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Exploring ethnomathematics in the Maldives: Counting and measuring

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ABSTRACT

Ethnomathematics is the study of mathematics that takes into consideration the culture in which mathematics arises. It is a subject that values and recognises the contributions of all cultures to the development of mathematics. The aim of this study was to explore the nature of indigenous thinking in the Maldives with respect to counting and measuring that are found in the Maldivian society and are related to traditional and cultural contexts, so that these ideas can be considered for inclusion in future primary mathematics curricula in the Maldives. The fieldwork and data collection was done in the Maldives. Data was collected through interviews with people who do practical work as part of their everyday life, and informal discussions held with historians, mathematicians, mathematics teachers, teacher educators and mathematics students. In total, 91 interviews and informal discussions were conducted. The study also involved the analysis of documents focussed on finding the sources of mathematics, and mathematics currently used in the Maldives. The data from interviews and document analysis show that counting and measuring are in the Maldivian culture even though people may not identify these as mathematics. Cultural contexts in the Maldivian society where counting and measuring are evident include fishing, boat building, building and construction, agriculture, astronomy and navigation, house work, mat weaving, rope making and toddy collecting. The evidence from informal interviews with historians and mathematicians, and document analysis show that initially Arabia and South Asia (mainly India) influenced Maldivian mathematics, and later the Britain. In conclusion, this study identified the Maldivian mathematical ideas related to counting and measuring thereby arguing that mathematics is not culture free. Mathematics exists in every culture even though the way ideas are expressed and emphasised vary from culture to culture.

Keywords: ethnomathematics, counting, measuring, Maldivian culture

Mathematics is a universally recognised academic discipline that has attracted philosophical attention since the time of Plato and Aristotle. Over the years, culture and mathematics have become a topic of interest as more and more educators and philosophers have begun to realise that mathematics is found not only in the tradition of Western rationalist thought but is also expressed in ways unique to every culture. Bishop (1988) and Wilder (1981) support this idea by stating that mathematical ideas are social in character and that each culture has its own form of mathematics.

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Ethnomathematics is a field of study that values and recognises the contributions of different cultures to the development of mathematics. Studies in this area probe the roots of mathematical thinking in different cultures; roots that are being ignored or in danger of being lost (Adam, 1999; Adam, 2004; Ascher, 1991). D'Ambrosio (1991) who is regarded as the father of ethnomathematics coined the term and described ethnomathematics as mathematics as a human invention that comes from inside one's culture - where culture is understood as the customs, civilisations and achievements of a particular group of people. In other words, ethnomathematics is the study of mathematics that takes into consideration the culture in which mathematics arises (Adam, Alangui & Barton, 2003; Barton, 2002; D'Ambrosio, 1997) and explores culture-specific mathematical practices and is in essence different from the formalised ways of mathematical knowledge. Ethnomathematics is particularly evident in counting, classifying, measuring, ordering, inferring and modelling, designing, playing and explaining (Begg, 2001; Bishop, 1988; Boaler, 1993; Shan & Bailey, 1991).

This research was conducted in the Maldives. Maldives is an island nation comprising about 1190 small coral islands of which 200 are inhabited. The islands are very small, low lying, widely dispersed over an area of 90 000 square kilometres including land and sea, and have a population of about 400,000.

Maldives has a rich heritage of mathematical thought because of the connections with the traditions of India, South Asia, the Muslim (Arabic) world, and later the Great Britain. In recent years, the dependence on the British education system, and the quest for modernisation have created a situation in which traditional Maldivian mathematical thinking is in danger of being lost. This study sought to explore the nature of indigenous mathematics thinking in the Maldives, with respect to counting and measuring in the Maldivian society so that future curricula can consider the inclusion of these indigenous ideas and practices. In particular, this paper will address the following areas:

- Purposes and research questions
- Scope of the study
- Research methodology, design and data analysis
- Tracing the early development of counting and measuring
- Counting in the Maldivian culture
    - The traditional Maldivian counting system
    - How people count in the Maldives
    - Cultural contexts where counting is used
- Measuring in the Maldivian culture
    - Five calendar systems
    - Measurement strategies used in the Maldivian society
    - Cultural contexts where measuring is used

Finally, a summary of the main points discussed in the paper, implications of the study and suggestions for further research are given in the concluding remarks.

Purposes and research questions

The purposes of this study were to:

- investigate the mathematical ideas found in the Maldivian society that are related to traditional and current cultural contexts
- explore the nature of indigenous mathematics thinking, with respect to counting and measuring, in the Maldives so that future curriculum development can consider the inclusion of such material

The main research question addressed in this study was:

- What is the nature and scope of mathematical thinking in Maldivian culture with respect to counting and measuring?

Scope of the study

The research was limited to two of the six activities that Bishop (1988) perceived as pre-mathematical and as pre-conditions for the development of mathematics in any culture. Of his six categories: (counting, measuring, locating, designing, playing and explaining); counting and measuring were selected as the categories for this research because the author believed that these two activities are most commonly used in everyday situations and represent important areas of study in primary schools.

Research methodology, design and data analysis

Data collection was carried out in the Maldives for 12 weeks. In total 91 (50 male and 41 female) interviews and informal discussions were held with people who do practical work as part of their everyday lives such as fishermen, boat builders, constructors, weavers, and with historians, mathematicians, teacher educators, mathematics teachers and mathematics students. In addition, to identify the sources of ethnomathematics or influences of other cultures to Maldivian mathematical thinking, archival records were analysed.

The data from the interviews, discussions and documents were analysed for mathematical content. Interviews, discussions and document analysis were recorded either in Dhivehi (the Maldivian language) or in English. Translations from Dhivehi were writer's interpretation of what was said and what was understood from the records that were analysed.

Tracing the early development of counting and measuring

Counting

Counting is a method used to label and distinguish quantities that cannot always be accurately differentiated by perceptual ways (Fuson, 1992; Powell & Frankenstein, 1997). In other words, counting principles imply a search for a certain order and application. In this light, the principles of counting are cultural because their application will vary from culture to culture (Carr et al., 1994). According to Fuson (1992), culture determines a basis for counting by using a succession of numbers, words, body positions, or gestures that can be linked to different labels to make it more meaningful. For example, in Papua New Guinea, different counting devices and techniques are used by different groups of people (Encyclopaedia of

PNG, 1972), and according to Boyer and Merzbach (1991) prehistoric people made number records by cutting notches on a bone or a stick.

According to Tyler (1874, cited in Ascher & Ascher, 1997), counting began with responses using toes and fingers. When human beings started counting, they counted only up to four and later they counted using words when they realised that there were words to express these. Later on it was found that a system based on five (one hand) was narrow, one based on twenty (hands and toes) was hazardous, and so the base ten number system was invented.

