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Comparative Analysis of the Turkana Ethnoecological Calendar and Gregorian Dating System: Prospects and Potential for History and Ethnographic Preservation

By

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Abstract

This article discusses factors contributing to the declining popularity of the Turkana ethnoecological calendar and the rising popularity of the western dating system among the Turkana. Ethnoecological calendars are a structural list of collective memory of cyclical annual events within a social group; they are based on local ecological knowledge about annual phenology of plants and animals, and sociocultural activities that deepen our comprehension of the climate and seasons of a certain ecological zone. The Turkana ethnoecological calendar has traditionally enabled the community to forestall seasonal uncertainties and serves as anticipatory knowledge for the security of livelihoods. However, the knowledge embedded in this ethnoecological calendar is diminishing due to the increasing effects of seasonal variations on livelihoods, the influence of western culture, and lexical borrowing and semantic change in the naming of months of the year in *ngaturkana*. There is an observed mismatch not only between the month and the established seasonal activities depicted in the naming of the month or season but also between the month and the corresponding month in the Gregorian calendar. Consequently, the Turkana have embraced a hybrid sense of time (numerical dating system) to reconcile the shifting actual weather conditions that define their seasonal calendar with the western dating system used by the majority. This article argues that the two calendars coexist and serve parallel needs of the Turkana. Ethnoecological calendar continues to supply the community with ecological information, along with local knowledge of the biophysical, and social-cultural cycles in their environment to make seasonal-based decisions, while the numeric dating system founded on the western dating system serves the ecological, religious and civic needs of the community. This article advocates for the preservation of the local ecological knowledge as 'Ethnoecocultural Heritage' of the Turkana people; a scientific justification for the use of ethnoecological indicators for commencing livelihoods activities; revitalization of the Turkana ethnoecological calendar by enhancing transmission of this knowledge to the next generations; a scientific study to recalibrate the Turkana ethnoecological calendar with the western dating system and current ecological data to enable people make feasible seasonal predictions to better plan their food production, adapt to future changes; and investment in harvesting of rain and flood water for dryland agriculture.

Key Words: Ethnoecological, Turkana, Ateker, Seasonal calendar, Ethnoecocultural, Phenology, Numeric Dating

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Comparative Analysis of the Turkana Peoples' Ethnoecological Calendar and Gregorian Dating System: Prospects and Potential for History and Ethnographic Preservation

By

Boniface Lokaale Korobe

Introduction

Background

The Turkana territory lies within the boundary of Turkana County, which covers approximately 77,000 km². Turkana territory is a great plain measuring about 800 km from Kapedo in Turkana South to Kibish in the North, and about 300 km from East to West. The rift valley escarpments forming the western boundary gradually slant the plain to the east, that is from the rift valley wall to Lake Turkana. Scattered over the territory are many ranges of hills and a few large mountain masses which vary in height between 4500 and 7,000 ft. Mt. Loima which is the tallest of them all measuring about 7,000 ft. high covers about 120 km from north to south and about 60 ft. from east to west. The second tallest is Mt. Lorionotom in the North. Lapur, Morueris, Pelekec, Kailongkol and other small mountains are solitary peaks rising up from the plains with broad slopes and shoulders. There are long stretches of plain land unbroken by mountains cutting across the territory. In the north, Mt. Lokwanamor and Mt. Mogila are bound by a long stretch of plain land measuring about 100 Kms. Other plains include Tarac, Tirkwel, River Malmalte, Lomelo and Meyen river basins.

The Turkana are a semi-nomadic agro-pastoralist group of Eastern Nilotes living in Turkana County in Northwest Kenya, sharing physical borders with Lake Turkana in the East, Pokot (Ngipokot in Turkana language, also called Ngiupe) Rendille (Ngirantale) and Samburu (Ngisambur also called Ngikor) people to the south, Karimojong (Ngikarimojong), Jie (Ngijie) and Dodoth (Ngidootho) of Uganda to the west, and Toposa (Ngitoposa) and Nyangatom (Ngidongiro) of South Sudan and Nyangatom (Ngidongiro) and Dassanach (Ngimarile) of Ethiopia to the North. Turkana economy revolves around livestock keeping among the pastoralists, subsistence agriculture along the Kerio and Turkwel rivers, fishing along lake Turkana, hunting and gathering across territorial sections, petty trade, menial and formal employment among the town dwellers etc.

The structure of Turkana settlements, specifically, among the nomadic pastoralists is based on *adaka*r, pl. *ngadakarin*, or associated groups of *ngadakarin*. *Adakar* is an autonomous grazing and livestock management unit usually comprising one or more homesteads of related or unrelated men living in the same neighborhoods. Due to the culture of warfare, hunting, and herding, which is predominantly a man's activity, Turkana society is patriarchal; that is, the government is in the hands of elders. Kinship is traced through the male line, and so, a father transmits his patronymic and group affiliation to his offspring.

In conventional writing, linguistic gender prefixes *(ngi-* and *nga-* for the people, language, and plurals for masculine and feminine nouns) have been left out, thus the name 'Turkana' refers to the 'people, land and language' of the Turkana people. Their own name for people is *ngiturkana*, the land is Turkan and the language is *ngaturkana*. According to the National Census of 2019, they number about one million, making them the second-largest pastoral group after the Maasai and the top ten majority in the republic of Kenya. A significant number of them live in Marsabit, Samburu, Baringo, Isiolo, and Laikipia counties.

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The Turkana speak a dialect similar to a variety of dialects spoken by a group of Eastern Nilotes referred to as 'Ateker'. Due to this linguistic intelligibility, Barton (1921) called them 'Niloto-Hamitic race', while Gulliver (1952a and 1952b) classified them as 'the Turkana speaking peoples', and 'Karamojong Cluster' respectively. Webster (1973) and Lamphear (1992) classified them as Ateker Group of the Eastern Nilotic Language Family. They have previously been classified as a 'Central Paranilotic group', 'Eastern Sudanic', 'Nilo-Hamites' which means nothing to the people, or 'Iteso-Turkana group' which also imprecisely suggests that this cluster of people descended from the Ngiteso and Ngiturkana tribes. Barrett (1988) calls them the 'Ngitunga group', in which *ngitunga* means human beings.

On account of origin folklore suggesting the entire cluster groups descended from the Jiye, Lokuruka & Lokuruka (2006) proposes, that they should be classified as the 'Jiye Cluster' rather than the 'Karimojong Cluster". For lack of generic name for the cluster and the fact that the word Ateker captures the mood whenever it is mentioned to refer to the cluster groups, as well as its wider acceptability and usage by the cluster scholars in the huge anthropological literature, Korobe B. (2021), proposes that the term Ateker should continue to designate all the eight cluster groups, namely: Ngiteso, Ngikarimojong – (Ngimatheniko, Ngibokora, and Ngipian), Ngijie, and Ngidoso of Uganda, Ngijiye, Ngitoposa and Nginyangatom of South Sudan, Nginyangatom of Ethiopia, and Ngiturkana of Kenya.

In submission to the fact that 'related dialects' are normally considered varieties of the same language if speakers of each variety have an inherent understanding of the other variety at a functional level, that is, can understand based on knowledge of their own variety without needing to learn the other variety, Korobe (2021) reclassified Ateker groups into two: 'Ngi-Nga Ateker' Nilotes referring to all the seven Ateker groups excluding the Ngiteso group which is now reclassified as 'Non-Ngi-Nga Ateker' of Eastern Nilotes.

Redefinition of Ateker cluster is based on the fact that the linguistic distance between the *ngateso* language and other Ateker dialects is so great that, when an *etesoit* (sing. for *ngiteso*) speaks, a translator is required to pass the message to the other members of Ateker groups and vice versa. Based on low mutual intelligibility, and great linguistic distance between the Ngateso dialect, and the rest of the Ateker dialects, the latter of which are characterized by the common use of (*ngi-* and *nga-*) gender prefixes. Due to their interaction with the Luo and Acholi neighbours the Ngiteso have lost Ateker noun gender markers: *'l-, e-'* for masculine, *'a-, n-'* for feminine and *ngi-* and *nga-* linguistic gender prefixes. These gender prefixes and noun markers characterize the remaining seven Ateker cluster groups of people by being common to all of them, includes all of them, and excludes all others. The use of common aspects of languages has been used in the past to classify languages into dialect clusters, and language families, e.g. the Maa, and Bantu speakers, etc. Note that the /ng/ sound in Turkana and Ateker dialects is velar /n/ sound as in the English hanger and not hunger.

Statement of the Problem

Although many Turkana agree on the names and chronology of the months of a Turkana ethnoecological calendar there is disagreement on the length, start and end points of a Turkana year. A recent WhatsApp discussion by the Turkana professionals on this topic yielded the following contentions, that: (1) Turkana treat seasons as two separate years (Titus Lokorikeju, WhatsApp discussion, May 10 2022); (2) By the time the Gregorian calendar gets to December, Turkana year will have ended in August – Losuban, and a new year begins

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in September – Lopo, so, a Gregorian calendar year falls in between two Turkana years (Ekuam Ewoi, WhatsApp discussion, May 10, 2022); (3) Turkana year begins at the beginning of the rain season in Lomaruk, which corresponds to March and ends in Lodunge which corresponds to February (Boniface Korobe, WhatsApp discussion, May 10, 2022); (4) Turkana seasonal calendar has been altered irreparably by climate change; weather-dependent activities associated with the naming of the months keep on shifting arbitrarily; as such, seasons have commenced on varying months of the year, and that, this situation has not only rendered Turkana calendar redundant to majority but also confusing to the users (Boniface Korobe, WhatsApp discussion, May 10, 2022); (5) Bearing in mind that majority of the Turkana utilize the Gregorian calendar due to redundancy of the traditional ethnoecological calendar, this being the standard dating system used by the church, governments and the neighboring speech communities for transacting business, it is proposed that Lomaruk the first month – *elap lo a ekingaren* in the Turkana traditional calendar should correspond to January referred to as *elap lo a ekingaren* in the Gregorian calendar used by the majority of the world, and not March (Boniface Korobe, WhatsApp discussion, May 10, 2022). To attempt to address these contentions, there is need to explore the nature of the Turkana system for counting time, the nature of their ecology, the effects of climate change on livelihoods and ethnoecological calendar, and interrelationships between ecological activities and their relevance in the naming of the months and seasons in relation to the Gregorian calendar. In this paper, Turkana words have been italicized except for proper nouns, and the names of the months are going to be capitalized.

