

DILLINGHAM 1982 TIDE CALENDAR

FISHING TOOLS OF OLD HAWAII

Fishing was the most varied and extensive food-related profession of early Hawaiians.

It was imperative that fishermen know the character of the sea and the many techniques and tools needed to catch various types of fish.

The tools of the professional fisherman (*lowai'a*) included a *koa* fishing canoe, *olonā* fish lines, fishhooks, sinkers, nets, traps, and bait cups.

Netting was the most efficient and profitable fishing method used by the Hawaiians. The nets (*'upena*) ranged in size from small, hand-held, wood-framed ones to larger deep water seine nets (*'upena pūloa*). These nets, with sinkers on one edge and floats on the other, were used to ensnare fish as the ends were pulled together or drawn ashore. The *'upena pūloa* measured up to 250 feet in length with a bag seven feet deep. On occasion, a large number of these nets were joined together to catch particularly large schools of fish.

Nets were generally made of *olonā*, a strong and lightweight vegetable fiber. A strong twine made from the inner bark of the *hou* tree was a useful substitute.

Net making began with the gathering of the *olonā* and was accompanied by the chanting of prayers. After the material was stripped, soaked and scraped, it was rolled into cordage. If the net was treated periodically with a potion made from *kukui* bark, it could be expected to last the lifetime of its maker, it is said, despite the ravages of frequent use in salt water.

Fish traps of various sizes were made for collecting fish and prawns in freshwater streams and in the sea. The traps were made of aerial roots of the *'ie'ie* and designed in three distinct shapes. The low, usually small, circular traps with open tops were called *hina'i*, and described the type of fish it caught such as *hina'i o'opu*. The traps had an open cylinder which projected downward into the cavity from the upper surface. An opening was made at the trap's bottom for easy release of the catch.

Long cylindrical traps, resembling a twined basket with an opening at one end, were primarily used for freshwater fishing. These traps were simply set down in a stream, lengthwise, without bait or cover. The *'o'opu* fish, known to rest at the bottom of streams, entered the traps; fishermen then placed their hands over the openings and lifted the traps out of the water.

Cone-shaped traps with small closed ends, similar to large funnels, were used to catch shrimp or fish in freshwater mountain streams. Shrimps were chased into the wide ends of the traps with leaves or sticks and the traps were raised by the fishermen.

Hawaiian fishhooks (*makou*) were adapted to catching various kinds of fish. Material such as turtle shell and other shells, dog and human bones were commonly used hook material. Although size and shape varied extensively, the hooks fell into two basic categories—simple and composite.

Simple hooks were made from a single piece of material and were most effective on smaller fish. There were three basic forms—U-shaped, circular and subcircular (straight shank, curved barbs)—all with a shank knob for tying the line with a snood.

The composite hooks were made from two pieces of material lashed together. Examples are hooks with a pearl shell shank and a bone point, or large shark hooks made of wood with a bone point.

Shark hooks (*makou manō*) were the largest of the Hawaiian fishhooks, ranging in length from seven to 11 inches.

Hawaiians also used a vast assortment of simple and sophisticated fishing accessories. Stone sinkers were used with nets, fishing lines and squid lures.

Stone sinkers were produced in various sizes and shapes and are categorized in four groups: grooved, perforated, bread-loaf and plummet.

Grooved sinkers were either rough or well-shaped, depending on the softness of the stone. Grooves were scraped horizontally or vertically into the stone to secure the sinker to nets or fishing lines.

The perforated sinkers were flat circular disks with central holes, and usually made of vesicular basalt and reef rock.

Bread-loaf sinkers were a specialized form peculiar to the Hawaiian Islands. They were named because the upper part is shaped like the top of a loaf and the lower portion of the sinker is shorter and narrower, like baked bread. These sinkers were made of reef rock and basalt.

Plummet sinkers (*pōhikiāloa*), another specialized Hawaiian sinker, were made to carry lines down to the bottom of deep fishing grounds. They resembled plumb bobs or poi pounders, with narrower upper ends topped by a small knob for the attachment of line.

Polynesian fishermen usually stored hooks and lines in plaited baskets but, in Hawai'i, fishermen preferred using gourds as containers. These containers were either made entirely from a gourd, both body and cover, or the bottom portion was fashioned from wood and fitted with a gourd lid. The covers of both types were secured by means of a short net.

Cowrie shell squid lures (*Jeho he'e'e*) were primarily used for fishing in water 80-120 fathoms deep, while stone lures were used in shallower waters. The cowrie shell was tied to a stone sinker along with a wooden rod about nine inches long. A bone, shell or metal hook was attached to the rod. The lure would be lowered a few feet away from a squid hole and, as the squid was drawn to the lure, the fisherman would jerk in the line impaling the squid on the hook. Historian Kamakau wrote: "A well formed cowrie had the power of attracting squid just as a beautiful woman arouses desire in a man."

In ancient times canoes were hewn from many kinds of wood. The various types of wood, shaped into pieces and then fitted and tied together, produced a canoe known as *wā'a*. Later *ma* canoes were hewn out of a single large *koa* tree, making the work less burdensome and shortened the labor.

Historical research was provided by members of the Bishop Museum staff. We would also like to thank Dr. Roger G. Rose, curator of ethnology; Dora Jacroux, assistant curator; and Mary Lee Weaver, communications coordinator, for their assistance and cooperation.



Throw nets became a common method of reef and shore fishing during the 1800's. (c. 1910-1915)



Funnel-shaped shrimp traps were used in freshwater streams and estuaries. (Photo by Charles Fumetoux c. 1890-1900)



Attracting fish by flashlight enables a relatively easy catch by drift scoop net fishermen. (Photo by Tai Sing Lau c. 1920)



A switch of lau hala was used to scare shrimp and small fish into a hand-held scoop net. (c. 1890)

Photos: courtesy Bishop Museum

the museum.

You can become a part of the Bishop Museum by joining the Bishop Museum Association. As a member of the organization, you will be entitled to free admission to the museum and planetarium, invitations to special activities and exhibit openings, and you will receive a subscription to *Ka'Elele*, the association's monthly newsletter.

Single membership is \$25; family memberships are available for \$35. A special \$15 membership is available for non-Oahu residents, senior citizens and students.

For further information, please write Bishop Museum-Membership, P.O. Box 19000-A, Honolulu, HI 96819.

Dillingham Corporation is pleased to have been given permission to present a portion of the Bishop Museum's collection of early Hawaiian fishing artifacts as the subject for Dillingham's 1982 tide calendar.

The Bishop Museum, home of outstanding collections on the anthropology and natural history of the Pacific, was founded in 1889 by Charles Reed Bishop as a memorial to his wife, Princess Bernice Pauahi.

Since the first opening of its exhibitions in 1891, the museum has continued to grow and includes a library, publication and education facilities, and a modern science center housing a planetarium and observatory. Atherton Halls, bringing to life Hawaii's past through crafts and the performing arts, is the newest facility at

ON THE COVER

The *hoiau* of Kalalea at South Point on the island of Hawaii was dedicated to *Ka'ula*, the god of fishermen, who had chosen to reside at Kalalea, according to legend. It is a *heiau ho'oulu* where fish were offered to insure good catches of *opelu* (mackerel), *māhala* (flying fish) and *'ahi* (tuna).

