

Nā Inoa Hōkū
Hawaiian and Pacific Star Names
Third Edition

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Supplementary materials

APPENDIX III
Comparative Study of Calendar and Compass Stars

pp. 23–70 of the first edition of *Nā Inoa Hōkū*
plus appendix (pp. 154–155)
and bibliography (pp. 170A–170E)

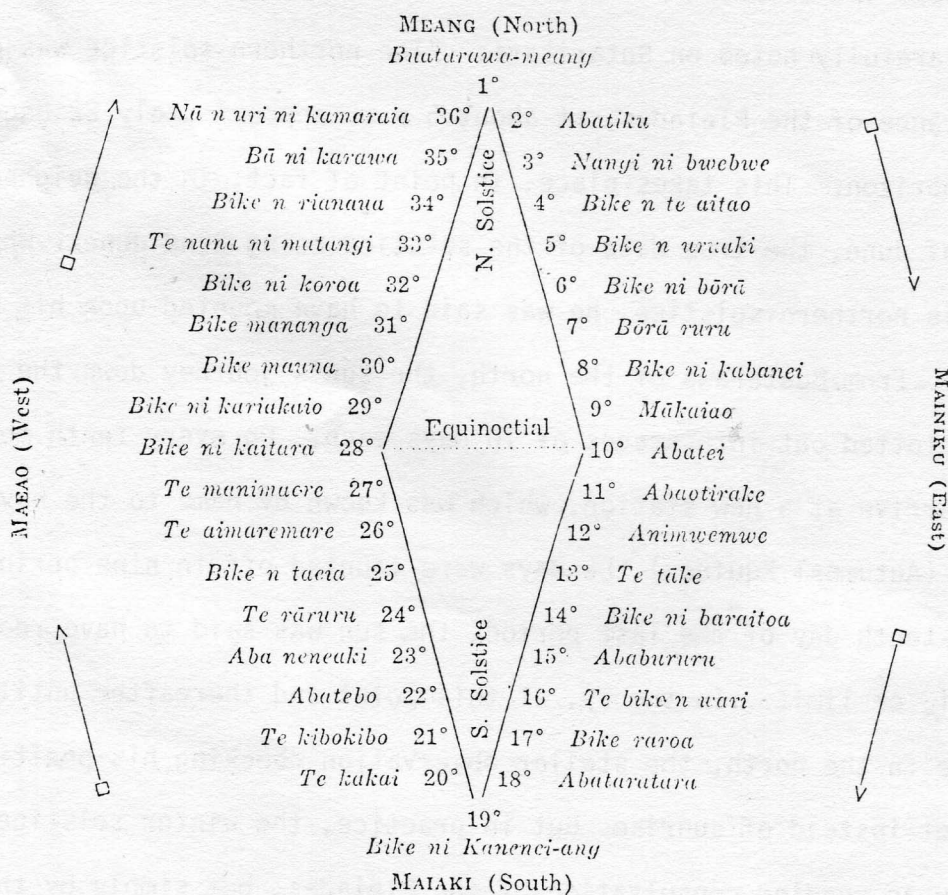
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Note: pp. 66 and 170E contain pencil annotations, apparently by RKJ

II. The Calendar Stars

How does one account for the significantly larger proportion of Hawaiian star names remaining in a list of disturbing "no data" files? Analysis of the data remaining for unidentified stars reveals another important factor, that of time-keeping. Stars used for calendar computation based on the ten-day week, the anahulu, expanded into a month of three anahulu, irrespective of the lunar calendar, and 36-anahulu year (makahiki) may well have belonged to a system commonly employed for keeping track of time and for apportioning space into a sidereal compass.

A similar method of computation is found in the Gilbert Islands (Micronesia). The sun was said to pass through 36 "stations" each year. These "stations" were computed in 10-day intervals but were not named for star positions. The apparent movement of the sun to the northward and southward of the equator was carefully noted on Butaritari: "The northern solstice was determined by the appearance of the Pleiades, at about 5 a.m. approximately 22 degrees above the eastern horizon. This takes place, in point of fact, in the neighbourhood of the 25th of June, the true date of the solstice being 22nd June...While the sun was at his northern solstice, he was said to have mounted upon his Buatarawa of the north...From Buatarawa of the north, the sun's journey down the eastern horizon was plotted out into stages of 10 days each. On every tenth morning he was said to arrive at a new station, which was known by name to the navigator... From Kaitara (Autumnal Equinox) the days were counted off in nine periods of ten. On the tenth day of the last period, the sun was said to have reached his southern toki, or limit...In theory, at this point and thereafter until his arrival once more in the north, the stellar observation checking his position was now made at sunset instead of sunrise. But in practice, the winter solstice was calculated, not by an evening consultation of the Pleiades, but simply by the count of ninety days from the time of the autumnal equinox...From the southern point again

the sun was said to proceed, by nine stages of ten days each, up the western horizon until he again reached the Kaitara, or equinoctial...the western Kaitara, or vernal equinox, was also checked by a supplementary observation of the star Antares just before dawn...that is to say, when Antares is about 9-12 degrees past the meridian at 5 a.m...and so from the Bike ni kaitara northward up the western horizon the sun's stations were counted as before, the last period of ten days being shortened or lengthened as the case might demand, when an observation of the Pleiades (in the morning once more), indicated that the luminary had returned to his original starting-point, the Buatarawa-meang... The following is a sketch of the diagram made by Biria of sticks and pebbles laid on the floor, to illustrate the principles set forth above. The sticks represent the horizon, the pebbles the ten-day stages, to which I have appended the names enumerated by my informant. The circles after the numbers 1-36 represent the pebbles:



[Grimble, 1922: 197-205]

The ten-day basis for computing the year of 36 weeks has been documented for Egypt, China, Java, and Hawaii. For Babylonia and Egypt from which the system eventually spread to Greece this calculation corresponded to the use of the 36 Decani, or the Decan stars:

"Other divisions of the sky, somewhat analogous to these*, were the Decans of the Chaldeans, Egyptians, and Greeks, 'belts of stars extending round the heavens, the risings of which followed each other by ten days or so,' but of much greater extent north and south than the Lunar Mansions, and thirty-six in number instead of twenty-eight. Miss Clerke writes of them: The Chaldeans chose three stars in each sign to be the 'councillor gods' of the planets. These were called by the Greeks 'decans', because ten degrees of the ecliptic and ten days of the year were presided over by each. The college of the decans was conceived as moving, by their annual risings and settings, in an 'eternal circuit' between the infernal and supernal regions" [Allen, 1963: 9].

The twelve constellation signs of the zodiac were divided into 3 decans or 30 degrees, each decan representing 10 degrees [Murray, 1807: 85]. There were thus 36 decanate points in the division of the ecliptic into a 360° circle. The sidereal year was calculated on the time it took the sun to complete one passage through twelve constellations along the ecliptic (the zodiacal path) to the star where it had begun.

Assyrian records list 36 names of stars or constellations, three for each month, of which every first one is clearly related to the heliacal rising in that month, as the Ram and the Whale (Dilgan, Nissanu); Mulmul (Pleiades); Sibziannu (Orion) in Simannu [Pannekoek, 1961: 21-31]. According to Babylonian myth Merodach (Jupiter), having fixed the stars of the zodiac, made three stars for each month. Scholars are of the opinion that the leading stars of three constellations are referred to, viz: (1) the central or zodiacal constellations, (2) the northern constellations, and (3) the southern constellations. There was * [i.e., the lunar mansions].

thus a scheme of thirty-six constellations...The three constellations associated with each month had each a symbolic significance: they reflected the characters of their months. At the height of the rainy season, for instance, the month of Ramman, the thunder god, was presided over by the zodiacal constellation of the water urn, the northern constellation "Fish of the Canal", and the southern "the Horse" [Mackenzie, n.d.: 287-309].

The appearance of the decan system in Greece has been credited to the Phoenicians who studied the stars relative to navigation and were probably the link between Babylonia and Greece, as Homer wrote, "the stars were sent by Zeus as portents for mariners." The decans were noted in Greece before the 6th century B.C., each as per their predecessors, ruling a ten-day period as follows:

The Decans (Greek)*

Northern	Zodiacal	Southern
Cassiopeia	Aries	Eridanus
Auriga	Taurus	Orion
Cepheus	Gemini	Canis Major
Ursa Minor	Cancer	Argo
Ursa Major	Leo	Hydra-Crater
Boötes	Virgo	Corvus
Ophiuchus	Libra	Centaurus
Hercules	Scorpio	Lupus
Lyra	Sagittarius	Ara
Aquila	Capricorn	?
Pegasus	Aquarius	Piscis Australis
Andromeda	Pisces	Cetus

[Jobes, 1964: 277-278]

Another list by Eudoxus of Cnidus was found in the work by Aratus (270 B.C.) using 44 constellations, adding Draco, Perseus, Triangulum, Delphinus, Cygnus, Sagitta, Corona, the Pleiades, Lepus. These were increased by Hipparchus to 48 in 150 B.C. In 200 A.D. Ptolemy catalogued these in the Almagest:

* [The spellings of constellations in this list are per the source consulted. They do not reflect the currently accepted forms used by astronomers].

The Decans (Ptolemy)

Northern	Zodiacal	Southern
Ursa Minor	Aries	Cetus
Ursa Major	Taurus	Orion
Draco	Gemini	Eridanus
Cepheus	Cancer	Lepus
Boötes	Leo	Canis Major
Corona Borealis	Virgo	Canis Minor
Hercules	Libra	Argo
Lyra	Scorpio	Hydra
Cygnus	Sagittarius	Crater
Cassiopeia	Capricorn	Corvus
Perseus	Aquarius	Centaurus
Auriga	Pisces	Lupus

[Jobes, 1964: 277-278]

Thus far most discussion on the matter of the Decan stars relates their origin to Babylonia, rather than Egypt although concrete evidence for the position of the Decans relative to the zodiac has been documented from the temple of Hathor at Denderah: "In the rock sepulchres and on the lids of the mummy caskets lists are formed of the so-called 'decans', 10-day periods or weeks, sections of the months, each under the protection of a deity represented by a star or star group. The structure of these lists points to their use for determining the night hour...There are pictures of numerous human and animal figures which probably represent constellations; but the stars themselves are missing, since only the celestial beings depicted here were of real importance to man" [Pannekoek, 1961: 84].