One of the earliest indications of counting was revealed on a bone dated 9000-6500 B.C. that was dug up in the 1950s at Ishango - now known as Zaire. The bone has what appears to be tally marks engraved on it, and series of notches arranged in three distinct columns. These marks closely resemble 'calendar sticks' used by Namibians to record the passage of time (Fauvel & Gray, 1987; Joseph, 1991).

Since the time of ancient Egyptians or earlier, there has been documented interest in trying to understand how counting began (Fauvel & Gray, 1987). It has been acknowledged that the principle of counting arose in connection with primitive religious rituals (Boyer & Merzbach, 1991; Everett, 2018; Groza, 1968). In religious ceremonies, it was essential to call the participants in a certain order and counting appears to have been invented to take care of this problem (Boyer & Merzbach, 1991). Therefore, it is not surprising that the concept of whole numbers is one of the oldest and its origin lies in the prehistoric era. The concept of fractions developed relatively late as it was not necessary to use fractions for the needs of the practical person, and decimals were a product of the modern age (Boyer & Merzbach, 1991; Everett, 2018; Fauvel & Gray, 1987).

Measuring

Measuring is a means of finding a size, quantity or capacity estimated by a standard or a rule (Concise Oxford Dictionary, 2012). It is concerned with comparing, ordering and quantifying (Powell & Frankenstein, 1997). As with counting, measuring depends on the environment and the needs that it gives rise to. It is the environment or the culture that determines the qualities to be measured as well as the units of measurement (Bishop, 1988a; Groza, 1968). Presumably, the human body was the first measuring device to be used by all cultures. According to Bishop (1988, p. 34),

> *we have the ell (six hands' breadths or 24 fingers), the cubit, the digit (or finger width), the foot, the hand span, the pace and the fathom (distance that the two arms can fathom), all of which are convenient measures of length.*

These measurements or something similar seems to have existed in all cultures. For instance, until recently and even now, Maldivian housewives use one arm as a standard measurement for fabrics.

Although the origin of the concept of measuring is not clear from history, recorded data indicated that humans had already developed systems of weights and measures in the pre-historic time (Groza, 1968; Boyer & Merzbach, 1991; Moreley & Renfrew, 2010). Mathematical activity in the period of construction 3500-2000 B.C. was found in large stone remains of which Stonehenge is the best

known in North-Western Europe (Boyer & Merzbach, 1991; Moreley & Renfrew, 2010). It was also concluded from statistical analysis of measurements of the sites of the stone remains that there was a standard unit of measurement called the 'megalithic yard', which was a uniform standard throughout a wide region (Fauvel & Gray, 1987).

Findings

Counting in the Maldivian culture

The traditional Maldivian counting system

Traditionally, Maldivians used base twelve to count and even today there are many older people who still do. It is the oldest documented counting system used by Maldivians. According to Maloney (1980), from at least the medieval Christian era, the number twelve was used in the Maldives together with decimal multipliers. Ibn Batuta (1325-1354), an Arab traveller, wrote about bundles of 12,000 cowries and he also mentioned that 100 cowries make one *hiya*, 700 a *fau* and 12,000 a *kottey* (Gibb, 1994; Maldives Monetary Authority, 1983). Another traveller, the Frenchman Francois Pyrard, also reported that 12 000 shells equalled one laari (coin) and until recently one Maldivian Rufiyaa consisted of 120 *laari* (Maldives Monetory Authority, 1983). This indicates that duodecimal system together with decimal multipliers has been used in the Maldives for a long time. However, counting by twelve is not known in the two neighbouring countries, Sri Lanka or India. Its origin supposedly goes back to Mesopotamia. The base number six, often multiplied by 10, was used for counting by Mesopotamians even in ancient times and was later enlarged to 12 as six was too small (Boyer & Merzbach, 1991; Maloney, 1980). How duodecimal counting appeared in the Maldives is a mystery but most probably it had been transmitted to the Maldives by Persians who might have settled in the Maldives or by Arab traders. When asked about the origin of the system a historian [H1] said:

ދ ސިސްޓަމް ބާރަ ފުށުގައި ފެށުނީ ކަންކަން ކުރެވިފައި ހުންނަ ވަރަށް ކުރިން. ބާރަ ފުށުގައި ފެށުނީ ދިވެހި ރާއްޖެ ދުވަލުގައި ކަންކަން ކުރެވުނު ދުވަސްތަކުގައި ކަމަށް ދެކެވޭ.

How counting in duodecimals started in the Maldives is not known. It probably started during the period of Arab trade with the Maldives.

The language used for counting prior to Dhivehi is not known. There is no evidence of any previous language use in the Maldives for counting. When asked whether any other language was used in the Maldives for counting, the historian [H2] said:

ގުދަން ތާރީހުގައި ދިވެހި ފިޔަވައި ބަސް ބޭނުންކުރެވުނު ކަމަށް ލިޔެވިފައި ނެތް. ހަމަކަށަވަރުން، ކުދިން ދިވެހި ބަހުން ގުދަނުގައި ކަންކަން ކުރާ ގޮތް ފެނެ.

There is no evidence in history that any other language was used for counting. However, the growing children invariably count in English.

Indo-Aryan words were used for numbers in the duodecimal system. Twelve was called *dholhas* while it is *baara* in the decimal system. An interesting feature,

according to Maloney (1980) is that Indo-Aryan words for 25, 50, 75 and 100 are closely related to the Dhivehi words for 24 (*fassehi*), 48 (*fanas*), 72 (*faahiti*) and 96 (*hiya*) respectively.

At present, the decimal system is generally used throughout the Maldives. This seems related to the growing influence of Indo-Aryan discourse in South Asia; the Arabs, and then the Europeans who came to the Maldives reinforced its use. The Dhivehi names used for numbers in the decimal system are closely related to Sinhalese (a Sri Lankan language) and Hindi (an Indian language).

It is interesting to note, however, that the decimal system did not fully displace the duodecimal system. Even today, when enumerating, Maldivians use the duodecimal term for sixty which is fas dholhas (meaning five twelves) and not the decimal term hatti. In addition, for fast counting of coconut, fish or shells, some people still use the duodecimal system. For instance, a fisherman [F7] talking about distribution of fish said:

ކަށަވަރުގަނޑުން ފަސްތިއަކާ ހަމައިގައި ދެ ފަހަރެއް ލިބެއެވެ. ދިއަރުގައި ހަ ފަހަރެއް ލިބެއެވެ. ހިޔަކީ ތިންފަހަރު ހަސްގަނޑެއް ކަމުގައި ވާތީ ހިޔަ ހަ ގެ ތެރެއަށް ދަތުރުކުރާ ކަމެކެވެ.

