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The *tabla* of Toba Inlet

by Nick Doe

Those of you who have read Barrie Humphrey's saga of the lost gallery of Malaspina (*SHALE* 10) might be forgiven for thinking that no sketch by José Cardero could have caused more trouble than the one he made of Gabriola's famous gallery in 1792. In fact however, there are at least two contenders for this honour, and in this article I want to focus on another puzzling sketch by Cardero, this one of mysterious markings on a wooden plank (*tabla* or *plancha*) found in Toba Inlet (shown opposite).

On June 24, 1792, the Spanish naval expedition commanded by Cayetano Valdés and Alcalá Galiano, anchored at Kinghorn Island (*Isla de la Quema*) at the entrance to Desolation Sound. Never before had Europeans reached the northern end of the Gulf of Georgia (*Canal del Rosario*),[1] and neither the Spanish, nor the British naval expedition led by Captain Vancouver, knew anything of the numerous passages and islands that lay between them and the open ocean of Queen Charlotte Sound.

The following day, June 25, dawned clear, and so Valdés, who commanded the *Mexicana*, left the anchorage in his ship's launch with eight days' provisions to explore the mainland coast of the Homfray Channel (*Canal de Arco*). The weather however turned nasty,[2] and he returned just two days later, having travelled 32 kilometres up the Toba Inlet to its head.

Galiano records the return to the ships of the Valdés excursion on June 27 thus:[3]

> "At sunset Valdés returned. He had followed the *Canal de la Tabla* [Toba Inlet] and inspected the vicinity. [The inlet], which appeared [of] considerable [width] at its beginning, came to an end in a few leagues; its shores were very high, with sharp peaks, its depth great, and the inlets he saw were full of small islands. On its east shore Valdés found a plank [*tabla*], for which he named the inlet[4] and of which he made a

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[1] Now known to be a strait of course. Its full Spanish name was *Gran Canal de Nuestra Señora del Rosario la Marinera*.

[2] While Valdés was away, the *Mexicana* and *Sutil* were forced from their anchorage at Kinghorn Island and had to seek refuge in the Lewis Channel (*Canal de la Separación*) between West Redonda Island (*Isla Redonda*) and Cortes Island (*Isla de Cortés*).

[3] John Kendrick, *The Voyage of Sutil and Mexicana 1792*, pp.141–2, Arthur H. Clark, Spokane 1991.

[4] The name of the inlet given by Valdés, *Canal de la Tabla*, lasted only a year or two before being changed to *Canal de Tova* (or *Toba*, the Spanish scarcely distinguish between a "v" and a "b").

Captain Walbran (whom you may remember also appeared in the Malaspina Gallery story) says:

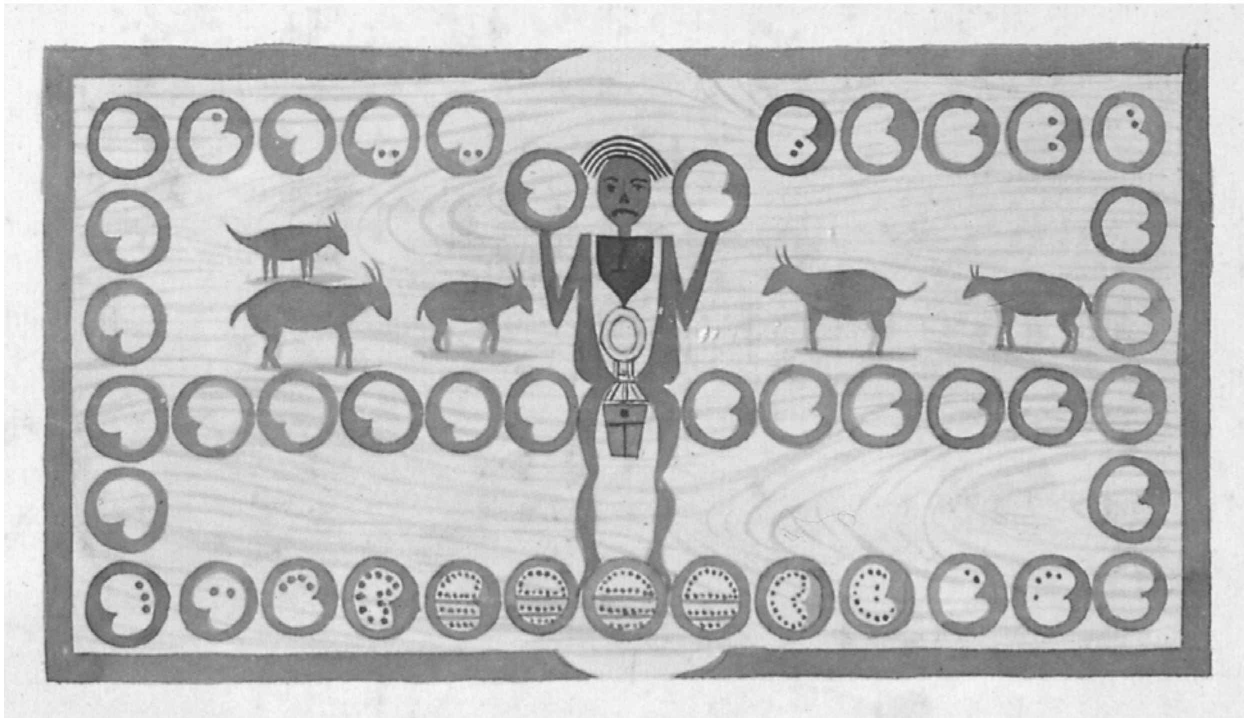
"By a Spanish engraver's error 'Tabla' became changed into 'Toba', and this error has since been perpetuated on the charts."

> Captain John T. Walbran, *British Columbia Coast Names, 1592–1906, their origin and history*, p.490, Ottawa, 1909.

Henry Wagner however has another explanation:

"TOBA INLET …Valdés examined it June 27 [1792] and found a board in it containing some hieroglyphics which were afterwards reproduced in the atlas to the account of the voyage. For this reason Galiano named it 'Tabla' and it so appears on his map of 1793. On the maps of 1795 the name was changed, however, to 'Tova', no doubt in honor of Antonio Tova Arredondo, one of the officers of the Malaspina expedition…."

