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CONSOLIDATION OF THE RAPANUI ASTRONOMY CONCEPT INVENTORY AND RE-APPRAISAL OF APPLIED ASTRONOMIC OBSERVATION AT PAPA UI HETU'U, RAPA NUI

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ABSTRACT

Rapa Nui, the easternmost settlement and most isolated trade outpost in ancient Polynesia, represents one of the most ambitious feats in Polynesian wayfinding, and by default reflects the high level of competence in navigation and interpretation of astronomical and natural phenomena, currently a popular field of inquiry in Polynesian ethnoastronomy. However, as skywatching was not limited to navigation, the full scope of Rapanui applied astronomical observation and complexity of astronomical devices was much broader. Observatories, calendric calibration systems, "star-maps," and structures with astronomical alignments, have all been identified for Rapa Nui, yet the two main challenges confronting researchers is the scarcity of extant information, as well as degradation and site location due to errors in the official mapping of the island. The present investigation re-examines and extends the Astronomy concept inventory of the ancient Rapanui, with regards to the toponymy of local stars and asterisms, and an inquiry into the stars and methods used by traditional navigators to locate Rapa Nui in past times. The results have been analyzed within both a local and regional context. In addition, our team did a re-appraisal of the astronomical functions of the Matariki (Pleiades) stone and related petroglyphs in the area of Papa Ui Hetu'u (star-gazing rock) on Poike Peninsula, which E. Edwards and Antonio Belmonte had investigated in 2004. For the first time, this collected data was evaluated within the context of a digital planetarium, permitting the review and identification of alignments between astronomical phenomena and sites of observation as if viewed in situ and in the pertinent chronology; together with photogrammetry/3D-modelling of astronomical devices at Papa Ui Hetu'u, these techniques offer a new and more precise line of research, rendering intriguing results.

KEYWORDS: archaeoastronomy, ethnoastronomy, toponymy, Easter Island, Rapa Nui, Polynesia, planetarium, 3D modelling

1. INTRODUCTION

The purpose of this paper is to consolidate the Rapanui Astronomy Concept Inventory mainly obtained from the works of Routledge (1911-1923; 1919) Englert (1974), and Métraux (n.d.; 1960), as well as the previous ethnographic research of E. Edwards (2010, 2013). Previous studies have built upon the works of Routledge and Métraux, which are invaluable but brief, and contain several inconsistencies due to the inaccurate interpretation of data. Routledge and Métraux collected ethnographic information from direct sources, however, subsequent scholars without access to the original material built upon the errors of their previous colleagues, incrementing and confirming fallacies, which upon closer inspection yielded an assembly of unreliable results. Based upon the field notes of both Routledge and Métraux, identifying errors, offering a few amendments, and hypothesizing on the correct interpretation of specific elements we were able to form a compendium of the terms used to designate different types of heavenly bodies (planets, asterisms, and individual stars), ultimately offering an updated and exhaustive list of Rapanui star names, as well as their meaning and cultural significance. Regarding Papa Ui Hetu'u, our team re-appraised the cultural features and landscape context of this observatory, adding alignments to the Pleiades (or June solstice) and the path of the stars that Polynesian navigators would have used to locate Rapa Nui.

2. PREVIOUS STUDIES AND METHODOLOGY

Of the many scholars that have worked on Rapa Nui only a few have covered the subject of ethnoastronomy. Ferdon (1961), Mulloy (1975), and Liller (1986, 1989, 1993, 2000, 2004) worked on the island between 1955-2004, however most of their work focused on *archaeoastronomy*, recording alignments between the famous Rapanui ruins and celestial phenomena, and less on the cultural aspect regarding the purpose behind these orientations beyond basic time-keeping. Excluding E. Edwards and his team, the few scholars that collected information about the names of stars and their significance in a cultural context are Routledge (1911-1923; 1919), followed by Englert (1974), and Métraux (n.d.; 1960). However, all of their collected data does not amount to much if presented individually. Routledge worked on Rapa Nui between 1914 and 1915. Her principal informants were Kapiera Maherenga and Parlemón Te Haha. Maherenga, once a competitor (*hopu manu*) in the Bird-man cult competitions was born ca. 1846 and was a member of the Ure o Hei clan via paternal descent and the Hamea Clan from his maternal side.

