hanalei

MOON + TIDE CALENDAR

2018

PAPAHĀNAUMOKUĀKEA
Marine National Monument

HAWAIIAN ISLANDS HUMPBACK WHALE
NATIONAL MARINE SANCTUARY

HanaleiWatershedHui

WAIPĀ

Aloha mai!

This calendar was developed through a partnership between the Hanalei community, the Hanalei Watershed Hui, Papahānaumokuākea Marine National Monument, the Hawaiian Islands Humpback Whale National Marine Sanctuary, the Department of Land and Natural Resources Division of Aquatic Resources, and the Waipā Foundation.

Traditional Hawaiian knowledge about fish spawning was based on lunar cycles and seasonal changes. Observations provided in this calendar can be used to better care for our reef fish population in Hanalei.

Hanalei Tides

The tides presented in this calendar are the subordinate tide predictions for Hanalei Bay. These predictions are based on harmonic data from Nāwiliwili Bay.

Hawaiian Moon Phases

Many calendars are based on the synodic month, a 29.53 day average orbital period of the moon. In this calendar, the moon phase of Hilo was aligned with the astronomical new moon as determined by the U.S. Naval Observatory. The moon phase of Muku was combined with the Hilo phase where appropriate.

FISHING SEASON TABLE

	ʻĀholehole	Manini	ʻŌmilu	ʻŌpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	ʻAmaʻama
JANUARY	!	–	–	–	–	–	!	–	–	–	✕
FEBRUARY	!	–	–	–	–	–	!	–	–	–	✕
MARCH	!	!	–	–	–	–	!	–	–	–	✕
APRIL	!	!	!	!	!	–	!	–	–	–	–
MAY	–	!	!	!	!	–	!	✕	✕	✕	–
JUNE	–	!	!	!	!	–	✕	✕	✕	✕	–
JULY	–	–	–	!	!	–	✕	✕	✕	✕	–
AUGUST	–	–	–	!	!	!	✕	✕	✕	✕	–
SEPTEMBER	–	–	–	–	!	!	!	–	–	–	–
OCTOBER	–	–	–	–	!	!	!	–	–	–	–
NOVEMBER	–	–	–	–	–	–	!	–	–	–	–
DECEMBER	–	–	–	–	–	–	!	–	–	–	✕

TERMS USED IN THIS CALENDAR

LIMITED HARVEST

Some species have limited harvest periods, restrictions on harvest method (type of gear), bag limits, and/or minimum sizes.

- Halalū harvesting is limited August to October.
- Moi harvesting is limited September to February.

SUGGESTED LIMITED HARVEST

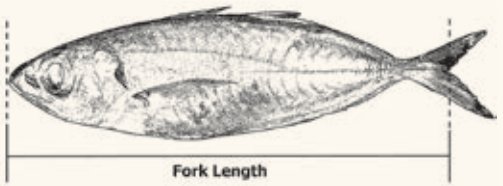
The species listed under suggested limited harvest (SLH) in this calendar are meant to inform fishers when peak spawning may be occurring in Hanalei. These periods are based on observations and gonad data collected in Hanalei. SLH is not a part of Hawai‘i fishing regulations. Annual variations are likely to occur, so harvest carefully.

CLOSED SEASON

These periods of complete harvest restriction are based on current fishing regulations administered by the State of Hawai‘i through the Department of Land and Natural Resources, Division of Aquatic Resources.

A complete list of the regulations can be found at: dlnr.hawaii.gov/dar/fishing/fishing-regulations

During a closed season for a given species, there is a ban on harvesting, possessing, or selling that species.



FORK LENGTH: Measured from fish’s snout to base of “V” in tail fin. State regulated species are measured in this way.

GONAD: Reproductive organ, male or female.

L50: Length at which 50 percent of a species population is reproductively mature.

Suggested Limited Harvest

Suggested limited harvest (SLH) is not a part of Hawai‘i fishing regulations. The species listed under SLH in this calendar are meant to inform fishers when peak spawning may be occurring in Hanalei. This means that harvesting should be minimized or completely avoided to allow fish to reproduce undisturbed. Although data on manini and ‘āholehole spawning was collected in Hanalei, slight variations on peak spawning activity is likely to occur from year to year, so be observant. Spawning may also vary significantly at other locations around Kaua‘i.

The traditional practice of seasonally restricting the harvest of a specific fishery in Hawai‘i was carefully maintained through keen observation. By learning how to better care for our reef fish stocks, communities can help to restore balance by limiting harvests during periods of stock replenishment. Modern fishing tools are very efficient at harvesting fish, so we need to be extra careful when using them.

If you’re interested in learning how you can help to contribute information to this project, contact the Hanalei Watershed Hui at:

808-826-1985
hanaleiriver@hawaiian.net

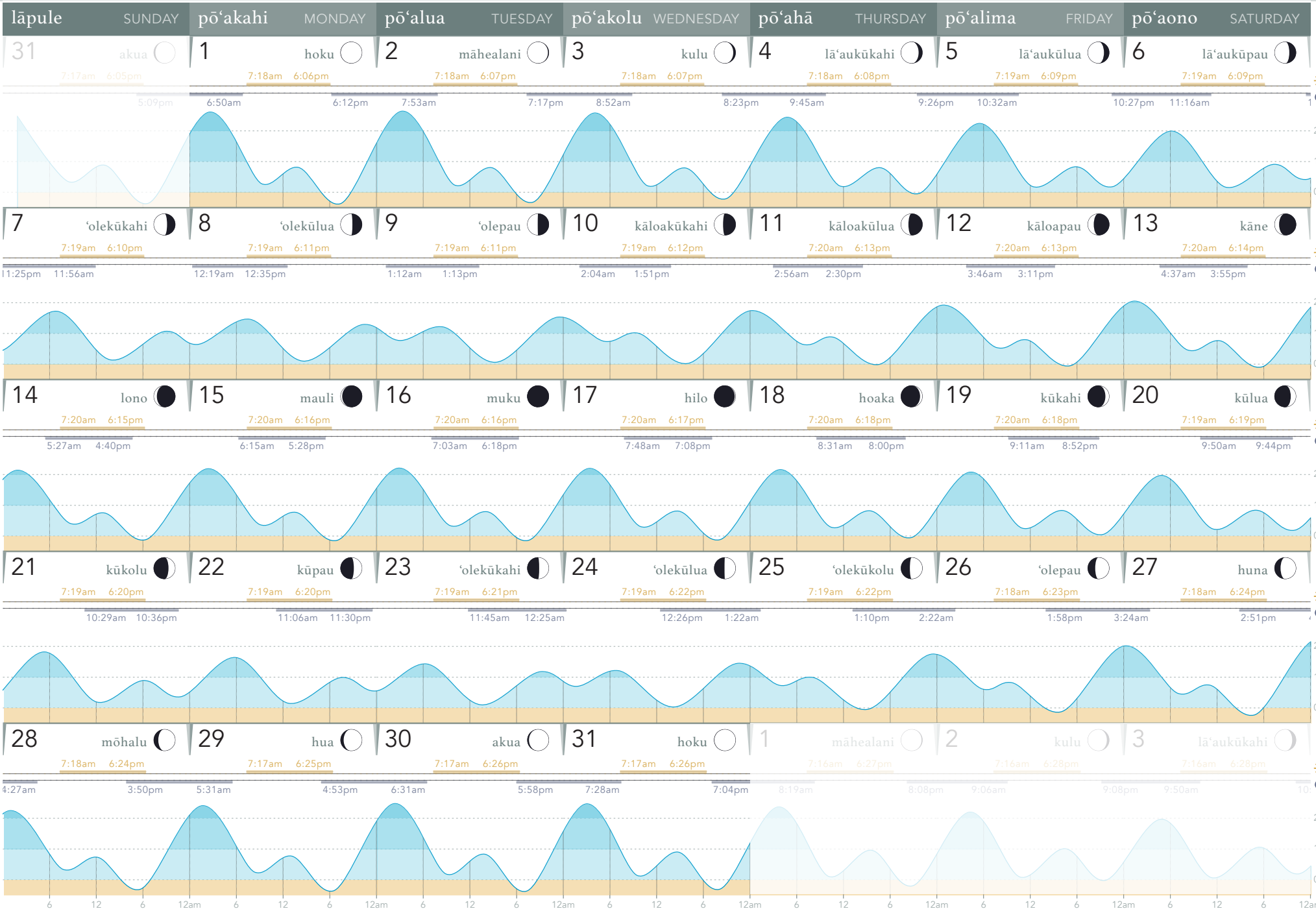
JANUARY	‘Āholehole	Manini	‘Ōmilu	‘Ōpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	‘Ama‘ama
For more info see the full **FISHING SEASON TABLE** near the start of the calendar	!	–	–	–	–	–	!	–	–	–	✕

LIMITED HARVEST
15/day 11 in. minimum fork length

ianuali

hanalei
MOON + TIDE CALENDAR
2 0 1 8

JANUARY



Harvest wisely to ensure future catches!

Slot Limit Catches: *Recognizing the importance of leaving very large individuals of each species.*

Small fish = no take. Allow to reach reproductive size.

Harvest Pono: One 27" ʻōmilu will produce roughly the same amount of eggs as 87 14" ʻōmilu. **Medium sized are a good choice to fish sustainably.**

Very large fish = no take. Larger fish in every species produce much more eggs than fish that have just reached the reproductive size. The yolk reserves in these eggs are also much larger, giving the young that hatch a much better chance of survival.

FEBRUARY	ʻĀholehole	Manini	ʻŌmilu	ʻŌpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	ʻAmaʻama
For more info see the full **FISHING SEASON TABLE** near the start of the calendar	!	–	–	–	–	–	!	–	–	–	✕

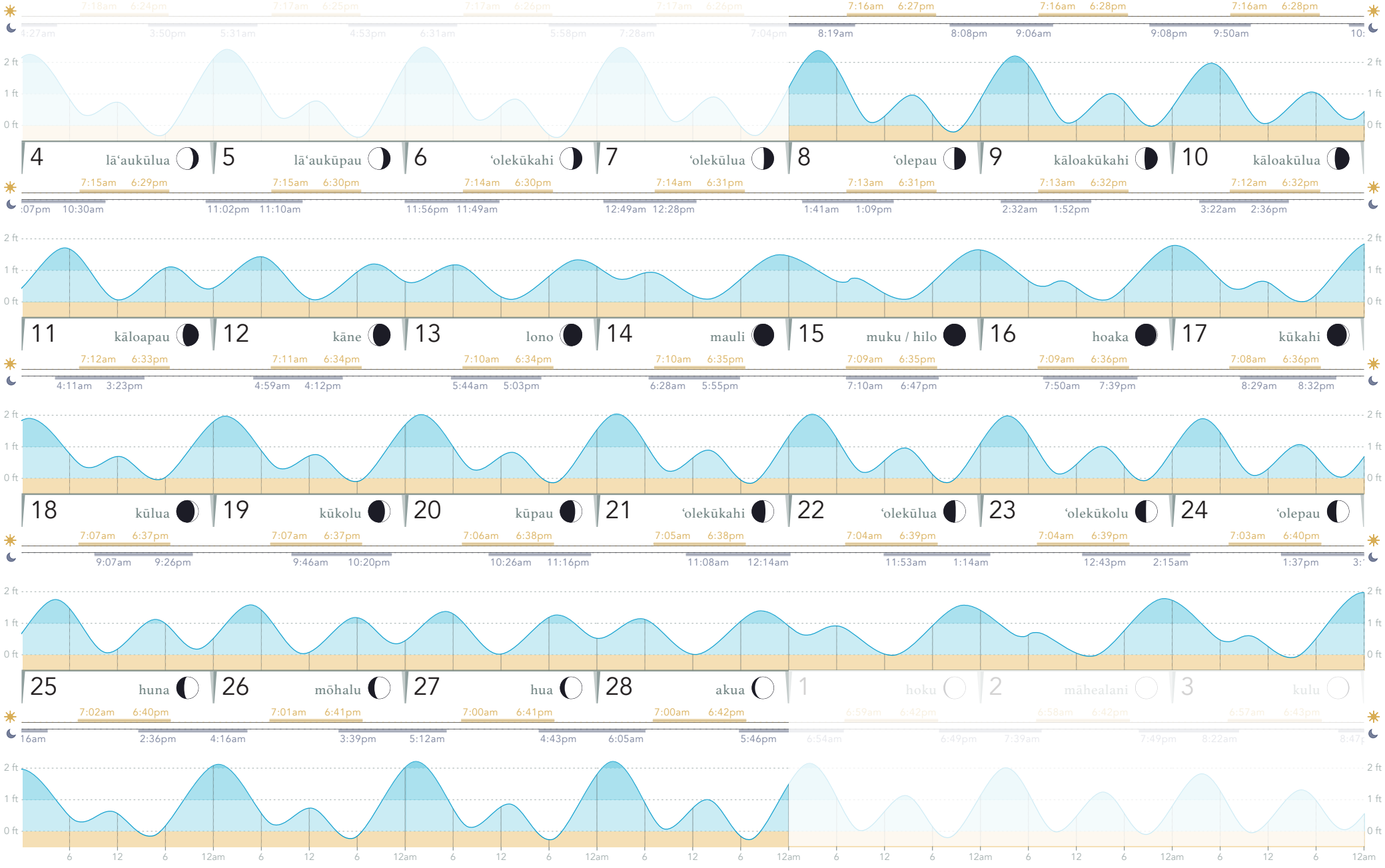
LIMITED HARVEST
15/day 11 in. minimum fork length

