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## CULTURAL ASTRONOMY OF RYUKYU ISLANDS, SOUTHERN JAPAN

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### Abstract

The Japanese archipelago extends over 20 degrees of latitude from north to south. The Ainu culture flourished in Hokkaido at the northern end, and the Ryukyu culture flourished in Okinawa at the southern end. The Ryukyu Islands are located at the intersection of the Japanese archipelago, the Chinese mainland, Taiwan, and the islands of Southeast Asia. From prehistoric to historical times, cultures flowed in from various directions. Furthermore, the region's religion was characterized by shamanism overseen by female priests, and independent kingdoms formed. This paper aims to elucidate Ryukyuan cultural astronomy in this geographically and culturally diverse context. This section's methodology involves interpreting astronomical phenomena discernible from folklore, myths, and rituals using astronomical data and celestial simulations. This paper introduces the unique aspects of archaeoastronomy and cultural astronomy in Okinawa, focusing on monuments such as the Sun Stone, the Utaki shrines, and star-observing stones. In addition to the importance of the sun, this paper shows that the Pleiades and Orion's Belt are the most conspicuous in the Ryukyu Islands. The paper also discusses the local names and legends of southern stars, such as the Southern Cross. Other notable constellations in Okinawa include Centaurus, Scorpio, Sagittarius, and  $\alpha$  and  $\beta$  Centauri. There is also a unique tale about the origin of "star sand." This paper then provides an overview of cultural astronomy related mainly to southern stars, focusing on the Ryukyu Islands.<sup>1</sup>

**Keywords:** Ryukyuan Cultural Astronomy; Archaeoastronomy of Okinawa; Southern Stars and Indigenous Beliefs

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<sup>1</sup> This paper is an expansion of my on-line oral presentation, "Significance of Southern Stars in the Japanese Archipelago," which I presented at the "Cultural Astronomy in the Southern Hemisphere" session of the 27th International Congress of the History of Science and Technology (ICHST) at Otago University in Dunedin, New Zealand, on July 2, 2025.

## GEOGRAPHY, HISTORY AND CULTURE OF THE RYUKYU ISLANDS

The Ryukyu Islands consist of four regions from north to south: the Amami Islands, Okinawa Main Island, the Miyako Islands, and the Yaeyama Islands (Figure 1). The Miyako and Yaeyama islands could be grouped as the Sakishima Islands, which means "islands at the far end."