The skipper gets two fish out of a 'hiya'. The bailer gets four fish. A 'hiya' is 96 and a 'hassa' is approximately 600. That is six 'hiya'

Counting in the Maldivian Society

The Dhivehi word for number is *nanbaru*, which presumably came from the English word number and the Dhivehi word for counting is *gunun* (Manik, 1995). Maloney (1980) notes that counting, especially rapid counting, has always been important in the Maldives to count fish and coconuts. The right hand is always used to count and the left hand for tallying. Counting is done two at a time starting with the small finger, and fingers are closed as each is said. For 10, the thumb is closed, and those who count in base 12, the thumb is opened for 12. A finger is closed on the left hand for each unit of 12 or 10 and if there are more than five units of 12 or 10, the fingers are opened again beginning with the thumb. This method of counting two at a time is also evident in other South Asian countries, but keeping tallies on the left hand seems to be a Maldivian innovation.

Even though the decimal system is commonly used in the Maldives, Maldivians never think in terms of decimals. They always count or think in terms of fractions. The denominator is read first, unlike in English. For example, 5/16 is read in English as five sixteenths, whereas in Dhivehi it is read as from 16 parts, five parts are taken. During a discussion about counting fractions, a person [MIS1] who learned mathematics in the traditional way, and has recently started to study in the English medium, said:

ދިވެހި ބަހުން ބަލައިގަންނަ ކަމުގައި ވަކި ގޮތެއް ނެތް. ކޮންމެ ވެސް ބަހެއްގެ ތެރެއަށް ވަދެ ދަސްކުރަންވާ ގޮތެއް ވަކި ގޮތެއް ކަމުގައި ވާ ކަމެކެވެ.

I am used to reading fractions from bottom to top. Therefore, I find it very difficult when I have to read fractions from top to bottom when studying in English.

The concept of counting also differs between generations. The concept of a date is not important to the older generation because they always relate events to other important events that are meaningful to them.

ދިހަ ފަސްވަހަރަކު ހަދަނީ. ޝަމްސުއްދީ ދަނޑިވެރި ކަލޭގެ ރަސްކަމުގައި ތާރީޚުގައި ހުންނަ ކަމެއް ކަމަށް ވާތީ ދިހަ ފަސްވަހަރު ވާނެ ކަމަށް ވިދާނެ؟

I am about 100 years old now. I remember the reign of King Shamsuddeen. So I must be 100 years old? [F9].

The fisherman [F9] is probably in his early nineties and was relating his age to a significant period that he remembers.

The middle-aged and younger generations count in twos and fives using fingers or mentally.

The younger people (those below 35 years), because the medium of instruction at schools was English, probably think and count in English and use the decimal system. When asked how they count, some of the students noted:

Using a calculator (sometimes) or when adding numbers or subtracting, I try to split the numbers so that I can deal with them more easily [S1].

Depends on the situation or the numbers I am counting. If it is simple and easy, I just do it in my head. If it is a little big, I use my fingers (not by bending just count looking at them). But now for most of my simple counting, I can manage them in my head [S4].

The counting techniques and the language used above seem to reflect an influence of the West because of being taught Western mathematics in English in preparation for British examinations at Maldivian schools.

In addition to the British influence, words from Dhivehi in Maldivian mathematics are very similar to that of Hindi words and quite similar to Bengali words as well. For example, for three plus one equals four, we say *theen eku saar*i in Dhivehi while it is *theen eku chaaru* in Hindi.

Further, in the Maldivian counting system, a million is *dhiha lakka*, which means ten *lakka*. A *lakka* is equal to 100000 (hundred thousand). Similarly, a kroadu is 10000000 (ten million). These words are also very similar to Hindi. For example, a *lakk*a is *laak* and a *kroadu* is *kroalhu* in Hindi. Table 1 gives Dhivehi words used for some numbers (Fathy & Ismail, 1948).

Cultural contexts where counting is used

As with other cultures, there are cultural contexts in the Maldives culture, where counting is applied, even though people may not identify these aspects as mathematics or counting. These include fishing, agriculture, housework, and money. In addition to these, counting is evident in the system used in the Islamic law for dividing inherited assets (Fathy, 1968), and in Maldivian games such as *londi* and *esvattaa*, which were not looked at in this study.

Table 1
Dhivehi Words Used for Place Values

Dhivehi word	English word	Numeral
Eykan	One	1
Dhiha	Ten	10
Satheyka	Hundred	100
Haas	Thousand	1 000
Dhiha Haas	Ten Thousand	10 000
Lakka	Hundred Thousand	100 000
Dhiha Lakka	Million	1 000 000
Kuroadu	Ten Million	10 000 000
Dhiha Kuroadu	Hundred Million	100 000 000
Arabu	Billion	1 000 000 000
Dhiha Arabu	Ten Billion	10 000 000 000
Karabu	Hundred Billion	100 000 000 000
Dhiha Karabu	Trillion	1 000 000 000 000
Neel	Ten Trillion	10 000 000 000 000
Dhiha Neel	Hundred Trillion	100 000 000 000 000
Padham	Quadrillion	1 000 000 000 000 000
Dhiha Padham	Ten Quadrillion	10 000 000 000 000 000
Sinku	Hundred Quadrillion	100 000 000 000 000 000
Dhiha Sinku	Quintillion	1 000 000 000 000 000 000

Fishing. Fishing is one of the main occupations of the Maldives. It is a joint venture where the owner and the crew share the profits among them. Counting is evident in the system of sharing. Sharing varies slightly from atoll to atoll. However, it appears that throughout the Maldives, the boat owner gets twenty percent of the catch, the owners handling different equipment such as the fishing rods gets a share each, and crew with special duties such as the skipper will get an extra share (Ministry of Fisheries and Agriculture, 1960). Because of this system of sharing, precision in counting has been very important for Maldivian fishermen. When asked whether they count their fish precisely, some fishermen's responses were:

ތަނަށް ތަރިއްވަން ގެންނަން، ފަހަރުގެ ތެރެއިން ބިއިދޮށ ދާނަމަ ދާ ގޮތަށް ވަކިކޮށް ދާ ގޮތަށް ގުނަން ގެންނަ

We count after we come back to the island. Then we separate the fish according to size and count two by two. [F7].

ދުނިޔެއާ ދުނިޔެ ހަމަ ކަނޑު ގެންނަ، ފަހަރުގެ ތެރެއިން ފަހަރުގެ ތެރެ ކަނޑުގެ ތެރެ ދާ ގޮތަށް ވަކިކޮށް ދާ ގޮތަށް ގުނަ ގެންނަ

The skipper will count the fish one by one. The fish will be separated according to size. Then we calculate the total of different kinds and then divide the fish [F8].