> Henry R. Wagner, *The Cartography of the Northwest Coast of America to the Year 1800*, pp.418–9, Vol. 2, University of California, 1937.



Although Galiano reported that Valdés made the drawing of the *tabla*, this version was without doubt drawn by José Cardero. Possibly it was based on a rough sketch by Valdés, but far more likely, I think, is that Cardero drew it first hand. Certainly the handwriting of the title (not shown) is his, and the careful attention to detail is one of Cardero's hallmarks. The crew that explored Toba Inlet travelled in the launch of the *Mexicana* and Cardero was a member of the crew of the *Mexicana*. Cardero also frequently travelled with the boat expeditions as is evidenced by some of his other sketches and by remarks by Valdés and Galiano in the expedition documentation. There is therefore every reason to believe that Cardero saw the plank for himself on this occasion. A *vara* (scale not shown) was roughly an English yard, so the *tabla* (1.3 × 2.5 *varas*) must have been about 1.2 metres high × 2.3 metres wide [4 × 7½ ft].

This drawing of the *tabla* is from the *Atlas para el viage de las goletas Sutil y Mexicana al reconocimiento del Estrecho de Juan de Fuca en 1792*, Vista 16, *PLANCHA de madera llena de geroglíficos, hallada en el Canal de la Tabla* [wooden plate filled with hieroglyphics found in Tabla Inlet], Madrid, 1802. The original drawing is in the Museo de América (colección Bauzá, tomo II-42) 2.275.

> drawing. It was covered with paintings, which were apparently hieroglyphics of the natives. He found some abandoned villages, but not one inhabitant."

The drawing of the plank made quite an impression at the time and it was reproduced in the atlas that accompanied the account of the 1792 expedition.[5] It has frequently been reproduced since in articles and books about the Spanish explorations of the BC coast.[6]

So far as I am aware, nobody has offered an interpretation of the "hieroglyphics" on the plank, so that is what I propose to do now.

Toba Inlet is within the traditional territory of the Klahoose Qaymux^{w}, who together with the closely related Homalco and Sliammon people form the Mainland Comox members of the North Coast Salishan family. Their cousins on Vancouver Island are the Island Comox and the Pentlatch.

The two main Klahoose villages in Toba Inlet were on Brem (Salmon) Bay and along the Toba River,[7] but there were several others. By the 1920s, almost all had been abandoned and the people now reside at Squirrel Cove on Cortes Island, or at Sliammon Creek near Powell River.

The tidal currents in Toba Inlet are modest on account of its great depth, but, significantly, as we'll see later, the tidal range is very large, 5.5 m [18 ft.]. The tide is mixed diurnal and semidiurnal, that is, one of the two low-tides of the day is often much lower than the other.[8]

The plank was obviously of some lasting significance to the Klahoose. It scarcely seems credible that it would have been used to record anything as transitory as, say a loan to be re-paid on a certain date. It is, I suggest, a calendar, but a calendar with an unusual twist in that it incorporates information about the tides in the inlet.

The drawing contains a total of 43 circular symbols arranged in three rows with two columns either side. If you include the two circles held in the hands of the central figure, the top row contains 12 circles. The middle row also contains 12 circles, six either side of the figure. The bottom row contains 13 circles, including one the figure is standing on. The total number of circles in the three rows is thus:

$$12 + 12 + 13 = 37.$$

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[5] The original of the book illustration is in the Museo Naval; see María Dolores Higueras Rodríguez (ed.), *Catálogo critico de los documentos de la Expedición Malaspina (1789–1794) del Museo Naval*, 3229, Museo Naval, 1985. The original drawing itself is in the Museo de América; see Carmen Sotos Serrano, *Los Pintores de la Expedición de Alejandro Malaspina*, 651 *Tabla de Madera* (José Cardero) p.208 and Figure 660, Madrid, 1992.

[6] See for example: Cecil Jane (trans.), *A Spanish Voyage to Vancouver and the North-West Coast of America*, p.131, Argonaut Press, London, 1930; Donald C. Cutter, *Malaspina & Galiano—Spanish Voyages to the Northwest Coast, 1791 & 1792*, p.129, Douglas & McIntyre, 1991; Thomas Vaughan, E.A.P. Crownhart-Vaughan, Mercedes Palau de Inglesias, *Voyages of Enlightenment—Malaspina on the Northwest Coast 1791/1792*, p.53, Oregon Historical Society, 1977; María Dolores Higueras Rodríguez, *Costa NW de América—album iconográfico de la expedición Malaspina*, p.142, Museo Naval, 1991; Mercedes Palau, Carmen Fauria, Marisa Calés y Araceli Sánchez, *Nootka: regreso a una historia olvidada*, p.146, Ministerio de Asuntos Exteriores de España, 1999.

[7] Dorothy I.D. Kennedy & Randall T. Bouchard, *Northern Coast Salish*, in *Handbook of North American Indians*, vol. 7, Wayne Suttles (ed.) *Northwest Coast*, pp.441–452, Smithsonian Institute, Washington, 1990.

[8] $\Sigma\,|\text{semidiurnal species}| = |M2|+|S2|+|N2|+\ldots=1.53$
$\Sigma\,|\text{diurnal species}| = |K1|+|O1|+|P1|+\ldots= 1.91$

The 37 circles in the three rows suggest that the circles represent "moons" (synodic months or lunations). As we all know, there are approximately 12 moons in a year (354 days), but, more exactly, there are close to being 37 moons every three years (an average of 364 days per year, see Appendix A). Each column of six circles may symbolize six moons in each half of the year, and perhaps the three lone moons in each column emphasize a three-year cycle.

Now most of the moons (if that is what they are) to the right of the figure have a notch hinting at the shape of the moon when it is waning (full-to-new moon). A waning crescent moon sets before sunset and is most conspicuous in the early morning when it rises ahead of the sun at dawn.

