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ALASKA Tidelines

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(Photo by Jimmy Bedford)

If water is the life blood of the earth, tides are like the beating of its pulse. The lives of many coastal Alaskans are tuned to the regular rise and fall of the tide, like these sea birds perched on pilings in Wrangell Harbor, who are waiting for it to bare a banquet on the beach.

ALASKA TIDES —and the Tricks They Play

Ask a ferryboat captain out of Ketchikan how many high tides there are a day and he will say, "Two."

Ask a fisherman at St. Michael in the Bering Sea how many low tides there are a day and he will say, "One."

Ask a seal hunter from Barrow how many tides there are a day and he will say, "What tides?"

Who's right? They all are. While the tidal cycle from high to low and back again occurs twice a day along most sea coasts of the world, Alaska has about the wildest mix of tides imaginable.

Tides, of course, are the regular rhythmic rise and fall of great bodies of water. They are caused by the tugs and pulls at work in our solar system — mainly the force of gravity from the moon and sun, combined with the spin-off force of the earth as it turns on its axis every 24 hours *(see page 3)*.

But the way the earth itself is made also has a lot to do with tides. Each of the great oceans differs in size and depth. Each has its own special underwater landscape of mountains, valleys, trenches and plains which affect the movement of water during the rise and fall of the tides. And the same goes on a smaller scale for the sounds, bays, inlets and river mouths that carve out their coastlines.

Look at a map of Alaska. How many oceans wash its shores? ____. How many seas? ____. Now consider the fact that Alaska has some 6,640 miles of coastline — more than half that of all the Lower 48 states. And if you want to include all the miles of saltwater *shore*line (islands, delta areas and such), add another 28,000 miles.

All in all, there are so many combinations of depths and shapes and sizes that affect the flow of our coastal waters, it's no wonder Alaska tides are tricky. *Alaska Tidelines* asked oceanographers at the University of Alaska for some examples of the tricks these tides play — and why:

RICK 1: The Biggest

Q. *When you're talking about tricky tides in Alaska, the first place you think of is Cook Inlet. There the range between high and low tides is about the greatest in the world. Why are the Cook Inlet tides so big?*

A. That's because of the peculiar size and shape of Cook Inlet. You could say that the length of Cook Inlet almost tunes it to the timing of the tides. This combination of distance and tidal flow patterns is called *resonance*, or response, to the tides. When a high tide enters Cook Inlet, it meets the previous high tide on its way out and they add to each other. The same thing happens at each low tide. So the high tides get higher and the low tides get lower than the ocean tides. It's like rocking a half-full bathtub back and forth. If you rock it over a certain rate, you'll have water climbing up the sides and all over the floor.

In addition, Cook Inlet gets narrower and shallower as it moves up from the sea. So the water from a high tide at Homer (already increased by resonance) can only rise higher as it rolls along. Finally when the tide gets to Anchorage and splits off into shallow Knik and Turnagain Arms, it can reach a height of up to 39 feet – more than twice as high as the tide at Homer.

The word oceanographers use to describe this is *amplification*, which means increase in volume. (If you have a hi-fi set or an electric guitar, you probably already know what amplification means. It means somebody is yelling at you to turn it down.) In the Bay of Fundy on the east coast of Canada, which has the highest tides in the world, the amplification is 2.4 times higher at the head of the bay than at the entrance. Amplification in Cook Inlet is 2.2 times.

All this water moving in and out of Cook Inlet creates very strong tidal currents. Where the Inlet narrows between the East and West Forelands, this current has been reported to reach a speed of up to 8 knots (about 9 miles an hour). It is so strong that when Captain Cook first explored the Inlet 200 years ago *(see pages 4-5)* he thought he was sailing up a river. And even today a ship like the RV *Acona (see page 7)* bucking the current could be going at full speed and making almost no headway.

Q. *Every once in a while a single big wave called a tidal bore forms on Turnagain Arm near Anchorage. What is a tidal bore and what makes it?*

A. A tidal bore is a standing breaking wave that moves along like a wall of water. These strange waves are found in shallow tapering inlets or river mouths at scattered points around the world where the tidal range is high. At some places, like the Ganges River in Indian, a high incoming tide almost always causes a bore. But on Turnagain Arm the bore builds up only when the winds and tides are right.

The Turnagain Arm tidal bore usually occurs two or three days before the highest tide of the month. It is most apt to form when a high tide is rolling into Turnagain Arm and the wind is blowing out towards Cook Inlet. The Turnagain tidal bores are usually three or four feet high – sometimes higher – and move along at a speed of about 5 knots.

RICK 2: The Smallest

Q. *Why is there such a difference between the tides in southern Alaska and the tides along the Arctic Ocean? How can they be over 30 feet high in Cook Inlet and only inches high at Prudhoe Bay in the Beaufort Sea?*

A. The gravitational pull of the moon is greatest over the equator and smallest over the poles. The tides along the southern coast of Alaska are reacting to the great sweep of the tidal bulge pulled up by the moon over the Pacific Ocean. But the moon is never directly over the Arctic Ocean at all, so its influence is very slight.