The most complete information on the possible identification of the Decan stars is from reconstructed evidence based on translations from cuneiform of the Babylonian creation epic in which there is a reference to the twelve months of the year, for each of which Merodach (Jupiter) fixed three stars or constellations. As an aid to the identity of these decan stars, there exist in the British Museum fragments of astrolabes recovered in excavation. These are arranged "in concentric circles, the outermost containing the name of a month,

a star or constellation, and a number; the second the name of another star or constellation, accompanied by a number half the value of the first; and the third a star or constellation, and a number half the value of that of the second row. There are, therefore, three stars or constellations for each month, corresponding with the statement in the Babylonian Creation-Story...Taking these fragments as a base...restoring the names of the remaining stars or constellations and the numbers in accordance with the system that the astrolabe seemed to indicate...a system was drawn up in which the stars or constellations there enumerated were arranged:

The Decans (Babylonia)

Months (Contellations)	Stars	Numerical Value
Nisan (20th March) (Aries, the Ram)	1. Dili-gana (Iku, the Water Channel; Alpha Arietes, or Hamal [Allen: 180]; or Alpha Lyrae, Vega [Allen: 285]; at the vernal equinox before 1730 B.C., Capella in Auriga.	200
	2. Dili-bat (Nabat, "She who proclaims")	100
	3. Apin (Ansara), The Channel: Beta, Delta, Kappa Aquarii in the lunar station Apin [Allen: 53]	50
Iyyar (20th April) (Taurus, the Bull)	1. Mula (probably Mulmul, the Pleiades [Pannekoek, 1961: 31]	220
	2. Sugi (Alpha Carinae in Argo [Allen: 71]); 110 or the Euphratean Chariot Yoke in Libra: Alpha and Beta Librae [Allen: 274-276]	110
	3. Anu-ni-tu: Lambda Sagittarii; or Kaus Borealis (Anu-ni-tum), the Northern part of the Bow, associated with Ishtar [Allen: 359]; also Delta Sagittarii, Kaus Meridionalis, the Middle of the Bow [Allen: 358]; Eridanus.	55
Sivan (21st May) (Gemini, the Twins)	1. Sib-zi-na: Alpha and Eta Boötis, Arcturus and Muphid [Allen: 101, 104]	240
	2. Ur-a (Ur-gula, the great Dog, confused with Leo the Lion; Canis Major; Uru- anna, supposed derivation of Orion [Allen: 304].	120

Months (Constellations)	Stars	Numerical Value
Sivan (continued)	3. Nagar (probably Nagar-asagga, Cancer [Allen: 108])	60
Tammuz (21st June) (Cancer, the Crab)	1. Dusiba (Kakkab mesre, "star of prosperity"; Sirius (Dushisha), the Director, in Assyrian Mesrie [Kalb al Akbar], Canis Major.	220
	2. Mas-tab-ba ("the Twins"); Epsilon Geminorum, Mabsutāt; Al Maisan, Gamma Geminorum; Makbu'dah, Zeta Geminorum [Allen: 234-235]; or Alpha & Gamma Orionis.	110
	3. Al-tara	55
Ab (22nd July) (Leo the Lion)	1. Pan, or Ba ("The Bow", Ishtar of Babylon); Sagittarius [Allen: 354]	200
	2. Mas-tab-ba-gal-gala (the Great Twins, Castor & Pollux), same as Lugal-girra, Meslan-ta-ea; Sin & Nergal [Allen: 354]	110
	Nergal: Sagittarius (in Akkadian, Ban, the Arrow [Allen: 354].	
	3. Mar-gid-da (the Wagon)	50
Elul (23rd August) (Virgo, the Virgin)	1. Biri (Anu and Anatu, Ansara between them).	180
	2. Ug-ga (variant, arabu, "the Raven").	90
	3. Su(?) -pa; Akkadian lunar station in Gemini [Allen: 116]; Queen of the Igigi.	45
Tisri (23rd September) (Libra, the Balance)	1. Nin-maha (Queen of the Gods).	160
	2. Zi-ba-ni-tum ("the Lords of the Sun"); a lunar asterism in Libra [Allen: 276]	80
	3. En-te-na-mas-lum (the weapon of the star); 40 Alpha 1 and 2 Librae; Beta & Gamma Hydra Star of the tail-tip; Upsilon or Gamma Scorpio [Allen, 248, 276, 369]	40
Marcheswan (23rd Oct.) (Scorpio, Scorpion)	1. Ur-bat (Beast of Death in Akkadian [Allen 278], Lupus; in Euphrates, Antares [Allen: 366]	140
	2. Gir-tab (Father of Heaven and Earth); Iota, Kappa, Lambda, Upsilon, Delta Scorpii in the lunar zodiac. [Allen: 369].	70

Months (Constellations)	Stars	Numerical Value
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Marcheswan (continued)	3. Lugala (King, Lord of the Igigi); probably Lugal Tudda, Dar Lugal, god of lightning: Antares [Allen: 366]	35
Chisleu (22nd Nov.) (Sagittarius, Archer)	1. Mustabarru mutanu (mutu, Death)	120
	2. Ud-gu-du-a (the god Mustabarru mutanu, "forecaster of death"; Sagittarius [Allen: 354]; same as Utucagaba; Udkagaba, Lepus or Sagittarius [Allen: 265].	60
	3. Uz: Akkadian stars in Capricorn [Allen: 140]; Alpha Capricornus, Uz the Goat; Alpha, Beta, Nu Capricornum.	30
Tebet (21st December) (Capricornus, Ea's Goatfish)	1. Gu-la (Lord of Death, God of Ea) Alpha Orionis, Betelgeuse [Allen: 311].	140
	2. Al-lul (the Seat of God)	70
	3. Ti (the Hero of Igigi), the Eagle	35
Sebat (19th January) (Aquarius, God with the Water-Urn)	1. Nu-mus-da (Adu and Marduk)	160
	2. Nam-maha (Father of the Stream)	80
	3. Da-mu	40
Adar (18th February) (Pisces, the Fishes)	1. Ku (The Fish, the triple god, Ea) Alpha Arietes, Aldebaran.	180
	2. Lula (The Lord causing to stand)	90
	3. Amaruduk (The King, God of the Igig, Merodach)	45

[Reconstructed from Pinches, T.G., 1900: 571-577; Mackenzie, n.d.:308; Allen, 1963]

The Decani were also known by the Egyptians who "had noticed the rise, culmination, and setting of the stars. Among the constellations they attached special importance to those which they saw at fixed times sinking toward the horizon, disappearing, and then imperceptibly taking their original place after this disappearance. The 36 decades of the 12 months were placed under the protection of a number corresponding to these constellations when situated on the horizon. Hephaestion (4th cent. A.D.) has given in Greek a list of their names, the comparison of which with the Egyptian monuments has established greater exactness. For a long time Egyptologists thought that their invention belonged to the Theban epoch. They were found at Abydos, at the Ramesseum, at the tomb of Seti I, in that of Rameses IV., then on the sarcophagus of Nectanebo, in the temples of Edfu, Esneh, Denderah, etc. The discovery of sarcophagi with texts of the Middle Empire has led to their recovery, with extremely curious details, as early as the Xth dynasty at least (coffin of Masahiti, and fragments of coffins of Akhmim). It seems certain...that allusion is made to them in the pre-historic formulae of the Texts of the Pyramids. Each of the three decani of the month presides in turn over the decade of the head (tapi) of the month, that of the heart (abi), and that of the hind portion (pahu). Their variants and variations, as well as the remnants of time when the decani combine with the influences of the planets laid bare ...a vast region for special studies" [Hastings, 1910: 100].

While Babylonian influences, transmitted by Greece, brought into Egypt the generalization of the use of signs of the zodiac, admitting in a general way that the zodiacs were unknown in Egypt before the Graeco-Roman period, their elements, "nevertheless, are found on the tomb of Seti I. They figure on a certain number of sarcophagi of the Saite epoch, or previous to the Greek period (cf. British Museum, No. 6678). Lastly, there are real indications that the signs of the zodiac were known and used as early as the first Theban Empire, according to certain allusions in the funerary texts, which have not yet been carefully studied " [Hastings, 1910: 100].

Ten-day week calculations have been documented for Egypt about 4000 B.C.:

"In regard to the week, we find a similar contrast between the practice in Chaldea, i.e., among the nomadic and West Semitic tribes, and that of the Babylonian state religion, in which the worship, not of the moon, but of Shamash and Marduk, was the dominant factor. As has been ingeniously argued by Sayce--with the independent support of Winckler and Jensen--from early Assyrian contract tablets found in Cappadocia, the most ancient division of the month was into weeks of five days, the year accordingly having 72 weeks (which presupposes, moreover, a year of 360 instead of 354 days), as was also the case in ancient Egypt, where a week of ten days--originally, no doubt, a double-week of 2 X 5 days--was recognized. The uniform months (abudu) were divided into three periods of ten days.... The most probable supposition, then, if we want a hypothetical history of the Egyptian calendar, is that the lunar year or the 13 sidereal months was originally followed by an epagomenal month. The use of the numeration by ten, and especially the need for practical symmetrical divisions, naturally led (but undoubtedly much later) to the creation of the month of thirty days, which, owing to its artificial character, corresponding neither to the sun nor to the moon, denotes a distinct step in advance. The fraction remaining to be harmonized was thus reduced to the five epagomenal days...We find these epagomenal days in the very earliest mentions of the calendar. The first Egyptologists for a long time believed that the invention did not go further back than the XIIth dynasty. It is now proved that these five days over and above the year (haru duait hiru ronpit) existed not only under the Memphite Empire but long before, since mention is made of them in the Texts of the Pyramids (Pepi 2, line 754). This, to all appearance, carries them back to the pre-historic period, and it is quite incorrect to ascribe the 'invention by Thoth playing chess with the moon...has shown that the legend existed in its essential features in the time of the Thebans, and the Texts of the Pyramids have carried it back to the very beginnings of Egyptian mythology...This calendar has justly been cited with admiration, and classed with those which mark most clearly

the height reached by ancient civilizations; and Breasted (Ancient Records, p.5) was right in pointing out the immense advance it was for humanity...far superior to the lunar year of Chaldea..."[Hastings, 1910: 76-94.

The 36 Decan stars were carved on the planisphere at Denderah representing the zodiac. It is a late sculpture dating from 34 B.C. in the time of Tiberius and Cleopatra but shows the heavens of many centuries previous, possibly between 1700 and 700 B.C. (acc. Biot, Brugsch) and probably copied from works of Sargon's time [Allen, 1963: 109].



Figure 1: Zodiacal Planisphere at Denderah, Egypt.

The figure of the circular zodiac of Denderah was on the ceiling of an upper room of the temple dedicated to Isis, the Tentyris (Greek) or Tentore (Coptic), names derived from Tan-ta-rer of ancient Egypt, Land of the Hippopotamus. The outer circle of figures, moving counterclockwise like the stars, represent the 36 decans, or 10-day weeks of the Egyptian year; the twelve arms of the supporting figures, the twelve months of the year [Tompkins, 1971: 171].

The computation of 36 ten-day weeks to the year without reference to the Decan stars may be observed among the Shang in China about 2000 B.C.: "The unit of a ten-day period was used by the Shang people as we today use the seven-day week. Since divination was performed every ten days, there must have been 36 such divinations each year. This practice seems to have been a tradition continued throughout the reigns of all the kings of the Shang Dynasty" [Tsien, 1962: 29-30].

Scholars are divided on the question of relationship between the Chinese zodiac and the Babylonian, as to whether the former was derived from the latter. If the similarities which exist between the Arabian, Indian, and Chinese lunar stations are any indication of relationship, there is a very strong possibility that all three have been influenced by an older tradition, probably Babylonian.

The Lunar Stations

Hindu (nakshatra)	Arabic (manzil)	Chinese (hsiu)	Sumero-Akkadian
1. Asrini (Beta, Gamma Arietes)	1. Alsharatan (Beta, Gamma Arietes) A'ashrat, Al Nath (The Horn)	. Lou (Alpha, Beta Gamma Arietes)	3. Gam: Sheratan (Aries)
2. Barani (Musca Borealis)	2. Abutain (Epsilon, Delta, Pi Arietes)	. Wei (Musca Borealis)	
			4. Mas-tab-ba-gal- gal-la (Pleiades, Hyades, Aldebaran)

Hindu (nakshatra)	Arabic (manzil)	Chinese (hsiu)	Sumero-Akkadian
3. Krittika (Eta Taurii)	3. Althurraya (Pleiades, 6 stars)	18. Mao (Pleiades: Cock, Hen)	
4. Rohini (Alpha Taurii, Aldebaran)	4. Aldebaran (Alpha Taurii, also called Alfa- na)	19. Pi (Hyades; Rho and Upsilon Taurii)	
5. Mrgasiras (Lambda Ori- onis)	5. Alhah'a (Lambda, Phi' and Phi" Ori- onis; Gamma and Lambda Orionis)	20. Tzu (Tau and Phi Orionis)	5. Meissa and Phi Orionis
6. Ardra (Alpha Orionis)	6. Alhana' (Lambda, Epsilon Geminorum, foot of the second twin)	21. Ts'an (Alpha, Beta, Lambda, Delta Epsilon, Xi, Eta, Kappa Orionis)	6. Lugal: Betelgeuse
7. Punarvasu (Beta Gemin- orum)	7. Aldhura (Alpha, Beta Geminorum)	22. Ching (four stars in the feet of Gemini) The Tapir	7. Khi-galla: Alhena (Gemini)
8. Pushya or Tishiya (Delta Cancri)	8. Alnatha (Praesepe; Aselli; Epsilon Gamma, Delta Cancri)	23. Kwei (Gamma, Delta Eta, Theta Cancri): Goat, Sheep	8. Palura (Procyon, in Canis Major)
9. Aslisha (Alpha Cancri)	9. Altarf (Eye of Leo)	24. Leu (Delta, Epsi- lon, Xi, Eta, Rho, Sigma, Omega Hydrae)	9. Supa-Beli-sa-pan- matari-i-simmu (Gemini)
10. Magha (Alpha Leonis)	10. Aljabha (Zeta, Gamma, Eta, Alpha Leonis)	25. Hsing (Alpha, Tau, Kappa Hydrae)	10. Gu-sir-kes-da- ili-Anin (Cancer)
11. Purva Phalguni (Delta Leonis)	11. Alzubra (Delta, Theta Leonis)	26. Chang (Tau, Rho, Phi Hydrae): Deer	11. Tur-us-mal-makh (Hydra)
12. Uttara Phalguni (Beta Leonis)	12. Alsarfa (Beta Leonis)	27. Chen (Beta, Lamb- da, Delta, Epsilon Corvi): Earthworm	12. Gis-bar-nam-ru- sa-pan-Mul-mo-sarra (Algeiba, Leo)
13. Hassa (Gamma, Corvi)	13. Al'awwa (Beta, Eta, Gamma, Delta Epsilon Virgin- is)	28. ?	13. Gub-ba(ra)-mes-su- tu-E-kur (Regulus in Leo)