On the other hand, most of the circles or "moons" to the left of the figure have a notch hinting at the shape of the moon when it is waxing (new-to-full moon) [Don't let the top left two fool you—they're exceptions]. A waxing crescent moon doesn't appear in the sky until after the sun has risen, and is most conspicuous in the late evening after the sun has set.

If we take the waxing and waning of the moon to be an analogy for the waxing and waning strength of the sun during the year, then the waxing moons on the left signify the first half of the year (spring), and the waning moons on the right signify the second half of the year (fall). Possibly, the greater number of mountain goats on the left (male, female, and kid) than on the right (male and female alone) has something to do with this too. Spring was a season of abundance for many Native people.

The body of the central figure is split, suggesting that it represents a dividing point in the year, a winter or summer solstice. The fact that the figure holds a waxing moon in one hand (its right, our left) and a waning moon in the other also suggests that it represents either a new or full moon. According to ethnographer Franz Boas, the K^{w}ak^{w}aka'wak^w (Kwakiutl) of Vancouver Island called the moons in which the solstices occur (December and June) the "split both ways" moons.[9]

Being accustomed to reading left-to-right, I would say that the solstice in the middle is a summer solstice (spring to fall) rather than a winter solstice; however, an Arabic reader reading from right-to-left would disagree. Since however the figure is standing on a "notchless" moon, I'm going to assume that the figure represents both full moon and, by analogy, the summer solstice.

Another conjecture I'm going to adopt for convenience is that a "moon" ran from one full moon to just before the next full moon.[10]

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[9] Franz Boas (ed.), *The Jessup North Pacific Expedition*, vol. V, *The Kwakiutl of Vancouver Island*, p.412, Memoir of the American Museum of Natural History, 1909.

[10] This choice is arbitrary and the theory I'm about to present certainly won't fall apart if it is wrong. Modern astronomers start a lunar cycle with a new moon, but the trouble with that is that new moons can't be observed until about 24–30 hours after they have happened because of the glare of the sun. Full moons on the other hand obviously can. Not only does the full moon's disc look shadowless, you know

The break between the first six moons of the year and the start of the second six moons of the year (as indicated by the middle row of circles) then occurs at a full moon.

The middle row

The middle row simply represents a 12-moon year.

The top row

The top row is similar except that it adds some interesting detail. Firstly, some of the "moons" have dots in them,[11] and secondly not all the moons on the left are waxing moons—the two on the far left are waning moons.

The vital clue as to the significance of the dots in the top row is that there are eleven of them:

0 1 0 2 2 0 0 2 0 0 2 2 = 11.

Eleven days is the number of days that you need to add to a 12-moon cycle to obtain one solar cycle.[12] One lunar cycle or moon lasts, on average, 29.53 days, so twelve of them amount to 12 × 29.53 = 354.36 days, which is 365.24 – 354.36 = 10.88 (eleven rounded off) days short of one year.

Let's see an example. There was a full moon on December 19, 2002. So the first complete "moon" of the year (starting close to winter solstice) started then and ended one day before the next full moon on January 17, 2003. The second complete "moon" of that year started on January 18 and ended one day before the next full moon on February 15, 2003. If we carry on counting like this we get to the twelfth complete "moon" of the year which ended one day before the next full moon on December 8, 2003, that is, on December 7, 2003.[13] If we count 11 days from December 7, 2003, we get to December 18, 2003, which, sure enough, is the last day of a solar year that started on December 19, 2002.

That's the easy part of the explanation for the top row. The more difficult question is why are the eleven days distributed among the twelve moons in the way that they are? Why not, for example, assign one extra day to all but one of the moons?

Take our example again, and count the number of days in each moon and add the number of days indicated by the number of dots in that particular moon. The duration of each *tabla* month for our year 2002/3 is:

December	30 + 0 = 30	days
January	29 + 1 = 30	
February	30 + 0 = 30	
March	29 + 2 = 31	
April	29 + 2 = 31	
May	30 + 0 = 30	
June	29 + 0 = 29	
July	29 + 2 = 31	
August	30 + 0 = 30	
September	30 + 0 = 30	
October	29 + 2 = 31	
November	30 + 2 = 32	
	365	

I can't for the life of me see any logic in a sequence that varies between 29 and 32 days

that it is full when the moon rises in the east at exactly the same moment the sun sets in the west.

[11] An intriguing thought is that the "dots" represent maria on the moon, and sunspots on the sun, but the *tabla* symbols have too many dots for them to be that.

[12] See Appendix A for more detail.

[13] The next 12-moon year would run from December 8, 2003, to November 25, 2004. The third "leap moon" year with 13 moons would run from November 26, 2004, to December 14, 2005. This example falls four days short of three years in the solar calendar, but the average slippage is closer to one day a year. I've no idea if, or how, the Klahoose allowed for that. An 18th-century example, with the same calendar dates, would run from 1782 to 1785.

per month, but what is so delightfully ironic about that is that the creator of the plank would have had *exactly* the same problem in trying to figure out why my sequence of days in the month varies between 28 and 31. All we could agree on is that the total is 365.

This pretty well completes the explanation of the top row except for the two waning moons on the left. I suggest that these are just a result of counting December and January as part of the previous winter. The total number of waning moons in the row is eight, that is two-thirds of the row, which echoes the design of the three-season petroglyph calendar on Gabriola.[14]

Another piece of symbolism may be that if we exclude the two moons held in the hands of the figure, we are left with a ten-moon year in the top row, and such calendars were fairly common before the modern era. Ten-month calendars have a lengthy intercalary period and require some trigger, either astronomical—such as the rising of the sun at a particular point on the local horizon—or environmental. The K^{w}ak^{w}aka'wak^{w} of Vancouver Island were said to have started their year on the "high tide of the second moon after the winter solstice", which was when the oolichan started to arrive.[15]

This leaves us with the challenging bottom row of 13 moons.

The bottom row

The total number of dots in the bottom row, which we can again surmise represent days, is:

3 2 4 13 23 25 |29| 28 19 14 2 4 0 = 166.