But something else interesting is going on here too. Except for narrow Bering Strait, the Arctic Ocean is completely cut off from the North Pacific tidal flow. Instead, the Arctic Ocean tidal patterns come from those of the North Atlantic, which means you really have *three* oceans involved in Alaska tides, rather than two. The Atlantic tides move up between Norway and Greenland, and then counter-clockwise through the Arctic Basin. However, the Arctic Ocean is not resonant with the North Atlantic, so these tides get smaller as they go along, rather than larger.

RICK 3: The Mix

Q. *You hear all kinds of strange stories about tides of the Bering Sea. Two tides a day here. One tide a day there. What's going on?*

A. Just about anything can happen in the Bering Sea. It is influenced mainly by Pacific tides and to a very small degree by Arctic Ocean tides. But the Aleutian Island chain forms a barrier of sorts to the free movement of water from the North Pacific, just as the Bering Strait cuts down the flow from the Arctic. Not only that, but the southwestern portion of the Bering Sea is very, very deep, while the water covering the Continental Shelf – the area that was once the Bering Sea land bridge – is quite shallow *(see* Alaska Tidelines, *October, page 5).*

So you really have a mix. But remember that except for Bristol Bay, most of the tides in the Bering Sea are quite small. And most of their tricks can be explained by these various influences and by the effects of local land and basin formations.

For example, think of all the factors that might lead up to that single tide a day at St. Michael: The Bering Sea is like a big bay within the Pacific Ocean. Norton Sound is like a smaller bay within the Bering Sea. And when you get down to tiny St. Michael Bay within Norton Sound, the usual two tides a day could merge into one tide.

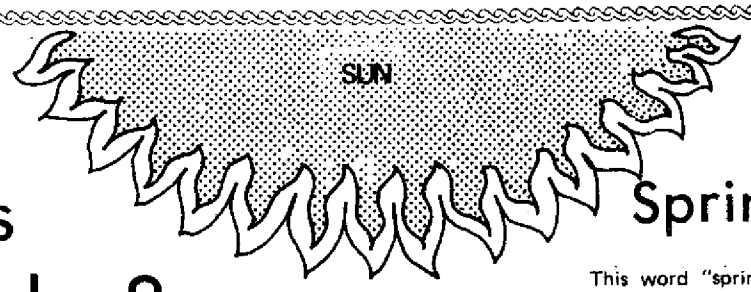
Q. *How about Southeast Alaska tides?*

A. That could be the biggest mix of all because the coastline is so broken up. The tide comes in from the open ocean and then must make its way through a maze of waterways, around big islands and small islands and peninsulas. While there are usually two tides a day in Southeast Alaska, their size and timing can vary from bay to bay and inlet to inlet.

Q. *Then how can you keep track of the tricks Alaska tides play?*

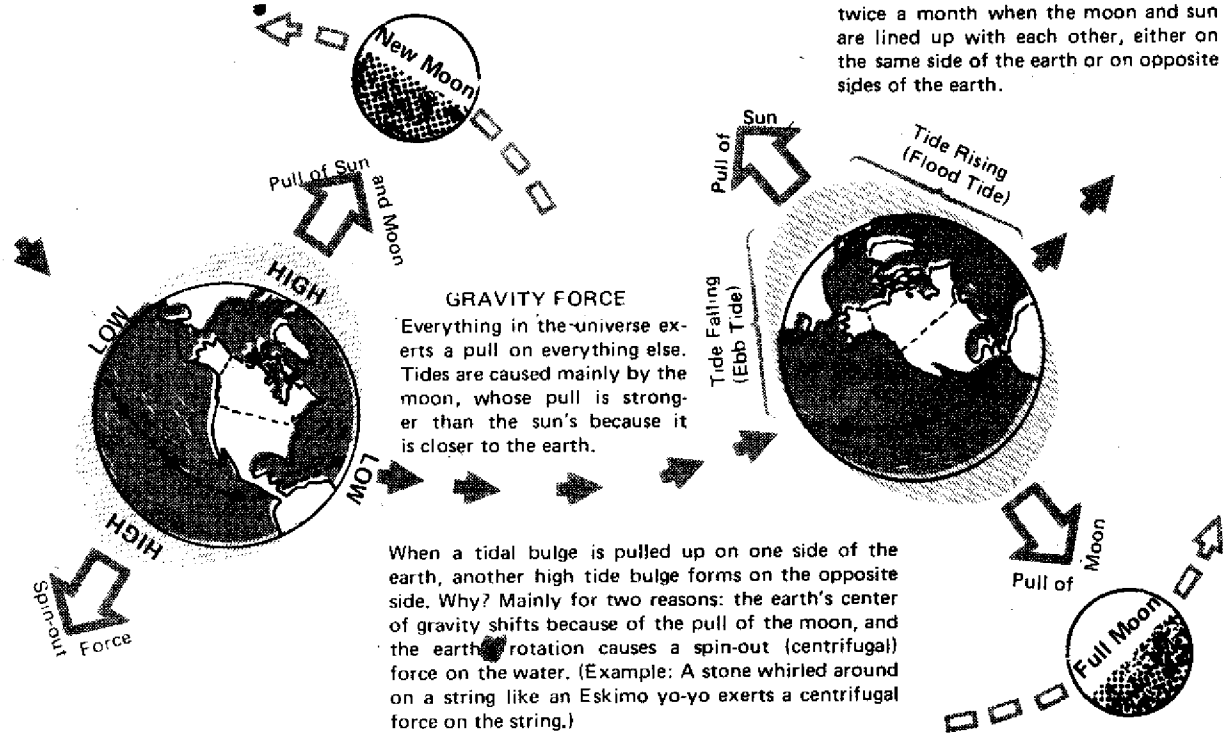
A. Well, giant computers are getting into the act, and soon we may be able to predict tides even in such tricky places as Southeast Alaska. Also, the latest space satellite SEASAT may someday make it possible to measure tides anywhere in the world. But for the time being, the best way for you to keep track of tides would be to turn to page 6 and learn how to read a Tide Table.