Turkana Ecology and Climate Change

The climate of Turkana County is mostly arid and semi-arid. The temperature oscillates between 20 to 41ºC, with an average of 30.5ºC (Turkana County Government, 2018). The county has several agroecological zones with varying humidity and temperature; the wide-lying plains are dry and get the least rainfall in the county, averaging 180 mm per year (Turkana County Government, 2018). The rainy season is divided into two parts: the long rainy season takes place between March and July, while the short rainy season runs from October to November.

The County gets 200 mm of rain on average each year. January, February, and September are often the driest months. Salt and hardpans form on the soil surface as a consequence of little rainfall and high temperatures, along with high rates of evapotranspiration. As a result, just 30% of the county's soil is suitable for cultivation (Turkana County Government, 2018). Rainfall in the county is irregular and inconsistent. Heavy storms and devastating flash floods are also possible. Flooding may also be caused by heavy precipitation in a short period (NDMA, 2016).

According to Olang (1984) and Herlocker (1979), the Northeast monsoon wind which originates over Arabia from December through March passing over Somalia before reaching Turkana District, brings a flow of hot, dry air masses resulting in little or no rain. Long rains occur under the influence of the southeast monsoon, known by the Turkana as *loriu* which originates over the Indian Ocean and is relatively cool and moist. The areas along the western wall of rift-valley bordering Uganda receives more rain than any other part, partially due to the orographic lifting of air masses loaded with moisture from Lake Turkana. Rainfall data from the Meteorological department show that the area bordering Uganda receives about 500 mm annually (Herlocker, 1979). Meteorological figures from Lokitaung from 1975 to 1981

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indicate that the hilly areas along the Kenya – South Sudan boundary receive more than 500 *mm* yearly.

Climate change in Turkana County is a sad reality. According to MoALFC (2021), Turkana County is among the places battling serious consequences of climate change in the world. The region has become very hot and dry, the amount of rainfall received annually has decreased tremendously and trends indicate that it is going to drop further in future. The number of consecutive dry days during the long rainy season has increased and is projected to increase by up to twenty five days in the future. Droughts and famines have become frequent and dry seasons have become extended.

Future climate projections indicate that average precipitation will increase by 10 *mm* or more during the short rainy season. The study also established that during the long wet season, there are normally more than 70 days with a maximum temperature of more than or equal to 35°C, and future climate estimates suggest this number will slightly rise in certain locations, by up to 30 additional days during the long rainy season and by more than 15 days during the short rainy season. A comparison between historical and projected trends showed that Turkana County will face between 10 and 12 more days of moisture stress in the coming years and that this amount will reduce by up to 20 days during the short wet season. This means that farmers should plant early maturing and drought-tolerant varieties of crops. Pastoralists on the other hand have to review their grazing patterns to cope with climate change.

Turkana Local Ethnoecological Calendar

The Moon Cycle and Clock-time

The Turkana reckoning of time is based on a twelve-month 'lunar year' whose monthly cycles are the moon's cycles, and 'tropical year', which is the time that the sun takes to return to the same position in the sky completing a full cycle of seasons. For example, the time from Lomaruk to Lomaruk in two consecutive years. The lunar year is determined by the length of time it takes the moon to complete each of its phases (new moon, half-moon, and full-moon); it quantifies the period between the new moon and the subsequent new moon, or between the new crescent and the subsequent new crescent for a period of one year. The Turkana speak of about 28 white days (*ngirwa luakwaak*) and two black days (*ngirwa lukirionok*) between a new moon and the next. You will hear them say, *irukorete elap ka akolong akwaar na, tourak moi ka moi nace, ani akwaar na a ngauni, kilamu* – (the moon will accompany the sun to night, and vanish for two days, on the third day, it resurfaces). Traditionally, Turkana do not utilize the weekday system, they simply count days of the month from the day when the moon's crescent is spotted to the day when the next crescent is spotted. When a new moon is spotted, the Turkana say, *elamu elap* meaning a new moon has been sighted – born; when it vanishes, they say *atona elap*, meaning the moon has died. If the new crescent is not spotted on the eve of the new moon, maybe due to clouds or unclear vision, and is spotted the following day, it is declared to have been sighted the previous day.

When a new crescent is sighted people ask it for blessings, *wole wole wole, nakinae akiyar, nakinae ngibaren* – (hey, give me hope, give me livestock, etc.), as such, it is the whole society which is involved in spotting the crescent, for no one wishes to miss the opportunity to be the first to pray to the crescent and ask for blessings; by doing so, people are able to account for the days of the month. Keeping track of the days of the month is a daily affair; people keep on reminding one another the days of the month. For example, a Turkana speaker will say, *ati ngiai ngirwa a elap akwaar na?* – so and so what is the day of

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the month/moon today. The person being talked to will start explaining the day of the month according to him/her as follows: *elamuni elap lo niti ayei ayong nabor, ani iwalari eriu atoperiu Lodwar, kiwala atoper, atorotok been atoperiu ne, ngikan ngirwa akwaar na* – this moon was sighted when I was at the cattle camp, a day later, I left the cattle camp for Lodwar, where I spent two nights, after which I left and arrived here yesterday, so, the days of the moon are five today. The people present will agree or disagree; if they disagree, each will give their versions until a consensus is reached.

For a strange reason, the Turkana say that when the moon vanishes for two nights from the sky it is still visible to the livestock and the blind; they say that animals usually sight it on the 1st dark night of its disappearance, followed by the blind who spot it on the 2nd dark night before it is sighted by everyone the following day. I think there is a clue to this belief; the Turkana maintain the integrity of the moon; the moon-god has religious significance to the people. The first day of the crescent is a lucky day; when the new crescent is sighted, people come out waving at the crescent asking it for blessings. However, no rituals are conducted till the fourth day when the newborn moon is expected to drop the cord-stump – *atubwor apusit*. They believe that when a new moon is born, like a child it takes four days to drop the cord-stump, as a norm, no rituals are conducted at this time. The period from Day 5 to Day 24 of the new moon is considered lucky; this is the time allowed for festivals and rituals. The last six days (four white and two black) are considered unlucky; therefore, no rituals or celebrations are conducted at this time. The posture of the arms of the crescent also matter to the people, they hint at the direction to move the livestock, an imminent danger to the people, etc. When the crescent tilts, say, to the southern direction, depending on other cues, this might signify that it is safe for cattle camps to migrate northwards – the direction of the raised arm. It might also mean that the enemy living in the northern direction is in advantageous position, or that the one living in the southern direction is in disadvantageous position.

The resurfacing of the moon renews hope, this is why when the new crescent is seen people rush to ask it for blessings; as a deity, when it vanishes from the sight of the people for two nights, it is held that it is still visible to animals and the blind, so it does not really die or disappear completely. During lunar eclipse, people say the moon is dying, and so they beat drums and other objects, to resuscitate and prevent it from dying. This implies that the moon-god is not supposed to die; accordingly, its disappearance for two nights may be part of the time the moon takes to reincarnate or reboot before resurfacing with hope to the people. Four of the white days are named: *egete* – the antelope, is the day when the moon (full moon) starts to rise at 6 pm, followed by *ekamuran* – the in-law, *ekatutuyat* – walking with blurry vision, and then *amutwae*/*amute* – darkness nights when people step on others or objects due to lack of vision.

By the words of Evans-Pritchard (1939), the Turkana sense of time reflects their personal ties with the physical environment and with one another within the social structure; their time reckonings are sociological notions referring to sequences of events that are significant enough to society to be noted and cognitively linked. The Turkana do not have lexical translation for days of the month, days of the week and western clock time. Time is given by pointing at the exact position of the sun, star or moon. The position of the sun in the sky indicate right time for social activities that the Turkana traditionally might do or usually do at that time. Thus, the position of the sun is a pointer for a named event-based time interval, the name of which is defined either by the position of the sun, the presence of light or absence of it or by some traditionally associated activity. Traditionally, these event-based

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time intervals have the connotation that people would engage in certain activities customarily at this position of the sun, light etc. Note that, the activity-based time interval is a true time reference, which is different from the actual activity, the name does not indicate the activity is actually taking place at the time of mention. For example, a Turkana speaker may say *awariun ngesi ebong – ekamuran niti elepio ngakitowoet* – he arrived in the evening of *ekamuran* day, at the second round of camel-milking. Traditionally camels are milked four times a day: at 6.00 am, 9.00 am, 6.00 pm and 9.00 pm. (refer to table 5).

The Turkana split the year into two six-month-long seasons: the rainy season (*akiporo*) and the dry season (*akamu*). Although there is a subsidiary rain season – *erupe* or *akiceer* which literally means little rain or sprinkling around the month of Lomuk – the 4th month of the dry season, it is nonetheless ignored as showers habitually fail to come due to shifting weather conditions. The names of the months are phenomenal, they are determined by the prevailing weather, environmental conditions, sociocultural, socioeconomic, ecological and ecocultural – weather dependent activities that occur during the month. The Turkana ethnoecological calendar is an important depiction of the behaviour of plants and animals, as well as the seasonal availability of resources and the occurrences of cultural practices.

