

Traditional System of Counting on Ifalug Atoll, Yap State, Federated States of Micronesia

By Godfrey Jerry Fagolimul
EDSC 606-411 [MAN.3445.SP10]
Instructor: Dr. Donald Rubinstein Ph.D.
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Introduction

Before any foreign influence was felt in the central Caroline Islands, the culture and traditions had evolved over many generations primarily based on a simple and unique living style of a subsistence economy. The indigenous culture and traditions of these small islands have always been dependent upon the natural environment and its resources as well as on the social fabric in which knowledge and skills have accumulated for many centuries to support a self-sufficient and resilient life style. The central Caroline Islands (Figure 1) include many coral atolls with low lying islands, and several high volcanic islands. Ifalug Atoll (Figure 2) is one of the groups of islands in the central Caroline Islands which is part of the State of Yap in the Federated States of Micronesia. Today, the people of Ifalug Atoll still maintain and preserve their own living style based on the island culture and traditions despite the pressing western influences that have changed the living styles in many of the outer islands within the State of Yap.

The primary aim of this research paper is to document the indigenous mathematical knowledge and applications of the counting system on Ifalug. This paper describes the specifics of the indigenous counting system which had been established and has been used for many centuries on Ifalug Atoll. Like many other established civilizations in other parts of the Pacific region, the people of the Central Caroline Islands had created and used their own system of counting that had evolved out of their own creative knowledge on the basis of the natural island setting and the social living patterns.

It is the intention of this research paper to begin the documentation of the invaluable knowledge on the indigenous counting system and its applications on Ifalug Atoll. Hopefully, someday the information can be used to create curriculum materials for the first to seventh grades of the primary education of the children in the neighboring islands, especially Ifalug.

Physical Setting

Ifalug Atoll is located in Yap State in the central Caroline Islands of the Federated States of Micronesia (FSM) at 7° 15' north latitude and 147° east longitude (Figure 2) and is situated approximately 640 km south of Guam. The closest inhabited atoll is Woleai at about 53 km west of Ifalug. The largest and higher elevated Yap Islands where the capital of the State is located lies about 560 km northwest of Ifalug. Ifalug is often referred to as part of the Woleai region which also includes the atolls of Eauripik, Faraulep, Elato, Lamotrek, and Woleai. Ifalug Atoll consists now of three islands within the coral reef and the two separate main islands of Felachig and Felalop, which are inhabited by about 800 people and are connected as one long island as a result of natural processes over the centuries. The total land mass of all the islands within the atoll is about 1.48 sq. km (Sosis 1994) and the nearly circular lagoon is 2.43 sq. km [Sosis 1994 (Freeman 1951)]. Daily temperatures range from slightly above 21°C to 35°C and remain nearly constant throughout the year. The two seasons on Ifalug are differentiated by the presence of northeast trade winds from October through May.