This is for sure a very puzzling sequence (see graph, *top of next page*), but here's how I think it was generated.

The clue to understanding what the dots represent is that the number of dots in the moon that the figure is standing on is 29, that is, the number of dots equals the number of days in a month. So we are looking for some phenomenon that happens every day of the month at the height of summer, and yet drops off to near zero times a month in the depth of winter.

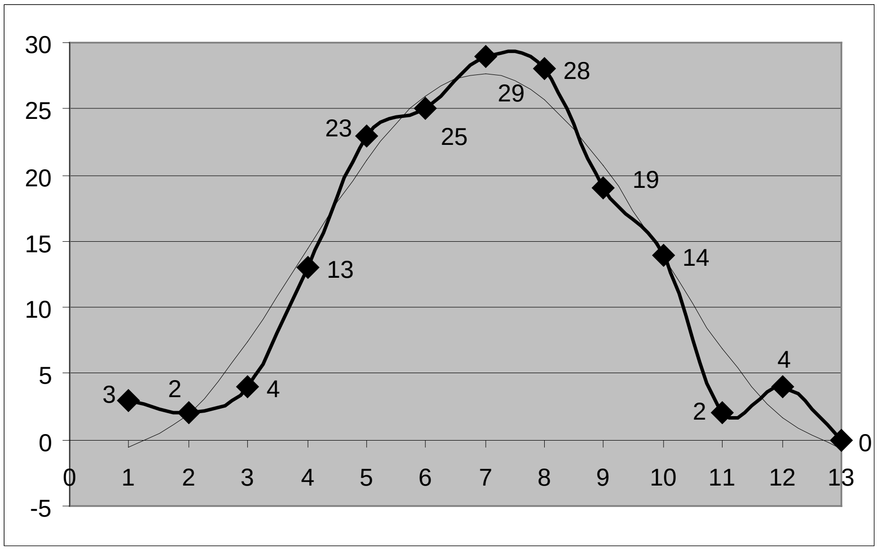
One simple idea is that the dot count has something to do with the weather—something like the number of days in the month it didn't rain; or the number of days of sunshine; or the number of frost-free days. The problem however with these ideas is that the number involved is very variable from year to year. It is difficult to believe that statistical averages would be of much interest to the Klahoose. After all, not many of us rely on the Old Farmer's Almanac for our daily weather forecasts.

What we are looking for is a phenomenon that is related *both* to the duration of a moon (or month) and the duration of a year. The visibility of a (non-circumpolar) star doesn't do it because that's only a function of time of year. Planets are just too variable. No—because the moon orbits the earth at a rate that has nothing to do with the rate the earth orbits the sun, the phenomenon cannot be purely astronomical. There is only one thing it can be—the numbers have to have something to do with the tides.

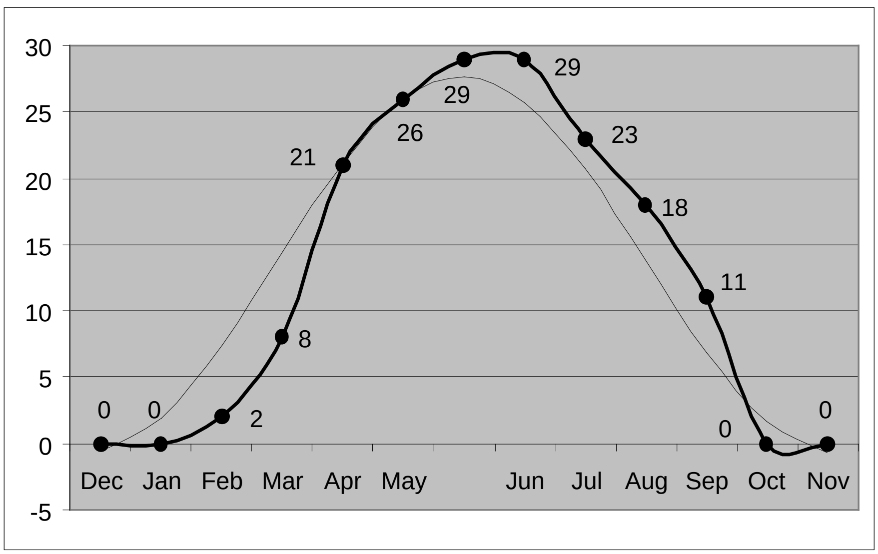
The graph (*bottom of next page*) shows the number of days in the month the low low-tide in the Toba Inlet occurs during the hours of daylight. The curve has the same common bell-shape that the number-of-dots

[14] Nick Doe, *A most unusual petroglyph, SHALE* 10, pp.25–32, January 2005.

[15] Franz Boas, *Invention*, in Franz Boas (ed.), *General Anthropology*, p.274, D.C. Heath & Co., 1938. The oolichan used to run in Toba Inlet in early March, so I take it that Boas meant "full moon".



The graph shows the number of dots in the 13 circles in the bottom row of the *tabla* reading left to right. The data points are joined by the thicker of the two lines. The thinner line represents a simple mathematical approximation of the thicker line (an offset sinewave). The fairly close resemblance of the two curves suggests that there is some underlying physical basis for the numbers of dots; they are not just random or otherwise unpredictable numbers.