One characteristic of Ateker months is that months follow each other according to the order of the seasons and weather-dependent activities traditionally associated with them. In a nutshell, the order of the months refers to succession of ethnoecological indicators – (Ecological indicators are biological assemblages or taxa that by their presence or condition indicate something about the environment). Even though the activities associated with the naming of the months have stopped to correspond to the month due to the shifting actual weather conditions associated with the month, but the order of the months has remained unchanged for most of the Ateker groups. This means that an *eturkanait* (sing. for *ngiturkana*) standing at any point of time has conceptual knowledge of what lies before, and this knowledge enables him to predict and organize his life accordingly. The Turkana memorize the sequence of the months through a narrative that explains how ecological and ecocultural indicators and/or biophysical and socio-cultural activities are linked to one another cyclically. The narrative goes as follows:

> *Erai ekaru loturukanait ngilapio ngitomon ka ngiarei; ngilapio lu a akiporo ngikanikapei, ngilapio lu a akamu ngiakanikapei. Na ebilia akiru akiram, kimarukokis* (Lomaruk) *ngidowon, taram akiru, ani erami, min ecoto* (Locoto) *akwap, kititimak* (Titima) *amel(u), dio kiela* (Ele-el), *tojoker akwap min ajako, tonyounoe akisub* (Losuban) *ngitalio, ani erumwor kiitia akwap, totiakas* (Lotiak) *akiporo ka akamu, toting alongu* (Lolongu) *akwap, kisiakis ngitunga akipore* (Lopoo) *ngakoot, eedung, edapal, ngibeyo, tooko ngikito tararaut* (Lorara) *ngatur/ngakwii, kidisik akwap kimuko* (Lomuk) *ngidowon akwap, acepak dae kilimilimak, tokut ekuwom, totingakin ngitunga ka ekwange, tokwangaketa* (Lokwang) *ngitunga ngawat, tonyout ngilowui a akwaan, tasha elap kilore, kilamu elap lo edudungiari* (Lodunge) *akamu.*
>
> Turkana year has twelve months; six belong to the wet and the other six belong to the dry season. When the rain clouds start to form (Lomaruk), it rains, when it rains, mud appears (Locoto) everywhere, grass germinate (Titima), grass blossom (Ele-el), the land becomes good and bountiful, people begin celebrations, ritual festivals (Losuban), then the wet and dry seasons part ways (Lotiak), aridity engulfs the land (Lolongu), people begin to bleed animals to draw blood for food, cook wild fruits

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> (Lopoo), trees wither and shed leaves, (Lorara), scattered clouds cover the land (Lomuk), short rains may be experienced, then dry wind, bright moon and clear sky (Lokwang) follows, then comes the month which dislodges/overturns (Lodunge) the dry season marking the beginning of the wet season.

From the above narrative, it is clear that the first month of the Turkana calendar Lomaruk begins at the onset of the wet season. In the past, the rainy season used to begin around March, meaning Lomaruk corresponded to March and Lodunge corresponded to February in the Gregorian Calendar.

Names of Months and Meanings

The names of Turkana months of the year are eponymous. Months take their names from ecological, ecocultural, sociocultural, socioeconomic, and weather–dependent activities that occur during the months and serve as local seasonal indicators. It is not possible to equate Turkana months to the Gregorian calendar months given that the Gregorian months are not connected to the moon's cycle like the Turkana ones (Table 1). The mismatch is twofold, firstly, a new moon is sighted on varying dates of the Gregorian months, secondly, Lomaruk, the first month in the Turkana ethnoecological calendar, does not correspond to January the first month in the Gregorian calendar; as such, a complete cycle of a Turkana month straddles two adjacent Gregorian months. Ideally, Turkana ethnoecological calendar is an aggregate of activity-based lunar time-interval between two Gregorian months as hereunder.

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Table 1: The Turkana Ethnoecological Calendar

Turkana Months	*Gregorian Months*
Lomaruk	March – April
Locoto	April – May
Titima	May – June
Ele-el	June – July
Losuban	July – August
Lotyak	August – September
Lolongu	September – October
Lopoo	October – November
Lorara	November – December
Lomuk	December – January
Lokwang	January – February
Lodunge	February – March

Source: Author

In March of 2021, the new moon was sighted on the 13th of March, meaning the full lunar cycle of the new moon (Lomaruk) ended on the 11th day of April and Locoto began on the 12th day of April and ended on the 10th day of May. If the rain clouds were to gather from the 25th day of Lomaruk, the 5th day of April until 24th of May, the 13th day of Ele-el when the rain is expected to come, it means that weather-dependent activities will have shifted by one month thus affecting the position of the month in the cycle. Lomaruk will have shifted to Locoto, Locoto to Ele-el and so on for the rest of the month. The mismatch between the days of the month (Gregorian calendar) and the days of the moon (Turkana local ecological calendar) coupled with seasonal variability usually continues until the year repeats or reboots when long rains are again received irregularly. As seasons restart around the same time across the world, the long rainy season almost always begins, unless otherwise, between March and April and ends in July to August as the dry season commences between August and September and ends between January and February.

One characteristic of a Turkana month is that when the rain clouds begin to form, for example, on the 20th day of Lomaruk and extend, say, to the 20th day of Locoto when the rains are received towards the end of Locoto, in principle Locoto will be regarded as Lomaruk and Ele-el as Locoto and so on. As such, when the activity associated with the first month of the Turkana calendar *(akimaruk)* begins towards the last days of the lunar month, the wet season is reckoned to have begun the following lunar month. To live with this reality, as rule, all the Turkana have to do to maintain the month in its fixed seasonal position is to change the name from the month they thought it was to the month it must be. Evans-Pritchard (1939) observed this among the Nuer of South Sudan. Like the Nuer, Turkana months adjust themselves to the annual cycle of activities. Seasonal changes may delay or come early, but there are certain activities undertaken in each of the months, it is these seasonal activities that regulate the calendar rather than the calendar regulating activities.

Wet season

The name of each month is a one-word aphorism that projects what will occur with the seasonal changes or the ecosystem during that particular month. Etymologically the names of the months are locative verbal nouns describing ecological and ecocultural activities that take

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place during the month. Almost similar terms are applied to names of the months among the Ateker groups but there are several exceptions. Refer to the Table 2 below.

Table 2: Ethnoecological Calendar of Ateker Groups

Turkana	*Matheniko*	*Bokora*	*Jie*	*Nyangatom*	*Dodoth*	*Toposa*
1. Lomaruk	Lomaruk	Lomaruk	Lomaruk	Lomaruk	Lobal	Lodesulae
2. Locoto	Titima	Titima	Locoto	Locoto	Lomaruk	Longoomo
3. Titima	Ele-el	Ele-el	Titima	Lotimae	Locoto	Lotiimae
4. Ele-el	Lomodokogec	Lomodokogec	Lolingacino	Losuban	Lowasicino	Locoto
5. Losuban	Losuban	Losuban	Lorengerot	Lotyak	Lomodokogec	Lolingacino
6. Lotiak	Lotiak	Lotiak	Lopoo	Ele-el	Lorengerot	Lomodokoge
7. Lolongu	Lolobae	Lolobae	Lakabinen	Lorara	Lotiyak	Lotyak
8. Lopoo	Lopoo	Lopoo	Lolobae	Alongaan	Losuban	Alongaana/ Loipo
9. Lorara	Lorara	Lorara	Lorara	Lokwang	Lolobae/Lopoo	Loara
10. Lomuk	Lomuk	Lomuk	Lomuk	Lomuk	Lomuk	Lomuk
11. Lokwang	Lokwang	Lokwang	Lokwang	Lodunge	Lokwang	Lokwang
12. Lodunge	Lodunge	Lodunge	Lodunge	Lopo	Lodunge	Lodunge

Source: Data for Matheniko, Bokora, Dodoth and Jie is based on Sagal et al. (2012), the data for Turkana, Teso and Toposa is based on the author's findings. Note: Many months have shifted for most of the groups most certainly because of climate change, different agroecological zones of the groups and actual weather-dependent activities associated with each month in different regions.

1. Lomaruk:

This is the first month of the wet season; it derives its name from the verb 'akimaruk' which literally means the formation of rain clouds. Among the Turkana, this indicates that rain is imminent; therefore, women begin to prepare sleeping huts and renovate kraals. In Karimojong, it is a month when the white mushrooms – *ngimaruk* begin to grow, when the rain is drizzling – *ilimi akiru*. Lomaruk corresponds to March among the Turkana, Matheniko, Pian, Nyangatom and Jie, but corresponds to April – Lobal among the Dodos [when inedible brown mushrooms – *ngibaalel* appear]; and June – Omaruk among the Teso is a month for gathering mushrooms. Lodesulae, the 1st month of the wet season among the Toposa corresponds to March.

2. Locoto

Derived from *ecoto* mud, Locoto is the month of lots of rain, when every place is muddy making the movement of people and livestock difficult. Depending on the length of rain, the mud may overlap other months, namely Titima, El-el, etc. This does not shift the months as the physiological events of plants eg. *akititimare* - blossoming, or *akielar* – flowering associated with the month will have commenced taking place. Locoto will therefore remain

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the second month of the wet season; regardless of whether rains pick in the third month or not.

3. Titima

Titima derives its name from the verb *akititimare*, which means to blossom. There is plenty of grass for livestock; shepherds graze the animals close to the homestead. This is the time friends begin to look for reciprocal gifts or carry out appeals for support from their kinsmen and extra-familial relatives in and outside Turkanaland. Those who lost livestock to drought approach friends for compassionate gifts of livestock viz, *ngibaren luketepak* (mounting males), *ngibaren lubaran* (female herds), etc. This goes along with loaning animals to relatives or stock associates; it is usually a continuous activity; it may go for a long time as long as a man is in need of breeding services from his livestock associates. Although this is a continuous activity, it is common at this time when families embark on reestablishing their herds after drought stress. Among the agro-pastoralist groups of Ateker, Titima is the month when sorghum is lush and green, and about knee-high, depending on the agro-ecological zone of the group, Titima corresponds to different months in the Gregorian calendar.

