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On The Astronomical Context of Fish-shaped Vishap Stone Stelae

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Abstract

The work discusses the problems related to the celestial parallels of Fish-shaped Vishap (dragon) stone stelae. In particular, it is shown that these monuments are the material manifestations of the cult of the constellation Pisces Austrinus (the Southern Fish) and relate to the modern Pisces of zodiac only indirectly. At the same time, the well-known result of their dating by astronomical methods does not change qualitatively, but is more clarified, by placing about 18800 BC. Here, the coincidence of the heliacal rising of Fomalhaut (α Piscis Austrini) and the ancient Armenian Navasard holiday (beginning of the year, 4 days before summer solstice) is taken as the basis of the calculation.

Keywords: *Fish-shaped Vishap Stone Stelae, Piscis Austrinus, Archaeoastronomy, Megalithic Monuments, Armenian Calendar History, Cultural Astronomy*

1. Introduction

Archaeology, especially in the last decade, has touched a lot on the importance of the study of the Vishap stones of the Armenian Highlands (Bobokhyan et al., 2012, 2015, Gilibert et al., 2012, 2013, Petrosyan & Bobokhyan, 2015). The most up-to-date comprehensive information of them is especially reflected in the last publications (Bobokhyan et al., 2020, Gilibert, 2020, Hnila et al., 2019, 2023). However, the works on their astronomical essence are unique. For the first time, the astronomical significance of the Bullheaded and Fish-shaped Vishap stones is hinted, that they may correspond to the Taurus and Pisces constellations of the zodiac, respectively (Khnkikyan, 1997). Astronomer Grigor Broutian made a more meaningful reference to this consideration later. In the mentioned work (Broutian, 2020), according to their astronomical context Vishap stones are classified into 5 main types, which are matched to 5 adjacent constellations of the zodiac (Table 1) (Broutian, 2020). Considering this pattern, the author tried to calculate the approximate date of their creation. In particular, it was based on the fact that, according to the Armenian calendar tradition, the main event of the year is the Navasard holiday and it was celebrated 8 days before the summer solstice[1] in ancient times. With this logic, **the time when the Sun was in the range of the constellation corresponding to Vishap stone on the day of Navasard was calculated** (Table 1).

It is clear, and the author himself states (Broutian, 2020), that such a calculation is very approximate, because in order to make an accurate calculation, it is necessary to specify at which particular point of the constellation the position of the Sun was on the specified day. It should also be noted that the start point of calculation in the mentioned work was the time when the Sun passed from one constellation to another (for example, from Aries to Pisces), and the beginning of the Salvation Era (1 AD) was taken as a time of such transition when the Sun passed from Aries to Pisces at the vernal equinox (Broutian, 2020). However, in the conditions of the mentioned antiquity, such rough[2]

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[1] About the Navasard fast see section 5.

[2] In the mentioned work of Grigor Broutian, 25766 years are taken as the duration of one whole precession, but its more adjusted duration is 25776 years. Such a small difference does not qualitatively affect the obtained results in any way, but in our calculations we took the number 25776 as a basis.

Table 1. Classification and astronomical dating of Vishap stones by Grigor Broutian

Type of Vishap	Corresponding constellation	Date (BC)
Donkeyheaded	Cancer	28487.4
Whit the pair of birds	Gemini	26331.4
Bullheaded	Taurus	24184.4
Ramheaded	Aries	22037.4
Fish-shaped	Pisces	19890.4

calculation is completely acceptable. However, **it should be specially emphasized that if we take as the starting point of the calculation, not the transition from Aries to Pisces, but the conventional midpoint of the section of the Ecliptic "crossing the constellation domain", then the x error will be approximately[3] 1074 years**.

$$x = \frac{25776(precession)}{12 \times 2} = 1074$$

Taking into account such deviations, it is completely acceptable and logical to subtract 2148 years from the dates given in Table 1. In other words, such a calculation allows us to take an interval of 2148 years for the time of the corresponding Vishap stone, accepting the date obtained by Grigor Brutean as its early limit. For example, **it is more correct for Fish-shaped Vishap stones to take period 19897-17749 BC, and the midpoint will be 18823 BC**.

