EVOLUTIONARY PROCESS IN AN OCEANIC CHIEFDOM

INTERGROUP AGGRESSION AND POLITICAL INTEGRATION

IN TRADITIONAL ROTUMAN SOCIETY

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We certify that we have read this dissertation and that, in our opinion, it is satisfactory in scope and quality as a dissertation for the degree of Doctor of Philosophy in Anthropology.

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DEDICATION

To Jenny and Peter Ladefoged

for all their love and support, and

Sarina Pearson

for never doubting that we could finish it.

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ABSTRACT

This study adopts a multidisciplinary approach to address some of the limitations of previous explanations concerning intergroup aggression and political integration in Oceania. An interpretation that is based on evolutionary ecology and political economy is presented that distinguishes between the factors involved in the emergence of intergroup aggression and political integration from the factors that perpetuated these behavioral strategies. Instead of merely describing the behavioral strategies, the study offers an explanation of how and why they developed and were maintained. In particular, the study focuses on the natural and social constraints where specific behavioral strategies would have conferred benefits to the people who employed them.

Three kinds of data are used as evidence for the proposed explanation. Archaeological data from the hilltops of Rotuma are used to determine the nature and distribution of monumental architecture throughout the island. A geographic information system (GIS) is used to analyze environmental data to determine the heterogeneous nature of potential resource productivity throughout Rotuma. The third kind of data comes from an analysis of recorded Rotuman myths and ethnohistorical accounts of the island. The myths and ethnohistorical accounts are used to delineate some of the societal norms that characterized Rotuma during the late prehistoric and early historic eras.

The study suggests that during this time the pan-Rotuman sauship was not a rotational position, rather was dominated by the elite from the relatively less productive eastern side of the island. The integration of the island provided the eastern chiefs with socially and materially defined benefits. Because of these benefits, the eastern chiefs employed behavioral strategies to perpetuate the political structure. People from other districts participated in the hegemonic political structure because there were long term benefits to the structure, minimal costs, and relatively fewer advantages for them to obtain the pan-Rotuman positions. By evaluating the environmental and social constraints of traditional Rotuman society it is possible to determine the costs and benefits conferred on populations who participated in interdistrict aggression and political integration.

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CHAPTER 1

EXPLANATIONS OF INTERGROUP AGGRESSION AND POLITICAL INTEGRATION

Introduction

Traditional Polynesian societies exemplify a diverse array of political forms. Over the past decades anthropologists have tended to separate these societies into essentialist categories or stages and to theorize about how the societies have evolved from one type or stage to the next. The focus of such studies has usually been on the degree of social stratification or differentiation and the extent of political integration. These dimensions are generally correlated, with an increase in social stratification corresponding to an increase in the area being ruled and the number of social units integrated into a single polity.

Hypotheses concerning the development of Polynesian political integration are certainly varied. Some researchers have focused on the role of cultural ideals (Goldman 1970, Howard 1985, 1986), and others have considered environmental factors (Sahlins 1958; Service 1962) or interregional trade (Friedman 1981; Spriggs 1986). More recently, Kirch (Kirch 1984; Kirch and Green 1987) has taken a epigenetic approach and considered how the founder populations with their cultural traditions were transformed within the context of particular island or archipelago environmental settings. The aim of this current study is to both extend and complement these approaches by specifying the environmental and social constraints in which the integration of a relatively small isolated island, Rotuma, Fiji, into a single polity would have been advantageous to the participants.

The proposed explanation for the political integration of Rotuma is based on the precepts of evolutionary ecology (Smith 1983a, 1983b, 1987; Boone 1983, 1992; Winterhalder and Smith 1992; Smith and Winterhalder 1992) and political economy (Earle 1991a; Brumfiel and Earle 1987; D'Altroy and Earle 1985). The goal of this study is to explain why people chose to exercise specific behavioral strategies when experiencing particular social and environmental constraints. The explanation considers why people participated in intergroup aggression and how this aggression could have led to political integration. An effort has been made to distinguish between the emergence of intergroup aggression and political integration and the maintenance or persistence of these social processes.

Three kinds of data are used as evidence in the proposed explanation. Archaeological data were collected during seven months of field work on Rotuma (January 1991 to August 1991). The data are the results of a reconnaissance, intensive survey, and limited excavations on the hilltops of Rotuma to determine the nature and distribution of monumental architecture. Furthermore, archaeological evidence of agricultural practices from throughout the island was recorded.

Environmental data forms the second line of evidence for the proposed explanation. Prior to the archaeological fieldwork a geographic information system (GIS) was used to develop and analyze environmental maps of the island. While in Rotuma the data on these maps were field checked and additional environmental data were collected based on field observations and information provided by Rotuman consultants. The data in the GIS were updated and additional analysis of the environmental data was performed. The third kind of data comes from an analysis of recorded Rotuman myths and ethnohistorical accounts of the island. The myths and ethnohistorical accounts were used to delineate some of the societal norms that characterized Rotuma during the late prehistoric and early historic eras.

Typically archaeologists, anthropologists, historians, and geographers have eschewed each others' data and information. There is an impression that because the different kinds of data were gathered using different methodologies, they are incomparable and should not be used in conjunction with one another. This study shows that this argument is specious. Although the data generated by the diverse disciplines varies in quality, accuracy, and precision, the data do exhibit variation and are relatively robust and vigorous. When used together these data can be employed to evaluate specific hypotheses about past social processes. Moreover, by combining the diverse kinds of data a more complete explanation for intergroup aggression and political integration during the prehistoric-protohistoric period on Rotuma can be proposed.

The dissertation is divided into nine chapters. In the remaining portion of this chapter the previous explanations of intergroup aggression and political integration in Oceania and the precepts of evolutionary ecology and political economy are discussed. In Chapter 2 an alternative model based on evolutionary ecology and political economy is presented. Chapter 3 reviews the physical and cultural setting of Rotuma. Chapters 4 through 7 present the various strands of data that are used to evaluate the model presented in Chapter 2. Chapters 4 and 5 discuss Rotuman subsistence strategies and how the natural constraints of the island might have affected these strategies. Included in Chapter 5 is a GIS based analysis of the heterogeneous distribution of environmental zones and a discussion of the implication of this distribution for potential agricultural productivity. Chapter 6 is a review of traditional Rotuman society drawn from the myths and ethnohistorical literature with emphasis placed on the role and characteristics of polity wide leaders. Chapter 7 examines government censuses to address the issue of differential population densities throughout Rotuma, and myths and ethnohistorical accounts to elucidate patterning in interdistrict aggression. Archaeological data from surface mapping and excavation, and the geographic distribution of large scale monumental architecture and agricultural features, are the focus of Chapter 8. In Chapter 9 the data presented in the preceding chapters are reviewed and the relationships between the data are elucidated to evaluate the model proposed in Chapter 2.

Explanations of Intergroup Aggression and Political Integration in Oceania

Researchers (Sahlins 1958; Service 1962) have for some time argued that political integration in Oceania stemmed from the necessity and advantages of economic managers. These functionalist managerial hypotheses usually emphasize the role that regional chiefs played in coordinating the production and exchange of staple products in diverse environments. It was suggested that the services provided by the chiefs were beneficial to all members of society and were essential for society's continued existence. These ideas have been criticized for a number of reasons (Earle 1987:292). First, researchers recognized that there are considerable logistical difficulties in redistributing large quantities of staples (D'Altroy and Earle 1985; Earle 1987:292). In addition, it has been suggested that resource diversity usually resulted in localized variation in diet and community size and not extensive staple exchange (Brumfiel and Earle 1987; Finney 1966). Furthermore, redistributional ceremonies occurred in chiefdoms far too infrequently to provide the staples required to fulfill the needs of daily subsistence or to provide a margin of resource safety. Finally, the approach assumes that societies or groups are the unit of explanation and does not focus on the costs and benefits for individuals.

As an alternative, Friedman (1981) proposed a model for the transformation of Oceanic societies which focused on areal and regional social systems instead of individual societies. Friedman classified the societies of Oceania into the Western Polynesian prestige-good system, Eastern Polynesian theocratic feudalism, and the

Melanesian big man system. He suggested that the social structure of all three types was based on the elementary structure of the prestige-good system. In its most elemental form the prestige good system consisted of generalized exchange with a chiefly monopoly over prestige-good imports that were necessary for marriage and other crucial social payments. The system had a bilineal tendency in kinship structure with asymmetrical political dualism, and these were the basis for oppositions such as religious versus political chiefs, original people versus invaders, female versus male, inside versus outside (Friedman 1981:281).

The founding societies throughout Oceania were initially based on a prestige good system but were transformed through time into the social formations observed at European contact. In Eastern Polynesia the social structure was transformed into theocratic feudalism. According to Friedman (1981:292) this transformation was related to the quantum increase in distance between the island archipelagos of the region. The spatial increase caused the near total disappearance of interregional trade and the loss of monopolistic control over interregional trade as one means of gaining power. Without such a monopoly, power was legitimized through increased rivalry, resulting in an increase in competitive feasting and warfare, and possibly the rapid intensification of agricultural production. The lack of interregional trade led to the disappearance of exogamy and the bilineal character of kinship and ranking. There was a greater concern for the purity of the lineage, and endogamy and seniority became the dominant structural principles. If extensive agricultural intensification was a viable option, cyclical theocratic chiefdoms formed, prehistoric Hawai‘i being an example. If agricultural intensification did not succeed, over-intensification occurred and the result was political decline and a further increase of warfare in highly unstable conditions, the Marquesas and Easter Island being examples (Friedman 1981:289).

In Melanesia, the shorter distances between islands resulted in a greater intensity of interregional trade. In areas central to the trade networks it was impossible to establish a monopoly over trade. The lack of monopolistic control resulted in intense competition, the absence of political hierarchy, and the establishment of a big man system. In more peripheral areas of Melanesia a monopoly over trade could be established, the result being a somewhat more developed form of political hierarchy.

Western Polynesia remained "a classic example of the full blown prestige-good system" (Friedman 1981:285). Friedman (1981:292) attributes this to the spatial configuration of the islands and the distance between islands which allowed a monopolistic control of interregional trade and the maintenance of political hierarchy. Warfare was less prevalent and instead of the competitive feasting and taxation found in Eastern Polynesia, valuables moved in exchange against food.

While Friedman's model excels in detail, it tends to misrepresent the uniformity of ancestral society and homogenize the diversity that existed in Oceania at European contact. The model oversimplifies the social structures to the point of misrepresentation. For instance, intense warfare was present in Western Polynesia, and dualism occurred in Hawai'i. However Friedman's (1981) model does have merit and Spriggs' (1986) has successfully modified and applied it to analyze social developments in southern Melanesia. The contribution of Friedman's model is that it draws attention to geographic or spatial variables as factors in the development of exchange and social complexity.

Kirch (1984) and Kirch and Green (1987) proposed a model for the evolution of Polynesian society that took as its starting point the founding society, Ancestral Polynesian Society, and focused on how divergent paths of development among societies led to different social structures throughout Polynesia. They use archaeological, linguistic, and ethnographic evidence to reconstruct the structure of Ancestral Polynesian Society. They suggest that Ancestral Polynesian Society was agricultural with a social structure based on hereditary chiefs, the conical clan, and landholding descent groups. The reconstructed social structure included the fundamental principles of mana and tapu, with an emphasis on status rivalry and a social position associated with warriors.

The transformation of Ancestral Polynesian Society into different sociopolitical structures was the result of several key mechanisms and evolutionary trends. Kirch and Green (1987:440-442) list isolation, the founder effect, the selective pressures imposed by new environments, long-term environmental selection in dynamic environments, and external contacts, as the key mechanisms for divergence. In addition they suggest that there are several evolutionary trends that most Polynesian societies have experienced. These include 1) the transition from a high-growth demographic strategy to a more competitive limited growth one; 2) the intensification of agriculture, animal husbandry, and marine exploitation; and 3) an increase in competition between sociopolitical groups. These trends were the result of the interaction between the persistence of ancestral Polynesian societal predilections and selective pressures such as "circumscription, resource limitation and degradation, ecological perturbations, and population growth" (Kirch and Green 1987:443). The precise form that Polynesian societies took was the result of the predilections of Ancestral Polynesian Society, the ecological constraints, and the creativity of individual actors (Kirch 1984:279; Kirch and Green 1987:441). Critiques of Kirch and Green's (1987) approach have suggested that it is not evolutionary in a biological sense, but is progressive (Dunnell 1987:444) and offers a framework that is generalizing as opposed to truly explanatory (Terrell 1987:448).

Goldman (1970) developed a theory for competition and political integration in Polynesia which focused on the elaboration of cultural values. Goldman (1970:542) notes that Polynesian social evolution involved two processes: "enlargement" and "diversification." Enlargement is the process of political integration wherever larger communities and territories are encompassed or influenced by a single political power. Diversification is the process of social stratification where the members of society become distinguished from one another by both role and status. According to Goldman (1970:542) the two processes of enlargement and diversification are correlated and "What is enlarged diversifies, and what diversifies tends to enlarge."

Goldman (1970:20) classifies the social systems of Polynesia into three hierarchical types. Traditional societies are a "religious system headed by a sacred chief and given stability by a religiously sanctioned gradation of worth" (Goldman 1970:20). Genealogical kinship relations based on seniority form the foundation of Traditional societies. Open societies have modified the principles of seniority "to allow military and political effectiveness to govern status and political control" (Goldman 1970:20). They are "more strongly military and political than religious and stability in it must be maintained more directly by the exercise of secular powers" (Goldman 1970:20). Status differences in Open societies are "no longer regularly graded but tend to be sharply defined" (Goldman 1970:20). The major economic distinction between these two societies is that in Traditional societies tribute was given as a sign of subordination along genealogical lines whereas in Open societies land was also seized and redistributed according to political merit (Goldman 1970:557). In Stratified societies there are "clearcut breaks in status that are far-reaching in their impact upon everyday life" (Goldman 1970:20). In these societies the commoners were disenfranchised from the land which was under the control of the elite. Goldman (1970:567-568) suggests that there was a progressive evolutionary trend for societies to develop from Traditional, to Open, to Stratified, where conditions allowed.

The primary impetus for the development of Polynesian society was the expressionary articulation of cultural principles. Goldman (1970:26) suggests that the status system had "the controlling influence over the evolution of Polynesian societies." For Goldman (1970:542), status rivalry was "the source of energy for transformation" which created ever increasing enlargement and diversification of polities. Goldman (1970:567) proposes that "status systems respond to all material conditions of life." Although the status system was in a dialectical relation to the material conditions, Goldman (1970) suggests that the primary stimulus for competition was status rivalry and not the material benefits that could be obtained.

In Polynesia, status is based on mana which has both genealogical and achieved components (Goldman 1970; Shore 1989). According to Goldman (1970:9) the principle of genealogical seniority was the primary basis for determining a person's mana and social status. Mana, however, was not a fixed state but could be increased or decreased depending upon an individual's behavior. Mana could be physically manifested as success in warfare or the prosperity of one's chiefdom. Due to the achieved and inherited components of mana, it had a range of gradations and thus there was sufficient ambiguity in one's status position for individual chiefs to exploit for their own gain (Goldman 1970:9). It was this ambiguity coupled with chiefly ambitions and experiences that were the impetus for chiefly rivalry. Goldman (1970:12) suggests that chiefs were inherently competitive with one another, and consistently strove to increase their relative status and prestige by increasing their mana. Under certain conditions, the outcome of status rivalry between two chiefs might favor one and thus lead to the enlargement and diversification of Polynesian society.

The growth in political centralism and hegemonic power was usually the result of warfare instigated by status rivalries between chiefs (Goldman 1970:486). By all accounts these wars had little economic utility but were nonetheless instrumental in strengthening political centralization (Goldman 1970:546). Goldman (1970:23-24) suggests that "A Polynesian chief may murder all potential rivals among his kin and precipitate a civil war at the end of which a triumphant chief establishes supreme authority over an enlarged political community." As such, warfare between groups was the result of the inherent status rivalry between chiefs. If the warfare was successful, conquest and increased political integration of society occurred. Goldman (1970:542) concludes that "The growth of the political community represents the fulfillment of chiefly ambitions and of Polynesian status ideals."

With increased political integration, the genealogical segmentary order associated with Traditional societies was altered by the creation of larger territories and the imposition of territorial administration (Goldman 1970:545). The implementation of political organization at the scale of a district in a Stratified society was the result of the conquest and subsequent control of other people's land. Goldman (1970:546) notes that there can be a "composite system" where "the major subdivisions were territorial, while their branches, headed by local chiefs, continued to follow the traditional pattern of segmentation." This composite system appears to have been associated with some Open societies.

Although Goldman stresses the importance of status rivalry for transforming society, he acknowledges that the environmental context of an island could influence the process. Goldman is, however, ambivalent on this point. In several passages he belittles the influence of the environment, yet elsewhere appears to recognize its importance. For instance he (1970:487) suggests:

> Since Polynesian societies can be similar in basic culture whether they occupy atolls or high islands, relatively rich habitats or barren islands they cannot be regarded as having been molded by their different material environments. The same basic status system existed on all Polynesian islands, posing everywhere the same basic economic demands.

Yet he (1970:482-483) wrote:

> Quantity of production is indeed a crucial economic condition, with profound social and cultural consequences. In Polynesia, productivity was a general measure of chiefly efficacy. Poverty was demeaning. Abundance brought out the cultural patterns in their full splendor. Scarcity reduced them to their most meager forms. Abundance supported rich and costly rituals. Scarcity stripped ritual life to the bone.

Goldman suggests that in some cases the productivity of an island might roughly correspond to the degree of enlargement and diversification in the society. Those societies occupying areas with the highest productivity had the greatest opportunities for developing increased social complexity and those societies living in lower productivity areas had the fewest opportunities.

Goldman's consideration of the role of the environment in relation to Polynesian chiefdoms was generally restricted to the overall productivity of an island and he gave little detailed attention to intra-island or intra-archipelago variability. However, in a few instances he did consider the effect of heterogeneity and wrote, "as on most volcanic islands of Polynesia, it is not general productivity that is significant but the pattern of distribution of rich and poor farm lands" (Goldman 1970:77). In cases of heterogeneity, "economic capability added enormously to the strength of a chief. The chiefs who could promote production though terrace irrigation were the most successful..." (Goldman 1970:486). This implies that the chiefs who occupied the most productive areas of an island were generally the most economically successful and hence powerful.

Goldman (1970:487-491) distinguishes between the goal of warfare in environments with high productivity and those with low productivity. Warfare in highly productive environments was more political in nature, with the aim of increasing chiefly jurisdiction and importance by controlling people. In contrast, warfare in poor environments was "more desperate, more utilitarian, more directly concerned with conquest of food lands" (Goldman 1970:488). In these environments the power of the chiefs usually declined relative to the power of warriors.

Goldman's interpretation of the development of Polynesian competition and political integration is based on the role of primogeniture coupled with the inherent status rivalry which existed between members of the chiefly ranks. Rivalry was fueled by the ambiguous nature of the system of rank, based as it was on the concept of <u>mana</u>. Although chiefly competition could have material ramifications, these benefits were secondary and were not the prime impetus for competition and subsequent social changes. Goldman acknowledges that environmental variables could affect the expression of status rivalry. In general, Goldman focuses on the overall productivity of an island and suggests that highly productive environments provided opportunities for the development of social complexity and poorer environments inhibited it. Competition and warfare in poorer environments were more utilitarian in nature, focusing on subsistence resources, as opposed to political warfare which occurred in richer environments. Goldman also suggests that given environmental variability within an island, the chiefs from the more productive regions were more powerful or capable of territorial enhancement. For Goldman, then, the evolution of Polynesian social systems was a consequence of chiefly rivalries played out in favorable environmental circumstances.

The theoretical framework for Howard's (1964, 1966, 1985, 1986, 1989) view of competition, social stratification, and political integration on Rotuma is generally similar to that advanced by Goldman. Competition or warfare on Rotuma "was generally motivated by status rivalry rather than economic considerations, and was not a means of territorial aggrandizement" (Howard 1966:63). The fundamental causes of interdistrict strife resulted from breaches in etiquette between chiefs and these acts were associated with the system of status ranking (Howard 1964:28). Howard (1986:11) suggests that "Imputed motives (for usurpation) include anger over slights, the incumbent chief's misconduct, and sheer ambition." Howard (1966) implies that the victors in war or the dominant elite of Rotuma achieved little or no material gain. He suggests that the chiefs of a district "were entitled to first fruits, and regularly received portions of food from feasts and fish from communal fish drives, but under usual conditions these were not consequential" (Howard 1989:146).

At the time of European contact (c. 1793) Rotuma was divided into seven semi-autonomous districts that were integrated into a single loose polity. The polity was led by three pan-Rotuman positions, the <u>fakpure</u>, <u>sau</u>, and <u>mua</u> (see Chapter 6). The <u>fakpure</u> was the secular ruler of the island, whereas the <u>sau</u> and <u>mua</u> were religious leaders. Ideally, the position of <u>sau</u> was rotational with representatives of each district holding office in turn (Howard 1964, 1985). The rotational nature of the sauship indicates to Howard (1985:69) that the position symbolized the unity of Rotuma in the absence of stable hegemonic political integration. The sau personified the polity and represented the entire island to the deities. Howard (1985:70) proposes that there was an inherent instability to Rotuman integration which was the result of common people being ruled by chiefs from outside their districts. This instability was partially resolved by the periodic geographic rotation of authority vested in the sauship. Despite this cultural ideal of a well organized rotational political system, instability was manifested by commoners and lesser chiefs occasionally deposing unpopular pan-Rotuman chiefs (Howard 1985:70, 1986). Thus the leadership of the polity could occasionally change according to the fortunes of war (Howard 1985:69).

Howard (1985) proposes that social stratification on Rotuma was not highly developed because at the district level there was still a genealogical connection between the district chiefs and the common people. However, the relationship between commoners and the supra-district rulers was not solely genealogical, but included political, ideological, and material dimensions. Howard (1985:68) proposes that:

> The relationship between the people and chiefs, is finally constructed as one of complementarity, with the people producing the food (and other goods and services) for the benefit of chiefs, who intercede with the gods, who provide abundance to the land.

In Goldman's (1970:20, 546) terms, Rotuma would thus appear to be an example of an Open society with a composite social system. The major district subdivisions of the island were political territories that were integrated into a single polity in an unstable manner, while the internal organization of the districts was structured on genealogical lines.

Howard (1985) relates the political structure of Rotuma to the demographic level and geographical size of the island. He (1985:72-73) states:

> In Rotuma, however, which is an isolated island of rather small size (7 square hectares [sic., ca. 4200 hectares]) and a medium-sized population, pragmatic constraints favored local autonomy and set limits on the degree to which chiefs could be differentiated from the people. Genealogies were shallow and distancing was difficult both physically, because of the small size of island, and socially, because the population was too small to facilitate a distinct breeding population of chiefs, keeping kinship distance within boundaries. As a result Rotuman chiefs were not in a strong position to be either elevated in rank or mystified to a level approximating gods.

This is an argument that the elaboration of social stratification and political integration in Polynesia was to some extent dependent upon the size and population of an island. On larger islands with substantial populations, the principles of social differentiation based on genealogy could be extensively elaborated and a high degree of political integration and social stratification could occur (Howard 1985:72).

An Alternative Model for Intergroup Aggression and Political Integration on Rotuma

Previous explanations for intergroup aggression and political integration in Oceania have emphasized a number of variables. These explanations provide some useful insights into how Polynesian societies may have changed. However, some of these explanations are teleological in nature. Some suggest that Polynesian societies were evolving towards an ultimate end of ever increasing social differentiation and political integration. Furthermore, some of the explanations rely heavily on essentialist schema, where ideal societal types are reified and variation is ignored. There is also a tendency for descriptions of societies to be proposed as if they were explanations of evolutionary processes.

To address some of the limitations inherent in these explanations, I propose an alternative that is based on the constructs of evolutionary ecology and political economy. The advantage of this approach is that it allows the delineation of a limited number of variables in a non-essentialist manner. Explanations within this theoretical framework do not presuppose that there are specific societal types or stages that are passed through in a lineal, progressive fashion. Therefore it is possible to generate interpretations where no ultimate end point is assumed a priori. Explanations are framed in terms of processes in which the behavioral strategies that comprise societal norms are selected for and perpetuated if and only if they confer benefits within specific environmental settings. It is therefore possible to distinguish between the factors which influenced the emergence of a behavioral strategy and those factors which perpetuated it. These explanations emphasize the evolutionary processes involved in how and why behaviors were selected for, and are not just generalizations or descriptions of the behaviors.

Theoretical Foundations of Model

Evolutionary ecology applies the principle of natural selection to the study of adaptation and biological design within an ecological setting (Winterhalder and Smith 1992:5). An aim of the discipline is to delimit how evolutionary forces act on both genetic and cultural variation to produce the behaviors of individuals. The aggregate behavior of individuals form the societal norms which are explained as the consequence of evolutionary processes. Evolutionary ecological models derive precepts from neo-Darwinism, microeconomics, and decision theory, and as such involve a blending of complementary theoretical approaches (Smith 1983a; Winterhalder and Smith 1992:8).

According to evolutionary theory, natural selection occurs in Darwinian rather than Larmarkian terms (Dunnell 1988; Rindos 1985). Natural selection in Larmarkian evolution is a one step process where the generation of variation is controlled by selection. In contrast, Darwinian biological evolution involves a two step process where variation is first randomly generated and then natural selection operates on this variation to allow the more "fit" variants to reproduce at a higher average rate. The process of differential reproduction leads to either the eventual replacement of the relatively less "fit" variants or their persistence at a lower frequency (Smith and Winterhalder 1992:26).

Given the distinction between Darwinian and Larmarkian natural selection, some evolutionary ecologists have suggested that the random generation of undirected variation is not a requirement for evolutionary approaches (Rosenberg 1990:401; Richerson and Boyd 1985:83). They propose that variation in cultural behavior is often directed by the same forces that determine selection. According to Rosenberg (1990:411), selective pressures can cause varieties to exist, which are then selected for or against. Kirch and Green (1987:450) recognized this process and suggested that "cultural variation does not simply arise randomly; people frequently invent identical ideas almost simultaneously and are often purposely innovative in responses to natural and cultural selective pressures." Although there is some debate concerning the generation of cultural variation, most evolutionary ecologists agree that the unit of selection is the individual and the effect of group or kin selection is minimal, although it may be significant in some contexts (Smith and Winterhalder 1992:32).

The inheritance or transfer of cultural behaviors from one individual to another is distinct from genetic transference in a number of important ways. Unlike genetic material transmitted during reproduction, cultural behaviors may be continuously transmitted throughout an individuals lifetime by learning. This transference is not just a one time event from a parent to their offspring. Rather, cultural behaviors can be continuously transmitted between sibs, other relatives, and unrelated people.

Although there are differences between genetically transmitted traits and cultural behaviors with regard to the origin of variation and the mechanisms of inheritance, natural selection can operate on cultural behaviors. Culture can thus be said to evolve by the selective retention of non-genetic traits that enhance individual fitness (Leonard and Jones 1987). Natural selection may act on any system of inheritance which contains a few key properties (Richerson and Boyd 1984). These properties include: 1) the existence of heritable variation; 2) variation must affect an individual's phenotype; and 3) phenotypic differences must affect an individual's chance of transmitting the variants to others. Cultural behaviors conform to each of these key properties. Variation in cultural behavior is transmitted from individual to individual through learning. The variation affects the observable appearance and behaviors of the individual, and behavioral differences between individuals can and do affect the probability that the trait will be passed on.

