

# CALYPSO LOG

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# POROROCA!

*Observations on the Amazon tidal bore  
from the personal journal of Dick Murphy*

## Background

A tidal bore is an advancing wall of water from the sea that signals high tide moving up a river; the wave can range from only a few inches in height to 25 feet. After the bore passes, the river continues to flow upstream until the tide reaches its peak and the current reverses again.

Such waves occur in many parts of the world (for example, major bores move up the Tsientang River from the East China Sea, up the Severn in England from the Bristol Channel, up the Ganges from the Bay of Bengal, and up the Petitcodiac and Salmon rivers in Canada from the Bay of Fundy), but little organized study has been done in this century on specific bores or on the phenomenon in general.

While bores vary from river to river, or even from one tide to the next, we do know some of the basic conditions that produce them. The tides of the region must be relatively great (a difference of at least 20 feet between high and low

water), and the river mouth must be shallow and the estuary funnel-shaped. When these conditions exist, the incoming tide is forced into the narrowing river mouth, confining and piling up the water to form a single wave moving upstream.

On the Araguari River, a tributary of the Amazon in northern Brazil, there is a bore known locally as "pororoca," which is interpreted variously by inhabitants of the area as "alive water," "thundering," "destructive." We have heard that it can reach a height of 15 to 20 feet and be detected 500 miles upriver. One of our jobs in the Amazon is to observe this phenomenon and to document it on film. What follows is a compilation of notes and recollections from my journal entries of March 28, 1983.

*Right: Dick Murphy perches in his "perfect" observation post: painful, awkward, possibly dangerous—but oh, what a view.*

**0600** Out to *Calypso's* helicopter pad to load equipment: movie cameras, film, still camera, personal equipment, and of course the ever-present raincoats. Pilot Bob Braunbeck warms up the helicopter *Felix*, while cameraman Raymond Amaddio and I strap ourselves in & put on headphones so we can talk. Still night as we lift off.

**0610** Through overcast we see light of rising sun to east & setting moon to west. Bob says to keep an eye out for an unlit lighthouse, since we fly low enough to hit it. I see it off to the right, about 2 km offshore. Amazingly, 10 years ago it was on land. If the pororoca can reshape a coastline like that, it will be something to see!

**0620** Over jungle, looking for clearing where cinematographer Louis Prezelin and still photographer Scott Frier spent the night: one house in a clearing at the edge of the Araguari River, a few miles from the mouth. We land, unload, get stories of nocturnal pig fights from Scott.

**0630** Four of us separate to find observation points. Raymond to the east at the edge of the jungle. Scott in front of the house. Louis and I try a projection of land at the west edge of jungle, facing downriver on a bank 2 m high. Louis perches on upturned roots of a fallen tree. A local boy comes to us and tells Louis he is not at a good location. Dangerous. We notice logs all the way up to the edge of the jungle, piled up & pushing cane & small trees over. Could the

pororoca have carried logs so far and smashed them into the jungle? This could be more exciting than we bargained for.

**0645** What are the options? Louis moves a bit inland and closer to Scott. This bank still seems the best observation point. There are about five trees big enough to climb, one perfect one nearby. Forget it—trunk & branches covered with 1-cm spines. There's another of the same species; the other three are dead, slimy with moss, and have no low branches.

Nothing on river yet. Tide very low. This is a good spot; must be a way. I will knock off the thorns! So begins the countdown: Get stick to knock off spines, watch for pororoca, leave enough time to get out if I can't make it up the tree before the wave hits.

I think I see a line on the horizon beyond the river mouth. Can't be sure. The others are anxiously readjusting equipment. Each working alone—calm, deliberate. As so many times before, we are preparing for something never previously experienced, our only information based on vague and contradictory rumors. We must prepare for anything.

**0700** Definitely see pororoca now, thin line in center of river, the waves at the edges of the river higher. Can hear it now, like surf off in the distance. (Logical.) Flash of mild panic. I'm not even up in the tree yet. Each time I begin to climb I find new spines. Must hurry—need time to get away if pororoca approaches.





Pororoca definitely advancing. Large wave in some places, small in others. How far? 2 miles? No perspective, can't tell. If 2 miles at 20 mph, have 6 minutes! Must hurry.

Finally enough spines off to get to first branch. Impossible to touch anything above, spines everywhere. Hurry.

Wave coming—louder. Scott motions with hands over head: a big wave.

Still banging on tree. Back down for raincoat & cameras. Am completely dirty, hands bleeding. This was a dumb idea. Look and feel like the guy in *Quest for Fire*, chased up a tree by a great cat.

**0705** Still knocking spines off branches so I can grab and remove vegetation for better view. At least up in the tree now, good view and safe. Can clearly see wave breaking. Large swell in some places, others a mass of white water with spray whipped up into the air. Very irregular, very impressive. I'm glad I'm in the tree.

**0710** Wave hits. Chocolate wave with dirty white foam, crashing ahead with a deafening roar. Beautiful, fearful. What power!

As the wave advances, refraction due to the drag of the wave on the bottom bends it around to face Raymond and Scott more directly. They don't seem to be in any danger. Glad it is not as big as reported—seems to be about 1 m or slightly greater. Situation somewhat emotional—will have to wait for photographs to determine true size.

Suddenly I realize the helicopter is dancing only feet above the pororoca. Like a dragonfly, it hovers, advances, dips, turns, and rises above a potentially lethal force of nature. What other man-machine relationship can be so graceful? Bob is truly an artist.