Figure 1. Map of the Central Caroline Islands

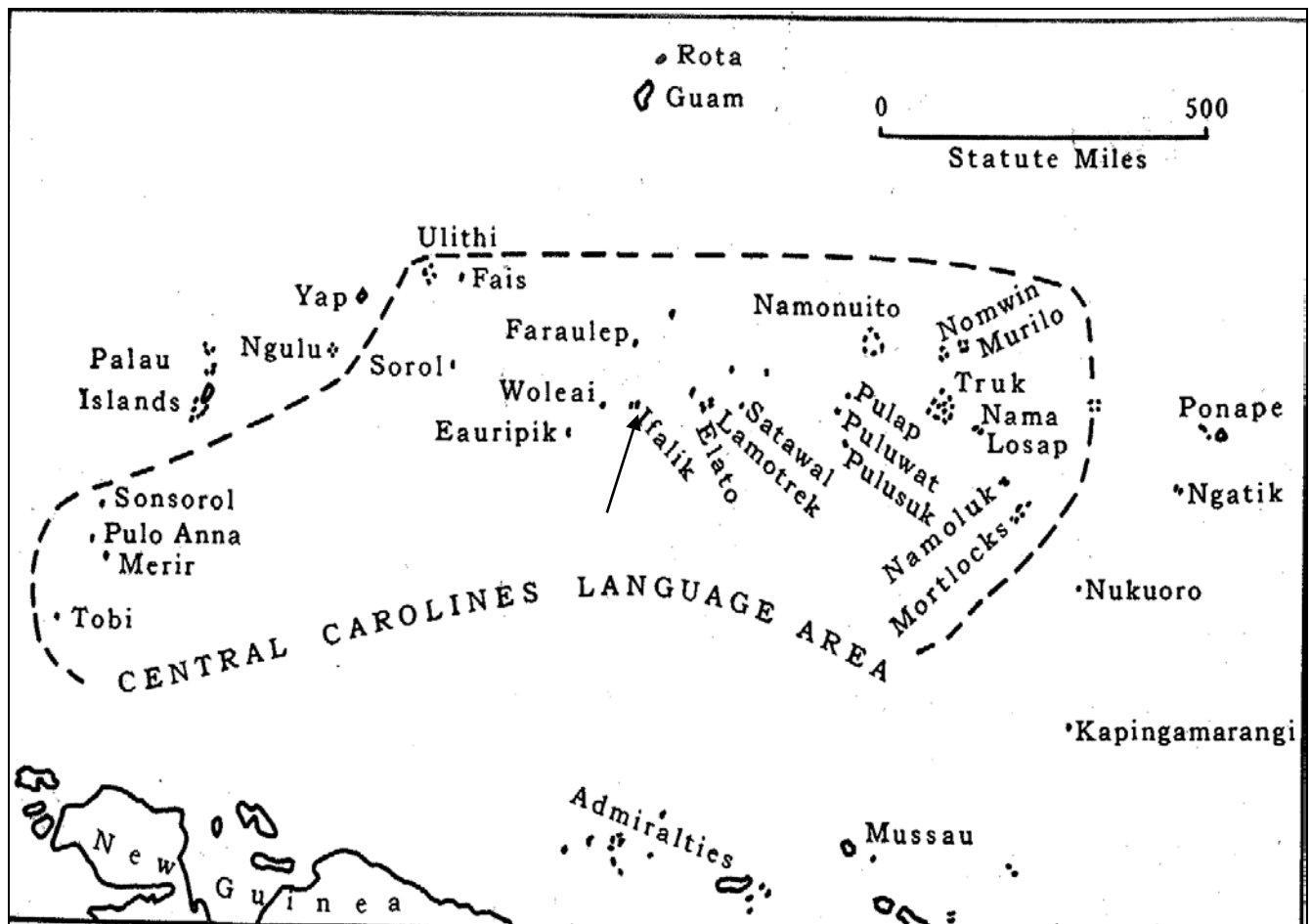




Figure 2. Satellite Photography of Ifalug Atoll, Yap State, Federated States of Micronesia (Google Earth)

Research Methods

The research process and methods involved the following steps and procedures during the course period:

1. reviews of the existing mathematical curriculums at the Yap State Department of Education as established for the New Baseline Curriculum (NBC) for grades 1 to 7;
2. interviews of two Yap State Department of Education Curriculum specialists who are responsible for curriculum development for the primary and secondary schools in the neighboring islands;
3. interviews of two Ifalug Atoll elders who still serve in the capacity of chief advisor, Moses Talimeiche and chief messenger, Steven Yangireisei who taught me challenging mathematical operations in late 1960's when the first Peace Corps volunteers first arrived on Ifalug. Both men still possess in-depth knowledge of the island culture and traditional skills as they are also known as master builders of traditional houses and canoes; and
4. extensive online research was also undertaken.

When the interviews were conducted with the valuable individual sources, the following method and procedures were utilized in order to allow for a friendly and normal conversation to occur with smooth exchange of information.