Maherenga provided most of the star names recorded by Routledge. Te Haha was born near Maunga Kou'a in approximately 1832. He was an *ariki paka* nobleman of the prestigious Miru clan and was a member of the noble entourage of paramount chief Ngaara. His nephew Charlie Teao was one of Métraux's principal informants. Another of Routledge's informant was José Fati (Hati) Rongo Pua Tea, Fati was the father of Isaías Fati, one of the main informants of Englert, Métraux, and E. Edwards.

Englert's main informants were the previously mentioned I. Fati, as well as Rafael Haoa, Mateo Hereveri, and Santiago Pakarati. Haoa was the informant for a host of present-day ethnographers working on Rapa Nui. Hereveri, a nobleman of the Miru clan was considered an authority regarding Rapanui lore. Hereveri was also an informant to E. Edwards. Pakarati was the son of Rapanui catechist Nicolás Pakarati Ure a Potahi (also an informant of Routledge and Métraux). Métraux's informants were Victoria Rapahango Tepuko and Charlie Teao. Rapahango was also a Miru Clan member and she had learned much from Mateo Hereveri and her uncle Parlemón Te Haha who had lived with her in her youth; both men had been informants of Routledge. Teao, was a nephew of Te Haha and a grandson of Tomenika Vaka Tuku Onge, also Routledge's informant.

For this paper we reviewed the original and published works of Routledge, Métraux, Englert, and E. Edwards, as well as the dictionaries of Tregear (1891) and Churchill (1912)

3. CULTURAL CONTEXT

The same as other Polynesians, the Rapanui visualized the celestial sphere as several superimposed heavens, which together with the stars and constellations were believed to be the abode of the gods. The careful observation of the sky was useful for navigation but also to determine the time of the year, establishing a ritual calendar and regulating farming and fishing activities. Astronomer priests or skywatchers studied the Moon and stars, and less often the Sun, from special observatories built in places with the best vantage point for each astronomic event, announcing when festivities, ceremonies, prohibitions, and the different seasons started and ended. A total of 58 alignments have been registered on Rapa Nui, with observatories (*tupa*) oriented to significant celestial markers, most to the Pleiades and Orion's Belt, but also Vega, Alpha Beta Centauri, in a North-South axis, etc....(Edwards and Belmonte 2004; Edwards and Edwards 2010). These constructions reflect a shared bank of knowledge that dates back to the Austronesian roots of the Rapanui people, and which evolved for very practical reasons:

subsistence, immigration and trade. Clark has calculated that “the probability of these alignments being accidental is 10,000,000 to 1.” (Edwards and Clark 1984).

Makemson (1941) recorded 772 star names elsewhere in Polynesia, and skywatching was taught in special schools. In Rapa Nui unfortunately much of this information did not survive the great cultural and social upheaval as a result of outside contact, colonization, and missionary proselytization.

Like other Polynesians, the Rapanui had an annual cycle of activities that determined what sort of chores and rituals people carried out during each month of the year, evidently linked to the weather and the seasons. Astronomical phenomena helped astronomer priests (skywatchers) determine the different times of the year, divided between periods of rain and drought, a season of plenty and of want. Since the chiefs were the medium by which deified ancestors provided for their descendants by making the plants grow and animals multiply, the entire clan ensured the success of their subsistence activities by making offerings and sacrifices to honor the gods in an agricultural cycle that in other Polynesian islands was called *Te Fekai Nga Atua* (the gods produce food; Edwards and Edwards 2013). The Rapanui diet depended mainly on agricultural products, chicken, and fish, in that order. The Rapanui carried out several rituals related to the planting and harvest of their most important crops. The harvest was important not only as related to food production and surplus, but through feasting and ceremonies it was also of great social and symbolic significance. Food-sharing expressed kinship ties and solidarity, and validated a set of principles, social codes, rights and duties. The opening of the deep-sea fishing season in October/November was also widely celebrated. It was imperative that the seasonal activities and feasts should be performed at the right and auspicious times, and that was the jurisdiction of skywatchers. Aside from the lunar months, specific annual activities and events were marked by the first appearance of specific stars at dusk and dawn. Since there was a fair amount of prediction involved in their work, these specialized priests also delved into the world of prophecy and magic.