pepeluali

hanalei
MOON + TIDE CALENDAR
2018

FEBRUARY

lāpule SUNDAY	pōʻakahi MONDAY	pōʻalua TUESDAY	pōʻakolu WEDNESDAY	pōʻahā THURSDAY	pōʻalima FRIDAY	pōʻaono SATURDAY
28 mōhalu	29 hua	30 akua	31 hoku	1 māhealani	2 kulu	3 lāʻaukūkahi
4 lāʻaukūlua	5 lāʻaukūpau	6 ʻolekūkahi	7 ʻolekūlua	8 ʻolepau	9 kāloakūkahi	10 kāloakūlua
11 kāloapau	12 kāne	13 lono	14 mauli	15 muku / hilo	16 hoaka	17 kūkahi
18 kūlua	19 kūkolu	20 kūpau	21 ʻolekūkahi	22 ʻolekūlua	23 ʻolekūkolu	24 ʻolepau
25 huna	26 mōhalu	27 hua	28 akua	1 hoku	2 māhealani	3 kulu



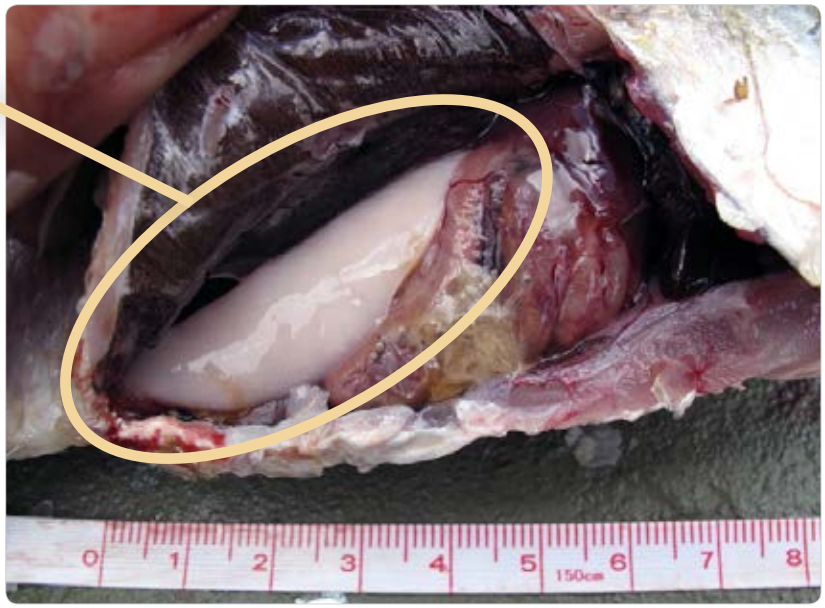
Fish Gonad Identification

FISHING PONO

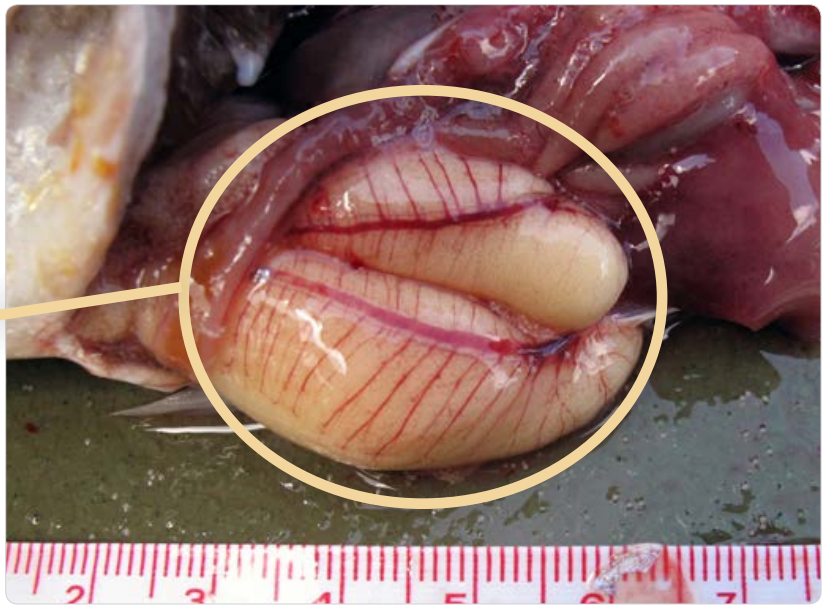
By learning how to identify the reproductive organs in fish, you can track spawning seasons in your area.

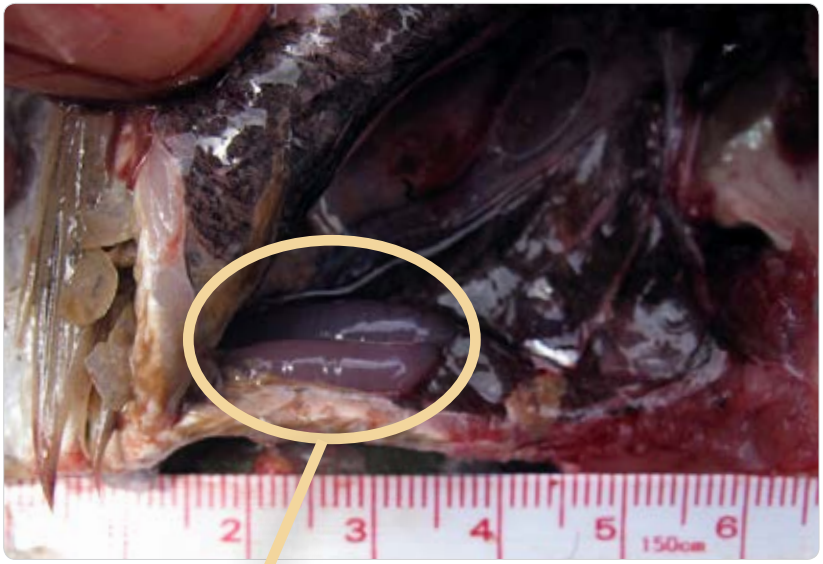
When cleaning your catch look for developed gonads. This can indicate spawning, and harvesting should be limited.

MALE REPRODUCTIVE ORGANS are also important to identify as they indicate spawning when developed.



DEVELOPED EGGS are yellowish in color with large blood vessels clearly visible.





UNDER-DEVELOPED EGGS mean fish are most likely not reproducing—this is a good time to harvest. Remember when these seasons occur in your area as each species will spawn at nearly the same time each year.

MARCH	ʻĀholehole	Manini	ʻŌmilu	ʻŌpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	ʻAmaʻama
	!	!	–	–	–	–	!	–	–	–	✕

LIMITED HARVEST
15/day 11 in. minimum fork length

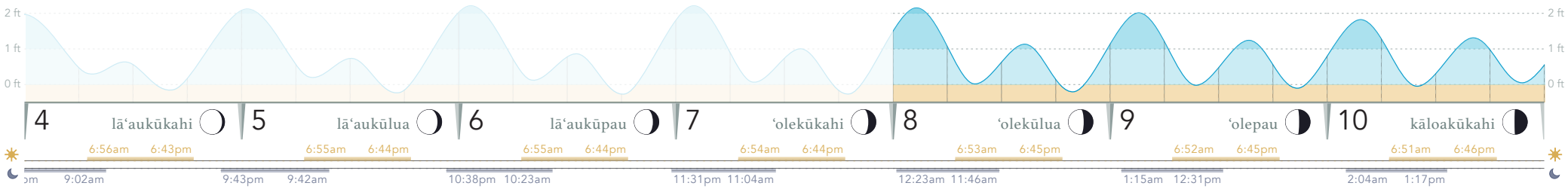
For more info see the full **FISHING SEASON TABLE** near the start of the calendar

