



Representations of the Stone Age Anglers about the Sky (Sanctuaries of the Lake Onega)

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Abstract

In this report, the author addresses original symbolic images portraying disc, crescent, and 'half-moon' morphologies, with one or two ray-like lines that are meaningfully directed to one side. These pictures have been incised on the extremities of rocks at capes of the eastern shore of Lake Onega (61°40' n.l. & 36° e.l.), together with depictions of waterfowl, elk, boats, anthropomorphs, etc., and were first discovered over 160 years ago [1848]. These images are attributed to populations of the Pit-Comb Ceramic Culture (end of 5th - middle 3rd millennium BC). The author analyzes these complex symbolic figures, taking into consideration particular visual-graphical, cultural-chronological, natural-geographical, and topographic-astronomical features. The chief focus of this report is in interrelationships between the orientations and functions of the figures, peculiarities of their forms, and azimuthal values calculated on the basis of the directions of the ray-like components of these signs. 62 examples of these symbolic figures have been analyzed. The results of this research demonstrate the connection between the incised figures and moonrise/moonset azimuths in all visible phases on the days of equinoxes and solstices. Of the 62 figures examined, only eight can be classified as solar symbols. Such a situation therefore may be connected with the contemporaneous existence of a preponderant lunar calendar. Taking into consideration the specific context of the location of the 'sanctuary' on Lake Onega, peculiarities of petroglyph forms, and the probable semantic content of these symbolic figures, the author hypothesizes that one or two radial lines, located on postulated solar and lunar signs, could depict sun and moon paths reflected from the lake surface, and extrapolate sun and moon rising and setting azimuths relative to the water horizon. The primary bodies of the figures reflected peculiarities of form for the observable celestial body. There is sufficient evidence and reason to think that lunar and solar signs of similar type have served as the most ancient of astrolabes. The majority of them were demonstrated to have pointed toward the direction of the positions where stars rose and set on the horizon. Some figures are thought to portray the mutual positions of the sun and the moon at the time of rising and setting on astronomically significant days of year.

Keywords: archaeoastronomy, petroglyphs, symbolic images, Moon, Sun, azimuth, Onega Lake.

The petroglyphs of Onega Lake were discovered 160 years ago. At present 1300 preserved images are known at Onega Lake. Administratively, the Onega Lake rock carving territory

belongs to the Karelian Republic of Russian Federation. The geographic coordinates of the sites are 61,4° northern latitude, 36° eastern longitude.

The petroglyphs are located on the capes rock tips of the eastern coast of the Onega Lake, deeply jut out into the area of water (fig. 1, 1, 2, 5). Together with depictions of waterfowls, elks, ships, men etc., the original symbolic images of disc-, crescent- and half-moon-shaped figures with one-two ray-like lines, directed to one side are hacked on the rocks (fig. 1, 3, 6; 2, A, B). The images have been made by hacking the rock surface with stone tools.

The pictures belonged to the population of Pit-Comb Ceramic Culture of the Neolithic-Eneolithic Epoch dated by period from the end of V-th millennium to the middle of III-rd millennium BC [1], [2].

During 160 years of the Onega Lake rock carvings study, there had existed different versions of the purpose and sense of those unusual shaped figures. The basic discussion was developed between two researchers and their supporters, which had proceeding during more than 70 years. A.M. Linevskiy determined these figures as traps, similarly to the snares of the Permian hunters. V.I. Ravdonikas considered the signs as cosmic solar and lunar symbols. Similarly to the Egyptian hieroglyphs, he regarded that pair lines were Sun and Moon rays [3], [4].

Only one researcher - F.V. Ravdonikas – has considered the Onega symbolic figures in the context of their astronomical orientation. He concluded that the figures fix a complete Lunar 18.6-year's cycle and that the complex of figures with rays was a lunar calendar [5].

In recent years, the majority of the specialists interpreted them as signs symbolizing the Sun and the Moon [6], [7], [8]. However there is no clear evidence of these assertions yet. There is no also certainty about what the lines starting at one side of these images may mean.