4. RESULTS

Polynesians had names for over 700 stars, and it was believed that many of them were placed in the sky by the gods to simply humor humans while others were thought to be the eyes of deified ancestors (Makemson). This explains why several Polynesian star names include the term *mata*, meaning “eye” (Ibid). The generic Rapanui name for stars, asterisms, and constellations is *hetu'u*, a term with a

root common to all Polynesian languages, however, Eastern Polynesians grouped stars to form figures that differed from those of Western Polynesia with only the names of the most important calendar stars remaining constant, specifically the Pleiades (*Matariki*) and Orion (*Tautoru*; Makemson, Tregear, Churchill).

We were able to record 25 star names (three of which remain undetermined in relation to classic astronomy terms (*Mere*, *Ehuo/Ehua*, and *Pau*), in addition to the names for the Milky Way (*Te Ngo'e*), and Venus (various terms) and Mars (*Matamea*). We amended the designation of several Rapanui star names in relation to the previous concept inventory. We also added *Tau Ehu* for *Sirius*, and *Tauhoru* and *Hetu'u Tea* in addition to the existing names for Venus. Four “new” star names were added: *Atutahi*, *He Mata/Mataa Te Tautoru*, *Ehuo/Ehua*, and *Pipiri*, while two were deleted as a duplicates (*Vari Hariu/Horia* and *Hare a Tanga*). *Sirius* and *Vega* had multiple Rapanui names, which seems accurate for the latter, but may be a source error for the former. Orion's Belt on the other hand is both a constellation of six stars (*Etui* = Orion's Belt + Sheath), but is called *Tautoru* when referring only to the belt (Routledge n.d., Metraux n.d.). We also revised the translation of Rapanui stars names, some of which have more than one interpretation. A list of the complete and revised Rapanui astronomy concept inventory appears in Appendix 1. The table in Appendix 1 starts with the terms for the Milky Way, followed by the planets Mars and Venus, continuing with the names of fourteen asterisms and constellations, and ending with eleven single star names. These are presented in alphabetical order within each of their categories.

For the Rapanui, the Milky Way was a mythical marine creature, a non-fearsome sea monster of sorts. Regarding the planets, the Rapanui realized that Venus and Mars were different, that they do not twinkle, and move unlike stars, however the distinctions stopped there, with bright stars and planets both being called *hetu'u purapura* (Churchill).

As for the planets, only the Rapanui names for Venus and Mars survived to the present day, although it is likely that like other Polynesians they would have also recognized the other visible planets, namely Mercury, Saturn, and Jupiter (Makemson, Tregear).

Important time-keeping stars and asterisms were: *Matariki* (the Pleiades), *Nga Vaka* (Alpha and Beta Centauri), *Mere* (possibly *Vega*), *Tau Ehu* or *Te Pou o Te Rangi* (*Sirius*), and *Atutahi* (*Canopus*), as well as the constellation Orion, which the Rapanui divided into six separate parts: *E Tui* (Orion's Belt and sheath - 6 stars), *He Mata/Mataa te Tautoru* (*Bella-*

trix and probably Meissa and η Ori 1 and 2), Tautoru (Orion's Belt), Po'o or Po Roroa (Saiph), Rei a Tanga (Betelgeuse), and Vari Koreha (Rigel). Matamea (Mars) was also used as a calendar marker together with the Pleiades (Matariki), Orion's Belt (Tautoru), and Sirius (Tau Ehu or Te Pou o Te Rangi). The events that each of the above marked can be seen in Appendix 1. Other stars that stand out are Nga Vaka (Alpha and Beta Centauri), which in the Southern Hemisphere may be used to find the South cardinal position in relation to Crux (Tatauro), and Antares (Te Hau Vaero), the traditional star used to mark the latitude position of Rapa Nui in traditional Polynesian navigation when at its zenith; islands were marked by the brightest stars that passed directly above them and Antares may be seen at 89°19'07.5" over Rapa Nui.