What Makes The Tides?



Spring Tides

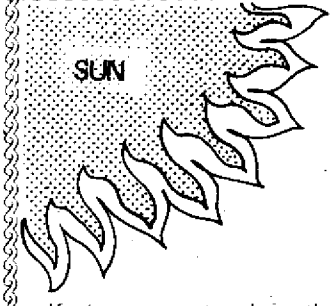
This word "spring" has nothing to do with the season. It comes from the Old English word "springan" meaning "to leap." Spring tides bring the highest and lowest water levels. They occur about twice a month when the moon and sun are lined up with each other, either on the same side of the earth or on opposite sides of the earth.



GRAVITY FORCE

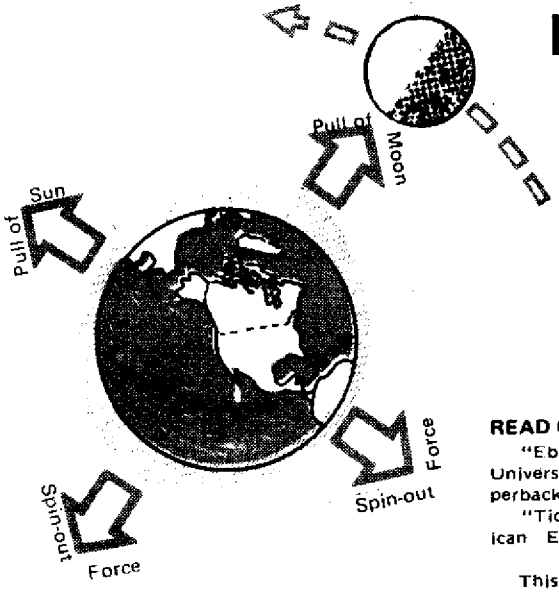
Everything in the universe exerts a pull on everything else. Tides are caused mainly by the moon, whose pull is stronger than the sun's because it is closer to the earth.

When a tidal bulge is pulled up on one side of the earth, another high tide bulge forms on the opposite side. Why? Mainly for two reasons: the earth's center of gravity shifts because of the pull of the moon, and the earth's rotation causes a spin-out (centrifugal) force on the water. (Example: A stone whirled around on a string like an Eskimo yo-yo exerts a centrifugal force on the string.)



If the moon stayed in the same place all the time, that big piling in Wrangell Harbor would pass under it every 24 hours as the earth turns on its axis, and the tides would come at the same time every day. But the moon is moving slowly ahead in its own orbit while the earth turns, so the tides are about 50 minutes later each day. This time span of 24 hours and 50 minutes between one full tidal cycle and the next is called a "lunar day," based on the Latin word "Luna" for moon.

Neap Tides



Tides are smaller when the moon, sun and earth are at angles with each other. This happens about twice a month when the moon is near its 1st and 3rd quarters. These tides are called Neap (NEEP) tides, from the Old English word "nep" meaning scant or lacking.

READ ON:

"Ebb and Flow," by Albert Defant, University of Michigan Press, 1958 (paperback).

"Tides" by D.H. MacMillan, American Elsevier Publ. Co., N.Y., 1966.

This issue was reviewed for scientific accuracy by Drs. Brian Matthews and G.D. Sharma, University of Alaska.

POSTCARDS from 200 Years Ago

You might think of the famous British explorer Captain James Cook as Alaska's first tourist. He didn't come to stay, as the people crossing the Bering Sea Land Bridge had done. He didn't come to occupy the country and cash in on its resources (mostly sea otters), as the Russians had done. Instead, he came to look and to learn, as most tourists do.

Cook's voyage through Alaska waters was even timed to the usual summer tourist season. From May 1 to Oct. 26, 1778, the two small sailing ships under his command traveled the route traced on this map. The main hope of Cook and his crew was to discover a year-round water link between the Atlantic and Pacific oceans. They didn't find that "Northwest Passage," of course, because it didn't exist. But the maps, charts and notes Cook made during the search added immeasurably to human knowledge of the world and its peoples.

Since that all-important tourist tool, the camera, hadn't been invented yet, Cook took along his own "photographer" in the form of artist John Webber. Cook himself, who had a lively interest in just about everything, made careful and detailed reports about the waters he sailed, the scenery he saw, the people he met, the clothes they wore, and the strange creatures he observed. (Obviously, he'd never heard of a walrus.)