Hindu (nakshatra)	Arabic (manzil)	Chinese (hsiu)	Sumero-Akkadian
14. Sitra (Alpha Virginis)	14. Alsimah Al'a'zal (Spica in Virgo)	1. Chio, Chiao, Keo (Spica and Xi, Theta Virginis) The Serpent	14. Ili-kua-mes-su- tu-E-kur (Zosma in Leo)
15. Svati or Nishtiya (Alpha Bootis) Arcturus.	15. Alghafi (Iota, Kappa, Gamma Virginis)	2. K'ang (Kappa, Gamma, Rho Virginis)	15. Lamas-su-nukid- isati-ili-Ba-u (Denebola in Leo)
16. Visakha (Alpha Librae Zubenelgenubi)	16. Alzubana (Alpha, Beta Librae) Zubenelgenubi, Zubenalschumali.	3. Ti (Alpha, Beta, Gamma, Zeta Librae) Zubenel- genubi, Zubenel- schumali.	16. Nin-sar-u-ilu- Ur-ra-gal (Porrima in Virgo)
17. Anuradha (Delta Scorp- ionis)	17. Al'iklil (Beta, Pi Scorpion- is)	4. Fang (Beta, Delta, Pi Scorp- ionis): Rabbit	17. Sakh, ilu, Danu (Spica in Virgo)
18. Iyestha (Alpha Scorp- ionis, Antares)	18. Alhalb (Antarès)	5. Hsin (Antares and Sigma, Tau Scorpionis: Fox)	18. Ansu (Gienah in Corvus)
19. Visritau or Mula (11 stars of Scorpio)	19. Alshaula (Lambda, Omicron Scorpionis)	6. Wei (Scorpio: Tiger).	19. Lu-lim (Iota and Kappa Virginis)
20. Purva-shaddha (Delta Sagitt- arii) Kaus Meridionalis.	20. Alna'a'im (Lambda, Delta, Epsilon, Eta Sigma Sagittarii)	7. Chi, Ki (Gamma, Delta, Epsilon, Beta Sagittarii: Leopard)	20. Mulu-izi-u-La-ta- rah (Delta Librae)
21. Uttarashadha (Tau Sagitta- rii)	21. Albadha (Sagittarius)	8. Tow (Eta, Rho, Sigma, Tau, Xi Sagittarii)	21. Belit (Zubenelgenubi and Zubenelschumali; 16th nakshatra).
22. Ashiji (Alpha Lyrae, Vega)	22. Sad-Aldhabih (Alpha, Beta Capricornis)	9. Niu (Omega, Alpha, Beta Sagit- tarii; Alpha, Beta Tau Capricornis)	22. Gig-gan-gusur- kakku-saili-Ea (Beta, Delta, Pi Scorpionis; see 17th nakshatra)
23. Sravana, Srona or Asvattha (Aquilae)	23. Sad-Bula (Upsilon, Mu, Epsilon Aquarii)	10. Nu (Epsilon, Tau Aquarii), the Bat.	23. Mul-mul-la (?)

Hindu (nakshatra)	Arabic (manzil)	Chinese (hsiu)	Sumero-Akkadian
24. Sravishtha Dhanisttha (Alpha Del- phini)	24. Sa'd Alsu'ud (Beta, Epsilon Aquarii and Epsi- lon Capricornii)	11. Heu (Beta Aquarii and Alpha Equulei), the Rat.	24. Dar-lugal (Antares in Scorpio) See 18th nakshatra.
25. Satabhisha (Lambda Aqua- rii)	25. Sa'd A'akbiya (Gamma, Zeta, Eta Aquarii)	12. Wei (Alpha Aquarii, Epsilon Pegasi): Sparrow	25. Mulu-bat (Yed Posterior, Ophiuchus)
26. Purva Bhadra- padra (Alpha Pegasi)	26. Afargh Al'aw- wal (Alpha, Beta Pegasi)	13. Shih (Alpha, Beta Pegasi, with parts of Aquarius and Capricornus) The Bear.	26. Tsir, the Snake (Eta, Xi, Theta Ophiuchus and Ser- pens)
27. Uttara-Bhad- rapada (Alpha Androm- eda)	27. Alfargh Althani (Gamma Pegasi, Alpha Andromeda)	14. Pi (Chi Pegasi and Alpha Androm- eda)	26. Nabui-ur-Sar (?)
28. Revati (Xi Piscium)	28. Batn-Alhuit (Beta Andromeda), Al Risha (Cord)	15. Kuei (16 stars in Andromeda and Pisces) The Wolf.	27. Gir-tab (Theta, Iota, Kappa, Lambda, Nu Scorpionis).
		16. 17.	28. Ligbat-ilu-Ku-su (Alpha, Beta, Gamma Delta Lupi).
			29. Anu-ni-tum-u-si- nu-nu-tum (Kaus Bor- ealis; Kaus Meridio- nalis, Kaus Australis in Sagittarius)
			30. Gu-sur-a-ab-ba (Zeta, Pi Sagittarii)
			31. Ma-gur-Vuna-kha (Capricorn)
			1. Apin (Anshar) Sadalmelik in Aquarius.
			2. Lik-bana (Anu) Markab (Pegasus)

The strength of the evidence in favor of a Sumero-Akkadian origin for the lunar stations and the lunar zodiac does not deny the great probability of an independent Sino-Tibetan tradition, but China is lacking in the 36 Decan stars as well as the 28 ecliptic constellations forming the earlier complementary

28 lunar stations which point to Babylonia and Chaldea for the development of the luni-solar calendar. The earliest zodiac, for example, has only six constellations in the ecliptic documented from the Euphrates: Taurus, Cancer, Virgo, Scorpio, Capricornus, and Pisces dating from about 3880 B.C. [Allen, 1963: 1]. Twenty-eight stations in the ecliptic are to be found in Pisces (recent), Aries, Taurus, Gemini, Leo, Virgo, Libra, and Capricorn:

1. Lambda Arietes, the First in Aries (1800 B.C.). Now in Pisces.
2. Mahru-sha-rishu, the second ecliptic constellation (Aries) [Allen: 82].
3. Arku-sha-rishu-ku (Back of the Head of Ku, the leader), Alpha Arietes, Hamal [Allen: 80]. Hamal was the first of the 36 Decans beginning in the month of Nisan corresponding to March 20th.
4. Temennu, the Foundation Stone, Alcyone in the Pleiades (Taurus).
5. Pidnu-sha-shane, Iku: Alpha Tauri, Aldebaran in Taurus was the fifth in Pidnu-sha-shane [Allen: 385]. Pidnu-sha-shane was the name of the zodiac.
6. Shur-narkabti-sha-eltanu, El Nath, Beta Tauri [Allen: 390].
7. Shur-narkabti-sha-shūtū, Gamma Tauri [Allen: 391].
8. Maru-sha-pu-u-mash-mashu, Eta Geminorum [Allen: 235].
9. Arkū-sha-pu-u-mash-mashu, Mu Geminorum [Allen: 236].
10. Mash-mashu-sha-Risū, Gamma Geminorum [Allen: 234].
11. (?), Castor, Alpha Geminorum [Allen: 231].
12. Mash-mashu-arkū, Beta Geminorum, Pollux [Allen: 233].
13. Arkū-sha-nangaru-sha-shūtū, Delta Cancri [Allen: 112].
14. (?)
15. (?), Alpha Leonis, Regulus [Allen: 255].
16. Maru-sha-arkat-sharu, Rho Leonis [Allen: 263].
17. Zibbat, Beta Leonis, Denebola [Allen: 258].

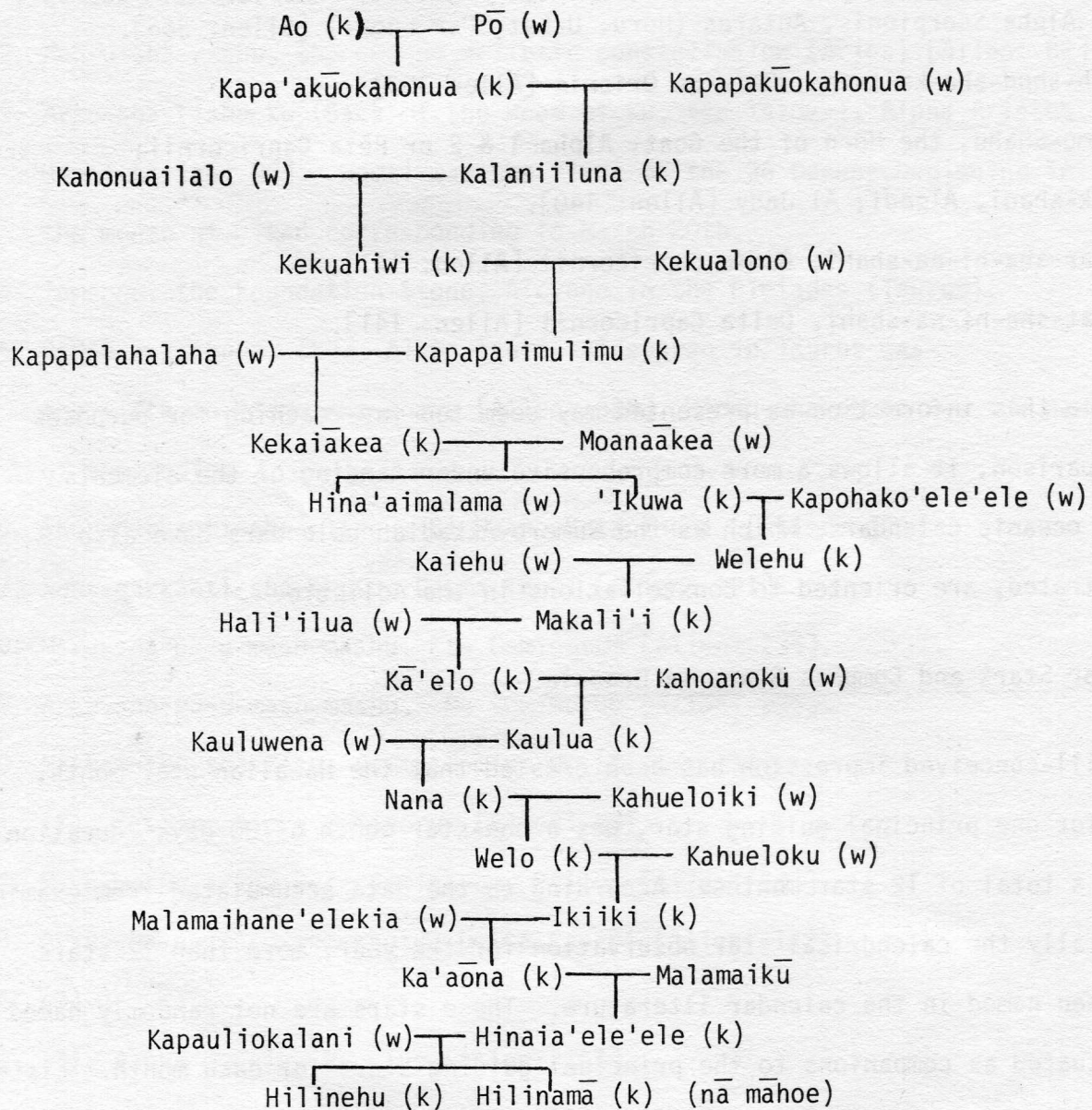
18. Shepū-arkū-sha, Beta Virginis, Al Zāwratī [Allen: 469].
19. Shur-mahrū-shirū (West), Kakkab Dannu, Star of the Hero; Gamma Virginis [Allen: 470].
20. Sa-sha-Shirū (Ki) Alpha Virginis, Spica [Allen: 468].
21. Nūru-sha-Shūtu, Alpha Libra and Beta and Gamma as En-tena-ma-luv [Allen: 276].
22. Nuru-shu-Itanu, Beta Libra, The Tree of Life [Allen 276].
23. Qablu-sharīshu-aqrabi, Delta and Beta Scorpionis [Allen: 369].
24. (?) Alpha Scorpionis, Antares (Huru, Ubat, Dar Lugal) [Allen: 366].
25. Kash-shud-sha-ka-tarpa, Omicron Orionis [Allen:303].
26. Qarmu-Shahū, the Horn of the Goat, Alpha 1 & 2 or Beta Capricornii; Shak-shadi, Algedi, Al Jady [Allen: 140].
27. Mahar-sha-hi-na-shahi, Gamma Capricornii [Allen: 141].
28. Arkat-sha-hi-na-shahī, Delta Capricornii [Allen: 141].

