

1977 TIDE CALENDAR

Dillingham Corporation



IN THE DEPTHS OF THE SEA

The benign, iridescent waters of the Hawaiian Islands are a haven for a stunning variety of plant and animal life. For the smallest invertebrates as well as the largest denizens of the deep, the ocean — warm and rich in nutrients — provides shelter and sustenance. For humans who are freed from their terrestrial habitat by the aqualung, these same waters are a playground of infinite variety and colors.

Cover Photograph

GREEN SEA TURTLE

Gracing the cover of this year's tide calendar is the amicable green sea turtle. A peaceful vegetarian whose diet consists mainly of algae, "Hono" provided a valuable source of meat protein for Polynesian seafarers of old. A greenish tinge to the inner body fat of this animal gave rise to the reference to green in the common name of this timid air-breathing reptile. Because of certain behavioral peculiarities exhibited by the members of our resident population, Hawaii is considered to have her own sub-species of this turtle. Always a delight to the eye, but an increasingly rare sight, *Chelonia mydas* has been declared an endangered species and is protected by law. Overhunting and greatly reduced breeding grounds are the two main factors contributing to their dangerously diminished numbers. French Frigate Shoals in the Leeward Islands is now the last major breeding area in the Hawaiian archipelago for this once numerous and still vital member of the reef community.

January

PARROT FISH

Though he may change sex during the course of his life, the adult male parrot fish is often attired in a costume so ostentatious that a clown might be jealous. Both the male and the female (whose relatively drab protective coloration makes her less conspicuous) possess the ability to envelop themselves in a cocoon-like mucous membrane at night. This acts as a scent barrier so nocturnal predators cannot detect them by smell as they sleep. In the course of scraping the algae from coral with its fused, beak-like front teeth, the "uhu" breaks off and ingests considerable amounts of coral itself. Undergoing further refinement in the digestive system of the parrot fish, this pulverized coral is eliminated in the form of fine coral sand. In addition to being a significant producer of sand, *Scarus rubrivittatus* has delighted the palates of island residents

This year, Dillingham is pleased to plunge you into this aquatic environment through the medium of Chris Newbert's underwater color photography.

Chris wrote the copy describing each of his illustrations. He was assisted in his research by Dr. Dennis Davaney, an invertebrate zoologist at the Bishop Museum; Dr. Leighton Taylor, director of the Waikiki Aquarium; Dr. E. Alison Kay, Department of General Science at the University of Hawaii; and Dr. S. Arthur Reed, Department of Zoology, University of Hawaii.

Chris' subjects were photographed in their reef

April

MOLE COWRIE

Displaying its sublime mantle, the mole cowrie takes on a beautifully bizarre appearance as it embarks upon a nighttime forage. Blanketing its entire surface, it is this fleshy mantle which, upon being extended to both sides from the lengthwise aperture along the bottom of the shell, secretes the calcium carbonate which forms the shell and it further serves to maintain the cowrie's glossy exterior. The mantle may additionally perform a respiratory function which is not yet fully understood. A siphon-like device which protrudes from the front of the mollusk passes water over the internal gills and various chemical sensory organs which aid the cowrie in locating both food and potential mates. *Cypraea talpa*, as all other cowries, is mainly a night feeder whose diet consists largely of algae and perhaps sponge.

May

SPANISH DANCER

Surely an inspired gift from Tepsichore to Poseidon, the splendid Spanish Dancer silently performs an undersea ballet of exquisite beauty as its gently undulating form glides through the nighttime water. *Hexabranchius sanguineus* is a species of "nudibranch" which refers to the fact that this animal has external or "naked" gills. Often divers will happen upon what appears to be a pinkish spiral flower found attached to submarine rocks and swaying delicately in rhythm with the sea. This underwater rose is actually an egg ribbon from the Spanish Dancer and each type of nudibranch will lay such a spiral egg ribbon of a size and color characteristic to their species. *Hexabranchius sanguineus* is the largest nudibranch found in Hawaiian waters, attaining lengths up to 12" and is one of the few species that is free swimming in its adult stage.

June

FRIED EGG NUDIBRANCH

Sunnyside up was nature's breakfast order when she designed this outlandish member of the nudibranch family. *Phyllidia varicosa* is a form of mollusk but one

habitat near Kona on the Big Island. He shot his subjects with a Canon F-1 and a 50 mm macro lens, contained in an Ikelite underwater housing, using either a Subsea Mark 50 or Oceanic Products 2003 Strobo to restore natural color.

ROBERT T. GUARD
Production Coordinator

BARBARA YAMATO
Production Assistant

ALEC BAIRD
Designer

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venomous spines, whereas upon the underside of this animal is a mass of supple, tentacle-like suction cup feet. While the starfish is able to centrally coordinate the movements of its hundreds of feet, each portion of this animal contains the necessary internal organs and nervous system to function on its own. If a leg becomes severed, not only will the body replace the missing appendage, but the severed limb may regenerate a new body! Feeding on living coral polyps, *Acanthaster planci* has been blamed for much coral reef destruction — a blame that must be shared in part by the unthinking shell collectors who prize a major natural enemy of this starfish, the Triton Trumpet shell.

September

REGAL SLIPPER LOBSTER

Named Ula-papapa by the Hawaiians of old, this species of slipper lobster is unique to our Islands. The flattened shape and maximum 6-7" size allows it to hide in narrow crevices and small holes. One of 25,000 species of crustaceans worldwide, *Arctides regalis* shares with its cousins a few interesting traits and its method of growth by "molting" is particularly curious. Confined in size by its rigid shell, it must first soften this external skeleton by extracting the lime. Then by shrinking its body to loosen itself and withdrawing entirely from this outgrown armour through an opening across the top of the base of the tail, it is now capable of growing at a rapid rate. It remains in constant hiding during this period due to its weak, susceptible condition, but the new shell will shortly harden and all growth stops until its next molting.

October

HAWAIIAN LIONFISH

The delicate form and docile appearance of the lionfish fails to betray its true nature. Though seemingly a slow swimmer, this elegant little carnivore is capable of lightning fast movements which make its venomous dorsal spines all the more perilous. The sting from *Pterois sphex* is not as deadly as that of its relatives in other parts of the world, but it is extremely painful and

February

HAIRY HERMIT CRAB

Possessing no heavy protective shell of his own, the hermit crab, or pap'i-iwi-pupu, must periodically seek out empty sea shells of suitable dimensions in which to make his residence. As the crab grows in size, it may become necessary to find larger quarters. Hermits have never been noted for their polished manners and the hermit crab is no exception. He is not above forcibly removing any other animal which may already be inhabiting the particular shell which the hermit has chosen to occupy. Reminiscent of an old hermit's grizzled beard, the long hairs on this specimen of *Aniculus maximus* are actually sensory mechanisms, aiding in the location of food and picking up vibrations in the water. The compound eyes, located as they are on the ends of those movable stalks, afford this old hermit a wide field of vision. With a carapace up to 6", this is one of the largest of all hermit crabs. Found only in Hawaii, *Aniculus maximus* is considered a rare species.

March

BANDED CORAL SHRIMP

Evolution has been playing with crustaceans for 500 million years and this whimsical pair of banded coral shrimp is one of the more delightful products of this perpetual process. Often found in couples and inhabiting tropical waters the world over, these shrimp are scavengers, doing their share to keep our ocean clean by disposing of decaying organic matter. Some of the smaller specimens of *Stenopus hispidus* act as "cleaner shrimp" by picking parasites off much larger fish and eels for their mutual benefit, immune to danger from their oversized hosts. As is characteristic of all crustaceans, these marvelous animals can lose any of their appendages and subsequently regenerate the missing parts. Close observation of these sometimes defiant little "opae kai" will reveal both forward pointing spines on the front portion of their body, and rearward pointing spines on the back portion of their body. Thus they are well equipped for defense from either direction.



Chris Newbert is a transplanted resident of the Bay State, having been born and raised in Massachusetts. Tiring of the harsh eastern winters, he decided to move to Hawaii in 1967. For the next four years Newbert attended the University of Hawaii majoring in history.

In 1973, Chris' love of the ocean prompted him to move to the Big Island where he could actively pursue his aquatic interests. Although he had been diving for a number of years up and down the eastern seaboard, Newbert found the calm, clear waters of the Kona coast

which never forms a protective shell such as the cowrie. Instead, this harlequin undersea cousin of the terrestrial garden slug is capable of secreting a toxic mucous substance which serves as a defensive mechanism, repelling both small fish and crustaceans. The function of the many bumps and warts on the nudibranchs surface is not entirely clear, but evidence indicates they may take part in the digestive process. However, the two elongated protrusions on the front portion of this animal, called "rhinophores" are chemical sensors which serve to locate both mates and their main food sources — algae and sponge. When nudibranch eggs hatch from their spiral ribbon, they are in the form of minute pelagic larvae which, after a period of swimming around, finally settle down and grow into their familiar, more sedentary adult form.