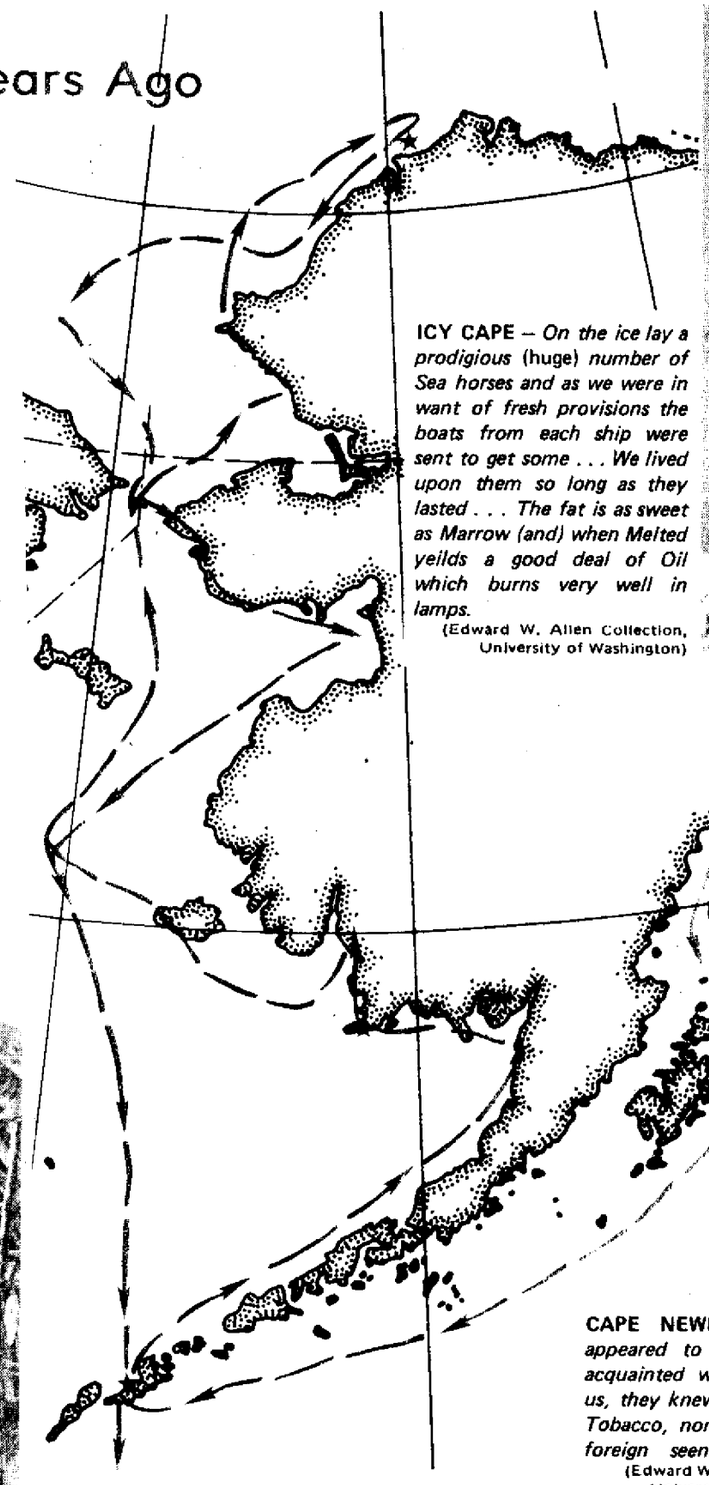
Here are some of those pictures[1] and notes, which come to us now like postcards mailed 200 years ago. The words are from Cook's Journals,[2] just as he wrote them. (You will notice that while Cook was a great explorer and a keen observer, he wasn't a very good speller. If you were his editor back in London, what changes would you make in his spelling and punctuation? Draw a circle around them.)

About Cook Inlet Tides: *(There) ran a prodigious* (huge) *tide; it looked frightfull to us who could not tell wheather the agitation of the Water was occasioned by the strength of the stream or the breaking of the waves against rocks or sands.*

About Fish, etc.: *The fishes that are common to other Northern Seas are found here: as Whales, Grampusses* (Cook was probably referring to Killer whales), *Porpoises, Sword fish, halibut, Cod, salmon, trout; soals, flat fish, and several other sorts of small fish . . . Except Musketoes, here are few other insects.*

About the Land: *I have already observed that the America Continent is called by the Russians as well as the Indians* Alaska, *which is the proper Indian* (Cook meant Aleut) *name for it, and probably meens no more than that part adjoining* Ooneemak, *however the Indians as well as the Russians call the whole by that name and know very well that it is a great land.*

UNALASKA — *The Native Inhabitants (to all appearance) are the most peaceable inoffensive people I ever met with, and as to honisty they might serve as a pattern to the most civilized nation upon earth . . . Thier dress, both Men and Womens, are made alike, the only difference, the Womens frock is made of Seal skin and the Mens of bird skins.*