4. Ele-el

Derived from the word *akielar*, meaning to spread; to flower; this is the month when some wild fruits ripen and are ready for harvest. Among the farmers, it is the month when sorghum opens the flowers. At this time, livestock camps congregate at the permanent settlements (*ere*) where main wet season activities are conducted. From this month, young men have enough time to visit their friends in distant places – *(toloto akipas, epasas, akipasare)*, or move about to mobilize contingents of fighters to conduct raids on the neighborhoods *(alogita, angare ngajorei*, etc.*).*

5. Losuban

Derived from the verb *akisub* meaning to make; it is the month of festivities, namely, *akisicumaanakin* (meat feasting/thanksgiving festival), *akiuta* (marriages), *amacar* (livestock branding), *asapan* (initiation ceremony for men), among other ritual celebrations. The Karimojong and Toposa refer to this month as Lomodokogec (dirty mingling stick), meaning the month when the pronged mingling stick – *egec* has plenty of oatmeal on it. This is the month of harvest, when farmers have a lot of grain in their granary, people eat sorghum flour until some remains on the mingling stick (*kidong egec emodok*). Among the Turkana it used to correspond to July; however, due to the difference in agro-ecological zones, and climate change, this month corresponds to different months in the Gregorian calendar; among the Karimojong (Matheniko and Bokora) it corresponds to July; among the Dodoth and Teso, it corresponds to October and November among the Toposa. Festivities may extend to Lotiak and the beginning of Lolongu. Generally, this is a period of full village life.

6. Lotiak

Derived from the verb *akitiak* (to separate, divide). This is the month which separates the wet season from the dry season, it marks the end of the wet season and the beginning of the dry season. All festivities come to an end; the grass begin to dry up. At this time herds are split; the milk herds remain at the permanent settlements as the rest of the herds are moved to the cattle camps (*ngaborin*) to look for greener pastures away from the permanent homesteads.

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Depending on the groups and agroecological zone, Lotiak corresponds to different months in the Gregorian calendar.

Dry Season

1. **Lolongu**

Derived from the word *alongu* meaning dry or open place, desert; at this time people and livestock experience much heat, vegetation starts to dry up and shepherds are forced to trek long distances in search of better pastures and waterholes. At this time, families still rely on their food reserves, e.g. *edodo* (dry curd cheese), *ngatoosa* – dry meat strips/fillets from big animals slaughtered during the wet season, *eengol* (nuts of doum palm, *Haphaene coriacea*), etc. Food-wise, the situation here is still good. This also marks the time for trapping/hunting bigger animals and gathering fruits of certain types of dry season food plants, viz *eedung* – *Borscia coriacea*, *edapal* – *Dobera glabra*, *eengol* – *Haphaene coriacea*, *ebei* – *Balanites orbicularis*, etc. The ripe fruits of *edapal* tree are normally picked for their sweet flesh and the green cotyledons, which are consumed after cooking. Before consumption the cover of the fruit is removed and seeds are washed thoroughly with ash, then cooked for 12 – 24 hours. It is usually consumed mixed with other foodstuff like boiled maize, sorghum etc. The surplus is stored for future use. At this time of the year, people begin to migrate to insecure areas across international borderlands which always have grass at this time. During the month animals are divided and driven to different agro-ecological zones according to their browsing and grazing needs. Some families which are small in size and do not have adequate human resource distribute (*akijok*) some of their herds to friends and relatives to keep for them during the dry season as they move with the remaining herds to wherever they think their survival is guaranteed.

2. **Lopoo**

The month's name is derived from the word *akipore*, which means to cook. During this month, people harvest wild fruits and berries, such as *ebei*, *edapal*, *eedung*, and *ngigilae*, and boil them for food. Due to lack of dairy products, people resort to bleeding animals; the blood may be consumed raw, blended with milk, or cooked. Actually, activities that are carried out during Lolongu gain momentum in this month. People start to face survival challenges, so they intensify trapping of the wild game and gathering of wild fruits. Families start to skive food for many days and spare the little they find for the older people and the younger children. The livestock at the permanent homesteads start to go to the watering wells once every two or three days, and on the days in between, they utilise that time to explore the surrounding area in search of new pastures.

3. **Lorara**

Derived from the word *araraun* or *araraar* meaning to shed, drop or fall from something; this is the month when trees begin to shed leaves (abscission) due to hot and dry weather. By this time, homesteads would have moved to the riverine areas to take advantage of the foliage. This is the time *edungoi* – pl. *ngidungoi* – young *Acacia tortilis* trees start to drop *ngitit* – pods. The pods are consumed by both the people and animals. Activities of Lolongu, and Lopoo usually extend to this month. Animals and people become weak and start dying. This is the time young men at the cattle camps in distant places drive meat animals back home to slaughter for their parents and families.

4. **Lomuk**

Derived from *akimuk* meaning to cover; this is the month when the sky is covered with scattered clouds, sometimes, short rain is experienced. If rains are received, this is the month

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of recuperation from the dry season shock, if not, survival activities are further intensified. People move to urban centres to look for support from their relatives or from government and non-governmental organizations. This is the time *ekoropus* (pl. *ngikoropusia*), giant *Acacia tortilis* trees begin to drop their pods (*ngitit*). Families may gather them to provide fodder and food to the kids and those left at home, surplus may be sold or exchanged for grains in urban centres where they are bought to feed livestock kept by households.

5. Lokwang

Derived from *ekwang* meaning white/bright; this is the month of sun and wind. Survival strategies are continued, but there is nothing happening, this is normally a dead time of the season. The sky is clear indicating there are signs of rain. It is windy and dusty. At this time trees have shed off their leaves and have become reddish in appearance.

6. Lodunge

Derived from the word *adudungiar* meaning to fall down completely or to dislodge; this month marks the end of the dry season and the beginning of the wet season. As seasons begin at different times in different parts of the region, Lodunge corresponds to February among the Turkana and Ngikarimojong groups, and April among the Ngiteso. The Ngimatheniko say that the name Lodunge means, edging out the weak or elderly; that is, the time when the dry season eliminates the vulnerable. Sometimes dry winds originating from the eastern direction accompanied by *eloc* or *ekunae* – (haze or misty sky) and cold nights may be experienced. Haze is traditionally an atmospheric phenomenon in which dust, smoke, and other dry particulates suspended in air obscure visibility and the clarity of the sky. This is usually an indicator of an extended dry season; at this point, people begin preparing for the difficult times ahead as the rainy season is likely to fail.

Discussion

In addressing the contentions raised in the statement of the problem, it may be necessary to put the Turkana activity-based reckoning of time into perspective, first by defining key terminologies that are used to express time and seasons of a Turkana year, and secondly, by examining the Turkana eponym dating system.

1. *Ekaru*, (noun) as epoch, eon, or era, is an extended period of 'wet' or 'dry' season. It also means a twelve-month seasonal cycle of the Turkana ethnoecological calendar year,
2. *Akiporo* (noun) is a wet season of six months,
3. *Akamu* (noun) refers to the dry season, usually of six months, it may be used to refer to famine or hunger,
4. *Atepun/Atepunet* (noun) is the wet season in general, and or extended wet season,
5. *Eron* (noun) refers to drought & famine, long dry spell, an extended dry season of extreme hunger,
6. *Erupe* (noun) – subsidiary wet season, mild wet season,
7. *Akiceer/Ekiceeres* (noun) – short rains leading to mild wet season,
8. *Akiyitiar, Ayit, Nayit* (noun) – the transitional period between the wet and dry seasons.

From the outset, the fact that Turkana have twelve (12) vernacular names for the months demonstrates that they have the same understanding as the rest of the world about the number of months that are in a year. The Turkana live in a climate that is characterized by just two seasons—the wet and the dry seasons that run alternatingly for a total of twelve months every year. This is in contrast to the rest of the globe, which experiences four seasons a year. The existence of two seasons in a Turkana year does not in any way enhance it to two years as

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held by Lokorikeju; rather, it simply means that a complete cycle of 12 months of weather-dependent activities has lapsed at the end of the dry season. From the definitions of the terms, a season is a unit of a year and not the entire year itself. The life of a calendar year is analogous to the progression of life, which begins with conception, progresses through age, and concludes with death. *Ekaru* (year, not epoch) is born at the beginning of the rainy season in Lomaruk, flourishes for six months, withers for another six months, and dies naturally at the end of Lodunge, which is the last month of the dry season after which the cycle repeats itself.

Most parts of the world have four hallmark seasons of three months each a year, namely, spring (March 1st to May 31st), summer (June 1st to August 31st), autumn (September 1st to November 30th) and winter (December 1st to February 28th or 29th in a leap year). These seasons follow one another regularly; each has its own light, temperature, and weather patterns that recur yearly. To have four seasons in one calendar year of 12 months does not transform the year into four years, it simply means, the year is divided into four quarters according to light, temperature and weather patterns. In this arid and semi-arid part of the world, the Turkana have collapsed the four seasons into two as follows: (1) *akiporo* combines spring and summer seasons running from Lomaruk (March – April) to Lotyak (August – September), and (2) *akamu* combines autumn and winter seasons which run from Lopoo (September – October) to Lodunge (February – March). It is my understanding that as '*akiporo* and spring' (wet seasons) begin in March, as such, they mark the beginning of 'seasonal calendar year'; similarly, '*akamu* and winter' (dry seasons) come to an end in February, thus, they mark the end of 'seasonal calendar year'.