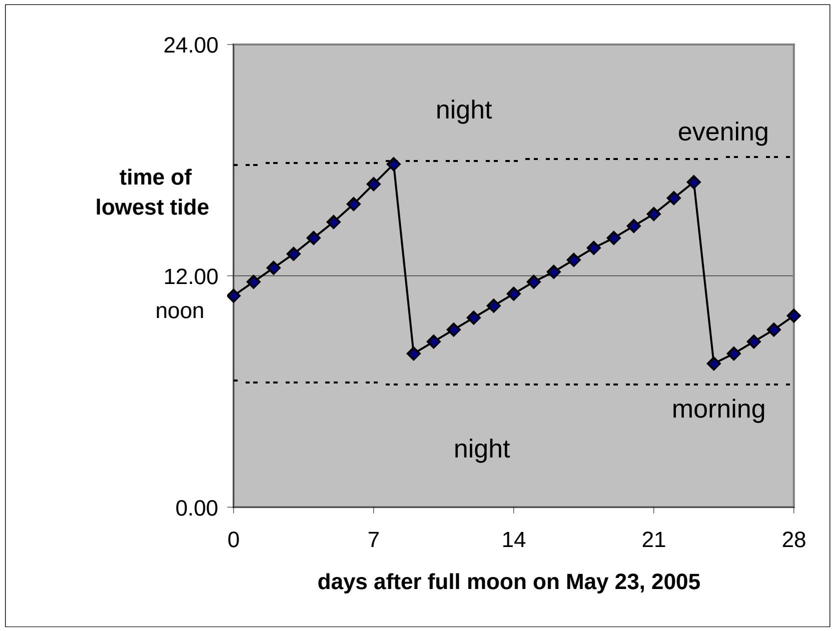


The graph shows the number of days in the month the low low-tide in the Toba Inlet occurs during the hours of daylight. These data points are joined by the thicker of the two lines. The thinner line, representing a simple mathematical approximation, is identical to the one shown in the graph above. The figures are averages for 37-moons (three years). The "months" on the horizontal scale are labels for the moons and are only approximately equivalent to our modern calendar months. The gap in the middle is a "leap moon" which, according to the *tabla*, was used every third year to synchronize the calendar with the solar seasons.

curve does, but interestingly it also shows a similar asymmetry, notably a peak that "bends" slightly to the right. This is not proof that the two curves were generated in the same way, but it encourages me to think that we're on the right track.

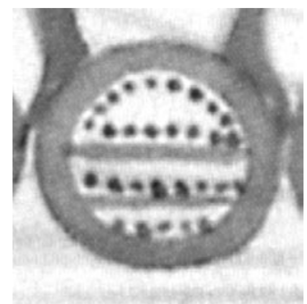
Although the horizontal scale has been labelled December, January, and so on, the data points actually correspond to "moons" beginning with a full moon. For example, the third figure, labelled "February", is the average count for the 3rd, 15th, and 27th moon of a 37-moon cycle that began on December 19, 2002. For us, these were Feb. 16–Mar.17, 2003; Feb. 6–Mar. 5, 2004; and Jan. 23–Feb. 25, 2005.

The unnamed moon in the centre is a "leap moon", which, according to the *tabla* is the 31st moon in the 37-moon cycle. In this example, it ran from between May 23–Jun. 20, 2005, that is the month ending with the summer solstice. It is this choice that creates the asymmetry referred to above in the *tabla* curve. Our modern neat and tidy minds would probably have put the leap moon exactly in the middle of the second year, that is made it the 19th moon, Jun.2–Jul.1, 2004 so as to make the curve symmetrical (like the thin line in the graph).



So is there anything else that suggests we are dealing with the tides? Yes, there most certainly is.

If you look at the middle of the bottom row, you'll see that four of the circles are divided into three segments. The count of dots in the three segments, reading top to bottom, and then left to right are: 14-5-4 (23); 15-6-4 (25); 16-8-5 (29); and 18-7-3 (28).



Four of the circles (bottom row centre of the *tabla*) are divided into three. This may be a recognition that, in summer, the lowest of the two low-tides of the day, which always occurs in daylight in the Toba Inlet, jumps twice in a moon from low-tide in the late afternoon to low-tide the next morning. If this conjecture is right, the dots indicate "runs" of days without such a jump.

These segments probably correspond to the three sequences of daily low low-tides that occur at this time of year without a "phase jump". Because each tide occurs, on average, 50 min. 28 sec. later than the one on the previous day, we can only have *all* the lowest tides of a moon (or month) in daylight if now-and-again, the time of the lowest tide "jumps" from being late in the afternoon, while it is still light, to early the next morning, after the sun has risen (*see graph above*). The tide doesn't really "jump" of course; all that happens is that the high low-tide of the day (HLW) becomes lower than the low low-tide of the day (LLW), and so the two tides switch designations. In mid-summer, this happens twice a month, which divides the month into three, as indicated in the *tabla*.

For example, between May 23–Jun. 20, 2005, there is a phase jump from May 31, when the lowest tide is at 5:45 p.m., to June 1, when the lowest tide is at 7:55 a.m. On June 2, it is at 8:35 a.m., and we are off on a 15-day "jumpless" sequence. The second phase jump doesn't occur until June 15, at 4:50 p.m., when the next day's lowest tide, June 16, is at 7:25 a.m. In this particular example, the duration in consecutive days of the jumpless sequences are 15-9-5 (29).[16]

[16] The numbers for all four moons (beginning on a full moon with the count for the longest run first) are: 9-7-3 (19); 12-8-4 (24); 15-9-5 (29); and 14-8-5 (27). I'm not sure why the count for the longest run wasn't

Not the same as the *tabla*, which shows 16-8-5 (29), but close enough to convince me that that was how the dot counts were arrived at.

Flaws

Now for the flaws in the theory. The first difficulty with the proposed explanation is that within the 37-moon cycle the 13-moon year, which is presumably represented by the bottom row of moons on the *tabla*, there are a total of 182 days when the tide is lowest during daylight hours. The *tabla* shows only 166.

I can only assume that this is because my definition of "daylight" (between first appearance of the sun's upper limb above the horizon in the morning and disappearance of the sun's upper limb in the evening) is not that used for the *tabla*. To reduce the count to 166, as has been done for the graph, you have to surmise that "daylight" began just over two hours after astronomical sunrise, and ended just over two hours before astronomical sunset. Actually this isn't too bad an adjustment to make given that high mountains surround Toba Inlet and these reduce the duration of daylight down in the valley at sea level.[17]

The second difficulty with the bottom row lies in the tails of the bell-shaped curve. The lowest tides of the year are around the time of the winter solstice, and they always occur in the middle of the night in Toba Inlet—no exceptions.[18] So there ought to be no dots at the ends of the row. Yet the designer of the *tabla* has nevertheless chosen to throw in a few days of daytime low-tide during the dead of winter. I don't know why. Perhaps because in winter, the full moon mimics the summer sun and is sometimes so high and so bright in the sky that it was possible for the Klahoose to go shell fishing for a few nights without using their pitchwood torches, just as though it were daylight?