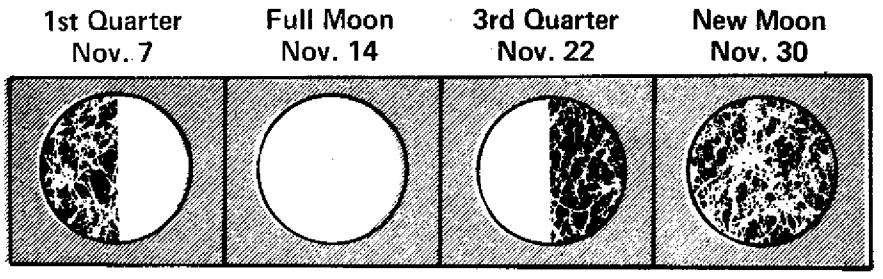
ICY CAPE — *On the ice lay a prodigious* (huge) *number of Sea horses and as we were in want of fresh provisions the boats from each ship were sent to get some . . . We lived upon them so long as they lasted . . . The fat is as sweet as Marrow (and) when Melted yeilds a good deal of Oil which burns very well in lamps.*
(Edward W. Allen Collection, University of Washington)

PRINCE WILLIAM SOUND— *Some both men and women have the underlip slit quite through . . . To the out side hang pieces of bone or beads (which) makes them look as if they had a double row of teeth in the under jaw.*
(Dixson Library, State Library of New South Wales)

CAPE NEWENHAM — *They appeared to be wholly unacquainted with people like us, they knew not the use of Tobacco, nor was any thing foreign seen about them.*
(Edward W. Allen Collection, University of Washington)

[1] Reproductions courtesy of the Anchorage Historical and Fine Arts Museum.

[2] Cook, James. The Journals of Captain James Cook, Vol. III, Part 1, The Voyage of the Resolution and Discovery, 1776-1780. Ed. J.C. Beaglehole, Cambridge. Published for the Hakluyt Society, 1967.



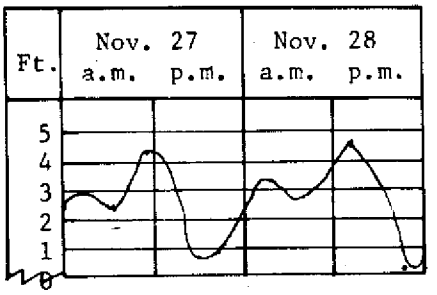
How to Read A Tide Table

If you take your boat through Peril Strait in Southeast Alaska, you'll want to know when the tide is high. If you're going clam digging near Cordova, you'll plan your trip for a low low (or "minus") tide. And to find out the time of these tides to the hour and minute, you'll look at the Tide Tables for your area.

Tide Tables can usually be obtained from local marine supply or sporting goods dealers, newspapers, banks, or village stores. They are based on tidal predictions published each year by the U.S. National Ocean Survey (NOAA). These predictions are made by a highly complicated process which involves past measurements of tides at key coastal points and charting future positions of the sun, moon and earth.

Here are pages showing this month's tides for the Anchorage area. It's a little chilly along the beaches there right now. But check it out so you can read the Tide Table at a glance come beachcombing time next spring.

1. High tides for each day are listed on the _____ right side _____ left side.
2. The letters *a.m.* stand for the hours between midnight and _____; *p.m.* for the hours between noon and _____. Which are printed in **Bold** (heavy) type? _____.
3. The time 0:46 means 46 minutes after _____.
4. Is the first tide of the day on Nov. 1 high or low? _____.
5. Check which is the lower tide:
   _____ 1.1 feet _____ -1.1 feet
6. On which day of this month are the high tides the same height in the Anchorage district? _____.
7. What is the tidal range (distance in feet) between the first high tide and the first low tide on Nov. 2? _____. On Nov. 10? _____.
8. Graphs of high and low tides are a good way to show the range and variations of tidal patterns. Here is a sample showing what the tides will be on Nov. 27-28 at the busy fishing port of Dutch Harbor on Unalaska Bay in the Aleutian Islands:



DUTCH HARBOR

About how many feet high will the highest tide be at Dutch Harbor on Nov. 27? _____. About what time will that occur? _____. How low will the lowest tide be on Nov. 28? _____. At about what time? _____.

9. Now you try it. Using the figures from the Anchorage Tide Tables, chart the high and low tides for Nov. 27-30 on the graph below. (Hint: Make a pencil dot marking the time and position of each high and low tide before you start the up and down lines.)

How do the Anchorage tides compare with Dutch Harbor Tides?

(Answers on page 8.)