Three out of 25 collected Rapanui star names include the word *mata*, which as mentioned previously, is characteristic of the Polynesians, who considered that some stars were the watchful eyes of important ancestors (Edwards and Edwards 2013). In addition, the planet Mars was called Matamea, but in this case it is probably best to interpret it in reference to color and the custom of visualizing stars as eyes, rather than it being the eye of a particular person.

5. OTHERS CONSIDERATIONS

In addition to star names we also collected a list of terms that are related to astronomical concepts, (from Churchill, Métraux n.d., and Englert). Many of these had not been recorded together before (see Table 1).

Table 1. Additional Rapanui Astronomy Terms

Rapanui Name	Translation	Comments	Source
Api te Mahina e te Ra'a	The Sun presses the Moon	A lunar eclipse?	3
Hetu'u Kokiri	Shooting star		1
Hetu'u Pupura	1. Planet or very bright star 2. -mai. To ogle, stare	Pupura is to shine bright	1 3
Hetu'u Rere	Meteor		1
Hetu'u Ave	Comet		2
Hetu'u Viri	Shooting star, meteor		2
Hiti	To rise (regarding the light of the moon, sun, stars)		2
Homo	Meteorite, meteoroid crater		2
Kai te Mahina e te Ra'a	The Sun eats the Moon	A lunar eclipse?	3
Kai te Ra'a e te Mahina	The Moon eats the Sun	A solar eclipse?	3
Kihi Ra'a	Ray of sunlight		3
Kihi Mahina	Moonbeam		3
Me'e Nui Te Hetu'u	Sky with many stars		3
Ruaroa	Tropic of Capricorn		3
Uero	Comet, twilight, a ray, radiant star		1
Verovero	To twinkle like the stars		1

Of the new terms listed above, there are a few that stand out because of their telling implications. First of all, there are several terms for different kinds of eclipses, all of them indicating that the Rapanui theorized that it was the sun and moon that caused eclipses. In addition, the word "*homo*" or meteoroid crater indicates that this event must have occurred on the island in past times, and perhaps more than once.

6. THE PAPA UI HETU'U OBSERVATORY.

In 1914, K. Routledge's informants told her that astronomer priests climbed Poike peninsula, on the Eastern headland of the island, during the lunar month of Tuaharo (February/March) to watch the rising of the Pleiades from Papa Ui Hetu'u (Figure 1), which in the Rapanui language means "rock to watch the stars from". Santiago Pakarati showed this boulder to E. Edwards in 1960, consisting of a basalt block of greyish color (Munsell chart 2.5Y-7/1) that probably originated in one of the lava flows located in the surrounding area that was purposely moved to its present location. The upper surface of

the boulder has 13 cupule-like depressions of different sizes and depths that most probably are a consequence of the natural cooling process of the lava and later erosion, but which locals have long considered to be akin to the Pleiades. In 2005, E. Edwards and A. Belmonte found that this spot was ideal for observing the heliacal rise of many important local calendric stars, as it is completely open towards the Eastern quadrant of the island.



Figure 1. Papa Ui Hetu'u

The boulder is located 178 m above sea level at 109°14'31. 80" W, 27°5'44. 21 S. It lies east of Pua Ka Tiki, the peak of Poike volcano. As it has an irregular shape, its approximate dimensions are: 1 m high by 1.5 m long and 0.80 m in width. It weighs approximately 300 kgs. The photogrammetric mould that we made of it appears in Figure 2.



Figure 2. Comparative images of the boulder known as Papa Ui Het'u--photograph on the left, and photogrammetry mould on the right, which highlights the distribution and depth of the cupules said to represent the Pleiades.

We proceeded to register the landscape's profile surrounding the Papa Ui Hetu'u site with a fisheye lens, and established several checkpoints upon the terrain, so we could later use it to correct the planetarium digital view (Stellarium, Figure 3).