About the photographer

Nick Pavloff was born in San Francisco and still resides in the Bay Area. He studied design in California and Japan and taught photography and design prior to becoming an editorial photographer.

Pavloff has photographed in most of the United States, Canada, Alaska, Hawaii, the Orient and Europe. His client list has included Amfac, Bank of Hawaii, Coral Petroleum, Dillingham, Natomas, Business Week, Fortune and Smithsonian magazines. He is currently at work on a project documenting the rapidly changing California landscape.



NICK PAVLOFF

BARBARA H. YAMATO
Production Coordinator

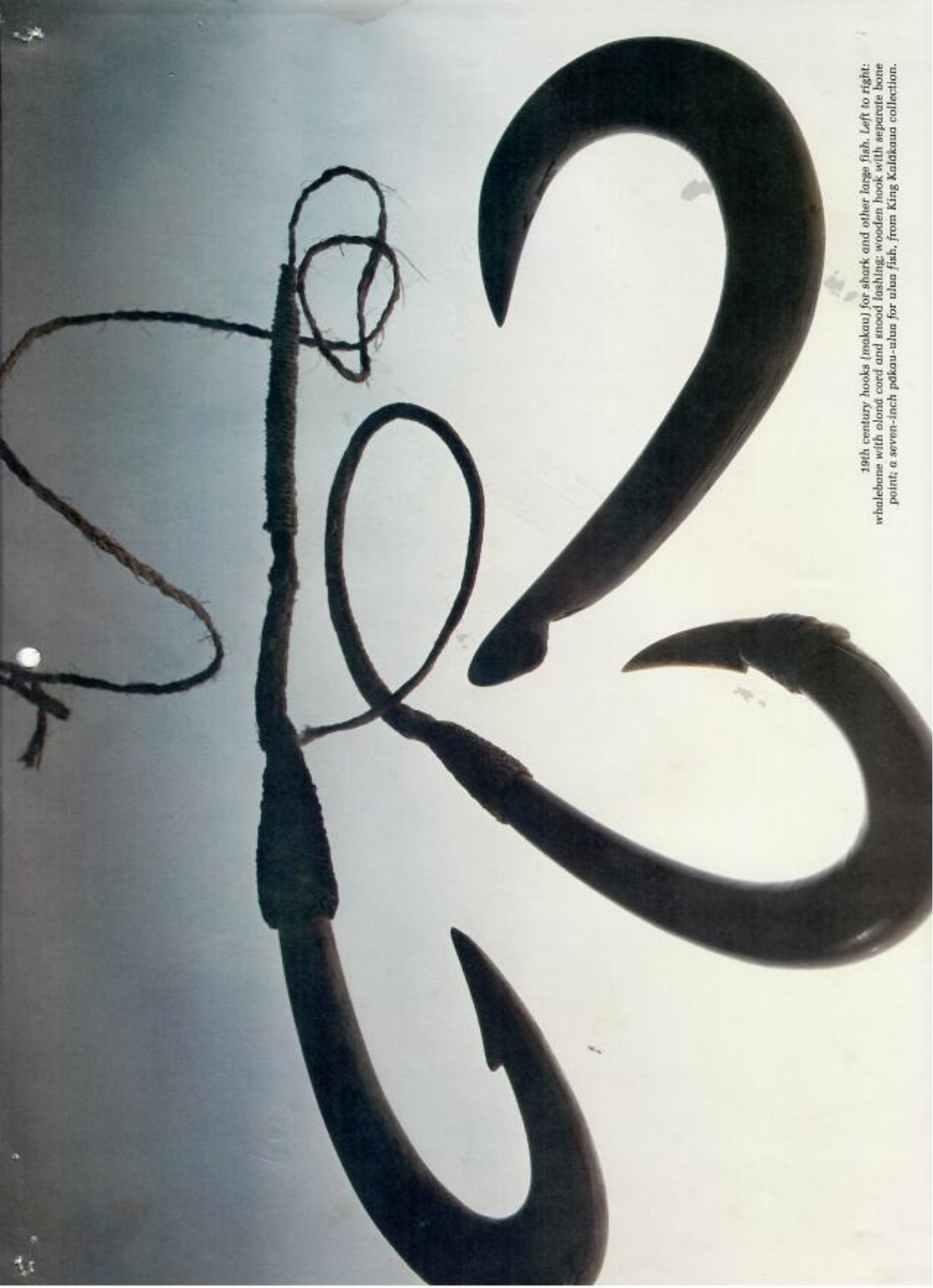
DONNA K. MAEDA
Production Assistant

ALEC BAIRD
Designer

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Fishing nets ('upena) made of olonú cord; netting needles (hi'a) of bamboo, ivory, wood and bone; turtle shell mesh gauge (haha); and three-inch diameter fish-line reel trimmed from a gourd neck.