The author of present article analyses indicated figures in a complex manner, using the archaeoastronomical methods. All the graphical, cultural and chronological, natural and geographical, topographic and astronomical peculiarities of the symbolic figures of the Onega Sanctuary were taken into consideration. The main focus of the article is the interrelation between the orientation function of the figures, peculiarities of their forms and azimuths meaning, calculated on the basis of the directions of rays-like parts of the signs.

In the present work, the symbolical figures with beam lines were selected only from the publications well supplied with the documents which allow precisely define the form of figures, their possible orientation and topographical binding concerning North [9], [10], [11]. The total amount of the analyzed symbolic figures is 62.

The Onega images are located in exclusive *topographical conditions*: on of East coast capes, deeply jutting out into the lake and directed by the extremity of capes almost exactly on the West (fig. 1, 1, 2). The figures are done on the extremity of capes and the coastal small islands near the very water, where rocks are almost horizontal with the straight slopes and the smooth surface.

Astronomical peculiarities of the Onega Lake are due to low vertical speed of the sunrises/sunsets and moonrises/moonsets. Therefore the Sun and the Moon set and rise under horizon much slower comparably to the southerly latitudes. In those timeframes, each of these luminaries is reflected upon surface of the giant lake with its faultlessly equal horizon (fig. 1, 2, 4). The most part of lake is finely seen from the capes of the sanctuary jutting out into water area (for up to 750 m).



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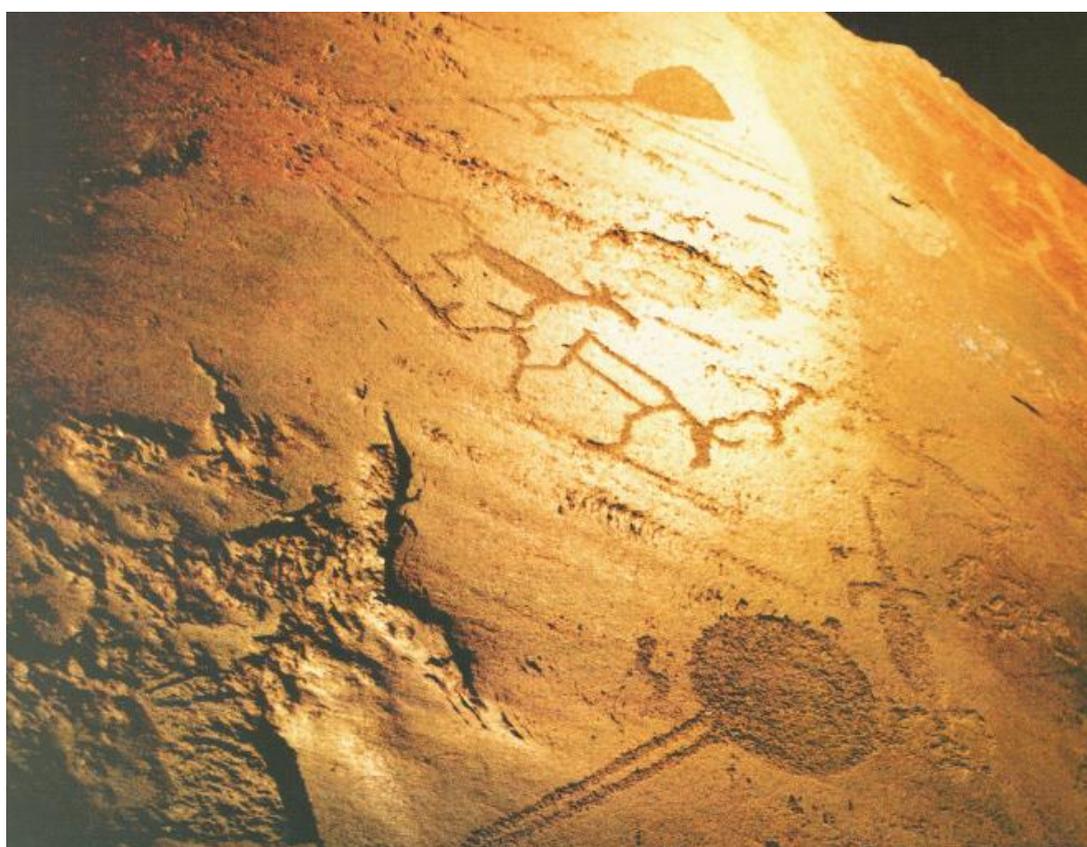
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Figure 1. The Onega Lake' sanctuary: *1* – view on Peri Nose V, VI capes from northwest; *2* – sunset on Besov Nos cape; *3* – petroglyphs of Peri Nos VI cape; *4* – Moon path on the lake surface; *5* – extremity of the Besov Nos cape; *6* – petroglyphs of Peri Nos III cape, the