Most evolutionary ecological models invoke methodological individualism as a fundamental premise (Winterhalder and Smith 1992:17-19). Methodological individualism is the assumption that cultural norms are the result of aggregate individual behavioral strategies (Mithen 1989:486; Boone 1983). As such, the rules and practices of social institutions result from both intentional and unintentional individual behavior. Methodological individualism provides an actor-based account for social phenomena, while recognizing that most evolutionary explanations will apply to aggregate behavioral phenomena.

Optimization models that are used by evolutionary ecologists propose that people's behavioral strategies are based on the maximization of individual benefits (Winterhalder and Smith 1992:33; Smith 1987; Durham 1976). In these models, people behave rationally in the sense that they act as effectively as possible and do not commit logical errors in ordering their preferences (Winterhalder and Smith 1992:26). The notion of rational behavior does not include assumptions about how people assign values to choices, rather it assumes only that people can logically execute these choices. Smith (1987:202) notes that all optimization models contain four features:

> (1) an actor that chooses or exhibits alternative states; (2) a strategy set (the range of options an actor chooses from or exhibits); (3) a currency (the cost-benefit measure that is maximized or minimized); and (4) a set of constraints (all those factors that determine the feasible strategy set and payoff to each option).

The "currencies" in optimization models are measures of the costs and benefits of alternative behavioral strategies. Fitness, defined as relative reproductive success, would be a strong measure for ranking alternative strategies but its use in evolutionary ecological models is considered impractical for a number of reasons (Winterhalder and Smith 1992:41). First, fitness is the result of a number of phenotypic behaviors that take place over a lifetime. It is therefore difficult to attribute alterations in an individual's reproductive success to a single behavioral action. Furthermore, people generally make choices based on shorter term cognitive definitions of costs and benefits, and not on the potential consequences of these behaviors to their reproductive success. In place of fitness as a currency, "proximate currencies" that are highly correlated to fitness are generally used. These can include: 1) access to mates, 2) access to resources, 3) the amount of energy expended, and 4) measures of food value obtained per unit time (Smith 1987).

The "constraints" of optimization models include the social and natural variables that constitute the context within which individuals exercise alternative behavioral strategies (Smith 1987:202). These constraints are similar to what some archaeologists have referred to as the "landscape" or "context" (Green 1990; Savage 1990b; Roberts 1987; Crumley and Marquardt 1990; Butzer 1982). Constraints can include natural variables such as the distribution of rainfall or soil types, and social variables such as specific political structures, the presence of a militaristic threat, or the type and quantity of information that are available for making strategic decisions.

Not all members of society experience the same constraints when making strategic decisions. For instance, the cognitive abilities of actors differ from one individual to the next. People possess innate differences in the ability to process information in addition to experiencing differences in the types and quantities of information they receive. Different kinds of information are available to the members of different social and economic groups. The information that members of one social and economic group use to make strategic choices is not necessarily the same as the information that members of another group may use. This variability in the distribution of information forms a distinct social environmental constraint for different members of society.

The social constraints that actors experience when choosing between behavioral strategies may change through time. The constraints that an actor experiences can be altered by a variety of processes, including the aging of the individual, the actions of the individual, or even the actions of other individuals. When actors mature from childhood to adulthood they will experience different constraints during their lifetimes. Social constraints also change in response to the actions of an individual. In societies with a high degree of economic mobility, the social constraints an actor may experience as a poor individual are not the same as those experienced when one becomes wealthy. Finally, actors influence the social constraints that other actors experience through specific behavioral strategies. For example, if one individual captures and controls another individual through slavery, the captive experiences an entirely different set of social constraints. The dynamic nature of social constraints means that individuals can employ behavioral strategies that affect or influence the constraints that other individuals experience. Actors make choices among behavioral strategies that tend to decrease their own costs and increase their benefits at the expense of others partly by affecting the constraints that other people experience.

Specific societal norms can be analyzed in terms of the actors, strategies, currencies, and constraints that make up optimization models. For example, the extent and type of competition that exists between groups can be analyzed in terms of the natural and social constraints that actors experience when they make strategic behavioral choices. In densely populated circumscribed environments with highly concentrated resources there will be a tendency for individuals to engage in intergroup competition.

The political integration of several territories into a single polity can be profitably examined in terms of optimization models. Political integration is not an inevitable outcome which occurs of its own accord. It is the result of people making strategic choices given the particular constraints and opportunities that they experience. Natural variables are part of the constraints people experience and therefore these variables must be considered in models of the development of political integration. In certain environmental settings with distinctive distributions of resources, political integration is more likely to occur than in other environmental settings with other types of resource distributions. Furthermore, the social constraints and opportunities that individuals experience also affect whether or not people choose to employ behavioral strategies that may result in political integration.

When political integration occurs, most members (i.e., virtually everybody except slaves and prisoners) of a polity have employed behavioral strategies that optimize their own benefits according to their perception of the constraints they experience. While being members of a single integrated polity may provide advantageous to participants, the elite usually benefit disproportionately (Earle 1991a:4-5; Brumfiel 1992:). The elite should therefore employ behavioral strategies which change the constraints commoners experience so that commoners will choose to employ behavioral strategies that include membership in the polity.

Earle (1991a:5-6) suggests that the elite will attempt to dominate the economic, militaristic, administrative, and ideological conditions that commoners experience. Elite members can try to influence economic conditions in such a way that they induce commoners to remain in the polity they rule. In general, the elite affect economic conditions by controlling the subsistence resources that people rely upon. This can be done by controlling plots of land or water use rights. Elites can also use the threat and application of force to achieve polity affiliation. Commoners will react variously to this social constraint depending upon its strength and extent, and then chose whether or not to be members of the polity. Elites will also try to impose particular types of administrative policies that promote the development of political integration. Finally, elites can use ideological means including mystification as a way to create and naturalize social constraints that commoners experience when they make their behavioral choices. These ideological beliefs are not post-hoc justifications for the behavior of individuals, rather such beliefs help to define the suite of social constraints individuals experience when they make their choices concerning behavioral strategies. If the natural environmental constraints are such that the elite can successfully employ behavioral strategies which alter the economic, ideological, militaristic, and administrative constraints commoners experience, a chiefdom may be maintained as a unified supra-district polity.

Summary

Previous explanations for intergroup aggression and political integration have provided useful insights into the social processes that have taken place on Polynesian Islands. A combination of evolutionary ecology and political economy theory provide additional theoretical constructs for clearly delineating the social and natural constraints that individuals experience when they choose behavioral strategies that involve intergroup aggression and political integration. A model of the social and natural constraints that were experienced on Rotuma during the prehistoric-protohistoric era is presented in the following chapter.

CHAPTER 2

INTERGROUP AGGRESSION AND POLITICAL INTEGRATION ON ROTUMA

Introduction

An optimization model for interdistrict aggression and political integration on Rotuma is presented in this chapter. Table 2.1 outlines the model. The propositions of the model are summarized in column (A) one through seven. The corresponding expectations are summarized in column (B) one through seven, and the data that will be used to evaluate these seven points are summarized in column (C) one through seven. Each proposition of the model is addressed in turn. The theoretical basis of each proposition is reviewed, followed by the expectations of the proposition and then the data needed to evaluate the proposition. It should be noted that some of the data used to evaluate the expectations of different propositions are the same. Specifically, the analysis of the distribution of different types of resources on the island is used to evaluate several expectations associated with different propositions (i.e., proposition two, expectation one; proposition three, expectation one; proposition six, expectation one; and proposition seven, expectation one). The same data, then, may serve as

Table 2.1 A model of interdistrict aggression and political integration during the prehistoric-protohistoric period on Rotuma.

A) PROPOSITIONS	B) EXPECTATIONS	C) DATA
1) There was a material basis for intergroup aggression. 1) Subsistence resources existed that were worth competing for. 2) Successful intergroup aggression enabled people to make material gains.	1) The distribution of primary subsistence resources was dense and predictable. 2) People should have engaged in warfare to: 1) gain access to additional or different subsistence resources either directly or through tribute. 2) lower the amount of time expended on subsistence practices.	1) 1) 1) An inventory of the types of resources found on the island (<u>Chapter 4</u>). 2) A determination of whether or not the subsistence resources were dense and predictable (<u>Chapter 4</u>). 2) Mythical and ethnohistorical accounts of the motivating factors behind warfare and the material benefits that could be won (<u>Chapter 7</u>).
2) The stimulus for intergroup competition occurred initially and was greatest in the regions of Rotuma that had relatively low productive potential.	2) 1) Rotuma should contain diverse environmental contexts where the marginal costs of subsistence strategies differed. 2) There should be evidence that the residents of the less productive areas had reached the inflection point of the subsistence cost curve whereas the residents of the more productive areas had not. 3) The leaders and people of the more marginal areas should have instigated more intergroup aggression than the people living in other parts of Rotuma.	2) 1) 1) An assessment of the distribution of resources (<u>Chapter 5</u>). 2) A justification that the marginal costs differed in the diverse zones (<u>Chapter 5</u>). 2) Archaeological evidence that the residents of the less productive zones had been intensifying agricultural production (<u>Chapter 8</u>). 3) An analysis of the ethnohistorical sources to determine if the people from the more marginal areas were involved in more intergroup aggression than other residents of the island (<u>Chapter 7</u>).

Table 2.1 (Continued) A model of interdistrict aggression and political integration during the prehistoric-protohistoric period on Rotuma.

A) PROPOSITIONS	B) EXPECTATIONS	C) DATA
3) Intergroup competition may lead to political integration if the disparity between environmental contexts was: 1) great enough to stimulate competition and territorial aggression. 2) but not so large as to support vastly disparate population densities.	3) 1) There was a heterogeneous distribution of resources on the island but the disparity between areas was not immense. 2) Population densities were relatively equal throughout the island.	3) 1) 1) An assessment of the distribution of resources (Chapter 5). 2) An assessment of how different types of resources balanced the district disparity of resources (Chapter 5). 2) An analysis of government census data concerning district population densities (Chapter 7).
4) The emergence of political integration was the result of successful interdistrict aggression.	4) Districts of the island were integrated into an enlarged island wide polity through successful conquest.	4) Mythical accounts of how the districts of the island were integrated into a single polity by successful warfare (Chapter 6 and 7).
5) The rotational aspect of the saušhip was a Rotuman ideal that varied from the practice of the political system during the prehistoric/protohistoric era.	5) The people who held saušhip came from one area of the island more often than any other single area of the island.	5) An analysis of the ethnohistorical sources to determine the homeland of the pan-Rotuman elite (Chapter 6).

Table 2.1 (Continued) A model of interdistrict aggression and political integration during the prehistoric-protohistoric period on Rotuma.

A) PROPOSITIONS	B) EXPECTATIONS	C) DATA
6) The pan-rotuman elite perpetuated political integration by employing behavioral strategies that influenced the economic, ideological, militaristic, and administrative constraints that lesser chiefs and commoners experienced. 1) Economic: The pan-Rotuman elite should try to control the economy by controlling the productive land. 2) Ideological: The pan-Rotuman elite should promote the ideology that they: 1) were fundamental to the continued prosperity of society. 2) were the legitimate owners of the land. 3) Militaristic: The pan-Rotuman elite should have engaged in warfare to encourage people to be members of their polity and to discourage insurrection. 4) Administrative: After a successful conquest the pan-Rotuman elite should try to redistribute the land to their allies to impose a strata of extra-district leaders.	6) 1) Economic: The pan-Rotuman elite should have tried to integrate the most productive areas of the island into their polity. 2) Ideological: There should be the construction of symbols and icons, such as monumental architecture, in the home districts of pan-Rotuman elites to help reify the ideology that the elite were supernaturally sanctioned and necessary for the survival of society. 3) Militaristic: The home districts of the pan-Rotuman elite should have participated in warfare more often than the other districts. 4) Administrative: The pan-Rotuman victors in war should appropriate the chiefly titles associated with the losing district to gain increased access to land holdings.	6) 1) 1) An assessment of the distribution of resources (Chapter 5). 2) An analysis of the ethnohistorical sources to determine if the elite were consistently controlling the areas of the island that had the highest potential for marine and terrestrial productivity (Chapter 6). 2) An analysis of the ethnohistorical sources and archaeological data to determine whether there was relatively more monumental architecture in the home districts of the pan-Rotuman elite or whether the distribution of large scale architecture was more random (Chapter 6 and 8). 3) An analysis of the ethnohistorical sources to determine whether the home districts of the pan-Rotuman elite participated more frequently in warfare than other districts (Chapter 7). 4) An analysis of the ethnohistorical sources to determine if the chiefly titles to the land were appropriated after a victory in warfare (Chapter 7).

Table 2.1 (Continued) A model of interdistrict aggression and political integration during the prehistoric-protohistoric period on Rotuma.

A) PROPOSITIONS	B) EXPECTATIONS	C) DATA
7) Political integration persisted because it increased the fitness of the members of the polity in relation to alternative strategies.	7) The costs and benefits associated with political integration outweighed those associated alternative strategies.	7) 1) An assessment of the distribution of resources (Chapter 5). 2) Mythical and ethnohistorical accounts of the costs and benefits of political integration (Chapter 6).

evidence for distinct portions of the model. This data set is reiterated in each section of the model for logical consistency.

The seven propositions of the model address several topics from a number of perspectives. Propositions one and two are concerned with the emergence of intergroup aggression. Proposition one specifies the general environmental conditions where intergroup aggression might have been a cost effective strategy and delineates a number of subsistence related material benefits that could have been obtained. Proposition two is concerned with more specific environmental characteristics and how these characteristics might have promoted intergroup aggression in one region of the island before another. Propositions three and four are concerned with the emergence of political integration. Proposition three outlines the specific environmental conditions where political integration was a viable option. Proposition four considers a specific behavioral strategy that might have led to political integration. Proposition five considers the saushin, a particular institution of the political system that existed on Rotuma once political integration had developed. Propositions six and seven deal with the persistence of political integration. Proposition six considers the behavioral strategies that the ruling elite of a polity might have implemented to maintain political integration. Proposition seven considers the costs and benefits of political integration in relation to other possible strategies to determine why political integration was maintained.

Propositions one through four, and proposition seven of the model are based on the precepts of evolutionary ecology and consider explanations that conform to this theoretical paradigm. In contrast, proposition six is derived from political economy theory and considers interpretations which are infused with praxis theory. The linkage between the two theoretical perspectives is that evolutionary ecology offers explanations on a general ultimate level whereas political economy provides more specific proximate interpretations of how individuals actively altered the constraints which others experienced by employing specific behavioral strategies. The two perspectives are not at odds with each other. Rather, they offer complementary explanations for specific societal norms which taken together form a more compelling explanation then either in isolation.

Presentation of Model

Proposition One

Howard (1985, 1986) suggested that intergroup competition on Rotuma was the result of chiefly competition over status and prestige. This suggestion, in conjunction with Goldman's (1970) earlier assertions about status rivalry, implies that there was little material gain for the dominant elite and the victors of war. In contrast, Earle (1987:290) notes that "the notion of chiefdoms as highly structured status systems unrelated to competition for economically based power appears to be unfounded." Earle's (1987) review of chiefdoms suggested to him that groups of people and their leaders rarely compete against each other merely for the sake of status and prestige. The material benefits that success can bring are also important considerations. In this vein, the first proposition of the model is that successful intergroup aggression on Rotuma had material benefits associated with subsistence resources and that the environmental context of Rotuma made the strategy of intergroup aggression cost effective (see Table 2.1).

Intergroup aggression is adaptive when the net material benefits of aggression are greater than the net material costs (Durham 1976). In most cases intergroup aggression should take place when the benefits of aggression outweigh either the costs of aggression or other available strategies (Boone 1992:301). The calculation of the costs and benefits of participating in intergroup aggression for an individual is contingent upon both social and natural constraints (Boone 1983:82).

The social constraints associated with an individual's status influence the calculation of the benefits and costs of participation in intergroup aggression (Brumfiel 1992:559). Moreover, the costs and benefits of participation for the commoners would have been somewhat different than they were for the elite since their respective social constraints differed. The material benefits of successful warfare for the elite might have included increased, or more reliable, access to additional and possibly different subsistence resources either directly or through tribute. The costs to the elite of intergroup aggression might have included the failure of this behavioral strategy to achieve its goal, and with this, the loss of control over the land, its resources, and people. Additional costs may have been increased morbidity.

The benefits to the commoners of successful intergroup aggression might have included increased access to additional or alternative plots of land for agricultural activities. If the new land was more productive, the commoners could have reduced the amount of time and labor they spent on producing agricultural products. This benefit, however, was by no means incontrovertible as the successful elite might have appropriated control over the conquered people and their land and kept the productive units intact. In instances where there were no direct material benefits for the commoners, they might have participated in warfare because they felt they had few alternatives. If the chiefs controlled the land that the commoners were currently inhabiting, then the chiefs would have been able to disenfranchise those who failed to act appropriately. This would have been especially true if the commoners were socially or naturally circumscribed (Carneiro 1970; Dickson 1987; Graber 1990). The commoners would have been left with few alternatives but to comply to the wishes of the chiefs and participate in the war or other aggressive acts. The costs to the commoners of being defeated might have included the possibility of increased demands for their resources or labor, alienation from their land, or death.

Environmental constraints also affect the calculation of the costs and benefits of participating in intergroup aggression (Boone 1992). In some environmental contexts, resources are not easily appropriated from other groups and the costs of aggression would have been high. In their study on territoriality, Dyson-Hudson and Smith (1978) focused on the timing and distribution of resources in order to specify the environmental contexts where the benefits of territoriality would outweigh the costs. The timing of resources in space, i.e., their presence or absence, ranges from highly predictable to extremely unpredictable. The presence of resources that are mobile, such as live game, is unpredictable, whereas the presence of stationary resources, such as agricultural crops, is highly predictable. Similarly the density of resources can vary. Most live game species tend to be thinly distributed across a landscape whereas the distribution of agricultural plots can be relatively dense. Dyson-Hudson and Smith (1978) proposed that only resources that were both densely and predictably distributed would be worth protecting, and only in environmental contexts containing these types of resources would territoriality occur.

Boone (1983) relies upon the foundations of Dyson-Hudson and Smith's (1978) model of territoriality in his discussion of intergroup aggression. Boone assumes that the same sorts of natural constraints which favor territoriality will also favor aggression. He proposes "...direct aggression is most intensely favored among groups controlling highly predictable resources which are relatively densely distributed" (Boone 1983:82). Earlier, Durham (1976) came to a similar conclusion in his review of primitive warfare. In environmental contexts where resources fit these criteria the benefits of participating in warfare will often outweigh the costs.

Researchers have thus suggested that in environmental contexts with dense and predictable resources intergroup aggression is one strategy employed to gain material benefits. The first proposition of the model proposes that in addition to symbolic consequences, the success or failure of intergroup aggression on Rotuma had material consequences associated with subsistence resources. There are two tenets of this proposition. The first is that there were subsistence resources on Rotuma worth competing for, and the second is that through successful aggression people made material gains.

Proposition One: Expectations and Data for Evaluation

The expectation of the first tenet is that the distribution of resources on Rotuma should have been dense and predictable. The data to evaluate this tenet are presented in Chapter 4 and includes an inventory of the types of subsistence resources found on Rotuma and a determination of whether or not they were distributed in a dense and predictable manner. The expectation of the second tenet is that people should have engaged in warfare to increase their access to material resources or to lower the amount of time spent on subsistence activities. The data to evaluate the second tenet include Rotuman mythical and ethnohistorical accounts of the motivating factors leading to warfare and the material benefits that could be won. These data are presented in Chapter 6 and 7.

Proposition Two

The second proposition of the model is that the stimulus towards intergroup aggression occurred initially, and was greatest, in the region of Rotuma which had relatively low productive potential. The proposition is based on the notion that the incidence of intergroup competition is relatively higher in less productive environmental contexts than it is in highly productive contexts (Kirch 1975, 1990a; Hunt 1990), and Earle's (1980) model of changing subsistence strategies.

Kirch (1975) proposed a model for social stratification in Western Polynesia which focused on intergroup competition in varying environmental contexts. Kirch (1975:441) suggested that social stratification developed when war leaders were promoted to chiefs in environmental contexts where intergroup competition was prevalent. The key variable in stimulating intergroup competition was the degree to which the environment could support agricultural intensification (Kirch 1975:438-441). In environments where irrigated agriculture could be practiced, an increased demand for agricultural outputs could be met through intensification. In contrast, the potential for agricultural intensification was less in dryland areas where shifting cultivation provided the sole means of subsistence. If an increase in agricultural output was desired in dryland areas for any number of demographic or social reasons, expansionary behaviors would be necessary. This inherent limit to intensification led to an earlier and more intense development of intergroup competition in dryland environments than in irrigated environments.

Kirch's basic model can be amended to include intergroup competition in heterogeneous dryland environments. Earle (1980) proposed a cost/benefit model for examining when prehistoric subsistence strategies change. The model is a derivative of Boserup's (1965) model of intensification. The currency in Earle's model is labor time, which is used to measure the costs of various inputs. The term "marginal cost" is applied to the amount of input required to increase output by a set amount (Earle 1980:8). Cost curves graphically represent the marginal cost of a given strategy as a function of the strategy's output (Figure 2.1). The x axis of the graph depicts the amount of output produced by a set marginal cost, which is depicted on the y axis. In most subsistence economies, marginal costs increase fairly monotonically as output approaches a limit set by the environmental context and the available technology (Earle 1980:11). Once this limit is neared the marginal cost of the strategy increases

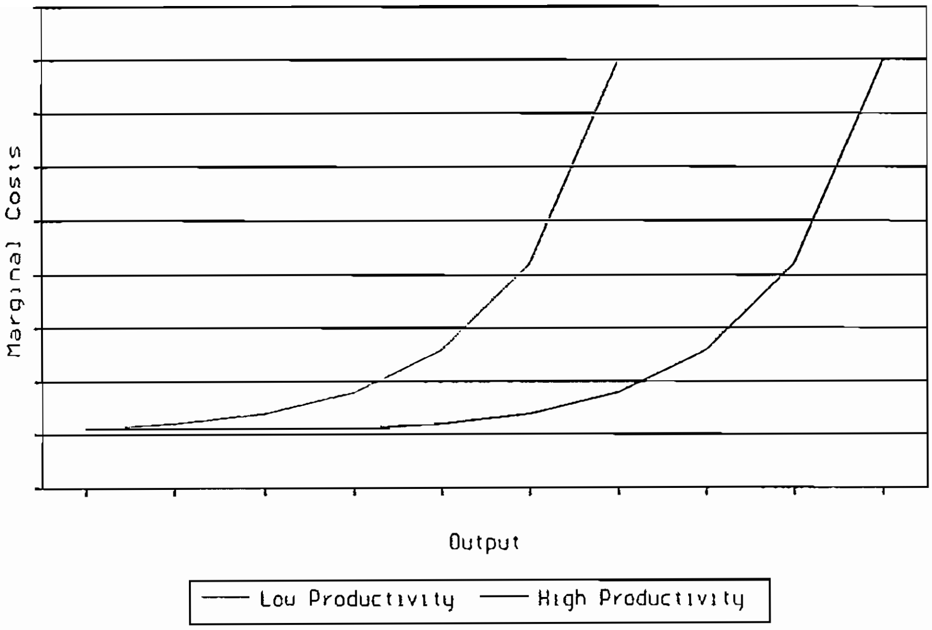

Figure 2.1 Cost curves for high and low productivity zones.

rapidly in relation to the output of the strategy. It is at the inflection point of the curve, where marginal costs are beginning to rapidly increase, that alternative subsistence strategies will be considered.

Hypothetical cost curves for agricultural practices in two dryland environmental contexts can be compared (see Figure 2.1). The cost curve of an agricultural subsistence strategy in an area with relatively low productive potential will be different than the cost curve for an area with relatively high productive potential. In order to obtain the same amount of agricultural output from the two areas, intensification would have to take place in the less productive region. The marginal costs in the less productive region would therefore be more than the marginal costs in the more productive environment for the same quantity of output.

This means that the inflection point of the cost curve in the less productive environmental context occurs at a lower output level. The inflection point of the cost curve is the point where alternative subsistence strategies should be considered. If the demand for output is the same in both environmental contexts, the people living in the less productive environment should consider alternative strategies before the people living in the more productive environment. One possible alternative would be intergroup aggression with the aim of controlling the resources of a more productive area.

Proposition Two: Expectations and Data for Evaluation

The stimulus to employ alternative subsistence strategies is not equivalent in diverse environmental contexts. People living in less productive areas will have higher marginal costs for the same amount of output than people living in more productive areas. The higher marginal costs will prompt people to consider alternative strategies to satisfy their subsistence needs, such as intergroup aggression. The second proposition of the model is that the stimulus towards intergroup aggression occurred initially, and was greatest in the regions of Rotuma which had relatively low productive potential. The expectations of this proposition are threefold. First, Rotuma should contain diverse environmental contexts where the marginal costs of subsistence strategies differed. Second, the residents of the less productive areas should have reached the inflection point of their subsistence cost curves, and were therefore considering alternative subsistence related strategies whereas the residents of the more productive areas had not. The third expectation is that the leaders and people of the more marginal areas should have instigated more intergroup aggression than the people living in other parts of Rotuma.

The data needed to evaluate the first expectation are presented in Chapter 5 and includes an environmental analysis of Rotuma which shows that the island contained diverse production zones. The second expectation is evaluated by examining the archaeological remains to determine if there were regions of the island where significant agricultural intensification had occurred. The data to evaluate this expectation are presented in Chapter 8. The third expectation is evaluated by analyzing the ethnohistorical sources to determine if the people from more marginal areas were involved in more intergroup aggression than other residents of the island. The data are presented in Chapters 6 and 7 and the relationship between the variables is discussed in Chapter 9.

Proposition Three

Goldman (1970) suggested that islands with highly productive environments provided more opportunities for enlargement and diversification than islands with poorer environments. Goldman (1970) also suggested that the chiefs from the more productive areas within an island would be more powerful than the chiefs from the less productive areas. In contrast, Howard (1985) focused on the overall size of Rotuma instead of its productivity as a limiting factor to increased social stratification and political integration. As an alternative to these suggestions it is proposed that intra-island environmental heterogeneity affects the development of intergroup aggression and political integration. Stated formally, it is postulated that intergroup aggression might lead to political integration if the disparity between the environmental contexts found on an island was great enough to stimulate competition and territorial aggression, but not so large as to support vastly disparate population densities and numbers in different regions of the island.

The environmental context of an island can affect the outcome of intergroup aggression and therefore the possible occurrence of political integration. In "neolithic societies" one of the primary factors determining the likelihood of successful warfare was the number of people belonging to a coalition (Durham 1976). Wars fought without firearms relied heavily on large numbers of people to overwhelm others in battle and to gain a decisive military and tactical advantage. In areas with high population densities, there would have been more people available to participate in warfare than in a similar sized areas with low population densities. Population density was limited to a large extent by the subsistence base of a society. People dependent on irrigated agriculture as their main subsistence crop could have lived in groups with higher population densities than people who had to rely on shifting cultivation. A large disparity in environmental contexts could have created a large disparity in resource bases, which in turn might have resulted in a disparity in population densities. If people who lived in two diverse areas of approximately the same size were in conflict the group from the area with a higher population density would have had a military advantage (Boone 1983, 1992).

Three possible environmental contexts which exhibit varying degrees of disparity are considered for their anticipated effects on warfare as a behavioral strategy for acquiring resources. The first is where there is minimal intra-island disparity in environmental contexts, the second is where there is extreme disparity in environmental contexts, and the third is where there is a moderate amount of environmental disparity.