HIGH Tides ANCHORAGE District
NOVEMBER 1978

DATE	DOT'S GUIDE	A M TIME	A M FT	P M TIME	P M FT
1 Wed	●	6:26	30.8	**6:22**	**32.1**
2 Thur	•	7:06	30.9	**6:56**	**32.2**
3 Fri	•	7:49	30.6	**7:35**	**31.8**
4 Sat	•	8:31	30.1	**8:17**	**31.0**
5 SUN	·	9:19	29.5	**9:06**	**29.8**
6 Mon	·	10:12	28.9	**10:01**	**28.3**
7 Tues	·	11:21	28.5	**11:10**	**27.0**
8 Wed	·	. . .	. .	**12:38**	**28.8**
9 Thur	•	0:41	26.4	**1:50**	**29.6**
10 Fri	•	2:09	27.2	**2:53**	**30.5**
11 Sat	•	3:18	28.4	**3:47**	**31.2**
12 SUN	●	4:18	29.4	**4:34**	**31.5**
13 Mon	●	5:08	30.1	**5:12**	**31.5**
14 Tues	●	5:51	30.4	**5:45**	**31.5**
15 Wed	●	6:31	30.5	**6:17**	**31.4**
16 Thur	●	7:08	30.5	**6:50**	**31.0**
17 Fri	●	7:43	30.2	**7:22**	**30.2**
18 Sat	●	8:18	29.6	**7:56**	**28.9**
19 SUN	●	8:55	28.8	**8:31**	**27.5**
20 Mon	●	9:37	27.9	**9:11**	**25.9**
21 Tues	●	10:25	27.1	**10:04**	**24.3**
22 Wed	●	11:23	26.4	**11:13**	**23.0**
23 Thur	●	. . .	. .	**12:28**	**26.3**
24 Fri	●	0:34	22.7	**1:31**	**26.6**
25 Sat	●	1:53	23.4	**2:29**	**27.4**
26 SUN	●	3:04	24.9	**3:20**	**28.4**
27 Mon	●	3:57	26.5	**4:03**	**29.4**
28 Tues	●	4:43	28.0	**4:43**	**30.5**
29 Wed	●	5:25	29.2	**5:19**	**31.5**
30 Thur	•	6:09	30.1	**5:57**	**32.2**

LOW Tides ANCHORAGE District
NOVEMBER 1978

DATE	DOT'S GUIDE	A M TIME	A M FT	P M TIME	P M FT
1 Wed	●	0:50	-2.0	**12:58**	**2.7**
2 Thur	•	1:31	-2.5	**1:36**	**2.8**
3 Fri	•	2:13	-2.6	**2:14**	**3.3**
4 Sat	•	2:54	-2.3	**2:56**	**4.0**
5 SUN	·	3:35	-1.5	**3:42**	**4.9**
6 Mon	·	4:22	-0.5	**4:35**	**5.7**
7 Tues	·	5:13	0.7	**5:41**	**6.1**
8 Wed	·	6:18	1.8	**7:02**	**5.3**
9 Thur	•	7:30	2.3	**8:23**	**3.3**
10 Fri	•	8:45	2.3	**9:38**	**0.8**
11 Sat	•	9:59	2.0	**10:39**	**-1.3**
12 SUN	●	10:56	1.7	**11:29**	**-2.5**
13 Mon	●	11:45	2.0	. . .	. .
14 Tues	●	0:14	-2.8	**12:26**	**2.7**
15 Wed	●	0:54	-2.4	**1:03**	**3.5**
16 Thur	●	1:31	-1.7	**1:35**	**4.3**
17 Fri	●	2:04	-1.0	**2:04**	**4.9**
18 Sat	●	2:34	-0.3	**2:34**	**5.4**
19 SUN	●	3:06	0.3	**3:10**	**6.0**
20 Mon	●	3:42	1.1	**3:51**	**6.6**
21 Tues	●	4:20	2.1	**4:38**	**7.2**
22 Wed	●	5:04	3.4	**5:33**	**7.6**
23 Thur	●	5:58	4.9	**6:52**	**7.2**
24 Fri	●	7:17	5.8	**8:17**	**5.2**
25 Sat	●	8:33	5.6	**9:16**	**3.0**
26 SUN	●	9:31	5.1	**10:07**	**1.1**
27 Mon	●	10:21	4.6	**10:56**	**-0.4**
28 Tues	●	11:06	4.2	**11:43**	**-1.7**
29 Wed	●	11:49	3.7	. . .	. .
30 Thur	•	0:28	-2.8	**12:34**	**3.3**

ANCHORAGE TIDES

Ft.	Nov. 27 a.m.	Nov. 27 p.m.	Nov. 28 a.m.	Nov. 28 p.m.	Nov. 29 a.m.	Nov. 29 p.m.	Nov. 30 a.m.	Nov. 30 p.m.
32								
30								
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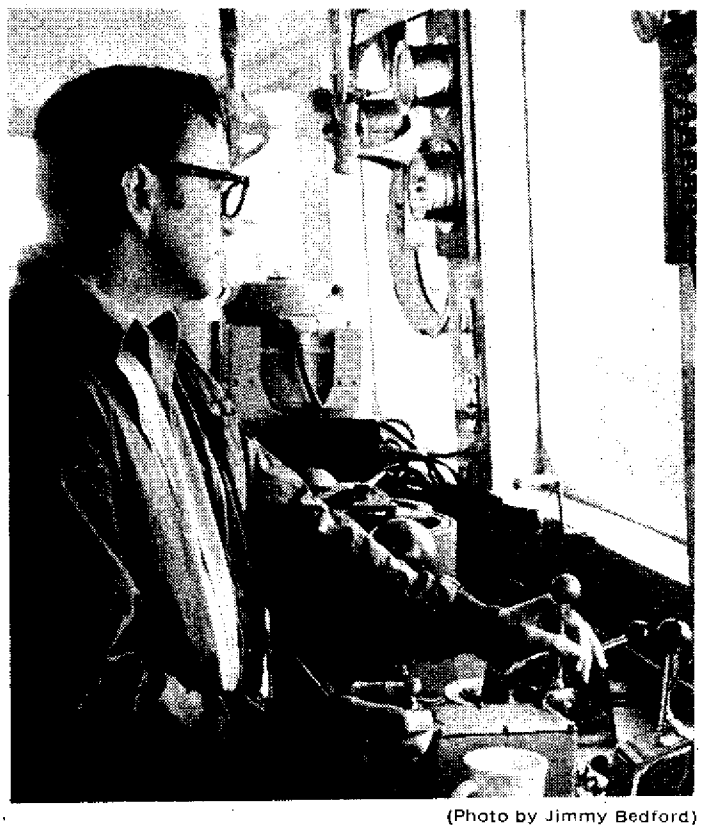
Career Corner:

Meet Captain Ken



(Photo by Jimmy Bedford)

Captain Ken Turner probably knows Alaska waters as well as any man afloat. Maybe better. For the past 12 years he has guided the University of Alaska's marine research vessel *Acona* into hidden coves and inlets, through uncharted waters, and across the open sea all the way from the Southeast Panhandle to the Bering Strait and far out the Aleutian Chain. And he thinks he has the greatest job in the world.

"As an oceanographic research vessel, we see so much other people might not have a chance to see," he told *Tidelines.* "We go everywhere scientists need to go." That might include biologists studying the feeding habits of Tanner crab, chemists seeking quick tests for toxin (poison) in clams, geologists searching for rich underwater mineral deposits, or physical oceanographers charting coastal currents.

The 85-foot *Acona;* fondly known as the "Blue Canoe," carries a full-time crew of six: captain, mate (second in command), chief engineer, two deckhands and a cook. "Except for a brief lay-up for maintenance, we're at it all year long, in all kinds of weather," says Captain Turner. "But I never get tired of it."

Actually, he doesn't sound like the kind of person who ever would get tired of it. Born and raised in the little town of Edmonds north of Seattle, he got his first summer vacation job aboard Puget Sound ferries. As soon as he was old enough he joined the Army Transportation Service. He served first as deckhand and then as mate aboard freighters and tugs which roamed the Pacific from Alaska to Hawaii to the Orient and points south. Except for service with the Army during the Korean War and a brief stint in a small boat yard in Seattle following a shipping strike, he has spent his life at sea.

"Two things I've never been able to stay away from for long," he told *Tidelines,* "are the water and Alaska."

So in 1964, he returned to Alaska doing survey work for several different oil companies. Two years later he took over as skipper of the R/V *Acona,* which is operated by the University's Institute of Marine Science under the sponsorship of the National Science Foundation.

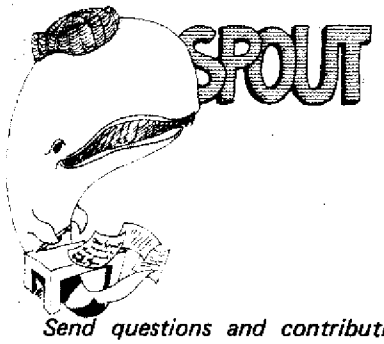
How do you go about getting a neat job like Captain Turner's? The goal is to become a licensed deck officer, and there are a number of routes you can take. The most obvious way to get sea experience, of course, would be to join one of the sea-going services — the Navy, Coast Guard, or even the lesser known NOAA organization, the National Ocean Survey. Or you can apply for admission at the National Maritime Academy at Kings Point, N.Y., where merchant marine officers are trained.

But if you want to follow Captain Turner's on-the-job training approach, the first thing to do is to get some "sea time" aboard a boat. "Any boat," he insists. "Ferryboats, tugboats, fishing boats." After you've served at least three years as a deckhand, you can apply to the Coast Guard to take the examination to qualify as a deck officer. "This is a very tough test," he warns. "I had to go to a special school for three months to get ready for it."

Once you are a licensed deck officer, what are your chances for getting a job in Alaska? Very good, according to Captain Turner, since licensed deck officers are in short supply. "There are all kinds of opportunities here," he says. "Aboard freighters, tankers, survey and supply boats for the oil companies, tugboats, tourboats, ferries and fishing boats. So much of Alaska's life depends upon the water."

Speaking of those Alaska waters, *Tidelines* asked how they compare with those in other parts of the world.

"Alaska waters are more beautiful, more frightening, more adventurous, more demanding, more *everything* than any other waters I have ever sailed. But they're really worth it."



Send questions and contributions to Spout, c/o **Alaska Tidelines** *at the address below.*

Thanks and a spurt of the Spout to Kami Hutchins of Kenai JHS for the question about the R/V *Acona (see page 7).* No trips planned to the Kenai area right now, but we'll try to keep you posted.

And thanks and two spurts to Christine McCubbins, also of Kenai JHS, who sent in a question about tidal bores *(page 2)* and also this fish story:

I won't tell you a joke, but I will tell you about my musical dad who tried to start a fish quartet.

He had a 1st tuna, a 2nd tuna, a barracuda and a bass. He started out with five and had a quintet. But one of them got out of tune, and of course you know how hard it is to tuna fish.