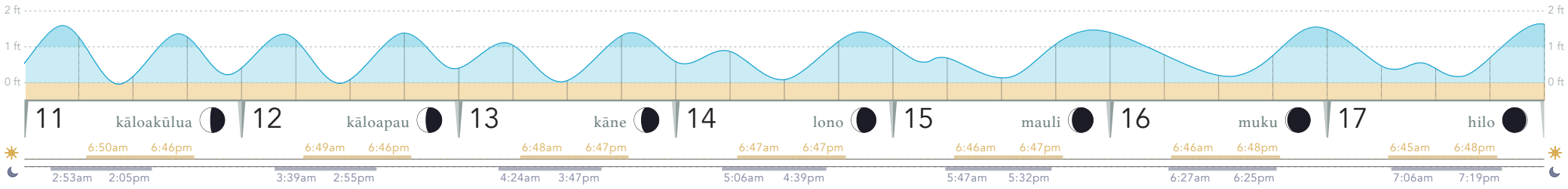
malaki

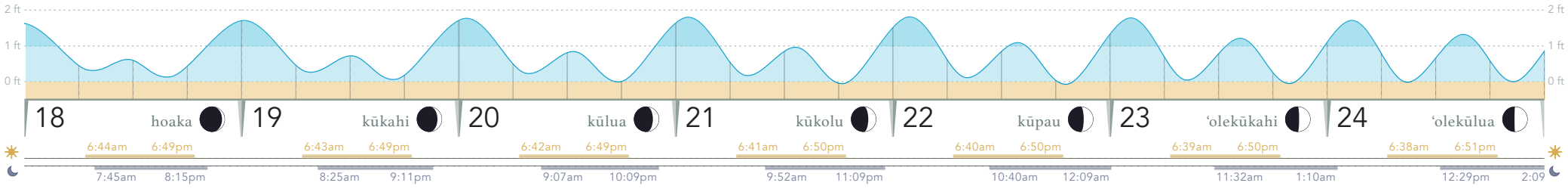
hanalei
MOON + TIDE CALENDAR
2018

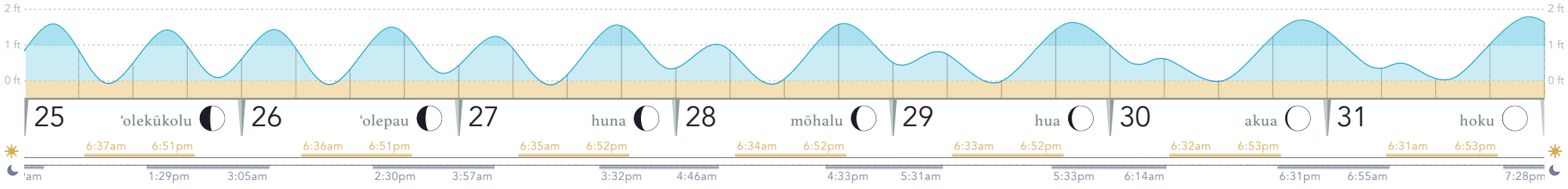
MARCH

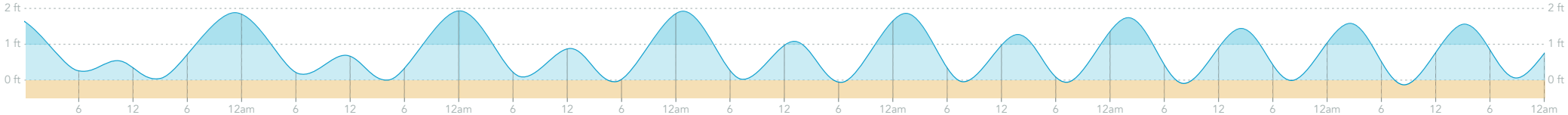
lāpule SUNDAY	pōʻakahi MONDAY	pōʻalua TUESDAY	pōʻakolu WEDNESDAY	pōʻahā THURSDAY	pōʻalima FRIDAY	pōʻaono SATURDAY
25 huna	26 mōhalu	27 hua	28 akua	1 hoku	2 māhealani	3 kulu
7:02am 6:40pm	7:01am 6:41pm	7:00am 6:41pm	7:00am 6:42pm	6:59am 6:42pm	6:58am 6:42pm	6:57am 6:43pm
16am 2:36pm 4:16am	3:39pm 5:12am	4:43pm 6:05am	5:46pm	6:54am 6:49pm 7:39am	7:49pm 8:22am	8:47p
4 lāʻaukūkahi	5 lāʻaukūlua	6 lāʻaukūpau	7 ʻolekūkahi	8 ʻolekūlua	9 ʻolepau	10 kāloakūkahi
6:56am 6:43pm	6:55am 6:44pm	6:55am 6:44pm	6:54am 6:44pm	6:53am 6:45pm	6:52am 6:45pm	6:51am 6:46pm
om 9:02am	9:43pm 9:42am	10:38pm 10:23am	11:31pm 11:04am	12:23am 11:46am	1:15am 12:31pm	2:04am 1:17pm
11 kāloakūlua	12 kāloapau	13 kāne	14 lono	15 mauli	16 muku	17 hilo
6:50am 6:46pm	6:49am 6:46pm	6:48am 6:47pm	6:47am 6:47pm	6:46am 6:47pm	6:46am 6:48pm	6:45am 6:48pm
2:53am 2:05pm	3:39am 2:55pm	4:24am 3:47pm	5:06am 4:39pm	5:47am 5:32pm	6:27am 6:25pm	7:06am 7:19pm
18 hoaka	19 kūkahi	20 kūlua	21 kūkolu	22 kūpau	23 ʻolekūkahi	24 ʻolekūlua
6:44am 6:49pm	6:43am 6:49pm	6:42am 6:49pm	6:41am 6:50pm	6:40am 6:50pm	6:39am 6:50pm	6:38am 6:51pm
7:45am 8:15pm	8:25am 9:11pm	9:07am 10:09pm	9:52am 11:09pm	10:40am 12:09am	11:32am 1:10am	12:29pm 2:09
25 ʻolekūkolu	26 ʻolepau	27 huna	28 mōhalu	29 hua	30 akua	31 hoku
6:37am 6:51pm	6:36am 6:51pm	6:35am 6:52pm	6:34am 6:52pm	6:33am 6:52pm	6:32am 6:53pm	6:31am 6:53pm
am 1:29pm 3:05am	2:30pm 3:57am	3:32pm 4:46am	4:33pm 5:31am	5:33pm 6:14am	6:31pm 6:55am	7:28pm











LIVING PONO

Volunteers are welcome to assist on the project at Community Workday events held on the 4th Saturday of every month. Call 826-9969 for more information and to RSVP.

Restoring An ʻAhupuaʻa

Building on the success of the Waipā Stream Restoration Project, the Waipā Foundation has expanded their scope of watershed best management practices to include agricultural, residential, and mauka areas. Aimed at reducing non-point source pollution entering Waipā Stream and Hanalei Bay, this new program includes cesspool replacements with alternative wastewater treatment systems, livestock fencing and watering to keep farm animals out of waterways, and upland reforestation and erosion control. Monitoring programs to assess project effectiveness include stream and reef assessments as well as regular water quality monitoring in streams, estuaries, drainage ditches, and the Halulu fishpond.

*Funding for this project has been provided by the Hawaii State Department of Health, Clean Water Branch, Polluted Runoff Control section.

APRIL	ʻĀholehole	Manini	ʻŌmilu	ʻŌpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	ʻAmaʻama
For more info see the full **FISHING SEASON TABLE** near the start of the calendar	!	!	!	!	!	–	!	–	–	–	–

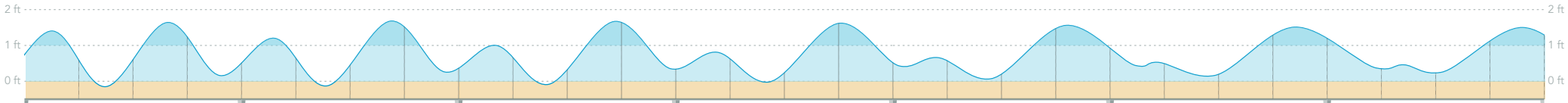
LIMITED HARVEST
15/day 11 in. minimum fork length

ʻapelila

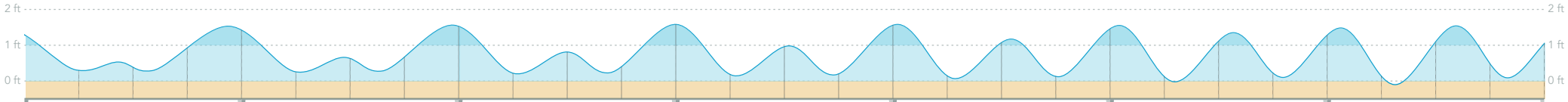
hanalei
MOON + TIDE CALENDAR
2018

APRIL

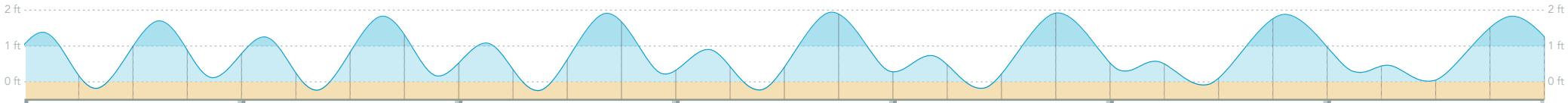
lāpule SUNDAY	pōʻakahi MONDAY	pōʻalua TUESDAY	pōʻakolu WEDNESDAY	pōʻahā THURSDAY	pōʻalima FRIDAY	pōʻaono SATURDAY
1 māhealani	2 kulu	3 lāʻaukūkahi	4 lāʻaukūlua	5 lāʻaukūpau	6 ʻolekūkahi	7 ʻolekūlua
6:31am 6:53pm	6:30am 6:54pm	6:29am 6:54pm	6:28am 6:54pm	6:27am 6:55pm	6:26am 6:55pm	6:25am 6:55pm
7:35am 8:24pm	8:15am 9:19pm	8:57am 10:12pm	9:39am 11:05pm	10:23am 11:56pm	11:09am 12:46am	11:57am



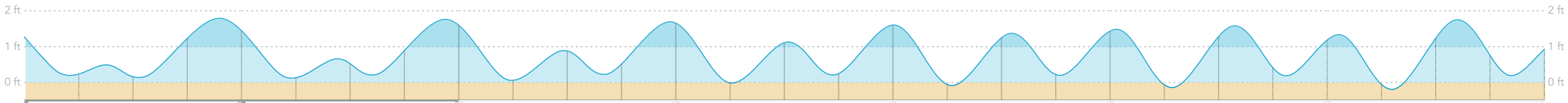
8 ʻolepau	9 kāloakūkahi	10 kāloakūlua	11 kāloapau	12 kāne	13 lono	14 mauli
6:24am 6:56pm	6:23am 6:56pm	6:22am 6:56pm	6:21am 6:57pm	6:21am 6:57pm	6:20am 6:57pm	6:19am 6:58pm
1:33am 12:47pm	2:19am 1:37pm	3:02am 2:29pm	3:43am 3:21pm	4:22am 4:14pm	5:01am 5:08pm	5:41am 6:04pm



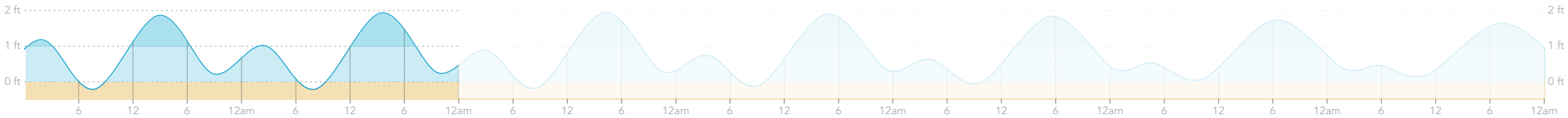
15 muku / hilo	16 hoaka	17 kūkahi	18 kūlua	19 kūkolu	20 kūpau	21 ʻolekūkahi
6:18am 6:58pm	6:17am 6:59pm	6:16am 6:59pm	6:15am 6:59pm	6:15am 7:00pm	6:14am 7:00pm	6:13am 7:00pm
6:20am 7:01pm	7:02am 7:59pm	7:47am 9:00pm	8:35am 10:02pm	9:27am 11:04pm	10:24am 12:04am	11:23am 1:02am



22 ʻolekūlua	23 ʻolekūkolu	24 ʻolepau	25 huna	26 mōhalu	27 hua	28 akua
6:12am 7:01pm	6:12am 7:01pm	6:11am 7:02pm	6:10am 7:02pm	6:09am 7:02pm	6:09am 7:03pm	6:08am 7:03pm
12:24pm 1:55am	1:25pm 2:44am	2:25pm 3:29am	3:24pm 4:11am	4:22pm 4:51am	5:18pm 5:31am	6:13pm



29 hoku	30 māhealani	1 kulu	2 lāʻaukūkahi	3 lāʻaukūlua	4 lāʻaukūpau	5 ʻolekūkahi
6:07am 7:04pm	6:07am 7:04pm	6:06am 7:05pm	6:05am 7:05pm	6:05am 7:05pm	6:04am 7:06pm	6:03am 7:06pm
6:10am 7:08pm	6:51am 8:02pm	7:33am 8:55pm	8:16am 9:48pm	9:02am 10:39pm	9:49am 11:27pm	10:38am



Cutting Carbon

Our oceans absorb 25% of the carbon dioxide released annually. When this happens, the seawater becomes more acidic and carbonate ions become less abundant. Not only does this potentially weaken calcium structures, but it means it takes more energy to grow leading to slower growth rates and potentially less energy for reproduction. This change can have huge impacts on organisms that build shells and other structures with calcium carbonate such as corals, lobsters, urchins, calcareous plankton and more.

LIVING PONO

In order to reduce the impacts of climate change, everyone needs to do their part to reduce carbon pollution. Currently, 90% of Hawai'i's food is imported and one cargo vessel can emit as much as 50 million cars a year. This makes food importation a big contributor to Hawai'i's carbon footprint.