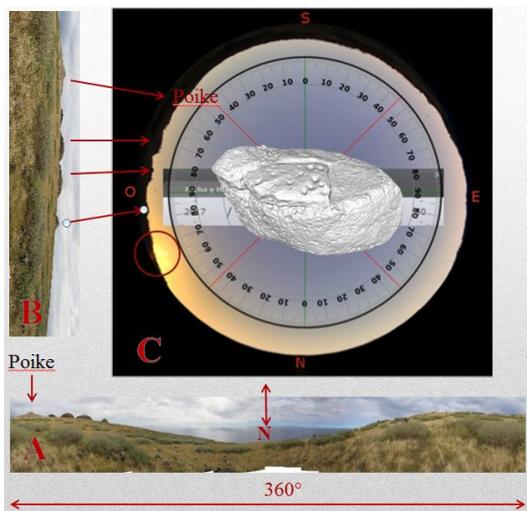


Figure 3. (A) development of the 360° panorama. (B) Important elements in its landscape. (C) Landscape profile with fisheye lens and mask used in the stellarium format. Installing the landscape profile in Stellarium and reproducing the observed event. Field check of the landscape profile altitude, plus the time, azimuth, and sunset on July 20, 2017.

This image was later edited in Photoshop and we then proceeded to erase completely the sky leaving only the profile and a transparent background. We then used this masked image in the profile of the digital planetarium and inserted into it the coordinates obtained from our GPS and reoriented the profile to show the most prominent elements of the landscape with the correct azimuth. Finally we verified the model to see if it adjusted to reality, by superposing an astronomic event, which in this case was the sunset of July 20, 2017, and check that the hour, elevation, and its profile, together with the height and azimuth of the Sun, were correct with the model. Using a Google Earth map, we proceeded to verify the area of the horizon that can be observed from there, and also to make sure that this adjusted to reality. This method served to locate in a more

exact manner all the cartographic elements contained in our profile.

We were interested in measuring the intervals between the angles and the azimuths observed on the nearly 180° wide landscape view from the stone, paying special attention to azimuths 302 and 116, while also checking if there was any relationship to the heliacal rising or setting of any important Rapanui calendar stars or the Pleiades as suggested in oral tradition (Figure 4).

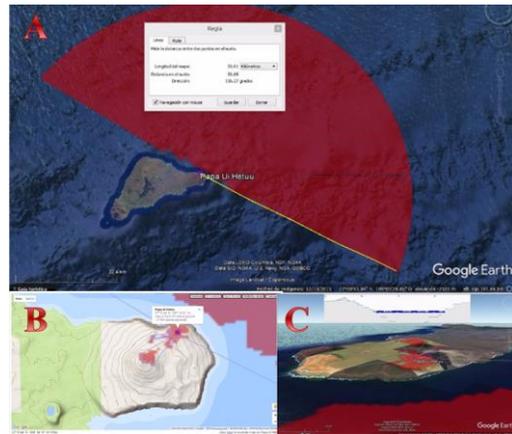


Figure 4. (A) Ocean view azimuths and intervals upon an oceanic horizon (B) Detail of the visible area of land and its geographic markers (C) Perspective view of the area that can be observed from Papa Ui hetu'u.

7. ANALYSIS OF THE CULTURAL EVENTS RELATED TO THIS SITE AND ITS PHYSICAL LOCATION

We carried out a basic survey of all the surrounding area to locate any contiguous archaeological remains, as well as specific places that could be associated with Rapanui cultural landscape.

On the East side there are three trachyte domes that are the most conspicuous elements in the landscape (Figure 5). On the northernmost dome, lie the remains of a disfigured statue (moai) with no platform or ahu, which is clearly visible from Papa Ui Hetu'u and may have been placed there intentionally. The southernmost dome is associated with several important oral traditions: on its southern foothill there is a cave that was the abode of a group of sky-watchers who lived permanently with their acolytes, while above and to the left of the cave there is a large rock carving called Vai a Heva (water of Heva) that consists of a face with a large protruding eye and a gaping mouth that served as a basin to collect rainwater. To the East, at a distance of approximately 200 m in an E-SE direction, lies a small basalt outcrop with several petroglyphs of fishhooks of different sizes and shape. These petroglyphs were previously registered by E. Edwards and G. Lee, and now we added a photogrammetric record of them (Figure 6).

Significantly, petroglyphs of fishhooks and deep sea creatures, such as tuna and shark, are also present in several Rapanui sites where skywatchers were known to observe the night sky.