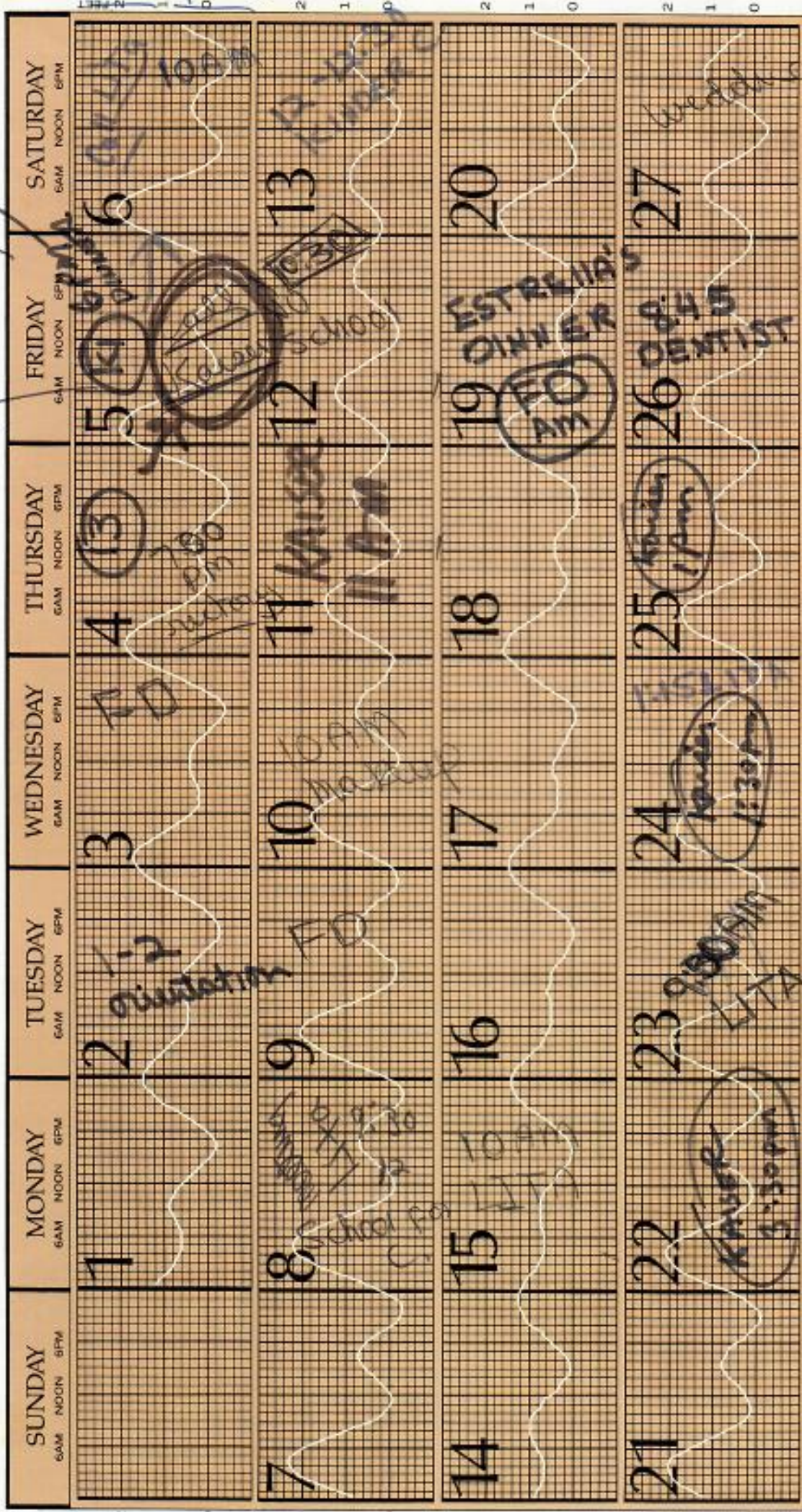


19th century hooks (maka) for shark and other large fish. Left to right: whalebone with olonā cord and snood lashing; wooden hook with separate bone point; a seven-inch pōkai-ulua for ulua fish, from King Kalakaua collection.

FEBRUARY 1982

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MOON PHASES

| | |
|------------------------|--------------------|
| FIRST QUARTER FEB 1 | FULL MOON FEB 7 |
| LAST QUARTER FEB 15 | NEW MOON FEB 23 |

For tide time at following places, add or subtract from Honolulu time.

| PORTS | hrs. Min. | POINTS | hrs. Min. |
|--------------------|-----------|---------------------|-----------|
| HAWAII BAY, KAUAI | -1 40 | KAUNAKAKAI, MOLOKAI | -0 00 |
| KAHULUI BAY, KAUAI | -0 32 | KAHULUI, MAUI | -1 48 |
| PORT ALLEN, KAUAI | -0 32 | KIHEI, MAUI | -0 14 |
| HALEIWA, OAHU | -1 36 | MAUI | -0 14 |
| KANAWAHA BAY, OAHU | -0 25 | HILO, HAWAII | -0 59 |
| KANEOHE BAY, OAHU | -1 35 | HONOLULU, HAWAII | -0 24 |
| LAIE, OAHU | -1 48 | MAHUKONA, HAWAII | -0 24 |
| WAILANA, OAHU | +0 16 | KALAEWA BAY, HAWAII | -0 16 |
| WAIMANALO, OAHU | -1 15 | | |

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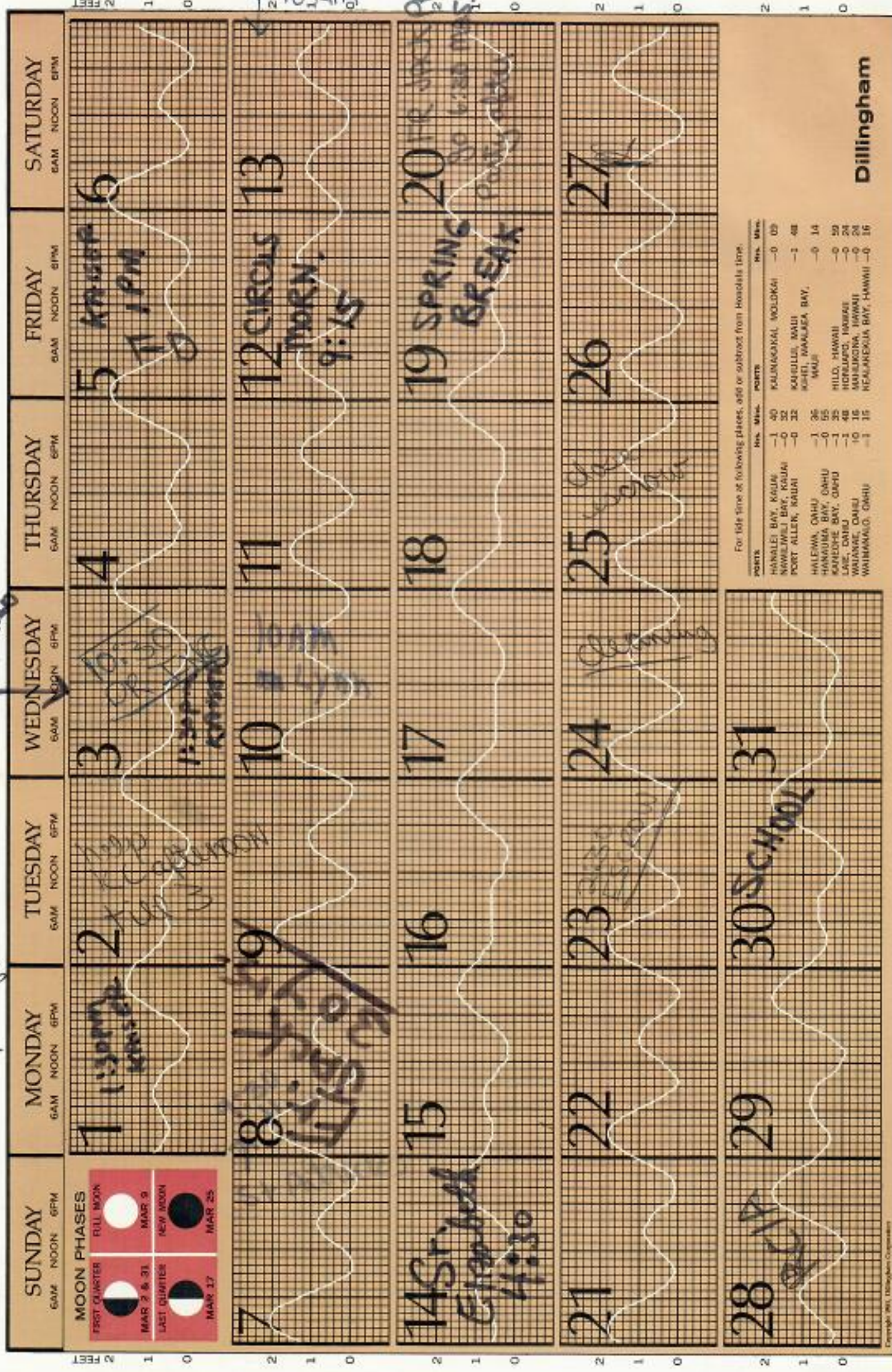


19th century traps (hina'i) of 'ie'ie aerial rootlets, two with original
bosait sinkers attached. Trap, measuring six inches in diameter (lower right).