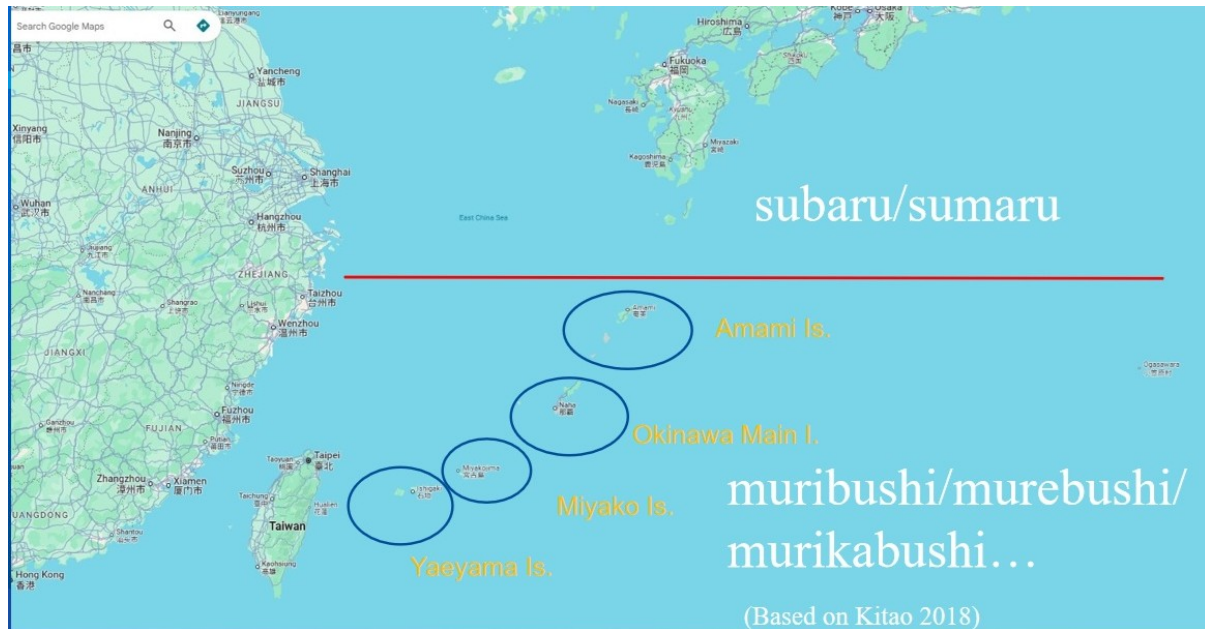


Figure 1: Map of Ryukyu Islands

According to Kitao (2018), the distribution of dialect names for the Pleiades differs between the Japanese archipelago and the Ryukyu Islands. In the north, names such as *Subaru* and *Sumaru* are used. In contrast, *muribushi* or *murikabushi* are used in the Ryukyu Islands. *Muribushi* literally means "clustered stars." These differences suggest that the Ryukyu Islands are a unique domain of cultural astronomy within the Japanese archipelago.

Since prehistoric times, the Ryukyu Islands have been influenced by the cultures of the Japanese archipelago, the Chinese mainland, and Southeast Asia as well. In the 13th and 14th centuries, local chiefs competed with each other by trading with China and Southeast Asia in order to obtain prestigious goods. They then distributed these goods to their followers (Asato, 1998). During the Gusuku (castle) period, which spanned from the 13th to the 16th century, many castles were built in competition with each other. It is possible that the main gates of several castles faced the sunrise on the June solstice (Goto, 2021).

Okinawa Main Island was subsequently divided into three kingdoms: the Northern Kingdom, the Central Kingdom and the Southern Kingdom. Ultimately, the Central Kingdom concurred the other two kingdoms, uniting the entire island. Thus, the independent Ryukyu Kingdom was formed. It maintained its independence until the beginning of the seventeenth century, when the Ryukyu Islands became subordinate to the Tokugawa shogunate.

Since the Gusuku period, the sun has been a symbol of those in power. Following the unification of the kingdom, the ritual of receiving sunlight continued to be performed by official priestesses. In the Ryukyu Islands, there is a traditional belief that women are more sacred than men. This belief is called *onarigami*, which means that men are guarded by their close female relatives, such as aunts or sisters.

During the establishment of the Shuri Dynasty, a gender division of roles developed: the king governed the kingdom, while women took on religious roles as priestesses. This type of dual kingship combines male political authority with female sacred power. The highest priestess was the Kikoe-ookimi, who was considered a kami to the king (Nakamatsu, 1992).

From Urasoe Castle, the foundation of the Ryukyu dynasty, the winter solstice sun can be seen rising behind Kudaka Island (Kojima, 1987). I myself observed this phenomenon on winter solstice day (Dec.22) in 2015. It is believed that this is why Kudaka Island was considered the holiest place in the Ryukyu dynasty, and the winter solstice ceremony was held there.

The *Seifa-Utaki* shrine is the most sacred, as it was here that the succession rite of the highest priestess, the Kikoe-ookimi, was held. *Seifa-Utaki* is located on the south-eastern coast of Okinawa Island, facing Kudaka Island.

During the succession ritual, the *Kikoe-ookimi*, was expected to arrive at the shrine in the evening. After praying at three altars at midnight, she was expected to sleep in a temporary palace in front of the shrine. Two golden pillows were prepared in her bed: one for her and another for the god, probably the sun god, who will come from Kudaka Island. It is said that when the first sunlight from Kudaka Island shines on the highest point of the rock formation, it marks the descent of the god to the shrine. This is understood of an example of a sacred marriage (Nakamatsu, 1992; Suetsugu, 1995; Goto 2021).

## **SUN STONE**

As discussed above, the sun was an important symbol of political power in the ideology of the royal court. Kume Island, located southwest of Okinawa Main Island, was an important stop on the trading route between the capital city of Shuri and China. A man of high status named *Donohiya* is known to have lived on this island. According to legend, he travelled to China, where he learnt about calendars and astronomy. Specializing in astronomy and navigation, *Donohiya* is said to have led the people by predicting the weather and seasons. This practice is called *Uteda-ugami*, meaning 'to worship or observe the sun.