In the first instance, a relatively homogenous resource distribution throughout an island provides only a minor stimulus for the type of intergroup aggression discussed in proposition two. Furthermore, the population densities supported throughout the island would be relatively equal. In this case, the lack of stimulus for intergroup aggression and the relatively equal population densities might inhibit people from employing behavioral strategies that would create political integration.

In the second case, an extreme disparity in the environmental contexts of two regions of an island might also inhibit people from becoming members of an integrated polity. Although the people living in the less productive regions might be motivated towards intergroup aggression to integrate the more productive regions into their polity, the large differences in population densities of the areas would inhibit successful conquest, unless there were marked differences in territorial size so that total population within the districts offset the density differences. The people living in the more productive areas would be less motivated to integrate less productive areas into their polity because the material gains would be relatively small. Therefore, although a higher density of people living in the more productive area might be able to conquer the people living in the less productive area and form a politically integrated polity, it is less likely that they would be motivated to do so as a consequence of subsistence stress or increasing cost.

The third case is where the disparity between environmental contexts is sufficient to stimulate intergroup aggression, but not enough to support sufficiently disparate population densities which would inhibit integration. It is this context where we expect political integration to occur more frequently. With environmental disparity, the people living in the less productive area might be motivated towards intergroup aggression as a means of gaining control over more resources. The environmental disparity between the areas however might not be enough to support disparate population densities which would inhibit successful aggression by those so motivated, and hence integration would be possible. Political integration might occur if the people living in the less productive areas successfully employed intergroup aggression as a means of controlling more resources and establishing their hegemonic control.

Proposition Three: Expectations and Data for Evaluation

The third proposition of the model is that there may have been enough environmental disparity on Rotuma to stimulate intergroup aggression, but not so much that political integration was inhibited. There are several expectations of this proposition. First, there was a heterogeneous distribution of resources on the island but the disparity between areas was not immense. The data to evaluate this expectation are twofold. An assessment of the environmental disparity is required, and an assessment of how the different types of resources might have counterbalanced the disparity is needed. Both are discussed in Chapter 5. A second expectation is that the population density throughout Rotuma should have been relatively equal. The data to evaluate this expectation are presented in Chapter 7. Unfortunately, the only data available to assess this expectation are population density figures for each district from the late nineteenth and early twentieth century. While the data may not coincide exactly with the population densities throughout the prehistoric-protohistoric period, they are taken to be indicative of a general pattern.

Proposition Four

Proposition three specified the environmental conditions where political integration was feasible. Under these environmental conditions, intergroup aggression could lead to political integration if one group defeats another, or if one group recognizes the inevitability of being attacked and submits or chooses to affiliate with another. The dominant group gains control of the resources of the subordinate group by installing its own chiefs in the newly conquered territory or by accepting the subordination of the conquered area. In this process the leaders of the victorious side have used intergroup aggression to integrate two or more areas into a single larger polity. Proposition four is based on these assumptions and suggests that the emergence of political integration on Rotuma could have resulted from successful interdistrict aggression.

Proposition Four: Expectations and Data for Evaluation

The expectation of proposition four is that the autonomous districts of Rotuma were integrated into an enlarged island wide polity through successful conquest. The expectation will be evaluated by analyzing the Rotuman mythical accounts of how and why the island wide political system was established. These myths are reviewed in Chapter 6.

Proposition Five

Part of traditional Rotuman ideology was the belief that the sauship was a rotating pan-Rotuman position (Howard 1985). Howard (1985:70) suggested that this ideal symbolized the social unity of the island and helped mitigate the contradiction of commoners being ruled by extra-district chiefs. The institution helped perpetuate political integration, albeit of an unstable nature, by acting as an ideological reinforcement of the belief that members from all districts were participating in the island wide government (Howard 1985:69). To complement Howard's suggestion, it is proposed that the rotational aspect of the sauship was a Rotuman ideal that varied from the political system practiced during the prehistoric-protohistoric era. It is suggested that the rulers of the political system, as represented by the sau, did not rotate in a systematic order, rather leaders generally came from a specific area of the island, i.e., those districts with the most to gain in terms of resources.

Proposition Five: Expectations and Data for Evaluation

This proposition suggests the sauship was not "rotational," rather was occupied by people from a specific area of the island more often than by people from other parts of the island. The data to evaluate this expectation are presented in Chapter 6 and include an analysis of the ethnohistorical literature to determine which portions of the island the pan-Rotuman elite often came from.

Proposition Six

Goldman (1970:20) suggested that Traditional Polynesian society was integrated along genealogical lines. Kinship was the principle that linked people together into a loosely knit society. In the "composite system" of Open societies, genealogical ties acted at the local level and political territorial ties acted at a regional level to integrate society into a single polity (Goldman 1970:546). In prehistoric-protohistoric Rotuman society, membership within a district was organized along genealogical lines to form local corporate groups called <u>ho'aga</u> and the larger island wide polity was organized according to political considerations (Howard 1964, 1970, 1985, 1986; see Chapter 6). Marriage alliances were undoubtedly important at both levels, but the people who obtained island wide positions appear to have done so by employing a number of strategies. Howard (1986:3) notes that the <u>fakpure</u>, or secular ruler of the island, was usually the head district chief of a victorious military alliance. Howard (1986) implies that unstable political integration was maintained with marriage alliances and militaristic dominance.

Boone (1983:81) proposed an alternative model for political integration that focused on the assumption that people chose strategies that maximized their individual fitness. He (Boone 1983:83) further suggested that in some environmental contexts an individual's fitness was maximized by joining large groups of people. Social hierarchy formed and was maintained because the people joining the coalition must join as subordinates. The benefits of belonging to the group, even as a subordinate, outweighed the costs of alternative strategies, such as existing as a solitary entity, joining an alternative group, or emigration. Political integration continues to occur when the costs and benefits of participation are more advantageous than those associated with alternative strategies.

While Boone's (1983) explanation for why people continue to be members of a polity is useful, it does not consider several important factors. The explanation does not emphasize that opportunities are not the same for all members of society. Furthermore, Boone's model does not incorporate the problem that individuals from different segments of society can affect the costs and benefits associated with the alternative strategies available to other people. In particular, elites can actively pursue strategies to alter the costs and benefits associated with the strategies available to commoners. In general it is in the best interests of the supra-district elite to employ behavioral strategies that maintain political integration (Earle 1991a). The strategy of political integration benefits the pan-polity elite at the expense of the lesser chiefs and commoners. The lesser chiefs and commoners are, however, still better off than they would be if they chose alternative strategies, but the costs imposed upon them are increased with integration. One outcome of higher commoner costs might have been that the commoners had to work harder to produce a surplus, which was in turn used to support the elite of a polity.

Because political integration had advantages for the polity wide elite, they should have taken steps to sustain political integration by limiting the options available to commoners. The sixth proposition of the model is that political integration of Rotuma was maintained when the elite employed behavioral strategies aimed at influencing the economic, militaristic, ideological, and administrative constraints commoners experienced. If these strategies were successful, the alternatives to political integration available to the commoners would have been minimized. Proposition six includes four tenets, each of which is discussed in turn.

Proposition Six, Tenet One

The persistence of political integration in a chiefdom is dependent to a large extent on the ability of the elite to control the economic constraints that commoners experienced. In pre-industrial societies the economy could be dominated by controlling subsistence production through the control of land. If the elite controlled the land they could provide use rights to commoners in exchange for a portion of the agricultural produce. The options of commoners, other than to comply with the wishes of the elite, were limited to a large extent by the degree to which their subsistence strategies were controlled by others (Earle 1991a:5).

The extent and ways that the elite could have controlled the economy depended upon particular environmental conditions (Earle 1991a:10). In environmental contexts where the options of people were naturally and socially circumscribed there was greater potential for the chiefs to influence the behavioral strategies that commoners chose to employ. Furthermore, the natural productivity of an area and the potential for intensification affected the extent to which people were readily controlled. In Hawai'i, for example, where there was an aggregation of people accompanying the agricultural intensification of wetland taro, chiefs were provided with a finite, valuable, terrestrial resource upon which people were somewhat dependent. Control over this resource provided a means of affecting the behaviors of the commoners (Earle 1978, 1991a).

In dryland environments this sort of concentrated agricultural investment usually does not exist, although in some circumstances the control of cleared land could be important. Furthermore, if there is considerable natural and social circumscription, good productive soil could take on a similar value. This could have been the case in Rotuma where the finite nature of good arable land was enough to make it a controllable commodity. In this environmental context the commoners were faced with deciding whether the costs and benefits of remaining part of the polity and adhering to the wishes of the pan-Rotuman elite were more advantageous than those associated with alternative strategies such as relocation, reaffiliation, or rebellion. If the pan-island elite controlled all the land of the island, (i.e., the island was integrated into a single polity), it severely reduced the number of alternative strategies available to the commoners. Perhaps the most feasible alternative would have been rebellion. The elite of a polity should therefore try to integrate as much productive land as possible into their polity in order to reduce the options available to the commoners.

Proposition Six, Tenet One: Expectations and Data for Evaluation

If the polity wide elite controlled the productive areas of an island, the commoners who relied on the land for their subsistence would have to acknowledge the elite's hegemonic control. The first tenet of proposition six is that the elite should try to control the economic constraints of the commoners as a means of maintaining political integration. An expectation of this tenet is that the elite should have tried to integrate the productive areas of the island into their polity in an effort to control the subsistence resources the members of society relied upon. The data used to evaluate this expectation are twofold. First, an analysis of the productive resources of the island presented in Chapter 5 will determine the extent of heterogeneity in resource distribution. The second line of data includes an analysis of the ethnohistorical sources to determine if the elite were consistently controlling the areas of the island that had the highest potential for marine and terrestrial productivity. The relationship between these variables is discussed in Chapter 9.

Proposition Six, Tenet Two

The second tenet of the sixth proposition is that the pan-Rotuman elite actively engaged in behavioral strategies which affected the ideological constraints that the lesser chiefs and commoners experienced, thereby maintaining the lesser chiefs and commoners participation in the political integration of the island. A prevalent ideological belief of traditional Rotuman society was that the chiefs had closer connections to the gods than the ordinary people (Howard 1985:67). The chiefs acted as intermediaries between the gods and mortals to ensure the continued prosperity and fertility of the island. According to the dominant ideology, the chief's connection to the gods supernaturally sanctioned elite control of the land and access to resources. The chiefs provided commoners a means of communicating with the gods to ensure fertility in exchange for the commoners continued support of the elite.

The dominant ideology helped maintain political integration by promoting the belief that the pan-Rotuman chiefs were vital to the commoner's prosperity. The commoners had to remain part of the polity if they wanted to receive the assistance of the chiefs in communicating with the gods or use rights to the land that they were dependent on for subsistence. The ideology that the pan-Rotuman chiefs were essential and that they legitimately controlled the land, benefitted the chiefs by reducing their physical costs. The pan-Rotuman chiefs were able to work less in subsistence production by extracting a surplus from the commoners.

The elite of a polity can try to establish ideological constraints in a number of ways. One way is to construct monumental architecture to symbolize and naturalize territorial claims, supernatural connections, and chiefly power. Monuments were often used to demarcate social, ritual, and economic landscapes that were owned or claimed by the people who built and maintained them (Earle 1991b:80). Conspicuously placed burial mounds were used in England to establish a link between ancestral chiefs and clearly defined territories (Bradley 1991). Furthermore, the elite actively promoted the ideology that they were essential to society by organizing the construction of monuments that were sacred gathering places (Earle 1991b). In highly competitive Polynesian societies these monumental religious structures were used as visual markers of chiefly dominance and hegemony (Kirch 1990b:206). The largest monuments "created a sacred space set off for ceremonies that fundamentally separated the rulers from the ruled and identified their legitimacy with universal forces outside the world accessible to commoners" (Earle 1991b:96). Finally, monumental architecture could have been seen as the physical manifestation of chiefly power. In environments lacking the potential for building large scale irrigated agricultural features, monumental architecture was one means for chiefs to display their power and fecundity. In these cases, monumental architecture is not merely a reflection of shared ideological beliefs, but acts as a visual cue which directly influences the behaviors of the people who see it (Hodder 1982; Shanks and Tilley 1987).

Proposition Six, Tenet Two: Expectations and Data for Evaluation

The second tenet of the sixth proposition is the pan-Rotuman elite actively manipulated the ideological constraints that commoners experienced. If the elite were successful, commoners would choose to employ behavioral strategies that included participation in political integration. An expectation of the tenet is that the pan-Rotuman elite should have had the capability to construct monumental architecture in their home districts to help reify the dominant ideological beliefs that formed the social constraints. This expectation is considered in Chapters 6, 8, and 9 using ethnohistorical and archaeological data to determine whether there was relatively more monumental architecture in the home districts of the pan-Rotuman elite or whether the distribution of large scale architecture was random.

Proposition Six, Tenet Three

The third tenet of the sixth proposition is that the pan-Rotuman elite should have engaged in warfare as a behavioral strategy to affect the social constraints that lesser chiefs and commoners experienced. In some instances, engaging in warfare created social constraints such that the commoners and defeated chiefs would employ behavioral strategies that aligned themselves with the ruling elite into an integrated polity. Elite sponsored warfare promoted political integration in at least two ways. First, warfare was a potential threat to individuals who were considering a strategy of rebellion or reaffiliation. People would have recognized that if they did not cooperate there was a possibility of several negative outcomes. These could have included restricted accesses to resources, the possibility of being killed, or perhaps being forcibly removed from the land and therefore being relegated to a class of landless slaves as was the case in Hawai'i (Hommon 1976; Kirch 1985). Furthermore, warfare enabled the ruling chiefs to expand their economic base and maintain control over productive resources (McCauley 1990; Ferguson 1990). As discussed above, intergroup aggression was a particularly good strategy to use if resources were dense and predictable. In this context it was possible for people to gain control of resources through violence, thereby limiting the options available to potential members of the polity.

Proposition Six, Tenet Three: Expectations and Data for Evaluation

The third tenet is that the pan-Rotuman elite should have frequently engaged in warfare to coerce people into remaining members of their polity and to control the economic resources of society, thereby limiting their subject's options. An expectation of the third tenet is that the home districts of the pan-Rotuman elite should have participated in warfare more often than the other districts. Ethnohistorical sources provide the data to evaluate this expectation. The ethnohistorical sources will be analyzed to determine whether the districts from which the pan-Rotuman elite originated were more likely to participate in warfare than other districts of the island.

The ethnohistorical sources concerning the elite participation in warfare are reviewed in Chapter 7 and the relationship between the two variables is discussed in Chapter 9.

Proposition Six; Tenet Four

The fourth tenet of the sixth proposition is that the conquering pan-Rotuman elite should try to impose administrative constraints on the people throughout the island by appropriating titles to land. After a victorious war the elite should attempt to redistribute the titles of the land they have captured to their allies. The appropriation of titles would have affected the chiefs being replaced and the common people living on the land. The deposed chiefs would have lost status and any associated material benefits. The common people would have been affected by the imposition of non-related land managers. The development of this institution breaks the genealogical connection between the people who were working the land and the people holding the titles to land. In some stratified societies this break is essential for controlling the economy of society, and forms a basis for the elaboration of social stratification and political integration.

Proposition Six; Tenet Four: Expectations and Data for Evaluation

The expectation of this tenet is that the titles to the land should have been appropriated from a district following defeat. The ethnohistorical sources will be analyzed in Chapter 6 to determine if this process took place.

Proposition Seven

The seventh proposition is that an unstable political integration of Rotuma persisted because it benefitted the members of the polity in relation to alternative strategies. The persistence of political integration was the result of natural selection operating on variation in alternative behavioral strategies. Behavioral strategies that decrease the costs and increase the benefits of people will be replicated at a higher rate than alternative, less advantageous, strategies. This differential replication of the behavioral strategies that make up the societal norms eventual leads to less advantageous behavioral strategies occurring at a lower frequency. If a societal norm consisting of a behavioral strategy, such as political integration, persists it must confer an overall benefit to the members of society who participated in it.

The costs and benefits associated with particular societal norms are determined by the constraints that individuals experience. Because different individuals experience different constraints, the costs and benefits of alternative strategies are not the same for all members of society. Despite these differences in individual costs and benefits the persistence of a societal norm is dependent upon it conferring some, albeit different, benefits to its participants.

To evaluate the costs and benefits of political integration it is necessary to consider what the possible alternatives were. A likely alternative was district autonomy without political integration at the island wide level. If people living in the districts were socially and naturally circumscribed, then frequent interdistrict competition and warfare would probably have been an element of this political configuration.

The benefit of absolute district autonomy for the common people living in a district would have included the exclusive use of the subsistence resources in the district. Furthermore, the social distance between commoners and district chiefs would have been less than the social distance between commoners and pan-Rotuman chiefs if the island were integrated into a single polity. This smaller social distance could have had material ramifications. For district chiefs, district autonomy meant that they were not under the hegemonic influence of outsiders and could rule their districts as they and their people saw fit. The costs of frequent interdistrict competition might have included the possibility of injury or death, or the destruction of homes and gardens. Furthermore, maintaining a political territory by defending district boundaries takes a considerable investment of energy that could be used for alternative activities if political integration occurred (Boone 1983). District autonomy with associated competition and warfare would have persisted if its costs and benefits were relatively greater than alternative strategies, such as political integration.

Some costs and benefits associated with political integration were shared by all members of society, whereas others varied according to the participant's status. Possible benefits for polity wide leaders might have included increased access to new or different subsistence resources, increased access to corvee labor, and an additional means for displaying chiefly fecundity. The additional means for displaying chiefly fecundity is part of the "currency", defined as a cost and benefit measure used to assess alternative strategies, of a pan-Rotuman chief. The chief's ability to display fecundity is beneficial in that it can affect the social constraints that other individuals experienced. The additional avenue for displaying fecundity would be particularly effective if the land the pan-Rotuman elite were integrating into their polity was relatively more fertile than their home districts. The elite living in poorer resource areas had fewer avenues for displaying their supernaturally sanctioned powers. If integration resulted in the inclusion of more productive land, the elite would have been provided with an avenue for displaying their fecundity. The costs of political integration for the pan-polity elite included the energy investment in promoting the behavioral strategies discussed in proposition six.

The benefits of political integration to the commoners might have included lower marginal costs associated with subsistence strategies. If the island was integrated into a single polity it would be possible for people living in one district to reside in an area with relatively low productive potential and farm in a different area with higher productive potential. The extra expenditure of energy for traveling to and from more distant gardens would have been compensated for by the lower amount of time needed to produce the same amount of food. If there was an abundance of land in a district with high productive potential, allowing people from other districts use rights would have been a minimal cost for the people living in the productive districts. If interdistrict warfare was endemic, interdistrict gardening would not have been a reliable strategy.

The costs of political integration for commoners might have included increased tributary demands to support a larger strata of non-producing elite at the island wide level. These demands would have affected commoners less if people lived in autonomous districts because then commoners would not have had to support a pan-Rotuman elite. Political integration might also have provided people from outside districts use rights to land within a neighboring district thereby conferring a disadvantage on the members of the neighboring district if land was scarce. The disadvantage of political integration for the lesser district chiefs was some loss of autonomy and possible loss of power.

Political integration could have provided several benefits for all members of society. The potential for pooling different types and quantities of subsistence resources throughout an island could have been a valuable social buffer against periodic natural disasters such as droughts or hurricanes (Boone 1992; Cashdan 1992; Hunt 1992). Droughts could have affected areas differently depending upon the crops that were being produced. A drought might affect people reliant on high levels of rainfall for crop production to a greater extent than people living in areas where drought tolerant crops were grown. Furthermore, if people or agricultural produce were movable, an island that was integrated into a single polity could balance differences in local resource production in times of stress. Differences in district productivity need not have been that great for balancing to provide a significant advantage over long periods of time. If political integration was stabilized it could have led to a decrease in intergroup competition with a resultant decrease in warfare related morbidity. Finally, political integration would have also reduced the amount of energy that was diverted away from subsistence production for the support of aggression.

Proposition Seven: Expectations and Data for Evaluation

Political integration should have persisted on Rotuma as long as the costs and benefits associated with the strategy outweighed those associated with alternative strategies, such as district autonomy. The expectation of the seventh proposition is that given the environmental and social constraints that Rotumans experienced, they generally benefitted from political integration. The data to evaluate this expectation include the mythical and ethnohistorical sources in conjunction with an environmental analysis to discern the constraints that different groups experienced and the costs and benefits associated with political integration for those groups. The data are presented in Chapters 4, 5 and 6, and the relationship between the data is discussed in Chapter 9.

Summary

The proposed model is based on several premises from evolutionary ecology and political economy theory. The model includes the notion that social behaviors are the result of individuals exercising choices concerning behavioral strategies given specific social and natural constraints. The strategies that particular individuals employ can affect the options available to other individuals. The strategies of individuals will be aimed at optimizing their individual social and material benefits. A model for intergroup aggression and political integration on Rotuma was proposed based on these premises. Ethnohistorical, geographical, and archaeological data will be presented in the following chapters to evaluate the expectations of the model for traditional Rotuman society.

CHAPTER 3

PHYSICAL AND CULTURAL SETTING OF ROTUMA

Physical Setting

Rotuma lies at 12° 30' S, 177° E, approximately 500 km northwest of Viti Levu, Fiji (Figure 3.1). The main island is a 14 km by 4.5 km basaltic shield volcano with an area of ca. 42 km^2 (Figure 3.2). There are approximately 27 hills throughout Rotuma (Figure 3.3). The maximum elevation on the island is 255 m (Figure 3.4). Six small islets (Uea, Hatana, Solkope, Solnoho, Afgaha, Haua) surround the main island.

Climate

The predominant trade winds on Rotuma blow from the southeast. The humid to superhumid tropical climate consists of warm temperatures throughout the year accompanied by relatively high humidity (Table 3.1) (Laffan and Smith 1986). Normal annual rainfall is 3568 mm, with a summer precipitation (December to March) of ca. 1420 mm and a winter rainfall (June to September) of ca. 944 mm. The mean annual temperature is ca. 27° C, with mean monthly temperatures differing by approximately 1° C between the summer and winter months. Rotuma lies in the

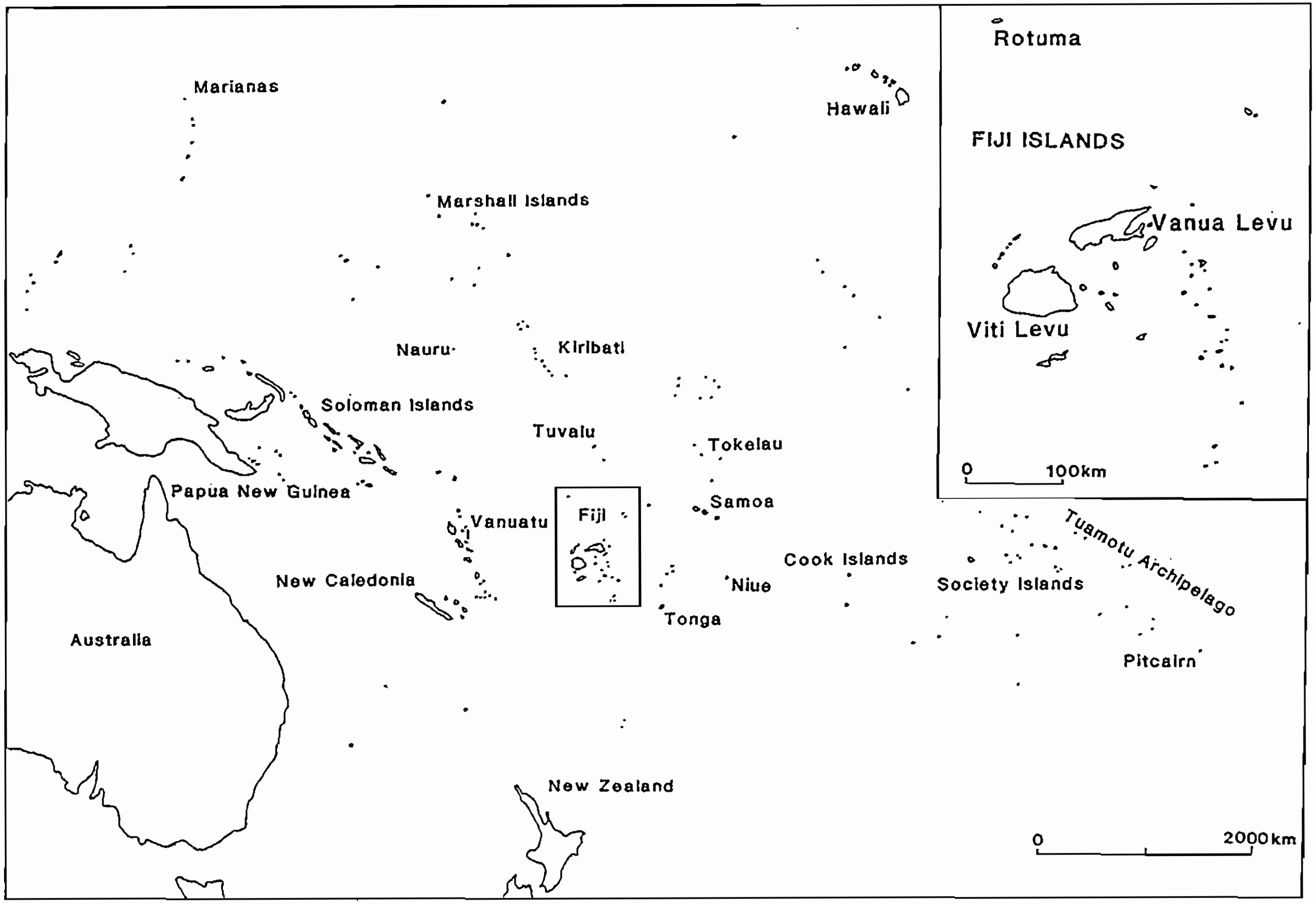

Figure 3.1 Map of the Pacific.

