Kaulana Mahina

Hawaiian Lunar Calendar

January 12, 2024 - January 29, 2025



Western Pacific Regional Fishery Management Council wpcouncil.org

Moon Phases

Native Hawaiians possessed a deep understanding of their natural environment, relying on their observations, or *kilo*, of the cycles and rhythms of natural resources over time for survival. One crucial aspect of their knowledge was their observation of moon phases, which was correlated to tidal movements. Notably, the greatest tidal currents coincided with the full and new moons. Through generations, Hawaiian fishers used the moon to understand impact of ocean currents and tides on fish migration patterns. They also recognized that the moon's angle, and its rising and setting times, were intertwined with the spawning cycles of certain species.



Photo: Rick Schonely Figure: VectorMine/Shutterstock

Kā'elo

January 12 - February 9 **'lanuali 12 - Pepeluali 9, 2024**

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IONS	hoʻonui (waxing)
RVAT	poepoe (full moon)
OBSE	hōʻemi (waning)

Rainfall and Multi-Year Cycles

Sustained rainfall contributes to the availability of food for halalu (young akule, or bigeye scad) in coastal areas. Strong rainfall indicates a strong recruitment of young halalu, which in turn corresponds with an increase in the population of akule the following year. This two-year cycle is not captured by typical Western management methods.



Halalu run at Waianae Boat Harbor. Photo: Cory Yap

Hanalei River flowing into the bay on the north side of Kaua'i. Photo: Kamealoha Hanohano-Pa Smith Halalu. Photo: Matt Ramsey

Kaulua

February 10 - March 9 Pepeluali 10 - Malaki 9, 2024



hoʻonui (waxing)
poepoe (full moon)
hōʻemi (waning)

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OBSERVATIONS

What's in the Gut?

At the September 2023 Council meeting, the Fishers Forum theme was "What's in the Gut?" highlighting how stomach contents correlate with which lures fishermen should use on their next trip. Traditional *lawai*'a (fisherman) practitioners knew and understood the connectivity between the species, and environment and were able to use this information to predict the seasonality of important fishery resources. An example is that when the 'oama (juvenile goatfish) show up along the sandy shoreline areas, the *aku* (skipjack tuna) are abundant offshore, and fishers should use lures similar to their targets' prey.

Below: 'Oama fishing circle in nearshore waters of O'ahu. Photo: Clay Tam



Photo: Tamiano Gurr

Nana

March 10 - April 8 Malaki 10 - 'Apelila 8, 2024



IONS	hoʻonui (waxing)	Å
RVAT	poepoe (full moon)	
OBSE	hōʻemi (waning)	



Cycles and Rhythms

Native Hawaiians were able to manage and sustain their resources and, at the same time, provide valuable food for consumption by knowing the spawning cycles of their target species, including uhu. Hawaiians would place kapu or restrictions on harvest of that particular species during these critical spawning times. Protecting fish during spawning season assured that stocks would be renewed for future generations. Usually during spawning, fish tend to aggregate, making harvest easier. It was important, therefore, to know when and how long these seasons occur. Once the majority of spawning occurs, harvest would be allowed. Only through adaptive management could this be possible. Rotating harvest to other species during these times provided alternative food sources for people.

(Paul Bartram, *Lαwαi*'α Magazine, 2016) Source: Randall, JE, et al., 1990 and Myers, RF, 1999 **1.** When young, all are females (*uhu pālukaluka*), dark reddish brown in skin color. Reproductive females develop a pale tail spot. They are blue-green when they become males.

2. Some females transform into males for the last adult phase (*uhu* 'ele'ele). They stake out specific territories and mate with particular females, which may be part of a harem.

Lifecycle Transition



3. Reproduction may peak in April. Many are ready

Redlip parrotfish inhabit shallow reefs and rocky

They can reach lengths of almost 30 inches.

to spawn when they reach a fork length of 14 inches.

bottoms from 1 to more than 30 meters (~100 feet).