There is a stone called "*Uteda-ishi*", meaning "sun stone". Legend has it that *Donohiya* used this stone to measure the sun's orbit. Grooves on the stone appear to indicate the position of the sun at sunrise during certain times of the year (Nakahara, 1990).

The stone is located on the northernmost peninsula of the island (Nakahara, 1990). It is situated far from *Donohiya's* residence because the peninsula is in an ideal position for observing the June and December solstices. From this location, the sun rises directly behind Aguni Island on the June solstice and behind Kuba Island on the December solstice (Figure 6). If the stone were situated elsewhere on the island, this alignment would not be possible.

I observed the June solstice sunrise from the stone on 22 June 2016. However, it was impossible to observe the December solstice sunrise from this location due to the dense vegetation.



Figure 2: Sun Stone, Kume Island.

Thus, in the Ryukyu Islands, people observed the rise and fall of stars, such as the Pleiades (discussed below), and the sun to determine the seasons and directions for everyday activities such as the solar calendar and navigation. Similar customs existed in other parts of Japan, as well as in Polynesia and Micronesia (Esteban, 2003; Kirch, 2004), prior to the introduction of the Gregorian calendar and the magnetic compass.

### **SHAMANISM AND THE CELESTIAL BODIES**

One of the most notable features of religion on Ryukyu Island is the minimal influence of Buddhism and Shintoism. In contrast, Okinawan religion is based on shamanism, in which women are considered more sacred than men and play a significant role in religious life. Shamans sent from the Ryukyu Kingdom were known as *noro*, or official priestesses (Higa, 1995).

Until it was banned by the government in 1899, it was customary for women in Okinawa to get hand tattoos called *hachiji*. These tattoos had various meanings, including marking girls' transition to adulthood, ensuring prosperity, and warding off evil spirits. The patterns varied by region, but some motifs may have been related to celestial bodies. For example, round patterns represented the moon, grid patterns represented the five stars, and the most common cross patterns were called *busu-gama*, meaning 'star marks'. Arrowhead-shaped patterns on the fingers were known as *yubi-bushi*, meaning 'finger stars' (Miyaji, 2020). This illustration was sketched by the French ethnologist Charles Haguenaaur.

In 1930, he spent about a month walking around Okinawa Island and making ethnographic recordings. His handwritten field notes had not been available for a long time, but have recently been reprinted in France as *Okinawa 1930*.

There is little direct evidence of the worship of celestial bodies in Okinawan shamanism. However, C. Haguenaaur's field notes suggest that shamans may have worshipped the Orion Belt. According to C. Haguenaaur, the *agari-mitsu-bushi* ritual, literally meaning 'three rising stars', was



performed at dawn on the first day of the lunar calendar, before the summer solstice, to celebrate the dragon boat race in advance.

A priestess performs a ritual on Santinmo Hill in Itoman City, which used to be a sacred shrine. Haguenaaur's sketch appears to depict the layout of a traditional Okinawan burial site. First, the priestess worships the *agari-mitsu-bushi*, meaning 'rising three stars', at the incense burner on the east side. Then, she worships the dragon god at the incense burner on the west side. Finally, she prayed to the gods of the nearby sacred places at the incense burners on the north and south sides (Kinjo, 2012).

In the Okinawan dialect, *agari*, which literally means 'rise', refers to the east. Therefore, the name of this constellation should be translated as 'eastern three stars', believed to refer to the three stars of Orion's Belt (Kitao, 2023). Today, several incense burners have been placed in the park. Among them, there is a trio of incense burners that appear to correspond to the three stars, but their orientations differ. It is possible that other incense burners on the eastern side were used for worshipping the Eastern Three Stars. However, information about which incense burner was used is somewhat confusing.



Figure 3 shows the incense burners in Santimo Park in Itoman today.