Here are a few simple diet choices that can have a big impact on reducing our carbon footprint while supporting the local economy:

MAY	ʻĀholehole	Manini	ʻŌmilu	ʻŌpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	ʻAmaʻama
For more info see the full **FISHING SEASON TABLE** near the start of the calendar	–	!	!	!	!	–	!	✕	✕	✕	–

LIMITED HARVEST
15/day 11 in. minimum fork length

mei

hanalei
MOON + TIDE CALENDAR
2 0 1 8

MAY

lāpule SUNDAY	pōʻakahi MONDAY	pōʻalua TUESDAY	pōʻakolu WEDNESDAY	pōʻahā THURSDAY	pōʻalima FRIDAY	pōʻaono SATURDAY
29 hoku	30 māhealani	1 kulu	2 lāʻaukūkahi	3 lāʻaukūlua	4 lāʻaukūpau	5 ʻolekūkahi
6:07am 7:04pm	6:07am 7:04pm	6:06am 7:05pm	6:05am 7:05pm	6:05am 7:05pm	6:04am 7:06pm	6:03am 7:06pm
6:10am 7:08pm	6:51am 8:02pm	7:33am 8:55pm	8:16am 9:48pm	9:02am 10:39pm	9:49am 11:27pm	10:38am
6 ʻolekūlua	7 ʻolepau	8 kāloakūkahi	9 kāloakūlua	10 kāloapau	11 kāne	12 lono
6:03am 7:07pm	6:02am 7:07pm	6:02am 7:08pm	6:01am 7:08pm	6:01am 7:08pm	6:00am 7:09pm	6:00am 7:09pm
12:13am 11:29am	12:57am 12:19pm	1:39am 1:11pm	2:18am 2:03pm	2:57am 2:56pm	3:35am 3:50pm	4:14am 4:46pm
13 mauli	14 muku	15 hilo	16 hoaka	17 kūkahi	18 kūlua	19 kūkolu
5:59am 7:10pm	5:59am 7:10pm	5:58am 7:11pm	5:58am 7:11pm	5:57am 7:12pm	5:57am 7:12pm	5:57am 7:12pm
4:55am 5:44pm	5:38am 6:45pm	6:25am 7:48pm	7:17am 8:52pm	8:14am 9:55pm	9:14am 10:56pm	10:16am 11:52pm
20 kūpau	21 ʻolekūkahi	22 ʻolekūlua	23 ʻolekūkolu	24 ʻolepau	25 huna	26 mōhalu
5:56am 7:13pm	5:56am 7:13pm	5:56am 7:14pm	5:55am 7:14pm	5:55am 7:15pm	5:55am 7:15pm	5:55am 7:16pm
11:19am 12:43am	12:20pm 1:29am	1:19pm 2:12am	2:17pm 2:52am	3:12pm 3:31am	4:07pm 4:10am	5:01pm
27 hua	28 akua	29 hoku	30 māhealani	31 kulu	1 lāʻaukūkahi	2 lāʻaukūlua
5:55am 7:16pm	5:54am 7:16pm	5:54am 7:17pm	5:54am 7:17pm	5:54am 7:18pm	5:54am 7:18pm	5:54am 7:19pm
4:49am 5:55pm	5:29am 6:48pm	6:12am 7:41pm	6:57am 8:32pm	7:43am 9:22pm	8:32am 10:09pm	9:22am

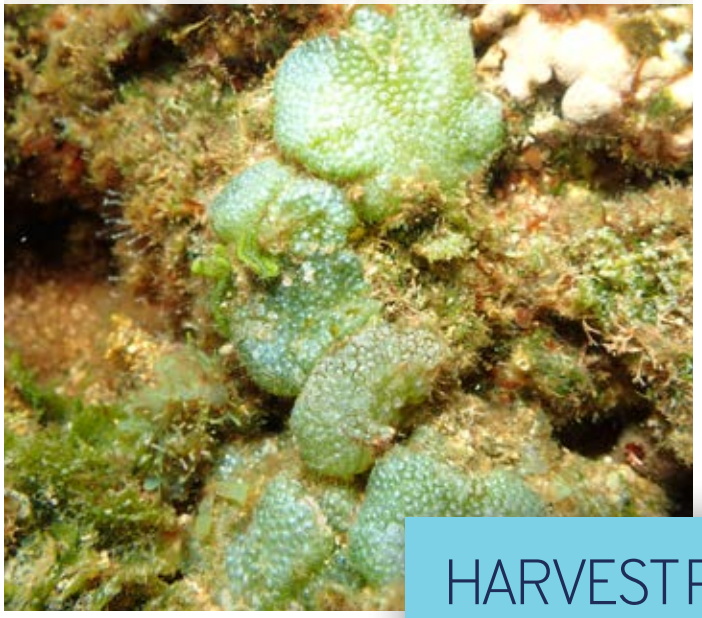
2 ft
1 ft
0 ft

6 12 6 12am 6 12 6 12am 6 12 6 12am 6 12 6 12am 6 12 6 12am 6 12 6 12am 6 12 6 12am

Limu
of Hanalei Bay

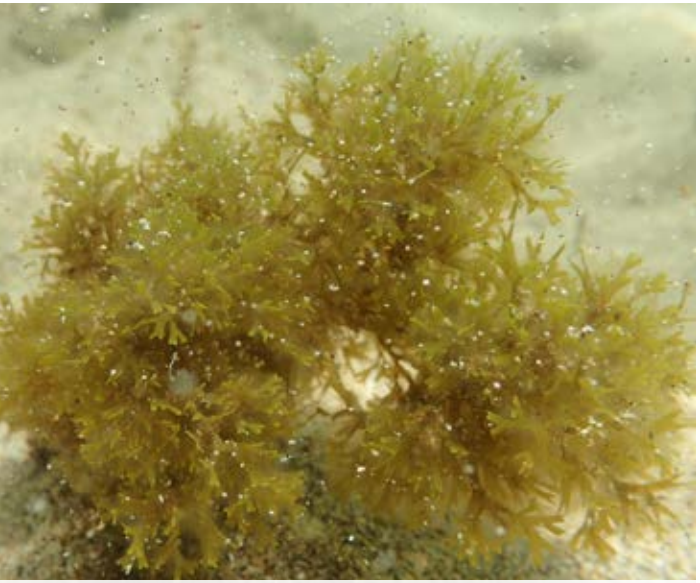
Dictyosphaeria spp

Haliptilon subulatum



HARVEST PONO

When picking limu, leave the rooted structure called a "holdfast" to regenerate.



Dictyota spp

Pterocladiella capillacea

Padina spp

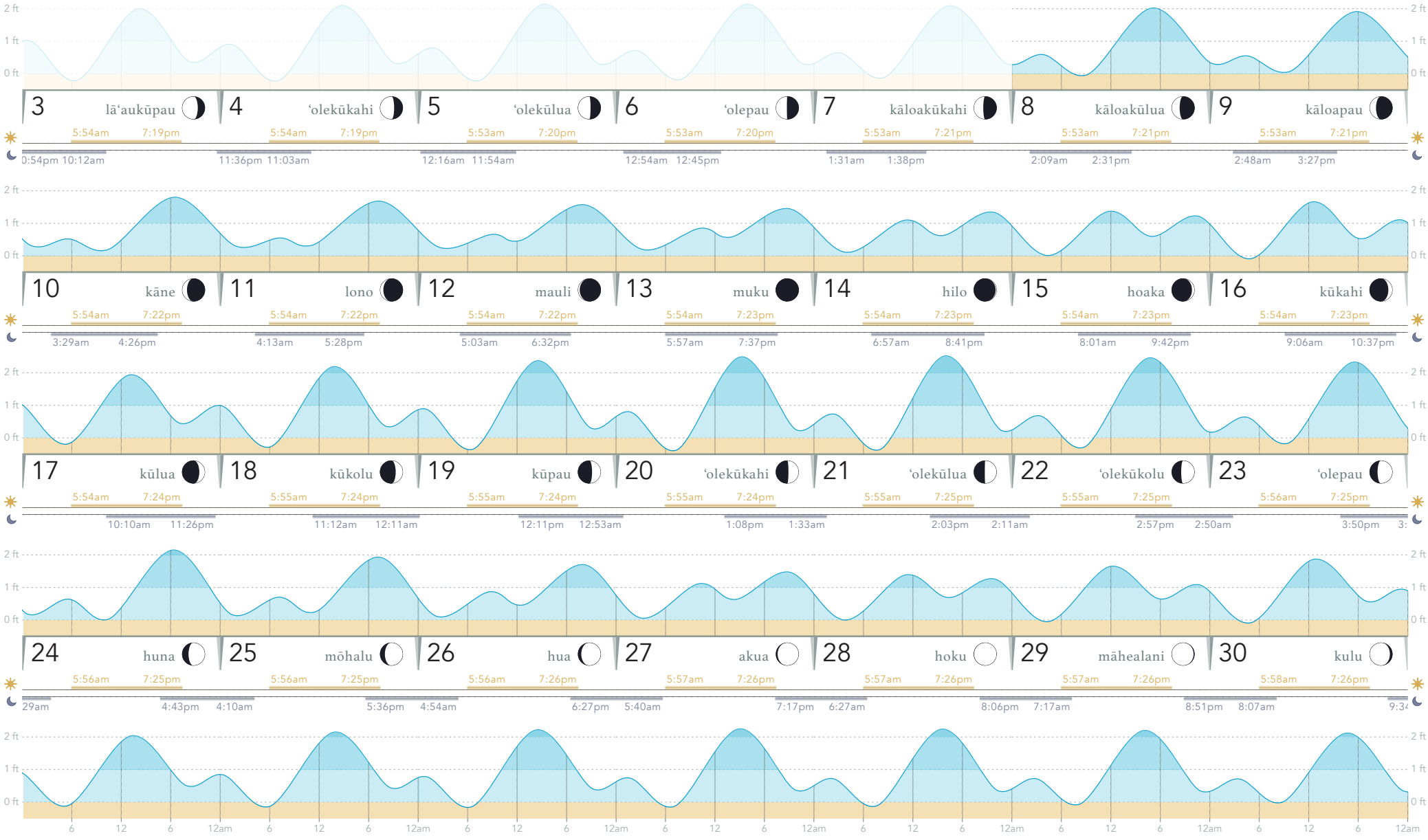
JUNE	ʻĀholehole	Manini	ʻŌmilu	ʻŌpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	ʻAmaʻama
For more info see the full **FISHING SEASON TABLE** near the start of the calendar	–	!	!	!	!	–	✗	✗	✗	✗	–

iune

hanalei
MOON + TIDE CALENDAR
2 0 1 8

JUNE

lāpule SUNDAY	pōʻakahi MONDAY	pōʻalua TUESDAY	pōʻakolu WEDNESDAY	pōʻahā THURSDAY	pōʻalima FRIDAY	pōʻaono SATURDAY
27 hua	28 akua	29 hoku	30 māhealani	31 kulu	1 lāʻaukūkahi	2 lāʻaukūlua
5:55am 7:16pm 4:49am 5:55pm 5:29am	5:54am 7:16pm 6:48pm 6:12am	5:54am 7:17pm 7:41pm 6:57am	5:54am 7:17pm 8:32pm 7:43am	5:54am 7:18pm 9:22pm 8:32am	5:54am 7:18pm 10:09pm 9:22am	5:54am 7:19pm
3 lāʻaukūpau	4 ʻolekūkahi	5 ʻolekūlua	6 ʻolepau	7 kāloakūkahi	8 kāloakūlua	9 kāloapau
5:54am 7:19pm 0:54pm 10:12am	5:54am 7:19pm 11:36pm 11:03am	5:53am 7:20pm 12:16am 11:54am	5:53am 7:20pm 12:54am 12:45pm	5:53am 7:21pm 1:31am 1:38pm	5:53am 7:21pm 2:09am 2:31pm	5:53am 7:21pm 2:48am 3:27pm
10 kāne	11 lono	12 mauli	13 muku	14 hilo	15 hoaka	16 kūkahi
5:54am 7:22pm 3:29am 4:26pm	5:54am 7:22pm 4:13am 5:28pm	5:54am 7:22pm 5:03am 6:32pm	5:54am 7:23pm 5:57am 7:37pm	5:54am 7:23pm 6:57am 8:41pm	5:54am 7:23pm 8:01am 9:42pm	5:54am 7:23pm 9:06am 10:37pm
17 kūlua	18 kūkolu	19 kūpau	20 ʻolekūkahi	21 ʻolekūlua	22 ʻolekūkolu	23 ʻolepau
5:54am 7:24pm 10:10am 11:26pm	5:55am 7:24pm 11:12am 12:11am	5:55am 7:24pm 12:11pm 12:53am	5:55am 7:24pm 1:08pm 1:33am	5:55am 7:25pm 2:03pm 2:11am	5:55am 7:25pm 2:57pm 2:50am	5:56am 7:25pm 3:50pm 3:
24 huna	25 mōhalu	26 hua	27 akua	28 hoku	29 māhealani	30 kulu
5:56am 7:25pm 29am 4:43pm 4:10am	5:56am 7:25pm 5:36pm 4:54am	5:56am 7:26pm 6:27pm 5:40am	5:57am 7:26pm 7:17pm 6:27am	5:57am 7:26pm 8:06pm 7:17am	5:57am 7:26pm 8:51pm 8:07am	5:58am 7:26pm 9:3



Know Thy ʻŌpae

ʻŌpae ʻoehaʻa *ENDEMIC*
ʻŌpae ʻoehaʻa have one pincer that is noticeably larger than the other. Found mainly in the lower parts of rivers and streams where water is brackish.