Be that as it may, due to climate change, seasons in Turkana County often extend erratically beyond the six-month period. Traditionally, this extension is usually given a name that distinguishes it from the normal six-month season. Among the Turkana, seasons are given names that typify them; a season is named after a distinct occurrence that took place during the season, meaning the name is given at the end of the season. When the wet season *(akiporo)* is named, the succeeding periods of the year viz. *akamu* or *eron/ekaru* in the case of an extended dry season are given names in reference to the name of the wet season. For instance, the wet season of 1992 is remembered as '*akiporo a* Longusil', named after a man nicknamed Longusil (an amputee without lower limbs), a staff of Oxfam-GB (Great Britain) who despite his disability managed to drive a car. The following dry season is remembered as '*akamu a* Longusil' or *'akamu a epeipe a* Longusil*'* and the year is remembered as '*ekaru a* Longusil'. Elsewhere, it is called '*akimuj/epeipe a* Longusil' – (named after relief maize distributed at the time of his visit).

Were it (*akamu a Longusil*) to extend sporadically, the dry season of Longusil would have transformed into a drought/dry spell. This period would have been remembered as '*ekaru a* Longusil' – the long dry spell or era (not year) of Longusil, or '*eron a* Longusil' – the long hunger/famine (not year) of Longusil. This period had several monikers; elsewhere it is remembered as '*ekaru a* Korie' – named after relief oil labelled Korie distributed by Oxfam, '*ekaru a ngakanoi*' – named after the brown wheat supplied to the hunger-stricken households during emergency relief intervention, etc. As such, while *akamu* (dry season) begins in Lolongu (September – October) and ends in Lodunge (February – March), *ekaru* (dry spell/drought) is declared at the end of the dry season when wet season rains fail to come in Lomaruk and runs for a long period of time.

The Turkana use a number of social devices to locate and/or keep time. For instance, to position '*ekaru a etop* (the year of the comet)' in time and space, the Turkana will start by

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recalling events that preceded *ekaru a etop,* happened during the *etop* incident, or occurred after the incident, etc. You will hear expressions such as, *edounio ati ekaru a etop nakiporo, nakamu, iceere, iyitiari*, etc. – (So and so was born during the wet season, dry season, end of the wet season, or at the end of *etop* year, etc.)

In drawing a distinction between *ekaru* as 'year' and *ekaru* as 'epoch', length of time is of essence. *Ekaru a Lopiaar* (epoch – a long period of decimation), for instance, began in Lomaruk 1979 when the seasonal rains failed for three consecutive years. According to records, Lokichoggio meteorological station recorded 140 mm of rain in May 1978, while in June 1980, this same station recorded no rain at all; also in June 1981, it recorded 105.9 mm, while in May 1981 this station recorded only 10.6 mm (Olang 1984). The Turkana remember that long dry-spell of (36 months) as *ekaru a Lopiaar* – the long time (not year) of obliteration, *ekaru a kiyoto-atangaa* – the long time (not year) of 'stay away and let me open the gates' drought, *ekaru a* Ata-a-Nayanae – the long time of 'the great Nayanae', meaning the long period of wandering along the valleys in search of food, etc. This drought came to an end around May which corresponds to Losuban of 1982. As this was the beginning of the rainy season, the rainy season was reset according to weather and so Losuban became Lomaruk, and the year rebooted. *Ekaru a Logaara* (1999-2000) is another long dry-spell (*eron*) that lasted for over two years. The name is derived from *akigaarakin* meaning to sit comfortably on a traditional stool with knees as armrests for a long time (implying the drought persisted stubbornly for a long time). Some people remember this year as *ekaru a* Aro Koriang - the era (not year) of Aro Koriang – (after a young girl) whose story featured in Kenya as the face of hunger in Turkana.

Going back to the contentions raised earlier, to me, the contentions do not spring from the proposed alignment of the Turkana ethnoecological calendar to the Gregorian calendar. The contentions, as I suspect, emanate from our blurry understanding of the Turkana ethnoecological calendric system, a lack of clear-cut distinction between *ekaru* as season – (fraction of year), and *ekaru* as an extended season – (a season plus), and absence of reference works. Realignment of the Turkana ethnoecological calendar to the modern dating system seems to be an idea whose time has come. Apaya (2013) may have seen the need to match Lomaruk to January, but he did not explain his reasons for doing so.

One of the contenders, namely, Ekuam Ewoi argues that his reason for thinking a Turkana year begins at the onset of dry season is influenced by the etymological meaning of the term *ekaru* – derived from the verb *aki-kar* meaning to be emaciated due to lack of food, and *akiporo* – derived from the verb *aki-por* meaning to jump. To rely on the etymological meaning of terms to explain or trace origin of words some of which may have no etymologies or are linguistically homonyms is disastrous and has the potential of creating confusion.

a) *Ekaru*, in reference to the 12 months of (wet and dry seasons) in good years, begins at the onset of long rains between March and April – Lomaruk and ends at the end of the dry season between February and March – Lodunge;
b) *Ekaru*, in reference to the long dry spell/drought (*eron*), is declared between Lodunge and Lomaruk (February – March) when the expected wet season rains fail to come and runs for an indeterminate period of time, and ends arbitrarily when the wet season rains are received (Etepuni) the following cycle or year. For examples, *ekaru a Namotor* – (the era of the emaciated), *ekaru a Kibekebek* – (the time of total annihilation of livestock).
c) *Ekaru*, in reference to the time (not year) of abundance e.g., *ekaru ka acaka ekipul* – (the year when God, so they say, lost the rain padlock), *ekaru a mugekimiet* – (the time of brownish ghee), *ekaru a ibore akwaan* – (the time of white substance – abundance, that is,

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when people bragged of self-sufficiency), *akwaadodo* – (the longtime of skimmed milk), *ekaru a epotipot* – (the extended period of abundance), *ekaru a najima* – (the time when people abandoned their begging norm), *ekaru a apetakaale* – (the time of heavy rains and run-offs), refers to a distinct time of extended rainy season in Turkana history.

d) Based on (b) and (c) above, *ekaru* as an epoch, is a long period of abundance or a long period of extreme scarcity; it starts at the beginning of the season and extends from the end of that season for an indeterminate period of time, it could be a year or more and ends at the onset of next season.

e) While the distance between one *ekaru* (era not year) and the other *ekaru* (era not year) is the length of the period of abundance or extreme scarcity, the distance between one *ekaru* (year not era) and the other *ekaru* (year not era) is not more than 12 months.

Eponym dating system is common in societies that do not have a system of writing therefore unable to cite distinct periods of history by referring to written records. In addition to weather-dependent activities, star constellations, arrival and departure of certain birds, etc., the Turkana memorize key periods in history by recalling other events that occurred before, during or after those key periods [epochs] or seasons. These events could be strange or peculiar happenings, disease outbreaks, raids, extreme droughts, mass migrations, peace accords, killings or the death of a prominent person that occurred during the season-based activities or in the period under reference. Seasons and memorable occurrences are simultaneously used to fix the year in time and space.

During *akamu* season, activities idiomized in the names of the months actually take place. The sixth month of the dry season is called Lodunge because it is hypothetically expected to dislodge and push away the dry season and usher in the wet season. When Lodunge fails to dislodge or flip the dry season, at this stage, the dry season is lengthened; as such, it changes and becomes *ekaru/eron*. People and livestock begin to experience extreme scarcity of resources; animals become weak and emaciated to bleed and draw blood to drink and cook, and wild fruits disappear. People and animals start dying from drought. This is the time people migrate to join their relatives in towns, cross to the neighbouring tribes for survival; it is the time people embark on eating *ngijomu* (dry sleeping hides), *ngasaaja* (leather donkey carriers), *ngamuk* (leather shoes), etc. Therefore, when referring to a prolonged wet or dry season, it begins at the onset of the rainy or dry season and runs for an indeterminate period of time and ends sporadically at the onset of the next rainy or dry season.

Celestial bodies have traditionally provided the basic standards for determining the periods of a calendar in many societies. The Turkana have traditionally used seasonal appearance of some stars and observation of star constellations to estimate time of the year. There are several prominent clusters of stars, namely, *ngikarikok*, *ngakanyer*, *ngikaremok ka etom*, *ekaal ka akibelyebelyet*, etc. *Ngikarikok* – the Orion stars constellation first appears in the month of Lotyak – August around 10 pm. They appear overhead in Lomuk – December around midnight and in the month of Lodunge – February evening sky. *Ngakanyer* – is the Pleiades, a group of seven stars that may or may not, depending on seasonal variability, appear around Lotyak at the position of 7 o'clock in the morning and remain visible for the rest of the dry season. They vanish at sunset around Lodunge (or another month, depending on seasonal variability) for about two months before they reappear in the night sky.

Ngikaremok ka etom appear clearly on the left side of the night sky when one is facing east. This is a cluster of three big stars with a minor one at the bottom of the constellation, recognized as three men namely, *ekaremon* (the spearer), *ekekoban ngakwaars* (the man who

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supplies spears to the spearer, and *eketiakan ngakwaars* (the spear maker), and *nyiingok* (dog). Their appearance signifies the coming of long rains.

Ekaal ka akibelyebelyet – the camel and its rolling yard is a dark spot resembling a camel and a rolling yard appearing on the left side of the morning sky while one is facing east. It is spotted *ajipunet a etop/ngitopon* – at the rising of the morning star/s, that is, at 3 – 5 am. The Turkana have traditionally used positions of heavenly bodies in the sky to forecast the future as well as delineate the months of the year when the sequence is lost perhaps due to the changing climate and shifting actual weather-dependent activities associated with the months.