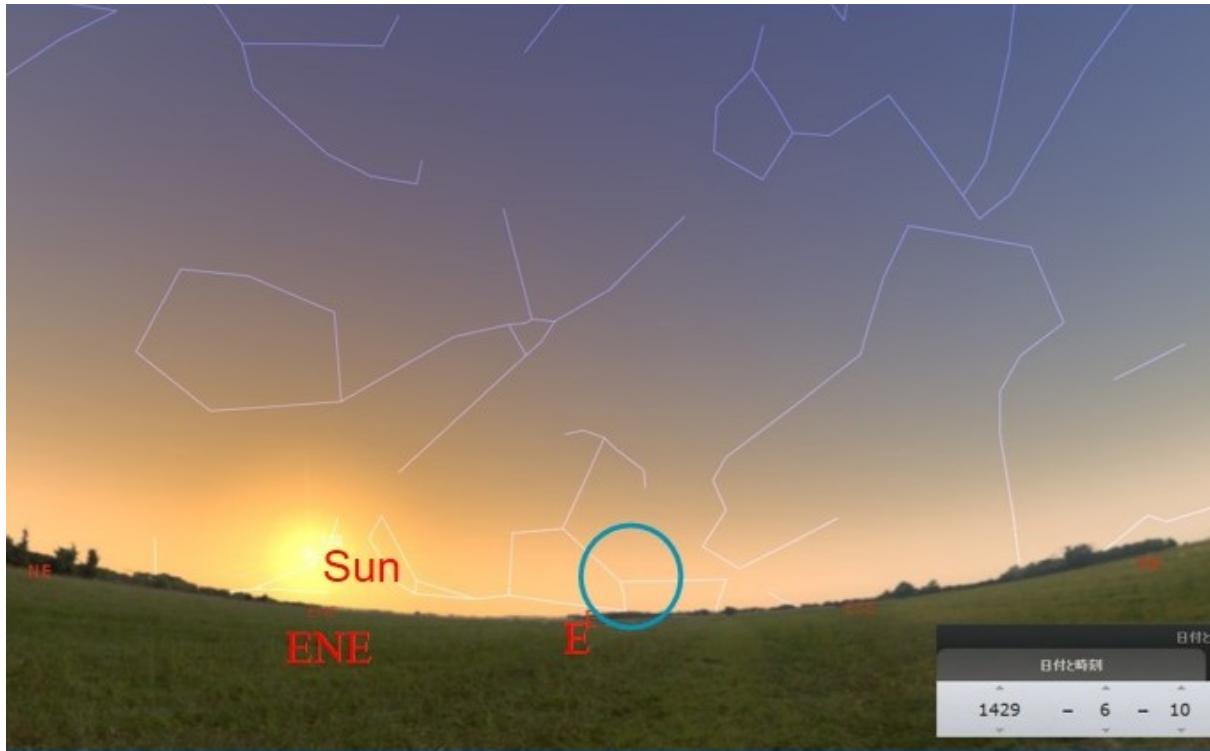


Figure 4 shows a simulated view of Orion's Belt at the summer solstice in 1429.

In any case, looking east from this location, you can see the direction in which the palace of the Southern Kingdom was located. Itoman City belonged to this kingdom. It is said that this park contains the tomb of King Tarumi. He was the last king of the Southern Kingdom. If we simulate the sky from 1429, the year when the king died, we can see that Orion's Belt rises almost simultaneously with the sun at the summer solstice to the east, slightly north of true east. Although the stars would probably have been invisible due to the sun's glare, it is possible that they worshipped the three stars rising with the summer solstice sun. (Figure 3: Simulated Orion).

*Tanabata* is the most famous example of Japanese star worship. This legend originates in China and tells the story of two lovers, *Hikoboshi* (Altair) and *Orihime* (Vega), who are separated by the Milky Way and meet only once a year on the seventh day of the seventh month of the lunar calendar. Festivals related to *Tanabata* are held throughout Japan and *Tanabata* shrines exist in several places. However, it is rare for Japanese people to actually gaze upon and worship Altair and Vega at that time. In this respect, the case of the Okinawan shamans who worshipped the three stars of Orion is significant.

## STARLORE IN THE RYUKYU ISLANDS

The Okinawa Oral History Centre's database contains over 70,000 oral histories. A search of the database yielded over 60 stories related to astronomy. Half of these are about the sun and moon, while the other half focus on various stars, including Polaris, Venus, the Pleiades, the Big Dipper (Northern Seven Stars), Sagittarius (Southern Six Stars), the Southern Cross and Centaurus.