Redlip Parrotfish (Scarus rubroviolaceus)

Photos: Keoki Stender

4. Uhu are herbivores and feed mainly on *limu* that fish scrape from coral using their strong beaks. Sometimes *uhu* ingest large chunks of coral that are ground up into fine particles by a special bony structure in its throat. A large *uhu* may produce up to one ton of sand per year.

Jan Feb Mar APR May Jun Jul Aug Sep Oct Nov Dec Dry Season Wet Season Interannual variability – El Niño prolongs dry season

Welo

April 9 - May 7 **'Apelila 9 - Mei 7, 2024**

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	hoʻonui (waxing)	ĥ	Ĩ
Ч Ч Ч	poepoe (full moon)		No. of the local division of the local divis
	hōʻemi (waning)		

Mauka to Makai Indicators

Some ecosystem indicators happen about the same time, while others occur months in advance. Mango blooms are an example of the latter, and serve as a good natural indicator of the balance between the land and sea. Vibrant blooms on mango trees in the spring signal a successful and robust replenishment of upland resources, which translates to the ocean. Typically following the rainy season, if there are low winds and the mango blooms are able to mature and produce fruit, this is a promising sign that there will be a good ' α hi (yellowfin and bigeye tuna) bite starting in the late spring.



Mango tree bloom. Photo: Suresh Babu Guddanti/Pixabay

Ikiiki

May 8 - June 6 Mei 8 - Iune 6, 2024



hoʻonui (waxing	g)	
poepoe (full mo	bon)	
hōʻemi (waning))	

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Ocean Currents and Swell

Fishing success depends on many environmental factors like water temperature, bait availability, and physical ocean conditions. When bottomfishers observe the first big south swell on 'Oahu in the summer, they know it's time to go to Penguin Bank (~20 miles southeast) because the *uku* (grey snapper) will be piled up and biting. The way the water moves helps fishers understand how the fish are moving. At "The Grounds," a unique underwater ledge off the coast of Kona on Hawai'i Island, fishermen watch for the onshore Kohala current to gather pockets of feeding baitfish, which are then used to target larger fish.

Waikiki south swell Photo: Jeremiah Klein/surfline.com

> Erik Handy with his uku catch. Photo: Ed Watamura

Ka'aona

June 7 - July 5 Iune 7 - Iulai 5, 2024



IONS	hoʻonui (waxing)
RVAT	poepoe (full moon)
OBSE	hōʻemi (waning)



Water Temperature

Mahimahi (dolphinfish) are a highly coveted catch and prized food fish. Scientists have studied their behavior, including what they eat and where they travel. Environmental cues like sea surface temperature can give clues for fishermen to find them. Research has found *mahimahi* spend the majority of their life at depths up to 20 feet, with peak productivity occurring in water temperatures between 79 and 81°F. So fishers could gain an extra advantage when planning their next fishing trip by considering sea surface temperature. Source: Perle et al., 2020. https://doi.org/10.1186/s40317-020-00217-9

Littl



Hinaia'ele'ele

July 6 - August 4 Iulai 6 - 'Akukake 4, 2024



hoʻonui (waxing)	
poepoe (full moon)	
hōʻemi (waning)	a.



Harvest Indicators

Pua ka neneleau, momona ka wana. When the neneleau blooms, the sea urchin is fat. Pala ka hala, momona ka uhu. When the hala ripens, the uhu is fat.

Hawaiian proverbs often correlate natural occurrences and provide indications of the best time to harvest certain seafood. The *neneleau* (Hawaiian sumac) blooms around the same time when *hala* (pandanus fruit) ripens. During this time, *uhu* grow plump snacking on large sea urchins. A smart fishermen will know that this is the time to use sea urchin as a lure to catch *uhu*.

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Above: Purple sea urchin. Photo: Jekaterina Voronina/iStockphoto.com Below: Cross section of a hala fruit. Photo: Konbini



Giant black sea urchin off the Big Island of Hawaiʻi. Photo: Tammy616/iStockphoto.com





Māhoe Mua

OBSERVATIONS

August 5 - September 3 'Akukake 5 - Kepakemapa 3, 2024



hoʻonui (waxing)	
poepoe (full moon)	
hōʻemi (waning)	



Cows feeding, fish feeding. Cows sitting, fish not biting.