Traditionally the fish was shared among the crew and the owner. Therfore, in the islands, it was up to the individual fisherman to sell his share. Also, it was quite interesting to find out that traditionally the island chief, assistant chiefs and the person who was in charge of the mosque - *mudhimu,* each gets a share from every fishing boat or *mas dhoni*. These shares represent their emoluments as there was no salary for these occupations. It also means that the fishermen support these community functions.

At present, fishermen sell their fish to the fish canning factory or to big vessels that are anchored in different parts of the Maldives or to Male', and share the money among themselves, instead of the catch. The sharing system is similar to the traditional system. However, these days the chiefs of the islands do not get shares from the fishing boats - it is divided among the owner of the boat and the crew daily. Even at present, the sharing system slightly differs among atolls. When inquired about how present-day fishermen share their profit, one fisherman [F1] commented:

ދަނޑުވާލާފަ ލޮއ ފަހަރު ބަހައްޓާ ގޮތަށް ބަދަލުކުރަން ބާއްވަ ބަދަލުކުރާ ގޮތަށް ދަނޑުވާލާ ލޮއ ކަނޑުގެ ތެރެ ދާ ގޮތަށް ބަދަލުކުރަން ބާއްވަ ބަދަލުކުރާ ގޮތަށް

Divide the profit we get after selling the fish. The profit will be halved. For example, if we get 8000, the dhoni gets 4000 and the other 4000 will be divided equally among the crew. The writer has not found any evidence in the literature, or from the discussions, that this system of sharing is in use in other cultures. It seems to be a Maldivian invention.

Agriculture. Until 1976, coconut and breadfruit trees were stamped to keep tally of the number of these trees outside people's homes that belong to the government and the locals. It is called *thah jehun*. A steel cylindrical tube with a handle on one end and the other end sharpened, was used for marking trees with a hammer. The method used for stamping were:

- Trees owned by individual people: *1 thah* (stamp)
- Trees owned by a group of people (people in that island): *2 thah*
- Trees owned by the government: *3 thah*
- Trees owned by both the government and people of that island: 4 *thah*
- Trees planted for shrines: *5 thah* (Ministry of Fisheries and Agriculture, 1998).

Thus, Maldivians developed a means of keeping tally or counting depending on the context.

At present, it is the responsibility of each island office to keep a tally of these trees and report to the Ministry of Fisheries and Agriculture. And it is the responsibility of individuals who own trees outside their homes, to register the number of trees they own at the Ministry (Ministry of Fisheries and Agriculture, 1998).

Housework. In the Maldivian culture, women are responsible for tasks such as childcare, preparing food and maintaining the budget for all household purposes. Hence, counting money and estimating the budget is an important part of women's daily life. Women calculate the daily expenses and the amount of money to put aside for different purposes. While talking about budgeting, one home-maker [HW3] stated:

> އަހަރެމެން މުސާރަ ލިބުނީމާ އެކި ކަންތައްތަކަށް ބަހާލަނީ. ކާއެއްޗަށް ގެންނަން، ސްކޫލް އެއްޗެހި ގެންނަން
> ވަކިވަކިން، ދަތިން އެހެނިހެން ހަރަދުތަކަށް. ބައެއް ފަހަރަށް ކުޑަކޮށް ވެސް. ދަތިން ފަހަރުގައި ފަސްފަސް ފަހަރު
> އާމްދަނީއެއް ލިބޭ. އަންހެނުން ފަހަރު ގަނޑު ދޫކުރޭ. އަހަރެމެންގެ ބާކީ ފައިސާއާ ބޭންކަށް ލާނީ. އެއީ ފަރަދާއެއްގައި
> ބޭސްފަރުވާ ފަދަ ކަމަކަށް ދިމާވެދާނެތީ

When we get the monthly salary, we divide it for different needs like food, school necessities and other things. Sometimes we just manage. I get a reasonable amount of income from sewing, which helps. If there is a balance at the end of the month, we deposit that in the bank in case necessities arise such as medical [HW3].

Thus, counting is an essential part of housework. In addition to budgeting, housewives play an important role in teaching their children how to count and compute. In that sense, the first mathematics teachers of Maldivian children would be their mothers.

Money. Traditionally, small shells of certain molluscs were used as money in the Maldives. When Maldivians started using shells as money is not known (Browder, 1969; Maldives Monetory Authority, 1983). However, Ibn Batuta (1344) mentioned that Maldivians used cowry shells as money (Gibb, 1994). The shells were counted as follows:

5 boli (shells) = 1 agi
25 agi (125 boli) = 1 hiya
8 hiya (1000 boli) = 1 fau
12 fau (12000 boli) = 1 kottey

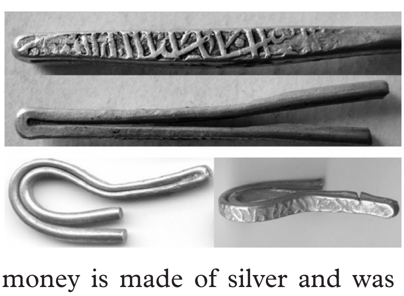

Figure 1. Fish hook money is made of silver and was in circulation in South Asian countries in the 17th century.

During the 16th and 17th centuries, silver wire or silver fish hook money was imported into the Maldives. A picture of the fish hook money is shown in Figure 1.

These coins were probably imported into the islands in exchange for the cowry shells, because during this time these coins were used in the Persian Gulf, India and Sri Lanka. The name of these coins was *laari. Laari,* seem to have originated from a town in Persia where they were originally minted in the name of the Shah of Persia (Browder, 1969; Maldives Monetory Authority, 1983). The *laari* was also known to be minted in Hormuz (Oman) and Basara (Iraq) in later times (Browder, 1969).

It was also during the 17th century that Maldivian money became round coins. Until very recently, even though the shape and sizes of the coins differ from time to time, one Maldivian Rufiya had 120 *laari.* It was during the reign of Mohamed Fareed (1954-1968) that one, two, five, ten, twenty-five and fifty *(laaris*) coins were made. The decimal system is used for Maldivian money at present. These coins were made in the United Kingdom (Maldives Monetory Authority, 1983). This seems to be an influence of the British because the Maldives was a British protectorate from 1887-1965.

