



*Hawaiian*

LUNAR CALENDAR

2011-2012

*Moku 'Okana O Hilo • Moku O Keawe*



**Western Pacific Regional  
Fishery Management Council**

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## About This Calendar



This Hawaiian lunar calendar features the work of the junior and senior high school students attending Ke Ana La'ahana Public Charter School, located in the ahupua'a of Honohononui, in the moku 'okana (district) of Hilo, on the Moku O Keawe (island of Hawai'i). These students are trained by kumu (teacher) and kia'i loko (fishpond caretaker) Roxane Stewart to be kia'i loko as part of their science curriculum at the Hale O Lono fishpond located across the street from their school grounds.

As part of their kia'i training during the 2010-2011 school year, students monitored the growth cycles of flora and fauna in addition to monitoring water quality at the fishpond. The data was analyzed to identify trends, correlations and significant events. Some of the findings from this year-long study are shared here in this calendar according to the time of the year the event was observed. The students (now seniors) are continuing to monitor growth cycles while training the juniors to become the new kia'i loko who will carry on the seniors' kuleana (responsibility) once they graduate.

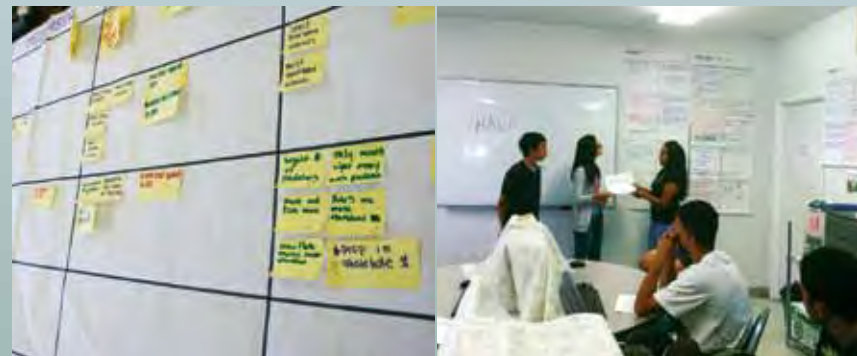
This 2011-2012 lunar calendar project was overseen by Kalei Nu'uhiwa, the first master's degree graduate of the University of Hawaii at Mānoa's Kawaihuelani Center for Hawaiian Language. Kalei's primary discipline is papahūlilani, the study of all aspects of the atmosphere—its energies, cycles and isochronisms.

The calendar was produced by the Western Pacific Regional Fishery Management Council, with funding support from the NOAA Coral Reef Conservation Program. The Council was created by the US Congress

in 1976 to manage fisheries in federal waters (generally 3 to 200 miles offshore) in the US Pacific islands. The Council began working with communities in Hawaii, American Samoa, Guam and the Commonwealth of the Northern Mariana Islands to produce traditional lunar calendars in 2006, as part of its shift from species-based to ecosystem-based management of fisheries. Through the ensuing years, the importance of managing natural resources at the moku level has surfaced, and the Council has become a strong supporter of the traditional Aha Moku process of management. This process provides an avenue for cultural and community consultation, adaptive management, education, generational knowledge and a code of conduct.

This year's calendar features observational sheets to encourage fishermen, students and others to reconnect with their environment through observation. It also promotes the use traditional place names that have fishing and resource management significance.

The Council coordinator for this project was Sylvia Spalding, under the leadership of Kitty Simonds, executive director, and in consultation with Charles Ka'ai'ai, indigenous coordinator. The tide charts were produced from data provided at the NOAA Tide Predictions website at <http://tidesandcurrents.noaa.gov>.



## Lonoikamakahiki

November is the start of the Makahiki season and a new lunar year. The Makahiki season starts with the rising of the constellation Makali'i (Pleiades) at a certain point of the horizon and ends in February. In these four months, a white *lepa* (flag) was erected to announce the start of the season. It is a time for rest and games. War was set aside; work was forbidden; and everything was at peace. The Makahiki was made in honor of Lonoikamakahiki, and each month required strict ceremony. At this time, taxes were collected from each family to provide for the *ali'i* (royalty) and his *kahuna* (priests).

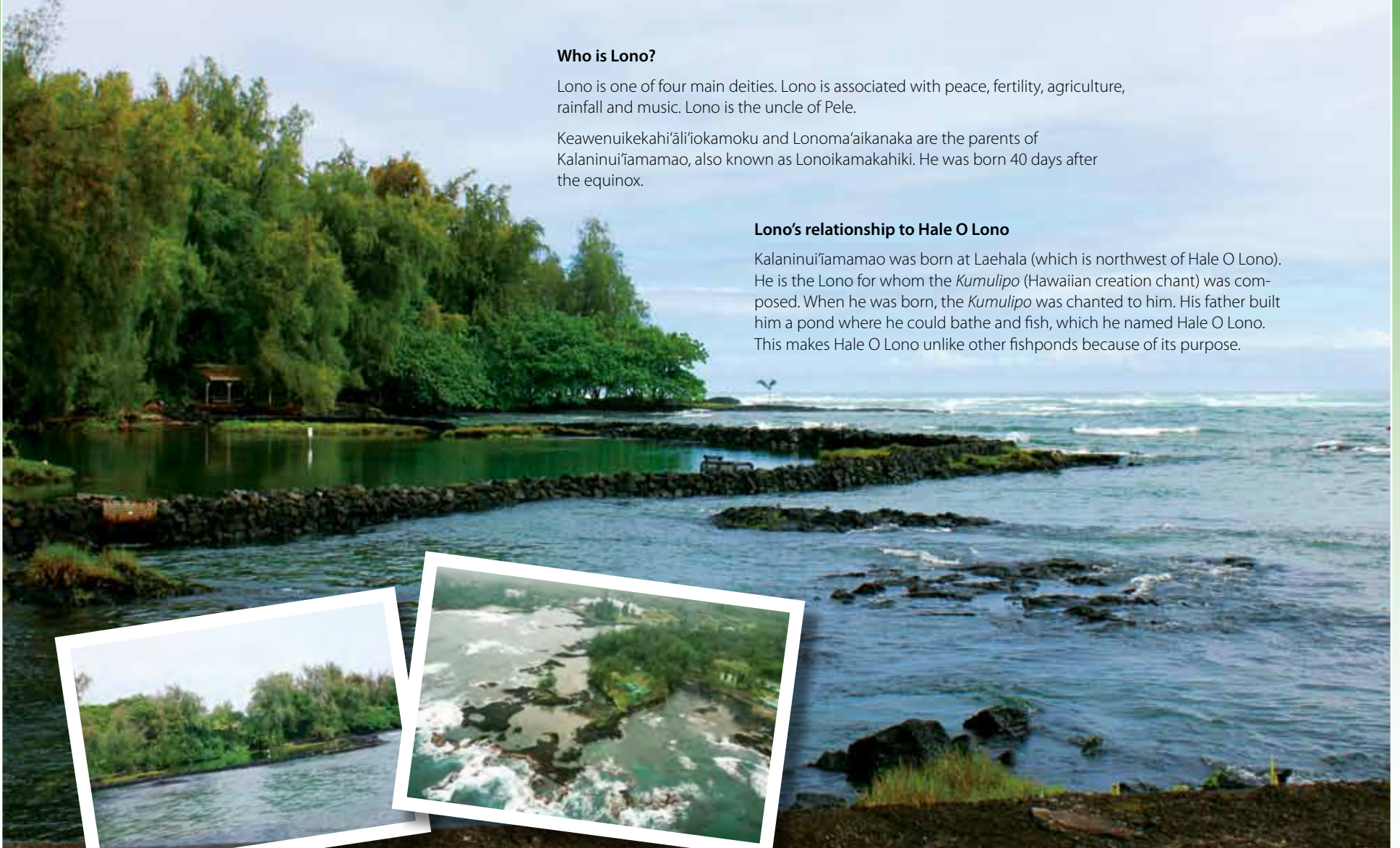
### Who is Lono?

Lono is one of four main deities. Lono is associated with peace, fertility, agriculture, rainfall and music. Lono is the uncle of Pele.