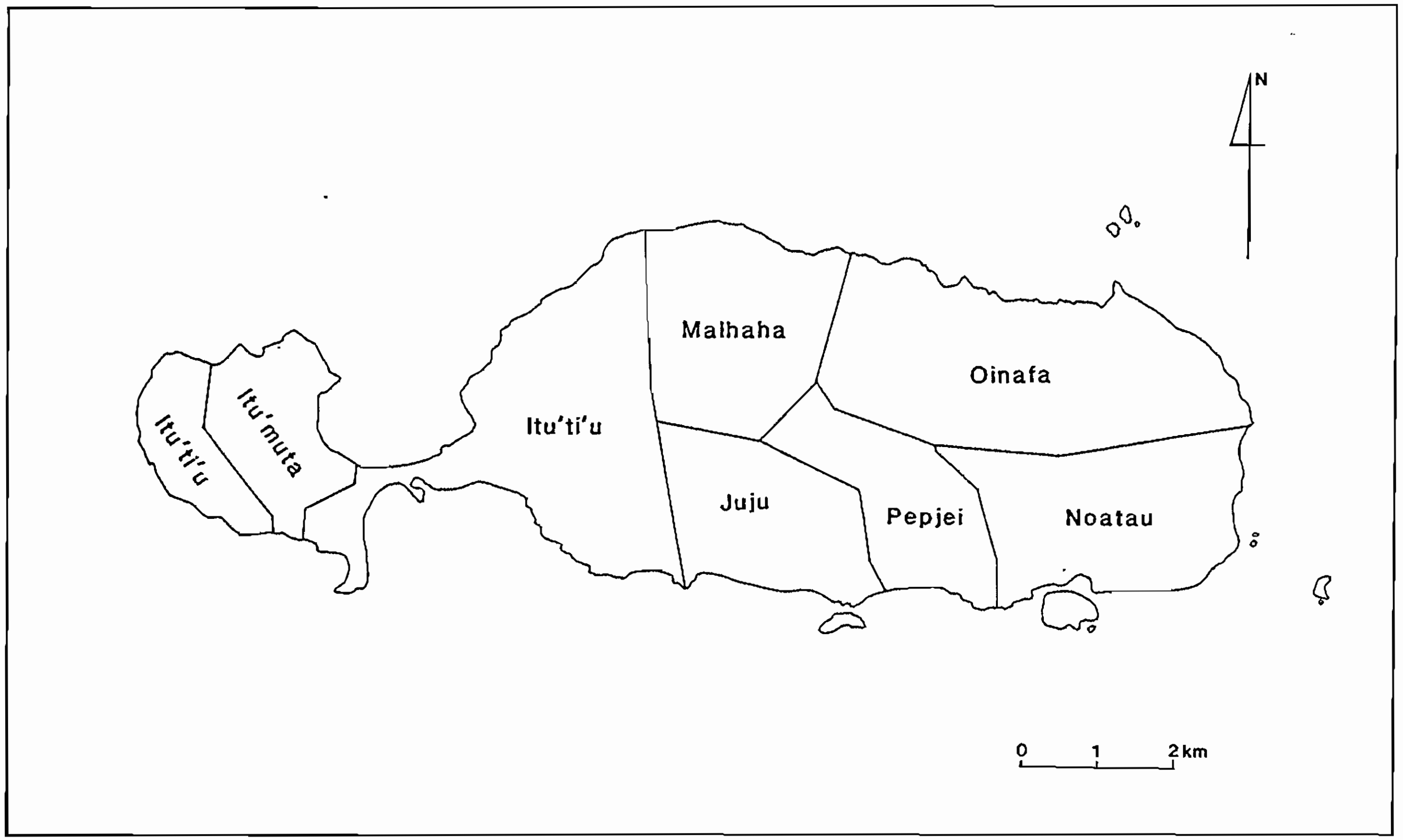

Figure 3.2 The island of Rotuma.

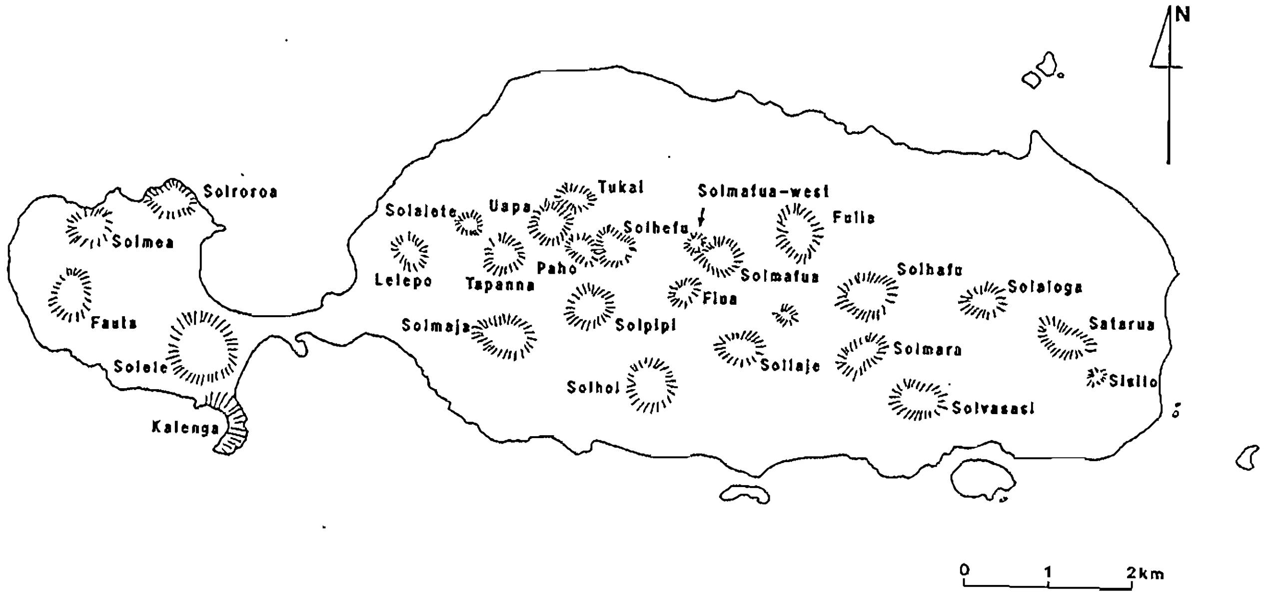

Figure 3.3 The hills of Rotuma.

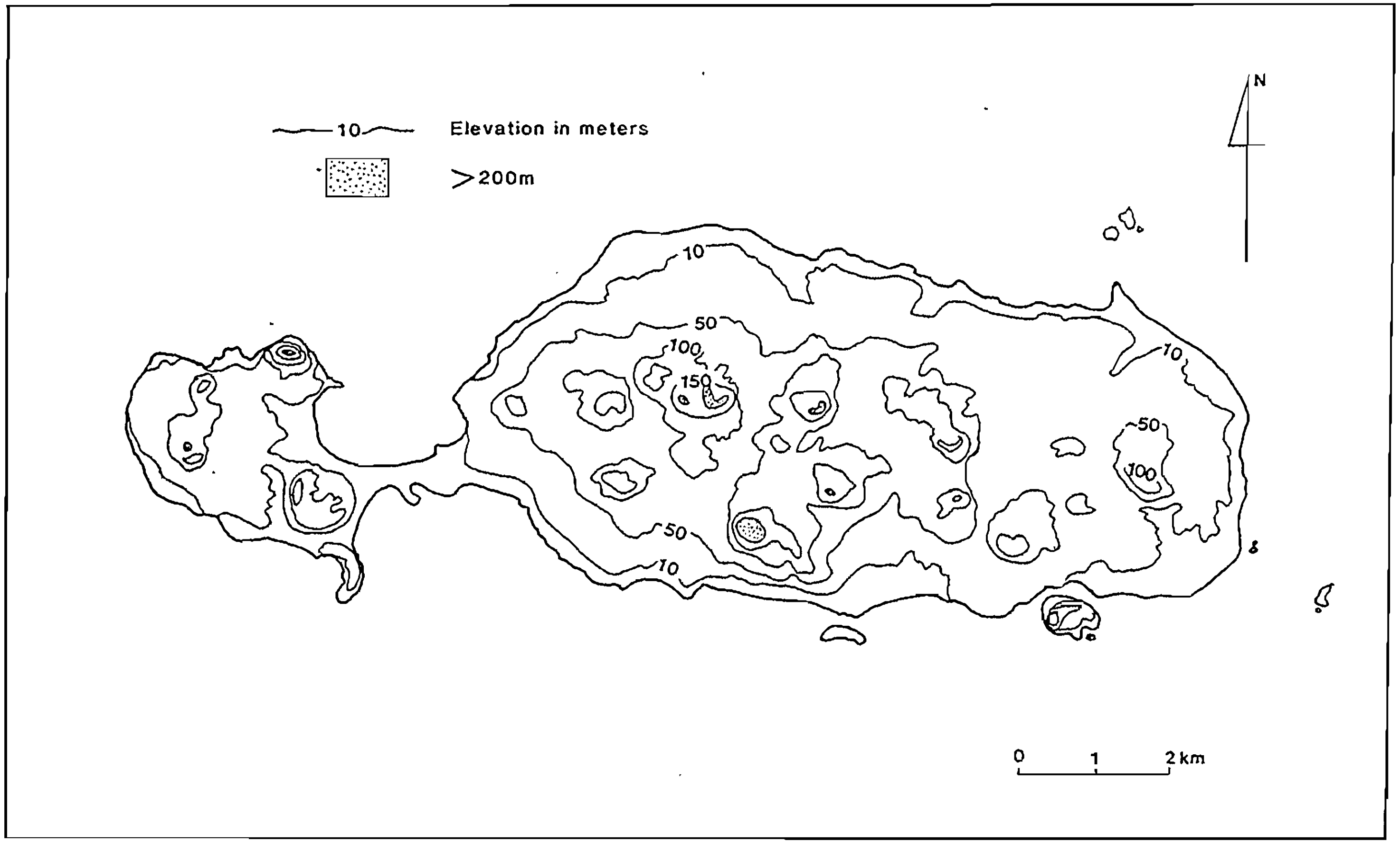

Figure 3.4 Elevation map of Rotuma.

Table 3.1 Summary of climatological observations on Rotuma.

Climate Element	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov	Dec.	Year
Rainfall (mm)													
highest monthly	679	925	1006	634	630	554	622	558	899	656	778	664	4439
normal	353	373	371	279	300	257	219	227	241	297	328	353	3568
lowest monthly	79	116	89	81	35	57	27	71	48	80	126	27	2571
Temperature (C)													
mean monthly max.	32.2	32.1	32.0	31.8	31.5	31.1	30.6	30.6	30.2	31.1	31.6	31.9	32.7
normal	27.4	27.4	27.4	27.4	27.1	26.9	26.4	26.5	26.7	26.8	27.0	27.2	27.0
mean monthly min.	22.5	22.5	22.7	22.7	22.3	22.1	21.7	21.6	22.0	21.9	22.0	22.2	20.7

Note: Data from Fiji Meteorological Service Information Sheet No. 65, 1982 cited in Laffan and Smith (1986); Rainfall records are from 1912 to 1980 and temperature records are from 1933 to 1980.

path of damaging cyclones, which can be expected to occur at least once or twice every decade (Kerr 1976; Revell 1981). There is no known quantified data concerning the occurrence of droughts, but Rotuman consultants (Fuata Kamoe, Vafo'ou Jiare, personal communication 1991) and ethnohistorical accounts (Lesson 1938-9) suggest that they do occasionally transpire.

Geology

Rotuma is situated within the Melanesian Borderland, which is comprised of three main elements: the Vitiaz Trench Lineament, the Samoan Seamount chain, and the North Fiji Basin (Woodhall 1987:1). Due to Rotuma's location on the forearc side of the Vitiaz Trench Lineament, the island has been subjected to minimal subduction (Woodhall 1987:4). The island rests on a 200 km^2 submarine bank of limestone (Woodhall 1987:1). The limestone represents the deposits of an atoll reef which developed on a Tertiary volcanic edifice.

Rotuma is composed of volcanic cones and shield volcanoes surrounded by calcareous sand beach deposits (Figure 3.5). The volcanic rocks are of the "Rotuma Volcanic Group." These include Oinafa Basalt, Noatau Scoria and Afo'a Tuff (Woodhall 1987:14). The lava flows of the main shield volcanoes are Oinafa Basalt. This volcanic rock includes both <u>pahoehoe</u> and <u>'a'a</u> flows which are the products of Hawaiian/Stromolian-type subaerial volcanism erupting magmas of low viscosity (Woodhall 1987:20). Noatau Scoria consists of pyroclastic rocks that were formed during Hawaiian/Stromolian-type subaerial eruptions. Afo'a Tuff are pyroclastic

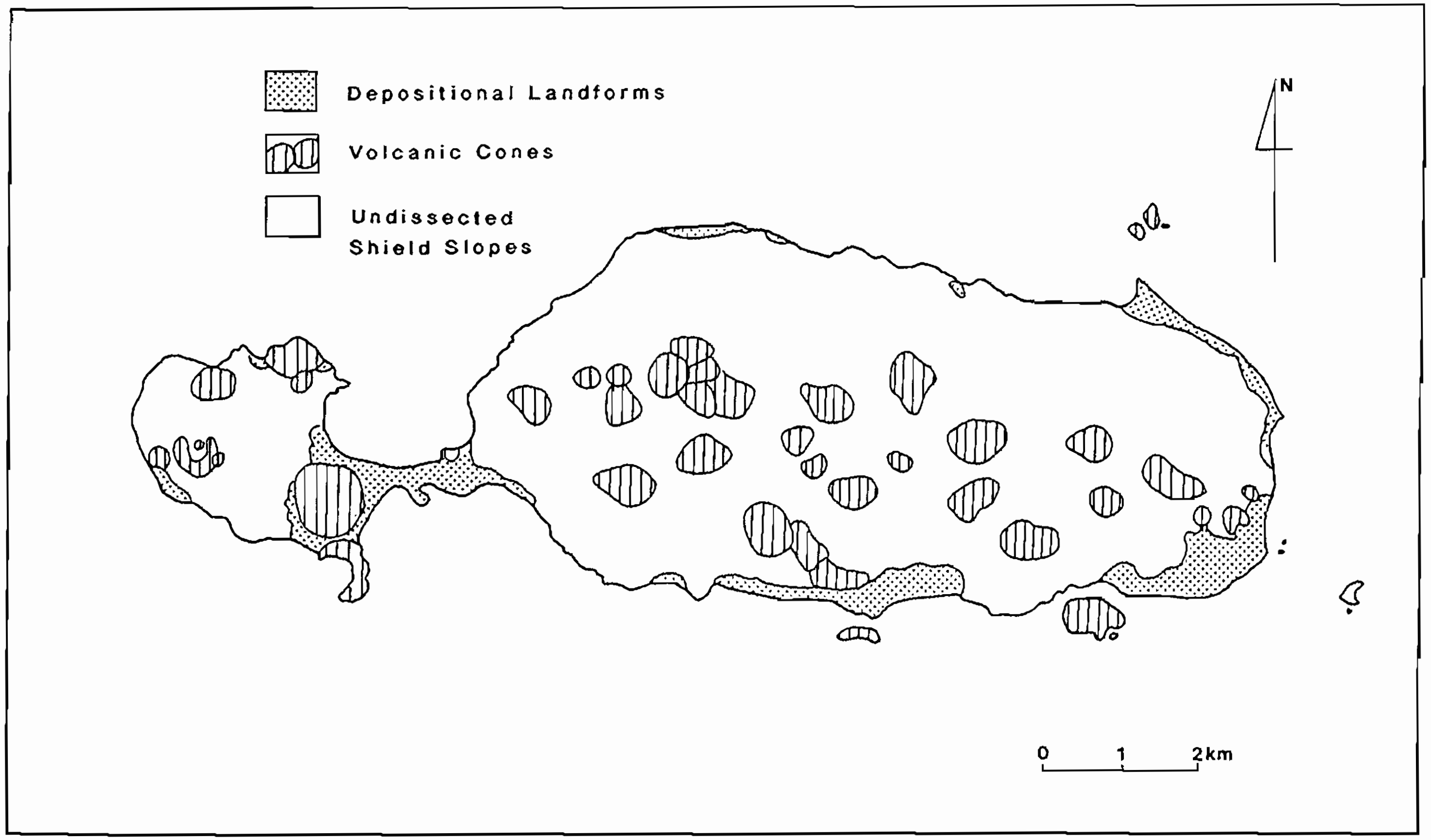

Figure 3.5 Geomorphology of Rotuma.

rocks produced by highly explosive Surtseyan-type volcanic eruptions resulting when water invaded a volcanic vent.

Although a small portion of Rotuma is ca. 1.5 million years old, the majority of the island was formed between 200,000 and 15,000 years ago (Woodhall 1987:20). Woodhall (1987:20) makes a distinction between the late Pleistocene Oinafa Basalt (Ob1) flows which he dates from 200,000 BP to 10,000 BP, and the more recent Oinafa Basalt (Ob2) flows which took place during the last 15,000 years. Due to the relative geologic youth of the Oinafa Basalt (Ob2) flows, little weathering has occurred in some parts of Rotuma resulting in poor soil development.

Depositional landforms on Rotuma consist of coastal plains and a narrow isthmus which connects the two basaltic land masses of the main island (see Figure 3.5). The depositional landforms are primarily composed of carbonate sand and gravel derived from the fringing reef. Woodhall (1987:21) hypothesizes that the coastal calcareous sand beaches were formed within the last 5000 years. The formation of these beaches were perhaps partially the result of human induced geomorphic processes. It is also possible that the depositional landforms formed during the last 2000 years following the higher sea level stand as has been documented in Fiji (Nunn 1990) and Samoa (Kirch in press).

Pedology

In 1981 a reconnaissance soil survey was conducted on Rotuma by the New Zealand Soil Bureau for the Fijian Ministry of Agriculture and Fisheries (Laffan and

Smith 1986). The soil survey resulted in the identification of 15 soil taxonomic units in three physiographic zones. According to Laffan and Smith (1986:10):

> ...soil taxonomic units are conceptual classes of soil that have properties that fall within defined limits. In this survey the taxonomic units are soil series. They have similar profile form, similar textural class, similar soil temperature and soil moisture regimes and are derived from the same or similar parent materials.

A description of each soil taxonomic unit is given in Table 3.2.

Laffan and Smith (1986) classified the soil taxonomic units into soil mapping units. Soil mapping units are delineated areas which contain one or more soil taxonomic units. In the soil mapping units which contain two taxonomic units, the proportion of the dominant to subdominant component is 60:40, and in areas with three taxonomic units the proportions of the dominant and subdominant components is 50:30:20. Soil mapping units are also differentiated by the slope of the area. Three distinctions were made; flat and rolling land (slopes from 0-12°), hilly land (slopes from 13-30°), and steep land (slopes > 30°). Given this classification scheme, Laffan and Smith (1986) classified Rotuma into 56 different areas that represent 23 soil mapping units (Table 3.3). The area of the eleven dominant soil mapping units in each district is presented in Table 3.4.

Vegetation

Abundant, evenly distributed rainfall and relatively fertile, well drained soils in some parts of Rotuma provide an ideal environment for lush vegetation (Kafoa 1987). The vegetation throughout the island is dominated by secondary growth and introduced species, with remnant natural forest occurring only on the peak of Solhoi

Table 3.2 Soil taxonomic units of Rotuma.

Soil Taxonomic Unit	Physio-graphical Zone	Description
Motusa	Coastal Margin	A somewhat excessively drained soil formed from sand derived from reef coral. The soils are coarse textured and have rapid permeability.
Rana	Coastal Margin	A very poorly drained soil formed from organic matter and coral sand. The soils have a permanently high water table and profiles are characterized by thick, peaty sandy loam horizons overlying coral sand at depth greater than 1 m.
Kirkiri	Volcanic Ringplains	A somewhat excessively drained soil formed from basaltic aa lavas with mixed basaltic ash. Profiles typically have stony or bouldery loamy A horizons over bouldery sandy loam B horizons.
Ono	Volcanic Ringplains	A well-drained soil formed from mainly thick basaltic ash, although some basaltic stones and boulders generally occur within the upper 1 m.
Sumi	Volcanic Ringplains	A well-drained stony soil formed from mixed basaltic ash and basaltic aa lavas. Stones and boulders vary from common (5-15%) to many (15-35%) in A horizons, to many (15-35%) in B horizons.
Rere'e	Volcanic Ringplains	A well-drained soil formed from basaltic ash overlying coarse sandy or gravelly basaltic scoria at depths of about 70-80 cm.
Paptoa	Volcanic Ringplains	A well-drained soil formed from basaltic ash overlying basaltic tuff at depths between 70-80 cm.
Ututu	Volcanic Ringplains	An excessively drained soil formed from extremely stony and bouldery basaltic aa lavas.
Hafhafu	Volcanic Ringplains	A somewhat excessively drained soil formed from extremely stony and bouldery aa lavas and minor basaltic volcanic ash.
Losa	Volcanic Ringplains	A somewhat excessively drained shallow and stony soil formed from massive pahoehoe basalt and minor basaltic ash.
Vaka	Volcanic Cone	A somewhat excessively drained soil formed from weakly weathered basaltic scoria and minor basaltic ash. Stony and bouldery basalt derived from aa lava flows often occurs as a minor constituent mixed with stony and bouldery basaltic scoria.

Table 3.2 (Continued) Soil taxonomic units of Rotuma.

Soil Taxonomic Unit	Physio-graphical Zone	Description
Mafua	Volcanic Cone	A well drained soil formed from a relatively thin cover of basaltic ash overlying weakly weathered basaltic scoria.
Umea	Volcanic Cone	A well-drained soil formed from mainly strongly red-weathered basaltic scoria.
Roroa	Volcanic Cone	A well-drained soil formed from weakly weathered basaltic tuff and derived slope deposits. They are moderately deep soils overlying massive, indurated tuff at depths between 50 and 100 cm.
Kugai	Volcanic Cone	A well-drained soil formed from strongly red-weathered basaltic tuff. Profiles are characterized by dark brown, friable, clay-textured A horizons overlying yellowish red, firm clay or heavy clay loam B horizons.

Note: Data from Laffan and Smith 1986:11-16.

(William McClutchey, visiting Brigham Young University botanist, personal communication, 1991). The agricultural gardens of the Rotumans are heterogeneously distributed throughout much of the island. Their cultigens are discussed in Chapter 4. Secondary growth and introduced flora cover many of the rocky, uncultivated, areas.

Distinction Between the Prehistoric and Historic Environments

The contemporary environmental conditions of Rotuma are undoubtedly different from what they were during the late prehistoric-protohistoric period. The beaches and swamps of the coastal zone appear to have been especially dynamic over the last several hundred years. For instance, in the low lying Itu'ti'u isthmus there is evidence of both progradation and regression. Furthermore, exploratory coring in the middle of isthmus recovered historic artifacts 1.8 m below ground surface (bgs) near

Table 3.3 Soil mapping units of Rotuma.

Soil Mapping Unit	Soil Classification
Hafhafu, Ututu	Rock
Kirkiri, Sumi	Well Developed Soil
Losa, Hafhafu, Ututu	Rock
Mafua hill	Well Developed Soil
Mafua hill, Vaka hill	Well Developed Soil
Mafua hill, Umea hill	Well Developed Soil
Mafua hill, Umea hill, Vaka steepland	Well Developed Soil
Mafua steepland	Well Developed Soil
Mafua steepland, Mafua hill	Well Developed Soil
Mafua steepland, Vaka hill	Well Developed Soil
Motusa	Beach
Ono, Sumi	Well Developed Soil
Paptoa, Rere'e	Well Developed Soil
Rana	Swamp
Rere'e	Well Developed Soil
Roroa hill	Well Developed Soil
Roroa hill, Kugai hill	Well Developed Soil
Umea hill	Well Developed Soil
Umea hill, Mafua hill	Well Developed Soil
Umea hill, Umea steepland	Well Developed Soil
Vaka hill	Rock
Vaka hill, Hafhafu	Rock
Vaka steepland, Mafua hill	Rock

Note: Data from Laffan and Smith 1986:11-16.

Table 3.4 The area of the dominant soil mapping units in each district.

District	Hafhafu (ha.)	Kirkiri (ha.)	Losa (ha.)	Mafua (ha.)	Motusa (ha.)	Ono (ha.)	Paptoa (ha.)	Rana (ha.)	Rere‘e (ha.)	Roroa (ha.)	Umea (ha.)	Vaka (ha.)
Malhaha	49.34	250.12	0.0	108.72	28.82	25.49	0.0	0.0	63.56	0.0	0.0	0.0
Pepjei	113.71	0.0	0.0	116.31	14.68	47.68	0.0	3.46	142.88	0.0	0.0	2.89
Juju	0.0	0.0	0.0	33.41	21.72	267.52	0.0	1.77	26.83	0.0	30.93	43.19
Oinafa	736.67	0.0	0.0	55.11	46.82	0.0	0.0	3.14	0.0	0.0	48.48	0.0
Noatau	297.99	0.0	0.0	65.76	85.30	0.0	0.0	12.82	1.20	0.0	30.31	101.35
Itu‘ti‘u	0.0	198.24	105.49	129.06	95.91	423.43	0.0	14.09	40.43	43.04	0.0	0.0
Itu‘muta	0.0	0.0	117.17	9.95	22.84	0.0	56.25	10.38	0.09	62.72	0.0	7.18

the water table suggesting that some parts of the isthmus were formed relatively recently. There is also evidence that new swamps were formed behind some of the beach berms by the catchment of terrestrial sediment. A core recovered a small charcoal sample from a burn layer at 70 cm bgs near the bottom of a swamp in Noatau. The charcoal sample was given extended counting time and produced a calibrated one sigma range of AD 1440 - 1660 (Table 3.5 and see Figure 8.1 for location). The date suggests that some of the swamps were formed during the late prehistoric period. Another core conducted in the terrigenous sediment of Itu'muta near the shoreline recovered several shell fragments from a cultural midden layer at 70 to 84 cm bgs. The shells (Strombidae and Tellinidae) had been broken open to extract the meat. The shell produced a calibrated one sigma range of AD 254-441 (see Table 3.5 and Figure 8.1). The cultural layer from which the shell midden was recovered extended to 98 cm bgs, and was on top of a layer of sterile orange terrigenous sediment. The water table was encountered at ca. 105 cm bgs and coring became impossible by 110 cm bgs. The sample produced the earliest known date from Rotuma.

Despite the dynamic nature of some beaches and swamps, the overall affect of landscape changes on the terrestrial environment of Rotuma appears to have been relatively limited. The beaches comprise only 7.5% of the land mass of the island and the swamps comprise 1.1%. The vast majority of the island surface consists of terrigenous sediments derived from the volcanic basalts. It appears that these terrigenous sediments were more stable than the beaches and swamps.

Table 3.5 Radiocarbon dates from Rotuma.

Site	Material	Beta Analytic Number	CAMS Number[1]	C-14 Age Years B.P. $\pm$ 1 sigma	C13/C12	^{13}C Adjusted Age	Calibrated Range (1 sigma)[2]
Itu'muta Core 2	Shell	51810		1620$\pm$80	+0.9 0/00	2040$\pm$ 80	A.D. 254-441
Noatau Core 9	Charcoal	53543		360$\pm$100	-27.8 0/00	320$\pm$100	A.D. 1440-1660
Fiua	Charcoal	53544	2988			80$\pm$60	A.D. 1684-1955
Kinehe'e	Charcoal	53545	2989			120$\pm$60	A.D. 1671-1955

Notes:
1) CAMS numbers refer to numbers given by the Lawrence Livermore National Laboratory in California. These samples were analyzed using the accelerator mass spectrometry technique.
2) Radiocarbon dates were calibrated using Stuiver and Pearson (1986). A Delta-R value of 0$\pm$0 was applied to the marine sample.

Therefore, although it is recognized that the entire island has undergone geomorphic changes in the last few centuries, the contemporary environment is taken as representative of the environment during the late prehistoric-protohistoric period.

Cultural Setting

Rotuma is situated at the juncture of Micronesia, Melanesia, and Polynesia, and has been influenced from all three areas. The cultural origin of the island's original inhabitants is unknown, but other islands in West Polynesia were settled by people associated with lapita pottery ca. 3200 BP who originated farther west in island Melanesia. During the late prehistoric period Rotumans were significantly influenced by the Polynesian cultures of Tonga and Samoa. Today, Rotumans are considered physically and culturally Polynesian.

The first Europeans to visit the island were the captain and crew of the Pandora in 1791 (Thompson 1915). The next European ship to stop at Rotuma was the Duff in 1797 (Smith 1813). Until the 1820s the island was only infrequently visited by European ships for supplies. After the mid-1820s Rotuma became a frequent stop for whalers and traders. During the 1820s and 1830s nearly 100 European seamen had deserted their ships and were living on the island (Gardiner 1898:400; Russell 1942:234). In 1839, Tongan Wesleyan missionaries introduced Christianity to the island, but it was not until 1864 that a permanent European mission station was established. Catholicism was introduced to the island in 1868, and for the next few decades the two religious sects were often at odds with each other. The "religious wars" of Rotuma culminated in the late 1870s, and in 1879 the chiefs of the island appealed to Britain for cession. In 1881 Rotuma was incorporated into the British Empire under the jurisdiction of Fiji. Although Rotuma remains part of the Republic of Fiji, it is cultural and linguistically distinct. The island currently has a population of ca. 2700 people (Fatiaki 1991:3) (see Chapter 7).