Measuring in the Maldivian culture

Five calendar systems

Five calendar systems have been used in the Maldives. They are the Gregorian (English) calendar, Hijri (Islamic) calendar, an Indian solar calendar, an Arabic solar calendar and a *naksatra* calendar (Maloney, 1980). The solar calendars are referred to as *iru* (sun) *mas* (month) while the Hijri calendar is called *handhu* (moon) *mas* in Dhivehi. The Gregorian calendar and the Hijri calendar are most commonly used, and are the official calendars of the Maldives. The Gregorian calendar is used as a link with the international world while the Hijri calendar is used as the basis to mark Islamic festivals and link with the Muslim world. The Hijri calendar, beginning with the *hijra* (flight from Mecca to Medina) of Prophet Mohamed (PBUH), is a lunar calendar which is about ten days shorter than the Gregorian calendar (Boyer & Merzbach, 1991). Most Maldivians, especially old people and people living in the rural areas use the Hijri calendar to compute time and dates, while the young generation and people who live in the urban areas commonly use Gregorian calendar to mark the days. The Gregorian calendar is an influence of the West while the Hijri calendar is an influence of the Arab world.

The most prevalent calendar was based on the lunar stations as the moon passes in front of constellations in the ecliptic. This calendar divides the ecliptic into 27 segments named after the prominent constellations of the segment. The constellations are called *nakaiy* (Sanskrit nakshatra). Nakaiy refers to the twenty-eight seasonal divisions of the stars and each division is named after a particular star. The Dhivehi names of the nakaiy are closely related to Sanskrit so it is evident that this system came to the Maldives from India (Amin, Willets & Marshall, 1992). The names of the nakaiy in Dhivehi and Sanskrit are given in Table 2.

Each nakaiy has 13 or 14 days and is fixed with the solar year. When asked how the number of days are allocated to nakaiy, a navigator [N1] said:

ދުވަސްތައް ހަމަޖެއްސާފައި އޮންނަނީ އިރުދާރާ ބެހިގެން. ނަކަތެއްގައި އޮންނަނީ ސާދަ ދުވަސް. ތިންސަތޭކަ ފަސްދޮޅަސް ފަސް ދުވަހަށް ބަލާފައި ބަހާލަނީ

Days are fixed with the solar year. Each 'nakaiy' has 14 days. We just look at 365 days and divide accordingly.

Table 2
Names of Nakaiy in Dhivehi and Sanskrit

Dhivehi	Sanskrit
Assidha	Asvini
Burunu	Bharani
Kethi	Krttika
Roanu	Rohini
Miyaheli	Mrga-siras
Adha	Ardra
Funoas	Punar-vasu
Fus	Pusya
Ahuliha	Aslesa
Maa	Magha
Fura	Purva-phalguni
Uthura	Uttara-phalguni
Atha	Hasta
Hitha	Citra
Hei	Svati
Vihaa	Visabha
Nora	Anuradha
Dhosha	Jyeshta
Mula	Mula
Furahalha	Purva-asadha
Uthurahalha	Uttara
Huvan	Sravana
Dhinasha	Sravishtha
Hiyavihaa	Satabhisaj
Furabadhuruva	Purva-bhadhrapada
Fasbadhuruva	Uttara-bhadhrapada
Reyva	Revati

There are only two distinct seasons or monsoons in the Maldives. Hulhangu (the rainy or wet season) which has 18 nakaiy and Iruvai (the dry season) which has nine nakaiy. Hulhangu monsoon is approximately from 8th April to 9th December and

Iruvai monsoon is from 10th December to 7th April. The first 18 nakaiy given in Table 2 are nakaiy of Hulhangu and the rest are nakaiy of Iruvai monsoon. Fishing, agriculture, trading and some festivals celebrated are correlated with the nakaiy system (Amin, 1950; Amin, Willets & Marshall, 1992). For example, trading boats avoid stormy nakaiy, Nora is a good nakaiy for fishing, Furahalha for planting, and Mula for kite flying.

Measurement Strategies in the Maldivian Society

There is no one collective word for measurement in Dhivehi. The term used for measuring dry and liquid measures are *minun, minekirun* for weighing and *minelhun* for linear measure.

Linear Measures

Body parts, specifically the arms were used traditionally, and even now, it is used in everyday life for linear measure in Maldivian society. Table 3 gives the commonly used for linear measure.

Table 3
Units Used for Linear Measures

Kaivaiy or handspan	Tip of thumb to tip of index finger on the same hand stretched out
Muh or half-arm span	Tip of the elbow to tip of middle finger on the same arm
Riyan or shoulder-length	Shoulder to tip of middle finger of same arm
Bama or two-arm span	Tip of middle finger of one arm to tip of middle finger of the other arm, both stretched out

Kaivaiy and *Muh* are commonly used to measure cloth and are mostly used by housewives and at textile shops. *Riyan* and *Bama* are used by boat builders and in construction work. While discussing the work they do, the responses of a fisherman and a carpenter were:

ތަ ފުށް ގާތަށް ދަށް ދާންދެން ދިގުކަމުގައި. ތިމަންމަ ދަނީ ތިމަންމަ ދިގުކަމުގައި ހަދާފައި ހުންނަ ދަތުރުތަކަށް ވަކި ދިގުކަމެއް ނެތް

We use boats of 17 'riyan' to fish. A 'riyan' is approximately 2 feet [F6].

ތިމަންމަ ދާނީ ތިމަންމަ ދިގުކަމުގައި. ތިމަންމަ 27 ޔާ ދުވަހަކަށް ދާނީ ތިމަންމަ ދިގުކަމުގައި

Traditionally we always use 'riyan' for measuring. A 'riyan' is 27 inches [BB1].

Similar words are found in Sinhalese and Tamil for these linear measures. In Tamil *mulam* means two hand spans which is similar to *muh* and in Sinhalese *rinan* is a similar measure to *muh* but the word correlates to the *Dhivehi* word *riyan*. Further, the two arm span is called *bamba* in Sinhalese while it is *bama* in *Dhivehi* (Maloney, 1980). This shows a strong South Asian influence in our traditional

linear measurement strategies. Today, however, people use imperial and 'Systeme International' (SI) units for measurement which is an influence of the West.

Dry and Liquid Measures

Traditionally, *laahi*, a container made out of half of an average coconut was used for dry measure and *aduba*, a container made out of a big coconut was used for liquid measure. Even today, *laahi* and *aduba* are used by housewives for measuring. However, instead of coconuts they commonly use plastic cups or mugs but still they call them *laahi* and *aduba*. Four *laahi* make one *naalhi.* A *naalhi* is approximately equal to one kilogram and an *aduba* has the same capacity as that of a *naalhi* and hence one fourth of an *aduba* is also called a *laahi.* The system of dry measures traditionally was as follows:

4 laahi = 1 naalhi
16 laahi = 4 naalhi = 1 kotte
48 laahi = 12 naalhi = 3 kotte = 1 faraa
192 laahi = 48 naalhi = 12 kotte = 4 faraa = 1 mulhi
1200 laahi = 300 naalhi = 75 kotte = 25 faraa = 6 1/4 mulhi = 1 kandi (Ismail, 1953).