2. The problems in the astronomical interpretation of Fish-shaped Vishap stones.

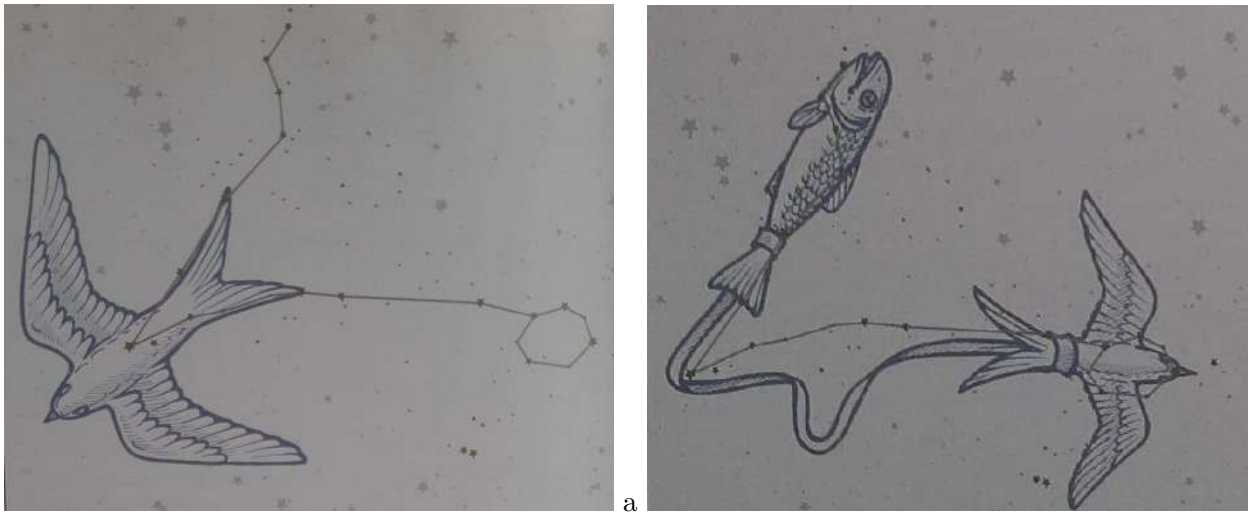
However convincing such results are (Broutian, 2020), apart from being highly approximate, they are also problematic in several other fundamental issues. Some of these are particularly relevant to the astronomical context of Fish-shaped Vishap stones. Of course, in the analysis of other types of Vishap stones, some questions also have not been addressed yet. One of such problems is the fact that the pair of birds are depicted on the upper part of some Vishap stones, at the same time on the others they are located lower. However, we will not address these problems here and will discuss only some questions related to the astronomical interpretation of Fish-shaped Vishap stones. In particular:

2.1. The Pisces constellation known to us in the zodiac is not odd in number, and Fish-shaped Vishap stones are clearly "statues" of one fish (Figure 1).

The point is that, for example, the idea of a pair of storks depicted on some Vishap stones is clearly connected with the Gemini constellation (Broutian, 2020), which we deal upon in another context, when discussing the Zorats Qarer monument (Malkhasyan, 2022a). In other words, we have the canonical iconography of a pair of birds and the corresponding Gemini constellation (with a idea of pair) in the sky. The same is to be expected in the case of the Pisces constellation, but here an inconsistency arises. Some explanations can be given to this (for example, that in very ancient times, perhaps, this constellation was perceived as *fish and not fishes*, especially since in the Armenian map of Middle Age ("Hamatarats Ashkharacoyc") (Vanandeci, 1695) it is indicated as a *fish instead of fishes* (Tumanyan (1985) p. 12), but such assumptions are extremely flawed and unfounded. In the oldest Sumerian astrolabs known to us, the Pisces of the zodiac are known as "Tails" (^{mul}QUNI.MEŠ), where MEŠ is a indicator of plural (Davtyan (2004) pp. 40-42). Moreover, in modern literature it is customary to consider one of these Tails to be the Swallow's and the other of the Fish (Hoffmann (2021) pp. 127-129) (Figure 2).

[3]The domain of a constellation is a well-defined concept today and was fixed in 1922 by a decision of the International Astronomical Union. However, we do not know any data about these in ancient times. Therefore, the equal part of the year for the 12 constellations of the zodiac are conventionally assigned to. That is, one whole precession time is divided into 12 equal parts (25776/12=2148). Therefore, the center of that period will differ from its borders by 1074 years (2148/2=1074).

Figure 1. The Fish-shaped Vishap stone from Geghama mountains (Imirzek 2) (Petrosyan & Bobokhyan (2015) p. 347)



a b

Figure 2. Depicting of Pisces stars in Mesopotamia according to Hoffmann S.M.. (a) Position of the Great Swallow (V-shaped Tails) constellation in Mesopotamian imagery. (b) Fish and bird tied with ribbon from the Uruk city, later times.