Keawenuikekahi'āli'iokamoku and Lonoma'aikanaka are the parents of Kalaninui'iāmamao, also known as Lonoikamakahiki. He was born 40 days after the equinox.

### Lono's relationship to Hale O Lono

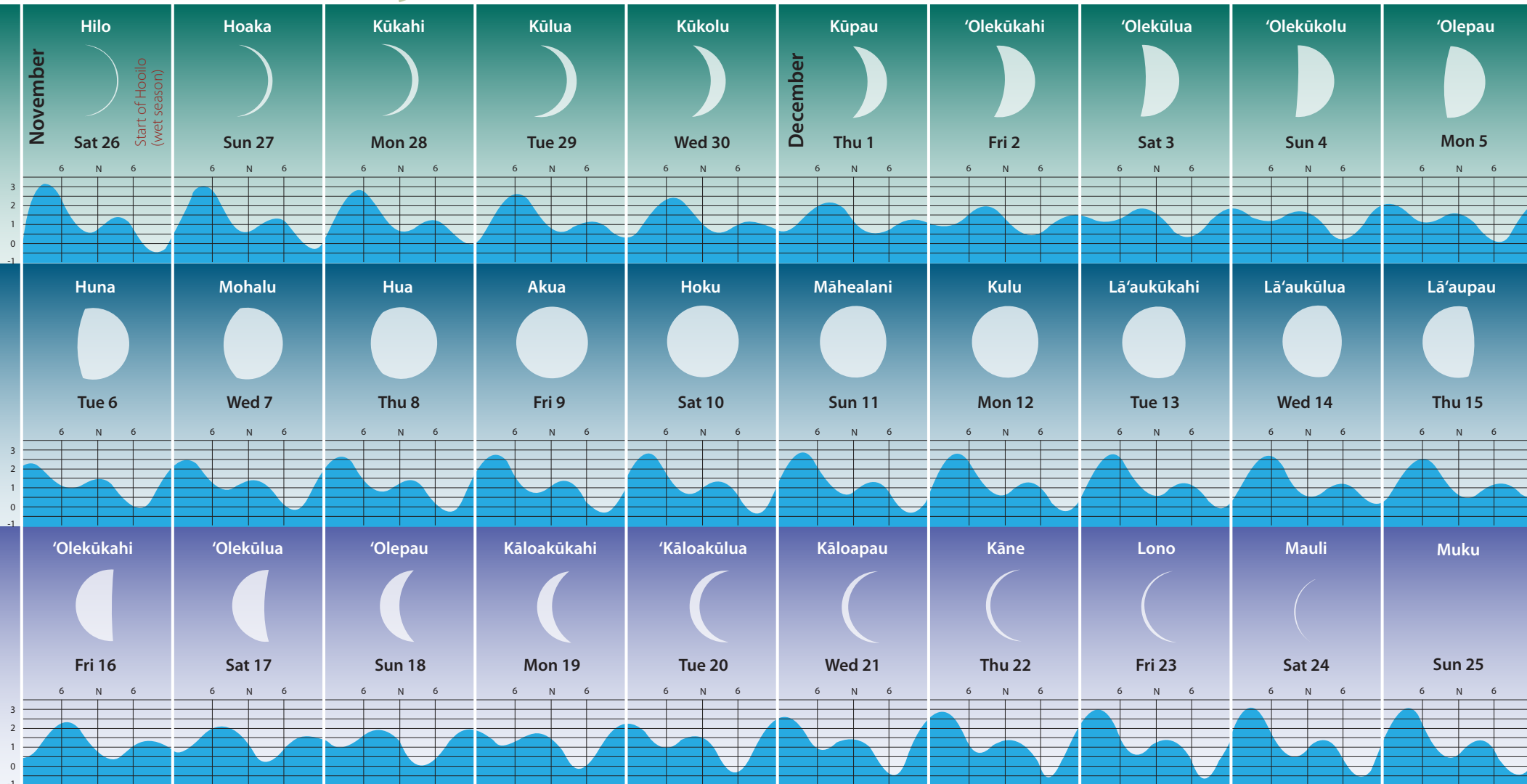
Kalaninui'iāmamao was born at Laehala (which is northwest of Hale O Lono). He is the Lono for whom the *Kumulipo* (Hawaiian creation chant) was composed. When he was born, the *Kumulipo* was chanted to him. His father built him a pond where he could bathe and fish, which he named Hale O Lono. This makes Hale O Lono unlike other fishponds because of its purpose.





# Welehu

## November-December 2011



### Highlights



November had the highest amount of rainfall at 10.28 inches, which is what we would expect because Lono is the deity of rainfall.



In October, the naupaka had an average of 113 flowers. In November, all of those flowers turned into seeds.

### ‘Ōlelo No‘eau

#### Le‘a ke kau ‘ai

*The time for food is pleasing.*

One can eat with pleasure—there are no wars, just peace.

## Most Reef I'a

November and December are when we experience high surf that can affect the stability of the outer rock wall. These waves can loosen the rocks, and the wall can become unstable.

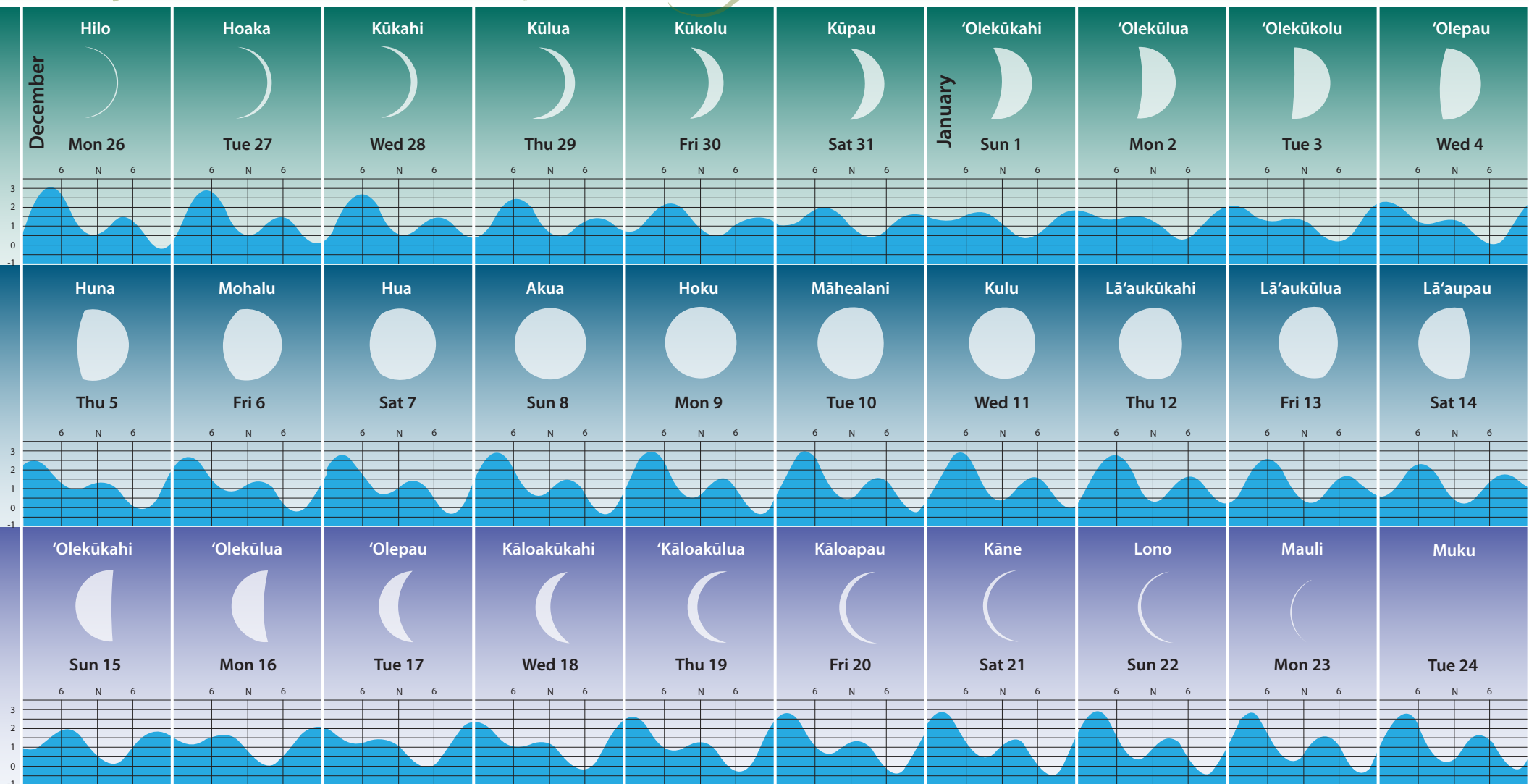
The diet of āholehole primarily consists of algae and tiny crustaceans. Manini only feed on algae. Both fish spend most of their day grazing on the rocks.