The morning star referred to as *etop lo a ekingaren* and the evening star – *etop lo a ebong* are used to guesstimate time of the night, not the year. The former rises at around 3.00 to 4.00 am – this time is referred to as *ajupunet ngitopon/etop lo a ekingaren* and the second one is seen sometimes after sunset. Note that, scientifically, the two stars are the same star Venus, spotted alternatingly, meaning when the evening star is visible, the morning star is not visible and vice versa. Venus orbits the Sun once in 225 days. The time it takes for the planet Venus to return to the same alignment relative to the Earth is 584 days. This means it will be seen in the morning sky for about 260 days or nearly 9 months, and in the evening sky during the next 260 days. When passing from the evening sky to the morning sky, it will be too close to the Sun, and will not be seen for about 60 days. As such, morning and evening stars cannot be accurately used to keep track of annual events.

The Turkana also observe the behaviour of animals to predict the time and onset of seasons. Elele and kilekilek are rain birds, when they make noise, they are indicating that the rain is approaching. Anakanak – monitor lizard spends its time on trees during the dry season with the head kept in the sky direction, however, it turns it downwards when rain is imminent.

The Turkana calendric knowledge like other forms of local knowledge is dynamic, changing with the progression of time and broadening of community networks (Frank, 2014). Due to the unpredictability and unreliability of weather patterns, the normal local ethnoecological calendar of the Turkana and neighbouring Ateker groups has changed over time and irreparably altered. Weather patterns have and will never be the same again and that weather-dependent activities in different agro-ecological zones will keep on taking place in different months and not the months depicted by the weather-dependent activity associated with the naming of the month and season.

Studies (MoALFC, 2021 and Sagal et al., 2012) have shown that Turkana and neighboring regions have been battling the effects of climate change for the last four decades; as a result, life has changed as well. Food shortage, water scarcity, altered disease patterns, extreme weather conditions, decreased rainfall, increased consecutive dry days, unpredictable rainfall patterns, displacement of communities, rural-urban migration, and human conflict are among the effects of climate change that have been witnessed in the region. Climate change has destabilized the Turkana ethnoecological calendar; weather patterns have become irregular, when the rainy season delays till, say, October (Gregorian calendar), then weather-dependent activity *akimaruk* associated with Lomaruk – the 1st month in the Turkana seasonal calendar shifts to between October and November. When rains in the whole of Turkana county begin for instance around April, then weather-dependent activity associated with this month – Lomaruk will again shift to Ele-el which corresponds to the period between April and May in the Gregorian calendar, while activities *akielar* associated with Ele-el, the 3rd month in Turkana calendar shift to Lotyak, the 6th month, that is, the period between

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August and September in the Gregorian calendar. Again, if the rains say, in Turkana East commence around April, and maybe delay in Turkana west, till say, June, then the people in Turkana East will be in Titima the 3rd month of the wet season in that region which is the 6th month in the Gregorian calendar, while those in Turkana West will be in Lomaruk the 1st month of the wet season in that region. Those living in rural and urban areas will be in June, the 6th month of the year in the Gregorian Calendar.

In a recent study on climate change and pastoralism in the Karimojong region, an area of 28,000 Km², inhabited by about 1.2 million people, sharing cultural and linguistic background with the Turkana, the climatic events associated with the naming of months have shifted for 10 of the 12 months; however, the names of the month have not changed for most of the groups (Sagal et al. 2012). The two hottest and driest months in the area viz Lokwang and Lodunge (January and February) have retained their original meanings. The study also established that in recent years (from the mid-1980s) Karimojong region experienced changes in seasonal patterns and alterations in the climate, namely, natural events like stormy rains, floods, landslides, high temperatures, irregular winds, poor vegetation growth, diminishing species of grasses, herbs and trees, and soil changes, extreme heat and/or little or too much rains causing rocks to fall, creating landslides and other hazards for the local people.

According to the Karimojong, Lomaruk, which is the month when the white edible mushrooms begin to appear, used to be in March and April, but since the 1990s, the white mushrooms first appear in July and August; Titima which used to correspond to April among the Ngimatheniko and Ngibokora is said to have shifted to July and August since 1979. Generally, activities associated with the naming of the months have shifted for all the months in the Ateker region; in Turkana County, they keep on shifting because of climate change.

Following irregularity of weather patterns, when it rains in different parts of Turkana County at different times, different parts of Turkana will be in different months of the (Turkana ethnoecological calendar) year. It is not uncommon to hear people talking of, '*alunyar kolong ngilapio lu a akiporo*; *atubun akiru na* Lorara*; atubun nyikiporo en* Lokwang*; atubun akiru na* Lomuk, etc. – (the wet season months have already lapsed, this rain has come in Lorara, this mild wet season began in Lokwang, or this rain started in Lomuk).

In 1978 for instance, rains delayed till the month of Lokwang which is the 5th month of the dry season; as such, to avoid confusion, and to live with the fact that the rainy season began before the end of the dry season, that season came to be called *erupe a* Lokwang – (the mild wet season of Lokwang). Elsewhere this same season was named *akiporo ngorok* – wet season exhibiting white and black marks' implying it fell on the wrong season. This trend is not unique to the Turkana alone; in his study of the Nuer of South Sudan, Evans-Pritchard (1939) noted that if a Nuer is asked for a list of the months that fall into each of their two seasons, they will ordinarily provide six to each season; but, may not always offer the same transitional months; one man may put a month in one season while another man may place the same month in the other season. He argued that lack of regularity may indeed be attributed to numerous factors, including the following: the transitional nature of some months at the ends and beginnings of the seasons, which allows them to be included in either season; and the fact that Nuer do not think of classifications of time so much in terms of physical conditions as they do in less precise terms of social activities, with the notion of seasons being inferred from the weather-dependent activities rather than from the climatic changes that determine the activities.

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Faced with the need to embrace the standardized system of dating – the Gregorian calendar to keep track of time for livelihood activities, government and donor programs, today, pastoralists are torn between keeping a somewhat redundant local ethnoecological calendar, and figuring out how to match the shifting weather conditions associated with the name of the month with the month's actual position in the ethnoecological calendar relative to the Gregorian calendar. Those in the mix keep on wondering, what is happening; things which used to happen for instance in June are now happening in this or that month or have even shifted to a different month; strange diseases have come, and star constellations are no longer aligned to the months and seasons they used to, and thus cannot be used to forecast the future.

Many of the town dwellers do not know the traditional calendar because it means nothing to them, they don't even know the names of the months let alone their order. To cope with the situation, and in keeping with the western wave of civilization, the majority of Turkana have embraced a hybrid sense of time, where the year is divided into twelve months, a month into weeks, a day into hours, minutes and seconds. This means that there are two calendars in use; the unpopular Turkana ethnoecological calendar used by a fraction of pastoralists untouched by the waves of western civilization in the remotest parts of the county, and the Gregorian calendar used by the majority of people in Kenya.

Lexical borrowing of foreign words into *ngaturkana* vocabulary is one of the factors contributing to the popularity of the Gregorian calendar and numeric system for counting time among the Turkana. According to Cooper (1989), bilingualism, which is a condition that is prevalent in the society of today, acts as an agent of linguistic change. Cooper argues that bilingualists incorporate aspects from one of their languages into another, so exerting an influence on monolingual speakers of the second language with whom they come into touch. This helps to explain the expansion of vocabulary, which occurs when new words enter a language as a natural result of circumstances in which speakers of different languages interact with one another.

In keeping with Hock (1986), the act of adopting individual words or even larger groups of vocabulary items from another language or dialect is referred to as "borrowing". When people who speak different languages spend a lot of time together, it is natural for their respective tongues to begin to affect one another. Trask (1994) makes the observation that native speakers of a language may borrow terms from speakers of other languages that they have come into contact with. Kachru (1994) makes the observation that lexical borrowing entails linguistic gaps in a language and that the primary motivation for borrowing is to cure the linguistic deficit, particularly in the lexical resources of a language. The borrowed words come from other languages because the language that has borrowed them does not have words that are equivalent to them. When one language is dominant or enjoys high status than the other, speakers of the less prestigious variety are compelled to switch to the variety that is more prevalent in usage. Borrowing and lending of words happens because of cultural contact between two communities that speak different languages. Often, the dominant culture (or the culture perceived to have more prestige) lends more words than it borrows, so the process of exchange is usually asymmetrical.

English and Kiswahili are co-official languages in Kenya, with Kiswahili doubling up as the national language. In order to transact government business and ensure inter-ethnic communication among the forty-five tribes of Kenya, the government made Kiswahili and English not only official but the language of instruction in schools as well. Even though Turkana is inhabited by one ethnic group – the Turkana people, however, it is increasingly

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becoming multi-ethnic and multilingual county; it is hosting more than 185,000 refugees from different nationalities alongside other Kenyans of different ethnicities working or doing business in Turkana; as such, English and Kiswahili remain the only convenient languages for broader communication.

Furthermore, being languages of wider communication, English and Kiswahili have relegated indigenous languages to intra-ethnic interactions, particularly among the aged and the uncontacted groups[1]. It can be observed that in Kiswahili, months of the year are named numerically. It can also be noted that English names with Latin etymologies have been embraced and phonologically transliterated or nativised to sound like Kiswahili words; further, Kiswahili names with English etymologies have equally been nativised to sound like Ngaturkana. As a consequence of western influence, today, most people take their first names from Christian and Islamic names. Many words without *ngaturkana* equivalents have equally been borrowed and modified phonologically to sound like *ngaturkana*. Examples are: motorcar – *amotoka*, meza (desk in Kiswahili) – *emeza*, kitabu (book in Kiswahili) – *akitabu*, (FN - Fabrique Nationale, a type of gun) – *epen*, elfu (thousand in Kiswahili) – *aluput*, kalamu (pencil in Kiswahili) – *ekalam*, mia (hundred in Kiswahili) – *amiyat/amiyot*, radio – *aredio*, etc.