While this information as presented may seem too far-reaching for purposes of comparison, it allows a more comprehensive understanding of the elements in the oceanic calendars, which as the Sumero-Akkadian calendars have also demonstrated, are oriented to constellations in the ecliptic.

Calendar Stars and Compass Stars in Oceania

An ill-conceived impression has been created that the Hawaiian star month, named for one principal guiding star, was a one-star month of 30 days' duration, giving a total of 12 star months. According to the data accumulated from examining totally the calendrical star observation for the year, more than 12 stars have been named in the calendar literature. These stars are not randomly named but situated as companions to the principal guiding stars for each month. Listed below according to the month sequence on Moloka'i are the companion stars which have survived in the nomenclature. An essay on the birth of Hawaiian months has been recovered outlining as genealogy the association of leading stars for months

With companion stars identified as "wives". Born of daylight and night are the firmament and foundation of earth, whose children are the "earth below" and the "sky above", who in turn have Mountain (male) and Mountain Ridge (female) from whom are born the Flat Earth and the Mossy Strata, giving birth to Wide Sea and Broad Ocean. From these parents the months, actually principal stars, are born, both male and female pairs, according to the Mo'okū'auhau o nā Malama [Chun, tr. 1861]:



These pairs of husband-wife stars are alluded to in a song text submitted by letter to the Hawaiian newspaper Ka Hae Hawaii (The Hawaiian Flag) [Kalama, 1860: 150]:

Ia Hikianalia, Hikikaulonomeha
Hiki i o Nana mua, i o Nana hope
O Kaelo la, o Kaulua
O Welehu ka malama e hanau ai
ko keiki
Hanau ka Hoku la o Hoku-ula
Hikikaulono, ka Hoku hookele waa
O na maka ia o Hoku-ula iluna
O a'u hoahale pai kauhale
O na kane noao a Poloula
O Manalo laua o Kaawela
O Holoholopinaau ma ka aoao
I huhu i kana wahine
Inaina ai i na punalua
I ka lilo o Hanakalauai
Me Uliuli, me Polapola
Ke eo mai no o Makalii
Kokua no i kana wahine
O na Huihui mai kekahi
E ae mai no o Kokoiki mamua
I ka poli iho no o Humu ma
E ukali ana o Keoea
Pii mai Kaulu o Mohai
Ea mai Kaulua kaoko
O Kukui, o Konamaukuku ma

Toward Hikianalia, Hikikaulonomeha (Sirius)
Arrives Nanamua, Nanahope (Castor, Pollux)
Kaelo (Betelgeuse) there, Kaulua (Sirius)
Welehu is the month when your child is born
Born is the star Hoku'ula
Hikikaulono (Sirius), the Star guiding canoes
Those are the eyes of Hoku-ula above
And my companion Pai-kauhale
The husbands of Polo'ula
Manalo and Kaawela (Venus, Jupiter, or Mercury)
And Holoholopinaau (Mars) by the side
Angry at his wife
Vexed by the wives
Because Hanakalauai is gone
With Uliuli and Polapola
Makali'i (Pleiades) becomes victorious
He helps his wife,
Na Huihui (Pleiades) is one
Consenting that Kokoiki is first
On the bosom of Humu (Altair) and company
(Aquila)
Keoea is waiting
Kaulu of Mohai (Sirius) climbs
Kaulua-kaoko is rising
Kukui-o-kona-mau-kuku and company

O na Hiku ia mai ka lewa a nai
 ia pau
 Pau ka inoa Hoku oi ala
 O ka inoa malama, helu malama nei
 E helu ana i ke ku o Kaaona
 Iloko o Hinaieeleele
 Ka pule malao ke kuahiwi
 Hoolue ke hau ke awakea
 Kai akaaka molalelale
 Opulepule o ka malie
 Lei kukulu ke aho a ka lawaia
 I ka hemo i ke ku o Nana
 Hoonana e ua ka ua
 E ua iloko o Ikuwa
 I ka poha-ko eleele
 Kahe ka wai, oaka ka uila
 Aweawe ka ua Puilani,
 Ka ua koko kaa lewalewa
 Hoolewalewa ke ao, he naulu pehu
 I hanini iluna o Puuanahulu
 He ua kiaha wai na kolaila kupa
 E kiaha ana iloko o ka haona
 I ola ke keiki a Hikuhia
 He kuhihewa nau e Kahinawa
 Aole a'u hala e hewa ai
 Hewa ka manu ai pua lehua
 I ka ia e ka manu a pau ka wai
 E ka Oo kani kua mauna

Na Hiku (Big Dipper) finishes its course
 Finished are the star names
 Now list the month names
 Counting when Ka'aona stops
 In the month of Hinaieeleele
 When summer twilight is upon the mountain
 The dew drops by noon
 The sea is shimmering clear
 Glinting in the calm
 When the fisherman sets his line like a lei
 And removes it in the month of Nana
 Observing when the rains begin
 The rain in the month of Ikuwa
 When the dark storms burst forth
 When streams flow, and lightning flashes
 Streaking red the Puilani rain
 The rainbow rolls across the sky
 The cloud swings swollen with rain
 To pour down upon Puuanahulu
 Rainwater for people there to drink
 To fill their cups of water
 By which the children of Hikuhia survive
 Was it your delusion, Kahinawa
 I don't believe I am mistaken
 The bird who eats the lehua blossom is at
 fault
 To have consumed all of the nectar
 The Oo bird is calling on the mountaintop

E kani ana i ke kua lono	Resounding from the mountain ridge
Lono au o ka leo o ka manu	I hear the voice of the bird,
E kani mai ana ua ao e	Crying that it is daylight,
E ao okoa'e ka opu--e	It is another day
E Kiilau e, hoomalamalama	Oh Ki'ilau, daylight is bright
O na keiki ala a Leleiahulili i ka lapawai	The children of Leleiahulili are by the waters that sparkle
Ke alalai la i ka Hoalii	In the way of Kahoali'i
O na keiki kali la	Those who are waiting there
A kau ae ka la	When the sun sets
Hoi ka ui o Manoa, ua ahiahi	The beauty of Manoa returns in the evening.

According to the genealogy of the months listing star pairs as husbands and wives, the companion stars for calendar months may be added to the reconstruction of twenty-eight month stars:

1. Ikuwā	Kahela Kau-ka-mālama Ka-welo-lani Hina-ai-malama Kapohā-ko'ele'ele
2. Hinaia-'ele'ele	Pa-konane Ke'ehu-hiwa Lua-ho'omoe Ka-pā-uli-o-ka-lani
3. Welo	Ka-huelo-kū
4. Makali'i	Hali'i-lua
5. Ka'elo	Ka-hoano-ku
6. Kaulua	Ka-onohi-ali'i Kaulu-wena
7. Nāna	Manawahine Ka-onohi-ali'i Ka-huelo-iki

8. Ikiiki	Kaulia Ka-onohi-ali'i Malama-i-hane'elekia
9. Ka'aōna	Pauahi-lani Ke-alohi-lani Malamaiku
10. Hilinehu	Hina-li'i Mūlehu Polo-wehi-lani Polo-'ula
11. Hilinama	Ka-wao-nui-a-ola
12. Welehu	Ke-ahi-lele Ke-alohi-lani Kaiehu

To this list may be added three of the planets (Venus, Jupiter, Mars) as month stars which are called the "husbands" of Polo'ula, a month star in Hilinehu.

The issue that these data raise, however, concerning the computation of three anahulu (10-day-week) per mahina or malama (month) and the 36 ten-day week calculation for one makahiki (year) is that in addition to the 12 principal calendar stars, several other "month stars" have been retained in the terminology. Secondly, the word makahiki meaning "year" becomes much more significant if, as a sidereal year based on Hiki as Sirius, it suggests that Sirius may have been at one time the starting point of year. Sirius was used to compute the sidereal year in Egypt when it rose in the morning at the inundation of the Nile. On the other hand Hiki in makahiki as "year" may be connected with the sun as the basis of computation, since Hiki means 'east' and Ka-lā-hiki-ola and Hikina are words connected with the rising of the life-giving sun in the east.

Is the evidence of the 36 anahulu to the year to be taken as inference that the 10-day week was computed throughout the months and year in the same manner as the

Gilbertese system?

This category, then, the calendar stars, may be considered the most vital for the purpose of reconstructing what may once have been a Polynesian star compass and for determining whether it has been borrowed from elsewhere in the Pacific. It is necessary, therefore, to study comparable names or other associations among the terminologies of related Austronesian languages in order to determine origins of the calendar stars and months, or failing in that, to determine what actual relationships did exist between Polynesia and Micronesia in the development of the calendar and the star compass.

In order to simplify the problem of comparison the moon calendar sequence on Moloka'i was chosen for standard reference from Hawaii. For some reason, Moloka'i's calendar is the least aberrant when compared with star months from West Polynesia (Samoa, Tonga, Tokelau, Futuna) and Micronesia (primarily the Carolines) and Polynesian outliers in Micronesia (Nukuoro). The problem may be more easily comprehended by demonstrating the discrepancies in the Hawaiian calendar per island sequence, according to Nathaniel B. Emerson's notes to David Malo [1951: 31-35] cited below:

MONTHS AND OTHER DIVISIONS OF THE HAWAIIAN YEAR

	HAWAII	MOLOKAI	OAHU
HOLOLO	1. Welehu Nov.	1. Ikuwa Jan.	1. Nana Jan.
	2. Makalii Dec.	2. Hina-ia-eleele Feb.	2. Welo Feb.
	3. Kaelo Jan.	3. Welo Mar.	3. Ikiiki Mar.
	4. Kau-lua Feb.	4. Makalii Apr.	4. Kaaona Apr.
	5. Nana Mar.	5. Kaelo May	5. Hina-ia-eleele May
	6. Welo Apr.	6. Kau-lua June	6. Mahoe-mua June
	7. Ikiiki May	7. Nana July	7. Mahoe-hope July
	8. Kaaona June	8. Ikiiki Aug.	8. Ikuwa Aug.
KAU	9. Hina-ia-eleele July	9. Kaaona Sept.	9. Welehu Sept.
	10. Mahoe-mua Aug.	10. Hili-na-ehu Oct.	10. Makalii Oct.
	11. Mahoe-hope Sept.	11. Hili-na-ma Nov.	11. Kaelo Nov.
	12. Ikuwa Oct.	12. Welehu Dec.	12. Kau-lua Dec.
	KAUAI		
	1. Ikuwa Apr.	7. Mahoe-hope Oct.	
	2. Welehu May	8. Hili-na-ma Nov.	
	3. Kaelo June	9. Hili-nehu Dec.	
	4. Ikiiki July	10. Hili-o-holo Jan.	
	5. Hina-ia-eleele Aug.	11. Hili-o-nalu Feb.	
	6. Mahoe-mua Sept.	12. Huki-pau Mar.	

