its unique exhibits since I first visited as a young boy on a school field trip in the 70s," Cole recalled. "After that first experience, whenever our family visited Waikīkī following the long drive from the North Shore, we always went to Sans Souci Beach, now known as Kaimana Beach, and stopped at the Aquarium."

When asked what he loves most about the Aquarium, Cole pointed to its roots. "I love that its iconic traditions are steeped in scientific development and discovery, including naming of new species and cutting-edge live coral exhibits and propagation," he said. "I also love the Aquarium's focus on childhood education and community-based programs, all of which have instilled in my three children a lifelong love of the ocean and its creatures."

As for his favorite marine animal? "It's definitely the Tiger Cowrie!"



CRITTER CORNER

Weedy Seadragon

The weedy seadragon

(*Phyllopterus taeniolatus*) is found only in the chilly waters of Southern Australia and Tasmania, where ocean temperatures seldom rise above 65 degrees F (18 degrees C). Within its definitive habitat of algal beds and rock reefs, the species is found from depths of 10 to 165 feet (3 to 50 m), where it cruises and hovers as it sucks crustaceans from seaweed surfaces and the surrounding water.

What makes this amazing dragon a fish? The weedy seadragon is a relative of the pipefishes and seahorses, all of which are members of the Family Syngnathidae. This group of tube-snouted fishes shares some unique adaptations and looks decidedly un-fishlike. For starters, they all have the distinctive tubular jaw that opens rapidly to suck in prey. They also have bony plates that sheath the body in an armor-like casing. Reduced pectoral fins are set just behind the gill cover on the head and are barely detectible, while the transparent dorsal fin is set far back on the body and undulates fan-like, providing the propulsion that allows the fish to glide over the seafloor. All other fins are reduced or gone!

Perhaps the most unusual syngnathid feature involves the way they reproduce. Sygnathids incubate their eggs on their bodies, holding clutches of eggs between modified fins, embedding them in special skin patches or enclosing them within pouches. And in the seahorses—most pipefishes and seadragons—it's the males that brood the eggs after receiving them from the females! (Happy Father's Day!)

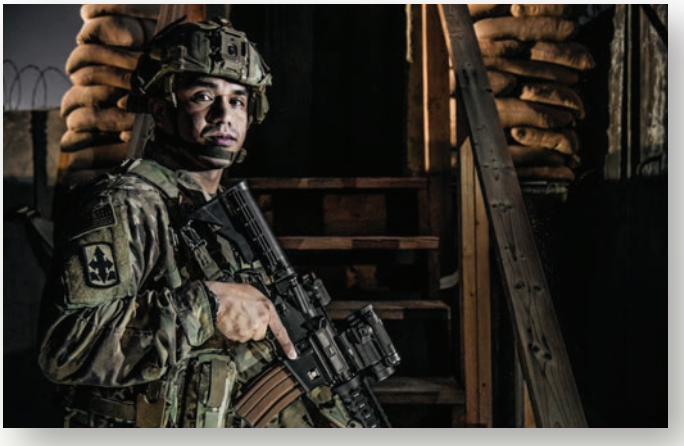
Even in a group of fishes known for being unusual, the weedy seadragon pushes the envelope. It is among the largest of the seahorse allies, reaching lengths of nearly 18 inches (46 cm). Its camouflage is intriguing, ribbon-like tabs, called cirri, sprout from its skin and make it hard to recognize as a fish. The scientific name records some of these characters: phyllo means leaf; pteryx is wing; and taeniolatus means broad ribbon. The colors of weedy seadragons vary with age, diet, location and, perhaps, behavior. Those on exhibit at the Waikīkī Aquarium are cream and gray with black edging and patches of fine yellow spots on the head and mid-body. Others range from yellow to reddish-orange with blue stripes on the belly side and patches of yellow-white dots on the upper surface.

There is still much to learn about the weedy seadragon. No one even knows exactly how many exist in its native Australian waters. But one thing's for sure—this species is rare, and the Australian government has taken steps to ensure its protection. Collecting is strictly regulated, but biologists have been able to raise them in captivity. From this research, scientists have learned that the weedy seadragons may live up to 10 years. When mature, they reproduce one or two times each year, and females may produce up to 300 eggs per clutch. Females transfer the eggs to the male, where they are brooded in a special skin patch on his abdomen for two months.

The care and feeding of seadragons is demanding, requiring cool conditions and special food. Among aquarium professionals, seadragons are known as challenging to maintain. Waikīkī Aquarium obtained our dragonettes from an Aquaculture program in Australia. The seadragons are fed live mysis shrimp, by hand, two to four times per day.