MARCH 1982

Lit^a 7:15
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CCD 8:00-9:00
↓



MOON PHASES

| | |
|-----------------------------|--------------------|
| FIRST QUARTER MAR 2 & 31 | FULL MOON MAR 9 |
| LAST QUARTER MAR 17 | NEW MOON MAR 25 |

For tide time at following places, add or subtract from Honolulu time.

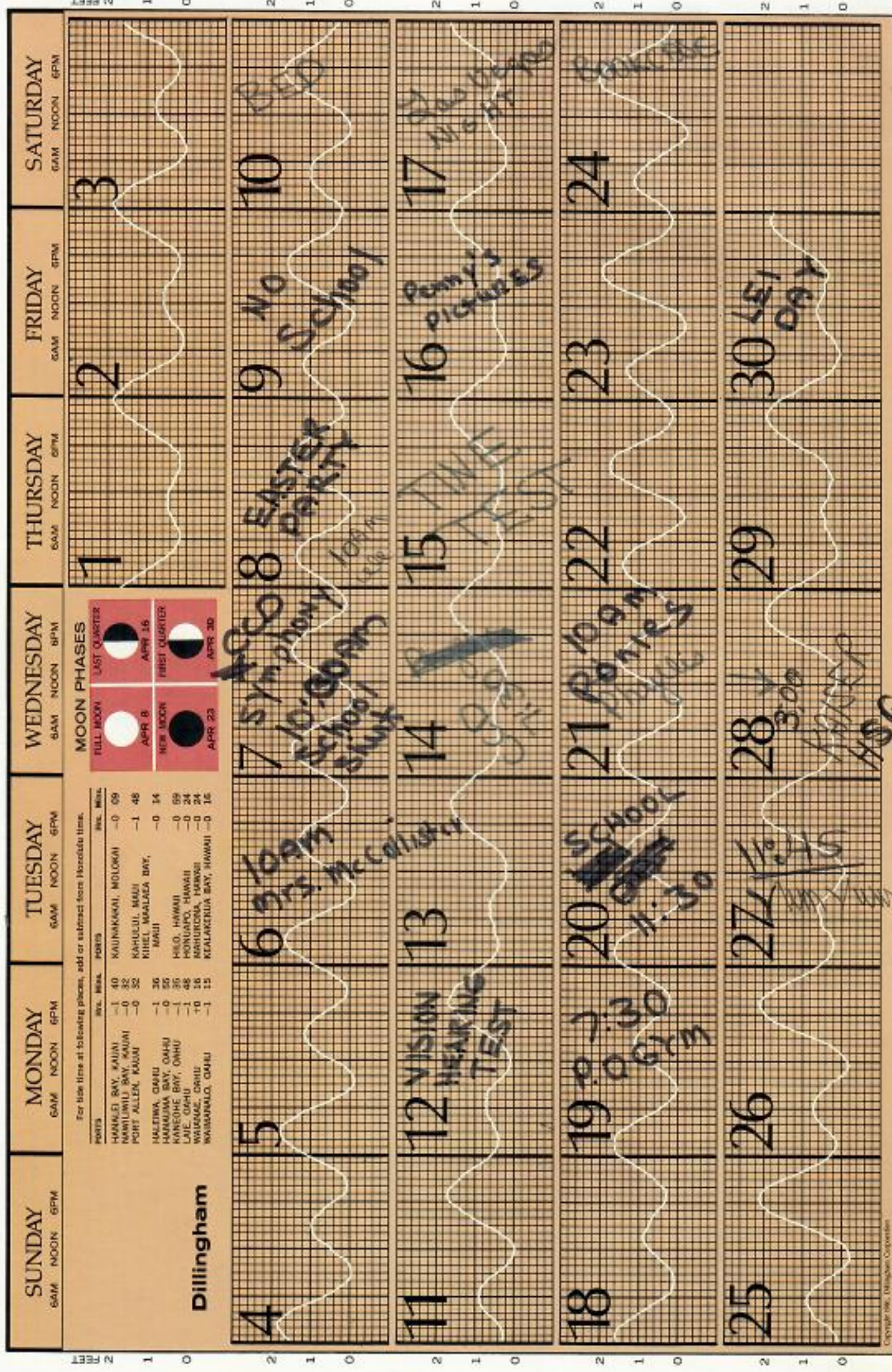
| PORT | Hrs. Min. | PORT | Hrs. Min. |
|---------------------|-----------|-----------------------|-----------|
| HAWAII BAY, KAUAI | -1 30 | KALINAKAVALI, MOLOKAI | -0 00 |
| NAWALELE BAY, KAUAI | -0 30 | KAPULULEI, MAUI | -1 45 |
| POINT ALLEN, MAUI | -0 30 | KOHOLOA, MAUI | -0 14 |
| HALEIWA, OAHU | -1 35 | HILO, HAWAII | -0 50 |
| HANALEIUA BAY, OAHU | -0 55 | HONOLULU, HAWAII | -0 24 |
| KAPUNUI BAY, OAHU | -1 40 | KAUNAOA, HAWAII | -0 24 |
| LAKE OAHU | 0 15 | KEAHOA BAY, HAWAII | -0 15 |
| WAIKANE, OAHU | -1 15 | KEAHOA BAY, HAWAII | -0 15 |
| WAIMANALO, OAHU | -1 15 | | |