Later Egyptian sources already depict the pair of fishes in this part of the sky (Lull & Belmonte (2009) fig. 6.25, p. 192). It is particularly noteworthy that we are not aware of any bifurcated fish tailed Vishap stones. Moreover, they are compared to the so called "Loko" fish species (Broutian, 2020, Petrosyan, 2015), whose tail is also not bifurcated, so this question remains open.

2.2. Sumerian astrolabs also describe the constellation known as the "Great Swallow" (mul.ŠIM.MAH) in the modern zone of Pisces.

Such a placement of the Great Swallow constellation is substantiated by the studies of several authors (Hoffmann, 2021, Hunger & Pingree, 1999, Van der Waerden, 1974). At the same time, it is also known that the "Tsitsarn" (the Swallow) constellation is present in Armenian sources (Acharian, 1926), which cannot be considered clearly identified in the sky yet, but it is noted that this is most

likely identical to the the constellation of Great Swallow from Sumerian list (Davtyan (2004) pp. 19-20). If the Armenian "Tsitsarn" constellation corresponds to the Mesopotamian The Great Swallow, which in turn is directly related to the modern Pisces or is a part of it, and there is no other valid argument to the contrary, then the logical question arises. How can the Swallow be related to the Fish-shaped Vishap stones, as it has not found any visible expression on their?

2.3. There are no obvious bright stars in the modern Pisces constellation.

The brightest stars in this constellation are 4-5th apparent magnitude and barely visible to the human eye. At the same time, if we are talking about observing the position of the Sun in the range of the constellation, it should be noted that it is highly unlikely to see the mentioned stars with the naked eye under the conditions of such illumination of the sky. In other words, in order to observe their heliacal rising, the Sun must at least pass from Pisces to Aries, and in this case, already, the logic of the above-discussed calculation (Broutian, 2020) becomes, to put it mildly, unclear. On the other hand, if this constellation was associated with the main event of the year and was the main object of worship, it is hard to imagine that in the sky it was expressed whit barely visible or a few stars. This hypothesis is also supported by the fact that the main stars in the ancient Armenian calendars were chosen to be quite bright (1st apparent magnitude) (α Virginis (m=0^m.95) in the Protohaykian calendar (9000 AD) (Broutian, 2016, 2017), α Orionis (m=0^m.45) in the Haykian calendar (2341 BC) (Broutian, 1985b, 1997). Another main star change was revealed in 5800 BC: α Canis Majoris (m= -1^m.45) (Broutian & Malkhasyan, 2021, Malkhasyan, 2021b, 2023a). So the question of the brightness of the stars also remains open.

Thus, it is obvious that the above-mentioned questions (subsections 2.1, 2.2 and 2.3) require clear answers, which is the main problem of this work. It is also clear that in the case of such antiquity, the material we have is very scarce. So, it is especially important for the facts of the starting point of the study to be highly reliable. Only written evidence can have such reliability, the most reliable of which, as mentioned above, are the Sumerian cuneiform MUL.APIN lists. Therefore, it is necessary to first look there for the answers to the questions that concern us.

3. The Fish in MUL.APIN.

As mentioned above, the modern Pisces (^{mul}QUNI.MEŠ) is attested in Mesopotamian sources as "Tails" and spelled with the plural indicator MEŠ (Davtyan (2004) pp. 40-46). At the same time, we also see some positional commonalities of the constellations Tails and Swallow, which, as mentioned (see subsections 2.1 and 2.2), are problematic in terms of the conjunction of this domain of the sky with Fish-shaped Vishap stones. Let us also add to this that the author himself on another occasion (Broutian, 2021b) takes the northern part of the Pisces as a manifestation of the Mother Goddess, citing again the famous *A-nu-ni-tu* constellation from Mesopotamian sources (Van der Waerden, 1974), comparing it with the Armenian Mother Goddess Anahit (with the "Artater Parav" of the epic "Sasnay Tsrer") (Broutian, 2021b). Armen Davtyan also tried to explain this identification to some extent, noting, however, that **such "confusion" is the result of some distortions in later sources**[4] (Davtyan (2004) pp. 126-129). We have thoroughly discussed the celestial parallel of the cult of Mother Anahit ("Artater Parav") on another occasion (Malkhasyan, 2021a), identifying it with the modern constellation of Cassiopeia, so we will not go into the details here. Taking such data into account, it becomes clear that **to equate the astronomical content of Fish-shaped Vishap stones with Pisces constellation is questionable, to say the least, and the connection must be sought elsewhere**.

