

Living with the Tides - Tutorial Script

One of the more exciting behaviors of tides is a phenomenon known as a **tidal bore**. This video shows a tidal bore moving up a shallow embayment south of Anchorage Alaska called Turnagain Arm. Remember, this area has a tidal range of 34 feet during Spring Tides. When 34 vertical feet of seawater rises in 6 hours and 12 minutes, and then falls again in the same time, it can cause quite a flood and ebb current, especially in areas that are flat, where waters can be required to move inland hundreds of miles to achieve that height. Where waters already exist, such as embayments and rivers, these fast-moving flood currents can create the effect of a wall of water migrating uphill. It is an incredible spectacle to see, as the power of the water can cause a lot of erosion along the edges of the embayment or river. And it's a major navigational hazard for swimmers and boaters. Areas of the world that are prone to tidal bores and have large populations, like in China, usually have some kind of warning system to alert folks and give them some time to move off the river or bay until the tidal bore has passed. These video images are from various places around the world where these tidal bores exist. As you can see, some enterprising surfers have taken advantage of these long-lasting high waves and ride them. The world record is over 30 minutes for a single ride! Not all locations have tidal bores of course. To get one you need a large tidal range traveling into a low-lying coastal river mouth or embayment or a narrowing. For example, we get a small tidal bore under the Golden Gate Bridge during Spring Tides. It has been known to overturn small boats, so it's wise to pay attention to the tides and be sure to stay away from this area when the flood current is coming in. This sidescan sonar image showing the depths around the Golden Gate Bridge illustrates the incredible strength of the tidal currents that run under the bridge - so strong that they have carved out a deep depression - 351 feet deep in fact - deeper than the edge of the continental shelf!

Where is tidal range highest in the world's oceans? That honor goes to the Bay of Fundy in Nova Scotia, Canada, with a range of 17 m or 55 feet. The high tidal range means that ships that come into this bay have to time their entry with the flood currents to ensure there is water at the dock when they pull in. When the tides go out, their ships are left exposed on the mud flats. Good time to clean the bottom of the boat, but only if it can happen in 6 hours or less. The fast tidal currents associated with this area are caused by water pushing 200 km inland. One location along the St. John River is known for its reversing falls, which alternate their direction depending on the direction of the tidal current. This push of water is so strong that it is used in some places to generate electricity on both the flood and ebb currents.

How do tides affect marine organisms? When the tide is out, it's not just humans who head out in search of clams and oysters. The wildlife takes advantage of the low tide as well - including large populations of birds, but also mammals like raccoons, foxes, and bears. When the tide rises, they retreat to the land, and predators of the ocean move in in search of the same crustaceans and mollusks. These predators include rays, skates, and leopard sharks. So feeding happens in intertidal zones when the tides are beneficial. That means that these birds and mammals feed by the tidal cycle, not by the solar cycle. You will often hear and see large flocks of birds setting down in these areas, even when it's the middle of the night, because it's the best feeding time.

Some marine organisms, such as horseshoe crab, grunion, and turtles breed, mate, or lay eggs according to the tides. This picture and video show a regular sight along the southern California coast when the grunion swim up onto the beach at high tide on a Spring Tide and lay their eggs. Why then? These are the highest tides available in every 2-week period. Sea level should not get that high again for another 2 weeks, and that gives the eggs time to develop before the water returns to take them back to the sea. Turtles will lay their eggs far from the water's edge. But by arriving on the high tide, the mother turtles do not have to travel so far up the beach to get to the dunes and the best and safest nesting areas. How do these fish, crab, and turtles recognize the Spring Tides? Most likely by the sight of the full moon.

Pause now.

[End credits]

Tides Series:

Part 1. Tidal Patterns

Part 2: Causes of Tides

Part 3: Living with the Tides

Living with the Tides

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