We've seen a significant increase in the overall number and the variety of reef fish in our big pond over the past two years.



# Makali'i

December 2011-January 2012



## Highlights



December had the highest number of mullet pua (fry) and pua 'ama (fingerling).



During the winter months when there is snow on Mauna Kea, our water is very cold because the freshwater springs are fed by water coming directly from the mountain.

## 'Ōlelo No'ēau

Kapeku ka leo ke kai, 'o Ho'oilō ka malama.  
When the voice of the sea is harsh, the winter months have come.

—First uttered by Hi'iaka



### **Hapawai**

- This month had the most amount of babies observed.
- In general, the spawning season for hapawai is from November to January.

### **'Ōpae**

- Baby 'ōpae were most abundant.
- Possible spawning occurred in November.

### **'A'ama**

- The least amount of 'a'ama were recorded.
- A large amount of baby 'a'ama was observed

### **Mullet**

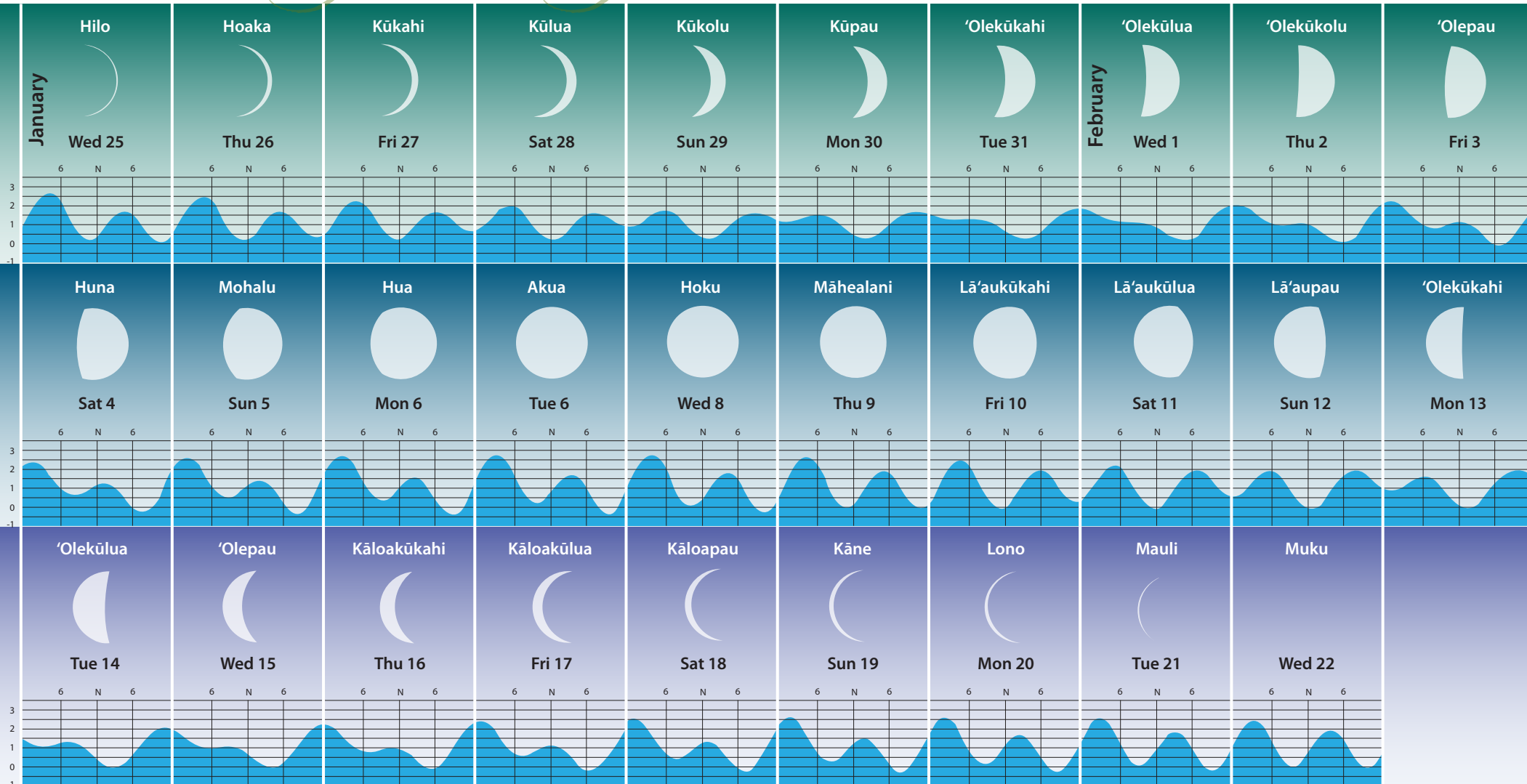
- This period had the most amount of kahaha (hand size) schools





# Kā'elo

January-February 2012



## Highlights



The eggs of the hapawai are white.



The black 'a'ama can only be found in Hawai'i.

## 'Ōlelo No'eau

'A'ohe lolena i ka wai 'ōpae.

*There must be no slackness when one gathers shrimp in time of a freshet.*

*Let there be no slackers when there is work to be done. Lazy people don't get anywhere.*

## **Tsunami of February 27, 2010**

The tsunami was generated from Chile's magnitude 8.8 earthquake.

Hale O Lono's outer pā broke in four places.

Water continued to inundate and recede long after the "all clear" was given.

It took three months to clean Hale O Lono of all the debris and mud brought in by the tsunami.

The sluice gates leading to the inner ponds were destroyed.

Much of our mullet stock was lost.

Hale O Lono became susceptible to predator and invasive species such as kākū, puhī, 'ōmilu, mangroves and new limu species.

It's taken over a year for the ecosystem to recover and stabilize.





## February-March 2012



## 'Ōlelo No'eau

**Ai puhi i ke kai pi'i.**  
*When the tide comes up it's time to eat puhi.*

### **Tsunami of March 11, 2011**

Hale O Lono had just recovered from extensive damage sustained in the February 2010 tsunami.

A tsunami was generated on March 11, 2011, from an earthquake in Japan reaching a magnitude of 9.0.

The outer pā of Hale O Lono was broken in two places.

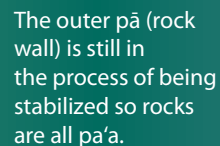
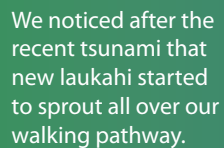
The interior of all Hale O Lono's inner ponds were untouched.

Water continued to fluctuate throughout the day, though not as significantly as it did during the 2010 tsunami event.





*March-April 2012*



**Iliki ke kai i ka 'ope'ope la, lilo; i lilo no he hawawa.**  
*The sea snatches the bundle and it is gone; it goes when one isn't watchful.*  
 A person who fails to watch out often loses.

## Pō Mahina Correlations

The moons have great significance to Hawaiians. We found several plant and animal moon correlations.

Whenever we did our surveys and found the ū'ū to be most abundant, we had full moons prior to the survey date.

Milo and false kamani seeds and naupaka flowers at Hale O Lono are most abundant during full moons.

Our mullet spawn during the full moon. Mullet fry (babies) are most abundant during full moons.