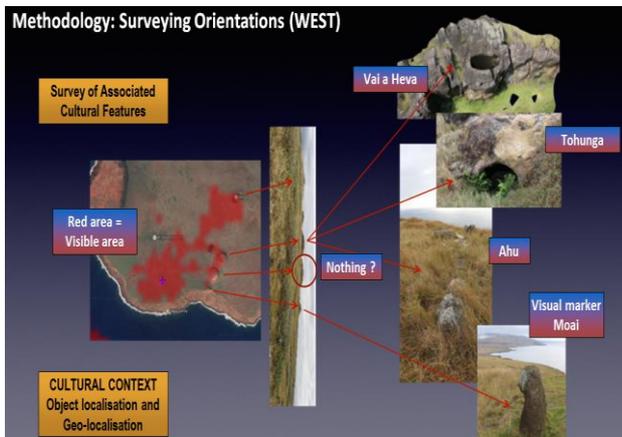


Figure 5. View from Papa Ui Hetu'u to the three trachyte domes in Poike; these were also exploited for trachyte and several small statues raised on platforms on the eastern headland of the island were sourced there.

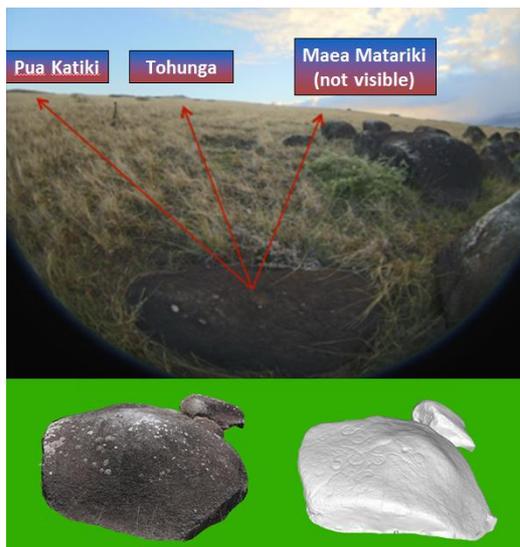


Figure 6. View towards Papa Ui Hetu'u as seen from the unnamed outcrop with fishhook petroglyphs. The cave where the skywatchers are said to have lived with their acolytes and the stone water basin known as Vai a Heva are also visible from this spot.

Lastly, to the Northeast there is a ceremonial platform that lies in a perfect East-West position. The relationship between the sites and/or significance of this emplacement remains to be determined.

8. ANALYSIS OF THE CULTURAL EVENTS RELATED TO THIS SITE AND ITS PHYSICAL LOCATION

By inputting our collected data into Stellarium we were able to determine the following:

There are two zenithal celestial objects that pass directly over Rapa Nui and Papa Ui Hetu'u. One is

Te Hau Vaero (Antares), and the other is Ko Tau Erua Ehu, which in our consolidation of star names we found to possibly represent Castor and Pollux or alternatively Wezen and Adhara, which are two bright stars in the Canis Major constellation. In past times, zenithal stars were known as pito (umbilicus) in many parts of Polynesia, and their path was considered to mark the umbilicus of the sky for the specific island that these stars passed directly over. Zenithal stars were of prime importance in traditional Polynesian navigation, serving to exactly locate each of the islands these stars marked. Interestingly, Antares is visible during the winter months, while Wezen and Adhara may be observed in the Summer, thus if Ko Tau Erua Ehu indeed refers to Wezen and Adhara it is possible to consider that traditional navigators would have been able to more easily locate Rapa Nui year-round. Now, determining what are the most propitious times of the year to travel to Rapa Nui from elsewhere in Polynesia is a subject of another study.

Most significantly, from Papa Ui Hetu'u it is possible to observe the entire path of the Pleiades from heliacal rising to heliacal setting. Such observations were very important to the ancient Rapanui as the first full Moon after the heliacal rising of the Pleiades marked the first night of the year and opened a time of festivities and island-wide rejoicing. This was also true in most of Polynesia. Due to the latitude of Rapa Nui, the Pleiades follow nearly the same trajectory of the path of the Sun on the June solstice. To determine approximately when the Rapanui new year began depends very much on the visible altitude of the Pleiades at the time of observation, which would have been in the very early morn, before sunrise. On Rapa Nui, the Pleiades disappear for a few months, becoming visible once again before sunrise in the last two weeks of June, considering that it is best observed the higher it is in the sky, 20-30 degrees degrees above the horizon. The Rapa Nui new year would have then begun on the first full Moon after this celestial event. Conversely, the observation of the Pleiades high in the sky shortly after sunset in November, marked the opening of the deep sea fishing season on Rapa Nui.