Dear Spout,

In the legend about "How the Salmon Started Up the Rivers" (*Tidelines,* September, page 7), there is a word our class can't figure out. It was Xanaxgatwaayaa, the name of the being who owned the octopus-tentacle staff. Could you give us the phonetic spelling?

Your Fellow Fishes
Mr. Vinette's 6th Grade Class
Iditarod Elementary, Palmer

Dear Fellow Fishes,

The Tlingit "X" is pronounced like a breathy "kh" from way in the back of your throat with your mouth wide open. So the phonetic spelling of X̲'anax̲gatwáayaa would be something like this: khuh-nukh-gut-wah-YAH.

The people we asked are not sure of the meaning of the name. But it refers to the power that pulled the salmon house ashore. You notice that Raven didn't have any luck with the magic octopus-tentacle staff until he sang a song using X̲'anax̲gatwáayaa's name.

Spout

Answers to Tide Table questions: 1-Left side. 2-Noon; midnight; p.m. 3-Midnight. 4-Low. 5-(minus) -1.1. 6-Nov. 17. 7-33.4 feet; 24.9 feet. 8-4.1 feet; 11:57 a.m.; 0.1 feet; 8:30 p.m.

December Issue: Winter Water — Life Above and Below the Ice.

UPS and DOWNS

Starred (*) words are based on information in this issue.

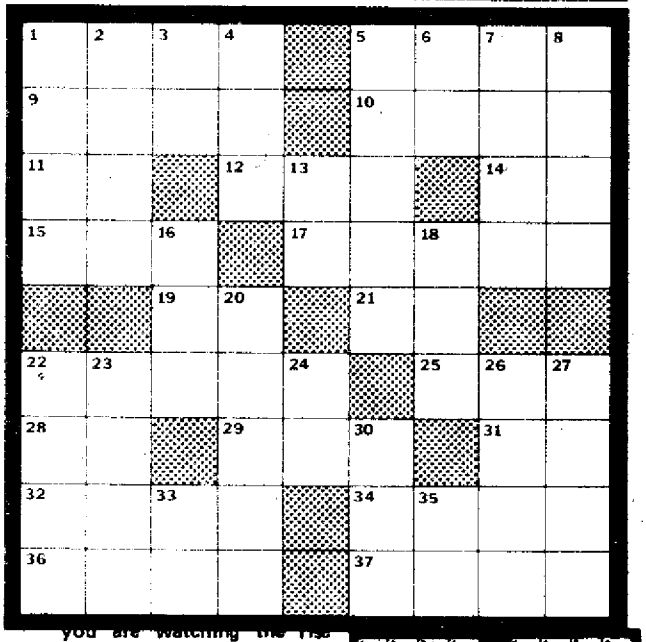
ACROSS

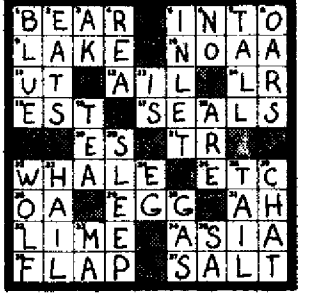
*1. Medium-sized tides that occur twice a month when the moon and sun are at angles with the earth are called ___ tides.
*5. The pull of the ___ has most to do with the rise and fall of the tides on earth.
9. Preposition meaning to get upon something.
10. A shorter word for "island."
11. Office of Volunteers (init.).
12. You need this for frying fish.
14. State of Georgia (abbr.).
15. New York City (init.).
*17. Referring to "Luna," the Latin name for moon.
19. Office of Information (init.).
*21. The broken coastline of ___ (init.) Alaska makes for very tricky tides.
*22. All tides have their ups and ___.
*25. In most parts of the world, there are ___ tidal cycles each day.
28. The letters in the alphabet between N and Q. ___
29. Famous words of Geo. Washington: "I cannot tell a ___."
31. "Exempli gratis" (meaning "for example") (init.).
32. Plural for "cetus," the Latin (and scientific) word for "whale."
34. Alaska has black, brown, grizzly, glacier and polar ___.
*36. Measurement of speed when you are on the water (like miles-per-hour on land).
*37. When the wind and tides are right, a tidal ___ builds up on Turnagain Arm.

DOWN

*1. The kind of print used in your Tide Table changes for times listed after midnight and after ___.
2. To be jealous of.
3. Preposition meaning time or place.
4. Another nickname for dear old Dad.
*5. When a tide is less than 0 (zero), it is called a ___ tide.
6. Ordinary Seaman (init.).
7. Girl's name.
*8. The sun isn't as ___ to the earth as the moon, so its gravity pull isn't as great.
13. Short for Albert.
*16. "Hey diddle diddle, the cat and the fiddle, the ___ jumped over the 5 across."
18. Gear used in fishing.
*20. The tides of Cook ___ are among the biggest in the world.
*22. A good place to stand while you are watching the fish and fall of the tides.
23. Not shut, but ___.
24. Spanish word for "yes."
*26. Captain Cook made detailed notes about the people in Alaska, including the clothes they were ___ing.
27. A horrible kind of person monster.
*30. An outgoing tide is called an ___ tide.
33. Preposition meaning toward.
*34. Equal Opportunity.

(Answers in December issue)





October X-Word Answer

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