Here we should mention that another constellation is known to us from Mesopotamia, which is called Fish and is written with the ideogram ^{mul}KU$_6$. The latter is identical with the Piscis Austrinus constellation (the Southern Fish) and especially its brightest star **Fomalhaut (α Piscis Austrini)** (Hunger & Pingree, 1999, Van der Waerden, 1974). Now, since in the same cuneiform sources there is also the Fish constellation (star), let's see how well it corresponds to the Fish-shaped Vishap stones in

[4]Translated from Armenian and highlighted by us.

its content. To this end, let's take some considerations about the Piscis Austrinus constellation point by point and see how far they answer the questions 2.1, 2.2 and 2.3 stated above.

1) First of all, it is obvious that **the Piscis Austrinus constellation is not expressed by any plural feature**, which immediately leaves the first point (2.1) out of the questions.

2) **In Mesopotamia, this constellation was given great importance from a mythological point of view**. First, as mentioned, for the Southern Fish, the ideographic inscription **(a fish image is drawn)** was chosen (Davtyan (2004) pp. 41-42), which is more reliable, because in the case of Vishap stones, we also have **a fish-shaped cult monument**. On the other hand, this constellation is strongly associated with the main deity of the pantheon **Haya**, who is the embodiment of the Father God (Davtyan (2004) pp. 109-110, Hoffmann (2021) pp. 93-95). This constellation is also associated with the Mesopotamian God Ohannes (fishman) (Allen (1963) pp. 344-347, Davtyan (2004) p. 42), who is depicted with a "fish-shaped helmet" and is considered the Creator God (Broutian, 2021a). It is clear that, contrary to the mythological and pictographic vagueness of the Zodiac Pisces, here we have strictly canonical ideas. Accordingly, the question mentioned in second point (2.2) can be answered by examining this constellation.

3) **The main star of the constellation, Fomalhaut, is not comparable to any star of the Pisces with its great apparent magnitude (m=1^m.15).** As mentioned in the previous subsection (2.3), the brightness of a star is an important factor in observations of its heliacal rising. In addition, it is more likely that the star heralding a major calendar event is chosen from among the brightest stars. In this sense, the main deity discussed in the previous point, the fact that the Fish-shaped Vishap stones are the main cult monuments (Broutian, 2020) and the great brightness of the star Fomalhaut are completely in harmony with each other. Let's also remember here that the rising of the constellation corresponding to the main deity (The Father God, Haykn (Orion) constellation) was determined the beginning of the year in the Armenian Haykian calendar in 2341 BC (Broutian, 1985a,b, 1997). Since the Mesopotamian Fish has a direct connection or is identified with the idea of the Father God, then it is here that one can also look for answers to the problems mentioned in point 2.3. Now let's take a closer look at the content of the Piscis Austinus (Southern Fish) constellation.

4. The description of the Piscis Austrinus constellation.

First, the name of the main star of this constellation, Fomalhaut (*Fum al Ḥūt*), translated from Arabic, means "mouth of the fish - lat. *os piscis*" (in other sources, it is also sometimes mentioned as "the eye of the fish") (Allen (1963) pp. 344-347). Notably, Fish-shaped Vishap stones also have well-defined mouth and eyes, and it is often difficult to distinguish parts other than the head on these monuments (sometimes the gills, fins and zigzag symbols are prominent (Harutyunyan, 2015)). It is also noted that the Pscis Austrinus **drinks the whole stream of water** and this notion goes back to more ancient times (Allen (1963) pp. 344-347). The latter description is more than in harmony with the mythological context of the dragon-fish (as well as Fish-shaped Vishap stones) (Harutyunyan, 2015), which sometimes **drains the springs**. On the other hand, in same context, the stars of the constellation are associated or attributed to Aquarius in some sources (Allen (1963) pp. 344-347). This is especially important because many star maps depict the constellations of Aquarius and Piscis Austrinus as a single entity. For example, in the Egyptian Zodiac, Aquarius is also depicted with a fish at his feet (Lull & Belmonte (2009) fig. 6.25, p. 192). Parallel to this, Aratos writes: *"One large and bright by both the Pourer's feet"* (Allen (1963) pp. 344-347). This connection is also evident from the medieval Armenian map (Vanandeci, 1695). Here the water from the Aquarius pitcher flows completely into the mouth of the Piscis Austrinus (Figure 3). In other words, the above-mentioned ideas were preserved in Armenian sources until the later Middle Ages.