1. General background of the MACIMISE project was provided to ensure understanding of what I was doing and why I was doing it that warrants this information gathering from these important individuals with valuable knowledge, skills, and time.
2. The interviews usually occurred as much as possible in a manner of normal daily conversations that would take place when two or more people are talking about topics that are considered important. In other words, the main questions are built into the conversation when inquiring and discussing about the ethnomathematical topics, such as the Ifalug counting system. Clarifying questions would be incorporated as well in the conversation and interaction for the important information to be addressed and clarified.
3. The following main questions were used as the basis for gathering the information on the main topic for research, the indigenous counting system of Ifalug Atoll.
 - a. Is there a traditional counting system used on Ifalug Atoll?
 - b. If there is an existing system, what is the traditional counting system and what is the basic numerical counting used in general and in other specific applications?
 - c. Can you describe based on your own knowledge the specific numerical terms that the system entails and how is it set up and used in daily living?
 - d. How is the traditional counting system important in the culture and traditions of Ifalug Atoll?
 - e. Is the traditional counting system an important part of the culture and traditional practices that's still in existence today? Explain your answer.
 - f. Is the school on Ifalug Atoll teaching the Ifalug counting system to the students? If not, why?
 - g. Should the Ifalug counting system be incorporated into the school mathematics curriculum?
 - h. Do you have any valuable ideas or suggestions to this project, MACIMISE?

The basic interview questions listed above were used to generate appropriate and relevant information in a respectful conversational manner. Records of information provided were noted and recorded in a notebook and transferred to a computer log folder as soon as practical while the information was still fresh in my mind.

Although the above methods and procedures were followed and completed, the time necessary for follow-up interviews to confirm certain details was not permitted especially for the two elders who had to travel back to their respective home island. They provided the basic backbone of the research information and were very much excited and supportive when they learned and understood about the MACIMISE project. Both men expressed their support and willingness to become part of the attempt to

document and to preserve the traditional knowledge and skills in school curriculum and education. Both of the elders interviewed are close relatives so it was easy to obtain information needed for the research. On the other hand, most of the information and verification of the counting system was done with the consultation and support of the neighboring islands curriculum specialist, Mr. Tino Uolai whom I have chosen to be the main advisor on this MACIMISE project because of his vast experience and knowledge in the culture and traditional skills and modern educational system.

Description of the Indigenous Counting System

The indigenous traditional counting system of Ifalug Atoll is the same as the one commonly used throughout the Woleai region, including, Eauripik, Fechaulap, Lamotrek, Elato, and Ifalug. The language used in the islands is called Woleaian. The system of counting is shown in Table 1 that begins with a general counting of natural numbers as one, two, three, four and so on to ten. When counting beyond ten, speakers add “one” to “ten” and it becomes “ten and one” in the vernacular Woleaian language, “seig me sew,” which is translated as “ten and one” or “ten plus one”. This pattern continues for the next set of ten, but instead of repeating ten, it becomes another number as in “twenty” or “riuweig”. This is basically the base 10 counting as in the English numeral count.