**Kamali'i 'ike 'ole i ka helu pō: Muku nei, Muku ka malama; Hilo nei, kau ka Hoaka**

Children who do not know the moon phases: Muku is here, Muku the moon; Hilo comes next, then Hoaka

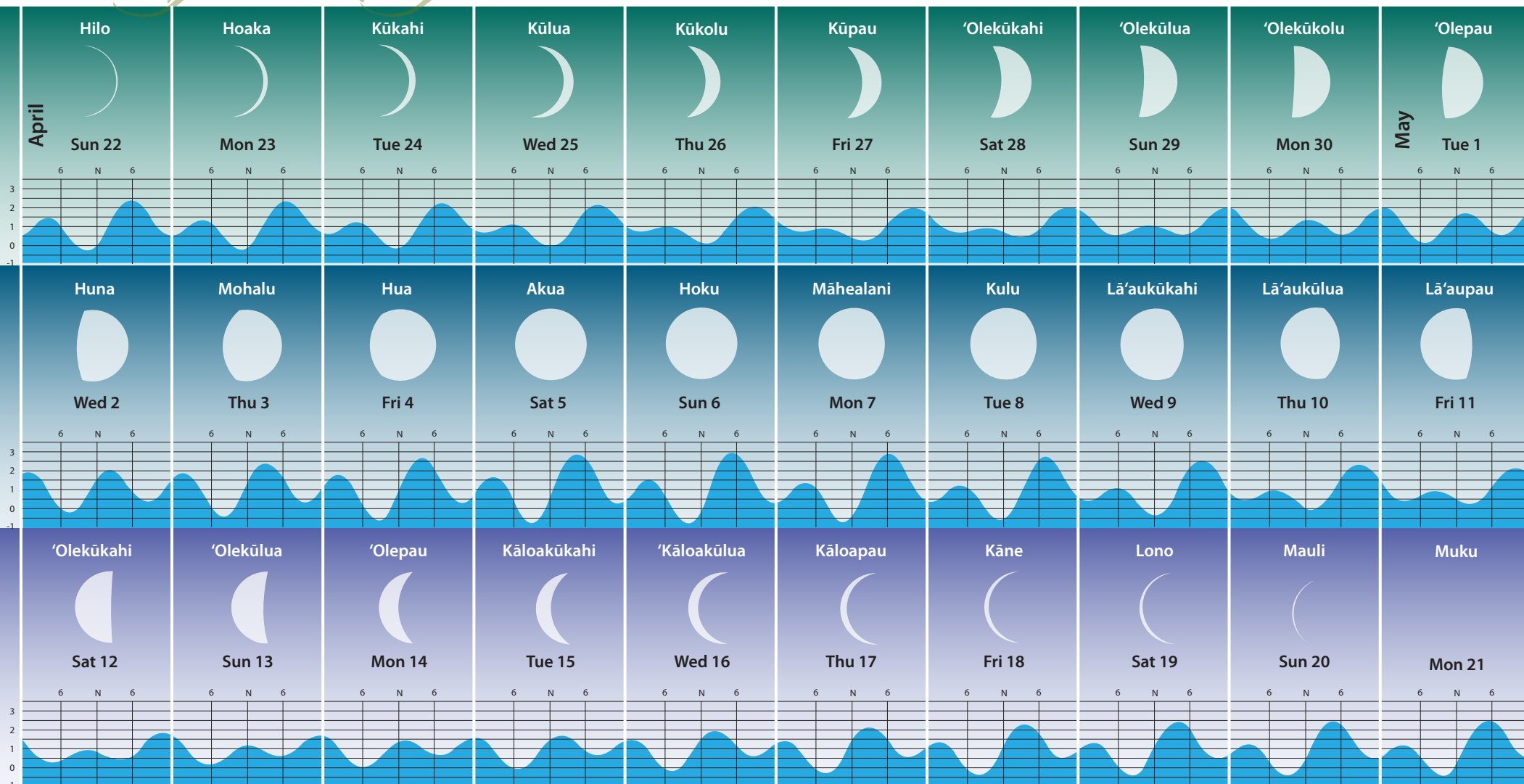
The first part of a child's chant for learning the moon phases. Also said of one who does not know the answer to a question or is ignorant. He is compared to a small child who has not learned their moon phases.





# Welo

April-May 2012



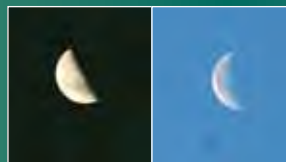
## Highlights



No predator fish were seen during this month.



'Ū'ū spawn during the full moons.



The waxing moons are associated with the deity Hinahānaiakamalama.

The waning moons are associated with the deity Hina'aikamalama.

On the moons that start with "'Ole," fishing activities should not be conducted because they will be unsuccessful.

## Parallel Forms

Parallel forms are any links that we found between growth events that happened on the land and the sea. Our ancestors discovered parallel forms through much observation of the marine and terrestrial ecosystems.

### Parallel Form # 1

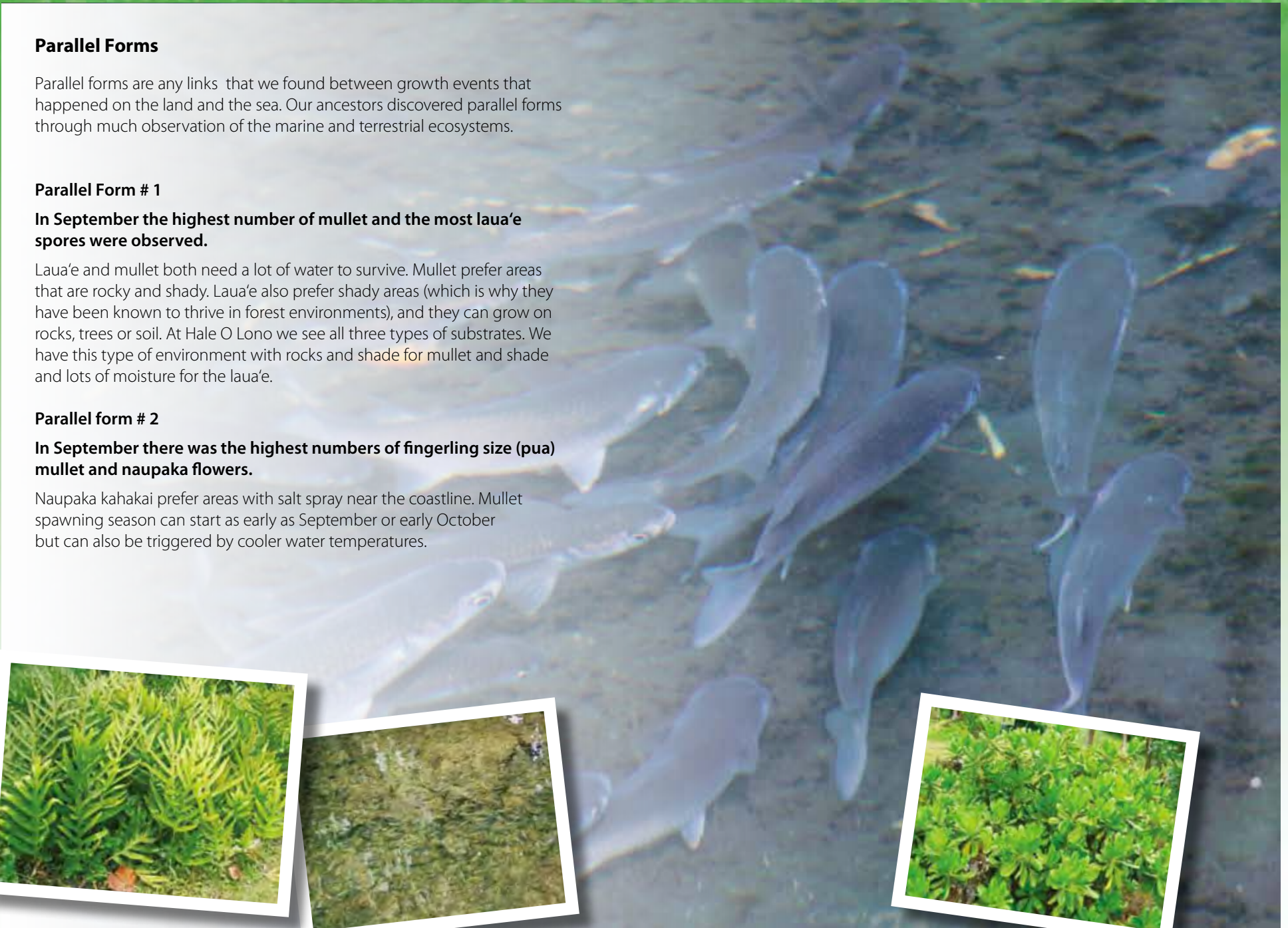
**In September the highest number of mullet and the most laua'e spores were observed.**

Laua'e and mullet both need a lot of water to survive. Mullet prefer areas that are rocky and shady. Laua'e also prefer shady areas (which is why they have been known to thrive in forest environments), and they can grow on rocks, trees or soil. At Hale O Lono we see all three types of substrates. We have this type of environment with rocks and shade for mullet and shade and lots of moisture for the laua'e.