Tahitian Prawn
Young prawns can look similar to native ʻōpae, but have two pincers of equal length when small.

ʻŌpae kuahiwi *ENDEMIC*
Also known as ʻŌpae kalaʻole, these endemic shrimp live in the upper reaches of clean, fast flowing streams.

FISHING PONO

Legal methods of harvesting stream animals is by pole and line, throw net, spear, and crab trap. Lay nets are prohibited.

JULY	ʻĀholehole	Manini	ʻŌmilu	ʻŌpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	ʻAmaʻama
For more info see the full **FISHING SEASON TABLE** near the start of the calendar	–	–	–	!	!	–	✗	✗	✗	✗	–

iulai

hanalei
MOON + TIDE CALENDAR
2018

JULY

lāpule SUNDAY	pōʻakahi MONDAY	pōʻalua TUESDAY	pōʻakolu WEDNESDAY	pōʻahā THURSDAY	pōʻalima FRIDAY	pōʻaono SATURDAY
1 lāʻaukūkahi	2 lāʻaukūlua	3 lāʻaukūpau	4 ʻolekūkahi	5 ʻolekūlua	6 ʻolepau	7 kāloakūkahi
5:58am 7:26pm	5:58am 7:26pm	5:59am 7:26pm	5:59am 7:26pm	5:59am 7:26pm	6:00am 7:26pm	6:00am 7:26pm
pm 8:58am	10:15pm 9:48am	10:53pm 10:39am	11:30pm 11:30am	12:07am 12:22pm	12:44am 1:15pm	1:23am 2:11pm
8 kāloakūlua	9 kāloapau	10 kāne	11 lono	12 mauli	13 muku / hilo	14 hoaka
6:00am 7:26pm	6:01am 7:26pm	6:01am 7:26pm	6:02am 7:25pm	6:02am 7:25pm	6:02am 7:25pm	6:03am 7:25pm
2:04am 3:10pm	2:50am 4:11pm	3:41am 5:16pm	4:38am 6:20pm	5:40am 7:23pm	6:45am 8:23pm	7:52am 9:16pm
15 kūkahi	16 kūlua	17 kūkolu	18 kūpau	19 ʻolekūkahi	20 ʻolekūlua	21 ʻolekūkolu
6:03am 7:25pm	6:04am 7:24pm	6:04am 7:24pm	6:04am 7:24pm	6:05am 7:24pm	6:05am 7:23pm	6:06am 7:23pm
8:57am 10:05pm	10:00am 10:50pm	11:00am 11:31pm	11:57am 12:11am	12:52pm 12:50am	1:46pm 1:29am	2:39pm 2:10
22 ʻolepau	23 huna	24 mōhalu	25 hua	26 akua	27 hoku	28 māhealani
6:06am 7:23pm	6:07am 7:22pm	6:07am 7:22pm	6:07am 7:22pm	6:08am 7:21pm	6:08am 7:21pm	6:09am 7:20pm
am 3:32pm 2:53am	4:23pm 3:37am	5:14pm 4:24am	6:03pm 5:13am	6:49pm 6:03am	7:33pm 6:54am	8:15p
29 kulu	30 lāʻaukūkahi	31 lāʻaukūlua	1 lāʻaukūpau	2 ʻolekūkahi	3 ʻolekūlua	4 ʻolepau
6:09am 7:20pm	6:09am 7:19pm	6:10am 7:19pm	6:10am 7:18pm	6:11am 7:18pm	6:11am 7:17pm	6:11am 7:16pm
m 7:45am	8:54pm 8:35am	9:31pm 9:26am	10:08pm 10:17am	10:44pm 11:09am	11:21pm 12:03pm	12:00am 12:58pm

2 ft
1 ft
0 ft

6 12 6 12am 6 12 6 12am 6 12 6 12am 6 12am 6 12 6 12am 6 12 6 12am 6 12 6 12am 6 12 6 12am

Mullet Species in Hawai‘i

11"
‘AMA‘AMA LEGAL MINIMUM SIZE
(Fork Length: Tip of snout to fork in tail)

‘Ama‘ama

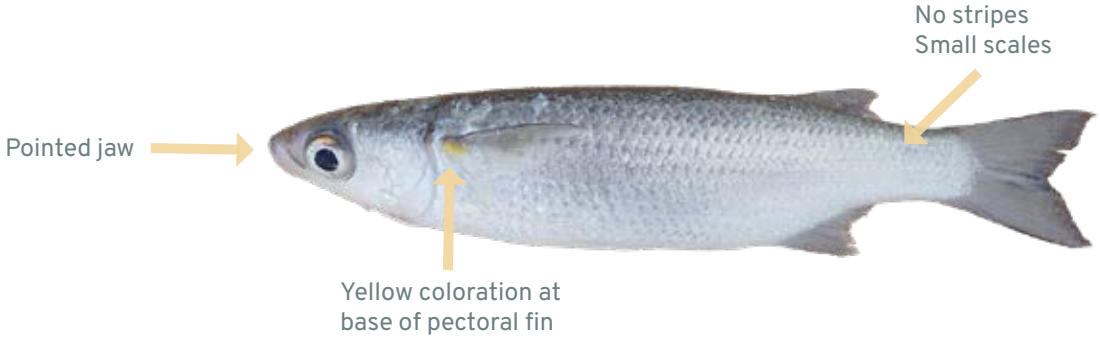
Striped mullet *(Mugil cephalus)*
Native
Max size: 27” Fork Length (FL), 10 lbs
Legal size– 11” Fork Length
Closed Season: December 1st to March 31st
Bag Limit: 10 per day (Hilo Bay only)

Kanda

Marquesan mullet *(Moolgarda engeli)*
Introduced
Max size: 10” FL, 3/4 lbs
No size restrictions
No closed seasons
No bag limit

FISHING PONO

Become an invasivore. Introduced species such as kanda mullet, ta‘ape, and to‘au are often overlooked as desirable food fish, but are quite tasty.



Uouoa

Sharp-nose mullet *(Neomyxus leuciscus)*
Native
Max size: 12” FL, 1 lbs
No size restrictions
No closed seasons
No bag limit

AUGUST	‘Āholehole	Manini	‘Ōmilu	‘Ōpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	‘Ama‘ama
For more info see the full **FISHING SEASON TABLE** near the start of the calendar	–	–	–	!	!	!	✕	✕	✕	✕	–

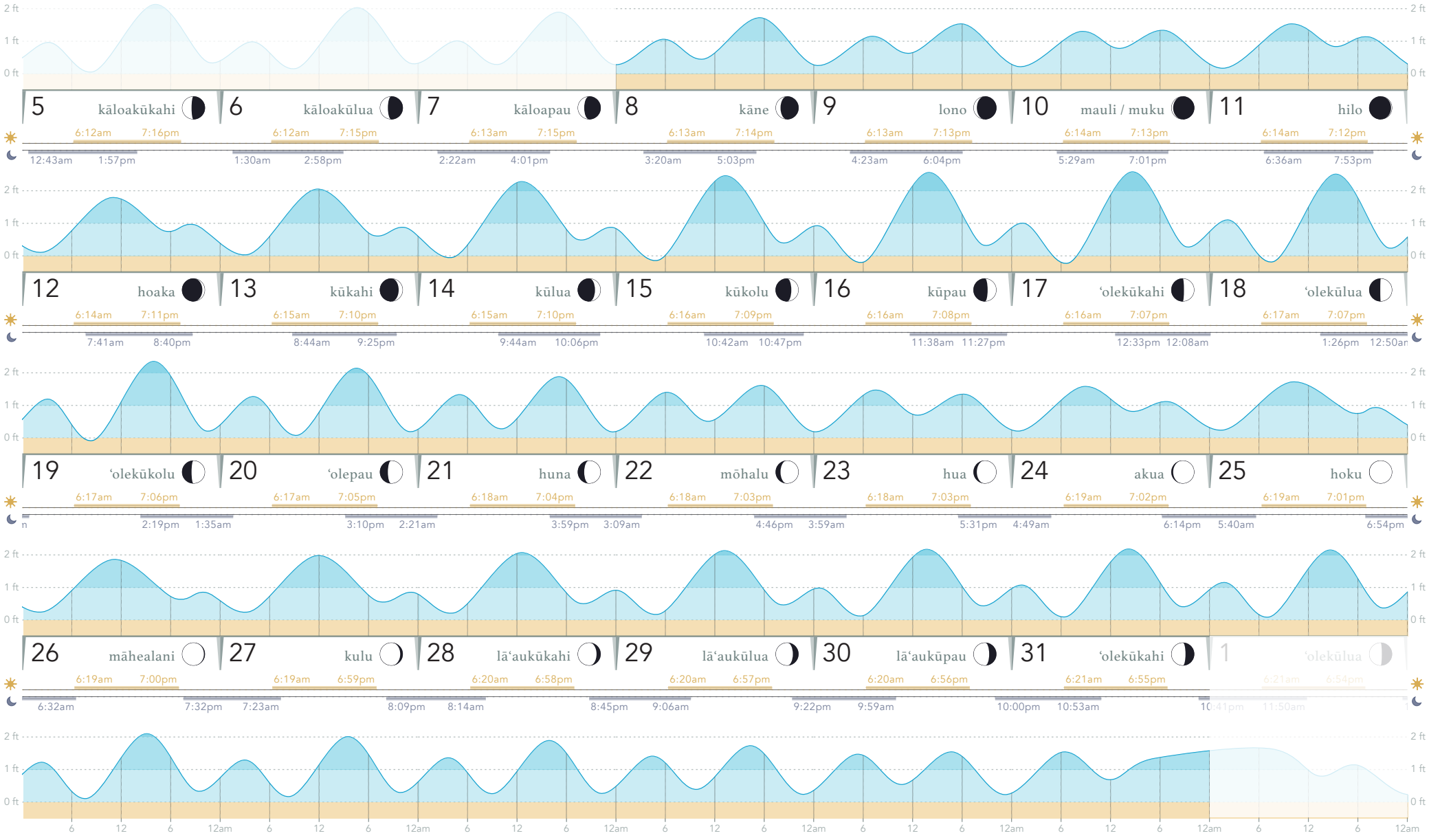
LIMITED HARVEST
State restrictions apply