July

WHITE TIP REEF SHARK

With a rusty hook still imbedded in its mouth as dramatic testimony to a triumphant battle against man, the white tip reef shark is again free to continue its invaluable function as a scavenger in the ocean's ecology. Few sights underwater can match the beauty, fluid grace and aura of power displayed by these holdovers from prehistoric times. So perfect is their design that, except for an overall decrease in size, the often maligned shark has changed little in millions of years of evolution. Collectively known as "mano" to Hawaiians, most sharks must swim continuously to pass water over their gills. However *Triacanthodon obesus*, which attain lengths up to 7', are capable of pumping water over their own gills, and are often found resting stationary by day in underwater caves. This mano is a territorial night feeder, dining mostly on small fish and invertebrates.

August

CROWN OF THORNS STARFISH

The camera allows us to take subjects out of their natural context and transform them into visual abstractions which transcend our normal frame of reference. This photograph is an extreme close-up of the tip of a Crown of Thorns starfish leg. The surface of this starfish is covered by row upon row of these sharp, mildly

to be irresistible. It was in this setting that he fashioned his still-youthful career as a professional diver and photographer.

A certified NAUI SCUBA instructor, Newbert regularly guides diving charters through offshore coral grottos and lava arches that dot the sea bottom. On the days when he is not giving SCUBA lessons or guiding fledgling divers through underwater labyrinths, he can be found with his camera in hand, photographing subjects such as you see here, or working in a well-equipped dark room at his home in

therefore the lionfish always commands respect from anyone encountering this reef denizen. Endemic to Hawaii, this lionfish is rarely seen larger than 4-6". It is normally found in relatively shallow water, usually less than 100 feet, and it frequents holes, caves and the underside of ledges.

November

HAWAIIAN SWIMMING CRAB

With his rugged armour plating affording him ample protection against the insidious spines of the "wana" or sea urchin, this nocturnal gourmet prepares one of his favorite midnight snacks with an apparent relish that only a crab would fully understand. Formally known as *Charybdis hawaiiensis*, this crustacean is referred to as a swimming crab because his back legs are formed into articulated flippers which allow him to swim as well as walk. Occasionally sought by skin-diving epicures from our own world as well as a variety of eels and other crab loving ocean predators, this nimble crustacean can rely on his swimming speed and maneuverability to facilitate his escape. Apparently this crab is fond of our Hawaiian waters, for he is found nowhere else in the world.

December

GORGONIAN CORAL

The diminutive gorgonian corals form intricate networks of rich color whose fragile structure and striking appearance embellish the underwater seascape. As are most corals, *Acabara bicolor* is actually composed of many separate animals living in an organized, unified cluster. Each of these individual coral "polyps" secretes a proteinaceous substance which forms the internal skeleton of the coral structure. All of the polyps are then inter-connected by a colorful, continuous veneer of living tissue covering the outside of the coral framework. The coral polyp will extend its fine, feathery tentacles to capture minute morsels of plankton. The polyp will then retract its fingers within the main body and digest its meal. These tenuous colonies of *Acabara bicolor*, which are endemic to Hawaii and rarely exceed an inch of two in size, are most often found in crevices, protected from destructive wave action.

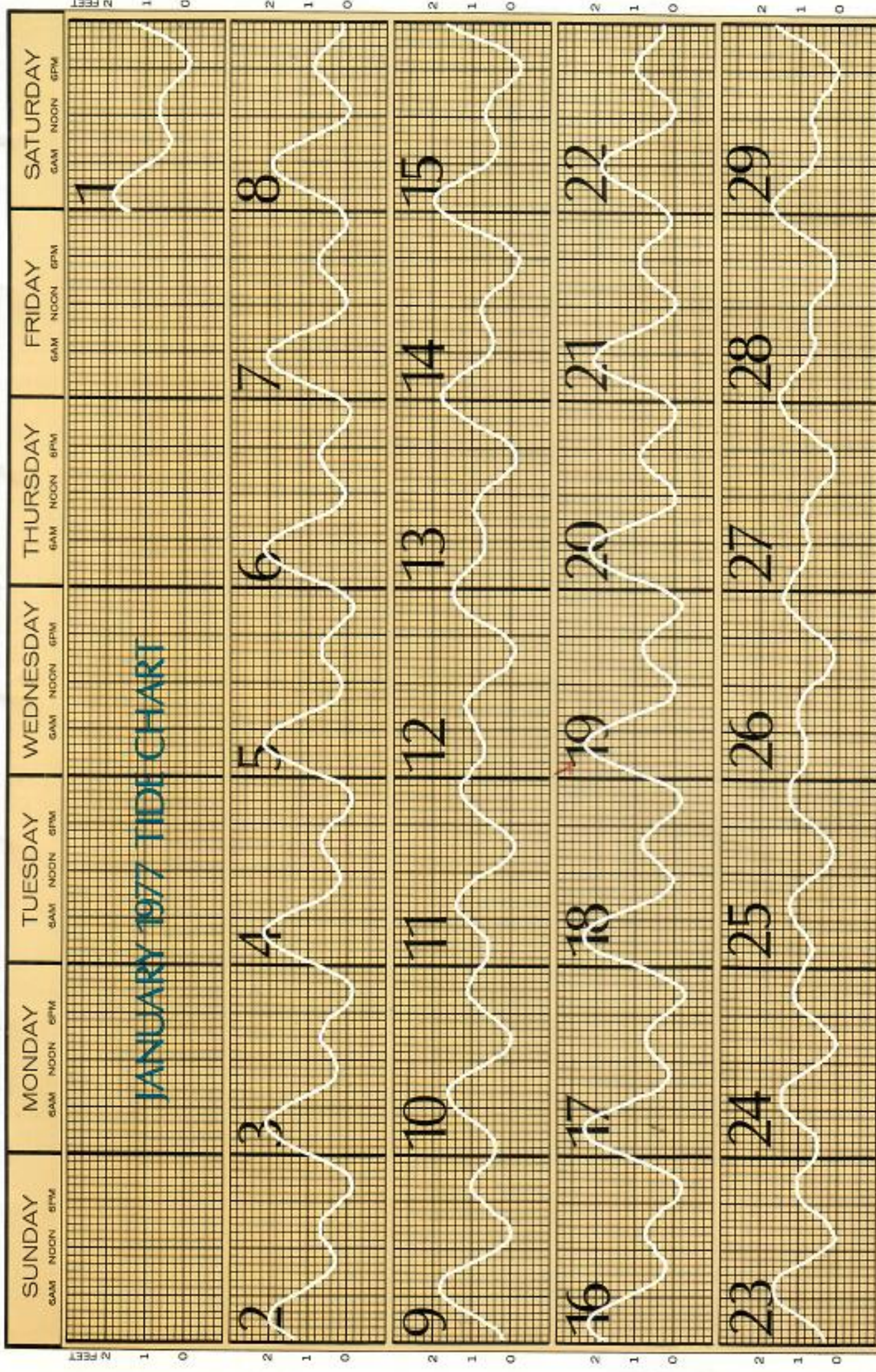
Kealahouka.

In addition to operating his own color printing business, Newbert plans and executes graphics for hotels and offices, and presents slide shows and lectures featuring his menagerie of undersea animals. His color photography will be incorporated into a book which is presently in preparation.

Inquiries about Mr. Newbert's photography should be directed to P. O. Box 1953, Kailua-Kona, Hawaii 96740.