### Parallel form # 2

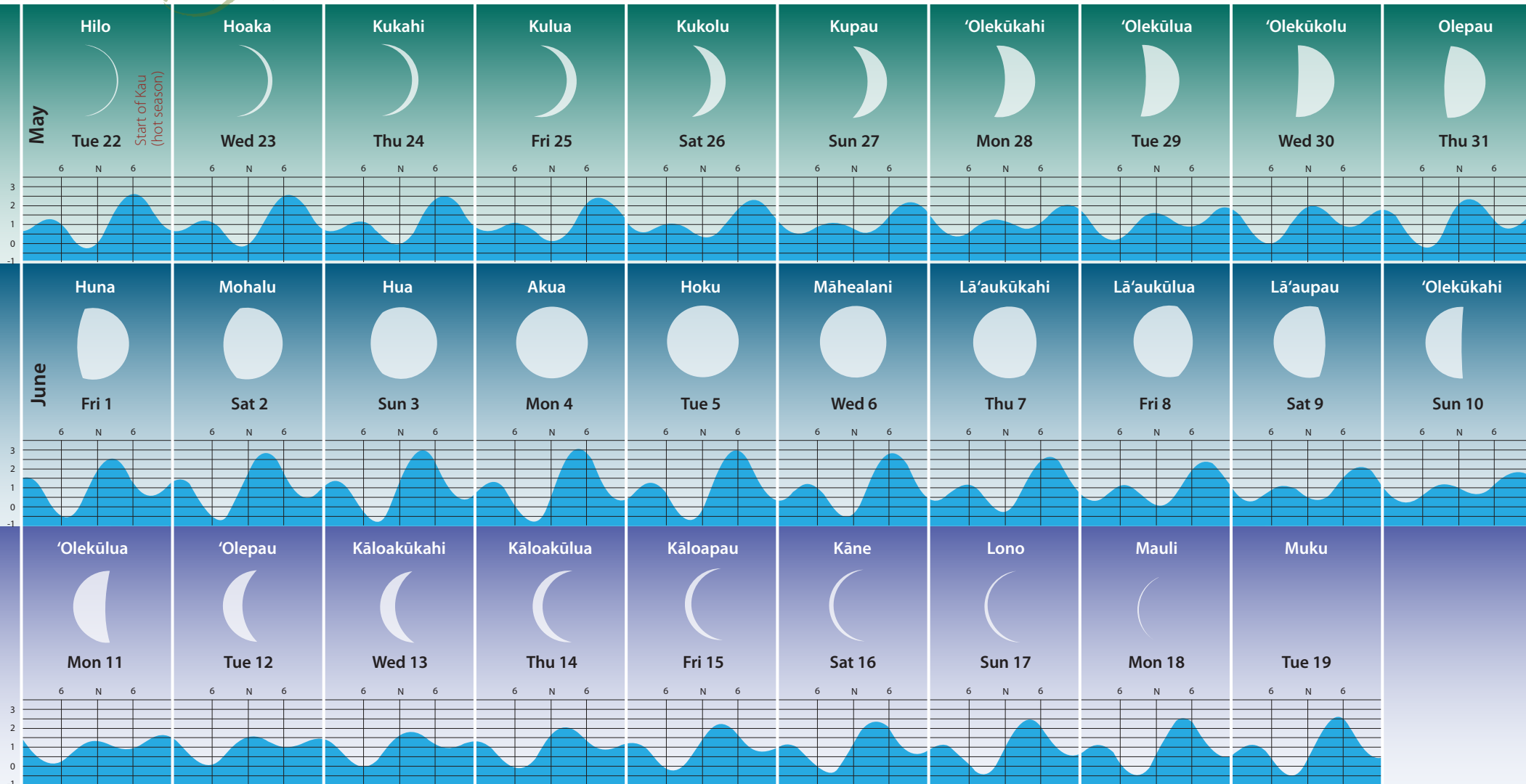
**In September there was the highest numbers of fingerling size (pua) mullet and naupaka flowers.**

Naupaka kahakai prefer areas with salt spray near the coastline. Mullet spawning season can start as early as September or early October but can also be triggered by cooler water temperatures.





## May-June 2012



### Highlights



**Do we plan to continue and further study these findings?**

**Yes we do.** We will continue our study this year to try and confirm last year's findings and to identify new trends, cycles and correlations while honing our own observation and analysis skills.

### 'Ōlelo No'eau

**Pua ke ko, ku ka he'e.**

*When the sugar cane tassels, the octopus season is here.*

## Kia'i Loko

As a kia'i of Hale O Lono (which operates under the konohiki system), it is our responsibility to understand everything about how a loko i'a works. Being able to conduct protocol, maintain the fishpond, and know all the organisms at the pond are also necessities as a kia'i.



## Protocol

### *Why We Do Protocol*

- To honor and ho'omana Hale O Lono and our elemental deities
- To set and keep our focus for the day
- To protect and guide us throughout the day

### *Responsibilities of a Kia'i Loko*

- Maintenance
- Management
- Production
- Harvesting
- Protection of the fishpond
- Carrying out specific tasks given by the konohiki
- Reporting to the head kia'i and the konohiki

### *Konohiki versus Kia'i*

- The konohiki is higher (in rank) than a kia'i.
- The konohiki makes sure the pond is taken care of.
- The konohiki is an overseer of the pond, makes major decisions and sets the kapu.
- The kia'i helps to manage the pond on a day to day basis.

## Maintenance

- Clean mākāhā so the water flows freely in and out of the pond.
- Weed pā and banks to keep pond structure strong by removing weeds that can cause the wall to weaken and collapse.
- Remove algal blooms as they absorb the nutrients in the water that the fish need.