English names with Latin etymologies have been adopted and phonologically nativised to sound like Kiswahili and *ngaturkana*. The Turkana have borrowed the Swahili system of naming months of the year, weekdays of the month, and clock time numerically. Besides counting months numerically, the Turkana use transliterated/navitised versions of both English and Kiswahili names of the months of the year. January is called *elap lo a ekingaren* meaning the 1st month of the year; it is sometimes referred to as Januwar (transliterated), or *elap lo a kwanza* (nativised); February – *elap lo a ngiaarei*, that is the 2nd month is sometimes called Feburwar (transliterated) or *elap lo a pili* (nativised); December – *elap lo a ngitomon ka ngiarei* that is the 12th month, is also called Disemba (transliterated), or *elap lo a kumi na mbili* (nativised). Table 3 gives a hybridized version of the Turkana numeric dating system founded on the Gregorian Calendar; Table 4 shows borrowed/nativised names of the weekdays and Table 5 gives event-based time intervals based on the western clock time.

[1] Uncontacted groups: these are communities or groups of indigenous peoples living in isolated places without sustained contact to neighbouring communities and the world community.

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Table 3: Turkana Names of Months of the Year (Grego-Turko-Numeric Calendar)

#	*English Names*	*Names in Numerals (Variant 1)*	*Borrowed from Kiswahili (Variant II)*	*Borrowed from English (Variant III)*	*Native Names of Months*
1st	January	*Elap lo a Ekingaren*	*Elap lo a kwanza*	Januwar	Lomaruk
2nd	February	*Elap lo a Ngiarei*	*Elap lo a pili*	Feburwar	Locoto
3rd	March	*Elap lo a Ngiuni*	*Elap lo a tatu*	Maac	Titima
4th	April	*Elap lo a ngiomwon*	*Elap lo a ine*	Epril	Ele-el
5th	May	*Elap lo a Ngikan*	*Elap lo a tano*	Meei	Losuban
6th	June	*Elap lo a Ngikanikapei*	*Elap lo a sita,*	Juun	Lotiak
7th	July	*Elap lo a Ngikanikaarei*	*Elap lo a saba*	Julae	Lolongu
8th	August	*Elap lo a Ngikanikauni*	*Elap lo a nane*	Agasit	Lopoo
9th	September	*Elap lo a Ngikanikaomwon*	*Elap lo a tisa*	Septemba	Lorara
10th	October	*Elap lo a Ngitomon*	*Elap lo a kumi*	Okutoba	Lomuk
11th	November	*Elap lo a Ngitomon ka epei*	*Elap lo a kumi na moja*	Novemba	Lokwang
12th	December	*Elap lo a Ngitomon ka Ngiarei*	*Elap lo a kumi na mbili*	Disemba	Lodunge

Source: Compiled by the Author

Traditionally, Turkana do not have week-day system for counting time in their local ethnoecological calendric system, thus, have no equivalent terms for week and names of the days of the week. However, due to the influence of the western dating system which divides the month and year into weeks, they have been compelled to borrow and translate the Swahili names of weekdays into *ngaturkana* vocabulary. The Swahili call Saturday 'Juma mosi', meaning their week begins on Saturday and ends on Friday 'Ijuma'. In Kenya, the week begins on Monday and ends on Sunday, and so Monday is the first day of the week among the Turkana.

Table 4: Turkana Borrowed Names of Days of the Week

English	*Borrowed (Transliterated)*	*Kiswahili*	*Borrowed (Transliterated)*	*Numerical Names*
Monday	Mandei	Jumatatu	Jumatatu	*Akolongit na a ekingaren*
Tuesday	Cusidei	Jumanne	Jumanne	*Akolongit na a ngiaarei*
Wednesday	Wenesidei	Jumatano	Jumanne	*Akolong'it na a ngauni*
Thursday	Thasidei	Alhamisi	Aramis	*Akolongit na a ngaomwon*
Friday	Furaidei	Ijumaa	Jumaa	*Akolongit na a ngakan*
Saturday	Satadei	Jumamosi	Jumamus	*Akolong'it na a ngakan kapei*
Sunday	Sandei	Jumapili	Jumapili	*Akolong'it na a ngakan kaarei*

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Table 5: Turkana Event-based Time Interval Expressions based on the Western Clock-time

Time	*Kiswahili*	*Turkana time expression*	*Turkana – English translation*	*Borrowed from Kiswahili*
AM				
1 - 2	Saa saba	- *Ngakibeloonokinet*	- Mid night, when people change sleeping position	- *Ngasa ngakanikaarei a akwaar / a usiku*
2 - 3	Saa nane ya asubuhi	- *Akutunet akatorot na a ngikosowa* - *Ngakibeloonokinet*	- When buffaloes' breeze begins to blow, - When people turn and change sleeping side	- *Ngasa ngakanikauni a akwaar* - *Saanane a akwaar / a usiku*
3 - 4	Saa tisa ya asubuhi	- *Ajipunet Ngitopon* - *Ni ebalator nyikeny kucikucil*	- When the stars commence rising - When birds begin singing,	- *Ngasa ngakanikaomwon* - *Saatisa a akwaar*
4 - 5	Saa kumi ya asubuhi	- *Anyakaikinet ngikaala* - *Arukinet a ngikeny*	- When the camels begin to chew cuds, - The time of birds 'dawn chorus', especially during mating season	- *Ngasa ngatomon* - *Saakumi a akwaar*
5 - 6	Saa kumi na moja ya asubuhi	- *Abaet,* - *Akicil Nanyang*	- Twilight, - When yellow rays appear, almost morning - when the Sun is below the horizon, that illuminates the lower atmosphere and the Earth's surface	- *Ngasa ngatomon ka apei a akwaar* - *Saakumi na moja a akwaar / a usiku*
6 - 7	Saa kumi na mbili ya asubuhi	- *Akiwalaret* - *Akiwalet,* - *Ajipunet Akolong* - *Ngalepyet na a ataparac(u),* - *Akidodikinet ngibaren*	- Dawn, almost Morning, - The moment when the upper rim of the Sun appears on the horizon in the morning. - Milking time - The time for releasing calves to suckle their mothers	- *Ngasa ngatomon ka ngaarei a ataparac(u)/asubui* - *Saakumi na mbili a ataparac(u) / ka asubui*
7 - 8	Saa moja ya asubuhi	- *Akipiripiruunet,* - *Akiramaramakinet*	- When the sun begins to warm, - The time when animals are taken to graze before returning for milking	- *Asait apei a ataparac(u) / ka asubui* - *Saamoja a ataparac(u) / ka asubui*
8 - 9	Saa mbili	- *Ataparac(u) nikaalimon*	- Early morning	- *Ngasa ngaarei a taparac(u) / ka asubui* - *Saambili a ataparac(u)*
9 - 10	Saa tatu	- *Ataparac(u),* - *Akitowoet Ngikaala,* - *Esimakunyuk,*	- Morning, - When camels are milked for the second time	- *Ngasa ngauni a ataparac(u)* - *Saatatu a ataparac(u) / ka asubui*
10 - 11	Saa nne	- *Acaunet ni palem isiakinia akolong amonun* - *Adetunet a akolong*	- Mid-morning	- *Ngasa ngaomwon a atapara(u) / ka asubui* - *Saaine a ataparac (u) / ka asubui*
11 - 12	Saa tano	- *Acaunet, ni palem elosio akipaaran*	- Late morning, - Almost noon	- *Ngasa ngakan a ataparac(u) / ka asubui* - *Saa tano a taparac(u) / ka asubui*
PM				

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12 - 13	Saa sita	-	*Naparan lotingilan*	-	Midday	-	*Ngasa ngakanikapei a apaaran / a mucana*
13 - 14	Saa saba	-	*Naparan lotingilan*	-	Midday, when the sun rests on head-tops	-	*Saasita a mucana / na a apaaran*
14 - 15	Saa nane	-	*Naparan Lotingilan*	-	Midday	-	*Ngasa ngakanikauni a apaaran / a mucana*
						-	*Saanane a apaaran / a jioni*
15 - 16	Saa tisa	-	*Asonget*	-	When the sun shifts to west,	-	*Ngasa ngakanikaomwon a apaaran / ka ebong*
		-	*Areet a akolong ni palem esaareta ngibaaren*	-	The time when livestock leave shade trees to graze	-	*Saatisa a ebong / a jioni*
16 - 17	Saa kumi	-	*Akicolongyet a akolong*	-	When the sun sits on the horizon (sunset)	-	*Ngasa ngatomon ka ebong*
						-	*Saakumi ka ebong / a jioni*
17 - 18	Saa kumi na moja	-	*Akitolom ngibaren, Ebong (Atabong)*	-	Evening, when the livestock enter the homestead	-	*Ngasa ngatomon ka apei*
						-	*Saakumi na moja a ebong / a jioni*
		-	*Eringa acuno a akolong*	-	It generally means final hours/minutes of the sun in the sky		
18 - 19	Saa kumi na mbili	-	*Akitolom Ngibaren,*	-	When animals enter the kraal,	-	*Ngasa ngatomon ka ngaarei*
		-	*Acuno a akolong*	-	Sometimes referred to as the time before the sun's stool – this is when the centre of the sun's disc goes beyond the horizon		*A ebong / a jioni*
						-	*Saakumi na mbili a ebong / a jioni*
		-	*Adooyoret*	-	Sunset		
		-	*Ngadolunet*	-	1st round of milking the camels		
19 - 20	Saa moja ya jioni	-	*Akikaikaakinet,*	-	When darkness begins to gather but still enough light in the sky,	-	*Asait apei a atabong,*
						-	*Saamoja ka ebong / a jioni*
		-	*Akiudet*	-	When animals are taken to the enclosures		
		-	*Akikamuyakinet*	-	The darkest moment of twilight just after sunset and before nightfall		
		-	*Nipalem ebeyere ngae iyong*	-	When people begin to say who are you		
20 - 21	Saa mbili ya usiku	-	*Akamuyat,*	-	At the falling of darkness,	-	*Ngasa ngaarei a akwaar / a usiku*
		-	*Ni palem ebeyere ngae iyong*	-	When people begin to say who are you	-	*Saambili a akwaar / a usiku*
21 - 22	Saa tatu ya usiku	-	*Ngakitowoet Ngikaala,*	-	The second round of milking camels,	-	*Ngasa ngauni a akwaar / a usiku*
		-	*Eringa iyanio*	-	When people are still	-	*Saatatu a akwaar / a*