Polaris is located in the north and hardly moves, making it a useful navigational reference point. It is also mentioned in folk songs and tales.

Some stories clearly originated in China. For instance, there are tales of the Northern Seven Stars (the Big Dipper) and the Southern Six Stars (Sagittarius) playing chess in heaven and deciding people's lifespans on Earth.

Other stories resemble popular Japanese tales. One such tale is about seven maidens who descended to Earth to bathe. A man stole one of the maidens' clothes and forced her to become his wife. Several years later, the maiden found the stolen clothes and ascended to the sky with her child. She was the eldest sister, but because she had been 'polluted' on Earth, she made the second sister the top star of the constellation (Alkaid). The eldest sister became Mizar, and the small star beside Mizar is her child. According to the Okinawa Oral History Centre database, there is also a version of the story in which the seven maidens are the Pleiades rather than the Big Dipper.

Legends of feathered robes are widely found throughout the world (Leavy 1995; Thompson 1946). In Indonesia, these stories are also used to explain the origins of kingship, but it is interesting that they are also related to the origins of constellations in the Ryukyu Islands

There are various stories about the Southern Cross known from Southeast Asia to India (International Editorial Team of Stars of East Asia, 2014). The Yaeyama Islands, where the Southern Cross is visible, have a sad story about a woman with four breasts. This tale is passed down on Ishigaki Island as the story of the Southern Cross and on Kuroshima Island as the tale of the two stars of Centaurus. These stars are called *hai-ga-bushi*, meaning 'Southern stars'.

The legend goes: Long ago, a woman with four breasts lived. Because she was so unusual, she was taken to the royal palace in Shuri on Okinawa's main island. Before she left, she said, 'If you see bright stars side by side in the southern sky in May or June, know that I have ascended to heaven.' She never returned. Since then, whenever people have seen these stars, they have known that the woman had died and become a goddess in the sky. These two stars,  $\alpha$  and  $\beta$  Centauri or  $\beta$  and  $\delta$  of the Southern Cross, can be seen horizontally from around 7:00 to 8:00 p.m. in May and June. This is the season for harvesting rice in Okinawa. When these stars set at dawn in winter, farmers know it is time to prepare the rice seedbed (Miyaji 2022: 126).

One of the summer stars is *iyutuyâ bushi*, meaning 'fish-fisherman-star'. The hooked shape of Scorpio resembles a fishhook. This concept is similar to that of the Polynesians, who saw Scorpio as the fishhook with which the demigod Maui fished up the islands. Similarly, fishermen in the Seto Inland Sea call Scorpio *uoturi-boshi*, meaning 'star for angling fish'.

The hooked shape of Scorpio was thought to resemble a fishhook. The red star Antares represents an old, drunken man with a red face using the fishhook to catch eels. The dark part of the Milky Way represents the eel (Miyaji, 2020: 40). This concept of viewing Scorpio as a fishhook is similar to beliefs in the Setouchi Inland Sea in western Japan. This is an interesting parallel to the Polynesian belief that Scorpio is the fishhook used by the demigod Maui to create the islands.

The Okinawan people call Vega *churaaguabusi*, meaning 'star of the beautiful lady', and Altair *mamakuwaabusi*, meaning star of the adoptive child. I am unsure why Altair is referred to as adoptive child, but this probably indicates that it rises alongside two smaller stars (Okinawa Oral History Center database).

### **SONG OF THE PLEIADES: WHY DO THE PLEIADES PASS THROUGH THE ZENITH?**

According to legend, this phenomenon occurs in the Yaeyama Islands, the southernmost location at which the Pleiades reach their zenith.

Legend has it that: Many years ago, farmers were burdened with heavy land taxes. Concerned about their plight, the King of Heaven ordered the Seven Sisters to rule the archipelago. However, they refused. The king then ordered the Southern Six Stars to rule the islands instead. Again, the stars refused.