As we can see, there is no obstacle to accepting that the Fish-shaped Vishap stones are a monumental manifestation of the worship of the Sumerian Fish (^{mul}KU$_6$) (modern

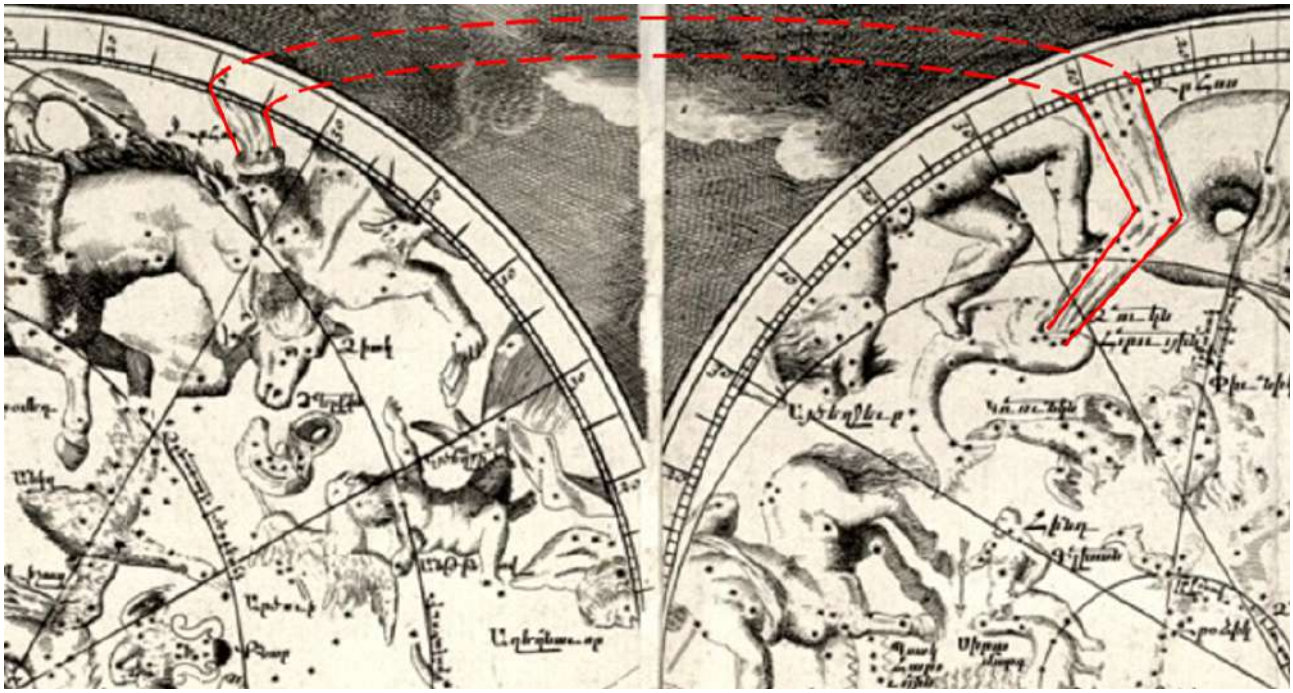


Figure 3. Fragment from the map "Hamatarats Ashkharhacoyc" published by Ghukas Vanandeci in 1695 (Amsterdam). The markings in red are according by us and show the flow of water from Aquarius's [*Djrhos*] pitcher to the mouth of the Southern Fish [*Dzukn Harawayin*].

Piscis Austinus) constellation and especially its main star Fomalhaut[5] **(α Piscis Austrini)**. It remains to calculate in which epoch the heliacal rising of this star took place on the first day of the year. For this purpose, let's first answer an important question. What day should be taken as the beginning of the year?

5. About the beginning of the year in ancient Armenian tradition.

The following was known to us about the main event of the ancient Armenian calendars, the beginning of the year (Navasard holiday), before the recent studies of the megalithic "observatory" Zorats Qarer.