The third difficulty with the bottom row is that the third and fourth moons are waning moons not waxing moons.[19] Perhaps this was a mistake, either by the original artist, or by the Spanish copiers. I have to confess that even after studying the design very closely for a few days, I still confuse waning and waxing moons and mistakes, I think, are easy to make. Another possibility though, one I like better, is that, as in the first row, the arrangement is a tacit recognition that, for some, the year started in late-February or early-March and not at the winter solstice.

The central figure

The enigmatic central figure has from the neck down:

(a) something that looks to me like a medal ribbon?
(b) a ring of some kind;
(c) a container suspended from the ring; and
(d) a dot-over-T marking on the container.

If you like the hair by the way, you'll be interested to hear that "in the old days, the people put oil in their hair before going out

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put in the middle segment. Possibly something to do with the new-moon spring tides around day 14?

[17] A possible, although less likely explanation, is that the 166 days were meant to be an annual average, not including a 13th moon. In this case, sunrise and sunset adjustments still have to be made, but the times involved are reduced from just over two hours to just one hour. By "fiddling" it is of course possible to reproduce the *tabla* figures exactly, a methodology that might please some, but in fact proves nothing.

[18] A fairly common belief among country folk used to be that tides are "stronger" at night than during the day because that is when the moon is "out".

[19] I assume that the moons in the middle have no notch simply because there are too many dots to be shown.

clam digging; this, they believed, would cause the sand to become soft and make the digging easier”.[20]

Some thoughts on what else might be depicted include the following:

The anthropologist Franz Boas collected at least two “man-in-the-moon” type stories from the coast that end with the assertion that you can see, even today, a figure (a girl[21] or a boy[22]) in the moon carrying a water container. These stories are a curious parallel to the old Norse myth of Hjuki and Bil (Jack and Jill) going up the hill to fetch a pail of water, a reference some think to the waxing and subsequent waning of the moon, and to the conspicuous small maria (Crisium and others) that are only visible while the moon is waxing (*lower photo, page* 25).[23]

The “medal ribbon” could be a symbolic view of the draining of the estuary of the Toba River as the tide ebbed.[24] The ring could be the hole in the earth into which the ocean pours when the tide is falling (according to several myths[25]). A lake surrounding the earth maybe? …or an eclipse?

I think (wild-guess alert) the dot-over-T on the “sporran” represents the constellation of Orion (Betelgeuse at the top, Rigel at the bottom, and Orion’s belt the cross bar in the middle). Orion is particularly significant because not only is this large constellation a very familiar and unmistakable sight in our night sky in winter, it also closely marks the longitude of the sun at the summer solstice.[26]

(Appendix B has another idea)

[20] Dorothy Kennedy & Randy Bouchard, *Sliammon life, Sliammon lands*, p.33, Talonbooks, 1983. This must be a ludicrous remnant of a custom now so ancient that its true significance and meaning have been lost. Rubbing oil in your hair would of course make your hands oily too, so… who knows? I remember my father teaching me to rub my hands in wet grass before we started fishing so as to avoid tainting the bait with the smell of soap or, in his case, tobacco.

[21] Legends of the Tlatlasik·Oala, *Moon Steals a Woman*, p.409 in Randy Bouchard & Dorothy Kennedy (ed.), *Indian Myths and Legends from the North Pacific Coast of America*, a translation of Franz Boas’ 1895 *Indianische Sagen*, Talonbooks, 2002.

[22] Legends of the Oowekeeno, *The Moon*, p.457, in *Indian Myths*… (ibid). Other stories end with Frog and her “satchel” or “small basket” on the moon.

[23] *Jack and Jill went up the hill to fetch a pail of water; Jack fell down and broke his crown; and Jill came tumbling after* (English nursery rhyme). Rev. Timothy Harley, *Moon Lore*, chap. 2, *The Man in the Moon*, p.24–26, Swan Sonnenschein, Le Bas & Lowry, London 1885.

[24] Suggestion of Susan Brain, Saltspring Island.

[25] *Indian Myths*… (ibid), p.624.

[26] The R.A. of Betelguese (α Ori) is 5 hr. 55 min., while that of the sun at the summer solstice is R.A. 6 hr. One of the three stars of the belt, δ Ori, is less than a degree of latitude from the celestial equator, and so marks the altitude of the sun at the equinoxes.

Frank L. Beebe

Mountain goats (*Oreamnos americanus*) like those drawn on the *tabla* are really antelopes. The kids are born in May, and there is usually just one young, but twins do occur. The horns of the males sweep upwards and backwards in an even curve, while those of the females rise without curving for two-thirds of their length and curve abruptly backward at the tip.

The mountain goats

Although mountain goats were hunted year round by the Klahoose, May and June are when they came down from the mountains to find salt.[27]

The hunting of mountain goats was a highly specialized skill engaged in by only a few. I imagine creating a calendar fell into the same category, although counting dots may once have been common among the Klahoose. Dorothy Kennedy and Randy Bouchard report that:

> "…some Sliammon women [neighbours of the Klahoose] kept count of their age by tattooing dots on their arms and legs. This was usually done in winter. The area of the body to be tattooed was rubbed with snow to make it numb. Then a mixture of charcoal and ratfish oil was inserted into a puncture made in the skin by running a needle through it. Rose Mitchell remembers how, when she was a child, all the kids would gather around her mother to count her tattooed dots!"[28]

Conclusions

So, have we solved the puzzle? Well, no we haven't, for although we may be able to reproduce the various numbers in the *tabla*, we have no way of knowing whether our method of generating these numbers is the same as that used by the *tabla* creator. For all we know, the two methods may be completely unrelated. But although we have no proven theory, I think we can say that some of the Aboriginal people on the coast evidently knew a whole lot more about the movements of the sun and moon and their relationship to the tides, and perhaps even the stars, than many European commentators have in the past given them credit for.