Parrot Fish





MOON PHASES

FULL MOON JAN 5	LAST QUARTER JAN 12
NEW MOON JAN 19	FIRST QUARTER JAN 26

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

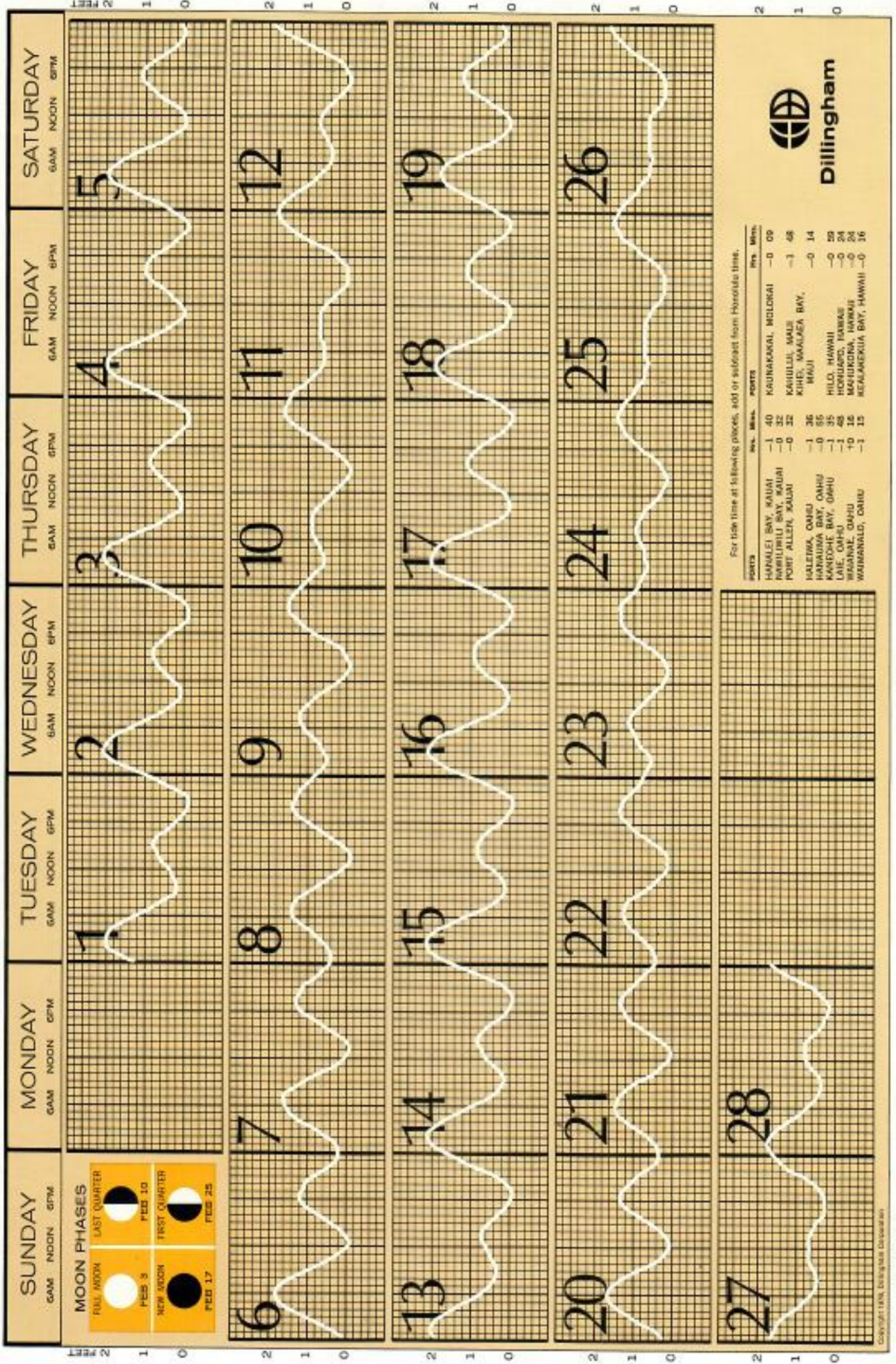
PORTS	Hrs.	Mins.
HANALEI BAY, KAUAI	-1	40
KALINAKAKAI, MOLOKAI	-0	09
HAWAIIKI BAY, KAUAI	-0	32
KAHULUI, MAUI	-0	32
PORT ALLEN, MAUI	-0	32
KIHEI, MAALAE BAY, MAUI	-1	48
HALEIWA, OAHU	-1	36
HANALEI BAY, OAHU	-0	56
KANEOHE BAY, OAHU	-1	35
LAIE, OAHU	-1	48
WAIMANU, OAHU	+0	16
WAIMANALO, OAHU	-1	15
KALAEKUA BAY, HAWAII	-0	16





Hermit Crab

FEBRUARY 1977 TIDE CHART



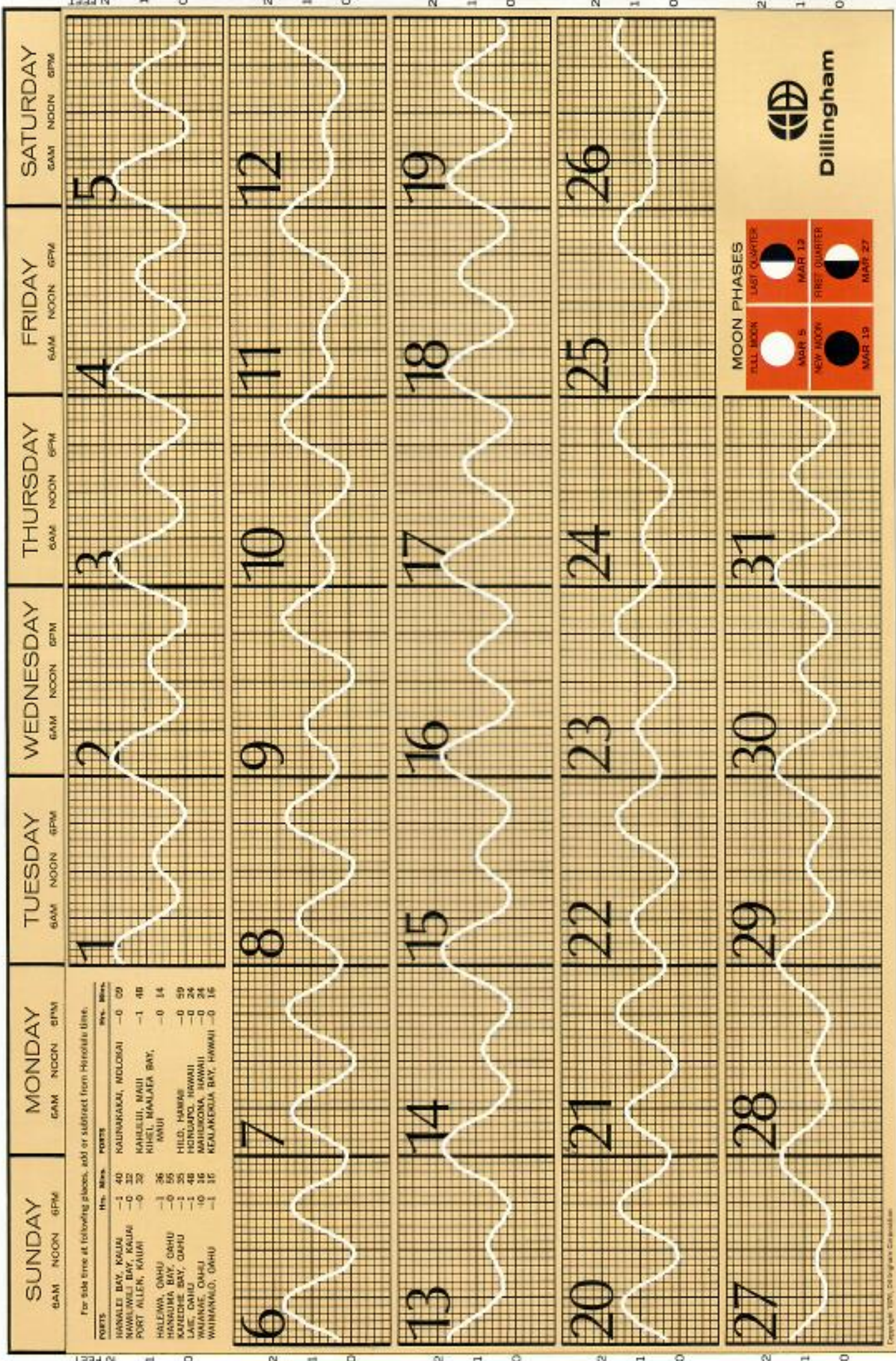
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For tide time at following places, add or subtract from Honolulu time.