- At the beginning of the Haykian calendar (2341 BC) Navasard was marked by the heliacal rising of the star α Orionis, 7-8 days before the summer solstice (Broutian, 1985b, 1997). *However, modern accurate calculation methods*[6] *show that in 2341 BC, the heliacal rising of the α Orionis at 5° horizon from 39.5° latitude north has been visible 20 days before the summer solstice. It is obvious that there is a need to clarify this issue*[7]*, especially since there are serious, even historical, justifications in favor of date 2341 BC* (Broutian (1997) pp. 211-246, 363-373).

- The beginning of the Protohaykian calendar (9000 BC) was marked by the heliacal rising of the star α Virginis, 8 days before the summer solstice (Broutian, 2016, 2017). *At the same time, the mentioned calculation methods show that in 9000 BC, from 39.5° latitude north, the heliacal rising of the star α Virginis has been visible on the 5° above the horizon 16 days before the summer solstice.*

At the same time, the last results of the studies of the Zorats Karer monument indicate that the apparent disappearance of the α Virginis in 9000 BC, it was observable on the summer solstice in the

[5]The other stars in the modern Piscis Austrinus constellation are significantly fainter in brightness (5^{th} apparent magnitude), so we will leave them out of consideration.

[6]All calculation data given in the article are according to Stellarium v0.20.4, www.stellarium.org

[7]We will not address this issue here, as it is beyond the scope of this article.

direction of the observational angle of the stone No. 198, at an elevation of about 20° (Broutian & Malkhasyan, 2021, Malkhasyan, 2022b). Studies show that in the mentioned year, the 7-8 day Navasard holidays covered the summer solstice, started 4 days before and ended 3 days after it (Malkhasyan, 2024). The beginning of the holiday corresponds in its content to the autumn grain harvest, and the summer solstice to the offering of "bread" (Malkhasyan, 2022b). If we draw a parallel between grain harvest and fishing (see in detail (Malkhasyan, 2023b)), then we should consider the heliacal rising of the Fomalhaut as an event heralding the beginning of fishing. Therefore, it is more correct to take the results obtained by studying the Zorats Qarer monument as the beginning of the year **(4 days before the summer solstice)** (Malkhasyan, 2024), especially since they are the oldest data known to us so far. At the same time, we will also give the results that will be obtained by calculating for the summer solstice and 8 days before it (Table 2). So, what kind of data can be taken as a starting point in calculating the heliacal rising time of a star?

6. About the calculation conditions.

To calculate the heliacal rising of any star, one must first select a latitude. Let's take into account several important circumstances.

- Taking into account several fundamental considerations 39.5° latitude north was taken into account for calculating the beginning date of the Haykian and Protohaykian calendars and the solar ascension of the main stars of those calendars (Broutian, 1985b, 2016).
- Later, the possible observation of the main star of the Protohaykian calendar was revealed in the Zorats Qarer megalithic monument of Syunik province (Armenia), which is located at 39.55° latitude north (Broutian & Malkhasyan, 2021, Malkhasyan, 2022b).
- Vishap stones are located in high mountain plains (2000-3000m above sea level). Recently, archaeologists discovered dozens of examples of Fish-shaped Vishap stones in the place called "Tirin Katar" of Aragats Mountain, and some of them were buried (Bobokhyan et al., 2015). According to archaeological methods, they are dated no later than in the 6^{th}-5^{th} millennia BC (Hnila et al., 2019). At the same time, **there is no scientific data on the earliest limit of their made yet** (Gilibert, 2020). This circumstance is important because the Fish-shaped Vishap stones unearthed here are the oldest dated by archaeological methods so far. "Tirin Katar" is located approximately 40.2° latitude north. In addition, the Geghama Mountains, known for their large accumulations of Vishap Stones (Bobokhyan et al., 2015), are located at approximately the same (39.8°) latitude.

Considering the above circumstances, it is acceptable to take 40° latitude north in the calculation. We should also consider the fact that the actual angular elevation of the horizon at the supposed observing location is unknown. However, in mountainous conditions, the elevation of the real horizon generally does not exceed 5°. The justification for this is actually available from the data of the real horizon seen from the Zorats Qarer monument (Malkhasyan, 2022b). **So let's see in which millennium the heliacal rising of the Fomalhaut has been observable 4 days before the summer solstice at 40° latitude north and 5° above mathematical horizon.**

7. Results and discussion.

The examination reveals Fomalhaut's heliacal rising occurred 4 days before the summer solstice in 18800 BC[8] under the above mentioned conditions (Table 2) (Figure 4). It should be noted that the declination of the star in the mentioned year is very close to the declination of the Sun on the equinox (Table 2), that is, the star rose very close to the East.