VOLUNTEER & STAFF SPOTLIGHT

VOLUNTEER SPOTLIGHT: KAINALU KAMAI

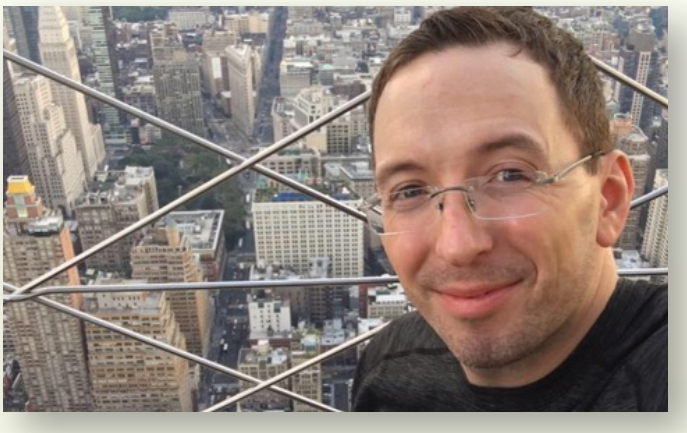


Aloha everyone! It has been well over a year since the last time I worked my volunteer shift at the Aquarium. For those of you who don't know, I am a Hawaii Army National Guard soldier with nine years of service and one deployment, joining back in 2011. I've been with the Waikīkī Aquarium as an Edge of the Reef volunteer since 2013. In April 2019, our unit, the 1-487th Field Artillery 'Hiki No' Battalion, was called to deployment missions in Afghanistan in support of 'Operation Resolute Support' and 'Freedom's Sentinel.' Our mission was to provide C-RAM (Counter-Rocket, Artillery and Mortar) missions using the Army's LPWS (Land-Based Phalanx Weapons System). In simpler terms, our main role during deployment was to protect US coalition, civilians, and important assets on military bases from enemy attacks involving indirect fire.

Throughout our time in the region of Afghanistan, we experienced two different indirect fire attacks on September 11 and October 11. On both days, I was on the same LPWS gun site that engaged the enemy rockets that attempted to inflict damage on our base. Our guns were able to deflect and destroy each rocket that came in, resulting in no injuries or damages to any structures. We were definitely on our guard 24/7 because we didn't know when the enemy would attack us. We had to deal with both Taliban and ISIS, who also often fought each other to control the region. Life there was drastically different, but we were safe regardless of what was going outside the base.

After Afghanistan, Alpha and Charlie Battery was called to deploy to Iraq, given the ongoing threats with Iran, to defend the airbase that was attacked by Iranian-backed rebel forces. Due to political reasons with Iraq's government, we never set foot in Iraq and waited in Qatar on standby. From there we were well aware of the coronavirus outbreak, which was still affecting China at the time. As we got to Kuwait, we were stuck there for almost a month due to the severity of the pandemic. We finally made it back on Hawai'i on April 15, 2020 after a two-week quarantine in New Mexico. All I can say now is that I'm so glad to be back home, even if life here is very different than what it was before.

STAFF SPOTLIGHT: MATTHEW "MATT" HILLER



We're excited to spotlight Matthew "Matt" Hiller, our new Gift Shop Assistant at the Waikīkī Aquarium. Originally from Syracuse, NY, Matt joined our Aquarium 'ohana in February, and although we temporarily closed our doors shortly after his start date, he's nonetheless made some truly valuable memories during his time at the Gift Shop.

"Though I was only at the Aquarium for five weeks before our temporary closure, I still had the pleasure of interacting with guests from around the world," said Matt. "One of my favorite memories was when I befriended a little girl named Haru, the daughter of a FOWA member who brings the family to the Aquarium frequently. She had a blast playing this game in which she would run over and show me a small octopus toy then hide it somewhere in the Gift Shop. When she would leave she'd always say, 'Bye Uncle!' and in my 13 years years of living in Hawai'i, this was the first time anyone had called me Uncle!"

During his time in Syracuse, Matt pursued web design and internet advertising. After vacationing in Hawai'i 13 years ago to escape the snow, he loved it so much that he ended up staying! He spent the past few years self-employed and working at home before deciding it was time to explore new opportunities and be a part of something again.