Banded Coral Shrimp

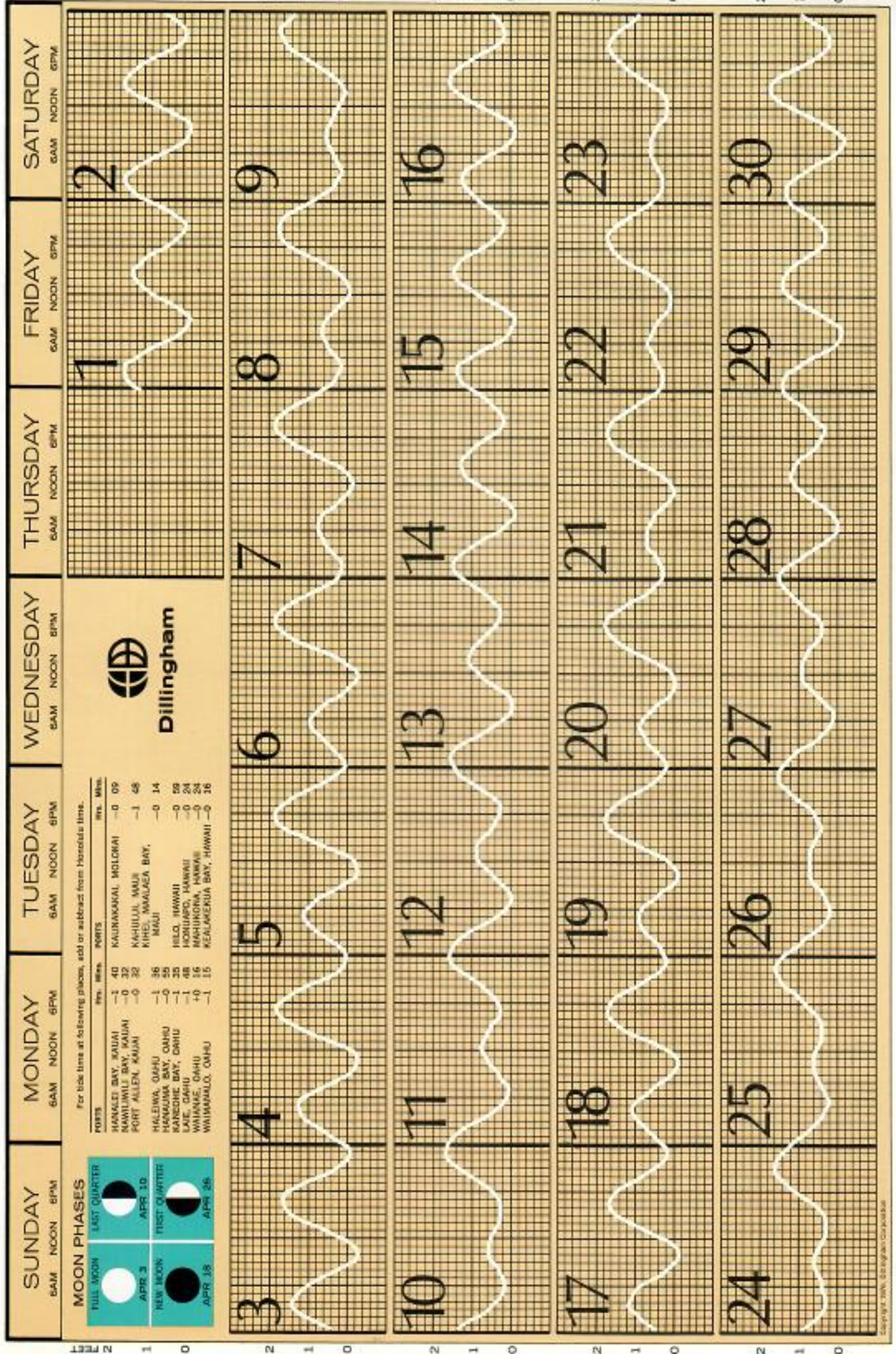
MARCH 1977 TIDE CHART



Mole Cowrie



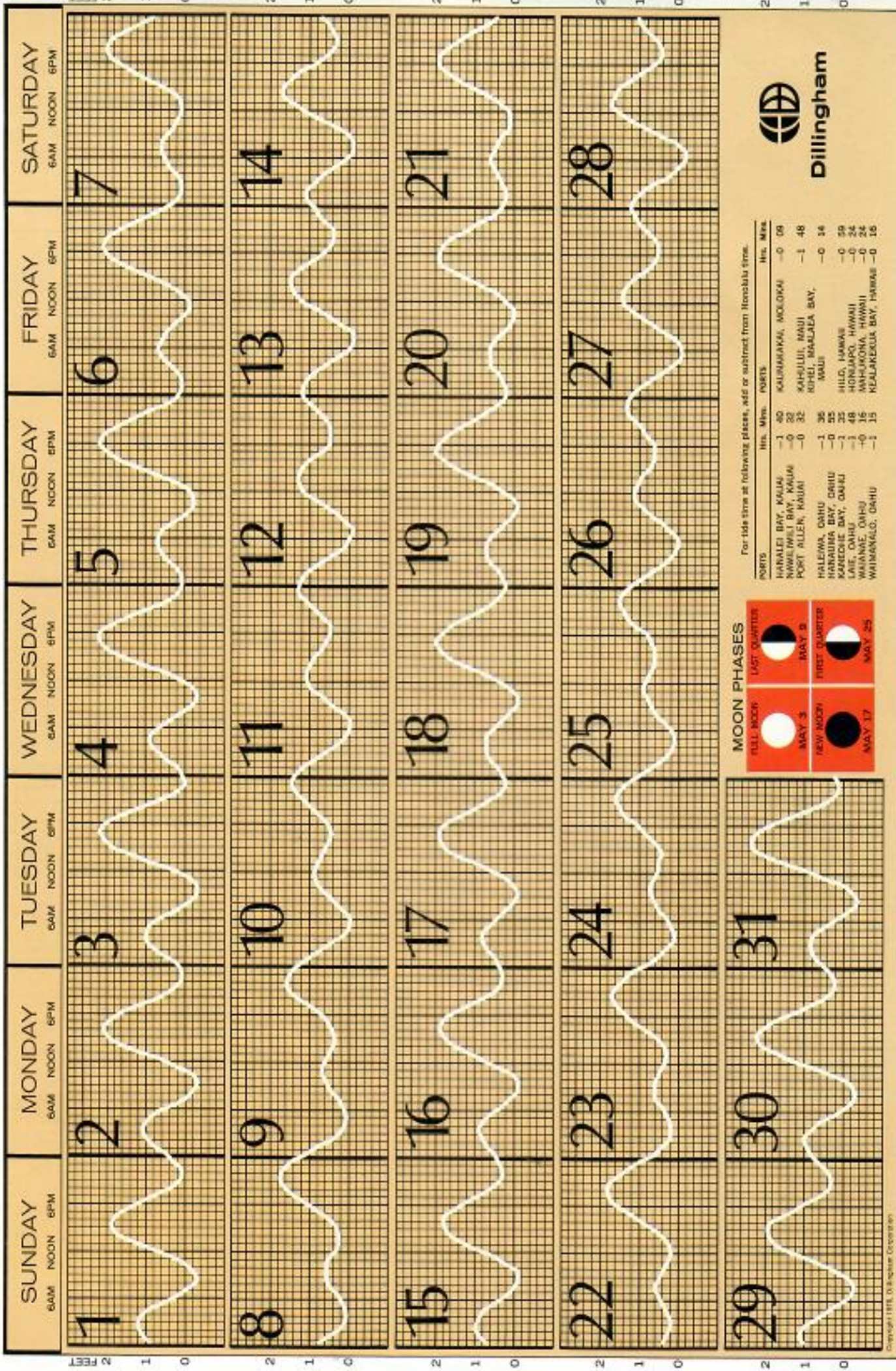
APRIL 1977 TIDE CHART





Spanish Dancer

MAY 1977 TIDE CHART

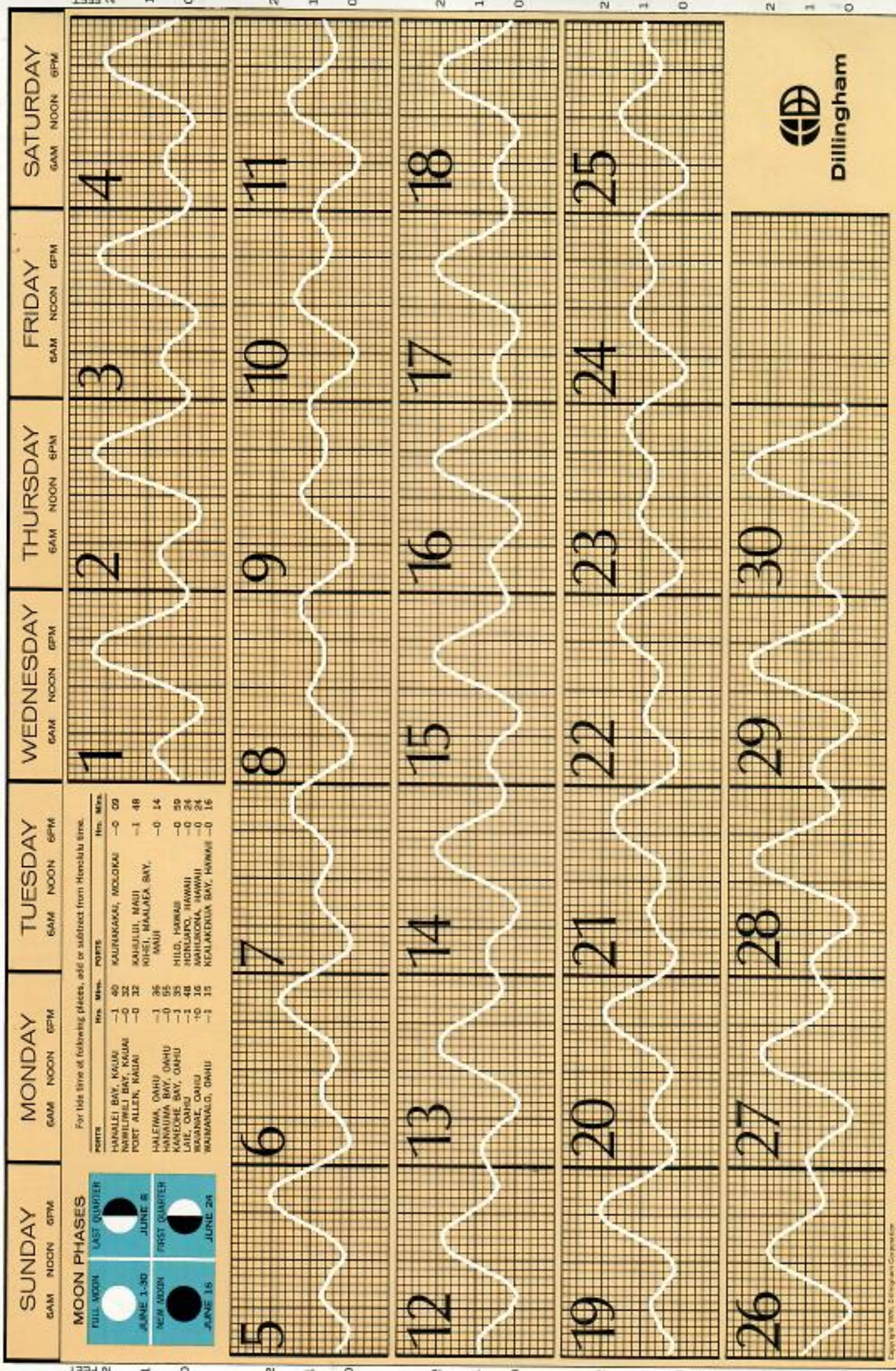


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Nudibranch

JUNE 1977 TIDE CHART



MOON PHASES	
FULL MOON JUNE 1-30	LAST QUARTER JUNE 8
NEW MOON JUNE 16	FIRST QUARTER JUNE 24

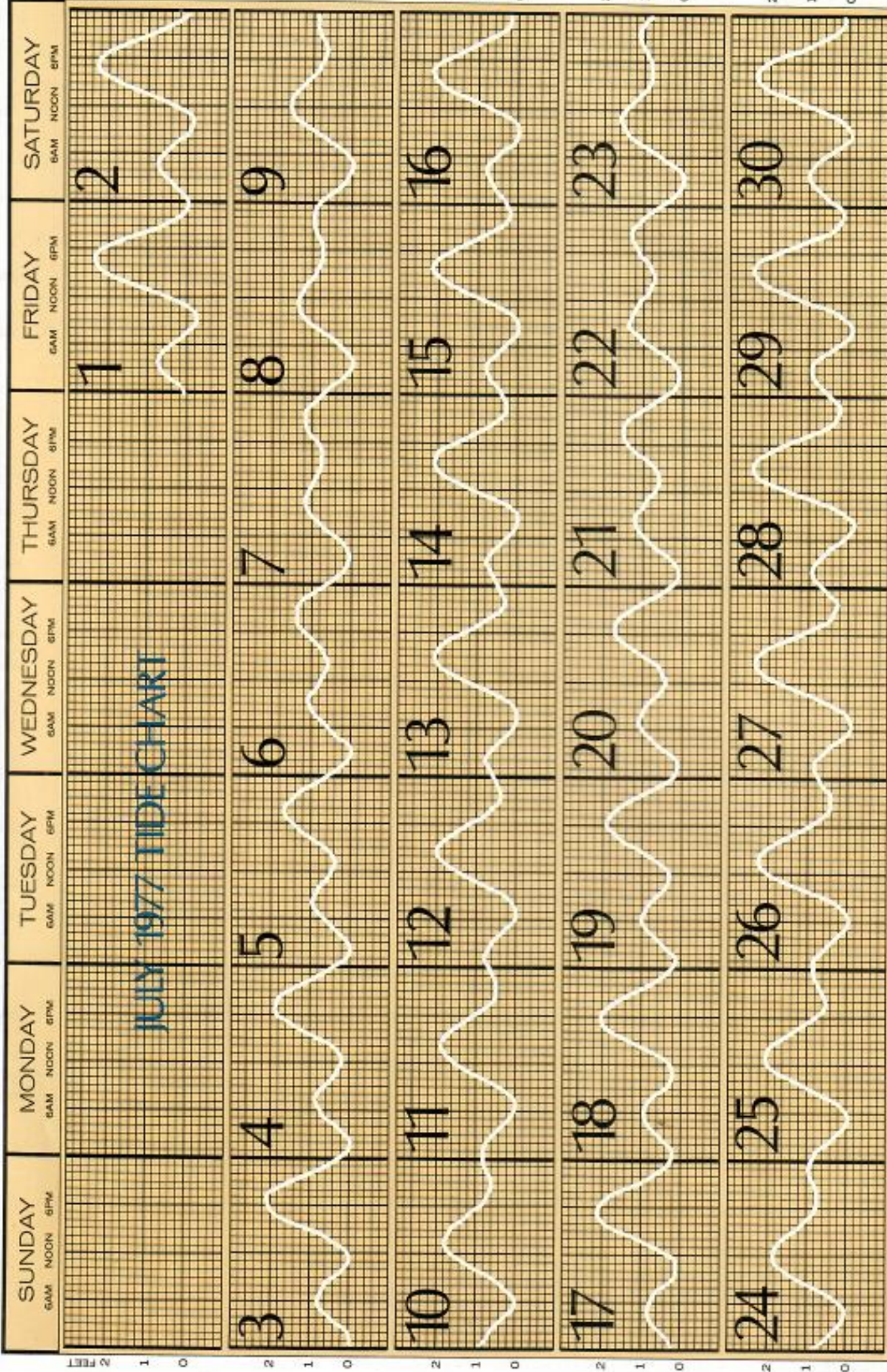
For tide time of following places, add or subtract from Honolulu time.

PLACES	Hrs. Min.	Hrs. Min.	
HAWAII BAY, KAUAI	-1 40	KAUNAKAKI, MOLOKAI	-0 00
NABEWELI BAY, KAUAI	-0 32	KAHULUI, MAUI	-1 48