Linguistic Affiliation

Rotuman is an Oceanic Austronesian language (Pawley 1979). It is a member of the Proto-Central Pacific group which includes Fijian and Proto-Polynesian languages. Pawley (1979:1) tentatively suggests that Rotuman "diverged from the Old Fijian dialect complex at a time after the breakup of Proto Central Pacific, i.e., after the divergence of Polynesian and Fijian." There appears to be a special connection between Rotuman and the languages of the western side of Fiji, specifically those spoken on Waya Island. Since this initial split the Rotuman language has been significantly influenced by the Tongan and Samoan languages (Pawley 1979).

West Polynesian Influences

The prehistoric culture history of Rotuma has not been established but the oral traditions do suggest that the indigenous inhabitants of Rotuma were periodically influenced and invaded by Samoans and Tongans (Gardiner 1898:492-497). While it is recognized that these myths might not depict precise historical events, there is probably some historical truth to them (see Chapter 6). The origin myth of Rotuma credits a Samoan or Tongan chief, Raho, with creating the island by pouring sand from a basket (Gardiner 1898:503-506; Churchward 1937:109-16). In this tradition there is reference to the hanitemous ("women of the bush"), who are thought to represent the original inhabitants of Rotuma (Russell 1942:232). Parke (1969:99) places the coming of Raho and the subsequent "formation" of Rotuma in the thirteenth century AD.

In the chronological sequence of the oral traditions, the next significant Tongan or Samoan influence is from a Tongan or Samoan warrior who was married to a Rotuman woman (Trouillet n.d; Gardiner 1898:515). The warrior helped the people of Pepjei overthrow the rulers of the island who had established themselves in Malhaha. As a reward to the foreigner, the people of Rotuma named his wife the sau ("king/queen") of the island. In this manner the oral traditions document the establishment of the new political order of the "rotating" sauship.

A third invasion by the Tongans noted in the oral traditions is thought to have occurred in the late seventeenth (Gardiner 1898:402) or early eighteenth (Churchward 1938:257) century. At this time a group of 300 Tongans from Niuafo'ou invaded Rotuma under the direction of a chief called Ma'afu. The Tongans initially assisted the people of Noatau in gaining the sauship and political supremacy of the island. The Tongans are then said to have established their own political hegemony by appointing their own chiefs in each of the districts. The legend ends by explaining how the Rotumans overthrew and killed the Tongans.

Past Archaeological Research on Rotuma

Very little archaeological research has been conducted on Rotuma. Wood (1877) provided a one paragraph description of several coastal cemeteries and

MacDonald (1918a, 1918b) briefly described several large stones associated with various myths. In 1964, Parke (nd; 1969) spent four months on Rotuma and traveled throughout the island examining archaeological sites. Parke described several archaeological house foundations, cemeteries, caves, and fortified sites. Although Parke's descriptions are interesting, he offered little in the way of interpretation or the explication of archaeological patterns. In 1981 Shutler and Evard (Shutler and Evard 1990) spent several months on the island surveying and excavating several historic villages in Itu'muta and a burial in Oinafa. Shutler and Evard (1990) relate the burial to the oral traditions concerning a prehistoric Tongan invasion. Shutler (personal communication, 1992) is currently analyzing the data from the historic villages. Benjamin (1984) has analyzed the historic glass artifacts from four of the sites that Shutler and Evard excavated.

Summary

It is within this relatively rich but diverse environmental setting that the political system of Rotuma developed. Although the island is relatively isolated and the political processes that took place on the island were the result of indigenous events, the oral traditions suggest that Rotuma was influenced by the surrounding West Polynesian cultures. Through the interaction of indigenous social process and foreign influences in this diverse environmental context, the unique Rotuman political system developed.

CHAPTER 4

ROTUMAN SUBSISTENCE STRATEGIES

Traditional Rotuman subsistence strategies included the exploitation of terrestrial and marine resources. Terrestrial resources included root and tree crops, supplemented by protein from swine. Marine resources were procured from the fringing reef and the surrounding marine bank. The resources of Rotuma were not homogeneously distributed, rather some portions of the island have much higher productivity potential than others. The terrestrial resources of Rotuma are considered first, and then attention is turned to the marine resources.

Terrestrial Resources

Rotuman Agricultural Practices

Prehistoric Polynesian agricultural practices reflect a dialectic between the structure of the natural environment including variables such as soil fertility, rainfall, hydrology, or topography, and historical and cultural factors (Kirch 1991b:115). The choice of agricultural technique was selected within an environmental context according to the varying sociopolitical and cultural needs and desires of the individuals of society. On Rotuma the natural variables of rainfall, hydrology, and topography are relatively homogenous. It was the heterogeneous distribution of soil fertility throughout the island, in conjunction with sociocultural pressures, that dictated the mode of agricultural production.

Rotuman agricultural practices included shifting cultivation, intensive dryland cultivation, and limited irrigated cultivation. Shifting cultivation is a process of bush-fallow rotation in which the fallow period is longer than the cropping period (Conklin 1963:1; Kirch 1991b:119). Kirch (1991b:119) succinctly describes the practice of shifting cultivation typical in most parts of Polynesia:

> Polynesian shifting cultivation usually focuses on an initial planting phase of aroids (Colocasia and Alocasia) and yams (Dioscorea alata and D. esculenta), followed by a second phase of bananas. Other secondary crops may be included. A swidden plot is first cleared and the cut vegetation allowed to dry sufficiently (usually 3-4 weeks) before firing. Yams are harvested first, after 7-9 months, followed by the aroids (12-24 months), while bananas extend the productive life of the plot up to 36 months or more. New swiddens are cut each year (during the yam planting season), so that each household will normally have several swidden plots representing various successional stages.

Shifting cultivation was practiced throughout Rotuma but was generally focused on the western side of the island where the older volcanic flows had weathered sufficiently to form a deep fertile soil.

Intensive dryland cultivation is distinguished from shifting cultivation by "(1) a fallow length shorter than or equal to the cropping period; and (2) the permanent demarcation of plots" (Kirch 1991b:120). Throughout Polynesia, dryland taro, sweet potato, yams, and a number of other secondary crops were grown by intensive dryland cultivation. The practice required a large amount of labor for weeding and mulching to maintain soil fertility. Kirch (1991b:120) notes that this labor input can be approximately twice that which is required for shifting cultivation. Further labor investment is required to construct the stone pits, alignments or terraces that are used to define plot boundaries.

Intensive dryland cultivation was only selectively practiced in some regions of Rotuma. On the fertile western side of the island there is little archaeological evidence of dryland intensification. Plots are generally not demarcated by stone boundaries and there are virtually no signs of terracing. In contrast, there is extensive archaeological evidence of intensive dryland cultivation in portions of the rocky eastern side of the island (see chapter 8). Hundreds of planting pits designed for cultivating yams were built into rocky <u>'a'a</u> flows. Extensive labor was invested to build the pits, as well as to maintain production through mulching. The result was the creation of an artificial agricultural environment where crops could be grown in an otherwise environment of low productivity.

Polynesian irrigated agriculture consists of several forms such as pond-field cultivation, drained raised "garden island" systems, and atoll pit cultivation (Kirch 1991b:121). <u>Colocasia</u> <u>esculenta</u> (taro) was the main crop grown by these agricultural techniques. On Rotuma irrigated agriculture was limited to "garden island" systems. These systems are slightly raised "garden island" beds constructed on low lying alluvial flats at the base of steep hillslopes where freshwater springs were located (c.f. Kirch 1991b:121). The result is a brackish swamp where the aroid <u>Cyrtosperma</u> (swamp taro) could be grown. There are several places on Rotuma where swamp taro is grown in swampy zones behind the beach berms. Currently, very little modification of these areas in terms of terracing or plot boundaries is done before planting.

Rotuman Cultigens

The most detailed account of Rotuman cultigens in the protohistoric period is provided by Bennett's (1831) 1830 description. He (Bennett 1931:200) states that Rotuman crops included:

> ...plantations of the ahan or taro, arum esculentum, which, from a deficiency of irrigation, is generally of the mountain variety. Of the sugar-cane they posses several varieties and it is eaten in the raw state; a small variety of yam, more commonly known by the name of the Rotuma potato, the ule of the natives, is very abundant; the ulu or bread-fruit, pori or plantain, and the vi, (spondias dulcis, Parkinson,) or Brazilian plum, with numerous other kinds, sufficiently testify the fertility of the island.

This account is corroborated by other early accounts of Dillon (1829), Lesson (1838-9), and in less detail by Jarman (1832). Each of these accounts confirm that the most important products were yams, taro, and breadfruit. Ethnohistorical accounts in the late 1800s note the importance of swamp taro in addition to the crops mentioned by the early accounts (Gardiner 1898; Allen 1895).

Each of the main cultigens of protohistoric Rotuma is discussed in turn. Table 4.1, which is based on Whistler's (1989) inventory of Rotuman plants, lists the Rotuman cultigens in taxonomic order, and summarizes data on their native names, the number of currently recognized clones, the type of crop, and the primary use of the crop.

Table 4.1 Major indigenous cultigens of Rotuma.

Botanical Name	Common Name	Rotuman Vernacular[2]	No. of Clones[3]	Type[4]	Use[5]
DIOTYLEDONEAE					
Anacardiaceae					
Spondias dulcis	vi apple	vi	1	NF	NS
Leguminosae					
Inocarpus fagifer	Tahitian chestnut	'ifi	1	NF	NS
Moraceae					
Artocarpus altilis	breadfruit	'ulu	9	FF	MS, C
Piperaceae					
Piper methysticum	kava	kava	1	O	N, M
MONOCOTYLEDONEAE					
Araceae					
Alocasia macrorhiza	Elephant ear	'apea	1	FT	SS
Cyrtosperma chamissonis	Swamp Taro	papai	1	FT	MS
Colocasia esculenta	Taro	papula	32	FT	MS
Xanthosoma nigrum	Giant Taro	'apea	1	FT	SS
Dioscoreaceae					
Dioscorea alata	Greater yam	'uhi	26	FT	MS
Dioscorea esculenta	Lesser yam	'uhlei	4	FT	MS
Dioscorea nummularia	yam	parai	1	FT	SS
Dioscorea sp.	yam	favi	1	FT	SS
Gramineae					
Saccharum officinarum	Suger cane	fo'u	7	O	NS
Musaceae					
Musa x paradisiaca	Banana	pari	22	FF	MS
Palmae					
Cocos nucifera	Coconut	niu	10	NF	NS, C
Taccaceae					
Tacca leontopetaloides	Arrowroot	mara	1	FT	SS

Table 4.1 (Continued) Major indigenous cultigens of Rotuma.

Notes:

1) Information about Rotuman cultigens adapted from Whistler (1989); Format of Table and additional information from Kirch (1991).
2) The Rotuman word for the basic plant; varieties or clones usually have specific names.
3) Number of linguistically labeled, locally recognized folk taxa
4) FT= farinaceous tuber or corm; FF=farinaceous fruit; NF=nonfarinaceous fruit.
5) MS= major staple; SS=secondary staple; NS=nonstaple food; C=construction; N=narcotic; M=medicinal.

Aroids

Aroids are a class of plants which originated either in southeast Asia (Terry et al. 1984; Onwueme 1978) or perhaps in New Guinea (Golson 1991), and were brought into Remote Oceania by the first settlers (Yen 1991). They were undoubtedly among the first crops brought to Rotuma by the original inhabitants of the island. Aroids require at least 2000 mm of rain per annum, and grow best where the soil is heavy and has a high moisture-holding capacity (Onwueme 1978:201). Aroids are grown under either flooded or unflooded conditions (Onwueme 1978:207). Furthermore, some varieties of aroid are tolerant of salinity, making it possible to grow them in coastal brackish swampy areas.

On Rotuma there is a sufficient annual rainfall of ca. 3500 mm, but the lack of perennial streams restricts the growth of aroids to dryland varieties and swamp taro. The primary aroid grown on Rotuma is Colocasia esculenta (L.) Schott (Rotuman papula), of which Whistler (1989:14) recorded 32 clones ('aparama, ararutu, ha*'i'ojo, ha*ifo mi'a, ha*ifo kele, ha*ifo maf'alagfisi, ha*mahini, ha*mi'a, ha*roroa, hu*fisi, kaka* 'ne ura, kautau, lagah*toto, ma'fulu, maeao, makasiva, manu'a, matlei, nikiua, papula Sa'moa, parasi, perpero, sahsaha, semete, sentiki, tarkura, tartea, tausala, tavtavake, tel jarava, tel fisi, ura). The swamp taro, Cyrtosperma chamissonis (Schott) (Rotuman papai), is also an important staple for local subsistence. Alocasia macrorrhiza (L.), the giant taro, is grown on the island but appears to be of secondary importance in relation to Colocasia and Cyrtosperma (Whistler 1989:14). Xanthosoma nigrum (Vell.) (Rotuman 'apea) a historic introduction, is also grown but only in small qualities.

Colocasia esculenta (L.) Schott

The relatively uniform climate and topography throughout Rotuma means that the critical variable for the growth of Colocasia is the extent or depth of soil development. Colocasia are generally planted throughout Rotuma wherever this condition is met. Colocasia are usually planted in plots that have been prepared by cutting and then burning secondary growth. No other demarcation of the plots is provided. The time from planting to harvest for Colocasia on Rotuma varies, but according to Rotuman consultants it is generally between eight to twelve months, depending upon soil fertility (Fuata Kamoe, personal communication, 1991; see also Onwueme 1978:215).

No observations or records of the annual yield of Colocasia on Rotuma were made, but estimates from other Pacific Islands are indicative of potential yields. Onwueme (1978:216) reports a yield for dryland Colocasia in Hawai'i of 15,000 to 25,000 kg/ha. If maturation of the plant takes nine months and continuous replanting occurs, annual yield would be 20,000 to 33,000 kg/ha. In Tubuai, French Polynesia, Joralemon (1983:100) reports that the yield of dryland taro is approximately 14,000 kg/ha. Again, if maturation of the plant takes nine months and continuous replanting occurs, annual yield would be ca. 18,000 to 19,000 kg/ha. Farrell and Ward (1962:217) report an annual yield of dryland taro in Western Samoa of 1780 to 4760 kg/ha. Purseglove (1974:64) reports a yield of 7500 kg/ha in Melanesia. Landon (1984:270) reports a yield of dryland taro for "all less developed countries" of 4960 kg/ha. Landon (1984:270) proposes that the yields for the less developed countries are fairly representative of yields produced by traditional farming methods. In another table Landon (1984:273) reports that rainfed Colocasia esculenta has an annual yield of 5000 to 20,000 kg/ha.

The annual yield of rainfed Colocasia therefore appears to be between 1780 kg/ha and 33,000 kg/ha. This is an extremely large range and it should be noted that in some cases the larger estimates are probably inflated by assuming that maturation takes only nine months and continuous replanting occurs. Variables that affect productivity include the type of taro planted and the fertility of the soil (Onwueme 1978:216; Joralemon 1983:100; Landon 1984:269-270). Landon (1984:270) proposes that tropical soil fertility is effected by the following factors:

> (1) depth of limiting horizon; (2) texture; (3) structure and consistence; (4) moisture conditions; (5) plant nutrients; (6) cation-exchange capacity; (7) weatherable minerals; (8) Ph; (9) salinity; and (10) organic matter.

With these factors in mind, it is possible to estimate the annual yield of Colocasia in different parts of Rotuma by assessing the productive potential of the soils depicted on Laffan and Smith's (1986) soil map. The soil mapping units on Rotuma that could produce a relatively high yield of Colocasia are indicated on Table 4.2. Although precise figures are unavailable, it is estimated that the annual yield of Colocasia in these areas would probably be closer to 33,000 kg/ha than to 1780 kg/ha. In other more marginal parts of the island, where soil development is minimal, production of Colocasia would be either impossible, or at best, significantly less.

Cyrtosperma chamissonis

In Rotuma the swamp taro (Cyrtosperma chamissonis) is grown in brackish swampy areas behind the beach berms at the juncture of the beach and volcanic core. It is an extremely large plant, two to three meters high, with mature corms measuring approximately 60 cm in diameter and weighing between 40-80 kg (FAO 1989:40). The corms observed on Rotuma were considerably smaller than this, weighing ca. 15 kg with diameters of ca. 30 to 40 cm. The plant is slow growing and may take two to three years to produce mature tubers (FAO 1989:40). Purseglove (1972:59) notes that mature corms of 60 kg can be obtained from ten year old plants. Rotuman consultants told Whistler (1989:14) that the plant was able to remain alive in the ground for forty years or more.

Cyrtosperma grows in saturated soil and therefore is restricted to the rana soil mapping unit indicated in Table 4.2. No estimates concerning the annual yield of Cyrtosperma were made on Rotuma and no other estimates have been found. At a minimum, it can be said that while the plant is slow growing and was restricted to a

Table 4.2 Soil mapping units of Rotuma with associated soil type and major cultigens.

Soil Mapping Unit	Soil Type	Major Cultigens Supported
Hafhafu, Ututu	Rock	Yam
Kirkiri, Sumi	Deep Soil	Taro, Yam, Bananas, Breadfruit
Losa, Hafhafu, Ututu	Rock	Yam
Mafua hill	Deep Soil	Taro, Yam, Bananas, Breadfruit
Mafua hill, Vaka hill	Deep Soil	Taro, Yam, Bananas, Breadfruit
Mafua hill, Umea hill	Deep Soil	Taro, Yam, Bananas, Breadfruit
Mafua hill, Umea hill, Vaka steepland	Deep Soil	Taro, Yam, Bananas, Breadfruit
Mafua steepland	Deep Soil	Taro, Yam, Bananas, Breadfruit
Mafua steepland, Mafua hill	Deep Soil	Taro, Yam, Bananas, Breadfruit
Mafua steepland, Vaka hill	Deep Soil	Taro, Yam, Bananas, Breadfruit
Motusa	Beach	Bananas, Breadfruit
Ono, Sumi	Deep Soil	Taro, Yam, Bananas, Breadfruit
Paptoa, Rere'e	Deep Soil	Taro, Yam, Bananas, Breadfruit
Rana	Swamp	Swamp Taro
Rere'e	Deep Soil	Taro, Yam, Bananas, Breadfruit
Roroa hill	Deep Soil	Taro, Yam, Bananas, Breadfruit
Roroa hill, Kugai hill	Deep Soil	Taro, Yam, Bananas, Breadfruit
Umea hill	Deep Soil	Taro, Yam, Bananas, Breadfruit
Umea hill, Mafua hill	Deep Soil	Taro, Yam, Bananas, Breadfruit
Umea hill, Umea steepland	Deep Soil	Taro, Yam, Bananas, Breadfruit
Vaka hill	Rock	Yam
Vaka hill, Hafhafu	Rock	Yam
Vaka steepland, Mafua hill	Rock	Yam

small geographic area of Rotuma, Cyrtosperma was a dependable food resource which could yield large quantities of food.

Trouillet (n.d.) noted in the second half of the eighteenth century that "papai (swamp taro) is today what one might call the granary of Rotuma ." Furthermore Gardiner (1898:483) wrote that "the possession of a good strip of swamp land, papai patch, always caused and gave to the hoag (ho'aga) a position of importance." The food was often thought of as insurance against famine (Gardiner 1898:483; Williamson 1924:308), and Williamson (1924:312) notes that "It is perhaps significant that it was the swamp land, which was used to provide against famine, that was subject to communal cultivation." Williamson's explanation emphasizes the role of swamp taro as an insurance buffer against famine.

Yams

Yams (Dioscorea spp.) are tubers of Southeast Asian origin (Yen 1991) that were presumably brought to Rotuma with the original settlers of the island. Yams are more tolerant of drought than are aroids, although they flourish when there is abundant moisture throughout their growing cycles (Onwueme 1978:12). Most yams require seven to nine months to mature (Coursey 1967).

The primary yam grown on Rotuma is the Dioscorea alata (Rotuman 'uhi) of which Whistler (1989:24) recorded 26 clones ('uh 'on Malu, 'uh faktoto, 'uhse'e, fakso 'ul fisi mi'a, fakso at roroa, fuer fea, fuer kele, gu*, kaskasa, kaukauroroa, kaumaila, keu mia' 'ul mahini , keu mia' 'ul mafolu, keufisi, kinoa, maho'a, masi, pakete, parai, rautoto, riaria, roakroka, saulo*, taniale, toga, veni). Yams of secondary importance include the Dioscorea esculenta (Lour.) (Rotuman ʻuhlei) of which Whistler (1989:24) recorded four clones (ʻuhlei atkaka, ʻuhlei pupuk, ʻuhlei Rotuma, ʻuhlei toagfiti); the Dioscorea nummularia (Rotuman parai); and the Dioscorea sp. (Rotuman fav ʻon safoka).

Yams can be grown (1) in flat areas, (2) in mounds, ridges, or on raised beds, and (3) in trenches or holes (Coursey 1967:79-81; Onwueme 1978:45-48). Yams can be planted in flat, unusually soft and deep, alluvial flood plains by simply placing the sett a few centimeters below the ground surface. More often yams are planted in mounds or hills. Topsoil is drawn together and mixed with mulch to create a loose soil in which the tuber can grow. The third method is to dig a trench or hole and fill it with earth and compost into which the setts are planted. Coursey (1967:81) notes that this method is used "where soil is particularly poor or stony," and Purseglove (1972) notes that it was a method often used throughout the Pacific.

On Rotuma yams were planted in mounds where the soil was deep enough, and in artificially enriched holes in areas with limited soil development. The archaeological evidence of yam planting holes is found in the district of Oinafa where hundreds of holes were created in ʻaʻa lava flows. In these rocky areas it would have been virtually impossible to plant taro or the other primary cultigens and thus cultivating yams in artificially created pits was the only agricultural alternative.

The productive yield of yams depends on:

> (1) The basic production potential of the species and variety; (2) The quality of the material used for propagation; (3) the quantity of material planted per unit area of land; (4) The quality of the soil; (5) The adequacy and regularity of the

> water supply; (6) the degree of insolation; (7) competition from weeds or intercrops; (8) attack by pests and diseases (Coursey 1967:92-93).

Several studies suggest that the yield of Dioscorea alata ranges from 6838 to 42,542 kg/ha (Coursey 1967:89-92). Coursey (1967:92), however, concludes that "a fairly realistic indication of the gross yields that can be expected" for Dioscorea alata grown in Southeast Asia is ca. 12,500 to 25,000 kg/ha. This is the same figure provided by Landon (1984:279) for Southeast Asia, with a figure of 9280 kg/ha being the mean yam yield "for all less developed countries" (Landon 1984:270).

On Rotuma the quality of soil is the primary variable determining the yield of yams (see Table 4.2). In those portions of the island with well developed rich soils, yam yields would have been quite high. These are the same areas as those which could be used to grow Colocasia. It seems reasonable to infer that the combined tuber yields in these areas would be in the 20,000 to 30,000 kg/ha range. In contrast, the yield of yams in more marginal conditions, where only yams could be grown through mulching in artificially created holes, would be significantly lower. In these areas, yields closer to 7000 kg/ha would have been approached.

Bananas

Bananas (Musa x paradisiaca L.) (Rotuman Pari) are grown throughout Rotuma and are eaten either ripe or green, and either cooked or uncooked. Whistler (1989:15) recorded 22 different varieties of bananas (faksara hue roroa, faksara hue 'el'ele, fut Sa'moa, fut Rotuma, ha*kekele, mami, mermere, molea, paai Sa'moa, pamafua, pamea, parsika, poka*, rahrahu, ruaniua, sae liu, sae pukpuku, sae roaroa, sansani, taga, tapua, vavani). While not a staple of contemporary Rotumans, they are eaten as snacks and during ceremonial occasions. Landon (1974:271) suggests that an annual yield of 15,000 to 25,000 kg/ha can be grown under rainfed conditions. On Rotuma different varieties of bananas are grown in diverse environmental settings ranging from the interior valley in rich deep soil to the coastal calcareous sand beaches. The yields of bananas in these different environments undoubtedly differs with regards to the productivity of the soil.

Breadfruit

Whistler (1989:24) recorded nine varieties of seeded and unseeded breadfruit on Rotuma (<u>'ul</u> <u>fiti</u>, <u>'ul</u> <u>futpou</u>, <u>'ul</u> <u>kaumaja</u>, <u>'ul</u> <u>ma</u> <u>'on</u> <u>hula</u>, <u>'ul</u> <u>mahalu</u>, <u>'ul</u> <u>makeva</u>, <u>'ul</u> <u>pulpulu</u>, <u>'ul</u> <u>raululu</u>, <u>'ul</u> <u>Rotuma</u>). Breadfruit trees produce an edible fruit and the wood is used for the construction of boats and houses. Breadfruit trees usually bear fruit twice a year in tropical Polynesia (Kirch 1991b:118), and on Rotuma two fruit-bearing seasons were observed, one in January-February, and the other in June-July. Wright (1962:79) notes that breadfruit are tolerant of free calcium carbonate and are therefore one of the only crops that can be grown in the coastal beach soils of Western Samoa. The same conditions apply in Rotuma, and breadfruit are grown throughout the coastal villages and in some of the interior garden plots. Purseglove (1968:382) states that "mature trees will yield up to 700 fruits per year, each weighing 2-10 lb," and trees can be planted 9 to 12 m apart. Spacing at 15 m intervals would give a density of ca. 44 trees per hectare. If an average breadfruit weighed 2.2 kg, an annual yield of 70,000 kg/ha is possible. However, there is no locality on Rotuma where trees were planted at this density and therefore yields were undoubtedly much lower.

Coconut

Whistler (1989:13-14) recorded ten varieties of coconuts (Cocos nucifera L.) on Rotuma (niu ‘el‘ele, niu ‘uta, niu fa‘fa‘o, niu jarava, niu kaumaja, niu mi‘a, niu pui, niu unu, niu vai, no‘no‘o). Coconuts are grown throughout the island in both beach soils and on the more developed volcanic soils. They do not, however, thrive in the rocky areas of the island. Rotumans use coconuts as additives when preparing meals, for drinking, and for feeding pigs. Today they are grown for copra, which is exported to Fiji. The conversion of plant matter into animal protein was probably the most important use of coconuts in the prehistoric and early historic periods in Rotuma. Landon (19:272) indicates that the annual yield of dried copra from rainfed coconuts is between 1500 to 2500 kg/ha. The quantity of fresh coconut meat available for pig fodder would be considerably more.

The Distribution of Protohistoric Agricultural Resources

Agricultural crops on Rotuma are distributed in a dense and predictable manner. By planting crops in clearly defined plots, the cultigens comprise a relatively dense resource. In addition, it would have been possible to predict with some certainty whether or not the crops would have been present in a particular location. Furthermore the yield and quality of the crops would have been relatively predictable. Although the crops are considered dense and predictable resources, several early accounts attest to variability in their spatial and temporal distributions.

Early accounts of Rotuma generally describe the island as extremely fertile and productive. The Captain of the Pandora, the first European ship to visit the island, noted that the "hills are cultivated up to their very summits with coconut trees and other articles, and the island is in general well or better cultivated and its inhabitants more numerous for its size than any of the islands we have hitherto seen" (Edwards 1791). Bennett (1831) described Rotuma as "beautifully picturesque, (with) verdant hills gradually rising from the sandy beach, giving it a highly fertile appearance." Lesson (1838-9), Osborn (1835), and Forbes (1875) also note the fertility of the soils. In 1832 Jarman (1832:184) noted that "the island being very productive... (the inhabitants) have not to labor much for their subsistence." European observers in the late 1800s continued to note the island's fertility (Gardiner 1898; Allardyce 1885-6) and Allen (1895) wrote "the fertility of the soil is very great; everything grows luxuriantly and quickly."