In addition to this, it is interesting to note that both traditionally and at present, a special measurement called *maaru* is used to measure firewood. A maaru is made out of thick rope with two knots indicating the length of a *maaru*. A *maaru* has a circumference of approximately two feet.

In the Maldivian weighing system, the lightest weight is called *bai kulhan'dhu*, which is half of a *kulhan'dhu*. A *kulhan'du* has the same weight as Maldivian 50 laari (cents) and 5 *kulhan'dhu* is equal to an ounce. A historian [H2] explained the traditional system of weights:

ބައި ތޮލާ = އެއް ކުޅަނދު
ދެ ކުޅަނދު = އެއް ތޮލާ
ދިހަ ތޮލާ = އެއް ގައު
ހަތަރު ގައު = އެއް ރާތާ
އަށާވީސް ރާތާ = އެއް ފައުލާ
ސަތޭކަ ބާރަ ރާތާ = ހަތަރު ފައުލާ = އެއް ހަންދަރު
ވިހި ހަންދަރު = އެއް ޓަނު

1 kulhan'dhu = 1/2 thoalaa
1 thoalaa = 2 kulhan'dhu
1 gau = 10 thoalaa
1 raathaa = 4 gau
1 faulaa = 28 raathaa
1 handharu = 4 faulaa = 112 raathaa
1 tanu = 20 handharu

Today, Maldivians commonly use SI units for both dry and liquid measure, which is an influence of the West. However, there is evidence of South Asian influence as well on our dry and liquid measures. According to Pieris (2010), in Sri Lanka *laahaa*, which is similar to *laahi,* was a measure for paddy kept in the temple and *nali*, which is similar to *naalhi,* used by Indians was a container made from a section of bamboo. The word *tanu* most probably came from the word English word ton and *gau* is the Dhivehi word for stone.

Time and Distance

As with other cultures, the day is divided into 24 hours. An hour is called *gadi* in Dhivehi, *ghatikaa* in Sanskrit and *gadikai* in Tamil. The daylight hours are divided into four parts called *dhan* and hence each *dhan* equals approximately three hours. Hindus divide the daylight hours into four parts while Sri Lankans divide it into 3 parts (Amin, Willets & Marshall, 1992). Further, Maldivians measure time according to the five daily prayers. A lot of Maldivians approximate time when they hear the *bangi* (call for prayers).

Maldivians measure the distance by relating it to some other island or place. For instance, when asked how far the fishermen go to catch the fish, some of the responses were:

ދުވަހުގެ ކުރިން ދާދިފަހުން ދަނޑި ކަނޑިން ދަނޑަށް ދާނެ ކަމެއް ނެތް ދުވަސްވަރު ކަމަށް

We don't have to go very far those days. We fish very near the island. People on the island would be able to see us when we are fishing [F5].

ދަނޑި ކަނޑިން ކާޝިދޫ ދަށަށް ދާ ކަމަށް ވެގެންވެސް ވާނެ

We go near 'Kaashidhoo'. Sometimes we fish from 'Baraveli Kandu' (Baraveli sea) as well [F9].

This form of identifying locations is typical even on land. For instance, if someone asks for direction and how far a certain place is, the answer would be that it is near some significant place.

Cultural contexts where measuring is used

Similar to counting, there are cultural contexts in the Maldives where measuring is applied. These include boat building, building and construction, navigation and astronomy, agriculture, housework, mat weaving, rope making, and toddy collecting.

Boat building

Boat building is a remarkable skill in the Maldives. The boats or *dhoani* are made from coconut wood. The sizes of *dhoani* vary for different purposes and in different parts of the Maldives. Boat builders stress that the actual size of the *dhoani* is an estimation made by the chief carpenter or boat builder. For instance, the size of two or more fishing boats made by the same boat builder might differ. When asked how they determine the length and width of the boat, some of the responses were:

ދިގުމިނާއި ފުޅާމިން އަންދާޒާކޮށް ހޯދަނީ މާވަޑިމީހާ ކަމަށްވާތީ ދޯނީގެ ސައިޒުތައް ތަފާތުވެގެންދާނެ

The chief boat builder estimates the length and width. Hence, the sizes of the 'dhoani' vary [BB2].

އެގެންނަންނަވީ ކިއްސަރަކާއި އެއްޗެހި އޮންނާނީ މާވަޑި މީހާގެ ހިތުގައި

The chief boat builder conceptualises the shape of the 'dhoani' [BB3].

Traditionally, the inner bark (*vaka*) from a tree called *dhigga* was used as a measuring tape when boat building, and charcoal was used for marking. A boat builder [BB1] explained how they did it traditionally.

ވަކައަކީ ދިއްގާގަހުން ނަގާފައި ހުންނަ ގަހުގެ ތޮށި. ތޮށި ރީއްޗަށް ސާފުކޮށްފައި އެ ފަށައިގެން ގޮތްޖަހާފައި ހުންނާނީ.
ފާހަގަ ޖެހުމަށް ގެންގުޅޭނީ ދަނޑި ފުނޑައިގެން. އެއިރު ފުންސޫރު ވަރަށް ނުގެންގުޅެން

'Vaka' is the bark of 'dhigga' tree. We just clean the bark and cut into strings and put knots on the string. Charcoal is used to make marks on the wood. Pencils were rarely used those days.

At present, measuring tapes and pencils are used instead of *vaka* and charcoal. However, estimation still is very important in boat building. The chief boat builder estimates how wide the *dhoani* should be.

ޖޯޑުން ބަލައިގެން ހަދަނީ. އެއްވެސް ކަހަލަ މިނެއް އެއްޗެއް ނުނަގަން. ދަނޑިތަކުގައި މާވަޑިމީހާ އެޅި ތަކިމާ
ދަނޑިވަޅެން އަޅާނާ ހަދާނީ

We do not measure at all, instead we estimate. When the chief boat builder marks where a piece of wood has to go to, his assistants will place the piece of wood and smoothen it up [BB3].

Traditionally and at present, the shape, curvature and lines of a dhoani are in the chief builder's mind. There are no written plans at all in boat building. The builders, under the guidance of the chief builder, first lay the keel and the ribs. These determine the length and shape of a *dhoani*. They will then lay the planks for *dhoani* sides, each plank being curved individually to fit the cross-frame.

Maldivians may have learned boat building techniques from several different cultures. For instance, *dhoani* is Dravidian (Southern Indian) but also used in Indo-Aryan languages. However, the writer has not found any evidence in the literature or from the discussions that Maldivian boat building skills are linked to any other culture.