[8]Of course, this date can be deviated from between 18850 and 18750 BC, taking into account the observer's visual acuity, real horizon elevation, parallax, refraction, etc. However, the 50-year error can be ignored in such problems.

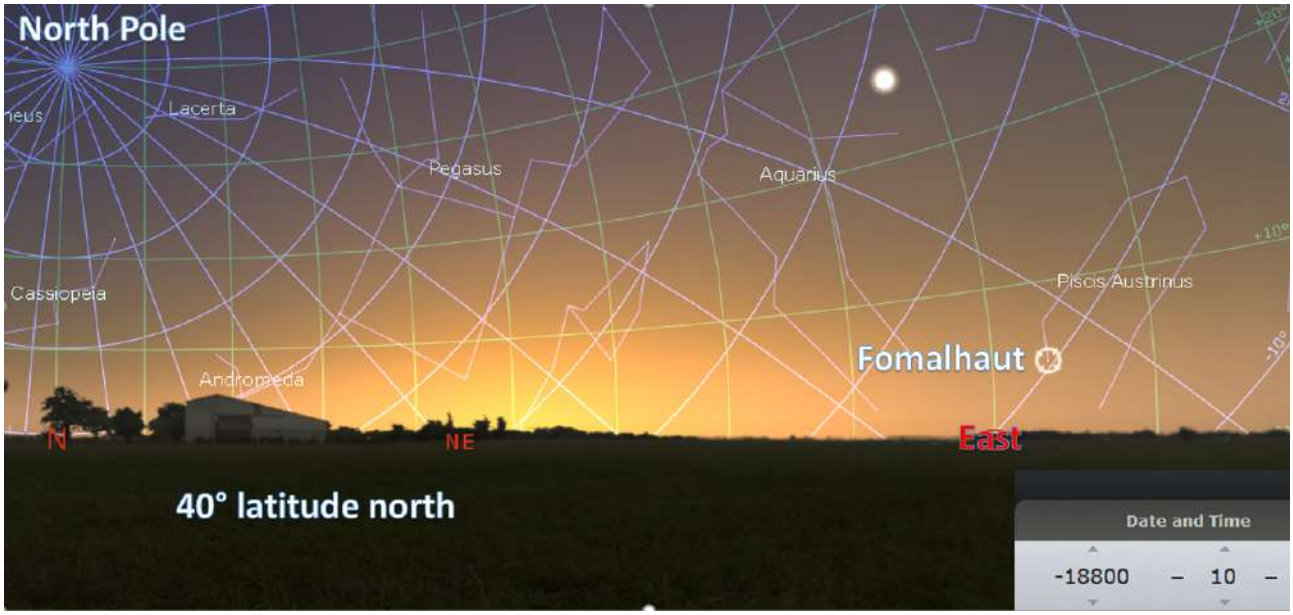


Figure 4. Sky veiw 18800 BC, 4 days before summer solstice at Fomalhaut's heliacal rising. Reconstructed in *Stellarium v0.20.4* software www.stellarium.org, added some notes.

Table 2. Data for the Fomalhaut by years and heliacal rising days. Azimuths from the South point calculated for the 5° elevation and 40° latitude north are given. All calculation data given in the table are according to *Stellarium v0.20.4*. www.stellarium.org

Fomalhaut (α Piscis Austrini)	**18400 BC**	**18800 BC**	**19200 BC**
Declination (δ)	$+1°42'$	$+0°21'$	$-1°08'$
Right ascension (α)	3^h35^m	3^h14^m	2^h53^m
Rising Azimuth (A)	$271°50'$	$273°36'$	$275°34'$
The day of heliacal rising	Summer solstice (SS)	4 days before SS	8 days before SS

It is clear that the received date (18800 BC) coincides with the midpoint of the period (19897-17749 BC; see section 1) when the sunrise has been in the domain of modern Pisces (Figure 4) 8 days before the summer solstice. In other words, **the result we obtained not only does not contradict, but coincides with the dating obtained previously** (Broutian, 2020). **It turns out that the qualitative result of the calculation is the same in both cases, but here, the problems 2.1, 2.2 and 2.3, listed above and not discussed before, have already been solved.** Moreover, Fomalhaut's direct connection with the Fish-shaped Vishap stones can be the basis for having some, however vague, ideas about the calendar (even if the primitive, simple calendar elements) of times of such antiquity. With these considerations, it is worth studying those examples of Armenian mythology and folklore that especially refer to the **dragon-fish**. We have already touched on one of them, which tells **about the dragon-fish and the bear** (Bense (1972) p. 48). A partial astronomical examination of that legend revealed that, along with religious ideas, it also contains information about the celestial motions of the **Piscis Austrinus** and the **Ursae Majoris** constellations, which refers to 22000-10000 BC (Malkhasyan, 2023b). As we can see, this result does not contradict, but in some sense complements the dating obtained above. Of course, Armenian mythology (folklore) can contain much more extensive information about the dragon-fish at the period of its worship. Therefore, such studies can shed light on calendar conceptions of time immemorial.