An old woman of Kipahulu, Maui, gives me the following as the names of the months of the Hawaiian year according to Maui nomenclature:

- | | | |
|------------|------------|--------------------|
| 1. Ikuwa | 5. Ka-ulua | 9. Kaaona |
| 2. Welehu | 6. Nana | 10. Hina-ia-eleele |
| 3. Makalii | 7. Welo | 11. Hili-nehu |
| 4. Kaelo | 8. Ikiiki | 12. Hili-na-ma |

She volunteered the information that each month had thirty days, save that four months, two in Hooilo and two in Kau, had thirty-one days apiece, thus giving three hundred and sixty-four days in each year.

In comparing the structure of the Polynesian calendar in general with the Micronesian system there appears to be a correlation in both systems between calendar stars and compass stars. There must still be, however, some carryover directly between the Micronesian compass and calendar into Polynesia before any true contact between the two systems can be said to exist. In order to demonstrate this parallel adequately, it is necessary first to review the Micronesian star calendars. The month periods do not coincide exactly with the month renderings in our own system but depend upon the risings of the stars for which the periods are named. It is also evident from the following list that constellations, rather than individual stars alone are used to mark the duration of the months. Consequently, there are more star names per month than that of the principal star for which that period is named.

1. Micronesian Calendar Stars (composite) [rising positions]:

December-January	Corona Borealis Antares	Seu, the Net Tumwur
January-February	Hercules Vega (Lyra) Altair (Aquila) Alpha Equuleus	Maacik (Altair) Mëën, the Adz Handle Maanap, the Bird Seeta, the Bowl
March-April	Formalhaut (Pegasus)	Naa, the Eel
April-May	Grus	
May-June	Deneb (Cygnus) Beta Andromedae Achernar (Eridanus) Gamma Andromeda	Kyyw, the Porpoise Jenimate, the Belly of the Fish

June-July	Pleiades (Taurus) Aldebaran (Taurus)	Mweriker Wuun, the Penis (The Worm)
July-August	Rigel (Orion) Orion's Belt Canopus Sirius (Canis Major)	Jenywen
August-September	Castor, Procyon, Pollux Regulus (Leo)	Maan, the Bird Jiic, the Rat
October	Crateris Pi (Virgo) Crux Corvus	Jonumas Jinnenikak Pwuupw, the Triggerfish Serepwen, the Viewer of the Taro Patches
November	Spica (Virgo) Arcturus (Bootes)	Jaap

[Goodenough, 1953: 33]

The months of the Lamotrek and Mortlock years correspond to the star names of the preceding list although beginning the calendar with different stars (month identifications are based on the Carolinian composite calendar):

LAMOTREK MONTHS (STARS)	MORTLOCKS' MONTHS (STARS)
1. Sept.- Oct.: Sarabol (Corvus)	1. Sept.-Oct: Yis (Leo)
2. Nov.: Aramaus (Arcturus)	2. October: Soropuel (Corvi)
3. Dec.-Jan.: Tumur (Antares)	3. November: Aramoi (Arcturus)
4. - Mairik (Pleiades)	4. December: Tumur (Scorpio)
5. Jan.- Feb.: Mai-lap (Aquila)	5. - Mei-sik (Upsilon, Epsilon, Omicron Hercules)
6. Jan.-Feb.: Seuta (Equuleus)	6. Jan.-Feb.: Mei-lap (Aquila)
7. Mar.-Apr.: Lakh (Pegasus)	7. Jan.-Feb.: Sota (Equuleus)
8. Apr.-May: Ku (Aries)	8. Mar-Apr.: La (Pegasus)
9. June-July: Ul (Aldebaran)	9. Apr.-May: Ku (Aries)
10. - Alliel (Orion's Belt & Aldebaran)	10. May-June: Mariker (Pleiades)
11. Aug.-Sept.: Man (Sirius)	11. July: Un-allual, Elluel (Aldebaran and Orion)
12. Sept.-Oct.: Ich (Pisces)	12. August: Man (Sirius)

Features of the Micronesian (Carolinian) calendar may be found in the Nukuoro system. Since Nukuoro is a Polynesian outlier in Micronesia, the calendar contains elements from both the Polynesian and Micronesian systems. By comparing this sequence from Nukuoro with those from Nuclear and Central Polynesia (East), it is possible to determine how much influence from Polynesian star nomenclature has affected the Micronesian calendar and vice versa [A variant Nukuoro calendar is listed in the Appendix according to Kenneth P. Emory].

Months	Micronesia	Nukuoro
(December-January)	Tumwur (Antares)	Tumur, Turnuru
January	Maacik (Altair) Mëën (Vega)	Maitiki, Meitiki
February	Maanap (Altair in Aquila)	Mailapa, Meirapa
March	Seeta (Alpha Equuleus) Naa (Fomalhaut, Pegasus)	Seta Kaka, Oraaka
April May	Kyyw (Beta, Gamma Andromeda; Deneb, Achernar)	Tahora, Tahola
June	Mweriker (Pleiades)	Matariki
July	Jenywen (Orion's Belt) Canopus Sirius	Takero
August	Maan (Procyon, Castor and Pollux)	Manu
September	Jiic (Regulus, Leo)	Idit, Ititi
October	Jonumas (Crateris) Jinnenikak (Pi Virgo) Pwuupw (Southern Cross) Serepwen (Corvus)	Sarapori
November	Jaap (Spica, Virgo) Aramoi (Arcturus, Boötes)	Aramoi
December	Ceeuw, Seu (Corona Borealis)	

2. Correlation of Polynesian Month Names with Micronesian Star Names

The month names for January through March in West Polynesia show a resemblance to Tumwur (Micronesia) and Tumor or Turnuru (Nukuoro) for Antares in Scorpio if the Micronesian form, Tumwur, is an elision of Polynesian Utu-wa-muri. The hypothesis that this form may be comparable is based upon the comparative data for the months of December through February in Polynesia and Micronesia:

December-January	Tumor (Nukuoro) Turnuru	Tumwur (Micronesia)
	Utuwa (Tokelau)	
	Ikuwā (Moloka'i)	
	Ikuwā (Maui)	
January-February	Utuwā (Samoa)	
February-March	Va-i-mua (Futuna) Va-i-muri	
	Utu-wa-mua (Rakahanga) Utu-wa-muri	
April	Ikuwā (Kaua'i)	
August	Ikuwā (Oahu)	
September-October	Ikuwā (Hawaii)	

Another tenable etymological origin for these forms may be the association in the Indonesian compass with east as Timur and in Tagalog with south as Timog [Echols and Shadily, 1968: 385; English, 1965: 982]. Tumugl is the month on Sonsorol (Micronesia) when the sun rises in Altair [Goodenough, 1953: 28], December to January. Tumor is a name for Antares in Scorpio. The compass associations are most likely oriented toward Timor, eastward in Indonesia and southward from the Philippines.

The second Micronesian star month Maacik (Meisik) becomes Maitik (Meitik) in Nukuoro where it is both the second and ninth month. For this reason,

the survival of the name Mai for the eighth month in the Marquesas may be a short form for Maitik or Mailapa which are adjacent in the calendars. No other place in Polynesia records this name. A close correspondence between Maacik, Meisik, Maitik, and Meitik as names for a month star and as forms for the demi-god culture hero-, Maui-tikitiki-a-Taranga, is noteworthy. Maui is a star name in Hawaii, and Te-Tolunga-Maui are the three stars in the Belt of Orion standing for the Maui brothers: Maui-mua, Maui-roto, and Maui-taha.

Hawaiian names for February show no agreement: Hinaia-'ele'ele (Moloka'i); Hili-o-nalu (Kaua'i); Welo (Oahu); Makali'i and Kaulua (Hawaii). The area of origin of the forms Hinaia- and Hili- as month prefixes may be located in Central and West Polynesia. They are evidently not the same as the Samoan Sina (May) although the month periods correspond. Hawaiian Hinaia is cognate with Tahitian Hi'aia which presupposes that a form Hingaia- may be reconstructed for these names, but no form as such can be found in West Polynesia:

May	Sina (Samoa)
May	Hinaia-'ele'ele (Oahu)
June-July	Hinaia-'ele'ele (Hawaii)
July	Sina (Samoa)
July	Hi'aia (Tahiti)
August	Hinaia-'ele'ele (Kaua'i)
February	Hinaia-'ele'ele (Moloka'i)

The qualifying suffix -kelekele seems to be of Tongan and Uvean rather than Samoan origin:

June-July	Hilinga-kelekele (Uvea) [Burrows, 1937: 11]
July-August	Hilinga-maa (Uvea)
June	Hilinga-kelekele (Tonga)
July	Hilinga-mea'a (Tonga)

The next two star names in the Micronesian calendar, Mĕĕn (Vega in Lyra) and Maanap (Altair in Aquila) are more significant for West and Central Polynesia than for Hawaii. In particular this is true of the constellation and month name, Maan-. The name appears as the base for the Micronesian month corresponding roughly to August-September and makes a formation of a big bird composed of three stars: Sirius, Canopus, and Procyon (Santa Cruz, Reef Islands). The identification of the Twins as belonging in Maan does not make good sense, since Canopus lies south of the celestial equator and the constellation of Gemini is far to the north of it. Since the Polynesian star lists construct the Big Bird formation with Sirius, Canopus, and Procyon or with Sirius, Rigel and Betelgeuse, it follows that there must have been a carry-over from Maan as Aquila to Sirius, Canapous, and Procyon in both Micronesia and Polynesia as the formation was moved eastward. Sirius in this formation was called Atutahi-ma-Rehua, and Rehua was pictured by the Maori as a "bird with a broken wing" (Maori) or the "triangle of the reflecting mirror" (Maori). The stars in the Big Bird formation were also called "pillars" or Pou in the sky. Another word for post is tu or turu. On Pukapuka Turu was Altair, the pillar in the constellation of Aquila. Thus, other names for the stars in Maan and Maanap across Micronesia and Polynesia identify Altair as Pou-tu-te-rangi (Maori), "Pillar-of-Heaven" and Procyon as Pou-n-Maan (Mortlocks), "Pillar-Maan".

So far as the calendars are concerned, however, the endurance of Maan-as Polynesian Manu (Bird) can be traced from west to east in the Polynesian calendar, attesting to its longevity and great importance to the calculation of time and for navigation in the two related oceanic cultural areas:

April	Ualoa (Futuna), "three stars in a line"
May	[Tula-lupe (Futuna), "four stars representing a perching pigeon"; cf. Tu'ula-lupe (Tonga), five stars; Tula-lupe (Pukapuka), Sirius].

May	Oloamanu (Tokelau)
June	Oloamanu (Samoa)
July	Oroamanu (Rakahanga)
August	Manu (Nukuoro): Castor, Procyon, Pollux Maan (Micronesia): Castor, Procyon, Pollux cf. Maan (Carolines): Canopus, Sirius, Procyon [Lewis, 1972: 214]; Māānap (Sonsorol), Altair [Goodenough, 1953]; Maanifono (Micronesia), Sirius [Lewis, 1972: 247]; Maanikaiup (Carolines), Canopus [Lewis, 1972: 247].
August	'Oa'oa-manu-me-pui (Marquesas), the 6th month

Knowledge of the location of Sirius as the southwestern wingtip in the formation of the Big Bird with Rigel at the eastern mid-point (head of the bird) and Betelgeuse at the northwestern wingtip (as a hypothetical possibility) would explain why the sailing directions given for Kila's voyage to Tahiti from Hawaii singled out Sirius at its heliacal rising (See A'ā, List I). The Marquesan, Maori, and Hawaiian star lists identify Puanga as Rigel, and the Moriori began their year with Rigel in June. Sirius is named A'ā, translated as "burning bright," but a'ā is also a bird, the booby. In mythology the Ā'aia-nui-nukea-a-Ku-lawai'a (Great-ā'aia-of-Ku-fisherman) was called Kane's bird, the booby (Ā'aia-nū-ke-alowaia-a-Kāne). Another name for Sirius is 'Ā-iki-kau-e-Lono, probably "the-small-booby-bird-of-Lono", and Hiki-kau-e-Lono. The prefix hiki- for Sirius may refer to this star's position near the latitude of Fiji (Hiti, Hiki), and Tahiti (See Hiki-kau-e-lia, Hiki-kau-e-Lono).