The King of Heaven became angry. Then the constellation *Murikabushi*, meaning 'clustered stars' (the Pleiades), appeared before him and said, 'I will undertake the job.' Pleased, the King ordered *Murikabushi* to pass through the center of the sky. From then on, farmers could schedule



their activities by observing the position of these stars in the evening sky. As they returned home from working on their farms, they sang the *Murikabushi-yunta* song, also known as the 'Song of the Pleiades' (International Editorial Team of Stars of East Asia, 2014, pp. 70–72).

In the Yaeyama Islands, stones were erected to observe the altitude of the Pleiades. The stones on Ishigaki and Taketomi islands are called *hoshi-mi-ishi*, meaning 'star-observing stones'. People would sit in front of the stone and observe the altitude of the Pleiades either above the stone's top or through a hole in it. This observation was practised around November, when the Pleiades appeared on the eastern horizon in the evening. When the Pleiades reached a certain altitude in the eastern sky at twilight, farmers would begin sowing wheat.



Figure 5 shows star-observing stones on Ishigaki (left) and Taketomi (right) islands.

On Ishigaki Island, there is a sacred shrine called *Muribushi-Utaki*, meaning 'Pleiades Shrine'. According to legend, the shrine was formed after a girl witnessed a light descending from the Pleiades one night.

One night, a well-behaved girl saw a light descending from the Pleiades. As she witnessed this strange phenomenon every night, people went there to investigate. They found a circular mark in the white sand on the ground. They believed that this was where the gods had descended from heaven. They then built a shrine to worship the Pleiades as a fertility god. A ceremony is held every year to celebrate this sacred place, during which banners are used. A decoration representing the six stars of the Pleiades is placed at the top of each one (Miyaji 2020, pp.84–86).



## **THE ORIGIN OF STAR SAND**

The Yaeyama Islands Are Home To A Type Of White Sand Known As Hoshi-Zuna, Meaning 'Star Sand'. This Sand Is Made Up Of The Shells Of Foraminifera. There Is A Story About This Sand That Is Told On Taketomi Island.

Long Ago, A Heavenly Goddess Became Pregnant And Searched For A Place To Give Birth. She Found A Beautiful Beach On Taketomi Island, Where She Gave Birth. However, The Sea God Became Angry Because The Goddess Had Defiled The Sea. He Ordered Sea Snakes To Bite And Kill All The Babies. The Star Sand Is Said To Be The Remains Of Those Babies. Taking Pity On The Babies, The Goddess Instructed Humans To Place Star Sand In The Incense Burner At The Utaki Shrine. During The Annual Ritual, People Fill The Incense Burners With Star Sand And Light Them. The Smoke Then Rises To The Sky, Carrying The Babies' Souls To Their Mothers In Heaven (Miyaji, 2020, P.130). Star Sand Can Only Be Found On A Few Islands, Such As Taketomi Island. This Story Was Probably Passed Down Through The Lineage Of Taketomi Island Shamans To Provide A Meaning For The Ritual Of Burning Incense And Watching The Smoke Ascend To The Heavens.



Figure 6. Shrine for worshipping star sand, Taketomi Island

## **CONCLUSION**

Ruggles and Sounders argued that “the ways in which cultures perceive celestial objects and integrate them into their worldview” are diverse. Furthermore, they argue that society's view of and beliefs about the celestial sphere are inextricably linked to the realms of politics, economics, religion and ideology (Ruggles and Sounders, 1993 p.1). This chapter has demonstrated how concepts of the Sun and constellations are deeply integrated throughout Ryukyu Islands, from the rituals of the Ryukyu Kingdom to the beliefs and folktales of its ordinary people.

The main issues discussed in this paper will be summarized as follows:

- (1) The cultural astronomy of the Ryukyu Islands has maintained an independent domain within the long north-south stretch of the Japanese archipelago. For instance, the local names for the Pleiades are distinctive.
- (2) The Ryukyu Islands have unique shamanistic rituals, particularly those related to the Pleiades. There may also be rituals directed towards Orion.
- (3) The Ryukyu Islands' agricultural cycle differs from that of other parts of Japan as they belong to the subtropical zone. However, the Pleiades, Centaurus and the Southern Cross served as indicators for agricultural activities.
- (4) Some of the Ryukyu Islands' star-related legends are similar to those in Japan or China. Nevertheless, unique legends and folktales related to southern constellations such as Centaurus, Scorpio and Sagittarius, as well as the origin of stars, have been identified.

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