Table 1. Ifalug Atoll General Counting System by Enumeration and Classification

General Numeral Counting		General Fast Counting		General Slow Counting	
Ifalug	English	Ifalug	numeral	Ifalug	English
Sew	One	Yeot	1	Yeota	One
Riuweou	Two	Riuw	2	Riuwa	Two
Seliuw	Three	Yel	3	Yelii	Three
Fauw	Four	Fang	4	Fangii	Four
Limwou	Five	Lim	5	Limaa	Five
Woleoiuw	Six	Wol	6	Wolaa	Six
Fisiuw	Seven	Fis	7	Fisaa	Seven
Waluiw	Eight	Wal	8	Walaa	Eight
Tiweouw	Nine	Tiw	9	Tiwaaw	Nine
Seig	Ten	Seig	10	Seig	Ten
Seig me sew	Ten and one	Yeot	1	Yeota	One
Seig me riuweouw	Ten and two	Riuw	2	Riuwa	Two
Seig me seliuw	Ten and three	Yel	3	Yelii	Three
Seig me fauw	Ten and four	Fang	4	Fangii	Four
Seig me limwou	Ten and five	Lim	5	Limaa	Five
Seig me woleouw	Ten and six	Wol	6	Wolaa	Six
Seig me fisiuw	Ten and seven	Fis	7	Fisaa	Seven
Seig me waluiw	Ten and eight	Wal	8	Walaa	Eight
Seig me tiweouw	Ten and nine	Tiw	9	Tiwaaw	Nine
Riuweig	Twenty	Riuweig	20	Riuweig	Twenty
Riuweig me sew	Twenty and one	Yeot	1	Yeota	One
Riuweig me seliuw	Twenty and two	Riuw	2	Riuwa	Two
▼	▼	▼	▼	▼	▼

Table 2 shows the base 10 counting and place value system as in tens, hundreds, thousands, and millions. When Ifalug counting reaches thousands and beyond, it becomes questionable in the Ifalug counting system because people of the island hardly count thousands of objects or creatures. It's rare to count that many thousands on a small island except on rare occasions when large schools of fish enter the lagoon and the occasion becomes a cause for celebration. This is when all laws of the land are lifted for free celebration without restrictions. The counting of fish, such as tunas and mackerels, can now reach up to thousands, and the distribution of the fish by equally dividing thousands of fish among hundreds of people that ranges from 600 to 800 for Ifalug Atoll becomes a big job for the clan head who has the responsibility. The counting of so many objects or creatures can utilize the fast counting system. To ensure that all objects or creatures are thoroughly counted, the slow counting system is applicable.

Table 2. Ifalug Base 10 Counting and Place Values

TENS		HUNDREDS		THOUSANDS		Ten Thousand to million	
<i>Ifalug</i>	<i>numeral</i>	<i>Ifalug</i>	<i>numeral</i>	<i>Ifalug</i>	<i>numeral</i>	<i>Ifalug</i>	<i>numeral</i>
Seig	10	Sebiuguw	100	Sangeras	1000	Sen	10,000
Riuweig	20	Riuwebuguw	200	Riuwangeras	2000	Selob	100,000
Seliig	30	Selibwuguw	300	Selingaras	3000	Sepiiy	1,000,000
Faiig	40	Fabwuguw	400	Fangeras	4000		
Limeiig	50	Limwebuguw	500	Limangeras	5000		
Woleyig	60	Wolebuguw	600	Wolengeras	6000		
Fisiig	70	Fisibuguw	700	Fisingeras	7000		
Waliig	80	Walibuguw	800	Walingeras	8000		
Tiweig	90	Tiwebuguw	900	Tiwengeras	9000		

In Table 3 the Ifalug traditional counting system uses numeral classifiers to count objects or living creatures by descriptions and classifications. There are numerous classifiers in the counting system used by the Woleaian language speakers in the Woleaian region. The numeral classification counting system is important in the culture and traditional setting because of its applications to many of the building designs and construction of physical structures such as local houses and canoes. The counting patterns of this traditional counting system apply to the various numeral classification systems for counting the different objects, items, and living creatures which include humans. It is easy this way to know what are being counted and for what purposes. For example, if one is counting long objects then it is easy to assume someone is going to construct a structure or use the materials for local buildings.