Nationwide, there is a common fishermen's belief that when cows are feeding, the fish are also feeding and it will be a good day of fishing. In contrast, if the cows are resting or lying down, then it's time to turn tail and go back home. This fishermen's tale has been validated through observations and found to be associated with changes in barometric pressure. High pressure, often corresponding with clear skies, could make cows uncomfortable and cause them to lie down.

Photo: Daniel Wedeking/iStockphoto.com



Māhoe Hope

September 4 - October 2 Kepakemapa 4 - 'Okakopa 2, 2024

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IONS	hoʻonui (waxing)
RVAT	poepoe (full moon)
OBSE	hōʻemi (waning)

When the wiliwili tree blooms, the shark bites.

Photo: Matt Ritter/CC BY-NC 4.0 Deed

Photo: Whitney Ramsey/CC BY-NC 4.0 Deed

Photo: Rafi Amar/CC BY-NC 4.0 Deed

Traditional Hawaiian knowledge, passed down through chants, warns about increased shark encounters in the fall months, when the wiliwili trees blossom. This annual spike in shark encounters throughout the Hawaiian Islands, typically observed in October, has sparked various theories. Current knowledge of shark behavior suggests that they may move closer to the shore to reproduce. So, when the wiliwili trees bloom mauka (upland), enter the kai (ocean) with extra caution.

'lkuwā

October 3 - November 1

'Okakopa 3 - Nowemapa 1, 2024



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	hoʻonui (waxing)	
HVA!	poepoe (full moon)	
OBSE	hōʻemi (waning)	

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Upland Indicators

Pua ke kō, kū mai ka heʻe. When the sugarcane flowers, the octopus appears.

Hawaiian sugarcane $(k\bar{o})$ blooms in late October or early November, which corresponds with peak abundance of octopuses on the reefs.

Octopus Photos Top/Right: Don McLeish Octopus Photo Below: Mark Mitsuyasu





Photo: Ricky Taylor CC BY-NC 4.0 Deed

Welehu

OBSERVATIONS

November 2 - December 1 Nowemapa 2 - Kēkēmapa 1, 2024



hoʻonui (waxing)	
poepoe (full moon)	
hōʻemi (waning)	



Nearshore to Open Ocean Connections

Hawai'i experiences a unique climate compared to many other regions, with two distinct seasons: rainy and sunny. Rainy seasons and the strong freshwater runoff from the islands have a notable impact on the population of baitfish like *nehu* (Hawaiian anchovy), leading to strong recruitment. This abundance of baitfish, in turn, provides a rich food source for open ocean fish that benefits both small and large fishing vessels seeking prized catches such as ' α hi, marlin and swordfish.



Top: Blue marlin off Kona coast of the Big Island of Hawai'i. Photo: Kevin Hibbard Left: School of *nehu*. Photo: James Watt, NOAA

Makali'i

OBSERVATIONS

December 2 - 30, 2024 Kēkēmapa 2 - 30, 2024



hoʻonui (waxing)
poepoe (full moon)
hōʻemi (waning)



El Niño / La Niña

The ocean has natural cycles and fluctuations, like the switch between El Niño (warmer than usual) and La Niña (cooler than usual) conditions in the central and eastern Pacific every 2 to 7 years. However, humancaused climate change also affects the ocean through increased temperatures and acidity, reduced oxygen, and many other impacts.

Warming oceans are reshaping fisheries. In general, marine species are gradually moving away from the equator into cooler waters, causing longline vessels to shift their fishing effort. Models also predict that if countries do not reduce their carbon emissions, there will be a shift from less tropical tunas in the western and central Pacific Ocean to more in the eastern Pacific.

Many marine species, including Kona crab, time their spawning to environmental cues like water temperature and daylight hours. Warmer waters could alter these cues, leading to shifts in their spawning seasons, which may affect other species in the food web.