Despite these reports of Rotuma's fertility, a number of accounts from the early 1800s note that it was extremely difficult to procure supplies from the island. Captain Smith (1813) of the Duff, the second European ship to visit Rotuma, wrote in the late 1700s:

> We arrived at... Rotuma, where we hoped by bartering with the natives, to procure some yams, etc. On nearing the land about fifty or sixty canoes came off, but scarcely any of them had any provision, and the people were exceedingly careful in parting with what little they had; they would not so much as part with a bread-fruit or cocoa-nut without demanding more than its value. We found it very hard to deal with these people, and only obtained a few yams at an exorbitant rate.

Dillon (1829:94) had a similar experience in 1827 and wrote: "...generally the productions of the island are not abundant; and this small spot being so thickly populated, the surplus produce is but inconsiderable at all times." Cheever (1834) notes "there is little or no provisions to be got here, but coconuts and fruit in abundance."

Ethnohistorical Accounts of Spatial and Temporal Variation in Crop Production

The apparent discrepancy concerning the productivity of the island in these accounts could be due to either spatial or temporal variation in the distribution of terrestrial resources. Alternatively, the Rotumans may have been keenly aware of their relative isolation and the effects associated with giving or trading resources that might later be critical for survival. In Chapter 5 I show that the distribution of terrestrial resources is not homogeneous throughout Rotuma. The ethnohistorical accounts concerning the spatial variation of productivity are discussed next and then the possibility of temporal variation of crop production due to natural disasters is addressed.

Spatial Variation in Crop Production

Although crops were grown throughout Rotuma in the protohistoric period, the early accounts are instructive as to which parts of the island were the most productive. These accounts coincide with the terrestrial productivity indices calculated in Chapter 5. In 1824 Lesson (1938-9) remarked that the gardens were "located in the interior of the island and form a continuous series of plantations."

Gardiner (1898:481) states that the "hill people cultivated exclusively in the great central valley" and Boddam-Whetham (1876:263) wrote, "as the center was the most fertile portion of the island, the losers had to cultivate it and the produce was at the disposal of the victors." In the late 1800s, people living in the eastern side of the island had plots in the interior of other districts, perhaps as a means of cultivating more productive land (Gardiner 1898:482). These accounts apparently refer to the interior portions of Itu'ti'u, Malhaha, and Juju as the most productive part of the island. Based on field observations in 1991, these are still the areas that are most intensively cultivated.

Although for political reasons the early ships resupplied at Oinafa bay on the east side of the island, they often found it advantageous to resupply at the Bay of Fao on the west side. This was probably due in part to the bay's close proximity to the more productive regions of the island and in part to the presence of a protected natural harbor. Findlay (n.d) wrote that there were:

> ..two roadsteads in Rotuma. That of Oinafa was for the long time the only one used, and still has the greatest number of ships to visit it, because this village is the residence of the king and chiefs of the conquering party; but more provisions may be found in the bay of Fao, where you may water as in the first, by the assistance of the natives.

Other accounts referred to the west side as "the pleasant part of the island" (Eagleston 1834) and "the principal anchorage" (Osborn 1835). Bennett (1831:199) maintained that "ships should prefer lying off and on at the lee-side (northwest) of the island, where they will be able readily to procure their supplies." Furthermore, he (Bennett

1831:199) wrote that the southern district of Fangwot (Juju and Pepjei) was the "best part of the island for procuring a large supply of provisions."

Several Rotuman myths are enlightening with respect to the spatial distribution of agricultural resources. The following myth provides an indication of which district on the island was considered the most productive.

> When the child, Ravaka grew to a handsome young man, his father (Fonmon, the sau of the island) became very proud of him and wished him to be seen by all the people of Rotuma. He sent Ravaka to live for a time in each district of the island. This scheme was also to rid Fonmon of providing for the boy who was an enormous eater. Ravaka went to Fanguta, Itu'ti'u and Malhaha, but it was only at this last district that the people supplied him with enough food to satisfy his appetite. In appreciation Malhaha was given a large strip of land in the interior of the island behind their boundary at that time (MacGregor 1932).

The symbolism of the myth is that the districts of Fag'uta (Juju and Pepjei) and Itu'ti'u could not support the demands of the preeminent chiefs of the island who were from the eastern district of Noatau. Malhaha, the district with the highest terrestrial productivity index (see Chapter 5), was the only district that was capable of meeting the demands of the chiefs.

Temporal Variation in Crop Production

As an alternative to the spatial variation of productive resources, it is possible that the traders who experienced difficulties obtaining supplies visited the island during or after a natural disaster when agricultural surplus would have been minimal. The two primary natural threats to agricultural productivity appear to have been drought and hurricanes.

Lesson (1838-9) noted the possible impact of natural disasters and wrote, "it is only in very rare cases, during extreme atmospheric disturbances, that their existence on that island is ever endangered." Lesson (1838-9) goes on to describe a famine caused by a drought that forced the Rotumans to kill most of their pigs and caused "more than a hundred islanders to die of starvation." Dillon (1829:93) reports a hurricane that struck Rotuma eight to ten years before his visit that ravaged the crops, causing a famine. Similarly, Boddam-Whetham (1876:262) reports the effects of a devastating hurricane that threatened the islanders with starvation. Contemporary weather statistics indicate that hurricanes generally strike every five to 10 years (Kerr 1976; Revell 1981). Today, relief is given by international agencies, but in the past these natural disasters could have had serious consequences for such an isolated island.

Swine

Swine were probably an important resource in traditional Rotuman society. Pigs were a source of protein and fat, in addition to being potent symbolic icons which could have bestowed prestige on particular individuals. In contemporary Rotuma, pigs are kept in stone walled pens and fed coconuts. If pigs were raised in a similar manner during the prehistoric-protohistoric period they would have been a valuable resource.

Although pigs were probably kept in stone walled enclosures and formed herds, they forage independently and therefore were not spatially distributed in a particularly dense manner. Furthermore, pigs move within the confines of their enclosures and therefore their presence in a specific location is somewhat unpredictable. Their presence is not as unpredictable as free ranging game, but they can be moved from one pen to another which adds an additional element of unpredictability to their temporal distribution.

Marine resources

Fiji Fisheries Division Survey

A 1983 Fijian Fisheries Division report titled "The Fishery Resources of Rotuma" classified the marine resources surrounding the island into two ecological zones: the inshore and the offshore regions (Figure 4.1) (FFD 1983:6). The inshore zone includes the fringing reef which surrounds the island. Water depth in this zone ranges from completely dry at low tide to approximately 2 m at high tide. There are occasional "holes" in the reef where the water is considerably deeper, but in general Rotuma does not have an extensive lagoon (FFD 1983:7,9). During their survey, the Fisheries Division caught a number reef fish including Acanthurus guttatus, A. pyroferus, Naso spp., and scarids. Less plentiful were predatory fish such as serranids and lutjanids. In general, the survey concluded that the biomass on the Rotuman reefs was relatively low in comparison to the other islands of Fiji (FFD 1983:9). However, the survey team did not determine whether the low biomass was the result of overfishing or was due to the particular ecological features of the reef (FFD 1983:12).

The offshore region was divided into the bank zone and the bank edge. The bank consists of a relatively flat area of sand and coral with water depth ranging up to

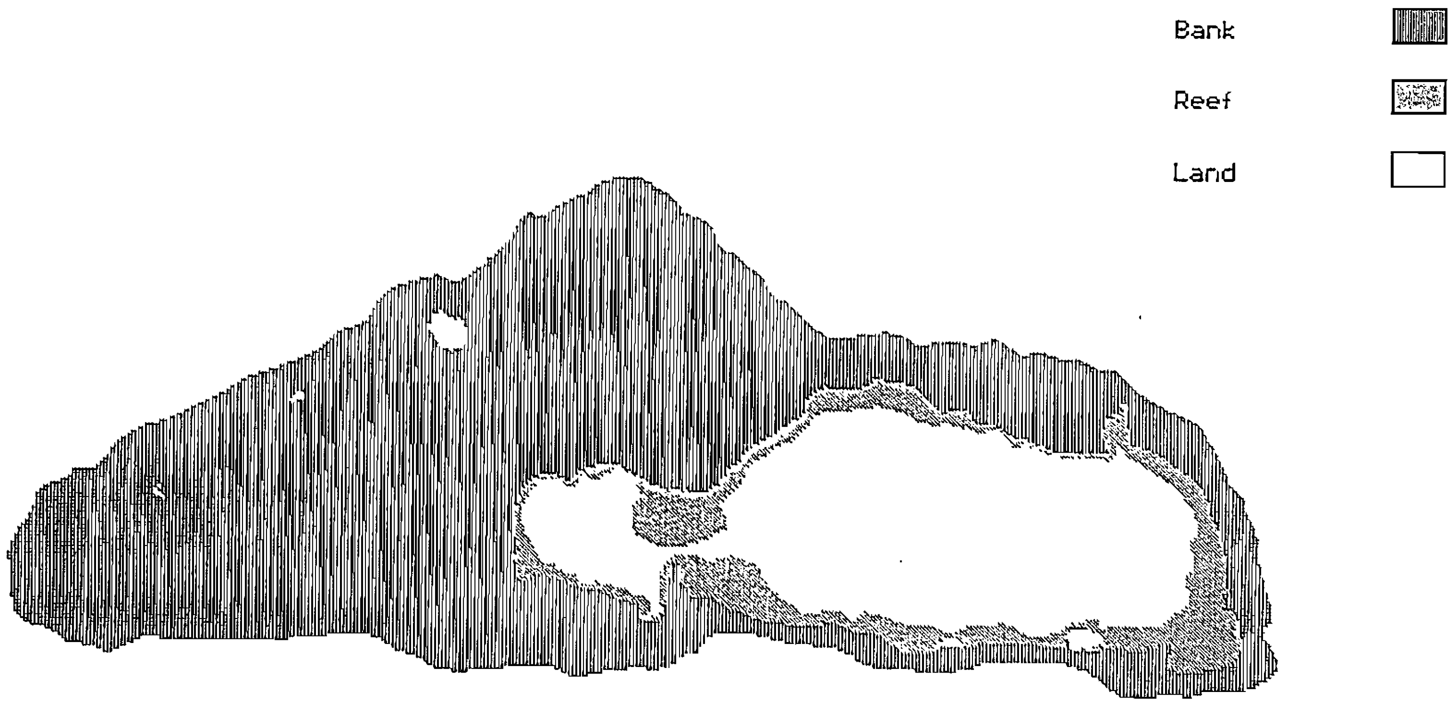

Figure 4.1 Rotuman marine resources.

60 m. It extends from the edge of the reef for a distance ranging from ca. 0.4 to 11 km. The interface between the reef and the bank is abrupt, with the depth of water increasing rapidly. The outer edge of the bank is also relatively steep, dropping from 60 to 100 m over a short distance. The fisheries survey concentrated on the bank edge and did only minimal research on the bank itself. By trolling along the edge of the bank the Fisheries Division caught Gymnosarda unicolor, Caranx melampygus, Thunnus alvacares, and Grammatorcynus bicarinatus. Residents of Rotuma report additional catches of Coryphanaena hippursus, Acanthocybium solandri, Elagatis bipinnulatus, and Scomberomorus commerson. Bottomfish, including Lethrinidae, were caught on the edge of the bank in about 50 fathoms. The presence of Snapper in deeper water was also noted (FFD 1983:13-15).

Ethnohistorical Accounts of Marine Exploitation

In traditional Rotuman society the marine resources were owned and controlled in a similar manner to the terrestrial resources. Marine boundaries were defined as a continuation of the boundaries on the island. Gardiner (1898:483-484) suggests that the boundaries extended from the shore out to the edge of the reef and the zone beyond the edge of the reef was designated communal property. A consultant to MacGregor (1932) reaffirmed this suggestion and notes that the territorial portion of the reef had the same name as the adjacent land. The zone outside of the reef, the bank, while "common property" to all was probably under the jurisdiction of the nearest district chief. This is indicated by the custom of people paying respect to the chief of a district when they sailed through the adjacent bank area (Trouillet n.d.).

The marine resources on Rotuma were reported as relatively rich during the early historic period. Bennett (1831) notes that the Rotumans procured large quantities of fish and mollusks from the reef on a daily basis. This food was thought to be the principal protein consumed by the Rotumans (Gardiner 1898). Gardiner (1898:425) suggests that the abundance of fish on the reef was so large that little deep-sea fishing took place. Fish were caught on the reef by hook, nets, and traps (Gardiner 1898:425-428). In addition, poisoning was used (Boddam-Whetham 1876:268).

The marine resources of Rotuma are generally not distributed in a dense and predictable manner. Some schools of fish could be considered densely distributed resources while other types of fish forage individually. The temporal predictability of fish also varies. Fish are generally mobile animals and therefore their presence or absence is somewhat unpredictable. Some species of fish, however, occupy specific niches and could be expected to be found in relatively circumscribed areas. These fish would be more predictable but, in relation to agricultural resources, the predictability of fish is generally low. The distribution of fish that live on the marine bank surrounding Rotuma would appear even less dense and predictably distributed than reef fish. Fish or shellfish grown in aquaculture environments would constitute dense and predictable resources, but these techniques were apparently not extensively practiced on Rotuma.

Summary

Both terrestrial and marine resources were exploited in traditional Rotuman society. The exploitation of terrestrial plant resources relied upon shifting cultivation, intensive dryland cultivation, and "garden island" systems. Using these methods large quantities of taro, yams, and swamp taro, were grown. The coconuts that flourished throughout parts of the island were undoubtedly used as fodder for swine, creating an important source of protein. The ethnohistorical sources suggest that the distribution of the productive land was not homogeneous, but that the most productive area was the "great central valley" located on the western side of the island. These accounts coincide with the analysis presented in Chapter 5. Although the productive land was heterogeneously distributed, the primary terrestrial resources were dense and predictable. Certain regions of Rotuma were extremely productive and that productivity could be reliably anticipated, with some inter-annual variation. The crops grown in these parts of the island were dense and predictable resources that were only occasionally disrupted by natural disasters such as hurricanes and drought.

The marine resources of Rotuma included the inshore and offshore zones. According to the ethnohistorical sources, the reef provided large quantities of fish, although the FFD report indicates that the biomass level is currently lower than other islands in Fiji. The offshore bank provided another resource that was exploited by the Rotumans, although the "costs" involved were probably higher than exploiting the reef resources (Allen 1992). While these resources were significant in traditional Rotuman society they were not dense and predictably distributed. The "risks" associated with exploiting marine resources would have been higher than those associated with terrestrial resources because marine resources are not stationary. However, the marine resources could have been a relatively important source of food in less productive terrestrial zones of the island.

CHAPTER 5

GEOGRAPHIC INFORMATION SYSTEM ANALYSIS OF ROTUMAN SUBSISTENCE RESOURCES

An analysis of the subsistence resources on Rotuma is presented in this chapter. This analysis relies heavily upon a geographic information system (GIS). The chapter begins with a discussion of GIS and then proceeds to a consideration of the resources on the island.

Geographic Information Systems

Pacific archaeologists have used relational data bases to facilitate spatial and temporal analysis (Weisler and Kirch 1985; Ladefoged 1987; Ladefoged et al. 1987; Kirch 1988). Most of these studies have used relational data bases to create an inventory of the architectural features in a study area. In general, feature attributes are coded and stored in a data base for statistical analysis. While these computer based projects allow the manipulation of large quantities of data, they do not utilize the spatial information inherent in mapped entities to the fullest extent. Maps have recently changed from "images describing the location of features, to mapped information quantifying a physical or abstract system in prescriptive terms" (Berry

1987:1405). Maps are no longer solely paper representations, but can now be digitally encoded to store large quantities of attributional data. This shift coincides with the development of a spatially indexed GIS.

A GIS is a relational database with a spatial component (Aronoff 1989; Star and Estes 1990; Laurini and Thompson 1992). It is "designed for the manipulation, analysis, storage, capture, retrieval, and display of data that can be referenced to geographic locations" (Kvamme 1989:139). The definitive characteristic of a GIS is an automated linkage between thematic and locational attributes (Marble 1984a; Burrough 1986). The data in a GIS have locational, nonlocational, and temporal dimensions (Dangermond 1984). Locational data include absolute positions or relative topological relations. Nonlocational data are the state or value of specific locational entities, and temporal data define the time period for which locational and nonlocational data are valid. The three dimensions of data are integrated to form a single layer or theme. An example of a layer is the spatial distribution of different kinds of archaeological sites dating to a specific time period. Examples of environmental layers include the spatial distribution of elevation, soils, or vegetation patterns. Several spatially co-registered layers of distinct information are combined to form the GIS. The GIS provides a fundamental technology for merging various independent data sets into usable information (Logan and Bryant 1987; Star and Estes 1990).

Marble (1990:12-13) provides a brief history of the development of GIS. The post World War II introduction of digital computers was a necessary antecedent for

GIS development but it was not until the early 1960s that technology was developed for managing spatial data. It was during this period that Tomlinson (Tomlinson et al. 1976) designed the first operational GIS for the Canada Land Inventory. During the late 1960s and 1970s, government agencies in the United States tried to implement a GIS but generally failed due to their concentration on technical questions rather than institutional factors. It was not until the early 1980s that the transition from a nonstandardized GIS to a widespread standardized technology occurred. Environmental Systems Research Institute (ESRI) developed ARC/INFO GIS, a system which was adapted to a variety of spatial problems. The revised and updated version of ARC/INFO remains the standard in the GIS industry today.

There are advantages to a GIS over conventional systems of storing and analyzing data (Dangermond 1984; Marble 1984a). GIS data are maintained in a physically compact form, usually on a magnetic computer medium. The cost of maintaining and extracting data is minimal, and retrieval is extremely efficient. Data are easily manipulated to form new layers, make calculations, and test specific models. The interactive graphic capabilities of a GIS are immense. Marble (1984b) notes that the value of automated analysis is greatest when many outputs are required from the same data base, when mapped and numerical analyses need to be combined, and when data are frequently changed or updated. These are the requirements of many archaeological projects. The primary disadvantages of a GIS are the initial costs of the hardware and software, the costs of entering the data, and the technical and financial overhead to maintain the system (Marble 1984a).

GIS are generally composed of four main subsystems (Marble 1990, 1984a). The data entry subsystem translates raw or partially processed spatial data into carefully controlled and evaluated data (Marble 1990). The most common form of input is digitizing maps. However, automated line tracing and scanning are often used. Digital information from remote sensing devices, global positioning systems, or digital survey instruments can also be read by the data entry subsystem. The second subsystem stores and accesses data in an efficient manner. The third subsystem analyzes and manipulates the data. This can be done by internal modules of the GIS or through an interface to a third party statistical software package. Marble (1990:13) notes that presently this third subsystem is the most underdeveloped of the four subsystems. Current GIS tend to focus on the creation of new maps by overlays and do not adequately perform spatial analysis and statistics. The forth subsystem is the data visualization and reporting module. This subsystem produces the results of queries and analysis in the form of new maps, graphics, and text. Marble (1990:12) suggests that current GIS designers are not innovative enough in this subsystem and merely try to replicate the results of traditional cartography.

GIS are usually one of three types, raster, vector, or object oriented systems (Zubrow 1990). The different systems have different characteristics which affect the way units are defined, the spatial relationships between units, the meanings assigned to the GIS representation or phenomenon, and the type of analysis that can be performed (Zubrow 1990:69-71). Raster based GIS divide space into grids. Regions are represented by a matrix of grid cells with associated values for each cell representing some characteristic of the region such as topography, soil type, or slope (Savage 1990a:24). Values can be coded in a number of ways including binary (presence/absence), extreme value (highest or lowest), average value, predominant value, or centroid of cell values (Savage 1990a:24). The advantage of raster based systems is that they have simple data structures which make them easy to understand and operate. Layers are relatively easy to manipulate, which facilitates the creation of new layers and data analysis. The main disadvantage of raster systems is the need to represent real world objects as either a single cell or a group of cells. Objects smaller or larger than the size of the grid cell will be disproportionately represented in the GIS. Because real world phenomena are rarely the same size and shape as the grid cells there is always some loss of detail. Zubrow (1990:70) notes that this loss is the "graphic equivalent of the rounding problem in statistics."

Vector based GIS use points, lines and areas or polygons to represent spatial phenomena (Savage 1990a:23). The advantage of vector representation is that it is quite similar to the way in which people perceive real world phenomena. Irregular shaped entities can be depicted with lines and edges. Another advantage is that a vector system can produce output that is visually similar to cartographic maps which is considerably more aesthetic than the output of raster systems. Marble (1984b) cautions, however, that this may be a disadvantage as it restrains the way people think of GIS output and as a result, there are few innovative approaches for clearly depicting geographic images. The primary disadvantage of vector systems is that they often foster a false sense of precision. Some phenomena do not have sharp boundaries, yet when they are entered into a GIS they become clearly defined entities. Vector systems also have disadvantages when performing boolean manipulations. These manipulations typically involve vector to raster conversion to perform the overlay and then a conversion back to vector format. This conversion can significantly degrade the data.

Object oriented GIS define objects such as roads, architectural structures, or artifacts as primitives in the data structure. These primitives can be combined to form other larger scale objects such as archaeological sites or activity areas. The primary disadvantage of object oriented systems is that the boundaries of entities are often unknown and therefore it is impossible to define the objects.

Zubrow (1990:71) notes that the characteristics of the three types of systems have important implications for studying archaeological landscapes. Raster based systems depict real world phenomena as values in a grid which prompts researchers to examine densities and distributions. In contrast, the point and boundary structure of vector systems permits both site and siteless approaches to archaeology. Object oriented systems can accommodate all approaches but tend to be less flexible.

Archaeologists have used GIS for a number of different applications. Briuer (1988) used a GIS to inventory and characterize 2100 archaeological sites. His main objective was to establish a statistically representative sample of the sites for preservation. A more elaborate use of a GIS is the generation of new and complex types of data through various transformations of existing themes by map algebra and boolean manipulation. For example the agricultural potential of different areas can be determined from several environmental themes (Burrough 1986; Brown and Rubin 1981, 1982). Another aspect of a GIS is that it can be coupled with statistical software such as SPSS or SAS. Kvamme (1990) used one-sample statistical tests to examine the environmental location of archaeological features. Savage (1990b) used a GIS to consider hydrology and topography in conjunction with archaeological evidence to model prehistoric territories. Allen (1990) used a GIS to model trade patterns based on native and early historic settlements and the hydrology of the area. Perhaps the most extensive use of GIS by archaeologists has been for the creation of predictive models (Kvamme 1989:176). The goal of predictive models is to identify areas within a region where archaeological sites are located. The premise of such attempts is that site locations will correlate to noncultural aspects of the environment. Several approaches to predictive modeling have been employed, including logistical regression techniques (Forney et al. 1988; Warren 1988) and multiple regression techniques (Savage 1990b). In another type of application Gaffney and Stancic (1991) used a GIS to analyze the distribution of bronze and iron age hillforts on the island of Hvar, Yugoslavia, in terms of site catchments. Their approach was innovative in that site catchments were defined by terrain surfaces, movement difficulties, and travel times. Recently, archaeologists have modeled social landscapes by looking at variables such as view perspectives and territorial boundary markers (Gaffney et. al 1992; Green and Stine 1992; Ogleby 1992).

The Rotuman GIS

Version four of Clark University's raster based GIS, IDRISI, was used for the analysis of the Rotuman data. The decision to employ IDRISI was based on a number of factors. First, IDRISI is significantly less expensive than the standard vector based GIS, ESRI's Arc/info. It was possible to purchase IDRISI at the student rate and run it on a personal computer. Furthermore, IDRISI contains an extensive array of modules for project management, display, data entry, attribute data management, and spatial data management. Finally, because IDRISI is a raster based GIS, it is relatively easy to use and the manipulation and creation of new data layers was simple. The disadvantage of spatial round off error inherent in raster systems was overcome by using a relatively small grid size.

Version four of IDRISI was installed on a Gateway 2000 33 megahertz 486 PC. A 12 x 12 inch Summagraphics SummaSketch II digitizing tablet was used for data input. A computer aided design program called DESIGNCAD 2D was used to digitize the maps and then the data were manipulated for IDRISI input. Output was obtained from a Hewlett Packard laser jet printer.

The Rotuma GIS is composed of seven different layers which include two soil layers, two terrestrial district boundary layers, two marine boundary layers, and a marine resource layer. The soil layers and the terrestrial district boundary layers have a similar structure. These layers cover a 15 km by 6 km area with a cell resolution of 10 m. These layers therefore consist of 1500 columns by 600 rows and include a total of 900,000 cells. The marine resource layer and the marine district boundary layers cover a 29 km by 14 km area with a cell resolution of 25 m. These layers consist of 1160 columns by 560 rows and include a total of 649,600 cells.

Districts and District Grouping GIS Layers

A GIS layer containing the district boundaries of the island was created by copying the district boundaries onto a 1:25,000 map from a 1:10,000 base map that was archived in the Rotuma District Office. The district boundaries depicted on the map are contemporary but probably reflect ancient territorial boundaries since field checking in 1991 revealed that some of the boundaries were delineated on the ground by stone walls. The district boundaries depicted on the 1:25,000 map were digitized for input into the GIS. The district layer is depicted in Figure 5.1, and the area of the seven districts is given in Table 5.1.

A second layer was derived from the district boundary layer by grouping the districts into northern, southern, eastern, and western district groups. The analytical justification for these social groupings is discussed in Chapter 6. The four district groups are depicted in Figure 5.2 and the total area of each district group is given in Table 5.2.

Terrestrial Resources

Soil and Productivity GIS Layers

The soil map produced by Laffan and Smith (1986) was digitized to create a GIS soil layer. The original map contained 56 polygons which were classified into 23 soil mapping units (see Table 3.3). The 23 soil mapping units were reclassified to

Table 5.1 District soil types.

District	Area ha.	Well Developed Soil ha. (%)	Rock ha. (%)	Beach ha. (%)	Swamp ha. (%)
Malhaha	526.05	447.89 (85.1)	49.34 (9.4)	28.82 (5.5)	0.00 (0.0)
Pepjei	441.61	306.87 (69.5)	116.60 (26.4)	14.68 (3.3)	3.46 (0.8)
Juju	425.37	358.69 (84.3)	43.19 (10.2)	21.72 (5.1)	1.77 (0.4)
Oinafa	890.22	103.59 (11.6)	736.67 (82.8)	46.82 (5.3)	3.14 (0.4)
Noatau	594.73	97.27 (16.4)	399.34 (67.2)	85.30 (14.4)	12.82 (2.2)
Itu'ti'u	1049.69	834.20 (79.5)	105.49 (10.1)	95.91 (9.1)	14.09 (1.3)
Itu'muta	286.58	129.01 (45.0)	124.35 (43.4)	22.84 (8.0)	10.38 (3.6)
Total	4214.25	2277.52 (54.0)	1574.98 (37.4)	316.09 (7.5)	45.66 (1.1)

Table 5.2 District group soil types.