As for his time at the Aquarium, Matt has nothing but positive things to say. "I truly enjoy the energy at the Aquarium," he said. "As soon as you walk in the door, you feel the inquisitive energy of the kids enthralled by all the animals, and the passion of the volunteers who are there because of their love of the ocean and community. My coworkers are also very friendly and come from many fascinating backgrounds. As someone who's joined the workforce after being self-employed for so long, I'm grateful to be part of such a positive workplace."

Welcome to the Aquarium 'ohana, Matt! We're so grateful to have you as part of our team.

FACILITY UPDATES: WAIKĪKĪ AQUARIUM REOPENS ITS DOORS

Welcome back to the Waikīkī Aquarium!
It's so good to "sea" you.

In response to new guidelines issued by Governor David Ige and Honolulu Mayor Kirk Caldwell, we were thrilled to reopen our doors to the public on Monday, June 29. We also had the privilege of welcoming Hawai'i's healthcare workers and their immediate family to explore the Aquarium for free a week prior to our public reopening.

Accompanying our reopening are a variety of new health and safety restrictions still in place for the foreseeable future. Until further notice, tickets may only be purchased online and in advance, with a maximum of 50 guests per pre-scheduled time period allowed at the Aquarium.

If you're planning on visiting the Waikīkī Aquarium, we kindly ask that you note the following new restrictions and safety protocols:

- When visiting the facility, face masks must be worn at all times by all visitors over the age of two. For guests who don't come prepared, face masks may be purchased at the Aquarium Gift Shop.
- Hand sanitizer stations are now positioned throughout the facility.
- Custodial staff wipe down and sanitize high-touch areas several times throughout the day.
- Guests are required to obey signage requiring a six-foot distance between individual visitors or different groups.
- Touch screens, informational kiosks and other high-touch technologies will be decommissioned until further notice.
- Clear acrylic barriers are now in place at the Front Desk and Gift Shop to minimize the potential spread of virus among guests, staff and volunteers.

"As always, the health, safety and wellbeing of our guests, staff, and volunteers remains our top priority as we transition to this reopening phase," said Dr. Andrew Rossiter, director of the Waikīkī Aquarium. "By implementing a variety of safety precautions and new initiatives, we're confident that we can welcome the community to explore the majestic wonders at the Aquarium in a safe and enjoyable way."

Reservations Required! Please visit www.fowaquarium.org for detailed instructions on how to make your reservations.

FRIENDS OF THE WAIKĪKĪ AQUARIUM UPDATES

MAHALO TO OUR HUKI CAMPAIGN DONORS!

From the bottom of our hearts, we thank each and every one of you who donated to FOWA through the Huki campaign! Since we launched the campaign in March, we've received over $28,000 donations to date. We're blown away by the tremendous contributions we've received, and are so grateful for the community's support. But we still need your help.

In response to a growing need to cover operational expenses typically funded through admission revenues, we're encouraging the public to support the Aquarium through a direct donation or by becoming a FOWA member. With every donation of $25 or more, you'll receive a custom FOWA dry bag for your outdoor adventures. For more information or to make a donation, please visit www.fowaquarium.org. We hope you will consider supporting us as we work to "huki" and pull the Aquarium through this challenging time!

VISIT THE FOWA WEBSITE FOR EDUCATIONAL CONTENT

We've been hard at work on our new Friends of the Waikīkī Aquarium website, and it shows! When you visit www.fowaquarium.org, you can access a variety of engaging, educational content, such as videos of past **Distinguished Lecture Series** lectures. Sponsored by Matson and Hawai'i Public Radio, our ongoing Distinguished Lecture Series (DLS) is a free community lecture series featuring some of the top scientific researchers in their fields. Past lectures are now accessible online – simply visit our website to learn more about our beautiful marine environment and the many ways our actions affect the oceans that surround us.

This summer, we also had the privilege of launching a **new partnership with Susan Scott**, a locally renowned writer of marine-related organisms and topics. For decades, Scott's "Ocean Watch" articles were a weekly feature in the Honolulu Advertiser and Star-Bulletin. She now has her own blog and is allowing us to feature her articles in our FOWA Member communications and website.

In line with the continued search for educational content for keiki and adults alike, please visit our FOWA website at www.fowaquarium.org to take advantage of these bountiful resources.

FOWA ART CONTEST RESULTS

Mahalo to everyone who participated in the FOWA Art Contest! In an effort to keep keiki and families engaged during the stay-at-home order, we encouraged members of all ages to submit a drawing of their favorite marine animals for the chance to win a FOWA dry bag, the perfect accessory for beach gatherings and other outdoor adventures. Every week through May, we selected five random winners to receive a dry bag. Below are the talented emerging artists.