All lunar-based calendars that are used to keep track of the solar seasons need to be reset occasionally. Aboriginal people on this coast, if they did this at all, did it by observing events in the natural world around them—much as gardeners and migrant birdwatchers could easily do now—so their need for astronomical "resets" was small. To imagine however that such close observers of nature never did take much notice of what happens in the sky doesn't make sense.

We are perhaps too accustomed to reading about the archaeoastronomy of ancient people who lived where there were unobstructed views of the horizon to recognize the Aboriginal ways. True, the sun may rise exactly in the east at the vernal equinox, but here on Gabriola along False Narrows, I'm more likely to observe that that's when the brightest star in the sky, Sirius, appears in the evening twilight directly south of us above Mudge Island

27 *Sliammon life…* (ibid), pp.38–39.

28 *Sliammon life…* (ibid), p.52.

opposite. From that day on, Sirius chases Orion into the sunset,[29] and when it's there, we know that summer is nigh.

How were the calendar and tidetable used? Again, I think that the question reveals a too-European frame of mind. The Aboriginal approach was not "it's winter, so it's cold", it was the reverse, "it's cold, so it's winter". They didn't need a written calendar any more than they needed a map to find their way around.[30]

The best answer to the question, how did they use it, I suspect, is, they didn't. If it had been useful, there would have been many more of them, and we would have all heard about them long before now. It is rather, I suggest, a careful record made by somebody who lived in an environment where one couldn't avoid knowing all about the tides, and where one's very survival was dependent on being observant.

When the Galiano-Valdés expedition awaited slack tide at the entrance to the Arran Rapids (*Angostura de los Comandantes*), "…the Indians [the account reads] using the sun's path, indicated to us very clearly that when that body was near the top of a high mountain on the mainland, the favourable moment we desired would come".[31] We can be sure that this information came from personal knowledge, not any handed-down tidetable.

There is perhaps too a second reason why the *tabla* calendar was not well known. In India today there are sixteen official languages, and in 1952, when the Calendar Reform Committee was appointed, there were about 30 different calendars still in use. As a consequence, probably few of us know what an (East) Indian calendar is, any more than we know what the (East) Indian language is. It's not hard to imagine that the situation was similar here on the coast—a multiplicity of languages and a multiplicity of calendars, each of little practical value except to the few who understood them.

Would it have taken very long to compile? No, it wouldn't, perhaps just ten or fifteen years would have been enough. If the knowledge of what it was, and how it was constructed, had been handed down from generation to generation, surely somebody would have made sure there were "backup" copies, perhaps engraved in stone, and wouldn't somebody have noticed that one 19-year cycle was considerably more accurate than six 3-year ones?

My guess is that the calendar was created and understood by just a few of the Klahoose in their isolated homes in Toba Inlet, maybe even by just one individual, and that with the death of those, or he, who

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29 ... or, to be honest, the lights of the Harmac pulp mill.

30 One story I can't find the reference to now, and may have garbled, tells of an anthropologist here on the west coast asking an old Indian when the "month of good rock-cod fishing" ended, to which the perplexed reply was "when the rock-cod fishing isn't good any more".

31 Henry R. Wagner, *Spanish Explorations in the Strait of Juan de Fuca*, p.276, AMS Press, 1971 reprint of 1933 edition. Another version says, "…the Indians told us by signs that we should make use of the course of the sun, and that at four in the afternoon would be the right time". *The Voyage of Sutil…* (ibid), p.155. While this suggests that the decision to enter the rapids at four was based on the advice received, a more careful reading suggests that in fact the decision was made because by that time the current had noticeably slowed. The slack (turn to flood) on July 20, 1792 was, according to modern calculations, actually at 1800 PST, or 5:33 p.m. reckoned locally (125°W), and the sun would then have been closer to the peak of Mount Stokes than it was at four. The eventful passage of the ships through the rapids confirms that the Spanish had, despite the warnings, entered them too early.

knew what it was, it was lost, and but for José Cardero, would have been lost forever.

Appendix A: Calendar construction

The principal numbers needed to construct a calendar are the:

number of days in a year
number of days in a month

from which we can deduce, by dividing the second into the first, the:

number of months in a year.

Ideally, all these numbers would be integers. But they aren't of course. Even if they were, the exactness would only be temporary as the numbers change slowly over the course of thousands of years.

The day

A day is the average time it takes for the sun to return to the same meridian, and it used to be, by definition, 24 hours long. Nowadays, time is defined by atomic clocks, which by astronomical standards appear to be gaining slightly because the earth's rotation is slowing down. Atomic time is kept in step with the earth's rotation by inserting "leap seconds" now and again, usually at the end of June or December.

Measured against the stars, an average day is 23 hr. 56.1 min. The stars, facing south, appear to move slowly clockwise (like the sun) if we follow their progress night after night.

Measured by the position of the moon, a day is, on average, 24 hr. 50.5 min.

The week

Our week is obviously derived from a quarter-moon, although many texts for some odd reason say it has no astronomical basis.

The first and third quarter moons are precisely marked by the moon being exactly due south (the observer's meridian) at sunset and sunrise respectively.

The change from neap to spring tides and back is especially apparent to us coastal dwellers. In early spring, a week of tides low enough for a walk on the beach first thing in the morning always alternates with a week of tides that are too high for that, and the dog gets to visit the meadows instead.

Some marine creatures are aware of quarter moons. There is a hydroid on the British coast for example that releases the medusae—the jellyfish offspring in its life cycle—only during the moon's third quarter.[32] Presumably this makes life more difficult for predators in the ensuing two weeks of relative night-time darkness.

The month

Currently (1990 epoch), the *average* number of days in a synodic month (the elapsed time between new moons) is:

29.53059 days
= 29 days 12 hr. 44.03 min.

A month measured relative to the stars is 27 days 7 hr. 43 min.