District Group	Area ha.	Well Developed Soil ha. (%)	Rock ha. (%)	Beach ha. (%)	Swamp ha. (%)
Northern	526.05	447.89 (85.1)	49.34 (9.4)	28.82 (5.5)	0.00 (0.0)
Southern	866.98	665.56 (76.8)	159.79 (18.4)	36.40 (4.2)	5.23 (0.6)
Eastern	1484.95	200.86 (13.5)	1136.01 (76.5)	132.12 (8.9)	15.96 (1.1)
Western	1336.27	963.21 (72.1)	229.84 (17.2)	118.75 (8.9)	24.47 (1.8)
Total	4214.25	2277.52 (54.0)	1574.98 (37.4)	316.09 (1.1)	45.66 (7.5)

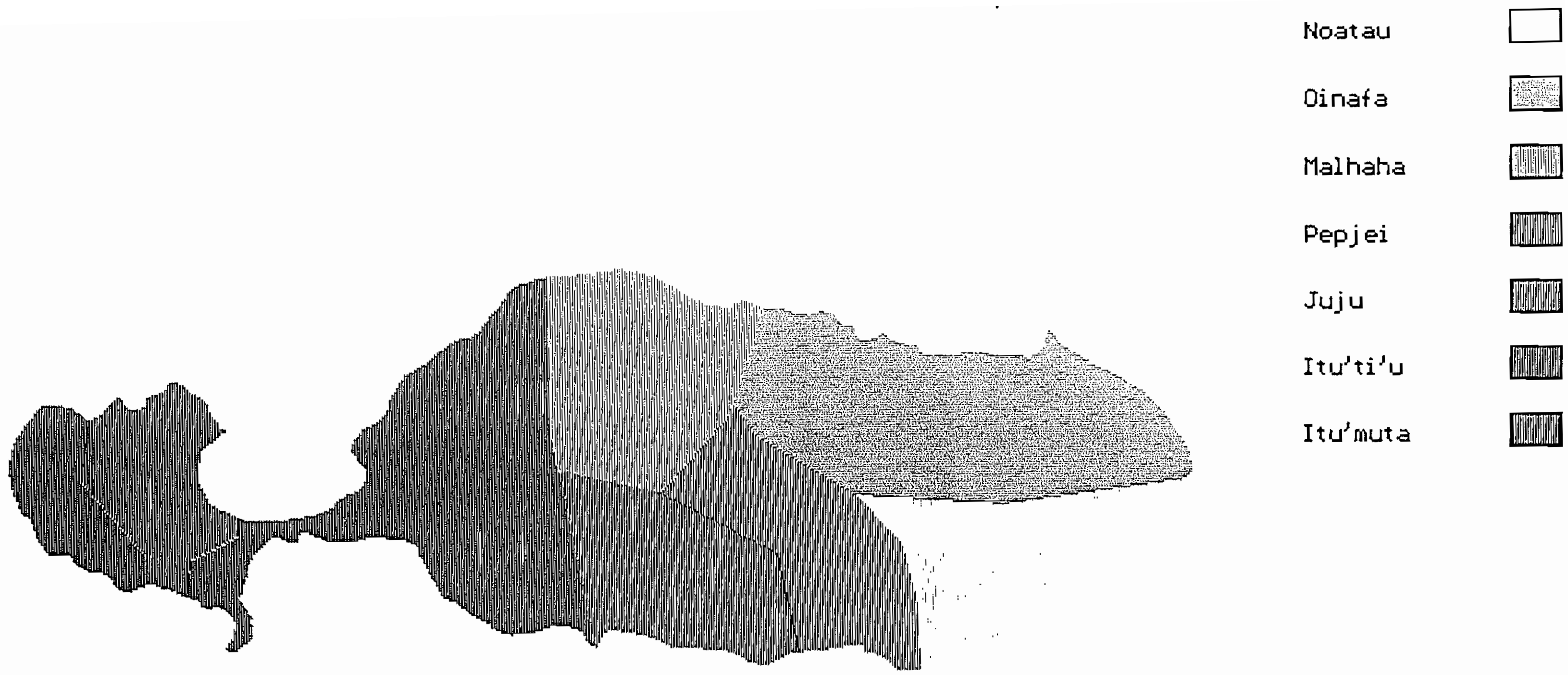

Figure 5.1 GIS district layer

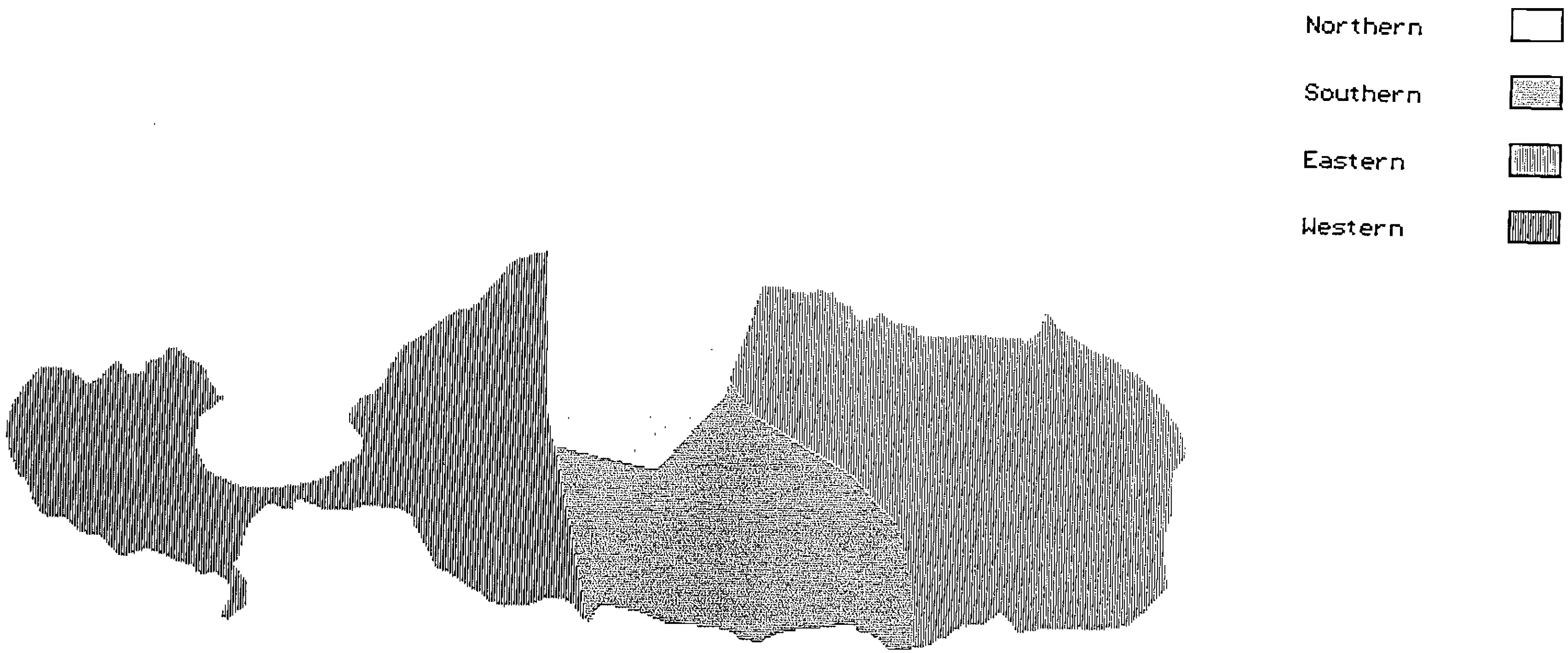

Figure 5.2 GIS district group layer.

Figure 5.3 GIS soil layer.

produce a new layer composed of four soil classes (see Table 3.3 and Figure 5.3). The four soil classes include: 1) well developed soils, 2) swamps, 3) beaches, and 4) relatively unweathered rock. The Kirkiri-Sumi, Mafua series, Ono-Sumi, Paptoa-Reree, Reree, Roroa, Umea series, and Vaka series soil mapping units are characterized by relatively well developed soils and were classified as such. The Rana soil mapping unit is composed of a thick, peaty sandy loam horizon overlying a mixture of terrigenous sediment and calcareous sand. It is situated behind the beach berms, is poorly drained and constantly saturated, and has been classified as a swamp. The Motusa soil mapping unit is composed of calcareous sand and is classified as beach sediment. The Hafhafu-Ututu, Losa-Hafhafu-Ututu, and Vaka series soil mapping units all contain a high percentage of unweathered or at most slightly weathered volcanic basalt flows and were therefore classified as rocky soils. It is worth noting that the four categories roughly correspond to the three Rotuman land divisions of "bush", "swamp", and "coast" specified by Gardiner (1898:483). Contemporary Rotumans make a distinction between "bush" land with fertile well developed soil, and "bush" land with rocky soils (Fuata Kamoe, Vafo'ou Jiare, personal communication 1991).

Tables 5.1 and 5.2 summarize the total percentage of the island that has been classified to the four soil types. Most of Rotuma (54%) is composed of well developed soils, 37.4% of the island is composed of rocky soils, 7.5% of the island is beach soils, and 1.1% of the island is swamp. The percentages of each soil class for each district are listed in Table 5.1, and the same information for the district groups is listed in Table 5.2. There is considerable variability in the distribution of soil classes by districts and district groups. Figure 5.4 graphically displays the soil percentages for the district groups and shows their departure from the island wide soil percentages. The northern, southern, and western district groups have a much larger proportion of well developed soil than the island as a whole. In contrast, the eastern districts contain a much lower proportion of well developed soils and a higher proportion of rocky soil. In sum, the four types of soils are not evenly distributed in the individual districts of the island. Some of the districts have much higher proportions of well developed soils whereas other districts have much higher proportions of rocky soils.

The relative productive potential of each of the four soil types for growing the primary subsistence crops was estimated. Productivity ratings were assigned on a scale from 0 to 1. Although the productivity ratings are not precise measures, they provide a means for assessing the relative productivity of areas throughout the island. As discussed in Chapter 4, the primary subsistence crops of Rotuma included taro, swamp taro, yam, and the tree crops of coconut and breadfruit. In areas of the island with well developed soil, the productive potential for all types of crops with the exception of swamp taro would have been relatively high. Areas with well developed soils have therefore be assigned a productivity rating of 1. The swampy areas of the island were more limited in the range of produce that could have been grown. These areas could have only have been used for the cultivation of the relatively slow growing swamp taro. A productivity rating of 0.3 has been assigned to the swampy

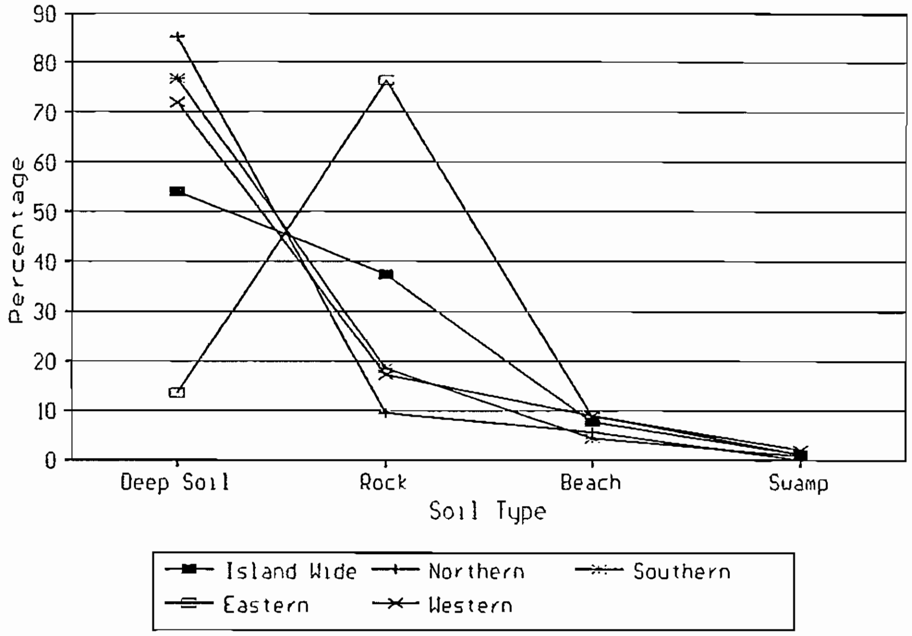

Figure 5.4 District group soil percentages.

areas of the island on the basis that swamp taro takes roughly three times as long to grow as dryland land taro. The beaches of Rotuma were probably restricted to the cultivation of coconuts and breadfruit. These calcareous soils generally lacked the nutrients of terrigenous soils and therefore have been assigned a productivity rating of 0.2. The rocky areas of the island are currently fallow. However, there is archaeological evidence that yams were grown in these areas at one time. In certain parts of the island there are hundreds of planting depressions which Rotuman consultants (Fuata Kamoe, personal communication, 1991) stated were artificially mulched for the cultivation of yams. Yams are therefore considered the main crop that could have been grown in the rocky areas of Rotuma. A productivity rating of 0.1 has been assigned to these areas. This rating is based on the estimates of yam production per hectare in relation to the estimates of dryland taro production per hectare that were presented in Chapter 4. Under optimal conditions approximately 30,000 kg/ha of dryland taro can be produced. In contrast, yam yields in the rocky areas of the island using artificial mulching would have been ca. 6500 kg/ha, or 22% of the yield of dryland taro under optimal conditions. Kirch (1991b:120) notes that intensive dryland cultivation such as artificial mulching, may take approximately twice the labor that regular dryland cultivation does. Dividing the relative crop yield in rocky areas (22%) by the amount of additional labor needed (2) results in the potential productivity of the rocky areas being approximately 10% of the optimal dryland zones. A relative productivity rating of 0.1 has therefore been assigned to the rocky areas.

The productivity ratings of the different types of soils throughout Rotuma can be used to calculate a terrestrial productivity index (TPI) for individual districts and for district groups. The TPI calculated for areas in Rotuma is a modified version of the "composite index of agricultural productivity" that Kintigh (1985:105-107) used in his study of subsistence strategies in the Southwest United States. Kintigh (1985:106) assigned ratings to different soils based on their potential for irrigated agriculture and then calculated an index for catchment areas around sites based on the percentage of soil types within the catchment. Acury (1990:108) has calculated similar soil productivity indices for counties in Kentucky, and notes that this type of measure was originally developed by Hart (1968) and was later elaborated by Raitz and O'Malley (1985).

The TPI for different areas on Rotuma were calculated using the following formula:

TPI=((% of area that is well developed soil*1.00)+(% of area that is swamp * 0.3)+(% of area that is beach * 0.2)+(% of area that is rock * 0.1)/100)

The TPI for the districts of the island are listed in Table 5.3 and graphically displayed in Figure 5.5, and the TPI for the district groups are listed in Table 5.4 and graphically displayed in Figure 5.6. The TPI of the entire island is 0.60. The district TPI indicate that Malhaha, Juju, and Itu'ti'u have the highest productive potentials with indices of 0.87, 0.86, and 0.83, respectively. Pepjei and Itu'muta have moderate productive potential with indices of 0.73 and 0.52, respectively. Noatau and Oinafa have the lowest productive potentials with indices of 0.27 and 0.21, respectively. A Mann-Whitney test for equal averages indicates that when Noatau and Oinafa are grouped together they have significantly smaller average TPI compared to the other five districts ($p=0.047$, $T=3$). The TPI of the district groups reflect this pattern (see Table 5.4 and Figure 5.6). The northern, southern, and western district groups all have relatively high TPI, and the eastern district group has a relatively low TPI.

Terrestrial productivity indices (TPI) are measures of potential productivity but they do not reflect how the size of a district or district group might compensate for low productive potential. To address this issue, area adjusted terrestrial productivity indices (AATPI) were calculated by multiplying the TPI by the area of the region in question. AATPI were calculated for individual districts and for district groups (see Tables 5.3 and 5.4, and Figures 5.7 and 5.8). The results indicate that Itu'ti'u is a

Table 5.3 District terrestrial productivity indexes (TPI) and area adjusted terrestrial productivity indexes (AATPI).

District	TPI	AATPI
Malhaha	0.87	458.59
Pepjei	0.73	322.50
Juju	0.86	367.88
Oinafa	0.21	187.56
Noatau	0.27	158.11
Itu'ti'u	0.83	868.16
Itu'muta	0.52	149.13

Table 5.4 District group terrestrial productivity indexes (TPI) and area adjusted terrestrial productivity indexes (AATPI).

District Group	TPI	AATPI
Northern	0.87	458.59
Southern	0.80	690.39
Eastern	0.23	345.67
Western	0.76	1017.29

relatively large district with a relatively high TPI and therefore had the highest AATPI of all the districts. Malhaha, Juju, and Pepjei all have relatively moderate to high AATPI, whereas Oinafa, Noatau, and Itu'muta have relatively low AATPI. The low AATPI value of Itu'muta is due in part to the small size of the district. The distribution of AATPI generally follow a similar pattern to the distribution of TPI. The eastern districts of Noatau and Oinafa have lower AATPI than all the other

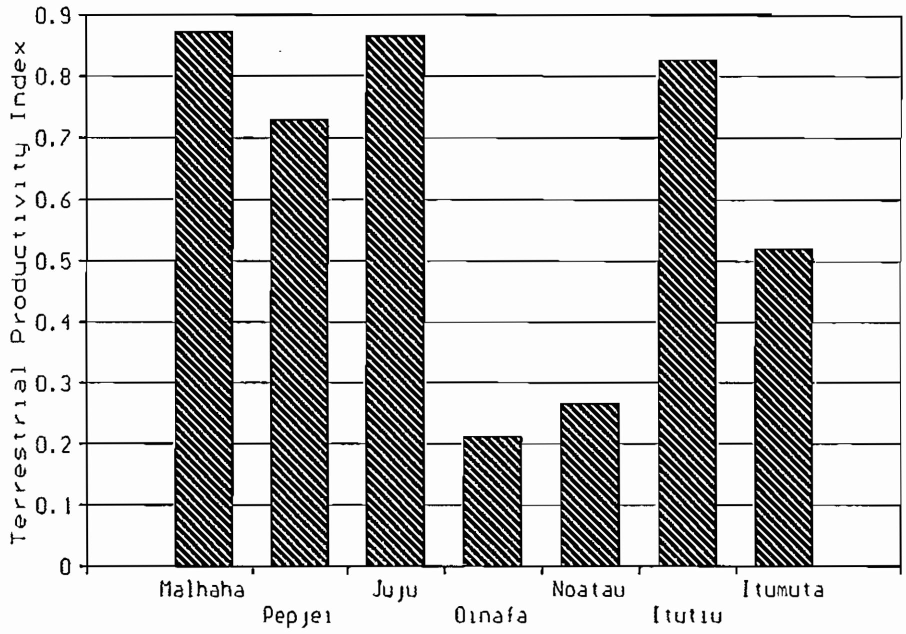

Figure 5.5 District terrestrial productivity indices.

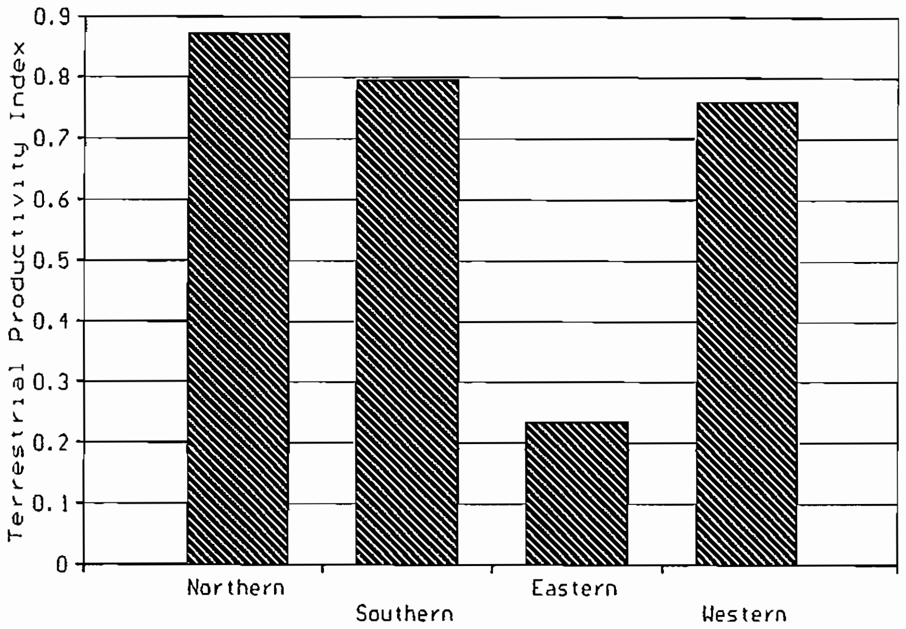

Figure 5.6 District group terrestrial productivity indices.

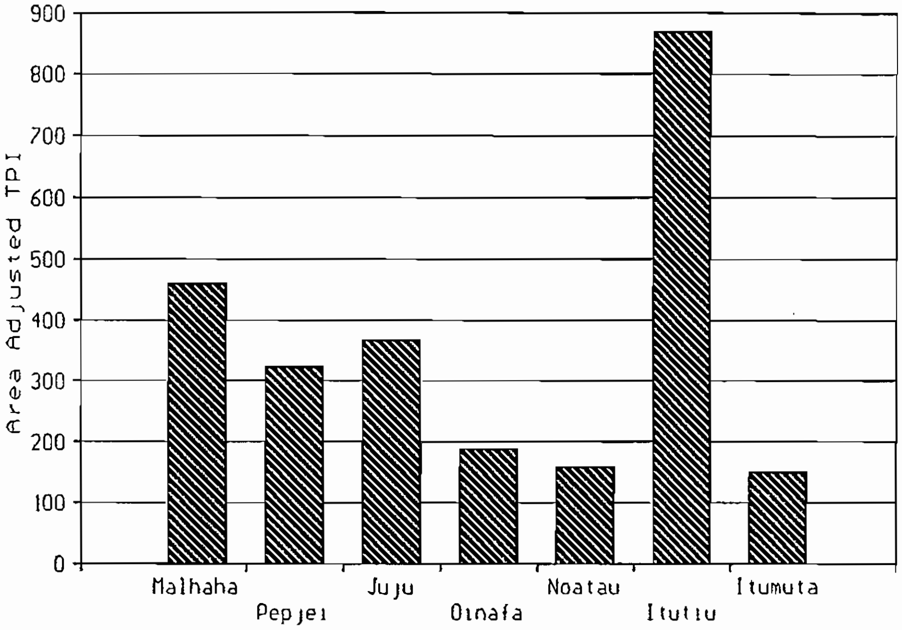

Figure 5.7 District area adjusted terrestrial productivity indices.

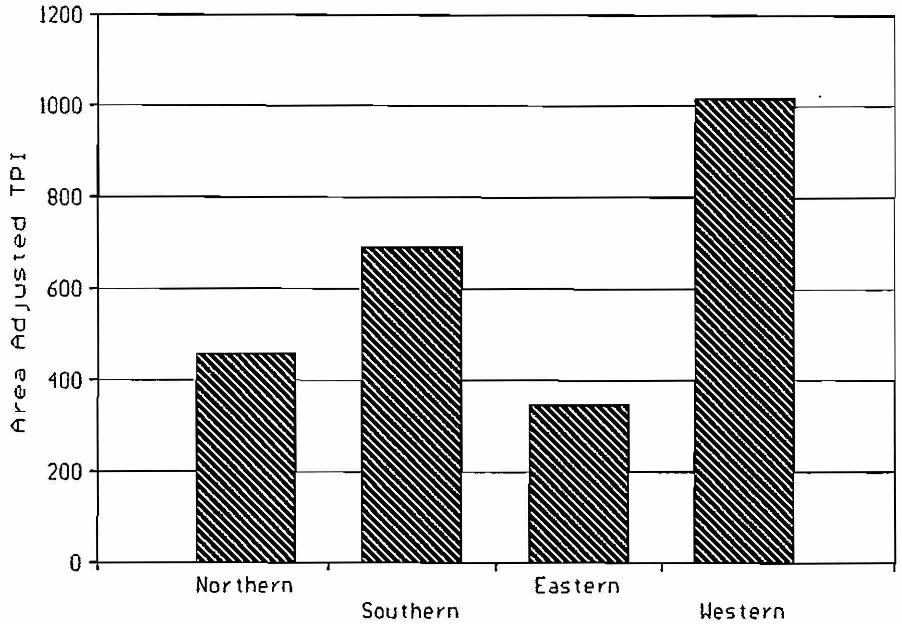

Figure 5.8 District group area adjusted terrestrial productivity indices.

districts with the exception of Itu'muta. The pattern becomes clearer if district groups are considered. In this case the low AATPI value for Itu'muta is compensated for by the high AATPI value for Itu'ti'u, and the eastern district group of Noatau and Oinafa clearly has a lower value than the other three groups.

In sum, Rotuma contains a number of different soils which can be classified into four main types. These four soil types are not evenly distributed throughout the island. The four soil types are heterogeneously distributed with some parts of Rotuma containing a large percentage of well developed soil whereas other regions contain predominately rocky soils. The relative productive potential of the four soil types can be assessed which allows the calculation of potential productivity measures for different regions of the island. These terrestrial productivity measures indicate that the most productive districts on the island are Malhaha, Itu'ti'u, and Juju, and the least productive districts are Oinafa, Noatau, and Itu'muta. The northern, southern, and western district groups have a high productive potential in relation to the low productive potential of the eastern district group.

Marine Resources

Marine Zone GIS Layer

A GIS layer of the marine resources near Rotuma was created using a Fijian Fisheries Division (1983) map and report in conjunction with marine data depicted on Woodhall's (1987) 1:25,0000 geologic map. The marine resources were divided into reef resources and bank resources (see Chapter 4). The reef zone consists of the fringing reef which surrounds the island and would traditionally have been used for catching small fish with nets or hook and lines. The bank zone extends from the edge of the reef for a distance ranging from ca. 0.4 to 11 km and would have been used for catching large pelagic fish with hook and line. A marine district boundary GIS layer was created by extending the terrestrial district boundaries seaward to determine the area of marine resources associated with each district. The justification for this procedure is that ethnohistorical sources indicate that the reef resources and possibly the bank resources were under the jurisdiction of the people living in the adjacent district.

The area of total marine resources, bank resources, and reef resources, associated with each district is listed in Table 5.5. The number in parentheses is the percentage that the area is of the total area for all districts. These percentages are not within district percentages, rather they are percentages across the resource class. The percentages indicate that Itu'ti'u was associated with 72.12% of all marine resources surrounding Rotuma (Figure 5.10). The districts of Oinafa, Itu'muta, and Noatau were associated with a smaller percentage of the total marine resources, and in contrast, the districts of Pepjei and Juju were associated with the smallest percentage of marine resources. The total marine resource percentages are skewed by the effect of the bank resources in relation to the reef resources. When reef resources are considered in isolation, a different pattern emerges (Figure 5.11). Reef resources were more equitably distributed but Itu'ti'u and Noatau were associated with a much larger percentage than the other districts. Oinafa, Malhaha, Juju, and Itu'muta were associated with a moderate percentage of the reef resources, and Pepjei with the

Table 5.5 District marine resources.

District	Total Marine Resources ha. (%)	Bank Resources ha. (%)	Reef Resources ha. (%)
Malhaha	493.13 (3.5)	352.81 (2.8)	140.31 (8.7)
Pepjei	90.63 (0.6)	51.13 (0.4)	39.50 (2.4)
Juju	262.75 (1.9)	148.75 (1.2)	114.00 (7.0)
Oinafa	1059.94 (7.5)	869.25 (7.0)	190.69 (11.8)
Noatau	965.19 (6.9)	555.63 (4.5)	409.56 (25.3)
Itu'ti'u	10172.00 (72.2)	9535.31 (76.4)	636.69 (39.3)
Itu'muta	1055.69 (7.5)	968.00 (7.7)	87.69 (5.4)
Total	14099.31 (100.0)	12480.88 (100.0)	1618.44 (100.0)

smallest percentage. The effect of shifting between the distribution of all marine resources (or just the bank resources) to the distribution of the reef resources in isolation is to lower Itu'muta's relative ranking and increase Juju's.