Photo: Palafamala Paddles



Kā'elo

December 31, 2024 - January 29, 2025 Kēkēmapa 31, 2024 - 'Ianuali 29, 2025



hoʻonui (waxing)	
poepoe (full moon)	
hōʻemi (waning)	· · · · · · · · · · · · · · · · · · ·

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About This Calendar

The theme for the 2024 Kaulana Mahina (Hawaiian Lunar Calendar) is ecosystem indicators, embracing the Hawaiian practice of *kilo* (observation) of the environment from *mauka* (upland) to *makai* (seaward). The months describe general natural indicators, but other factors to consider are interannual variability, the different time scales (hours to months ahead), and shifts that occur as our climate changes. For example, fishers may see differences in spawning months, which could lead to revisions to fishing regulations/adaptive management to reflect these changes.

The literal meaning of kaulana mahina is position of the moon. In the traditional Hawaiian calendar, each malama (month) was determined by the 29.5-day cycle of the mahina and divided into three anahulu (traditional 10-day period). The first period was called ho'onui (growing bigger), beginning when the first crescent moon was visible to the naked eye. The second anahulu was poepoe (round or full). The last anahulu was emi (decreasing).

Traditionally, nā pō mahina (lunar phases) are used to determine when specific activities should take place, such as fishing times and spawning times when harvesting of some species was limited. This calendar includes a space to record your observations each month. Send us an email at info@wpcouncil.org to let us know how you use our calendar!

Moon phase and lunar month names can vary by island and *moku* (district). This calendar uses the moon phases for

O'ahu listed in the Hawaiian Almanac by Clarice Taylor (1995. Honolulu: Mutual Publishing). Data to discern the first day of the lunar month are used with permission from HM Nautical Almanac Office, UKHO and the Keeper of Public Records, UK. The tide charts with moon rise and set times are in Hawai'i Standard Time for Pearl Harbor and were provided by OceanFun Publishing, NZ. The lunar months, moon phases, and traditional calendar months are given in Hawaiian.

Special *mahalo* to calendar contributors including Council family members Nathan Abe, Abraham Apilado, Jr., Gil Kualiʻi, Clay Tam and Nathan Tsao; *Lawai*ʻa magazine; Palafamala Paddles; Tamiano Gurr; Kamealoha Hanohano-Pa Smith; Kevin Hibbard; Don McLeish; Mark Mitsuyasu; Cassie Pardee; Matt Ramsey; Rick Schonely; Keoki Stender; Ed Watamura; and Cory Yap. The source for all of the Hawaiian proverbs is 'Oleleo No'eau Hawaiian Proverbs & Poetical Sayings by Mary Kawena Pukui, 1983.

Ka'elo

For an electronic version of this calendar, go to www.wpcouncil.org/ educational-resources/ lunar calendars.

The days of the wet season months are colored purple to lavender, and the dry season months are pink to orange.



About the Council

The Western Pacific Regional Fishery Management **Council** has worked with communities in Hawai'i, American Samoa. Guam and the Commonwealth of the Northern Mariana Islands since 2006 to produce traditional lunar calendars to promote ecosystem-based fisheries management, support indigenous fishing and management practices, and enhance community involvement in the fisheries management decisionmaking process. In Hawai'i, the Council strongly supports the traditional 'aha moku system of natural resource management, which recognizes the traditional moku as a basis for cultural and community consultation, adaptive management, education, general knowledge and a code of conduct. More information about the ' α ha moku system can be found at **www.wpcouncil.org** and www.ahamoku.org. If your organization is interested in working with the Council on a future calendar, please send an email to info@wpcouncil.org.

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Western Pacific Regional Fishery Management Council



Published in the United States by the Western Pacific Regional Fishery Management Council under NOAA Award NA20NMF4410013. © 2023, Western Pacific Regional Fishery Management Council

ISBN 978-1-950193-36-3

Front cover: Kōʻieʻie Loko Iʻa is a historical fishpond in Kīhei, Maui that has been restored by 'Aoʻao O Nā Loko Iʻa O Maui (Maui Fishpond Association).

Photo: hawaiiansupaman@hawaii.rr.com.