The duration of a synodic month varies by amounts up to roughly ±7 hours, but averaged over any particular year, it is close to the long-term average.[33]

Curiously, the mean menstrual period of women is 28 ±3.5 days, which is fuzzy enough for some to claim that it is in fact 29.5 days. For about 27% of women, it

[32] Francis E. Wylie, *Tides and the pull of the moon*, p.191, The Stephen Greene Press, Vermont, 1979.

[33] The elapsed time also varies only slowly during the year, so that a short time between new moons is never followed by a long time between new moons.

really is 29.5 ±1 day. Pregnancies last around 267 days. This is only 8.8 calendar months, but is (ah-hah!) almost exactly nine lunations or synodic months, which proves we're all slightly loony.

The year

Currently (1990 epoch),[34] the number of days in a (tropical) year is:

365.2421897 days
= 365 days 5 hr. 48.75 min.

The old Julian calendar, which was in effect until 1582, approximated this by defining there to be $(365 \times 4 + 1)$ days in every four years. This gives, on average, 365.25 days per year, which is an error of about 19 hours per century.

Pope Gregory XIII's reform, which defined the Gregorian calendar we use today, increased the cycle from 4 years to 400 years by decreeing that century years that were not divisible by 400 would not be leap years, despite being divisible by four.

In the Gregorian calendar, there are:

$400 \times 365 + 100 - 3 = 146097$ days every 400 years, which averages out to 365.2425 days per year.

The error is about 45 minutes per century.

The start of the year is defined in most solar calendars as one of the equinoxes (the two days of the year when the sun rises everywhere in the east and sets in the west and there are 12 hours of daylight), or one of the solstices (the days of the year when the sun is highest and lowest in the sky at noon). Although our own calendar starts at roughly the winter solstice (December 19–21 depending on where we are in our 400-year cycle), this is a modern development. In mediaeval times, the year started at the spring (vernal) equinox in March, which is why October, for example, is still named the eighth (Latin: *octavus*), not the tenth (Latin: *decimus*) month of the year.[35]

The lunar year

According to the figures above, the number of "moons" (complete lunar cycles, or lunations) in a year is 12.3683. Our own calendar approximates this to twelve (months), which is a pretty poor approximation, with the result that you can never tell what phase the moon is from the date, let alone say when Easter is without looking it up.

Cultures other than ours coped with this discrepancy in at least two different ways. The first was to reckon the solar year as being made up of 12 moons plus an intercalary period which makes up for the shortfall. Thus:

$12 \times 29.53059 + 11 = 365.3671$ days

The error is about three hours per year.

Unfortunately, this method fails to synchronize the start of a "moon" with the start of the year, as there is always an eleven-day slippage from year to year.

The second way of dealing with the non-integral number of moons per year is to do as we do with the days-in-a-year problem and count the number of moons in several years. For example, if instead of 12 months per year, we reckoned on there being 37 months every three years, we could reduce the intercalary period to three days:

[34] Kenneth Seidelmann (ed.), *Explanatory Supplement to the Astronomical Almanac*, University Science Books, California, 1992.

[35] Accountants haven't caught up with the change yet; their fiscal year still often starts in April.

$37 \times 29.53059 + 3 = 3 \times 365.2106$ days

The error, when the three days are added, is about 45 minutes per year.

Some societies went much further than this and were aware of the moon's 19-year cycle. If we reckon on there being 235 moons every 19 years, the required intercalary period is less than one day:

$235 \times 29.53059 + 0 = 19 \times 365.2468$ days

The error is about 11 hours per century. This is the traditional Chinese calendar.

The Islamic calendar is a purely lunar calendar, so its new year cycles through the solar year. It equates a 30-year 12-moon lunar cycle $12 \times 30 = 360$ moons to 10631 days. The error is about one hour per century.

One example of a non-astronomical way of tying the lunar cycle to the seasons is that developed by the Yami fishermen of Botel-Tobago Island, near Taiwan. They use a lunar calendar, but some time in spring, on a particular phase of the moon, they go out in boats with lighted flares. If flying fish appear, the fishing season is started, but if the lunar calendar date is too early, the flying fish will not appear and so fishing is postponed for one whole moon, thereby creating a 13-moon year, just as the Klahoose on this coast appear to have done. Maybe the goats and their kids were the Klahoose's flying fish.

The Venus month

Venus is the brightest object in the sky beside the sun and moon. It has a synodic month of 583.92 days (19.2 months, or a week short of 20 lunations). Because

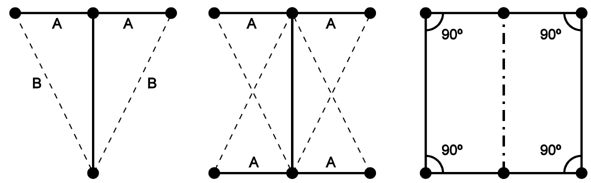
$5 \times 584 = 8 \times 365$ days

Venus appears in the same place in the sky at the same time of year, every eight calendar years (five Venusian months).

All this has nothing to do with the *tabla* of course… unless, that is, you believe in con-trails, and have noted that *five* (goats) and *three* (years) make *eight*.

Appendix B: Dot-over-T

If you don't like the idea in the main text for the dot-over-T marking, try this one.



It would be quite easy (it seems to me) for a T to become symbolic of "dividing a house into two". If you have to stake out the foundation of a house, with all its corners accurately squared off, one way of doing it is this. Lay out on the ground the desired centreline of the house (the upright of the T) and then centre the crossbar (A-A, the front of the house) roughly perpendicular to it. Make sure the crossbar is exactly at right angles to the centreline by adjusting its angle until the distances from the tips of the T to the base of the T are identical (B-B). Do the same for an upside-down T and you have the rear of the house. The four tips of the two Ts are then the corner posts, and the centereline exactly divides the house in half. Anthropologist, Franz Boas, noted this technique being used by the $K^w ak^w aka'wak^w$, who lived (and live) around the Johnstone and Queen Charlotte Straits, just north of Klahoose territory.[36]

And the dot? I'll leave speculation about that to you. There isn't much to go on without the help of the *tabla* designer. ◊

[36] Franz Boas, *The Kwakiutl*, in *The Jessup North Pacific Expedition*… (ibid), p.412.