An inference from these results of analysis and comparison is that the triangular formation (bird, mirror) as in Aquila and a combination of other "pillar" stars was a favorite or reliable alignment for navigation. Another bird formation is detected in the Southern Cross, Moa or Kauamonga (eagle). These names recall the tradition which associates Maui with the Moa clan (Hawaii) and the feat of sky-raising. The Ha'amonga-a-Maui trilithon on Tongatapu is named for the "Burden-

-of-Maui" in attempting to raise the sky from the breast of Mother Earth. The configuration is one of a balance pole used for bearing weights and lifting heavy loads (amo). A possible relationship may be seen between the theme of Maui lifting the sky and the motif in Indonesia which has a bird achieve it with its wings. Maui's transformation form is that of a bird, while in other traditions the feat is performed by the worm, Rigi (Nauru, Gilberts). A remote possibility is that in Micronesia the constellation involved in the feat of sky-raising by Maui is not the Southern Cross but Aquila. Maacik (Altair in the constellation of Aquila) becomes Maitik in Nukuoro. Maitik is a form of the name of Maui-tikitiki-a-Taranga. The medial t also changes to s in other forms of his name: Maisiki (Meisiki). Maacik is also described as a "pillar" in the sky.

The joint association of a "pillar" or "balance pole" in the constellation of the Southern Cross as the Moa (chicken, bird) recalls that Kau-amonga (Futuna) for the Southern Cross means "eagle". This bird association for the Southern Cross is again reinforced by the name Ko-Peka in the Tuamotus and Pe'a in Hawaii for a bird or bat. Other associations in Hawaii with pe'a extend to sea animals: octopus, starfish, and the stingray or batfish. There is a remote connection here with the configuration of the rayfish as the Southern Cross in Borneo (Landak Dyak) in the double constellation of the canoe-rayfish with the canoe in Alpha and Beta Centauri (See Prahua-Pare, List II.) Aside from this one very strong resemblance to Indonesian constellations, by and large there appears to be little data from Indonesia comparable to what is found in Polynesia and Micronesia.

Enjoying widespread distribution from Micronesia to Polynesia also is the constellation of the Pleiades as a star name, but as a month name it is not so consistently used in the West Polynesian calendar as that of Maan-:

April	Makali'i (Moloka'i), Pleiades
June	Matariki (Futuna), Pleiades
June	Mweriker (Micronesia), Pleiades (not a cognate of Matariki).

August	Makali'i (Hawaii)
October	Makali'i (Oahu)

The naming of October in Hawaii for the Pleiades (Oahu) is pertinent to the rising of this constellation in the evening during the winter season.

A much stronger relationship between the Micronesian and Polynesian calendars is indicated in the choice of the constellation Leo (Jiic, Yis), the Rat (Micronesia) for the month of August. This can be graphically demonstrated:

May	Ikiiki (Hawaii), probably Jupiter (?)
July	Ikiiki (Kaua'i)
August	Ikiiki (Moloka'i)
September	Jiic, Yis, Idit (Micronesia), the Rat (Leo) Idit, Ititi (Nukuoro), the Rat (Leo)
December	Ite (Samoa)
December	Iti (Marquesas)
January	Ikiiki (Oahu)
February	Ikiiki (Hawaii)

The comparable closeness between Moloka'i and Kaua'i for Ikiiki as July-August with Micronesian Jiic, Yis, and Idit for September according to the constellation of Leo with its bright star, Regulus, can be contrasted with the closeness between Samoan Ite, Marquesan Iti, and Ikiiki (Hawaii and Oahu) for December-February.

Most of the remaining star month names are not found outside East Polynesia and seem, therefore, to have originated in Central Polynesia with the exception of Faka'ahu or Whaka-afu which is found in the Uvean calendar. Distribution of this month name to Hawaii is not present. A strong relationship might still be seen, however, between West Polynesia and East Polynesia for the autumn months (October-November). There appears to be no correlation with

Micronesia:

October	Silinga (Tokelau)
November	Toe-silinga (Tokelau)
October	Hili-na-ehu (Moloka'i) Hili-nehu (Kaua'i)
November	Hili-na-mā (Moloka'i) Hili-na-mā (Kaua'i)
December	Hiringa-kerekere (Rakahanga)
January	Hiringa-mā (Rakahanga)
September	Huri'ama (Tahiti)
	'Iringa-te-rangi (Manihiki), a month 'Iringa-kerekere (Manihiki)
June	Hilinga-kelekele (Tonga) Hilinga-mea'a (Tonga)
June-July	Hilinga-kelekele (Uvea)
July-August	Hilinga-maa (Uvea)

It is observed that Moloka'i and Kaua'i usage corresponds directly to the Tokelauan (West Polynesia) and that Kaua'i has continued to use the prefix in an independent manner for January to February: Hili-o-holo, Hili-o-nalu. The Tongan usage is commensurate with Hina-iā'ele'ele in Hawaii for the summer months (May-August). The Hilin-ehu-and Hilina-mā month names are not found on Hawaii and Oahu, being confined to Moloka'i and Kaua'i. They are present in the Northern Cooks and Tahiti, but not in the Marquesas.

Finally, the name Ka'elo for the name of a month in the Hawaiian Islands is not given for the same referent as Takero in Central Polynesia. Le Ta'elo is Mercury in Samoa and a month name in the wet season. Nukuoro also applies Takero to a month. If Takero were originally for Mercury, the practice of using this name for a month would be an anomaly, since Mercury as a planet would not be a stable ruling star. The only explanation may be found by comparing the Nukuoro month with the Micronesian period in order to assess what constellations are accorded to that time. Takero in Nukuoro follows Matariki at a time when

Wuun (Aldebaran in Taurus) is marking June-July. Since Aldebaran is already rising in May, the identification of Betelgeuse (Ka'elo which is rising (heliacal) in the middle of June, may be an accurate assessment for Ka'elo in Hawaii. A thousand years ago Betelgeuse would have been rising about a month earlier. Per the readjustment in time which may have taken place over the years in West Polynesia and in Hawaii, the corresponding time for Moloka'i and Kaua'i are once more closer to what may have been true in the probable area of origin:

A month in the wet season	Ta'elo (Samoa)
A month	Takero (Nukuoro) [after Wuun, June-July]
May	Ka'elo (Moloka'i)
June	Ka'elo (Kaua'i)
September	Ka'elo (O'ahu)
January	Ka'elo (Hawaii)

A close correspondence in time for Takaonga and Ka'aona between the Tokelaus and Hawaii is again visible for the month of September:

March	Ka'aōna (Hawaii)
April	Ka'aōna (Oahu)
June	Ka'aōna (Hawaii)
	Taka'onga (Manihiki), a month name
August	Ta'ao'a (Tahiti)
September	Ka'aōna (Moloka'i)
September	Takaōnga (Tokelau)

By the foregoing process of elimination, focusing upon relationships between the Hawaiian calendar and what seems to be major influence from West Polynesia and Micronesia prevailing in the calendars from Moloka'i, primarily, and Kaua'i, secondarily, it is now possible to isolate from the Hawaiian calendar those month names for stars which belong to the nomenclature of East Polynesia.

The available data does not exhaust this subject for the present investigation. It is intended to focus particularly upon the Hawaiian and East Polynesian names for star months. No attempt is being made here, for example to determine how much agreement may exist between Marquesan and Tahitian versus Hawaiian and Tahitian. Generally speaking, it appears that the substitution of Palolo-mua and Palolo-muli for Hilinga- in the East Polynesian calendar (or the inclusion of both Palolo- and Hilinga-) is a point of departure for both the Marquesan and Hawaiian calendars from the rest of East Polynesian. The substitution of Palolo- in place of Silinga- appears to have taken place in Samoa and Tokelau rather than in Tonga, and it may then appear that the absence of this month name, Palolo- in the Marquesas and Hawaii may indirectly affiliate the Hawaiian and Marquesan migrations from West Polynesia as Tonga-Tokelauan.

The Tokelau-Nukuoro influence appears to be recessed but nevertheless present in Hawaii, since per the calendar as the basis of comparison, the paramount contact area for Micronesian influence is geographically situated from north to south. The Palolo- substitution does not appear in Nukuoro and is evidently a Melanesian influence on the calendar of Nuclear Polynesia (excluding Tonga) from Fijian Mbalolo for the season of the palolo worm. It is apparently not a primary referent for a star in Melanesia but for the worm and the season. The name has been assigned to the ruling stars on Futuna: Palolo-muli (Sirius) and Palolo-mua (Regulus). Since the palolo season is not active in East Polynesia where the month names are present in the Tahitian, Northern Cook and Tuamotuan calendars, the durability of acquaintance with the season of the palolo suggests a later migration into Central Polynesia from West Polynesia after the settlement of the Marquesas and before considerable culture exchange between Melanesia and Nuclear Polynesia. Or, another explanation may be simply the lack of the palolo in the Marquesas and consequently the withdrawal of the name from the calendar and the consequent absence of it in Hawaii. If so, this would not

explain why, after considerable migration from Tahiti to Hawai and the subsequent influence upon the Hawaiian language, the Tahitian calendar shows little strength in Hawaii:

April, the first month	Paroro-mua (Tahiti)
May	Paroro-muri
June	Muriaha
July	Hi'aia
August	Ta'ao'a
September	Huria-ma
October	Te'eri
November	Te Tai
December	Varehu
January	Fa'ahu
February	Pipiri
March	'Aununu

There are only three names which agree with the Hawaiian: Hi'aia (Hingaia, Hinaia), Ta'ao'a (Takaōnga, Ka'aona), and Varehu (Welehu). There are four Marquesan star names for months which agree with Hawaiian:

First month	Mata'i'i (Marquesas)	Makali'i (Hawaii)	Nov. - Dec.
First month	Iti	Ikiiki	Apr. - May
Second or Fourteenth	Ve'o	Welo	Mar. - Apr.
Third month	Taku'ua	Kaulua	Jan. - Feb.

Two Marquesan months appear in the Hawaiian calendar and nowhere else in East Polynesia, although as stars they are fairly well-distributed throughout the area. Welo (Wero, Ve'o) in particular is found as a star name in the Tuamotus (Vero, Viro), New Zealand, and the Northern Cooks. The other, Kaulua as Sirius

is identified as such in New Zealand and Tahiti but is applied to many other stars in Orion and Canis Major.

March	Welo (Moloka'i)
April	Welo (Hawaii)
December	Welo (Oahu)
January	Welo (Hawaii)
6th, 9th month	Ve'o me Tauto'u (Marquesas) [Cp. Vero- ma-Tautoru (Manihiki), Orion's Belt]
February	Kaulua (Hawaii)
June	Kaulua (Moloka'i)
October	Kaulua (Oahu)
November	Kaulua (Hawaii)
3rd month	Taku'ua (Marquesas)

The identification in West Polynesia for Taulua is Gemini (Santa Cruz) and Dubhe in Ursa Major (Samoa). There is a stubborn question as to whether Taulua (West Polynesia) and Takurua (East Polynesia) are related as cognates or if they are from separate etymological roots. The association of Samoan Taulua with Dubhe in Ursa Major may adequately explain why the direction north in the Polynesian compass is called Faka-rua, Ho'olua (Hawaii), 'Akarua (Cook Islands), Whaka-rua (Maori).