Table 3. Ifalug Atoll Numeral Counting by Classification of Sets of Objects and Creatures

Numbers	Enumeration by Descriptive Classification				
	Counting Long Objects	Counting Round Objects	Counting Flat Materials	Counting sheets, fronds, leaves,	Counting humans and other creatures
1	Sefasho	Sefaiu	Sesheo	Seyal	Semaliu
2	Riuwefasho	Ruwefaiu	Riuwasheo	Riuwal	Riuwemaliu
3	Selifasho	Selifeou	Selisho	Seliyel	Selimeliu
4	Fafeosh	Fafaiu	Fasheo	Fayal	Famaliu
5	Lifasheo	Lifeou	Limasheo	Liimal	Limeliu
6	Wolefasheo	Wolefaiu	Wolesheo	Woleyal	Wolemaliu
7	Fisifasheo	Fisifeou	Fisisho	Fisiyel	Fisimeliu
8	Walifasheo	Walifeou	Walisho	Waliyel	Walimeliu
9	Tiwefasheo	Tiwefaiu	Tiwasheo	Tiwal	Tiwemaliu
10	Seig	Seig	Seig	Seig	Seig
10 and 1	Seig me sefasho	Seig me sefaiu	Seig me sesheo	Seig me seyal	Seig me semaliu
10 and 2	Seig me riuwefasho	Seig me riuwefaiu	Seig me riuwasheo	Seig me riuwal	Seig me riuwemaliu
10 and 3	Seig me selifasho	Seig me selifeou	Seig me selisho	Seig me seliyel	Seig me selimeliu
10 and 4	Seig me fafeosh	Seig me fafaiu	Seig me fasheo	Seig me fayal	Seig me famaliu
10 and 5	Seig me lifasheo	Seig me lifeou	Seig me limasheo	Seig me limal	Seig me limeliu
10 and 6	Seig me wolefasheo	Seig me wolefaiu	Seig me wolesheo	Seig me woleyal	Seig me wolemaliu
10 and 7	Seig me fisifasheo	Seig me fisifeou	Seig me fisisho	Seig me fisiyel	Seig me fisimeliu
10 and 8	Seig me walifasheo	Seig me walifeou	Seig me walisho	Seig me waliyel	Seig me walimeliu
10 and 9	Seig me tiwefasheo	Seig me tiwefaiu	Seig me tiwasheo	Seig me tiwal	Seig me tiwemaliu
20	Riuweig	Riuweig	Riuweig	Riuweig	Riuweig
∇	∇	∇	∇	∇	∇

The Ifalug traditional counting system consists mainly of the general numeral counting that is base 10 and has place values as in the English counting system. When it gets to the thousands and higher, the patterns becomes questionable because counting in this range is rare unless an unusually large quantity of fish are caught, which calls for a special ceremony and free celebration for the entire island. However, the use of the counting pattern appears to be acceptable in the counting of thousands and beyond, as used in the English counting system and the Ifalug counting system.

Ever since the introduction of the western educational system and the common English counting system used in schools and everyday counting by the new generation, the use of the Ifalug Atoll or Woleai

region traditional counting system is declining and the need to revitalize it in the school curriculum is evident. It must be preserved for it is an equally important and efficient mean of counting and its applications in building and navigation are greatly valuable.

Conclusion

The important question that keeps popping into my mind is “What’s the next logical thing to do after this research effort and findings?” The following answers came to mind after discussing with my advisor, Mr. Tino Uolai, who is the Woleai region Curriculum Specialist charged with the development of the school materials and curriculum writing.

1. Much more extensive research and effort is needed to document a more or less comprehensive counting system for all the outer islands of Yap State as part of the Curriculum development for the elementary schools as there is an incomplete and outdated information available today.
2. More research is needed to improve and expand the documentation of the measuring systems for Ifalug Atoll and the rest of the neighboring islands of Yap State.
3. More research is needed to document the traditional knowledge and skills in the area of traditional building of local houses and canoes in order to preserve the knowledge and skills and to pass on the information to the next generations; and
4. More documentation by the islanders themselves of the traditional knowledge and skills of navigation for Ifalug Atoll and the rest of the outer islands in Yap State.

This research is an attempt to begin documenting the indigenous ethno-mathematical knowledge and skills of the neighboring islands in order to preserve them before it’s too late and while the older generation still possess the valuable knowledge and skills today.

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