9. CONCLUSIONS

Although much has been lost regarding the astronomical knowledge of the ancient Rapanui, the extant names recorded here adeptly convey the breadth and richness of Rapanui mythology and calendrics. The stars that were remembered up to modern times were the most important ones, part of a complex annual cycle of activities, both ritual and practical. They also point to a knowledge base that hails back to the Lapita ancestors of the Rapanui, as

is the case with Matariki and Tautoru (i.e. the Pleiades and Orion's Belt), but also that places Rapa Nui within a contact network extending to the Tuamotu Islands and Tahiti (i.e. the moral tale regarding the repentant jealous husband and/or the selfish parents). It seems significant that an important number of Rapanui stars refer back to the legendary homeland of Hiva, and to its infamous persons and notable culture heroes. The same as elsewhere in Polynesia, Rapanui ethnoastronomy went beyond navigation, serving a religious purpose associated to a belief system that on Rapa Nui survived until the mid-nineteenth century. Evidently, the present Rapanui star concept inventory is incomplete as there must have been many more star names than those presented here. Nevertheless, we have compiled an exhaustive list, benefitting from a comparative analysis of the various ethnographic sources. The number of clarifications and amendments to the previous concept inventory serves as a reminder of the pitfalls of relying on secondary source materials when carrying out this sort of work. Considering the total number of compiled star names, it seems significant that we were able to add two entries and provide a much more accurate index of star names, even if a few items remain undetermined. Lastly, it is im-

portant to note that the multiplicity of particular star names is simply a sign of a healthy evolution of concepts, in accordance with cultural growth and in response to societal changes. In the case of dual meanings, oftentimes this is purposeful, in much the same way that the connotations of words in a verse, lend themselves to a poetic layering of meanings. Ethnoastronomy and the unique Rapanui idiosyncrasy deserve as much.

As the Poike peninsula forms the eastern headland of the island, it's location is a privileged place to observe the heliacal rise of certain celestial objects from the ocean. The rock known as Papa Ui Hetu'u undoubtedly was intentionally placed in that position and although its cupules are of natural origin, the islanders identified them with the Pleiades (Matariki) and believed they held some magical power (*mana*). This was most probably due to the fact that from that precise location it was possible to observe the rising and setting of the Pleiades, the foremost calendar stars of the Rapanui and all Polynesians. Diverse cultural remains located in the vicinity of this site, testify to the presence of specialized observers or skywatchers as mentioned in their oral traditions.

Appendix 1. The Rapanui astronomy concept inventory.