## Monitoring Surveys

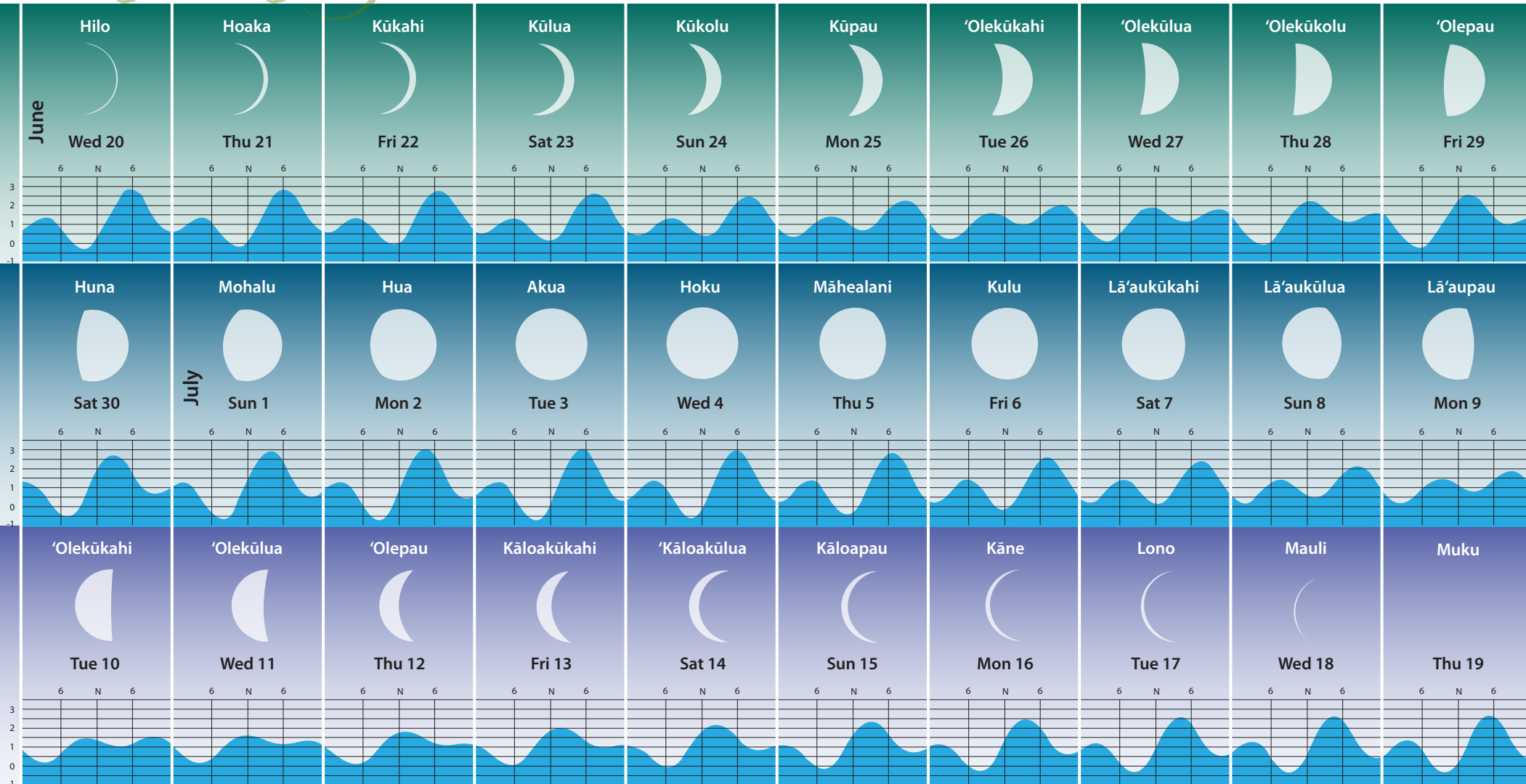
- Monitor the levels of various water parameters to give further insight into factors that may affect the health of our fish.
- Survey flora and fauna weekly and monthly to observe, analyze and document the growth cycles of our species.





# Ka'aona

June-July 2012



## Highlights



Flora surveys were conducted to monitor native and non-native plant growth and to strengthen our observation skills in the environment.



Fauna surveys were conducted to monitor fish abundance (most importantly, mullet) so we have an idea of when they're spawning.



Water quality was conducted to monitor the levels of temperature, dissolved oxygen, pH and other parameters.

## 'Ōlelo No'ēau

**He ali'i ka 'āina; he kauwā ke kanaka.**  
*The land is the chief; man is its servant.*  
 Land has no need for man; but man needs the land and works it for a livelihood.

## Negative Man-Made Impacts

During our years at Hale O Lono, we've observed several negative man-made impacts that directly affect the overall health of this ecosystem.

**Poaching:** When the pond is raided by people with nets and poles, it takes away from Edith Kanaka'ole Foundation (EKF) for its ceremonial fish use and the students for their educational use. We rely solely on our brood stock to sustain our fish populations. Harvests are halted when specific fish are taken out and the balance of fish in the pond is off. Just because you see the fish, that doesn't mean you can take them. Please observe and respect the posted signs.

**Littering:** Whenever you don't dispose of your trash properly it becomes hazardous to the organisms and the caretakers at Hale O Lono. Whenever you're near the shoreline, throw your rubbish away properly. Your trash could potentially end up in our pond.

**Trespassing:** Liability of the trespasser is put onto EKF as the land manager, and, if something were to happen to the trespasser, EKF would be held responsible. If you're caught inside of the pond without authorization, you can be arrested for trespassing.

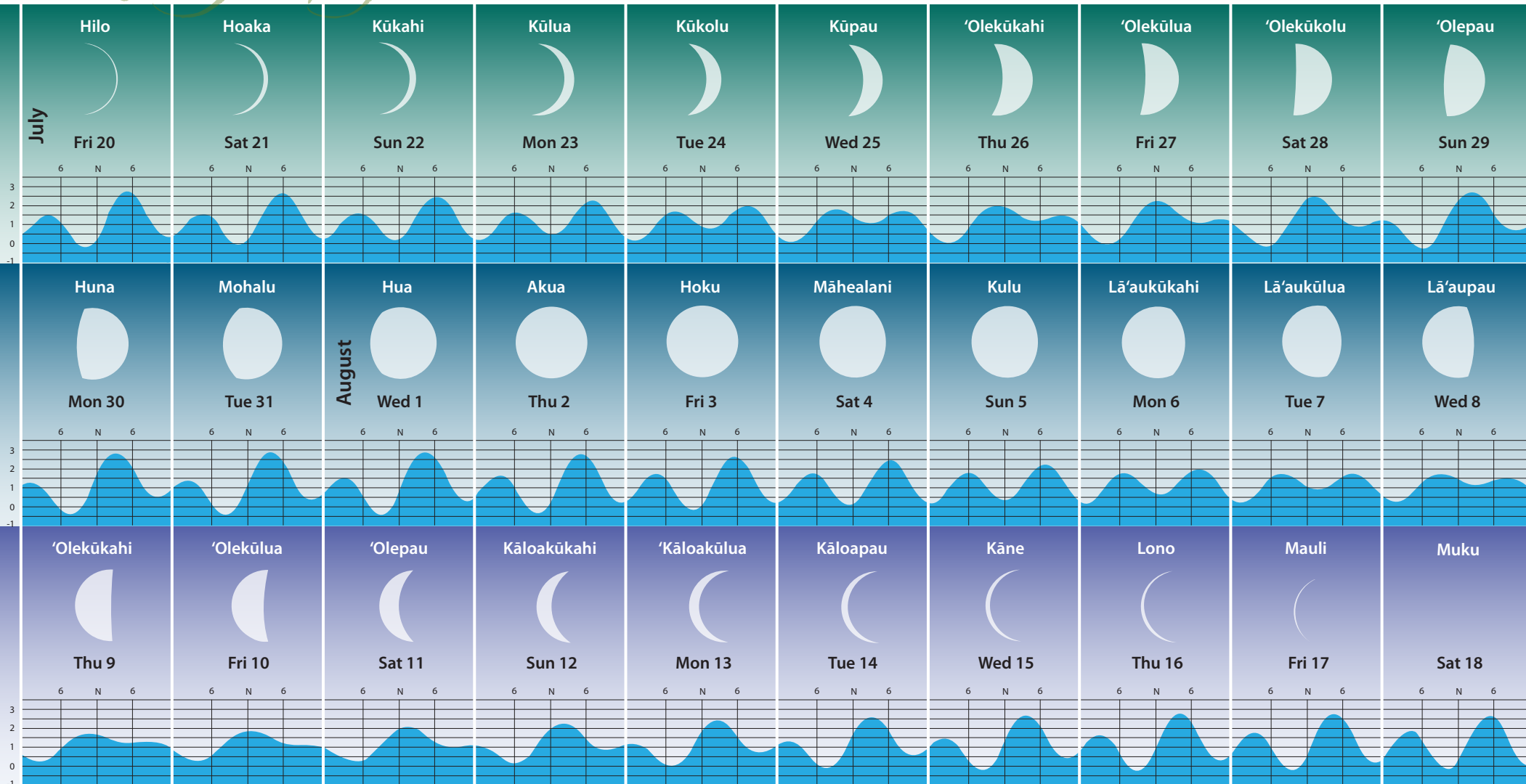
If you see someone in the pond who doesn't look like he/she belongs there, please take down an accurate description of the person and/or his/her vehicle and report it to the Edith Kanaka'ole Foundation at (808) 961-5242.





# Hinaia'ele'ele

July-August 2012



## Highlights



Kapu means sacred. Hale O Lono is sacred and has great significance to the Hawaiian culture and to the Keaukaha shoreline. It should be respected and treated as such.