ʻaukake

hanalei
MOON + TIDE CALENDAR
2018

AUGUST

lāpule SUNDAY	pōʻakahi MONDAY	pōʻalua TUESDAY	pōʻakolu WEDNESDAY	pōʻahā THURSDAY	pōʻalima FRIDAY	pōʻaono SATURDAY
29 kulu	30 lāʻaukūkahi	31 lāʻaukūlua	1 lāʻaukūpau	2 ʻolekūkahi	3 ʻolekūlua	4 ʻolepau
6:09am 7:20pm	6:09am 7:19pm	6:10am 7:19pm	6:10am 7:18pm	6:11am 7:18pm	6:11am 7:17pm	6:11am 7:16pm
m 7:45am	8:54pm 8:35am	9:31pm 9:26am	10:08pm 10:17am	10:44pm 11:09am	11:21pm 12:03pm	12:00am 12:58pm
5 kāloakūkahi	6 kāloakūlua	7 kāloapau	8 kāne	9 lono	10 mauli / muku	11 hilo
6:12am 7:16pm	6:12am 7:15pm	6:13am 7:15pm	6:13am 7:14pm	6:13am 7:13pm	6:14am 7:13pm	6:14am 7:12pm
12:43am 1:57pm	1:30am 2:58pm	2:22am 4:01pm	3:20am 5:03pm	4:23am 6:04pm	5:29am 7:01pm	6:36am 7:53pm
12 hoaka	13 kūkahi	14 kūlua	15 kūkolu	16 kūpau	17 ʻolekūkahi	18 ʻolekūlua
6:14am 7:11pm	6:15am 7:10pm	6:15am 7:10pm	6:16am 7:09pm	6:16am 7:08pm	6:16am 7:07pm	6:17am 7:07pm
7:41am 8:40pm	8:44am 9:25pm	9:44am 10:06pm	10:42am 10:47pm	11:38am 11:27pm	12:33pm 12:08am	1:26pm 12:50am
19 ʻolekūkolu	20 ʻolepau	21 huna	22 mōhalu	23 hua	24 akua	25 hoku
6:17am 7:06pm	6:17am 7:05pm	6:18am 7:04pm	6:18am 7:03pm	6:18am 7:03pm	6:19am 7:02pm	6:19am 7:01pm
n 2:19pm 1:35am	3:10pm 2:21am	3:59pm 3:09am	4:46pm 3:59am	5:31pm 4:49am	6:14pm 5:40am	6:54pm
26 māhealani	27 kulu	28 lāʻaukūkahi	29 lāʻaukūlua	30 lāʻaukūpau	31 ʻolekūkahi	1 ʻolekūlua
6:19am 7:00pm	6:19am 6:59pm	6:20am 6:58pm	6:20am 6:57pm	6:20am 6:56pm	6:21am 6:55pm	6:21am 6:54pm
6:32am 7:32pm	7:23am 8:09pm	8:14am 8:45pm	9:06am 9:22pm	9:59am 10:00pm	10:53am 10:41pm	11:50am



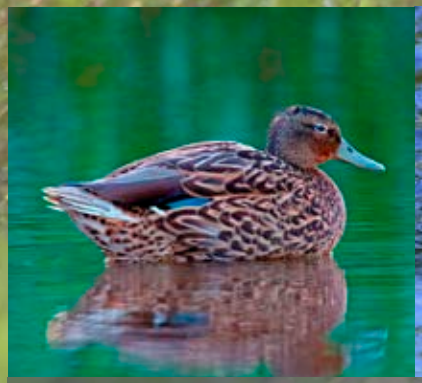
Hanalei National Wildlife Refuge

LIVING PONO

Our endangered wetland birds are treasured species found nowhere else in the world. Help minimize hazards such as drones, discarded fishing line, and vehicle strikes. Please drive with caution near wetland areas.

Koloa Flush Photo: Greg Stutzer
Specie Photos Below: Gary Kramer

The Hanalei National Wildlife Refuge was established in 1972 to protect and recover threatened and endangered species, including five endemic waterbird species, the Koloa maoli, ʻAlae ʻula, ʻAlae keʻokeʻo, Aeʻo, and Nēnē. Kauaʻi and Niʻihau are believed to support 90% of the state's pure Koloa maoli population, a significant portion of which are found on the Hanalei Refuge and in the greater Hanalei watershed. The Refuge aims to enhance these endangered waterbird populations by providing high quality nesting and feeding habitat through intensively managing wetlands in a rotational manner to mimic natural systems. Kalo farms both on the Refuge and in the surrounding area offer supplemental habitat, providing for some of the key life history requirements of endangered Hawaiian waterbirds. The U.S. Fish and Wildlife Service is honored to work with local farmers to sustain the multi-generational tradition of growing kalo in the Hanalei river valley, while working to recover these endangered waterbirds the Refuge was established to protect.



Koloa maoli (Anas wyvilliana) or Hawaiian Duck

ʻAlae keʻokeʻo (Fulica alai) or Hawaiian Coot

ʻAlae ʻula (Gallinula galeata sandvicensis) or Hawaiian Moorhen

Aeʻo (Himantopus mexicanus knudseni) or Hawaiian Stilt

Nēnē (Branta sandvicensis) or Hawaiian Goose

SEPTEMBER	ʻĀholehole	Manini	ʻŌmilu	ʻŌpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	ʻAmaʻama
For more info see the full **FISHING SEASON TABLE** near the start of the calendar	–	–	–	–	!	!	!	–	–	–	–

LIMITED HARVEST
State restrictions apply

LIMITED HARVEST
15/day 11 in. minimum fork length

kepakemapa

hanalei
MOON + TIDE CALENDAR
2 0 1 8

SEPTEMBER

Harvest wisely to ensure future catches!

Observations on He'e

Reproduction of he'e in Hawai'i is still not thoroughly understood. However, it's known that they are able to reproduce year-round, females often dying shortly after eggs have hatched (approximately 12-15 months of age). The eggs are carefully tended to in a den of the female who guards them 24 hours a day. She won't eat during this time, approximately 20-36 days, as leaving them unattended might allow small fish and crustaceans a chance to eat them.

The he'e populations today are reported to be only a fraction of what they were in the recent past. Kupuna tell stories of when he'e were much more abundant and easily found on reef flats at low tide. Harvesting of he'e was a community event in which men, women, and children would participate in. There were also seasonal restrictions on when he'e was open to harvest.

HARVEST PONO

Harvesting only 1 or 2 he'e per outing may help to prevent populations from being over-fished. Perhaps harvesting he'e by hand (not spearing) will allow females to be released if eggs are seen in the den.

OCTOBER	ʻĀholehole	Manini	ʻŌmilu	ʻŌpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	ʻAmaʻama
For more info see the full **FISHING SEASON TABLE** near the start of the calendar	–	–	–	–	!	!	!	–	–	–	–

LIMITED HARVEST
State restrictions apply

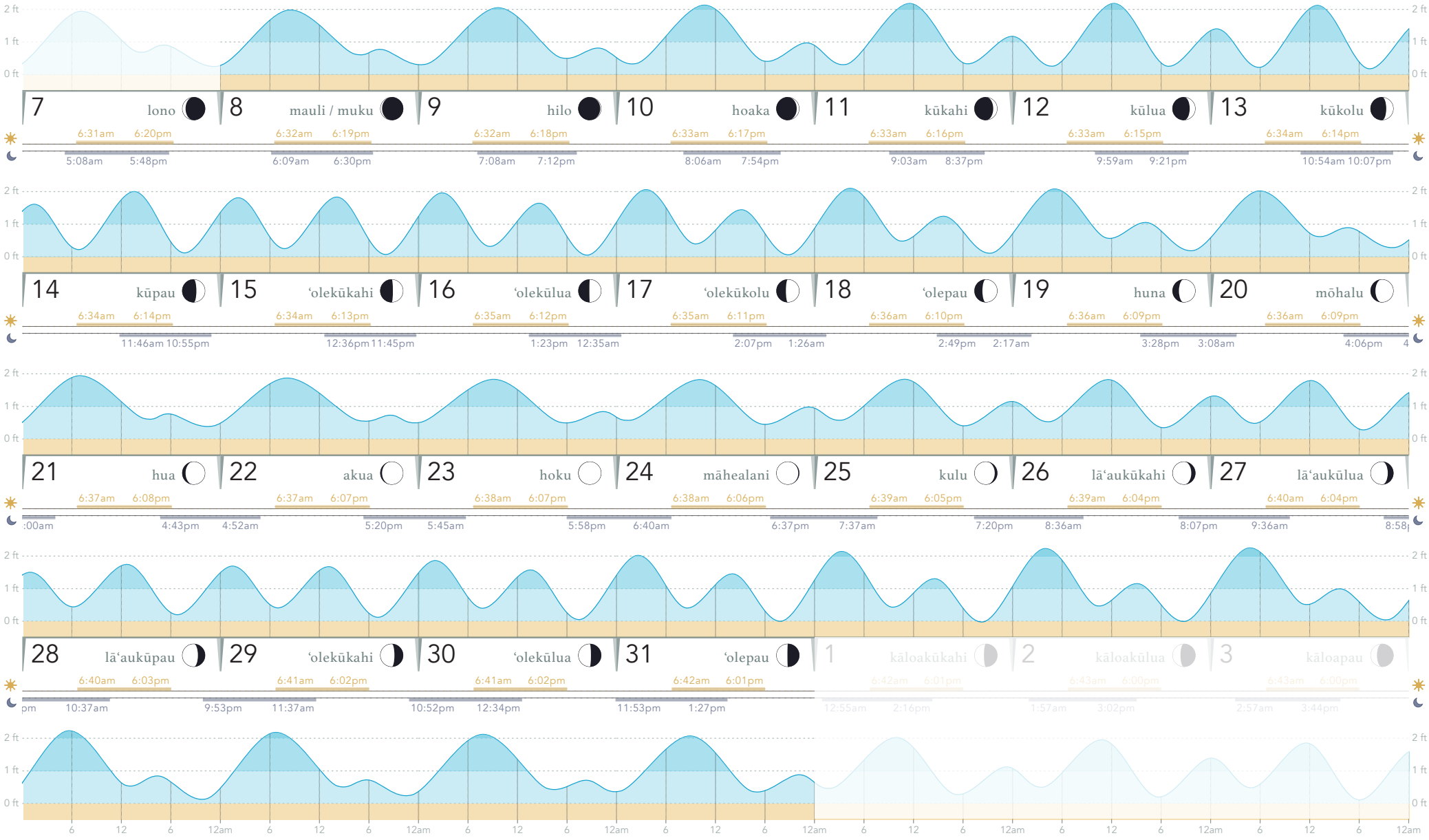
LIMITED HARVEST
15/day 11 in. minimum fork length

ʻokakopa

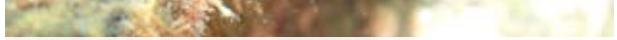
hanalei
MOON + TIDE CALENDAR
2 0 1 8

OCTOBER

lāpule SUNDAY	pōʻakahi MONDAY	pōʻalua TUESDAY	pōʻakolu WEDNESDAY	pōʻahā THURSDAY	pōʻalima FRIDAY	pōʻaono SATURDAY
30 ʻolekūkahi	1 ʻolekūlua	2 ʻolepau	3 kāloakūkahi	4 kāloakūlua	5 kāloapau	6 kāne
6:29am 6:26pm	6:29am 6:25pm	6:30am 6:24pm	6:30am 6:23pm	6:30am 6:22pm	6:31am 6:21pm	6:31am 6:21pm
:10pm 11:43am	11:02pm 12:42pm	11:58pm 1:41pm	12:58am 2:37pm	2:00am 3:30pm	3:04am 4:19pm	4:06am 5:05pm
7 lono	8 mauli / muku	9 hilo	10 hoaka	11 kūkahi	12 kūlua	13 kūkolu
6:31am 6:20pm	6:32am 6:19pm	6:32am 6:18pm	6:33am 6:17pm	6:33am 6:16pm	6:33am 6:15pm	6:34am 6:14pm
5:08am 5:48pm	6:09am 6:30pm	7:08am 7:12pm	8:06am 7:54pm	9:03am 8:37pm	9:59am 9:21pm	10:54am 10:07pm
14 kūpau	15 ʻolekūkahi	16 ʻolekūlua	17 ʻolekūkolu	18 ʻolepau	19 huna	20 mōhalu
6:34am 6:14pm	6:34am 6:13pm	6:35am 6:12pm	6:35am 6:11pm	6:36am 6:10pm	6:36am 6:09pm	6:36am 6:09pm
11:46am 10:55pm	12:36pm 11:45pm	1:23pm 12:35am	2:07pm 1:26am	2:49pm 2:17am	3:28pm 3:08am	4:06pm 4
21 hua	22 akua	23 hoku	24 māhealani	25 kulu	26 lāʻaukūkahi	27 lāʻaukūlua
6:37am 6:08pm	6:37am 6:07pm	6:38am 6:07pm	6:38am 6:06pm	6:39am 6:05pm	6:39am 6:04pm	6:40am 6:04pm
:00am 4:43pm	4:52am 5:20pm	5:45am 5:58pm	6:40am 6:37pm	7:37am 7:20pm	8:36am 8:07pm	9:36am 8:58
28 lāʻaukūpau	29 ʻolekūkahi	30 ʻolekūlua	31 ʻolepau	1 kāloakūkahi	2 kāloakūlua	3 kāloapau
6:40am 6:03pm	6:41am 6:02pm	6:41am 6:02pm	6:42am 6:01pm	6:42am 6:01pm	6:43am 6:00pm	6:43am 6:00pm
pm 10:37am	9:53pm 11:37am	10:52pm 12:34pm	11:53pm 1:27pm	12:55am 2:16pm	1:57am 3:02pm	2:57am 3:44pm