Rapanui Name	Translation	Star / Asterism	Comments	Source
Te Ngo'e	Fabulous Marine Creature	The Milky Way	A fabulous marine creature	<u>5</u>
Matamea	Red Eye	Mars	One "star" Observed from Poike Announced: start of Koro festival; egg hunt in Dec. with Matariki, Tau Ehu, & Tautoru Ominous with Pau and Tautoru appearing in Oct./Nov. Tuaurua refers to Venus (archaic) Presently Hetu'u Ahi-ahi	<u>2, 4</u>
Taurua or Hetu'u Tea, or Tauhoru and Hetu'u Ahi-ahi	Beautiful Two (Venus) and Evening Star	Venus	Tuaurua refers to Venus (archaic) Tauhoru is a historical name Presently Hetu'u Popohanga	<u>3, 6, 7</u>
Taurua or Hetu'u Tea, or Tauhoru and Hetu'u Popohanga	Beautiful Two (Venus) and Beautiful Bucking to & fro or Morning Star	Venus	Tuaurua refers to Venus (archaic) Tauhoru is a historical name Presently Hetu'u Popohanga	<u>3, 6, 7</u>
Ehuo or Ehua	-	-Undetermined-	A large constellation	<u>3</u>
E Tui	The Expelled	Orion's belt and sheath	Six stars	<u>2, 3</u>
He Mata Te Tautoru	The Eyes of the Beautiful Three	Bellatrix and possibly Meissa and η Ori 1 and 2	Two "stars"	<u>2, 6</u>
He Kete	Basket	Possibly Aldebaran and Δ, θ, ϵ Tauri or Pegasus	Four stars	<u>2, 6</u>
Ko Tau Erua Ehu	Two Beautiful Firebrands	Possibly Castor and Pollux or Wezen and Adhara	Two stars near Canis Major W&A: Antagonic to Antares, zenithal star?	<u>2, 3, 6</u>
Ko Toe Ko Peu Renga	Wake of the Fine Pickaxe/Energy	Menkalinan and Capella	Rnga is energy, but also to paint something yellow or red (sacredness)	<u>2, 5, 7</u>
Matariki	The Small Eyes or The Eyes of the Chief	The Pleiades	Six stars Announced: New Year; first harvests; bountiful season; Bird-man races; egg hunt in Dec. with Matamea, Tau Ehu, and Tautoru	<u>2</u>
Pipiri	The Deprived	Clustered star pair on the tail end of Scorpius	May have marked the December season	<u>1, 2, 4, 5, 8, 9</u>

Nga Rau Hiva	The Sprout from Hiva <i>or</i> Twins <i>or</i> The Weak	The Hyades	Hiva = Rapanui homeland	<u>6</u> , <u>3</u> , <u>5</u>
Nga Toa Rere Nga Vaka	The Flying Sugarcane The Canoes	Stars in Ursa Major Alpha & Beta Centauri	- Important for navigation Canoes of founders	<u>6</u> <u>2</u> , <u>5</u>
Taura Nukunuku Tautoru	The <i>Nukunuku</i> Rope The Three Handsome Ones	Procyon and Gomeisa Orion's Belt	Two stars Three stars Announced: colder rainy season (with Tau Ehu); start of Paina festivals; egg hunt (with Matariki and Tau Ehu); time for planting Legendary father and 2 sons (from Hiva)	<u>2</u> , <u>6</u> <u>2</u>
Tatauro	Cross	Crux	Te Tatauro (modern name) Four to five stars	<u>2</u>
Atutahi	The Wayward One <i>or</i> The First Apprentice	Probably Canopus	End of Paina (with Tautoru) Start of the planting season The first of all stars, chief of the others	<u>1</u> , <u>3</u> , <u>3</u> , <u>6</u>
Ko Para Tahiri	Tahiri's Club <i>or</i> Para's Fan, <i>or</i> Decayed Fan	Probably Arcturus	-	<u>3</u> , <u>6</u>
Ko Te Mata Pu/Po Nui Mere	Eye With a Big Hole/Darkness Voice of Joy	Spica –Undetermined– Some possibility it was Vega <i>or</i> Corvus	- If Vega, marked: Opening of the eel fishing season and ritual tattooing at Orongo	<u>6</u> <u>1</u> , <u>3</u> <u>6</u> , <u>7</u>
Pau	Open Piercing	–Undetermined–	Probably one star Announced: Ill-omen when appearing in Oct./Nov. with Tautoru and Matamea	<u>3</u> , <u>4</u> , <u>6</u>
Po'o or Po Rongo	O Rongo's Darkness	Probably Achernar	-	<u>6</u>
Po'o or Po Roroa	The Great Darkness/Infinity	Saiph	-	<u>2</u>
Rei a Tanga	Tanga's Breastplate	Betelgeuse	Wife and mother of men of Tautoru	<u>2</u>
Tau Ehu <i>or</i> Te Pou o Te Rangi	Beautiful Firebrand <i>or</i> The Post of the Sky	Sirius	Announced: colder rainy season with Tautoru; Dec. egg hunt with Matariki and Tautoru	<u>2</u> , <u>3</u> , <u>6</u>
Te Hau Vaero	Roostertail Feather Headdress	Antares	Rapanui zenithal star?	<u>2</u> , <u>6</u>
Vari Koreha	Fearsome Eel/Centipede Curling Into a Circle	Rigel	-	<u>2</u> , <u>6</u>

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