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					chatting, almost sleeping		*usiku*
		-	*Akinapakinet*	-	When people begin to sleep,		
22 - 23	Saa nne ya usiku	-	*Ni palem ingoorakineta ngitunga*	-	When people begin to snore,	-	*Ngasa ngaomwon, ngasa ngakan a akwaar / a usiku*
		-	*Ngaemet*	-	When the camels jump the enclosure to breast feed the calves	-	*Saaine, saatano a akwaar / a usiku*
23 - 00	Saa sita ya usiku	-	*Kidilikwaar*	-	Midnight	-	*Ngasa ngakanikapei a akwaar / a usiku*
		-	*Atyaket akwaar, ni etyakar akwaar ngaarei*	-	When the night divides itself into two	-	*Saasista a akwaar / a usiku*

Source: Author

Society is in a continuous process of change; the wave of civilization is sweeping across the globe, and indigenous groups are coming into contact with foreign cultures and languages. As such, many foreign vocabularies are gaining access into indigenous languages, words of foreign origin have been transliterated or nativised to sound like the indigenous dialects; some retrogressive traditions have been discarded or replaced along the way; indigenous groups have become multilingual; foreign languages have been nationalized for wider communication in multi-ethnic states.

Gregorian calendar is popular today, yet most people do not know the meaning and origin of the names of months although each name tells a story. The meaning is no longer important to anybody, what matters is the listing of months and numbering of days to keep track of time. It should be appreciated that the Gregorian calendar which begins in January and ends in December is traced to the ancient Roman calendar which, like the Turkana seasonal calendar began in March and ended in February.

The original Roman Calendar had only 10 months and the first month was March – *Martius* named after the God of War, Mars. It was generally the month where farming and military expeditions would begin, after a pause. April was from the Latin word *Aperire* meaning to open as it was believed the blooming of the flowers, and fruits happened around this time. May was named after Maia, the Roman Goddess of Growth and it was generally considered the time for pleasure. June was believed to have been named after Juno and was also called Junius. Months 5 to 10 were named after Latin numerals *Quintilis* – (5), *Sextilis* – (6), *Septem* – (7), *Octo* – (8), *Novem* – (9) and *Decem* – (10); months 5 now July and 6 now August were later renamed after Roman emperors Julius Caesar and Augustus Caesar. After some time, the Roman Calendar was reformed and January and February were added ahead of March. January takes its name from Janus, a Roman god who was responsible for guarding doors and openings; hence, this month was considered to mark the beginning of the year. The month of February gets its name from Februa, a Roman festival that celebrated the end of the purifying process and was usually celebrated in February. When January and February were added, the 7th, 8th, 9th and 10th months effectively became the 9th, 10th, 11th, and 12th months of the year respectively, but the names still stuck notwithstanding the fact that they had been pushed down by two numbers. After reforms, the names of the months from no. 9 to 12 would have changed as follows: November – 9, December – 10, Undecimber – 11, and Dudecimber – 12, instead of September – 7, October – 8, November – 9, and December – 10.

Losuban was traditionally a month for socio-cultural celebrations and rituals. Today, activities associated with Losuban: *akisicumaanakin/akinumunum* (feasting and thanksgiving

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festival), *akiuta* (marriages), *asapan* (initiations for men), etc. are no longer seasonal events, they take place sporadically at individual's convenience. Most people are gradually embracing annual International World Celebrations, national holidays and religious holy days; they include Mashujaa, Madaraka, Jamhuri, Easter, Christmas, and Eid-ul-Fitr, etc. People have embraced civil and religious forms of marriages which are flexible with time in addition to the customary marriage. December 25th a religious day for celebrating the birth of Jesus Christ of Nazareth, a Messiah according to Christianity has become a day when families reunite with their loved ones every year. the 1st of January is another day people attach a lot of importance, it is a day for merrymaking as people consider it a blessing to cross over to the new year which many have hoped to see but died before reaching there.

Although most of the Turkana use the numerical dating version of the Gregorian calendar, unlike their local ethnoecological calendar, it is irrelevant to the local ethnoecological conditions and sociocultural requirements of the local community. Similarly, the local ethnoecological calendar does not service the religious and civic needs of the people. As such, the two calendars have continued to coexist among the pastoralists: (1) The local ethnoecological calendar as ecocultural and ecological framework contributes to resilience and adaptive management of natural resources and agroecological zones; it guides herding, hunting, fishing, agriculture, foraging activities and planning of socio-cultural; (2) The conventional calendar enables them to keep track of time with the broader society to transact business and remain informed of government services and current global affairs.

Conclusion and Recommendations

Turkana do not have a system of transmitting calendric knowledge, this is perhaps due to the nature of their harsh environment, which subjects them to constant search for pasture and water for livestock, making it hard for the custodians of calendric knowledge to transmit it to their children, who because of this, are forced to acquire it pragmatically or in the same way a child acquires language naturally. Activities associated with the months have shifted making it impossible to triangulate the position of the sun, star constellations or moon with the local ecological indicators. Months and activities associated with their names have become different entities. It is no longer the lunar cycles of the moons that help people to plan and manage their scarce natural resources, instead, they rely on actual ecological indicators whose presence or absence are no longer corresponding to the months they used to. Influenced by the Gregorian calendar, and due to the unpredictability of weather patterns, and shifting weather-dependent activities, today, most Turkana recount months of the year numerically. The modern Turkana names for the months literally translate to 'first month', 'second month', and so on. There is evidence that names of months can change over time. Similarity and dissimilarity in the names and meaning of months of the year among the different groups of Ateker indicates that they have a common origin, however with fragmentation and dispersal of groups to different geographical locations and agro-ecological zones changes occurred and some months were renamed according to weather-based activities in those new areas e.g. Lolingacino, Lomodokogec, Lolobae, Lobal, Opedelei, Omodokokingol, Lootimae, Longoomo, Otikok, Alongaan, etc., as shown in (Table 2). The Roman calendar initially started in March, today it starts in January, etc. In summary, Turkana months of the year have separated from the weather-dependent/event-based activities they took their names from. Ethnoecological indicators continue to follow one another despite the changes in climate. Now, therefore, as this is normal in evolving society, it is recommended as follows:

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1. As Turkana calendar year begins with the first month of the wet season – Lomaruk, which traditionally corresponded to the period between March and April, and which due to climate change stopped corresponding to March – April, but keeps on shifting arbitrarily rendering the Turkana local ethnoecological calendar redundant and confusing, and in submission to the lexical borrowing and sematic change in the naming of the Turkana months through nativisation and transliteration of English and Kiswahili names of the months, in realization of the manifestation of the Gregorian calendar in the reckoning of time among the Turkana today, it is proposed in this paper, that Lomaruk is aligned to January, the first month of the year in the Gregorian calendar. Both Lomaruk and January are the first months of the year in their respective calendars. This realignment may be relevant to the rest of Ateker groups experiencing the same situation as the Turkana (see, Table 3).

   The proposed calendar adjustment, is not only a testament to the lexical borrowing and semantic change in the naming of the months of the year in Ngaturkana, but it also confirms the current popularity of the Gregorian calendar that has given rise to the numeric system for counting time among the Turkana. It is hoped that alignment of the Turkana local ethnoecological calendar to the Western dating system should not be misconstrued to mean mutilation of the Turkana ethnoecological calendar, instead, it should be understood as validation of the manifestation of the Gregorian Calendar in the numeric system for counting time already in use by the Turkana.
2. The Turkana local ecological knowledge of their environment is their 'Ethnoecocultural Heritage' that needs to be preserved; which when revitalized could foster the community's climate change adaptive strategies.
3. It is vital to provide a scientific justification for the use of ecological indicators for commencing livelihood activities, as this might give critical information on how changes in climate and other environmental factors influence key ecological indicators, as well as how the Turkana could adapt by (1) readjusting the techniques they have traditionally used in the fight for existence, and (2) matching their traditional practices in agriculture and grazing to a rapidly changing climate and thrive in the places that they have lived for generations.
4. It is strongly suggested that a method be devised that will assist in the incorporation of meteorological and ethnoecological information into the conventional calendar – numeric dating system currently used by the majority. With this knowledge, the community will be able to lessen the negative effects of climate change while simultaneously increasing the number of positive outcomes that may be achieved as a result of the opportunities that climate change presents. This may be achieved by the cultivation of additional crops or plantations of cash crops, as well as through the development of crop-livestock integration systems.
5. Government to fund a scientific study with the sole objective of recalibrating the Turkana ethnoecological calendar with the numeric dating system and current ecological data so that people can make feasible seasonal predictions to better plan their food production, adapt to future changes and keep the calendar in synchrony with the ever-changing world.
6. Following increased flooding during the rainy season, the government should invest in harvesting rain and flood water for dryland agriculture.
7. Farmers should plant early maturing and drought-tolerant varieties of crops. Pastoralists on the other hand have to review their grazing patterns to cope with the effects of climate change.

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Supplementary Information

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