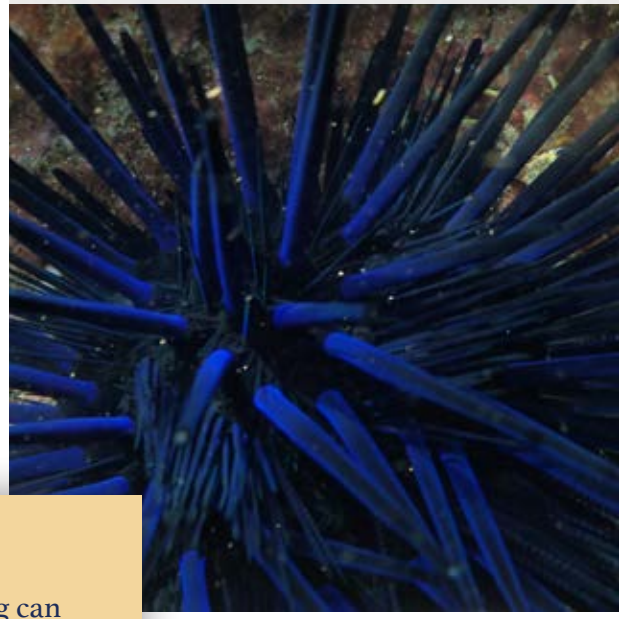
Urchins of Hanalei Bay



ʻIna / Rock-boring Urchin

Pūnohu / Red Pencil Urchin

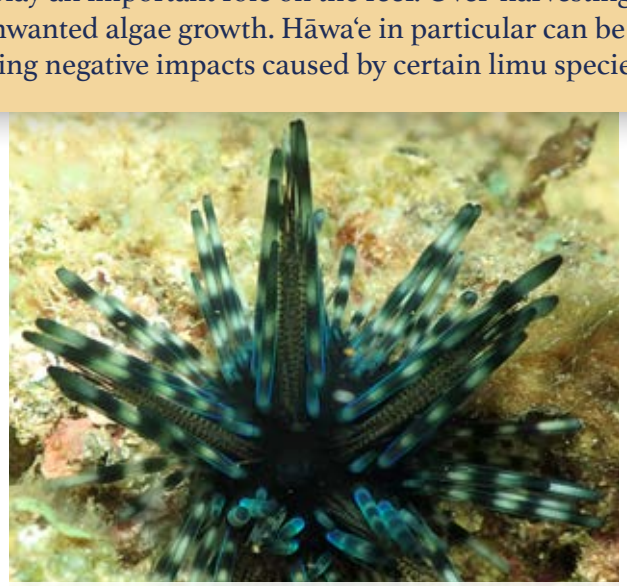
Wana / Blue-Black Urchin



HARVEST PONO

Urchins play an important role on the reef. Over-harvesting can lead to unwanted algae growth. Hāwaʻe in particular can be helpful in balancing negative impacts caused by certain limu species.

Hāwaʻe / Collector Urchin



Wana / Banded Urchin

Hāʻukeʻuke / Shingle Urchin

NOVEMBER	ʻĀholehole	Manini	ʻŌmilu	ʻŌpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	ʻAmaʻama
	–	–	–	–	–	–	!	–	–	–	–

LIMITED HARVEST
15/day 11 in. minimum fork length

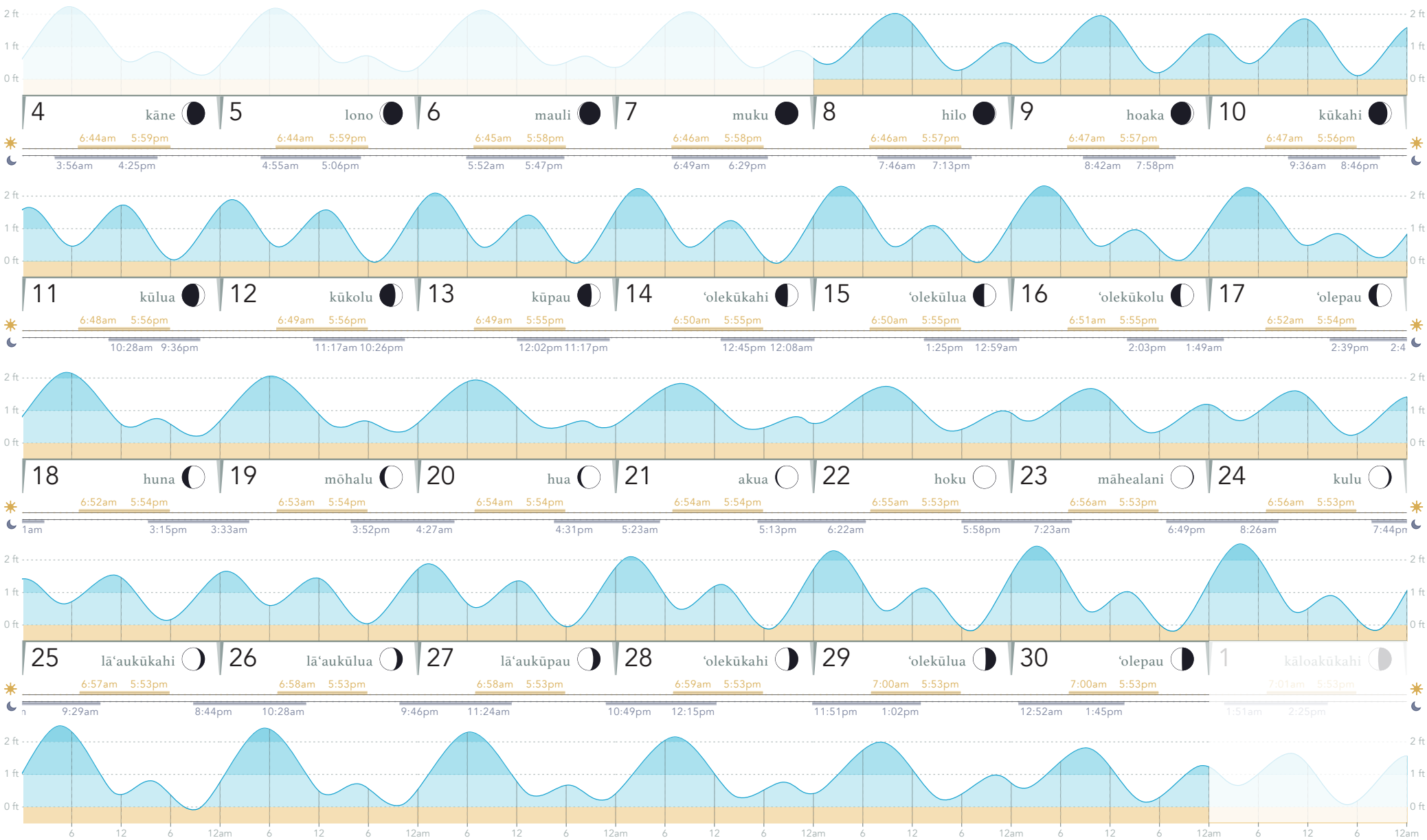
For more info see the full **FISHING SEASON TABLE** near the start of the calendar

nowemapa

hanalei
MOON + TIDE CALENDAR
2 0 1 8

NOVEMBER

lāpule SUNDAY	pōʻakahi MONDAY	pōʻalua TUESDAY	pōʻakolu WEDNESDAY	pōʻahā THURSDAY	pōʻalima FRIDAY	pōʻaono SATURDAY
28 lāʻaukūpau	29 ʻolekūkahi	30 ʻolekūlua	31 ʻolepau	1 kāloakūkahi	2 kāloakūlua	3 kāloapau
6:40am 6:03pm	6:41am 6:02pm	6:41am 6:02pm	6:42am 6:01pm	6:42am 6:01pm	6:43am 6:00pm	6:43am 6:00pm
pm 10:37am	9:53pm 11:37am	10:52pm 12:34pm	11:53pm 1:27pm	12:55am 2:16pm	1:57am 3:02pm	2:57am 3:44pm
4 kāne	5 lono	6 mauli	7 muku	8 hilo	9 hoaka	10 kūkahi
6:44am 5:59pm	6:44am 5:59pm	6:45am 5:58pm	6:46am 5:58pm	6:46am 5:57pm	6:47am 5:57pm	6:47am 5:56pm
3:56am 4:25pm	4:55am 5:06pm	5:52am 5:47pm	6:49am 6:29pm	7:46am 7:13pm	8:42am 7:58pm	9:36am 8:46pm
11 kūlua	12 kūkolu	13 kūpau	14 ʻolekūkahi	15 ʻolekūlua	16 ʻolekūkolu	17 ʻolepau
6:48am 5:56pm	6:49am 5:56pm	6:49am 5:55pm	6:50am 5:55pm	6:50am 5:55pm	6:51am 5:55pm	6:52am 5:54pm
10:28am 9:36pm	11:17am 10:26pm	12:02pm 11:17pm	12:45pm 12:08am	1:25pm 12:59am	2:03pm 1:49am	2:39pm 2:4
18 huna	19 mōhalu	20 hua	21 akua	22 hoku	23 māhealani	24 kulu
6:52am 5:54pm	6:53am 5:54pm	6:54am 5:54pm	6:54am 5:54pm	6:55am 5:53pm	6:56am 5:53pm	6:56am 5:53pm
1am 3:15pm	3:33am 3:52pm	4:27am 4:31pm	5:23am 5:13pm	6:22am 5:58pm	7:23am 6:49pm	8:26am 7:44pm
25 lāʻaukūkahi	26 lāʻaukūlua	27 lāʻaukūpau	28 ʻolekūkahi	29 ʻolekūlua	30 ʻolepau	1 kāloakūkahi
6:57am 5:53pm	6:58am 5:53pm	6:58am 5:53pm	6:59am 5:53pm	7:00am 5:53pm	7:00am 5:53pm	7:01am 5:53pm
n 9:29am	8:44pm 10:28am	9:46pm 11:24am	10:49pm 12:15pm	11:51pm 1:02pm	12:52am 1:45pm	1:51am 2:25pm



Hanalei National Wildlife Refuge

The U.S. Fish and Wildlife Service manages wetlands in the Hanalei National Wildlife Refuge. Wetlands are an important aspect within the Hawaiian ecosystem, serving as filters and purifying and improving the water quality of rivers and offshore waters. The plant communities and soil within wetlands also serve as carbon sinks, helping to moderate global climate change conditions.