PORT ALLEN, KAUAI	-0 32	KIHEI, MAUI	-1 48
		KIHEI, MAUI	-0 14
HALEIWA, OAHU	-1 26	HILO, HAWAII	-0 50
HANAUHA BAY, OAHU	-0 55	HONOLULU, HAWAII	-0 00
KANEHOE BAY, OAHU	-1 35	KAUNAKAKI, HAWAII	-0 24
LAI, OAHU	-1 48	KAUNAKAKI, HAWAII	-0 24
MOONAHU, OAHU	-1 16	KAUNAKAKI, HAWAII	-0 16
WAIMANALO, OAHU	-1 15		





White Tip Reef Shark



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

PORTS	hrs. Min.	PORTS	hrs. Min.
HANALEI BAY, KAUAI	-1 40	KAIUNAKAI, MOLOKAI	-0 09
MAHILUHI BAY, KAUAI	-0 32	KAHULUI, MAUI	-1 48
PORT ALLER, MAUI	-0 32	KIHEI, MAUI	-0 14
HALEIWA, OAHU	-1 35	MAUI	-0 14
HANALEI BAY, OAHU	-0 55		
KANEOHE BAY, OAHU	-1 25		
LAIE, OAHU	-1 48		
WAIKANE, OAHU	-0 15		
WAIMANALO, OAHU	-1 15		