Hermitage' exposition. 1, 4, 5 – Vologodskaya obl - Karelia 2007¹; 2 - Taganova E., Xapaeva S. Besov Nos, the Onega Lake, 2003²; 3, 6 – Zhul'nikov, 2006, fig. 18; cover sheet.

Sun and Moon rising and setting azimuths for the monument location latitude (61°40' northern latitude and 36° eastern longitude) in the astronomically special days of year in the time of the Onega Sanctuary functioning (3500 y. B.P.) were calculated by means of the Red Shift computer program (the obtained data are presented in the tables 1, 2). According to these data, judging by the calculated azimuths, in the days of the summer solstice a solar day on the Onega Lake is lasting about 20 hours. The nights in these days are light, and it is difficult to observe the rises and settings of Sun and Moon on the firmament. Only brightest planets and no stars can be seen in the sky during these days. In the days of winter solstice the solar day length is approximately 4 hours (tab. 1).

Table 1. Azimuths of Sunrises and Sunsets in the Northern Hemisphere for the Geographic Latitude of the Onega Lake sanctuary Latitude 61° North in 3500 year B.P.

Season	Summer solstice		Winter solstice		Equinox	
Phenomenon	Rise	Set	Rise	Set	Rise	Set
Azimuth (expressed in round numbers)	33°	326°	148°	212°	90°	270°

Table 2. Azimuths of High and Low Moonsets and Moonrises in its North and South positions for the Geographic Latitude 61° North in 3500 year B.P.

Outermost positions	High Moon				Low Moon					
Season	The Summer solstice (declination -29,22°)	The Winter solstice (declination +29,22°)	Spring and autumnal equinox (declination +5,15°)		The Summer solstice (declination - 18,92°)		The Winter solstice (declination +18,92°)		Spring and autumnal equinox (declination 5,15°)	
Phenomenon	Rise and Set	No setting	Rise	Set	Rise	Set	Rise	Set	Rise	Set
Azimuth (expressed in round numbers)	Near the South point of horizon from ≈172° to ≈188°	Touch upon the horizon at the North point from ≈352° to ≈8°	80°	280°	132°	227°	49°	311°	102°	258°

¹ http://lh3.ggpht.com/_A6h_kNdGKGc/R13JRee4gwI/AAAAAAAAASs/adzD_AAjTDg/29.JPG

² http://www.skitalets.ru/photogallery/besovnos_tagan2003/index.htm

The high full Moon in the summer solstice days rises above horizon only on height of half-degree and actually is "rolling" on the horizon during short time - no more than an hour. The low full Moon at this time is in the sky approximately 6 hours (tab. 2).

In winter solstice days, when the high full Moon is in extreme northern position, it moves practically without the moonset. The low full Moon is also rising in these days above horizon-level low and is shining up to 17-18 hours.

Taking into consideration the specific conditions of the Sanctuary location on the Onega Lake and peculiarities of the symbolic figures, the author of the article put forward the hypothesis that it were the Sun- and Moon-paths on the lake surface that could have serve as peculiar "astronomical instruments" and at the same time as exact natural marks of the points of sunrises (sunsets) and moonrises (moonsets) on the horizon for an observer at the lake coast.

One or two radial lines, located on the solar and lunar signs, could signify the above mentioned paths and indirectly Sun and Moon risings and settings azimuths. In such case they should be directed toward side on horizon opposite to the luminary, i.e. to a place of a presence of the observer on a coast of the lake. The main part of the figures represented the form peculiarities of the observed celestial body.