Building and construction

Traditionally, coral and sand were used for building and construction. Coral and sand are taken from the sea, and the coral is broken down to smaller pieces. Sacks and square tins (*dabiya*) are used to measure sand while well-like containers

and *dhoani* are used to measure coral. A constructor [BC2] explained how they take coral and sand from the sea and how they measure it.

ވެލިނަގަން ހަދާ ގޮތަކީ ވެލިނަގާ ފުރުދޫގެ ކަނޑުއެގެން އެތަނަކަށް ދަނީ. އިސްކޮޅުމެރުމަށް ފައިޖެހޭ
އަޑި ދުރުނުވާ ވަރުވެގެން ހަނދުމަކުން ފޫޓު، ހަތަރު އަދި ފަހެ ގޮންޖެހޭ އަޑިއަށް: މީޓަރުން ދެތި ގޮން
ވެލިނަގަނވެސް. ވެލި ގޮނޑީ މީހަކުގެ ހިފާފައި ދިއުމަށްޓަކާ މަތިގައި އަތުން ދިޔަކަ ނަގަނީ: ގޮނިހޮޅުއަތަށް
ހުންނަ ގޮނޑުއަގައި. އެއްގޮނޑު ފުރިހިނަގަން މީހަކު ފުސް ފުޅީ ހުފުޅީ ހުންނަފަށްގަ ހިސާބުގެ މަސައްކަތް: އެއީ
ދަ ފުޅީ. މިނޫން ހުރިގޮތަކީ ބޭރު ތިރިމަގެ ހުރިހާ ކޮނޑާ ނުނގުކުމާ ނޫނި ބޭޅުޖެ ވެލިބަރު ރަނގަޅު. ގާތްގަނޑަކަށް
ބަސްތާއެއްފުރޭ އެވެސް ކޮއްވެ ގޮނޑާ ހުރިހާ ހުރި ގައި ހުރިގަނޑި ބޭރުވެ ފަރުގޮނޑު ކުރީގައި ގޮނޑާކަށް
އަނބުރައިފަރުން އޮއްވަގެ އެއްވަރުކޮށްފައި ފޫޓުއަށް ކުރިމަކުރާ ބަލަން

To take sand, we go to lagoons that are easily accessible and not too deep. About 5 to 6 feet or if in metres about 2 metres deep. We cannot collect sand or coral if our feet cannot touch the bottom of the sea. We take the sand and fill the sacks while in the water and then lift it up to 'dhoani'. A sack has approximately the same capacity as a 'dabiya'. To measure sand, in some places they make a 'kodi' (cubic foot) or there are wells constructed to put the sand in. When a sack is full it is approximately equal to a 'kodi'. For coral, sometimes we just measure in terms of 'dhoani' or else we just bring the coral to the island, even it and measure to find the cubic feet.

For bonding or mortar, powdered lime stone (uva) is used. *Uva* is lime made by burning coral stone in a kiln. Mortar is made by mixing sand and quicklime.

Olan'bu kurun is the Dhivehi word for vertically plumbing. The builders explained how they establish a vertical datum to start building.

ދަނޑި ބިމަށްޖަހައި ބޮއްޖެހިގެން އަށަގަނޑު ބަހާނީ. ދެން ބޮނޑުފެނުގެ ވަރަށް އަނދި މައްޗަށް ނަގައިގެން ގޮނޑާނީ

Stick a pole into the ground and put a string on the pole. Take the string up as you construct the wall [BC3].

Even at present levelling is done the same way. However, instead of coral, rectangular concrete blocks are used mostly; and instead of *uva*, normal cement is used. The blocks are about one foot in length and six inches in height and width. The ratio of the mixture used for these blocks is about one-part cement is to four parts sand and the same ratio is used for mixing cement and sand for construction.

Navigation and astronomy

Maldivians depend on the *nakaiy* system to forecast weather. They sail at night by setting their direction according to the stars appearing at different points on the horizon. When asked how they forecast weather, some of the responses of fishermen were:

މޫސުން އަނދައިރުން ބަލަނީ ކަނޑުގެ. ދެން އަނބުރާލާފައި ނަކަތްތަކުން: ވަރަށް ބޯޖެހޭ ހުޅަނގުގެ ނަކަތްތަކުން
ވިސްނާ ބަލާ ހަދަން: ކެތި ހިސާބުން ވަރަށް ބޮޑަށް ބަލަން. އެއީ އެންމެ ވާރޭވެހޭ ނަކަތް

We look at the sea and the 'nakaiy' system. During 'hulhangu' season we are very alert, especially after 'kethi'. It rains the most in this 'nakaiy' [F1].

ތުއްދަހާ ހަދާފައި ވިއްސާނަ ހިތްތެރި ކަމެއް ފެންނަ ދަނޑުގައި ދާނެ

Look at the sky to see if there is any sign of rain and we leave the island to go fishing [F5].

The Chinese introduced the compass for navigation in the Indian Ocean. Maldivian navigators also used these compasses when travelling (Amin, Willets & Marshall, 1992). Navigation by sea was vital for Maldivians as the only form of travel was by sea before and Maldivians were sea traders, going presumably as far as China.

However, most navigators can sail between the islands without using a compass based on their experience. A fisherman [F4] mentioned:

ދަތުރުކުރާނެ ހަމަ ދަތުރުތަކެއް ކަމުގައި ތާވަލުގެ ބޭނުމެއް ނެތް. ލަދުގަ ދާއިރު ހަނދާ ރޭ ހަނދާ ރޭ ކަމަށްވާނަމަ ތާރާ ފެންނާނެ ކަމުގައި ތާރާ ބަލައިގެން ދާނެ

We know the routes by heart, from our experience, so we don't need to use a compass. When travelling at night, if it is a moon lit night, we can see the stars so we set the direction according to the stars.

Maldivians also used an old type of sextant file and a quadrant instrument called *goiduruvaan* before Europeans came to the Maldives. Captain Moresby wrote in the 1830s that Maldivians made and repaired sextants, quadrants and also copied and used English nautical tables. Further, James Tennet wrote in 1860 that Maldivian sailors used charts evidently copied from ancient charts developed by Arabs (Forbes & Ali, 1980). Hence, there is evidence of the influence of Chinese, Arabs and Europeans on Maldivian navigation and astronomy.

Agriculture

Before, and even now people are leased uninhabited islands. These islands are leased to the people by the government for agriculture and other purposes. The people who lease these islands have to pay a tax or *varuva* to the government. These taxes are charged according to the area and the availability of natural resources on the island. Traditionally, goods have to be given or paid to the government in the form of tax. For instance, traditionally, tax for an island were:

6000 coconuts
1 *handharu* (approximately 60 kilograms) fish
Mats equivalent to 100 *kotte* (approximately 60 kilograms) shells
(Ministry of Fisheries and Agriculture, 1924).