Wave advances along shore past Scott. Water in midstream breaking opposite me. Water piling up behind primary advancing wave. Unlike typical ocean waves, which peak and pass with water level behind descending to a lower level in sinusoidal form, the pororoca is followed by an even higher water level. The massive volume of water powering the wave makes it *very* impressive.

The wave is up to Louis and advancing on our projection of land. It hits us head on! Frothing fingers of brown and white surge across the mud and extend up my bank. Then mass of oncoming wave overtakes fingers and crashes onto the bank. As the wave hits the vertical face of the bank, it is reflected back on itself. At my feet a battle ensues as oncoming and reflected water leap vertically and swirl violently. The waves are not distinct—just turbulence, power, and force. The roar is deafening.

Just after the wave surges up the bank, all the water flowing past Raymond, Scott, and Louis hits the point, piles up, and then surges in the only direction possible—along the bank toward me. Complete mental overload for photographing. Merely reacting: One eye through viewfinder adjusting f-stops and focus, other eye reviewing entire scene to find best shots—fingers of water, major wave, reflected water,





surge & power, helicopter, chocolate turbulence. Attraction, revulsion, fascination. Deafening sound of rushing water.

**0712** Noise has subsided. Water moving past in relatively smooth but turbulent flow. Water on bank subsiding.

**0720** River now quiet, yet retaining ominous impression of power as the force of the tide carries water upriver. A second surge again causes the river level to rise. Total rise in water probably 2 m.

**0730** We regroup at house, which is now surrounded by lake, and discuss the pororoca from our different perspectives. Scott says it's not what we have been led to believe—definitely less than the 5 m that some had described. Raymond, who had been standing on the mud below the bank for a better perspective, commented that speed impressed him most: the water advanced so fast he barely had time to scramble up the bank, & by the time he was safe the wave had already passed. Louis said it sounded like a train & that the mass of flowing water was spectacular. I remain very very much impressed.

**0900** We wait for Bob and *Felix* to shuttle us to a new “village” of five houses where we will observe the pororoca again around 1940 [7:40 P.M.] and spend the night, then film the morning tide again around 0815. Decide to make a “tide gauge” of marked bamboo pole to measure water height.

**1800** Bob has brought soundman Yves Zlotnicka to record sounds of the pororoca. It begins to rain. Very windy. A problem for Yves, who cannot get a good recording of pororoca over sound of wind and rain.

**1915** Yves and I don raincoats & go out to bank to wait for pororoca. Totally dark, raining hard, not pleasant.

**1936** Think we hear pororoca. Turns out to be sound of a plane in the distance.

**1941** Pororoca arrives. Surge of water passing; in blackness of the night it seems to move very fast. Water level rises 4 to 5 feet in a few seconds. Not particularly spectacular—too wet and muddy to care.





*Above: Some 40 minutes after the first wave passed, buildings erected on 3-meter stilts scarcely clear the flood. Left: Filming from riverbed perspective on the mud below the bank, Raymond Amaddio barely had time to scramble to safety.*



*Left: For as far as the eye can see from the air (about 20 miles here), wave after wave surges forward to form the mighty pororoca.*

**2000** Back in house, ready for bed. Raymond, Yves, Scott, & I on floor in single room. Scott laughing about the overdramatized dangers of the pororoca.

**2040** Almost asleep, sounds of lapping water outside. Must be raining hard to make such big puddles. Sound of gentle thumping. Thumping, thumping...the sound could only be wood bumping against the house. So it must be floating...wait a minute! Up & open window: "Look at this! We are almost under water." In one hour the water has risen almost 3 m, almost to the floorboards of the house. We are only inches above the level of the rising water.

All up & busily working—must get all cameras and equipment above the floor.

**2045** Scott begins to tell the kind of story only Scott can tell.

"While we were sailing up the flooded Amazon in June of 1982, I saw a farmhouse floating down the river in the opposite direction—people, furniture, and animals—just floating. Drifting down the flooded river."

Right now all I can see in my mind is us, floating out to sea in this house. All I can think is, "Oh no, it's raining so

hard and the tide is so high, we'll float right on past *Calypso* and they'll never see us. I'm going to be lost at sea—in a farmhouse."

The owner of the house sticks his head in and calmly says, "Mas agua"—more water. Scott is less than happy. I go to sleep with my hands on the floor so I can feel the water in time to keep at least part of my bed dry when the water comes.

### Postscript

It never came. I slept well.

The next day we observed an even larger pororoca and measured a rise in the water level of more than 3 meters in 32 minutes and a total flux of 3.33 meters. Bob's perspective from the air turned out to be a vital part of our understanding of the tidal bore. "The pororoca was constantly changing. It could be large, then small, change from one side of the river to the other, alter its direction as the bottom changed, advance in one area and slow in another. I came to understand an old man's description of it as a wild beast eating everything in its path. It did seem alive, with claws outstretched in front, consuming all as it advanced." Bob clocked the average speed of the pororoca at 25 knots.

Although we did not see the 5-meter wall of water we had been led to expect, we did discover some interesting aspects of the pororoca, primarily its characteristics in the ocean. At one point there were two separate tidal waves advancing, perpendicular to each other—one moving north to south, parallel to the coast, and another coming east to west, toward the shore. At another time the helicopter team counted up to 30 breaking waves, 10 miles from shore, and extending from horizon to horizon (visibility about 20 miles). Our aerial footage of the extent of this tidal phenomenon should make a valuable contribution to the existing knowledge about the pororoca; we have documented for the first time the entire process of the Amazon tidal bore.

To see an entire river basin fill up in a matter of minutes has been an experience of a lifetime.