The rays of the rising (setting) Sun or Moon continued to be reflected as a light path not only on the water smooth surface, but also on a surface of smooth and humid coastal stones (fig. 1, 2, 3, 6). The rays of luminaries showed the ancient observers where the mark should be represented corresponding to this or that astronomical phenomenon. They hurried to represent the celestial luminary as they saw it, marking off simultaneously its reference points at the present. This may be possible explanation of the fact noted by the researchers: the petroglyphs are best visible in early morning during the sunrise, or in late evening during of the sunset.

Regarding the low speed of the rising(setting) of the disk, the Sun or Moon not only slowly appears above a line of horizon or disappears behind her, but also is simultaneously gradually moving along a line of horizon towards this or that side. The reflection of a luminary glade on water respectively an observer on a coast is simultaneously moving also. This is why the orientation toward rising (setting) of the observed celestial body is marked with the two lines corresponding the directions of the light paths in the moments of 1) appearance of the first rays of light or upper limb of the disk and 2) moment of full disk appearance in case of rising and vice versa in the case of setting being observed (fig. 2, C). This allows to suppose that the figures with rays were to fix the observed limits of the light path reflecting circumstantial direction and time of rises (settings) of the luminaries on the horizon. This allows to suppose that the figures with rays has fixed the borders of the light path reflecting conditional direction and time of luminaries setting (rising) at the horizon line [12].

It is probable that the use of lunar and solar glades to determine azimuths of rises and sets of the main luminaries has led the mankind to the creation of a lighthouse. Nowadays there is a lighthouse on the Besov Nos Cape (fig. 1, 5).

The opinion stated above allows the author to consider the single, pair and double ray-like lines on symbolical marks of Onega petroglyphs as conditional azimuths of the Sunrises(sets) and Moonrises(sets) [13], [14]. But for all that the rays marks reference points not so much on a point of a rising(setting) of the main heavenly bodies on horizon, as points at the segment on a line of horizon, within the limits of which the appearance or disappearance of a star above a line of horizon was visually observed. The true azimuth should to take the intermediate position between two rays represented in figure (fig. 2, C).

To check the adduced hypothesis and to obtain the determinate results, the correlation tables and diagrams of the various types were composed. In the tables and summary diagram all considered marks were distributed on conditional horizon according to their basic form and orientation. The data of the correlation tables confirm basic author hypothesis on the whole and prove the possibility to fix the azimuths of rise and set of the Moon and the Sun on horizon by lunar and solar paths with the help of unary and pair lines.

Thus, the distribution of figures in respect of the North and of coastal line on the schemes of their arrangement on separate capes show, that at 52 figures (84 %) from 62 ray lines are directed towards the coast and follow its outlines [15].

The diagram with the location of all the examined signs on the nominal horizon in accordance with their orientation shows that the azimuths values, determined by the rays-like lines, in the most cases correspond or are close to the high and low full Moon azimuths in extreme northern and southern positions. The correspondence to notional solar azimuths is observed in isolated cases only [16].

The correlation of the forms and orientation of the symbolic figures with the orientation of different Moon phases in various seasons demonstrates the connection of the examined carvings with the azimuths of the moonrises and moonsets in all the visible phases on the days of equinoxes and solstices (fig. 2, A).

Table 3. The correlation of figures representing the Moon in the various phases and seasons on the Omega Lake sanctuary

Phases of the Moon Season		Yang Moon, Set	Crescent	Full Moon		Old Moon Rise	Total	
				Rise	Set		Quantity	%
The summer solstice		1	-	2	9	3	15	24
The equinoxes		12	2	5	11	-	30	50
The winter Solstice		-	-	6	9	1	16	26
Total	Quantity	13	2	13	29	4	61	100
	%	21	3	21	49	6	100	100

The received data prove that at the Omega sanctuary, the azimuths of the moonrises/moonsets in all visible phases and in all seasons of year are fixed (table 3). Among the symbolical figures submitted in the sample, the images of the young Moon, half moon, full and old Moon are clearly distinguished. Almost all of them correspond to basic and intermediate Moon phases (fig. 2, A).