It should be noted that calendar elements are already expressed. In particular, if the main star of any calendar is known and its heliacal rising is taken as a main event of the year (the beginning of the year), then it is perfectly acceptable to also consider the day of the heliacal setting of that star in order to derive calendar structures. The heliacal setting of Fomalhaut in 18800 BC, at 40° latitude north and 5° above the mathematical horizon, it would have been observable 24 days after the vernal

Table 3. The main stars of the pre-christian Armenian calendars are given on chronology

Calendar	Constellation	Main star	Date	Interval
The period of Dragon-fish worship	Piscis Austrinus	Fomalhaut	18800 BC	——————- 3300 years
?	?	?	*15500 BC*	+ 3250 years
?	?	?	*12250 BC*	+ 3250 years
Protohaykian calendar	Virgo	Spica	9000 BC	——————- 3200 years
The change of the main star	Canis Majoris	Sirius	5800 BC	——————- 3459 years
Haykian calendar	Orion	Betelgeuse	2341 BC	——————-

equinox. That is, **Fomalhaut has not been visible for 65 days**[9] **in the mentioned millennium at 40° latitude north**. This is completely in harmony with the basic structure of the Protohaykian calendar (Broutian (1997) pp. 416-430). In other words, **the period of Fomalhaut's absence corresponds to the "extra-annual" part (65-70 days) of the Protohaykian calendar, and the period when it has been visible corresponds to the time of the "main year" (295-300 days)**. However, such considerations require a separate, more detailed analysis.

One more important circumstance should be mentioned here. In fact, in the tradition of the ancient Armenian calendars, we fixed another calendar main star as well (Fomalhaut α Piscis Austrini), that refers to the 18800 BC. Therefore, it is worth considering all the main stars[10] chronologically (Table 3). If we pay attention to the Table 3, we will notice that there is a certain pattern[11] in the intervals of the dates. It gives the impression that the main star has changed every 3250 years (this is approximately 1/8 of the duration of one full precession (25776/8=3222)). **Such a regularity allows us to assume that two more changes took place about 15500 and 12250 BC** (Table 3). It is noteworthy that the dating of an episode of the Armenian "Sasnay Tsrer" epic was obtained in 15500 BC in a completely different way (Broutian, 2021c). However, such considerations only create a wide field for further detailed studies of the history of Armenian calendars.

Summary

Contrary to the opinions (Broutian, 2020, Khnkikyan, 1997) that the celestial parallel of the Fish-shaped Vishap stones is the modern Pisces constellation, some questions are put forward. To answer them, reference is made to the data deciphered from the cuneiform records of Mesopotamia. Based on them it becomes clear that as a **most likely celestial parallel of the Fish-shaped Vishap Stones should be fixed the modern Piscis Austrinus constellation.** Moreover, since the **Fomalhaut** of this constellation is significantly brighter than the others, it is also **fixed as the main one**.

Then, taking into account the date (4 days before the summer solstice) of the heliacal rising of the main stars in the ancient Armenian calendars, the time of the heliacal rising of the Fomalhaut is calculated. **The resulting age of 18800 BC is fully consistent with the previous result** (Broutian, 2020) **of an astronomical dating of Fish-shaped Vishap stones**. At the same time, all the mentioned problematic questions are already answered.

The obtained results take one small step forward in the astronomical studies of Vishap stones, at the same time, they are some foundation for revealing the long-standing layers of the history of Armenian astronomy.

[9] 93 days (from vernal equinox (VE) to summer solstice (SS) - 4 days (heliacal rising 4 days before SS) - 24 days (heliacal setting 24 days after VE) = 65 days.

[10] See subsection 2.3.

[11] This pattern was noticeable even before the emergence of Fomalhaut (Broutian & Malkhasyan (2021) f.(31), p. 124).

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