At present, tax has to be paid in money- Maldivian Rufiya.

Housework

Maldivian housewives use l*aahi, naalhi* and *adubaa* in cooking. When asked how they measure in their day-to-day life, some of the responses were:

މިން ހަދަނީ ލާހިން. މީހުން ތިބޭ އަދަދަށް ބަލާލާފައި މީހަކަށް ދެބައިކުޅަ އެއްބައި. ބައިލާހި މީހަކަށް ކަދަން ބަލާފައި
އެގޮތަށް ދޫކުން ކައްކަނީ

I measure using 'laahi'. Just count the number of people and cook half of a laahi or bailaahi for each person [HW6].

ލާހިން މިންކުރީ. މިހާރު މިންކުރަނީ ޕްލާސްޓިކް ޖޯޑެއް ލާހިއެއްގެ ގޮތުގައި. ގޭގައި ތިބޭ މީހުންގެ އަދަދަށް ބަލާފައި
މީހަކަށް ބައިލާހި ފެނުބަތް ކައްކަނީ. ރިހަކުރު ހުރިހާ މީހުންގެ އަދަދަށް ބަލާފައި

I use laahi for measuring. Now I use a plastic cup as a 'laahi'. Depending on the number of people living in the house, I cook half 'laahi' rice for each person. I just estimate the amount of curry I have to cook for the same number of people [HW1].

Measuring tape are used by Maldivian housewives for sewing. Even in sewing, they estimate a lot in deciding how much material a particular person will need to sew a particular type of dress.

Mat Weaving

Mat weaving is an intricate craft carried out in the Indian sub-continent (Forbes & Ali, 1980). In the Maldives, mats are usually woven by women and girls. Mats are woven from a grass called *hau* and from *kashikeyo* (screw pine) leaves. For mats made out of *hau*, the *hau* is harvested and is allowed to dry in small bundles. Once it is dry, the *hau* will be dyed before mat weaving can begin. The colours used for dyes are black, brown and yellow. Leaves of *midhili* tree and bark of *uni* tree are the main components of black dye while it is dried and powdered bark of *uni* tree for brown dye and ground turmeric for yellow dye (Forbes & Ali, 1980; Shafeeg, 1988).

When asked how *kashikeyo* leaf mats were made, a mat weaver [MR1] explained:

ކަށިކެޔޮފަތް ކަނޑައިގެން ... ހިއްކަނީ. ...
...
...
...
...

Cut 'kashikeyo' leaves, tear it into strips and put the strips out in the sun. When the strips are a bit dry scrape the outer layer of the strip and let it dry again. Then again scrape the second layer and leave it to cool a bit so that the strips become soft. When weaving we put one strip on top of the other and so on. We just use our hands to weave, nothing else.

Rope making

Rope making is also carried out usually by women and girls in the Maldives. For rope making, coconut husks are buried in bogs for about two to three months. Then the husks are beaten with a wooden stick or mallet to separate the strands of coir. Wisps of the fibre are then laid up into double strands and rolled between the palms (Ministry of Fisheries and Agriculture, 1960; Shafeeg, 1988).

Bury coconut husk (not dry) in bogs. After about 2 to 3 months when the husks are soft, we take them out and beat with a wooden club called 'muguru' to separate the strands of coir. When the fibres are cleaned we roll the rope [MR2].

Rope bundles are made up of *foali* or strands of rope. The thicknesses of strands of rope or *foali* vary depending on usage. The number of *foali* in a rope bundle varies. A ***foali*** has 24 to 32 *riyan* (approximately equal to 27 inches) and is measured from toe up to a *kaivay* above knee.

The length of the rope bundle varies. These days a bundle of rope has about 5 'foali' [MR2].

Toddy collecting

Toddy is a very rich and nutritious drink collected from the sap of coconut palms. It is also used to make syrup or treacle called *hakuru*. *Hakuru* is obtained by boiling toddy for about four to five hours. The measure used for toddy-*raa* is called *badhi*. A *badhi* is made out of 2 to 3 coconut shells.

'Badhi' is made out of coconut shell. We collect the toddy and boil it until it is not very thick. When you put an eakle into the boiling toddy and take out the treacle, the eakle should be double the size for "hakuru" to be ready [TC2].

It is also quite interesting to note that traditionally, as with fishing; the treacle syrup made from toddy was also used to pay the salaries of the island chiefs. The toddy collectors commented on this.

The local people gave salaries to the chiefs in those days. Every month every toddy collector had to give 1 'adubai' 'hakuru' to island chief, 2 'laahi' to assistant island chief and 2 'laahi' to 'mudhimu' [TC2].

Concluding remarks

The need for counting seems to have been very important in the Maldivian culture since at least the beginning of the Christian era. The duodecimal counting system used traditionally and even at present is evidence of this. Quantifying is important for a society like the Maldives where natural resources are scarce and fishing is one of the main occupations. When Maldivians started counting or developed a traditional counting system is not known. However, there is evidence to suggest that initially Arabia and South Asia (mainly India) influenced our counting system. Later the British influence was felt.

Maldivians developed strategies for measuring length, volume, weight, time, distance and area. Body parts are mainly used for lineal measures while containers made out of coconuts are used for dry and liquid measures. This is evident in the work that people do as part of their everyday life such as boat building, building and construction, and housework. The five calendar systems, especially the *nakaiy* system, play a major role in the Maldivian society as it is correlated with weather and hence with travelling back and forth from islands, fishing and agriculture. In addition, Maldivians developed strategies for measuring length, liquids, dry measure, weight, time, distance, area and volume, which are evident from the practical work people do in their day-to-day lives. However, almost all our measurement strategies have been influenced by South Asians, and also by Arabs, and more recently by the West.

The results of this study show that there is evidence of mathematics in the Maldivian culture even though people do not identify these aspects as mathematics. There is evidence in literature that including cultural aspects or ethnomathematics in the curricula make mathematics more meaningful to students (Begg, 1996) and give a more holistic view of mathematics to students (Barton, 1996). Likewise, the importance of students' own mathematical ideas is now recognised in many curricula; for example, New Zealand Mathematics Curriculum (Ministry of Education, 1992, 2018).

Ethnomathematics has important implications for curricula. The mathematical ideas related to counting and measuring can be used in curricula so that students can make connections between formalised ways of counting and measuring, and their everyday life enabling students to make sense of formal mathematics. Further, it is believed that ethnomathematical aspects will be useful for mathematics educators in the Maldives in terms of determining curriculum policies. Therefore, it is perhaps timely that the traditional and indigenous Maldivian ways of counting and measuring be studied more explicitly in schools in the Maldives.

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