MOON PHASES

LAST QUARTER	NEW MOON
FIRST QUARTER	FULL MOON
JULY 7	JULY 15
JULY 23	JULY 30

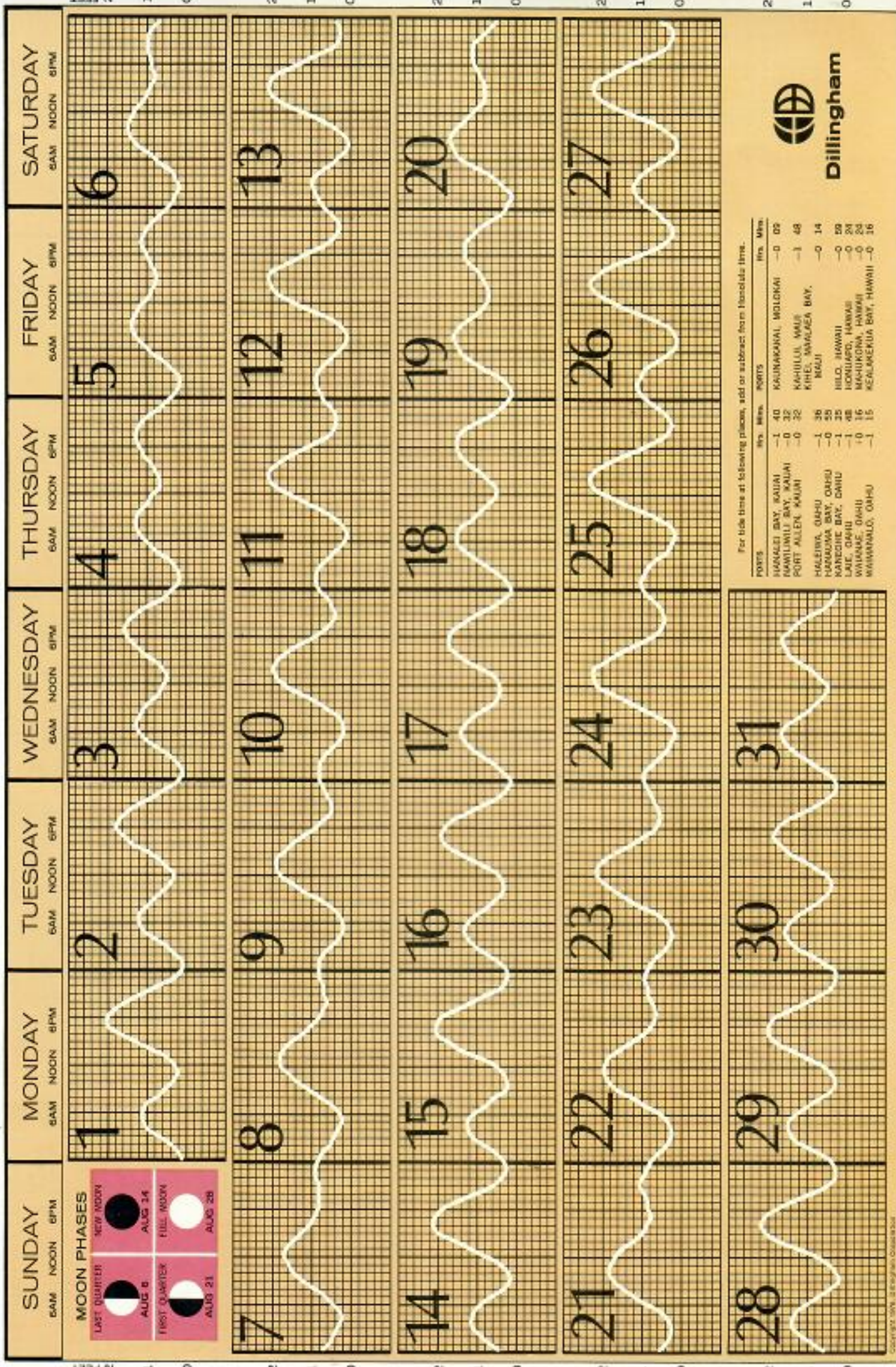


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Crown of Thorns Starfish



AUGUST 1977 TIDE CHART



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

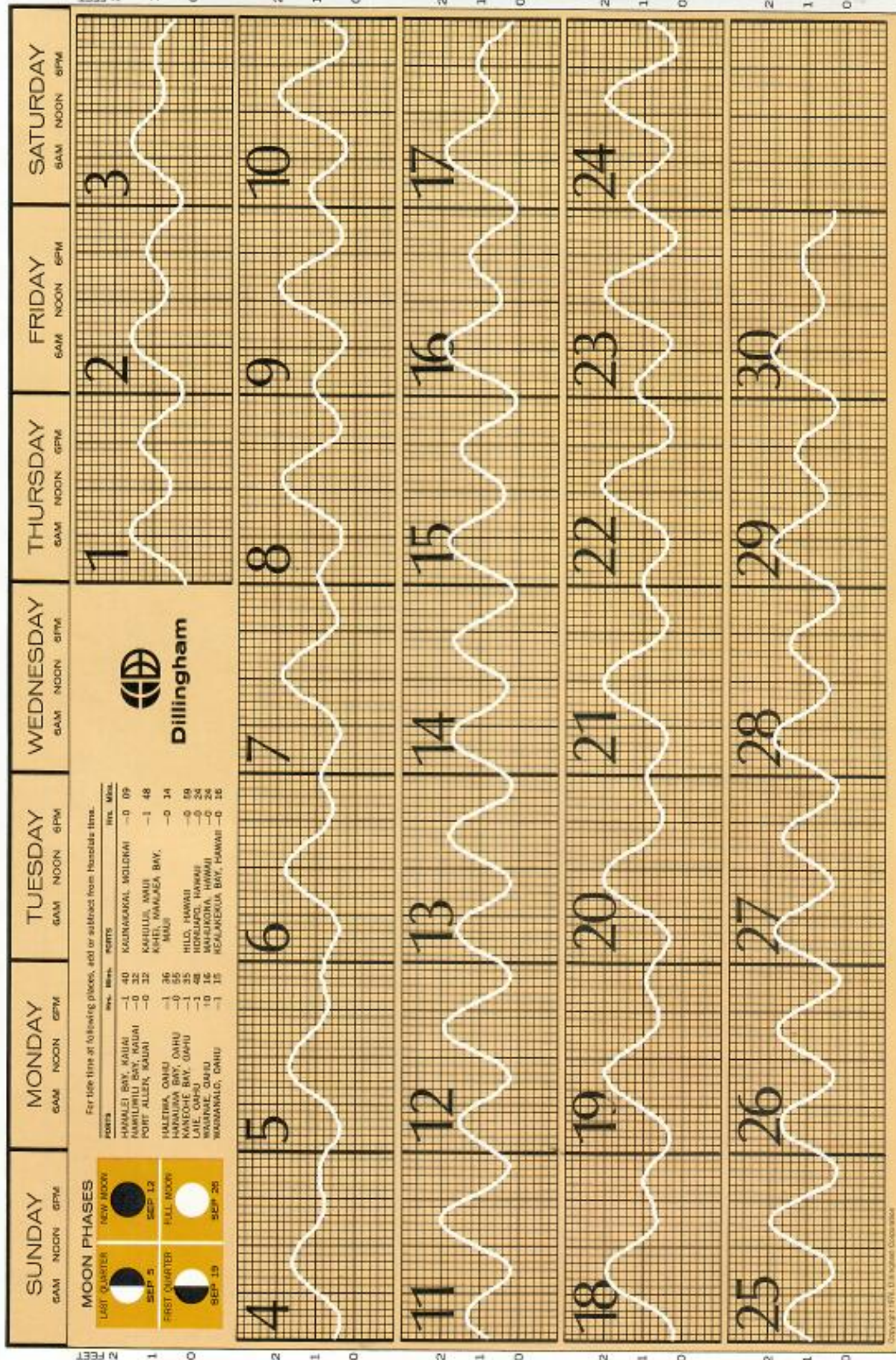


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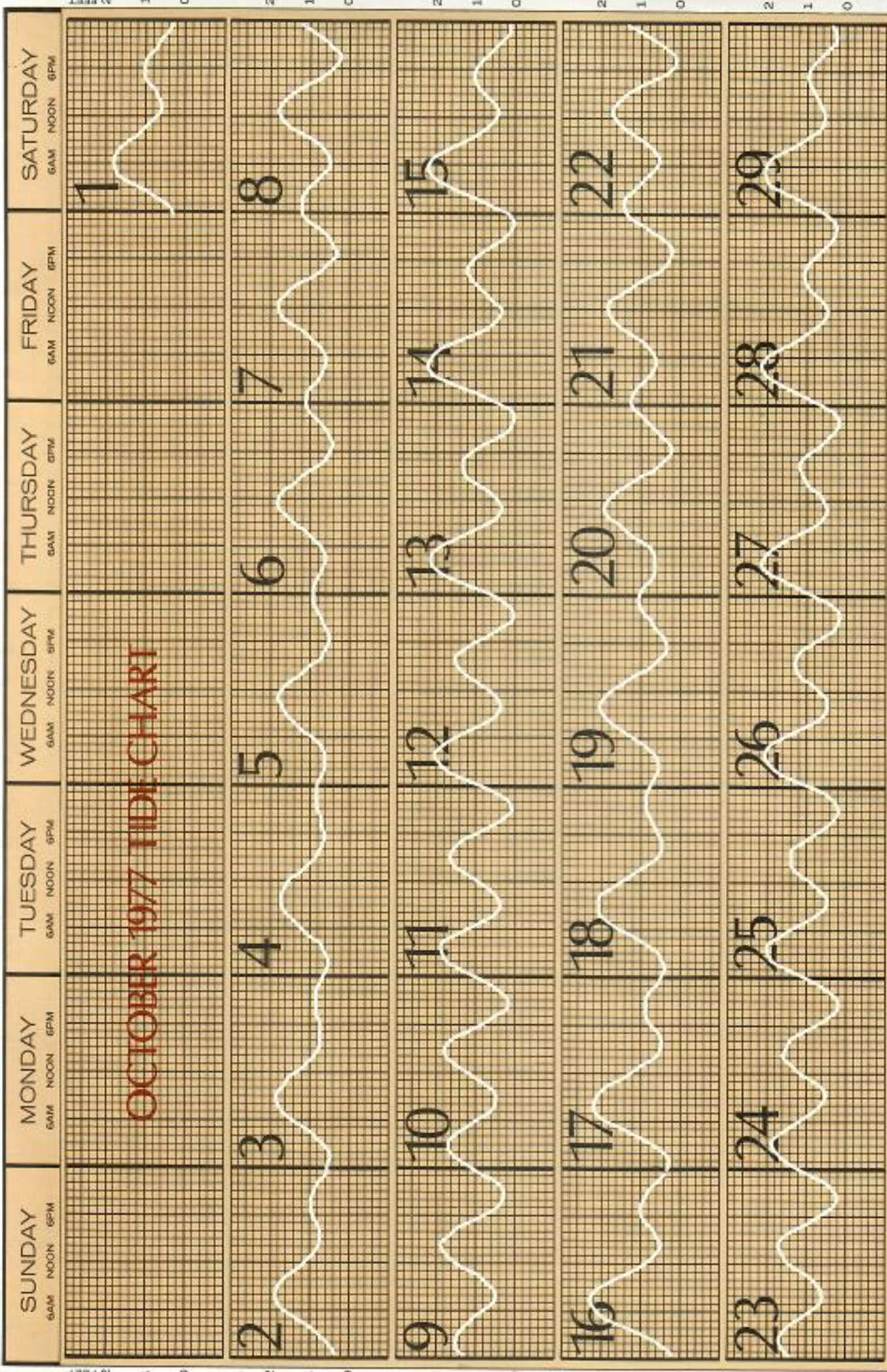
Regal Slipper Lobster

SEPTEMBER 1977 TIDE CHART



Lion Fish





OCTOBER 1977 TIDE CHART

SUNDAY 6AM NOON 6PM MONDAY 6AM NOON 6PM TUESDAY 6AM NOON 6PM WEDNESDAY 6AM NOON 6PM THURSDAY 6AM NOON 6PM FRIDAY 6AM NOON 6PM SATURDAY 6AM NOON 6PM

MOON PHASES

LAST QUARTER OCT. 4	NEW MOON OCT. 12
FIRST QUARTER OCT. 19	FULL MOON OCT. 26

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

PLACES	Hrs. Min.	PLACES	Hrs. Min.
HAWAII BAY, KAUAI	-1 50	KAUNAKAKI, MOLOKAI	-0 09
MAWILI BAY, KAUAI	-0 53	KAHULUI, MAUI	-1 48
PORT ALLEN, KAUAI	-0 52	KIHEI, MAUI	-1 48
		KIHEI, MALAKA BAY,	
		MAUI	-0 14
HALEIWA, OAHU	-1 26		
HANALEI BAY, OAHU	-0 55		
KANOE BAY, OAHU	-1 35	HILO, HAWAII	-0 59
LAKE, OAHU	-1 48	HONOLULU, HAWAII	-0 24
WAIKANE, OAHU	-0 16	MAHUKONA, HAWAII	-0 24
WAIMANALO, OAHU	-1 25	KEELAKEUA BAY, HAWAII	-0 16