## 'Ōlelo No'eau

### Pupuhi ka i'a o Uko'a

*The fish of Uko'a is gone*

Uko'a is a famous pond in Waialua, O'ahu. Said of one who takes flight or of something quickly and secretly taken.

## Fauna at Hale O Lono

At Hale O Lono, we have several types of fish. As *kia'i*, we know from our observations that fish have unique behaviors and some even have unique personalities. By observing behavior, we can learn a lot about an organism and about how that organism interacts with other organisms in the ecosystem.

### 'Ama'ama (Striped Mullet)

At Hale O Lono, larger mullet will actually pull the limu down and shake it. The smaller fish will come around and eat all the remnants that fall off. Our mullet are usually very active and can be seen flashing and jumping around and out of the pond.

### 'Auku'u (Black Crowned Night Heron)

We have an old tent frame that the 'auku'u will sit on to look over the pond and observe the fish swimming below. It will slowly climb down the pole (to avoid any fast and obvious movements), then go near the water and stand still like a statue before going in for the attack.

### 'O'opu (Brackish Water Goby)

'O'opu normally feed and stay on the bottom of the pond. At Hale O Lono, they will come and grab the limu on the top. 'O'opu will not only feed on the top but also swim near the surface. They are not very curious about things surrounding them. They are easily scared and can swim super fast. If you're not observing well enough, you won't see the 'o'opu; you will just see the small sediment cloud they left behind when they moved.





August-September 2012

Aholehole  
Manini

## Flora at Hale O Lono

Here's what's unique about how some of our plants are growing at Hale O Lono.

The aerial roots of the hala can be seen growing partially on land and partially in water.

Laukahi in some areas can get fully submerged underwater during high tide but continue to grow with no damage to the plant. A difference we do see is the submerged lauakahi stem is red.

Normally you'd see trees growing separately, but at Hale O Lono the milo and hala trees grow together in a number of locations around the pond. Milo keiki grow around our small pond within the laua'e patches.

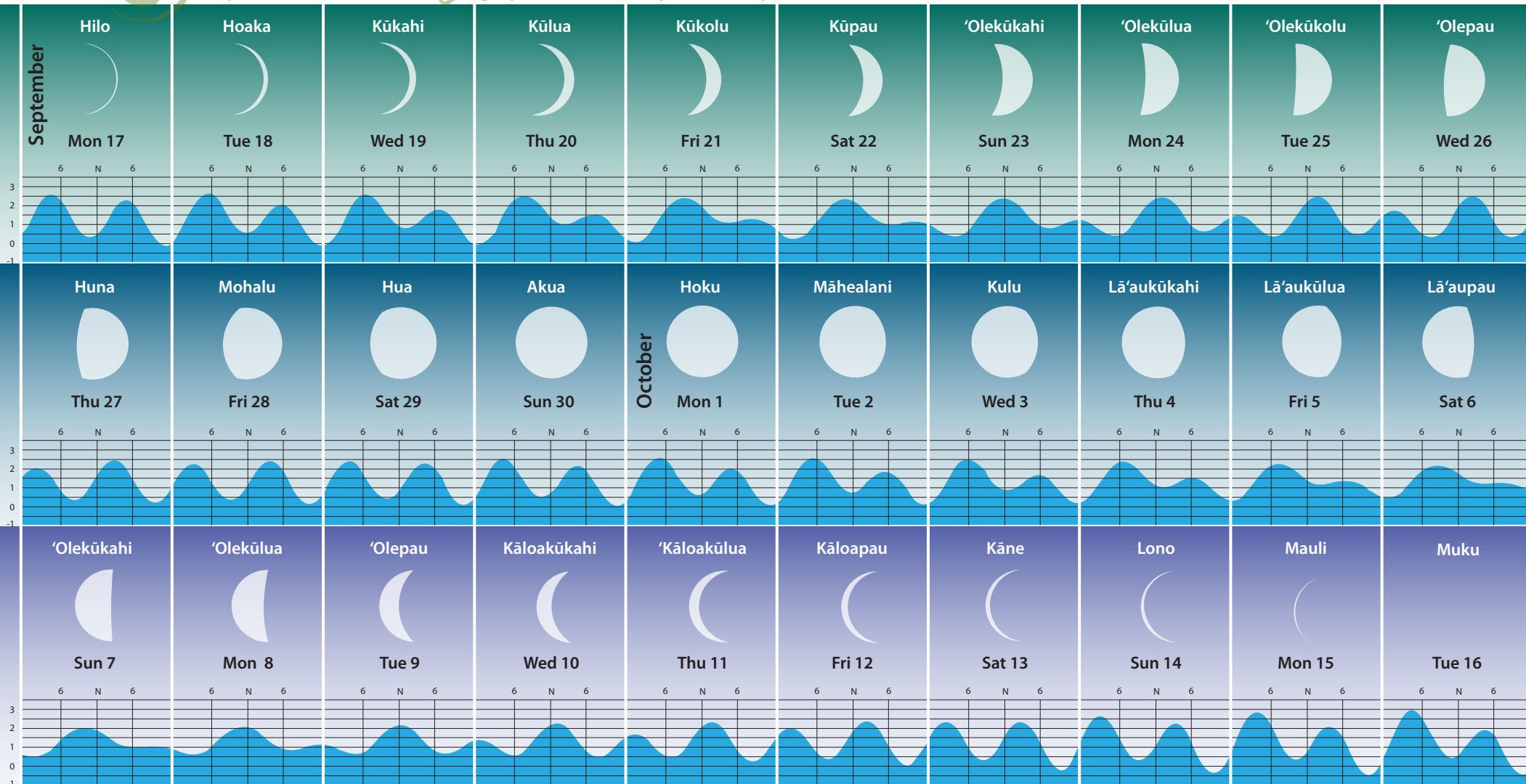
One of the niu trees had a green coconut that stayed on that tree the entire school year and didn't fall until summer. This niu tree only produces green coconuts.





# Hilina mā

September-October 2012



## Highlights



We use the naupaka leaves to de-fog our goggles when we snorkel.



The hala keys can be used to make lei to mark the passing of a loved one.



Last year, we cut back some of the lau'e patches and monitored the re-growth. After three months they grew back healthier, greener and fuller.

## Spawning

As kia'i of Hale O Lono we need to be familiar with the birth cycles of the fish in our pond. It is important to know when certain fish are most abundant, to better understand how the pond's ecosystem works. We also need to know what kinds of marine life are in the pond (other than the main stock of mullet) and what their birthing cycles are.

### Hapawai

White egg capsules  
↓  
Hatch  
↓  
Larvae drift to big pond as marine plankton 1 year  
↓  
Return to inner ponds  
↓  
Spawning  
↓  
Lay eggs on rocks

### 'Ōpae Huna

Eggs carried until ready to hatch ~1 month  
↓  
Swim upside down for 1 week  
↓  
Post Larvae (6 weeks)  
↓  
Juvenile ½ size adult  
↓  
Adult  
↓  
Molt  
↓  
Spawning

### Striped Mullet

Eggs  
↓  
Hatch in 48 hrs  
↓  
Pua (Fry)  
↓  
Pua'ama (Fingerling)  
↓  
Kahaha (palm length)  
↓  
'Ama'ama (8 inches & under)  
↓  
'Anae (adult 12 inches)  
↓  
Spawning