Here are additional benefits to wetlands:

- Dissipate energy: during periods of heavy rainfall, wetlands reduce stream flow and act as natural sponges that absorb water
- Improve water quality: wetlands purify water and filter out sediments and contaminants
- Supply groundwater flow: wetlands contribute to base flow of streams
- Reduce erosion: coastal wetlands buffer wave energy from large swells
- Provide habitat for fish and other wildlife

LIVING PONO

Our daily actions impact the environment around us. In order for our wetlands to provide Hanalei with all these great benefits, we must cultivate a healthy wetland. Please help to keep our waterways free of litter, fertilizers, and invasive plants.

DECEMBER	ʻĀholehole	Manini	ʻŌmilu	ʻŌpelu	Akule	Halalū	Moi	Ula	Ula Papapa	Kona Crab	ʻAmaʻama
For more info see the full **FISHING SEASON TABLE** near the start of the calendar	–	–	–	–	–	–	!	–	–	–	✕

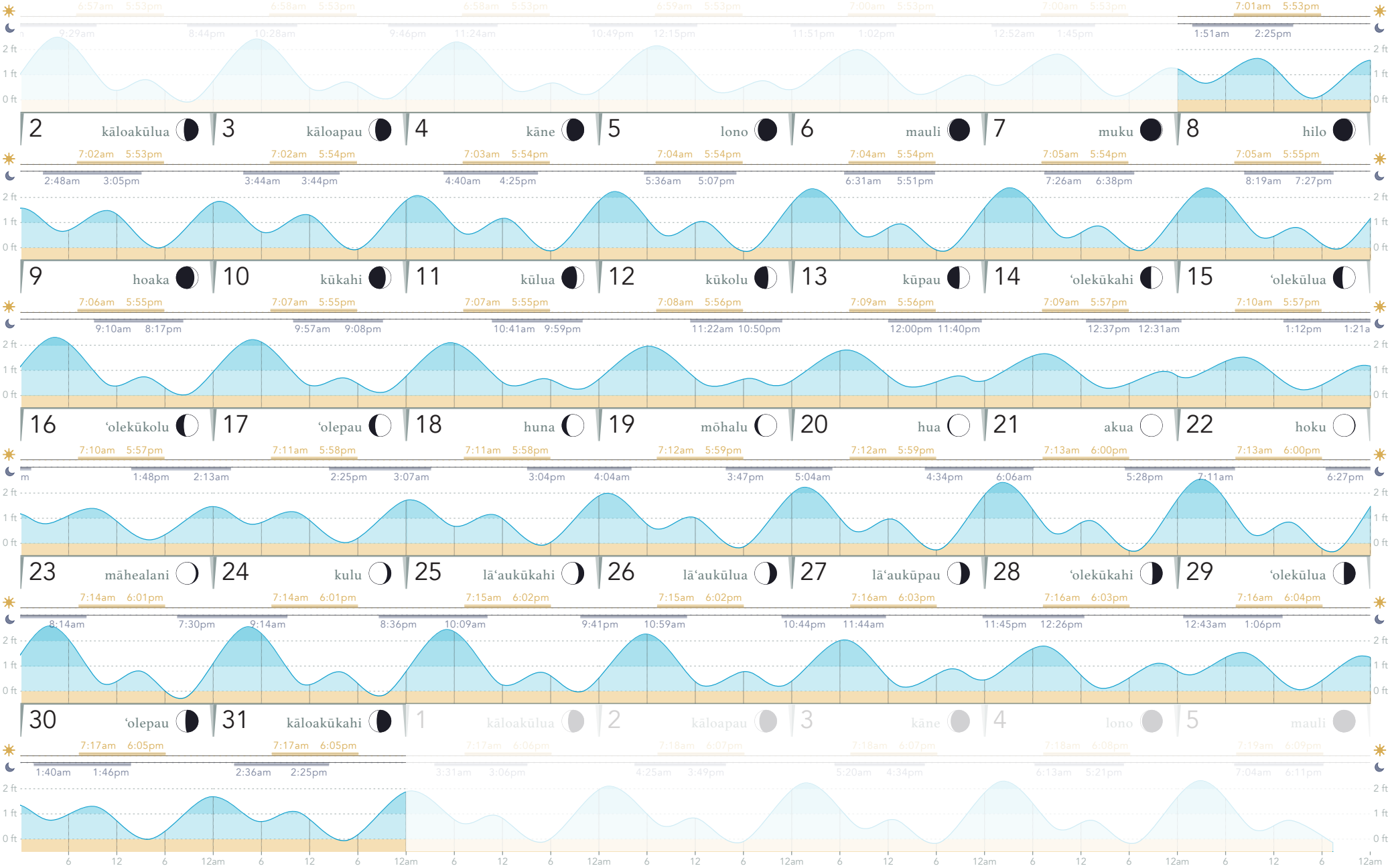
LIMITED HARVEST
15/day 11 in. minimum fork length

kekemapa

hanalei
MOON + TIDE CALENDAR
2 0 1 8

DECEMBER

lāpule SUNDAY	pōʻakahi MONDAY	pōʻalua TUESDAY	pōʻakolu WEDNESDAY	pōʻahā THURSDAY	pōʻalima FRIDAY	pōʻaono SATURDAY
25 lāʻaukūkahi	26 lāʻaukūlua	27 lāʻaukūpau	28 ʻolekūkahi	29 ʻolekūlua	30 ʻolepau	1 kāloakūkahi
6:57am 5:53pm	6:58am 5:53pm	6:58am 5:53pm	6:59am 5:53pm	7:00am 5:53pm	7:00am 5:53pm	7:01am 5:53pm
9:29am	8:44pm 10:28am	9:46pm 11:24am	10:49pm 12:15pm	11:51pm 1:02pm	12:52am 1:45pm	1:51am 2:25pm
2 kāloakūlua	3 kāloapau	4 kāne	5 lono	6 mauli	7 muku	8 hilo
7:02am 5:53pm	7:02am 5:54pm	7:03am 5:54pm	7:04am 5:54pm	7:04am 5:54pm	7:05am 5:54pm	7:05am 5:55pm
2:48am 3:05pm	3:44am 3:44pm	4:40am 4:25pm	5:36am 5:07pm	6:31am 5:51pm	7:26am 6:38pm	8:19am 7:27pm
9 hoaka	10 kūkahi	11 kūlua	12 kūkolu	13 kūpau	14 ʻolekūkahi	15 ʻolekūlua
7:06am 5:55pm	7:07am 5:55pm	7:07am 5:55pm	7:08am 5:56pm	7:09am 5:56pm	7:09am 5:57pm	7:10am 5:57pm
9:10am 8:17pm	9:57am 9:08pm	10:41am 9:59pm	11:22am 10:50pm	12:00pm 11:40pm	12:37pm 12:31am	1:12pm 1:21a
16 ʻolekūkolu	17 ʻolepau	18 huna	19 mōhalu	20 hua	21 akua	22 hoku
7:10am 5:57pm	7:11am 5:58pm	7:11am 5:58pm	7:12am 5:59pm	7:12am 5:59pm	7:13am 6:00pm	7:13am 6:00pm
m 1:48pm	2:13am 2:25pm	3:07am 3:04pm	4:04am 3:47pm	5:04am 4:34pm	6:06am 5:28pm	7:11am 6:27pm
23 māhealani	24 kulu	25 lāʻaukūkahi	26 lāʻaukūlua	27 lāʻaukūpau	28 ʻolekūkahi	29 ʻolekūlua
7:14am 6:01pm	7:14am 6:01pm	7:15am 6:02pm	7:15am 6:02pm	7:16am 6:03pm	7:16am 6:03pm	7:16am 6:04pm
8:14am	7:30pm 9:14am	8:36pm 10:09am	9:41pm 10:59am	10:44pm 11:44am	11:45pm 12:26pm	12:43am 1:06pm
30 ʻolepau	31 kāloakūkahi	1 kāloakūlua	2 kāloapau	3 kāne	4 lono	5 mauli
7:17am 6:05pm	7:17am 6:05pm	7:17am 6:06pm	7:18am 6:07pm	7:18am 6:07pm	7:18am 6:08pm	7:19am 6:09pm
1:40am 1:46pm	2:36am 2:25pm	3:31am 3:06pm	4:25am 3:49pm	5:20am 4:34pm	6:13am 5:21pm	7:04am 6:11pm



If you are interested in learning how you can contribute to this and other projects in Hanalei, please contact the Hanalei Watershed Hui at:

(808) 826-1985 or hanaleiriver@hawaiian.net

The Hanalei Moon and Tide Calendar was made possible through the following partnerships:

Hanalei Watershed Hui

Papahānaumokuākea Marine National Monument

Hawaiian Islands Humpback Whale National Marine Sanctuary

State of Hawaii Department of Land and Natural Resources Division of Aquatic Resources

Waipā Foundation

U.S. Fish and Wildlife Service

Dr. Alan Friedlander, University of Hawai'i at Mānoa

Sea Grant

HanaleiWatershedHui

DAR Hawaii Division of Aquatic Resources

Papahānaumokuākea Marine National Monument

WAIPĀ

Hawaiian Islands Humpback Whale National Marine Sanctuary

U.S. Fish & Wildlife Service

Sea Grant University of Hawai'i

references

HAR 13-95. Hawaii Administrative Rules Title 13 Department of Land and Natural Resources, Subtitle 4 Fisheries, Part V Protected Marine Fisheries Resources, Chapter 95 Rules Regulating the Taking and Selling of Certain Marine Resources. http://dlnr.hawaii.gov/dar/files/2016/03/ch95.pdf

Tide Predictions - NOAA Tides & Currents. (n.d.). Retrieved August 2017, from http://tidesandcurrents.noaa.gov/tide_predictions.html

Sun and Moon Data - U.S. Naval Observatory. (n.d.). Retrieved August 2017, from http://aa.usno.navy.mil/data/docs/Rs_OneYear.php

Food Independence Could Be a Matter of Survival for the U.S.' Most Isolated State (2015, June 29). Retrieved from http://www.takepart.com/article/2015/06/29/hawaii-local-food

Hawaii Coral Reef Strategy. (n.d.). Retrieved October, 2014, from http://www.hawaiicoralreefstrategy.com/index.php/strategy

Hoover, J. P. (1999). "Hawai'i's Sea Creatures A Guide To Hawai'i's Marine Invertebrates". Honolulu, HI: Mutual Publishing, LLC.

Huisman, J.M, et.al. (2007). "Hawaiian Reef Plants". Honolulu, HI: Univ. of Hawai'i.

Kahā'ulelio, D. (2006). "Ka 'Oihana Lawai'a, Hawaiian Fishing Traditions". Honolulu, HI: Bishop Museum.

Kanaka'ole Kanahele, Pualani, Huihui Kanahele-Mossman, Kalei Nu'uhiwa, and Ku'ulei Higashi Kanahele. Mahina. Hawaii: Edith K. Kanaka'ole Foundation, 2011.

Longenecker, K., Langston, R., (2008). "Life History Compendium of Exploited Hawaiian Fishes".

Malo, D., Emmerson, N.B. (1971). "Hawaiian Antiquities". Honolulu, HI: Bishop Museum.

Manu, Moke, and Others, (revised 2006). "Hawaiian Fishing Traditions". Honolulu, HI: Kalamaku.

Randall, J.E. (2007). "Reef and Shore Fishes of the Hawaiian Islands". Honolulu, HI: Univ. of Hawai'i.

Titcomb, M. (1982). "Native Use of Fish in Hawaii". Honolulu, HI: University of Hawai'i.

University of Hawaii Sea Grant Extension Service and State of Hawaii Department of Land and Natural Resources Office of Conservation and Coastal Lands (2004). "DRAFT Erosion Management Alternatives for Hawaii". Retrieved August 2017 from https://dlnr.hawaii.gov/occl/files/2013/08/dune-management.pdf

What is Ocean Acidification? (n.d.). Retrieved from https://www.pmel.noaa.gov/co2/story/What+is+Ocean+Acidification%3F