Welehu is probably named for the star Lehua-kona (probably Antares in Scorpio) [Cf. Rehua (Maori), Antares; Rerehu (Maori), Antares]. Canis Major (with Sirius) and Scorpio (with Antares) lie approximately in the same parallel and it is highly probable that the names for the brightest stars in these two constellations were given the same name. This practice by navigators has been observed by David Lewis [1972: 58]: "The Tongan practice was outlined by the 88-year-old Fe'iloakitau Kaho, the senior surviving Tuita. "The new stars of the kaveinga in one line take their name from the star you first navigated by. The new star is called by the same name as the first although it is a completely

different star." Rehua is therefore Sirius or Betelgeuse in Orion (Maori), or Antares in Scorpio (Hawaii, Maori). Since the next month (Tumur) in Nukuoro takes its name from Antares, and since Ikuwā (Moloka'i) corresponds to Utuwa (Tokelau) for the same period of the calendar following Welehu, Antares in Scorpio is not an unlikely choice for the lead star (Welehu-Ikuwa) between December and January. The sun is in Scorpio immediately before the winter solstice (Dec. 21st).

May	Welehu (Kaua'i)
September	Welehu (Oahu)
November	Welehu (Hawaii)
December	Welehu (Moloka'i)
December	Varehu (Tahiti)
A month name	Rehu (Rakahanga) Re'u (Manihiki)

Finally, only one month in the Hawaiian calendar appears to be a local appellation for a star name which appears in Tahiti and the Tuamotus. As a month name for the star Nāna- (Ngāna, Tuamotu; 'Āna, Tahiti) it is a unique addition to the East Polynesian calendar, existing only in Hawaii.

March	Nāna (Hawaii)
July	Nāna (Moloka'i)
November	Nāna (Oahu)

The star is unidentified in Hawaii, but its name is connected with the phallic rock on Moloka'i, Ka-ule-o-Nānahoā (Penis-of-Nānahoā). Nānahoā is a name remembered in the Tuamotus only scarcely, but in the Rata legends of the Cook Islands, Nānahoā is well-known for his exploits on the voyage of Rata, the navigator, from Kuporu. Nānahoā's role is that of wizard or priest who takes the form of a floating calabash or bailing gourd which warns Rata of approaching enemies: the giant reef, giant clam, and the giant squid (or octopus).

Ngana-heke is another Tuamotuan name which may be identified with the demon squid from the Rata legend. The Ngana- prefix suggests that it is a star name. It is found before star names which in pattern are similar to the enumerative style of Maui star names: Ngāna-mua, Ngāna-muri, Ngāna-roto, Ngāna-taha. In Tahitian the 'Āna- prefixes are found before nine stars, identified as "pillars" of the sky [Lewis, 1972: 241, acc. Henry, 1907: 101-104]:

Antares	Ana-mua	
Aldebaran	Ana-muri	
Arcturus	Ana-tahu'a-ta'ata-metua-te-tupu-mavae	
Spica	Ana-roto	
Alphard	Ana-Heuheu-po	
Procyon	Ana-tahu'a-vahine-o-toa-te-manava	
Betelgeuse	Ana-varu	
Phact	Ana-iva	[Note: could also be Phecda although Henry's spelling is Phaet]
Polaris	Ana-ni'a	
Dubhe	Ana-tipu	

The designation of 'Āna-muri as Aldebaran recalls that the constellation of Taurus is correlated in the Micronesian calendar with June-July (Mweriker-Wuun). Wuun is Aldebaran in Taurus. It refers to a worm or "virile member" (penis) which is the Micronesian configuration in the constellation of Taurus. The phallic rock on Moloka'i, Ka-ule-o-Nanahoa (Penis-of-Nanahoa) is probably associated with Aldebaran, since ule in Hawaiian is a cognate of Uun, Ul, or Wuun (Aldebaran) in Micronesian.

In concluding the present state of the investigation, allowing for error due to incomplete data from the Pacific for various Polynesian and Micronesian calendars, the general impression created by comparative study of Micronesian (primarily Carolinian), West Polynesian, and East Polynesian star calendars with the Hawaiian (primarily Moloka'i) is that the Hawaiian nomenclature is

predominantly West Polynesian-Micronesian with a secondary East Central Polynesian (Tahiti-Northern Cooks) inclusion. Influence from Melanesia appears to be absent, but this negative factor may not be due to lack of contact but to subsequent substitution.

Calendar Stars and the Sidereal Compass

In comparing the structure of the Polynesian calendar in general with the Micronesian there appears to be a correlation between calendar stars and the navigation stars to which the sidereal compass is oriented. This appears to be a parallel development in both areas. It can be graphically illustrated in a list oriented to the North-South axis of the earth and placing the stars in order. In the Micronesian sidereal compass there are nine principal navigation stars beginning with Vega and ending with Antares, although additional points of observation include the North Star (Polaris), Cassiopeia north of the celestial equator, and Shaula Scorpii and the Southern Cross south of the celestial equator. In the Tahitian star nomenclature are ten stars listed as "Pillars of the Sky", all prefixed with 'Āna. When these 'Āna stars are compared with the nine principal navigation stars in the Micronesian sidereal compass they are nearly identical in relative position. The 'Āna stars are ten in number allowing the tenth point to equal a zero position at the North Star, leaving nine principal stars counting from Dubhe in Ursa Major in the north to Phaet in Columba at the south so that the total count of nine is expressed as 'Āna-iva with Phaet:

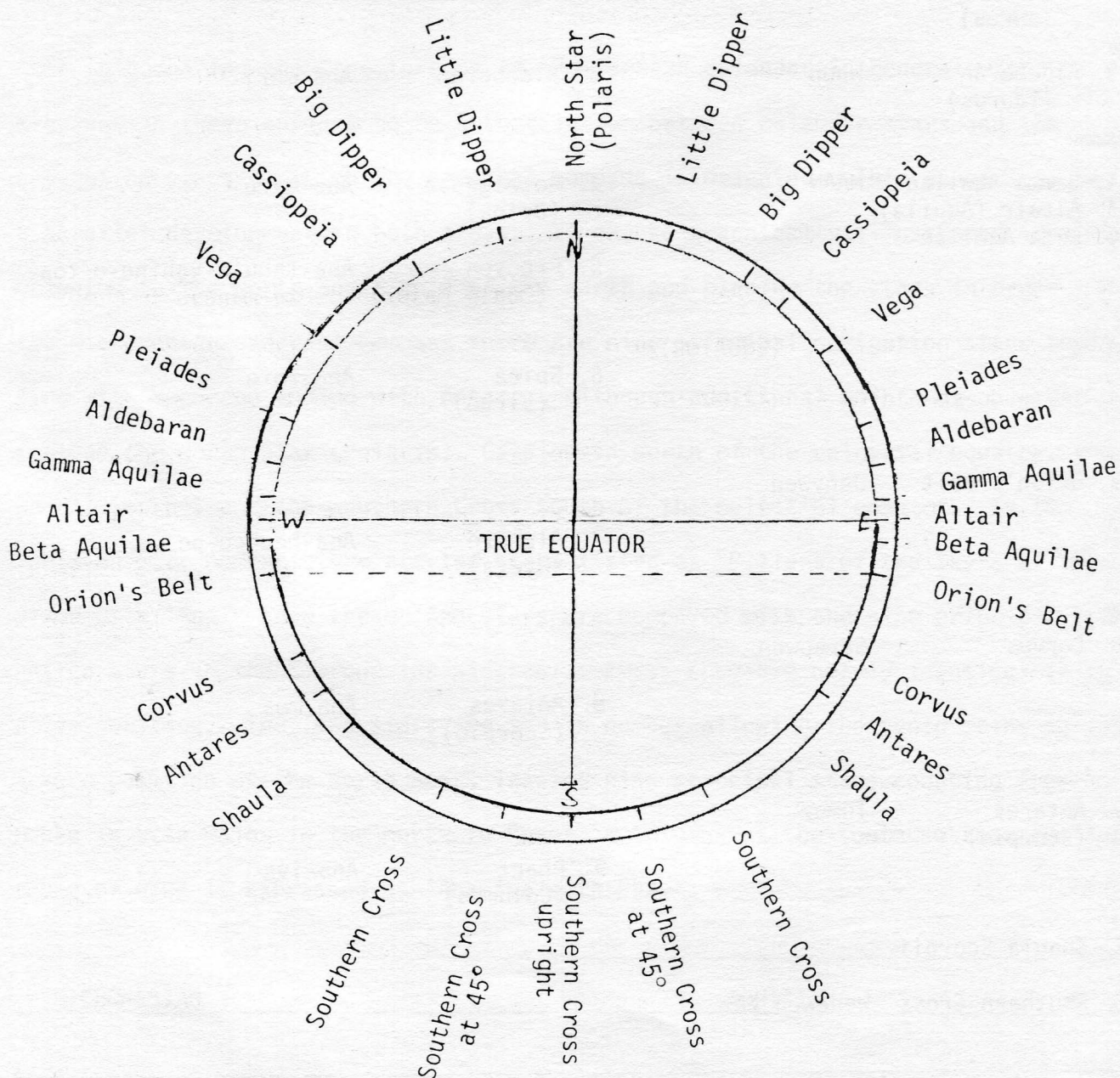
MICRONESIAN		TAHITIAN	
A. Polaris	Wenewen	A. Polaris	Ana-ni'a
B. Ursa Minor			
C. Ursa Major	Daane Wole	1. Dubhe	Ana-tipu
D. Cassiopeia	Ukenik		

MICRONESIAN		TAHITIAN	
1. Vega (Lyrae)	Mëën	2. Arcturus	Ana-tahu'a-ta'ata-metua-te-tupu-mavae
2. Pleiades (Taurus)	Mweriker		
3. Aldebaran (Taurus)	Wuun	3. Aldebaran	Ana-muri
4. Gamma Aquilae	MAAN	4. Betelgeuse (Orion)	Ana-varu
5. Altair (Aquila)		5. Procyon (Canis Major)	Ana-tahu'a-vahine-o-toa-te-manava
6. Beta Aquilae			
	(EQUATOR)	6. Spica (Virgo)	Ana-roto
7. Orion's Belt	Jenywen	7. Alphard (Hydra)	Ana-heuheu-po
8. Corvus	Serepwen	8. Antares (Scorpio)	Ana-mua
9. Antares (Scorpio)	Tumur	9. Phact (Columba)	Ana-iva
E. Shaula Scorpii			
F. Southern Cross	Wenewen ðër		

In the following diagram is a drawing of the sidereal compass in Micronesia [Goodenough, 1953].

SETTING POSITIONS

RIISING POSITIONS



STAR COMPASS (AFTER GOODENOUGH, 1953)

The use of this compass has been described by Gladwin [1970: 148-154]: "On Puluwat the cardinal direction is east, under the rising of Altair, the 'Big Bird.' However, the star compass system can most readily be described to a Westerner by beginning with the North Star, Polaris, "the star which never moves...Next around the circle of the sky both east and west (rising and setting) come two large constellations, the Big Dipper and then Cassiopeia. Although the Puluwat navigator does not include in these constellations precisely the same stars which we do, each still covers a great deal of sky...Due South is located by the Southern Cross in its upright position. When in this position the Southern Cross is a little too high in the sky for a really good bearing, but otherwise it is satisfactory; it is actually very close to true south and is a neatly symmetrical cross whose center is unambiguous...Moving south from Cassiopeia through a fairly wide arc of the sky devoid of navigation stars we come to the first of a succession of individual stars or small constellations which occupy positions fairly close together in the eastern sky at their rising and correspondingly in the western sky at their setting. There are nine closely grouped star positions, beginning with Vega on the north and ending with Antares on the south. When these nine rising positions are combined with their setting counterparts on the west, they embrace in the intervals between them sixteen or half of the thirty-two intervals into which the entire star compass is divided...In the middle of this arc, rising due east, is Altair, the "Big Bird." Just to the north and south of Altair, in the same constellation which we in the West also call a big bird, the Eagle, are its wings, Gamma and Beta Aquilae. Altair is where the count of stars on Puluwat begins, the greatest navigation star of all."

[Gladwin, 1970: 154]. This midpoint in the Tahitian compass is called 'Ana-roto for Spica, but the comparable points of MAAN, the "Big Bird" in the Tahitian compass line up with Procyon and Betelgeuse (in Orion), so that a fairly consistent parallel to the Micronesian sidereal compass is effected.