Amethyst N.: FOWA Member, Age 10
Auriele (age 8), **Elias** (age 5), & **Wyatt** (age 4): FOWA Members, siblings
Derek Mito: FOWA Member
Dexter, Age 5
Elias: FOWA Member, Age 8
Ellie Duca: FOWA Member, Age 6
Jack Pellett, Age 10
Jordyn (age 11) & **Saige** (age 10): FOWA Members, siblings
Kai S.: FOWA Member, Age 2
L. Lee, Age 8
Landon (age 7) & **Lance** (age 6): Brothers
Liuafi, Age 7
Maya: FOWA Member, Age 5
Megan Mueller: FOWA Member, Age 12
Meini Sadri: FOWA Member, Age 7
Millie Ng: Waikīkī Aquarium Volunteer
Milo (age 6), **Max** (age 4), & **Mateo** (age 2): FOWA Members, brothers
Naru Elliott: FOWA Member, Age 6
R. Lee, Age 11
Richard Lam, Age 7
Riley T., Age 6
Savannah R. Kerber, Age 8
Thomas: FOWA Member, Age 7
Tiger: FOWA Member, Age 5

Visit our website at www.fowaquarium.org/fowa-art-contest to view all of our weekly winners.

SEA WALL OF FAME

MAHALO TO OUR PARTNERS

Mahalo to the Freeman Foundation

Since our founding, the Waikīkī Aquarium has remained committed to providing valuable education for the people of Hawai'i through our School Programs, docent-led tours, and special educational presentations. Today, educational outreach remains crucial to our work at the Aquarium, and we're proud to partner with incredible organizations like The Freeman Foundation to offer educational programs for the local community.

For the past 11 years, education has been at the forefront of our partnership. The Freeman Foundation was instrumental in underwriting an educational module with transportation and lunch for elementary school students, and in this new chapter of our partnership, we're pleased to expand the program to provide small group, experiential learning for middle school students in Title 1 schools. We are so grateful for their generous support, and look forward to our fruitful collaborations for years to come.

Mahalo to Urgent Island Restoration & Cooke Foundation

URGENT ISLAND RESTORATION
Fire Flood Mold | Quality Service, Peace of Mind

Cooke Foundation, Ltd.
In honor of their Centennial Celebration

Mahalo to Boy Scouts Troop 304

Gabriel Estrada, Life Scout; Daniel Estrada, First Class Scout; and Boy Scouts of Troop 304 spent over 215 hours collecting nearly 260 pounds of recyclables, which enabled them to secure $230.85. They donated this money to the Waikīkī Aquarium. Mahalo for supporting the Aquarium and caring for our 'āina!

Save the Date: Arts Unmasked, Friday, October 30, 2020

A Fundraiser for the Waikīkī Aquarium: **Friday, October 30, 2020.** Indulge in an artistic evening at the Aquarium during our Arts Unmasked! Enjoy gourmet food, entertainment, and the opportunity to purchase beautiful artwork by some of Hawai'i's most talented artists. Stay tuned for ticket details and more information!

SEA WALL OF FAME DONATIONS

Lionel & Christine Aguiar
Qasim Kai S.
Megan & Anthony Alvarez
R. Arasaki
Patricia Augustine
Helen Baroni
Dr. & Mrs. Gardner Bemis
Werner Beuggert
Donna Brown
City & County of Honolulu
Cades Schutte LLP
Margaret Camacho
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Elaine Chang
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Albert Chun
Elizabeth R. Conklin
M. Gay Conklin
Cooke Foundation
Judy Cordel
Lois Crozer
Bobby & Lei Cunningham
Mary Doi
Charles & Jean Ehrhorn
The Elrod Family (Todd, Jennie, Riff, Bodhi & baby E)
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Andrea Wagner
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Melinda Walker
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Robert & Jennifer Whitton
Sandy Wong
Judith Wright
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WAIKIKI AQUARIUM
UNIVERSITY OF HAWAI'I

FRIENDS OF THE WAIKIKI AQUARIUM

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RESERVATIONS REQUIRED - GET YOUR TICKETS TODAY!

In order to maintain a safe, contained and socially distanced environment, the Waikīkī Aquarium has implemented new protocols for admissions. Until further notice, tickets may only be purchased online and in advance, with a maximum of 50 guests (per pre-scheduled time period) allowed at the Aquarium.

FOWA Members can visit www.waikikiaquarium.org to register an account and make online reservations.

Detailed instructions can be found on our website at www.fowaquarium.org/make-your-reservations.