### 'O'opu Nākea

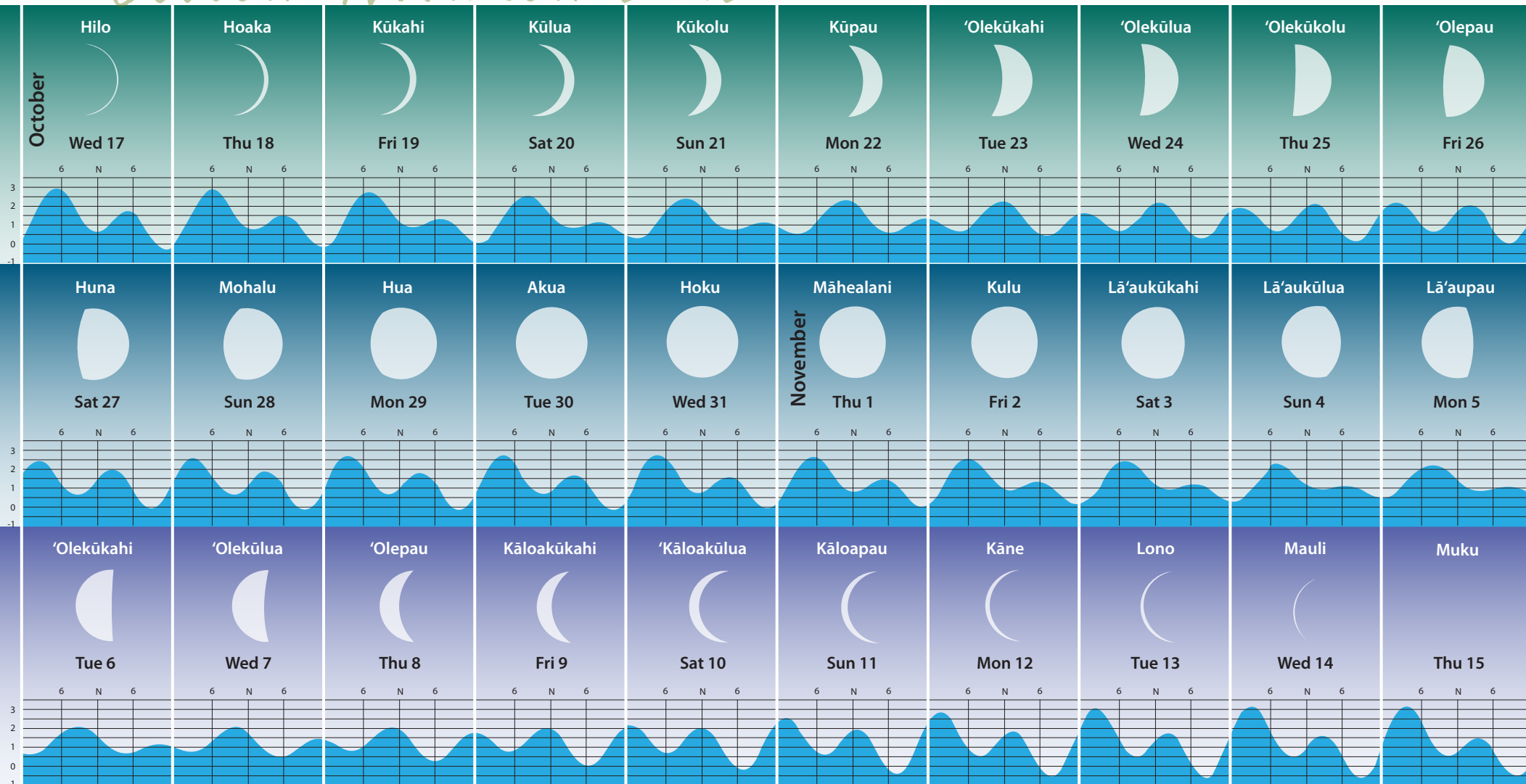
Lay eggs on bottom substrate  
↓  
Hatch in 48 hours  
↓  
Post-larvae taken out to big pond  
↓  
Juvenile  
↓  
Adult  
↓  
Spawning





# 'Ikuā

October-November 2012



## Highlights



Agitated water can trigger mature 'ōpae eggs to hatch.



Mullet is our main stock; they are normally harvested twice a year (depending on abundance) for ceremonial use.



The name hapawai means "half-fresh water," referring to its brackish water environment.

## Ōlelo No'eau

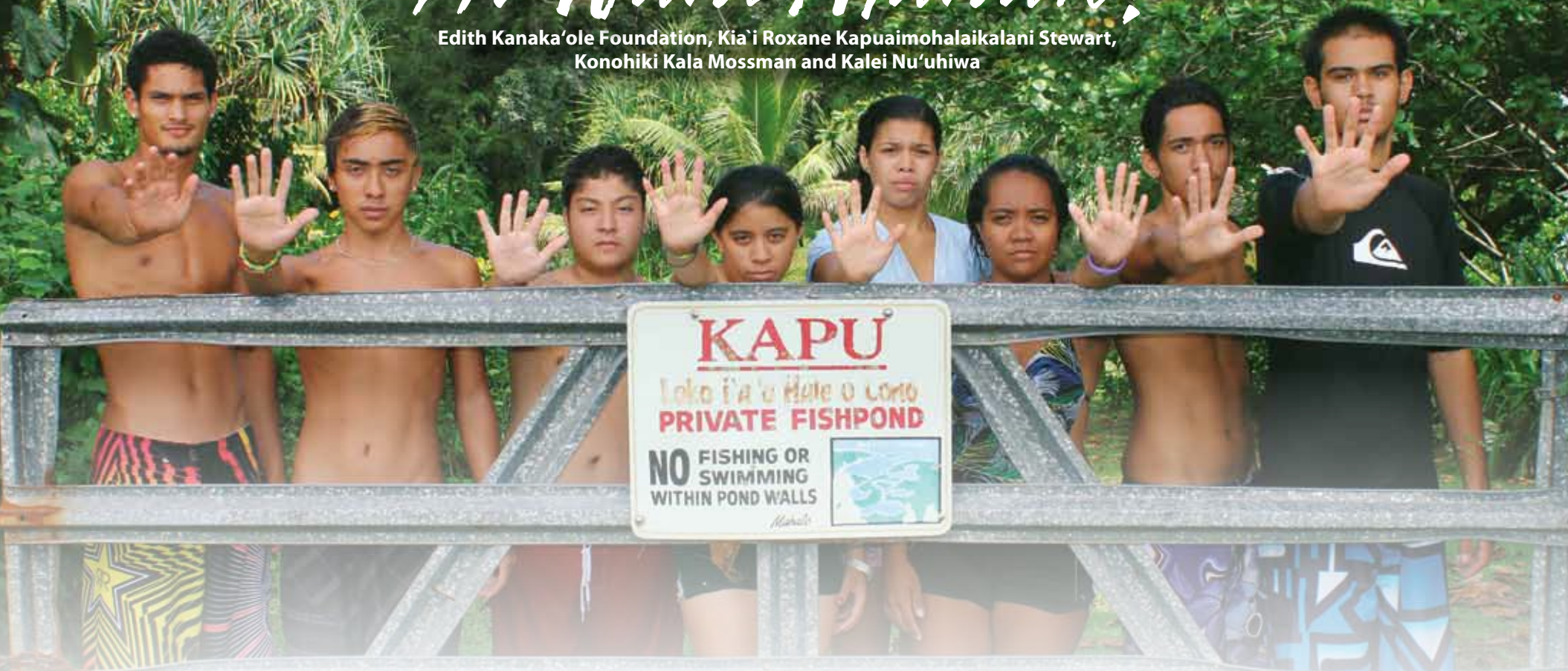
**Ka i'a mili i ka poho o ka lima.**

*The fish fondled by the palm of the hand.*  
When 'o'opu were in season, they would spawn in such great numbers that they could be scooped up in the palm of the hand.



# He Wahi Mahalo!

Edith Kanaka'ole Foundation, Kia'i Roxane Kapuaimohalaikalani Stewart,  
Konohiki Kala Mossman and Kalei Nu'uhiwa



Ke Ana La'ahana Public Charter School junior and senior high school students (l-r) Kieran Rosas, Roice Gariando, Bryson Sakai-Soto, Ruth Evans, Hinaikamalama Joaquin, Mokihana Lee-Ubedei, Kalei Wela and Ka'imipono Crivello

**Photo Credits:**

Na Kia'i o Hale O Lono  
Papaku Makawalu

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For more information on the perpetuation of the kia'i loko practice at Hale O Lono, please contact the Edith Kanaka'ole Foundation at (808) 961-5242.

For more information on the Western Pacific Regional Fishery Management Council, visit [www.wpcouncil.org](http://www.wpcouncil.org). If your community is interested in working with the Council on a traditional lunar calendar for your moku, please contact the Council at [info.wpcouncil@noaa.gov](mailto:info.wpcouncil@noaa.gov) and visit [www.ahamoku.org](http://www.ahamoku.org).