The orientation of the Micronesian compass to a point in Aquila as due East is similar to what is found in navigation directions for the Indian Ocean found in the Turkish Mohit as practiced by sailors from Arabia and the Maldives:

Of the Divisions of the circle of the sky: "The learned in nautical science agree that the circle of the sky, that is to say, the horizon, is divided into thirty-^w~~ty~~ directions, which applied to the horizon make these thirty-two divisions, every one of which is named after a particular constellation to which seafaring men have given a particular name. So they call in Turkey the north, Yildiz, which the masters of the Indian seas call Kutb Jah...So the two calves (Beta and Gamma in Ursa Minor) are true north, the rising point of them is N. by E., the setting point of them N. by W. The rising point of the bier (the square of Ursa Major) N.N. E.; the setting point of the bier N.N. W. The rising point of the camel (Beta in Cassiopeia:) N.E. by N. The setting point of the camel, N.W. by N.; the rising point of Capella N.E.; the setting point of it N.W.--The rising point of the falling eagle (Alpha in the Lyra, i.e., Vega) N.E. by E., the setting point of it N.W. by W. -- The rising point of Spica E.N.E.; the setting point W.N.W. The rising point of the Pleiades E.by N.; their setting point W. by N. The rising point of the eagle true east, the setting point of it, true west. The south is in Asia minor and Roomeli generally called the Kibla. The master of the Indian seas calls it Kutb-i-Soheil, that is to say, the pole of Canopus. The rising of Solbar or Solibar (which seems to be Alphard) S. by E.; the setting point of it S. by W. The rising point of the two asses (Gamma and Delta in Cancer:) S.E. by S., the setting point of it S.W. by S. The rising point of the scorpion S.E.; the setting point of it S.W. The rising point of the crown S.E. by E.; the setting point of it S.W. The rising point of Arcitenens E.S.E.; the setting point of it West South West. The rising point of the twins East by South.; the setting point of it W. by S. These are the names of the

thirty-two khans (points of the compass)...The denominations of the khans after the rising and setting of the above named stars, belongs to the Indian seas and the denomination is only approximative and metaphorical, and not real [Prinsep, James from Joseph Von Hammer, 1838: 768-769].

Upon the Arabian compass denominations the scheme of Micronesian and Tahitian pillar stars may be imposed for the sake of comparison:

Stars	Micronesian	Arabian*	Tahitian
A. Polaris	Wenewen(e)	1.The Kid N 89°08'	Ana-ni'a
B. Ursa Minor		2.The Calf N 74°16' (Beta Ursae minoris, Kochab)	
C. Ursa Major	Daane Wole	3. Alpha Draconis Alpha Ursae Majoris, Dubhe N 61°55'	Ana-tipu
		4.Eta Ursae Majoris Al Kaid N 49°28'	
D. Cassiopeia	Ukenik	(Beta Cassiopeia, Kaff)	
		5. The Goat, Capella N 45°58'	
1. Vega (Lyra)	Mĕĕn	6. Vega N 38°45'	
(Arcturus, Bootes)		7. The Spear-bearer Arcturus N 19°20'	Ana-tahua-metua- te-tupu-mavae
2. Pleiades (Taurus)	Mweriker		
3. Aldebaran	Wuun	8. Aldebaran N 16°27'	Ana-muri
4. Gamma Aquilae	MAAN		
5. Alpha Aquilae (Altair)		9. Alpha Aquilae, Altair N 08°47'	
(Betelgeuse, Alpha Orionis)			Ana-varu

Stars	Micronesian	Arabian	Tahitian
(Procyon, Canis Minor)			Ana-tahu'a- vahine-o-to'a- te-manava
EQUATOR			
7. Orion's Belt (Canis Major)	Jenywen	10. Delta Orionis, Al Mintaka S 00°19'	
(Spica, Virgo)		11. Sirius (Canis Major) S 16°41'	
(Alphard, Virgo)		12. Spica E.N.E. S 11°00'	Ana-roto Ana-heuheu-po
8. Corvus (Gamma and Delta Cancri)	Serepwen	13. Asellus borealis and Asellus australis. in Cancer: S.E.by S.	
9. Antares (Scorpio) (Sagittarius)	Tumur	14. Antares S 26°22'	Ana-mua
E. Shaula (Scorpio)	(Tumur)	15. Arcitenens E.S. 16. Lambda Scorpionis S 37°05'	
(Phaet, Columba)			Ana-iva
(Grus)		17. Alpha Grus, Al Nair S 47°07'	
(Argo)		18. Alpha Carinae Canopus (The Pole) S 52°41'	
(Eridanus) F. Southern Cross	Wenewen Eer	19. Achernar (Eridanus) S 57°23'	

Given the full range of these various compasses for the Indian and Pacific Ocean, a comparative table can be graphed by which to assess the Hawaiian claim for the stars used in navigation between Tahiti and Hawaii by various stars: Polaris, Sirius, Arcturus, Altair; constellations, Orion, Gemini, Pleiades, Aquila, Hyades, and the Southern Cross.

Navigation Stars	Arabian	Micronesian	Tahitian	Hawaiian
1. Polaris	The Kid N 89°08'	Wenewene	Ana-ni'a	Hōkū-pa'a Kio-pa'a
2. Ursa Minor	Kochab and Pherkad	N 74°16'		
3. Ursa Minor	Al Tinnin N 51°29'			
4. Ursa Major	Eta Ursae Majoris Al Kaid N 49°28'			
5. Ursa Major		Daane Wole		Nā Hiku
6. Ursa Major	Alpha Draconis			
7. Ursa Major	Dubhe N 61°55'		Ana-tipu	
8. Cassiopeia	Kaff	Ukenik		
9. Auriga	Capella N 45°58'			
10. Lyra	Vega N 38°45'			
11. Gemini (Castor, Pollux)				Nāna-mua Nāna-hope
12. Bootes	Arcturus N 19°20'		Ana-tahu'a- te-tupu-mavae	Hōkū-le'a
13. Hyades				Ka-nuku-o- ke-kapuahi Makali'i
14. Taurus	Pleiades (E. by N.)	Mweriker		
15. Taurus	Aldebaran N 16°27'	Wuun		(cf. Ka-u-le-o- Nanahoa (Humu-mā)
16. Aquila (Gamma)		Maan		
17. Aquila (Alpha)	Altair N 08°47'	Maan		Humu
18. Aquila (Beta)		Maan		(Humu-mā)
19. Orion			Ana-varu (Betelgeuse)	
20. Canis Major	Sirius S 16°41'			Hōkū-ho'okele- wa'a, A'ā
21. Canis Minor (Procyon)			Ana-tahu'a- vahine-o'to'a- te-manava	
22. Orion's Belt	Al Mintaka	Jenywen	Meremere	Melemele Nā Kao

Navigation Stars	Arabian	Micronesian	Tahitian	Hawaiian
23. Virgo (Spica)	Spica (E.N.E.) S 11°00'		Ana-roto	
24. Virgo (Alphard)			Ana-heuheu-po	
25. Corvus		Serepwen		
26. Cancer	Gamma and Delta Cancri (S.E. by S.)			
27. Beta Scorpio	Iklil al Jahbah (Akrab)			
28. Alpha Scorpio	Antares S 26°22' (Kalb al 'Akrab)	Tumur	Ana-mua	(probably Welehu, Lehua-kona)
29. Sagittarius	Arcitenens E.by S.			
30. Shaula (Scorpio)	Lambda S 37°05'	Tumur		
31. Phaet (Columba)			Ana-iva	
32. Grus	Alpha Grus, Al Nair S 47°07'			
33. Argo	Alpha Carinae. Canopus S 52°41'			Ali'i-o-kona- i-ka-lewa
34. Eridanus	Achernar S 57°23'			
35. Southern Cross		Wenewen Eer		Newenewe

[Declinations acc. 1973 Observer's Handbook: 80-89]

The Hawaiian Gourd Compass

The conclusive factor of relationship between the two compasses, Hawaiian and Carolinian (Micronesian), is the form of the names for the Southern Cross in the two languages: Micronesian is Wenewene Eer, meaning "Southern Wenewene" (Wenewene is the North Star, the "immovable point", Polaris). The Hawaiian name for the Southern Cross is Newenewe, probably the result of metathesis of Wenewene.

A second feature of relationship is the alignment of the two compasses on the north-south axis to Polaris in the north and the Southern Cross in the south. A diagram, based on the directions given by Kamakau, illustrates this:

Notes to Page 38 on the Nukuoro calendar [Acc. Emory, 1965: 346]:

These are the names of the 12 lunar months at Nukuoro and their equation with our months, as given by Iohanis, together with the identification of the star names, and their Kapingamarangi equivalents, as far as could be learned:

Month	Nukuoro Name	Kapingamarangi Name of Star or Constellation	Identification
January	Matariki	Matariki	Pleiades
February	Takero	Ti waka tokotoru	Belt of Orion
March	Manu	Manu	Sirius, Canis B,E
April	Itiiti	No name	One star, does not shine brightly
May	Harapori	Harapori	Spica
June	Alamoi	Romoi	Arcturus
July	Tumuru	Meremere	Antares & 2 other stars
August	Maitiki	No name	Sagittarius, 4 stars
September	Mairap	Mairap(a)	Aquila
October	Seta	Matatae	4 faint star in shape of Y
November	Laka	No name	Very faint group of stars, making a fork much like Seta
December	Tahora	No name	Cassiopeia forms the tail; a large constellation stretching across the sky

These are the same names, except for spelling, and in the same order as given to Jeschke (Eilers, 1934, p. 299). For comparison with the Micronesian names and identification of stars, see Goodenough, 1953, pp. 33-39.

On the early evening of August 22, 1950, I was sitting with Henry, the native pastor from Nukuoro and Iohanis, when the question came up of what month this would be at Nukuoro. They said it was Maitiki, pointing out Sagittarius nearing

zenith. "Maitiki will be directly overhead at the end of this month." They then pointed to Aquila (Mairap) which they said was coming into its right position for the beginning of the month of September, the right position being midway up the eastern sky in the early evening. In checking with the information given by Iohanis three years before, I find he said, "These stars stand overhead at dawn in the months given, and they end the months overhead." By adding "in the early evening," his first statement is consistent with the later one. [Emory, 1965: 346].

The following texts are from the Hawaiian newspapers to provide additional support for the discussion of the Hawaiian compass. They have been cited in the text, but not published and are not available except in rough translation. Other information which has not been used in the book has only been recently found and is included here for the purpose of providing as much as can be presently known about Hawaiian astronomical ideas and methods of instruction or oral transmission.

Kamakau, S.M. No Ke Ano Hoku, Ka Nupepa Kuokoa; August 5, 1865 [Entry dated July 26, 1865].

Ua kulai waiho mōla'ela'e a'e au i ka moololo o na wahi keiki hookele hoku holo moana, ai ko mane'o o Mokuleia; noweo maka uwahi kai o elokupaoa.

Ua ike ae au i ka lakou Kumu A'o Hoku holo moana. He wahi keiki i umi makahiki a oi ae paha, oia ka lakou kumu holomoku.

O Kanowa ke kahua o Hanai, ka halekula o Pekue, ka nalu o Kalakiki, ke kumu o Kaneakahoowaha ma na haumana.

NO KE AO HOKU ANA

1. E lawe ae ke kumu i ka ipu hokeo loihi me he pauku olokaa la ke ano. Ua kunikuni ahi ia he mau alanui. Oia hoi na alanui o na hoku hookele, ua kapaia na

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ABBREVIATIONS

BPBM. Bernice Pauahi Bishop Museum

Cf. Cross-reference

Cp. Compare

For. Fornander

7 H.M. *Hawaiian Mythology (by Martha W. Beckwith)*

JPS. Journal of the Polynesian Society

JRAS. Journal of the Royal Asiatic Society

Kep. Kepelino

Lit. Literal

n.d. no date

PE. Puku'i-Elbert

RASC. Royal Astronomical Society of Canada

tr. translator, translated