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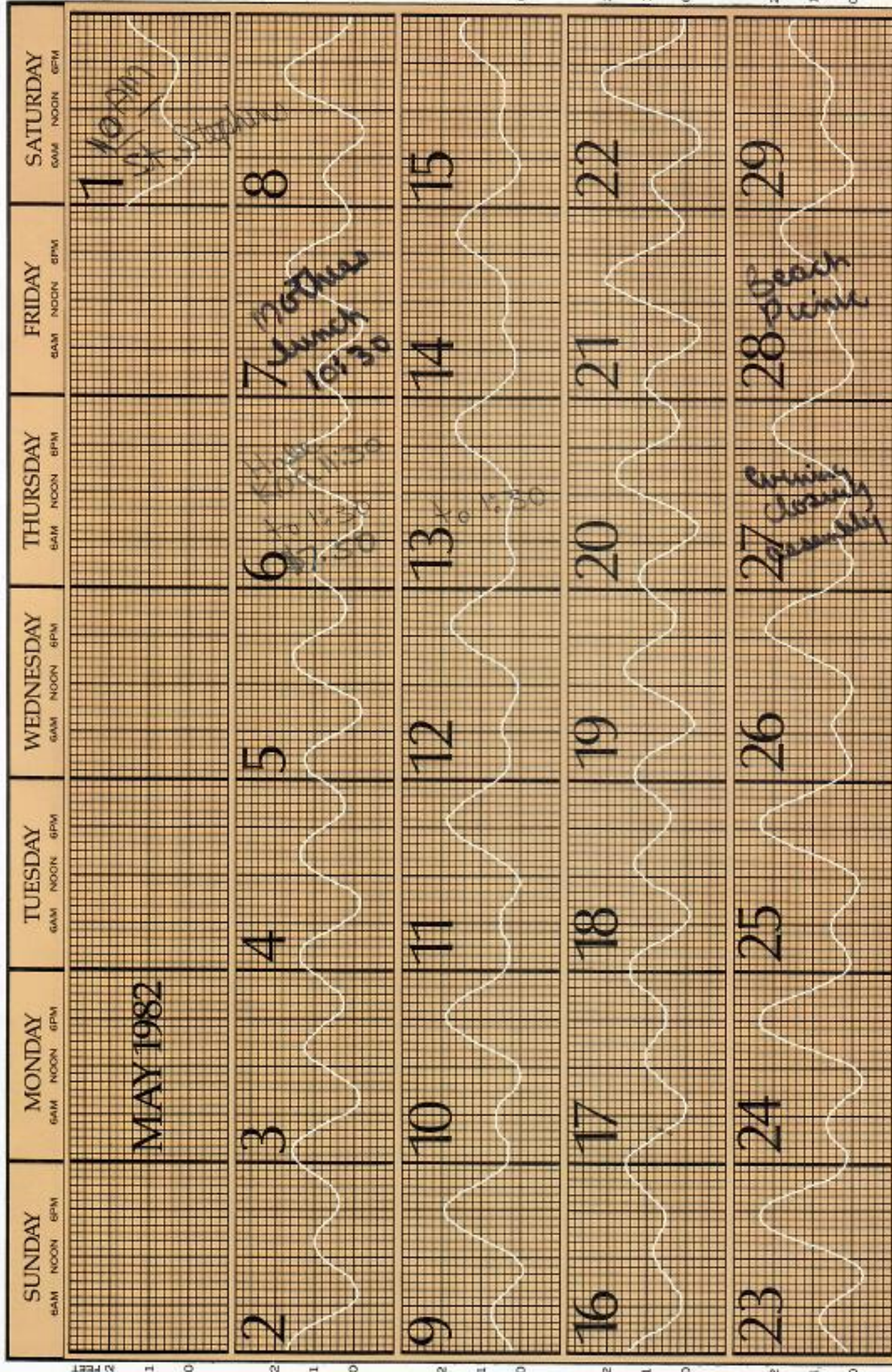
Hawaiian food fish. Top to bottom: 'Ula'ula or red snapper, averaging 12 to 24 inches in length; manini, or convict tang; akule, or big-eyed scad; and maomao, or sergeant major.

APRIL 1982





Squid lures (leho he'e) from the 19th century, weighted with imported granite and barbed with bone or metal.



For tide time at following places, add or subtract from Honolulu time.

| PLACES | Hrs. Min. | POINTS | Hrs. Min. |
|-----------------------|-----------|------------------------|-----------|
| HANALEI BAY, KAUAI | -1 30 | KAUAIKANAL, MOLOKAI | -0 05 |
| NAWILIWILI BAY, KAUAI | -0 32 | KAHULUI, MAUI | -1 48 |
| PORT ALLEN, KAUAI | -0 32 | KIHEI, MAUI | -0 14 |
| HALEIWA, OAHU | -1 26 | KAUNAOA BAY, OAHU | -0 52 |
| HANAULI, OAHU | -0 55 | KANEOHE BAY, OAHU | -0 58 |
| LAKE OAHU | -1 48 | HONOLULU, HAWAII | -0 00 |
| WAIANAE, OAHU | -0 16 | MAUNALOA, HAWAII | -0 58 |
| WAIMANALO, OAHU | -1 15 | KUALAEPUNA BAY, HAWAII | 0 16 |



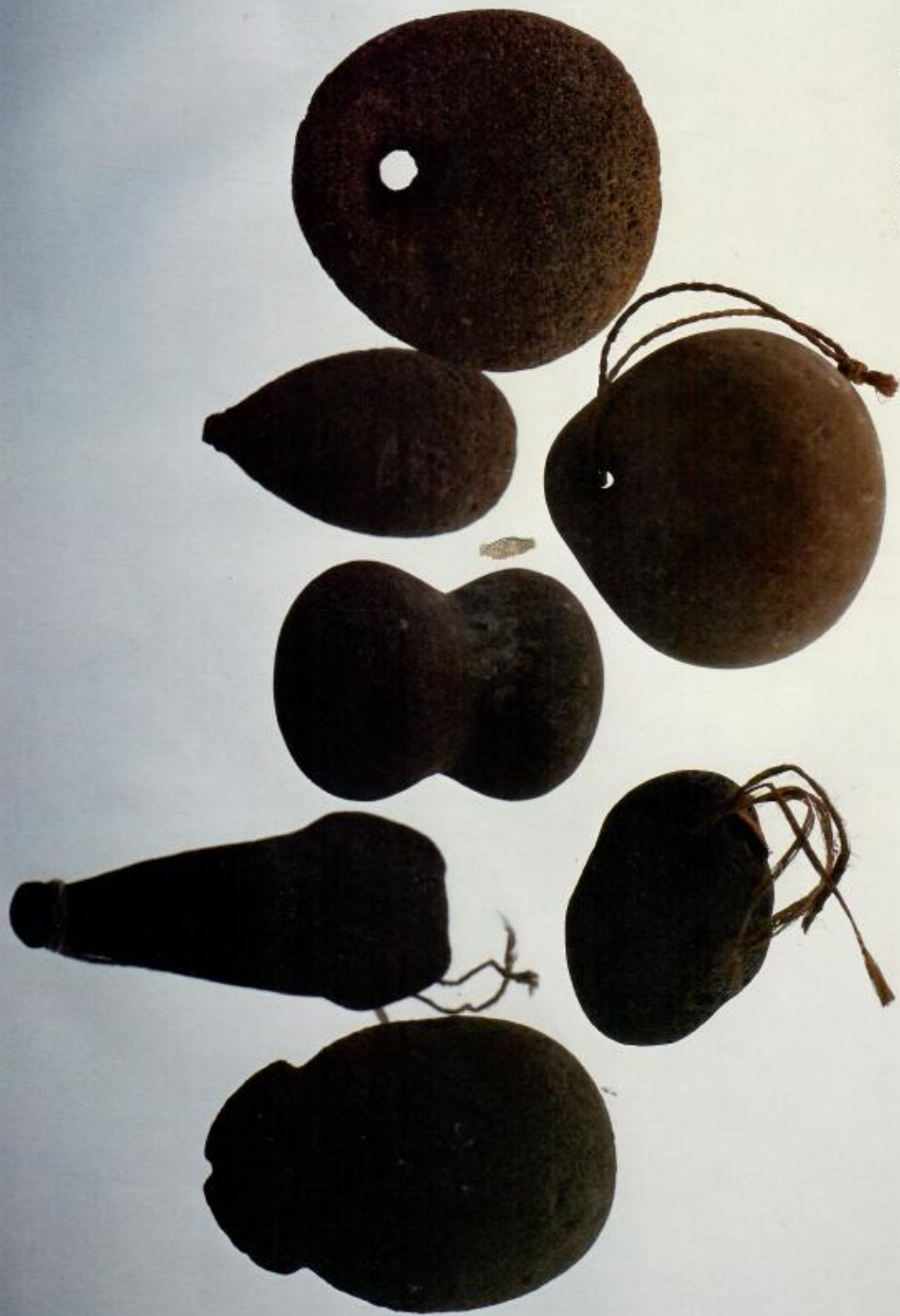
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Hawaiian canoe paddles (hoe) were carved in one piece and, traditionally, most were made of koa. Second paddle from top, with a blade length of 22 inches, belonged to King Kamehameha IV.