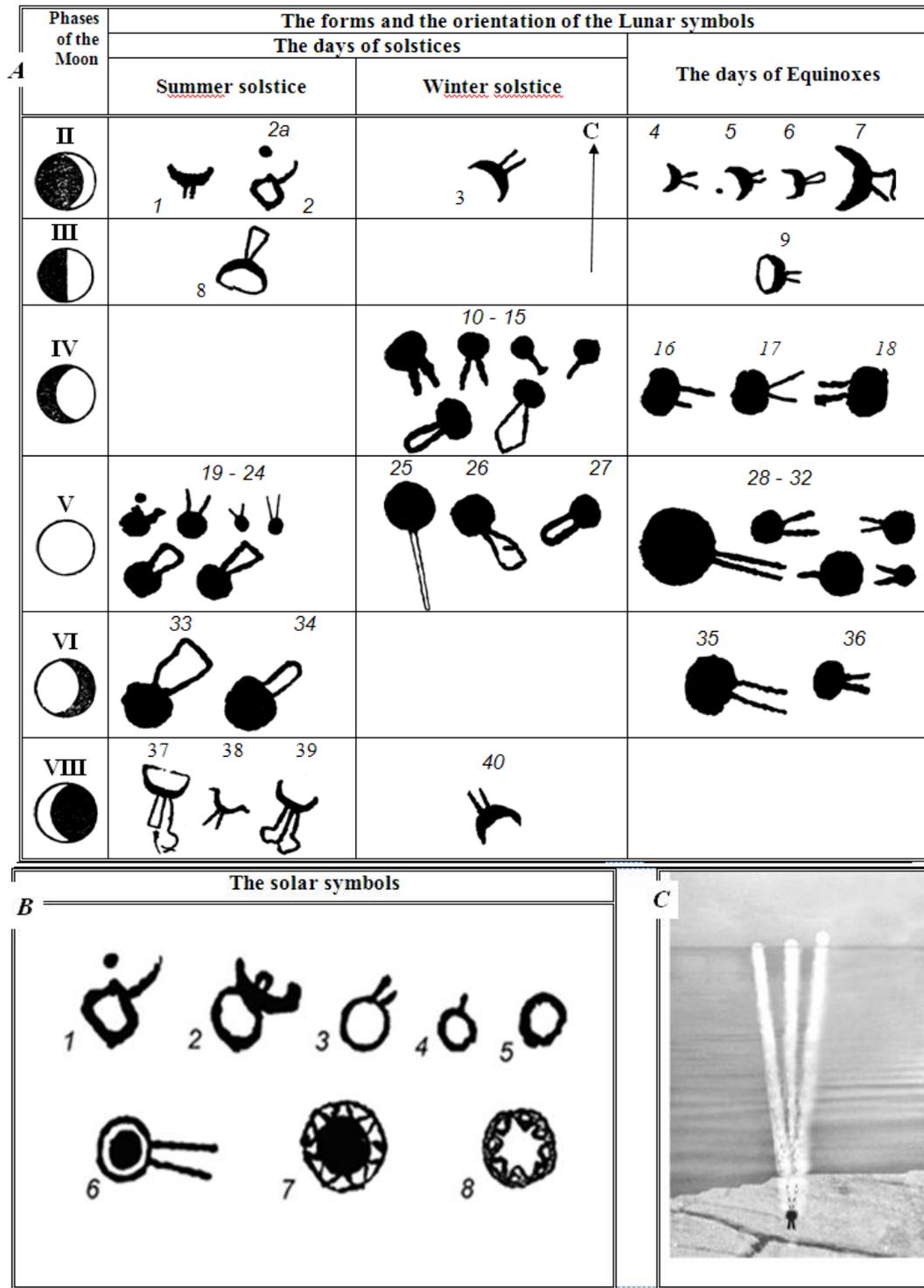


Figure 2. Lunar and Solar symbols at Onega Lake' petroglyphs: **A** –Lunar symbols: 1, 26, 29, 30, 32, 40 – Peri Nos III; 2, 2a, 8, 15 17, 31, 33, 34, 36, 37, 39 –Karetsky Nos; 4-6, 7, 9, 10, 12 – 14, 18, 19, 20, 23, 24, 27, 28, 35 –Peri Nos VI; 3 – Gury Island; 11 – Besov Nos, northern cape; 21, 22, 25, 38 – Peri Nos III, the Hermitage' exposition. 1-40 – Ravdonikas V.I., 1936, tables 1; 2; 4; 7; 8; 12; 16; 20; 21; 23; 37; Savvateev, 1970, fig. 106; 108; 1983, p. 101. Moon phases – Klimishin, 1985, p. 34; **B** – Solar symbols: 1, 2, 4 - Karetsky Nos ; 3, 7, 8 – Peri Nos III; 5, 6 - Peri Nos VI; 1, 3, 5, 6 – Ravdonikas V.I., 1936, table 2, 16, 20; 2, 4, 7, 8 – Savvateev, 1983, p. 83, 101; **C** – Scheme of the sunrise/sunset or full moonrise/moonset with reflection of illuminated glade on the water surface of lake and probable reproduction them in rock art images.

Most number of the lunar signs (23 figures, i.e. 38% of the investigated set) have reference points corresponding to the azimuths of young and full Moon settings at the days of equinoxes (table 3). Taking into consideration the weather conditions on Onega Lake that is covered with ice and thick snow since mid or end of October till mid or end of April, these should have been days of autumn equinox and days close to it at the end of September - beginning of October.

Special contoured manner of performance of some of the depictions (they are 8), their orientation, in the particular collocation with lunar signs allows to consider them solar symbols (fig. 2, B). (All the Moon signs are cut in the rocks as silhouettes). This hypothesis may be confirmed by peculiarities of the three images, fixing the rise of the old Moon and set of a new one during the summer solstice when the Moon is well seen near the Sun (fig. 2, B, 1, moon2).

At the depictions, crescent-like figures of young and old Moon carved like solid silhouette are adjacent to the circles depicted with the contour. It is known that on the 28th-29th day of the cycle, just before its disappearance, the old Moon rises on the East closely with the Sun, few hours or even several minutes before the sunrise. This is why the old half Moon is well seen on the sunrise. The elder and thinner the Moon is, the closer to the Sun it rises and sets. (fig. 2, B, 2).