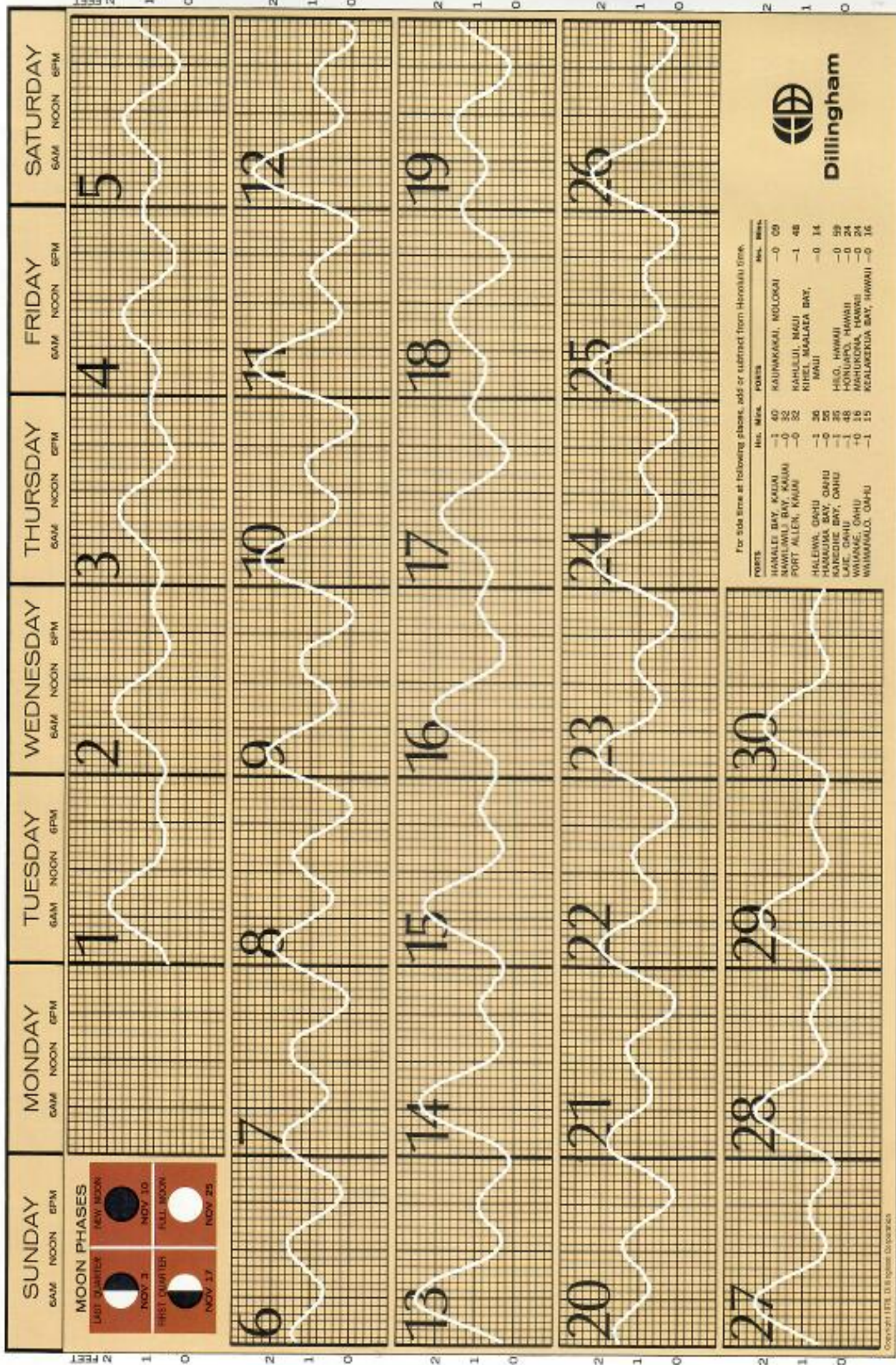


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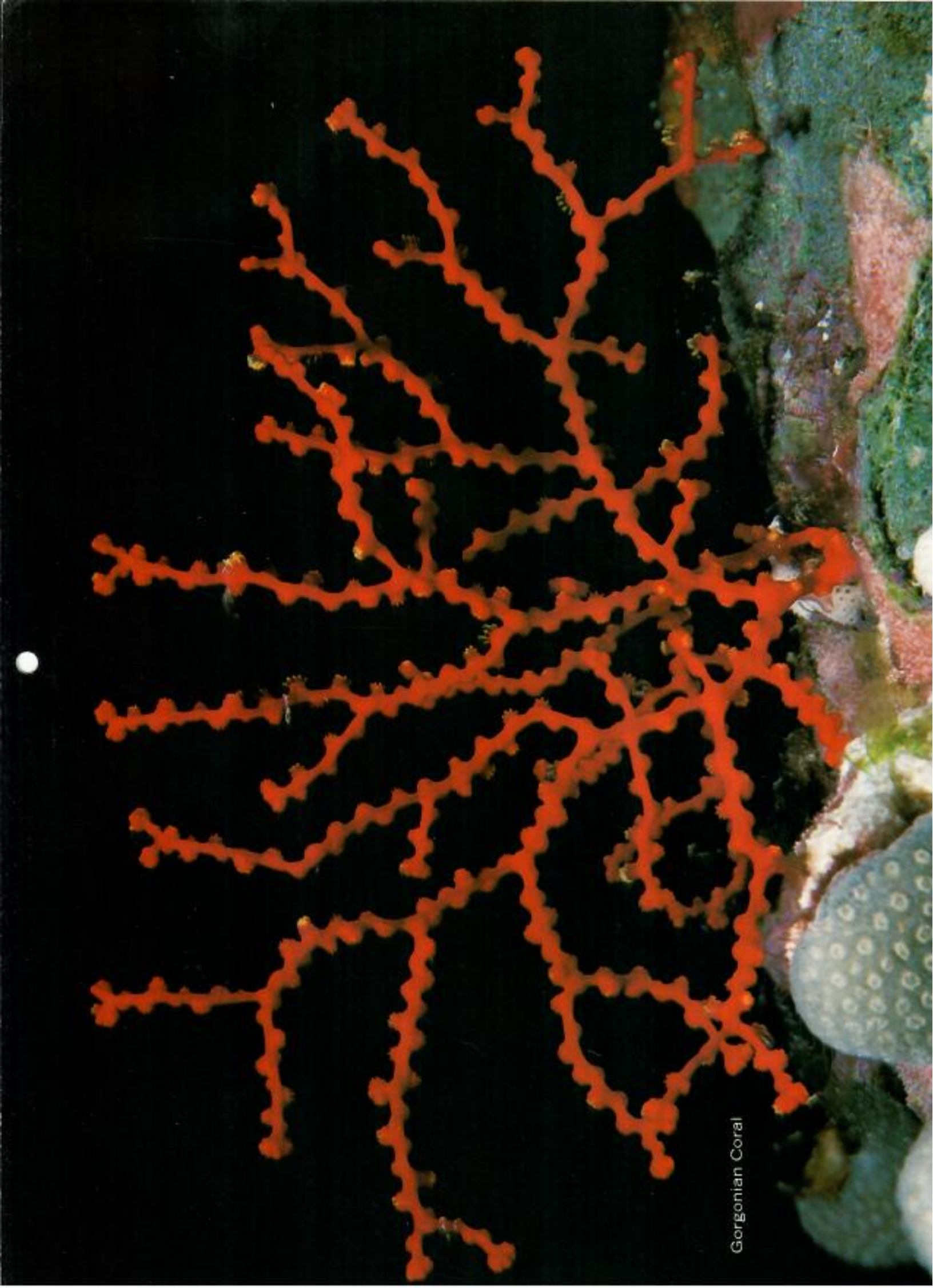


Hawaiian Swimming Crab

NOVEMBER 1977 TIDE CHART

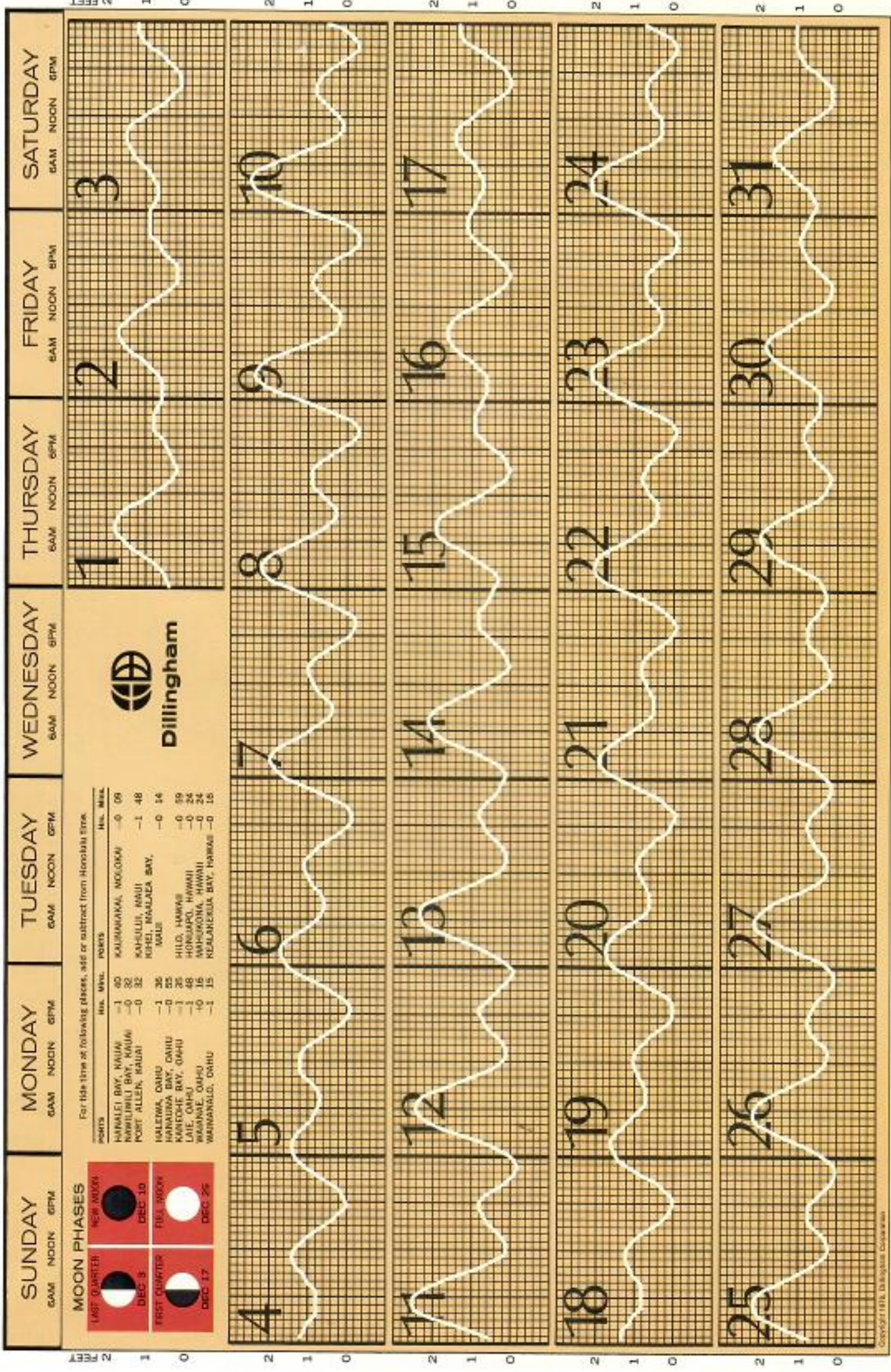


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Gorgonian Coral

DECEMBER 1977 TIDE CHART



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

PORTS	Hrs. Min.	PORTS	Hrs. Min.
HANALEI BAY, KAUAI	-1 40	KAIUMAKAI, MOLOKAI	-0 09
NAWILIWILI BAY, KAUAI	-0 32	KAHULUI, MAUI	-1 48
PORT ALLEN, KAUAI	-0 32	KIHEI, MAUI	-1 48
HALEIWA, OAHU	-1 36	MAUI	-0 14
HANAULUA BAY, OAHU	-0 55	HILO, HAWAII	-0 59
KANEOHE BAY, OAHU	-1 25	HONOLULU, HAWAII	-0 24
LAIHE, OAHU	-1 48	WAIKONA, HAWAII	-0 24
WAIMANU, OAHU	-0 16	KEALAKEKUA BAY, HAWAII	-0 16
WAIMANALO, OAHU	-1 15		

MOON PHASES

LAST QUARTER DEC 9	NEW MOON DEC 10
FIRST QUARTER DEC 17	FULL MOON DEC 25

1977 TIDE CALENDAR



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