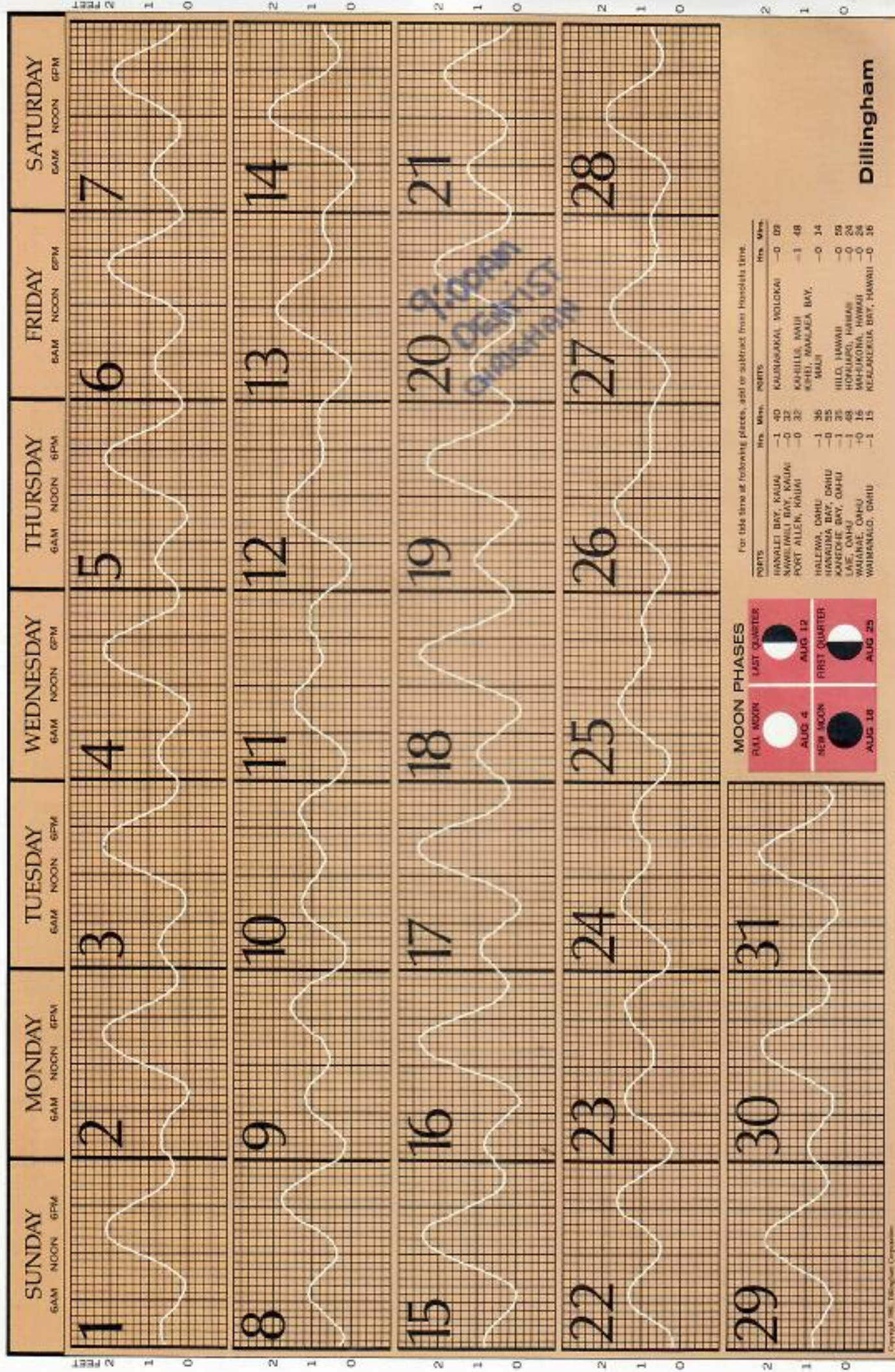


Assortment of 19th century one-piece turtle shell and bone fishhooks. Unusual Hawaiian feature is an external barb. Post-contact hooks of bronze (second and third from right) from King Kalidkaka collection precisely imitate traditional forms.



Basalt sinkers were made in many shapes before lead replaced traditional forms. The six-inch-tall grooved sinker (far left) from Princess Ka'ulani collection.