In a single case, the circle depicted with the contour is adjacent with the young-Moon-setting-related crescent-like figure carved by the solid silhouette. Next to it, the small silhouette circle is placed (fig. 2, B, 1). Most probably the figure represents the situation of the young Moon being well seen on the 3rd day at the West close by the Sun just before and short time after the sunset. The small circle may refer to the bright Venus planet that is well seen close to young setting Moon and the setting Sun.

Figures with twin rays on the tips are of special interest (fig. 1, 6; 2, A, 7, 8, 15, 25-27, 33, 34). There are only 18 of such lunar signs (29% of all the considered signs). Orientation of these figures is equal or close to the azimuths of the High and Low Moonrise and Moonset in extreme northern and southern positions [17], [18].

All above-stated testifies that the Neolithic Epoch population of the Onega Lake had the certain sign system worked out already, where among significant of symbols were also astronomical reference points, based on the cosmogonical notions.

There are the reasons to think that lunar and solar signs of a similar type have been the most ancient astrolabes. The majority of them had pointed to the directions to the places of the luminaries rising and setting on the horizon. Some figures marked relative position of the Sun and the Moon at the time of rising and setting in the astronomically significant days of year.

The lunar symbols, compiling the overwhelming majority of the images of the luminaries on Onega Lake prove an existing opinion that the change of phases of the Moon was the first astronomical phenomenon, to which the mankind had paid attention [19].

One of the important reasons of observing Moon phases during the Neolithic age might be connected to the existence of the lunar calendar, which is considered to be the earliest.

Lunar calendar was very significant for the ancient people who inhabited shores of big water reservoirs. Such important natural phenomenon as tides and ebbs depend on the mutual position of the Moon, the Earth and the Sun. They meant much for ancient fishermen of Onega Lake. On a surface of the Earth, the tides are aroused mainly by Moon. They are being of various flood strength and occur as every lunar month (with 29.5 day interval), as daily. If the Sun and Moon are located on one line while the Moon is full or new, a flow is the highest.

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