AUGUST 1982



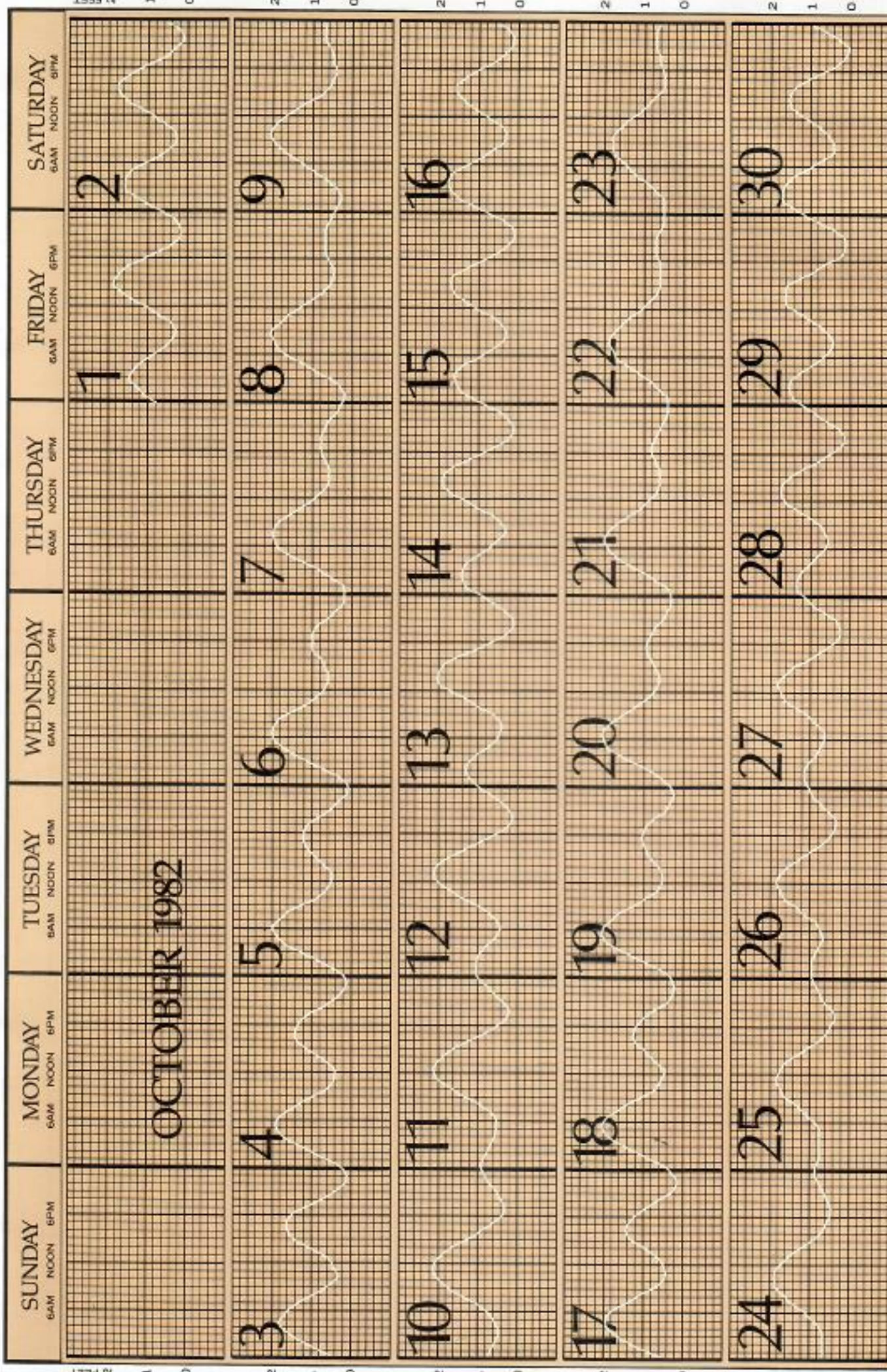
Dillingham



Hawaiian outrigger (wa'a kaukahi) and double-hulled (wa'a kaula) canoe models. Center model, 29 inches in length, collected about 1840; model at right from King Kulaikoa collection.

Gourd or wooden containers (ipu le'i) were used to carry tackle. Until 1887, Huakaniou of Ka'ohu, Big Island, used the 10-inch-tall container at top center for 'ahi hooks and bonito lures, but never for metal gear.





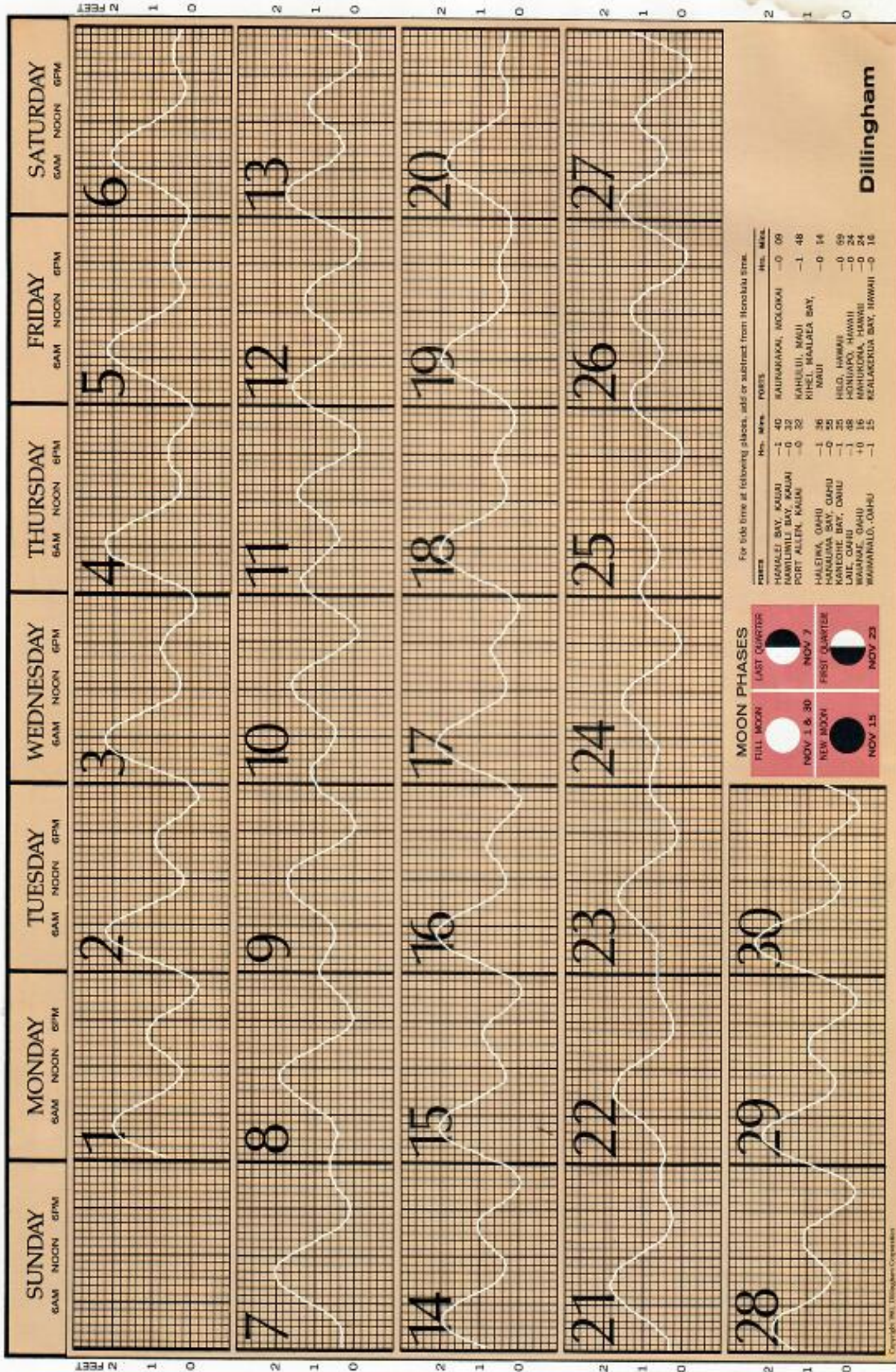
| PORTS | Hgt. Mms. | POINTS | Hrs. Mms. |
|-----------------------|-----------|--------------------------|-----------|
| HAWAII BAY, KAUAI | -1 40 | KALANAKAKAI, MOLOKAI | -0 09 |
| MAWILIWILI BAY, KAUAI | -0 52 | KAHOOLAHI, MAUI | -1 48 |
| PORT ALLEN, KAUAI | -0 32 | KIHEI, MAALAEA BAY, MAUI | -0 34 |
| HALEIWA, OAHU | -1 26 | HILLO, HAWAII | -0 59 |
| HANALEIUA BAY, OAHU | -0 55 | HONOLULU, HAWAII | -0 24 |
| KANEHOE BAY, OAHU | -1 55 | KAUNAOA BAY, HAWAII | -0 24 |
| LAIE, OAHU | -1 48 | KAILUAKEA BAY, HAWAII | -0 15 |
| WAIKANE, OAHU | -0 35 | | |
| WAIMANALO, OAHU | -1 15 | | |





Linon thread throwing net
dyed with persimmon juice; two netting needles (hi'o)
not far left introduced from Europe and Alaska, contrast with traditional
Hawaiian shapes (center). Two-and-three-fourth-inch-long
bonito trolling lure (pot hi aka) lower right.

NOVEMBER 1982



For tide time at following places, add or subtract from Honolulu time.

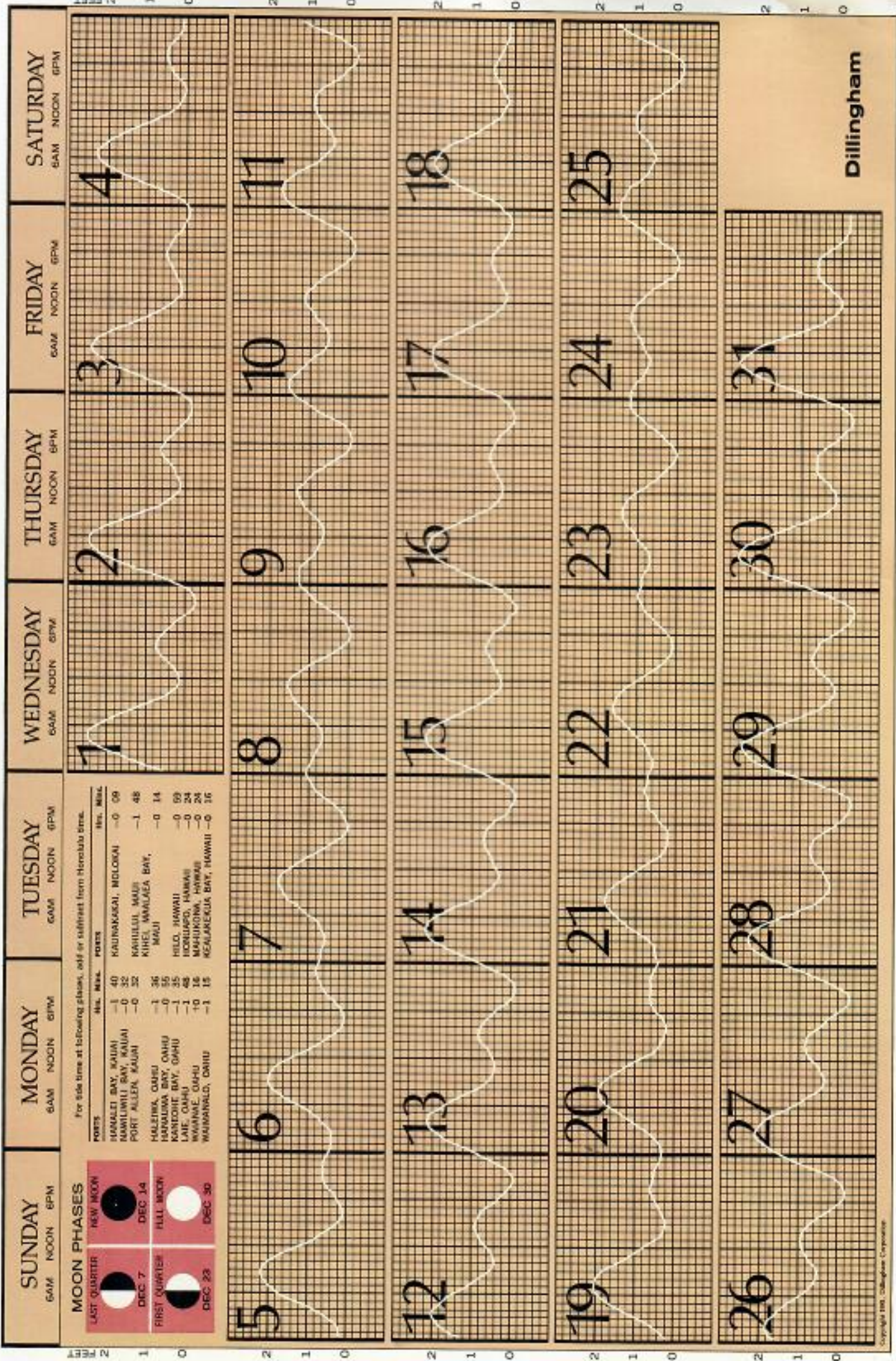
| PLACES | Hrs. Mins. | FORES | Hrs. Mins. |
|--------------------|------------|------------------------|------------|
| HANALEI BAY, KAUAI | -1 40 | KAUNAKAKAI, MOLOKAI | -0 09 |
| HAUOLI BAY, KAUAI | -0 32 | KAHULUI, MAUI | -1 48 |
| PORT ALLEN, MAUI | -0 32 | KIHEI, MAUI | -0 14 |
| | | MAUI | |
| HALEIWA, OAHU | -1 36 | | |
| HANALEI BAY, OAHU | -0 55 | | |
| HONOLULU BAY, OAHU | -1 25 | | |
| LAIE, OAHU | -1 48 | | |
| WAIKANE, OAHU | +0 16 | | |
| WAIHANA, OAHU | -1 15 | | |
| | | KEALAKEKUA BAY, HAWAII | -0 16 |









Woven baskets of 'ie'ie aerial rootlets for catching and transporting fish and crustaceans. Shrimp trap (*hina'i 'opae*) at left and the 12-inch-tall basket at top come from 19th century Kauai'i collection.

DECEMBER 1982



MOON PHASES

| | |
|--|--|
|  LAST QUARTER DEC 7 |  NEW MOON DEC 14 |
|  FIRST QUARTER DEC 23 |  FULL MOON DEC 30 |

For tide time at following places, add or subtract from Honolulu time.

| PORTS | MO. MEA. | PORTS | MO. MEA. |
|-----------------------|----------|----------------------|----------|
| HANALEI BAY, KAUAI | -1 40 | KAUNAKAKAI, MOLOKAI | -0 09 |
| MAWILIWILI BAY, KAUAI | -0 32 | KAHILUULU MAUI | -1 48 |
| PORT ALLEN, KAUAI | -0 32 | KIHEI, MAUI | -0 14 |
| HALEIUA, OAHU | -1 36 | HILO, HAWAII | -0 09 |
| HANALEI BAY, OAHU | -0 55 | HONOLULU, HAWAII | -0 24 |
| KANEOHE BAY, OAHU | -1 48 | MAHUKONA, HAWAII | -0 24 |
| LAIE, OAHU | -1 16 | KEALEKUA BAY, HAWAII | -0 36 |
| WAIANA'E, OAHU | -1 15 | | |

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