To standardize comparisons of marine resources between districts, the ratio of the total number of hectares of marine resources within a district to the total terrestrial area of the district was calculated (Table 5.6). A similar ratio was calculated for the reef and bank resources in each district. The ratios provide an indication of how extensive the marine resources within the marine boundaries of a

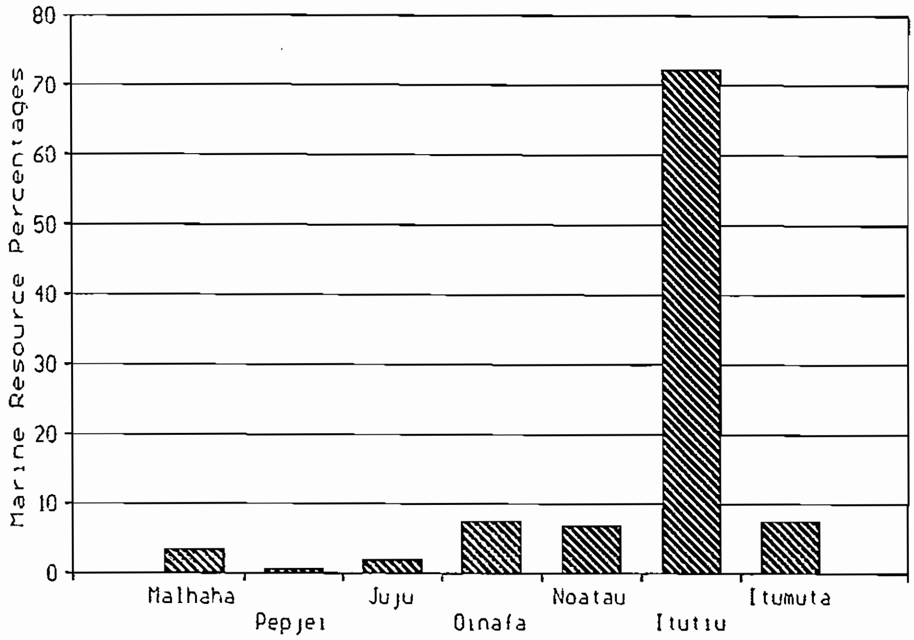

Figure 5.10 The percentage of marine resources in each district.

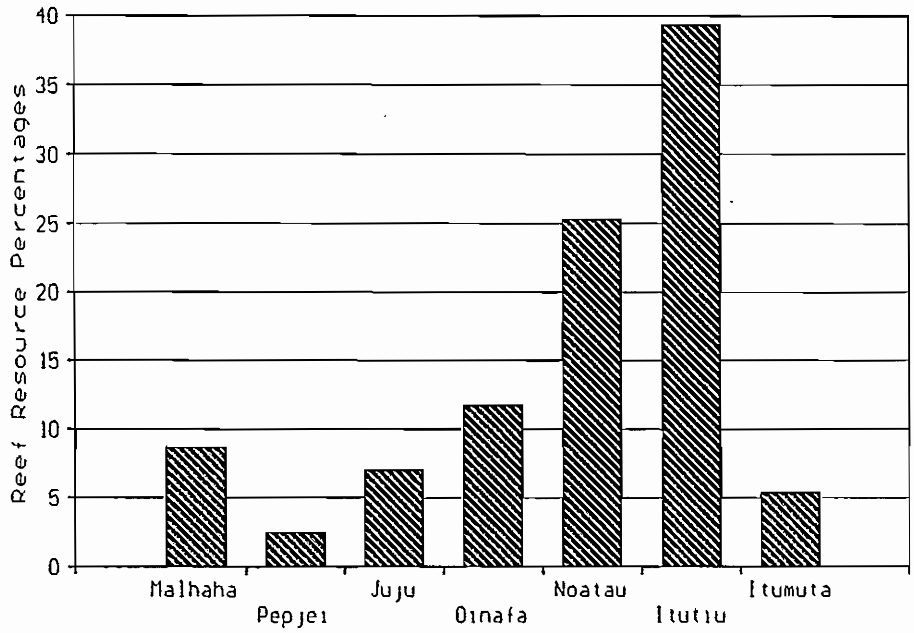

Figure 5.11 The percentage of reef resources in each district.

Table 5.6 District marine resource indexes.

District	Marine Resource Area/ Terrestrial Area	Bank Resource Area/ Terrestrial Area	Reef Resource Area/ Terrestrial Area
Malhaha	0.94	0.67	0.27
Pepjei	0.21	0.12	0.09
Juju	0.62	0.35	0.27
Oinafa	1.19	0.98	0.21
Noatau	1.62	0.93	0.69
Itu‘ti‘u	9.69	9.08	0.61
Itu‘muta	3.68	3.38	0.31

district are in relation to the terrestrial size of the district. Districts with relatively large ratios are considered rich in marine resources whereas districts with low ratios are considered poor in marine resources.

The western districts of Itu‘ti‘u and Itu‘muta have higher marine resource ratios than the other districts, and the southern districts of Juju and Pepjei have the lowest total marine resource ratios (see Table 5.6 and Figure 5.10). If the marine resource ratio is separated into the bank ratio and the reef ratio, the pattern changes. The bank ratios have a similar distribution to the overall marine ratios, but the reef ratios show less disparity between areas. Noatau and Itu‘ti‘u have the highest ratios, Itu‘muta, Malhaha, Juju, and Oinafa have similar moderate ratios, and Pepjei has the lowest ratio (Figure 5.12). The ratios for the district groups are presented in Tables 5.7. The reef ratios of the district groups reinforce the conclusion that the western

Table 5.7 District group marine resource indexes.

District Grouping	Marine Resource Area/ Terrestrial Area	Bank Resource Area/ Terrestrial Area	Reef Resource Area/ Terrestrial Area
Northern	0.94	0.67	0.27
Southern	0.41	0.23	0.18
Eastern	1.36	0.96	0.40
Western	8.40	7.86	0.54

and eastern districts had extensive reef resources, the northern district a moderate reef system, and the southern districts a poor reef system (Figure 5.13).

In sum, if both bank and reef resources are considered, the western district of Itu'ti'u clearly had access to the greatest area of marine resources surrounding Rotuma. However, for analytical purposes reef resources should be considered separately from bank resources. Reef resources were easier for the people of a district to protect and control, and probably provided more of the daily subsistence requirements than the bank resources. Again, Itu'ti'u was associated with a large percentage of all the reef resources surrounding Rotuma, yet Noatau also had a significant percentage. The southern districts of Pepjei and Juju seem particularly poor with respect to the percentage of marine resources at their disposal. The calculation of the ratios provides a means of assessing how extensive the marine resources were in relation to the size of the district. If all marine resources are considered, then Itu'ti'u and Itu'muta have the largest ratios, but if only the reef resources are considered then Noatau and Itu'ti'u have large ratios, with the southern

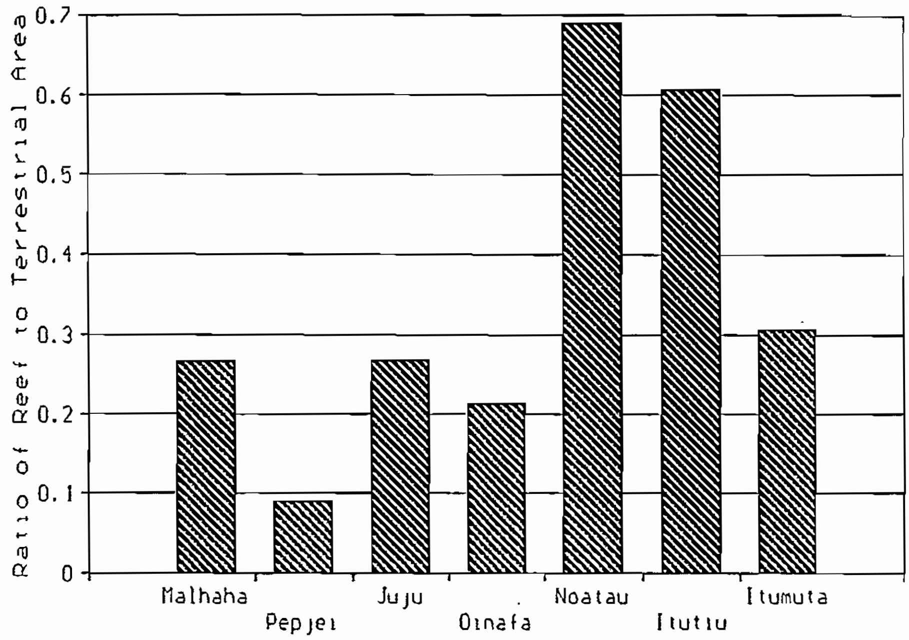

Figure 5.12 Reef resources of each district.

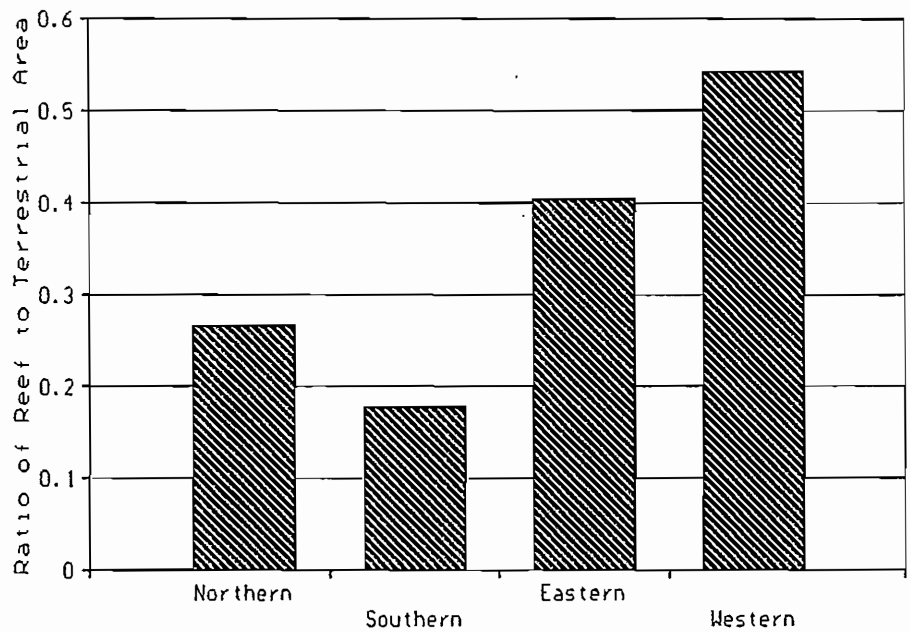

Figure 5.13 Reef resources of each district group.

district of Pepjei having a very small ratio. The district group reef ratios indicate that the western and eastern districts had accesses to relatively extensive reef resources, the northern district has access to a moderate amount of reef resources, and the southern districts appear relatively impoverished.

Summary: Terrestrial and Marine Resources Throughout Rotuma

The distribution of marine and terrestrial resources throughout Rotuma are not homogeneous. The northern, southern, and western districts were shown to have relatively high terrestrial productivity potentials whereas the eastern districts have a relatively low productivity potential (see Figures 5.5 and 5.6). Marine resources were divided into bank resources and reef resources. The western and eastern districts have relatively high indices for reef resources, that is, high ratios for the area of reef resources to the area of the district (see Figure 5.12). The northern district had a moderate index for reef resources, and the southern districts had a low index for reef resources.

In some cases a low terrestrial productivity potential could have been counterbalanced by extensive marine resources. This might have been the case for the eastern districts which had a low terrestrial productivity index but a relatively high ratio of reef resources to district size. To some extent, the lack of terrestrial resources could have been counterbalanced by the extensive reef system. The other district groups do not have similar distributions. The western districts had relatively high indices for both reef resources and terrestrial resources. The northern and southern districts had minimal reef resources but extensive terrestrial resources.

Furthermore, different types of terrestrial resources could have counterbalanced particular deficiencies within the districts. The eastern districts had an overall low terrestrial productivity potential because the soil in the district was predominately rocky and therefore only yams could have been cultivated using intensive agricultural techniques. However, the eastern districts do contain a relatively high to moderate amount of swamp land were swamp taro could have been grown. Swamp taro would have been a valuable resource because it can be stored in the ground for such a long time. The swamp taro could have been used during times of environmental stress, and indeed several ethnohistorical accounts refer to it as the "granary" of Rotuma (see Chapter 4). In a similar manner yams might have been an important crop. Although it would have taken more energy to produce the same quantity of yams in the rocky areas as dryland taro in areas with well developed soil, the yams could have been an additional source for social buffering during natural disasters. In contrast to dryland taro, yams can be stored for a considerable time once they have been harvested. It would have been possible to grow yams throughout Rotuma. Therefore, while all of Rotuma would have had the same potential to grow yams for insurance against natural disasters, yams were probably the predominant crop in the eastern districts.

The implications of the differential distributions of resources for social and political processes are discussed in Chapter 9.

CHAPTER 6

TRADITIONAL ROTUMAN SOCIETY

This chapter presents a reconstruction of traditional Rotuman sociopolitical structure based on recorded mythology, ethnohistorical sources, and the work of previous anthropologists. The validity of the myths and ethnohistorical literature is evaluated before the reconstruction of the traditional Rotuman political system.

Myths and Ethnohistorical Narratives

Use of Myths

Oral traditions have been viewed as both a "chronological history" and as a reflection of the structuring principles of a society. Kirch (1984:7) recognized that a considerable amount of distortion exists in oral traditions but felt that actual events and people are represented in traditions pertaining only to the last few hundred years before European contact. Kirch and Yen (1982:364) found that the correspondence between their interpretation of the archaeological record and some of the oral traditions of Tikopia was extremely close, and concluded that for the most recent period of time the oral traditions documented historical events (Kirch and Yen 1982:362). Shutler and Evard (1990) suggest that Rotuman myths chronicle actual historical events and have correlated the skeletal remains of a burial found in Oinafa with a Tongan invasion of Rotuma.

Alternatively, it has been proposed that myths do not necessarily chronicle history but that they can be used to organize and interpret it (Sahlins 1981, 1984; Howard 1985:40, 1986). Howard (1986:22) proposed that Rotuman myths were not a "putative sequence of historical events" but should be regarded as "a statement about the cultural logic of priorities in the constitution and reconstitution of the social order." Heriniko (1990:186) generally concurs with Howard (1985, 1986), but feels that there is probably a degree of historical and chronological accuracy to some Rotuman myths. Heriniko (1990:159) suggests that the myths provide information about both Rotuman culture and history that is unavailable through other sources.

Howard (1985:45-47) makes explicit several assumptions that he uses when analyzing Rotuman myths, and Heriniko (1990:160) has summarized these assumptions as follows:

1) There is a semiotic code from which the stories are constructed.
2) The stories use both digital and analogic codes; the former deals with basic oppositions--for example, land/sea, male/female, raw/cooked and with mediating categories, such as birds, male-like females etc.; the latter deals with quantitative changes in states such as emotion.
3) There is a set of meta-rules which determines the construction of the stories, allowing for variations which are acceptable. An examination of the full range of available texts should help to iron out important inconsistencies.
4) The meaning of important symbols, metaphors and metonyms can be inferred from the context in which they are used, and an examination of their occurrence in other stories as well. A frequent recurrence of the same symbols or metaphors in the texts is an indication of their importance.

5) The texts of narratives should not be construed as accurate records of chronological sequence, though they are often written as historical records.
6) The myths focus on the overarching problem of the genesis and control of mana "potency", in the regenesis of life--with the fertility of the land and the people.
7) The myths are explorations of "basic structural properties of the cultural system" (Howard 1985). They provide insights into key aspects of Rotuman culture which are not readily apparent anywhere else.

In my use of the oral traditions I have followed the precedent set by Howard (1985, 1986) and Heriniko (1990), and have used Rotuman myths to delineate the structuring principles of late prehistoric-protohistoric Rotuman society. My analysis does not presuppose that the myths chronicle precise events, but that the relative occurrence of events in the myths provides an indication of their importance and likely occurrence. Events that occur with frequency are thought to have been important to Rotumans and reflect the extent to which the activity was practiced.

Sources of Rotuman Myths

A rich body of Rotuman oral traditions has been collected and analyzed. The first systematic account of the oral traditions was collected by Father Trouillet (n.d.) around 1873. Thereafter, a number of visitors recorded Rotuman myths including Romilly (1893), Gardiner (1898), Hocart (1912), MacGregor (1932), Churchward (1937a, 1937b, 1938a, 1938b, 1939), and Russell (1942). Howard (1963a, 1963b, 1964, 1966, 1970, 1985, 1986, 1989, 1990) has analyzed a number of mythical and ethnohistorical accounts and provides insightful political and structural interpretations. Heriniko (1990) relies upon the interpretation of myth for his analysis of the <u>han mane'ak</u> <u>su</u>, a ritual clown who performs in Rotuman weddings.

Ethnohistorical Sources

The ethnohistorical records about Rotuma are from diverse accounts. They vary from a few brief comments in a captain's log to the detailed study of anthropologists who spent months on the island. Not every source that mentions Rotuma is reviewed here. Rather, I have surveyed the most important documents.

Although the Pandora was the first European ship to visit Rotuma in 1791, its captain and crew spent very little time on the island and their observations were minimal (Thompson 1915). The Duff sailed within a few miles of Rotuma in 1797 and traded with a number of Rotumans who came out to the ship, but little was documented about that exchange (Smith 1813). The first useful description of the island comes more than 20 years later from Rene Lesson (1838-9) who passed by the island in 1824. Several natives and a European deserter living on the island came out to the boat and provided Lesson with a relatively detailed account of the political structure of the island. Dillon (1829) briefly visited Rotuma in 1827 and made observations about the island that Gardiner (1898:400) felt were based on discussions with beachcombers. Bennett (1831) spent several weeks on the island in 1831 and provides a good firsthand description of the cultural and physical setting. Captain Eagleston and crew members Cheever and Osborn of the ship Emerald each provide descriptions of the island based on their short visit of a few days. From the 1840s numerous accounts of Rotuma are provided by visiting European missionaries. The most comprehensive of these is the work of Trouillet in the 1870s. Other Europeans, mentioned above, provided first hand observations of Rotuma during the late nineteenth and early twentieth centuries. MacGregor's (1932) Rotuman consultants in the 1930s provided a valuable perspective on their recollections of Rotuman sociopolitical structure in the late 1800s.

Rotuman Political System

Traditional Rotuman society consisted of a chiefdom with chiefs set apart from commoners (Gardiner 1898; MacGregor 1932; Howard 1964, 1966, 1985, 1986, 1989). The chiefly strata of the island included ho'aga leaders, district chiefs (Gagaj'es itiu), and the three pan-Rotuman positions of fakpure, mua, and sau.

Ho'aga and District Chiefs

Most accounts of the protohistoric period indicate that Rotuma was divided into seven semiautonomous districts each led by a district chief (Howard 1966). District chiefs were usually the leaders of the highest ranking ho'aga in a district (Howard 1964:27). Howard (1964:320) describes the ho'aga as:

> ...a localized corporate group composed of a cadre of patrilineally related males and a number of cognatically and affinally related kinsmen. Perpetuation of the group lay in the hands of the patrilineal core, the family title being passed within the agnatic line.

Howard (1964:27) estimates that prior to European contact the number of ho'aga throughout Rotuma was approximately one hundred, and each ho'aga had a membership of between thirty and forty. The leaders of the ho'aga were titled men called fa'es ho'aga. The highest ranking fa'es ho'aga within a district was the district chief (Gagaj'es itiu), and the second ranking fa'es ho'aga was the faufisi, who acted as the district chief's lieutenant, or "right hand" (Howard 1964:27). It was the responsibility of the faufisi to oversee all ceremonial functions in a district and act as the war leader in times of interdistrict warfare. Furthermore, the faufisi managed a portion of the district and exerted his authority over several lower ranking fa'es ho'aga (Howard 1964:27). The third ranking fa'es ho'aga was the district chief's "left hand", and was in charge of the remainder of the district.

Individual ho'aga were the basic productive units of Rotuman society. Gardiner (1898:484) states that the ho'aga leaders within a district would allocate land to their members to use, settle disputes, and oversee subsistence production. The district chief, or highest ranking fa'es ho'aga, would settle disputes between ho'aga, mobilize labor for community projects, and ensure that the district's communal swamp land was planted with swamp taro (Gardiner 1898:430).

Traditional Rotuman social organization corresponds to what Sahlins (1958:139-151) termed the "descent line" type (Howard 1970:103). Howard (1970:103) notes that:

> Choosing the successor to a (ho'aga) title was the right of the cognatic group tracing ancestry to the ho'aga which possessed the name. Although kinship seniority based upon agnatic descent was ideologically significant, just as it was in Fiji, any adult male in the cognatic group was eligible to succeed to the position, and strong consideration was given to personal character and other pragmatics. The important point is that lineal linkages, based upon father-son bonds, were not given as much weight as ideology would suggest, and that lateral links, based upon sibling bonds and uterine ties, were given prominence in actual decision-making procedures.

Fakpure

Of the three pan-Rotuman positions, it has been suggested that the fakpure was preeminent (Gardiner 1898:460; Howard 1985:41). The fakpure was referred to as

Rotuma's "emperor" (Lucatt 1851:159) or "great chief" (Trouillet n.d.), and was apparently the secular ruler of the entire island (Howard 1985:41, 1986:3). Several sources state that the fakpure was the head district chief of the alliance of districts that was victorious in the last war (MacGregor 1932; Howard 1986:3). Allen (1895), however, maintained that a new fakpure was chosen by the sau when the old fakpure died or resigned. According to most sources the fakpure's rule continued as long as he was beneficent, and not too demanding (MacGregor 1932). In addition to the secular duties of the fakpure, he may have been responsible for appointing the sau (Trouillet n.d.; MacGregor 1932). Furthermore, the fakpure allocated food among the chiefs, although the district chiefs maintained their relative autonomy (Trouillet n.d.).

Mua

The position of mua was not extensively documented by the early accounts but has generally been referred to as the spiritual priest of the island (Trouillet n.d.; Howard 1985). The main task of the mua was to bring prosperity to the island by incorporating the power of supernatural beings (Howard 1986:4). One of the mua's duties was to preside over a ritual procession for the relief of drought or famine (MacGregor 1932). The procession began in Pepjei and proceeded over the interior of the island to Muasol in Oinafa. The mua also held special prayers three times a year for a good harvest (MacGregor 1932).

Allardyce (1895-6:142) maintained that the mua was a rotational position. He goes on to say that the fakpure appointed the mua for indefinite periods, although it was customary to resign after a year. Wood (1877) claimed that the mua was elected by capture and therefore always resided in the most powerful district of the island. Other consultants to MacGregor (1932) indicated that the mua and sau were rarely housed in the same district as the expense was too great for a single district to bear.

Sau

The position of sau was the one most thoroughly documented by the early accounts (Howard 1985). However, there are some inconsistencies in the ethnohistorical literature with regards to the sau's behavior and characteristics (Howard 1985, 1986).

Behavior of Sau

The term "sau" has been translated as the "king" of Rotuma (Trouillet n.d.). Several accounts suggest that the sau was merely a symbol of authority for the fakpure, who was considered the real secular ruler of the island, and that the sau had very little actual authority (Trouillet n.d.; Gardiner 1898:460). Allen (1895), however, maintained that the sau was regarded as a god and extended his control over the entire island. The sau devoted most of his time to reclining and eating (Hocart 1912; MacGregor 1932), and to presiding over the proper performance of ritual feasts (Gardiner 1898:462). The sau was fattened as much as possible to show that he had been well taken care of by his host district (MacGregor 1932). MacGregor's (1932) consultants suggested that the sau's entourage consisted of relatives from the sau's home district and that they catered to his every need. In contrast, Gardiner (1898:461) stated that the sau's attendants included representatives from all districts of the island. Their job was to protect the sau in times of war, even if it meant acting against their own district. The sau's attendants in order of precedence included the "mua (chief priest), hagnata, titopu, fakpure (head chief), fanhoga (wife to sau), fahoa, fagata, tonhida (messenger), and mafuida (the presiding officer over all feasts)" (Gardiner 1898:462).

Selection of the Sau

There is little consensus concerning how the sau was selected or came to power. Dillon (1829:95) wrote that the sau was elected by a council of six district chiefs. Trouillet (n.d.) states that the fakpure had the privilege of selecting the sau, and Allen (1895) implied that the chiefs from each of the five principal districts would take turns selecting the sau. Similarly Gardiner's (1898:461) comment that "each district (took) it in turn to appoint" the sau could be interpreted as the leaders of each district took turns to chose the new sau. In the 1930s, MacGregor's (1932) consultants reaffirmed each of these three possibilities. One consultant suggested that an annual meeting of chiefs appointed the sau, another suggested that the fakpure selected the sau, and another claimed that the sau was picked by the chief of the district whose turn it was to choose the sau. Several other of MacGregor's (1932) consultants reported that the current sau could recommend the next sau on the basis of who had worked hardest to feed the incumbent. Finally it was reported that "the people had something to say as to the sau's appointment" (MacGregor 1932).

Homeland of the Sau

Howard suggests that most accounts agree that the sau "was chosen from different districts in turn" (Howard 1985:41) with "each district putting up a man in rotation" (Howard 1964:28). However, two early accounts do not substantiate this position and it is therefore possible that the conception of a rotational sauship was only a Rotuman ideal and the actual political practice deviated from this principle.

In 1824 Lesson (1838-9) wrote that the "Rotumans obey a high chief called the Chaou (sau) whom they frequently changed." Dillon (1829:95), who visited the island in 1827, wrote that "The island is divided into six districts, each ruled by its own chief. These meet in congress every six months, when they elect a president (sau) and deliberate upon state affairs..." There is nothing in either of these two statements which necessarily implies a rotational political system. However, Bennett (1831:473) wrote in 1830 that "The chiefs are elected kings in rotation, and the royal office is held for six months, but by the consent of the other chiefs, it may be retained by the same chief for two or three years." Trouillet (n.d.), who was on Rotuma in 1868 makes no mention of the sau being a rotational position, and notes numerous instances where incumbent sau were disposed and replaced through warfare. Allen (1895), however, wrote in 1895 that "the five districts took it in turn to elect (the) sau." Gardiner (1898:461) visited the island in 1896 and wrote that "each district (took) it in turn to appoint" the sau. In the 1930s several of MacGregor's (1932) consultants stated that the sauship was a rotational position. Two other consultants wrote that the next sau was elected from the district who was feeding the incumbent sau.

The two earliest accounts of the Rotuman political system make no mention of the sauship being a rotational position. However several of the later accounts do support this contention. By analyzing the recorded mythology it is possible to determine if the practice of holding the sauship differed from the ideal that it was a rotational position. There are narratives which document the hanua or the land where the sau came from (Trouillet n.d.; MacGregor 1932). An analysis of these narratives reveals a distinct pattern with regard to the district from which the sau of Rotuma originated, and this analysis is presented in detail below.

Domicile of the Sau

The sau's residence is another point of contention. Allen (1895) maintained that the district whose turn it was to pick the sau would "go into a neighboring tribe (district) and select their sau, and bring him to their own tribe (district) to live with them." Gardiner (1898:460) was more ambiguous and states that the sau "lived wherever he was placed by the fakpure and the other chiefs." Hocart (1912) maintained that "in Rotuma sau noh e hanua maro" which translates as "in Rotuma the sau dwells or lives in the land which wins." This is reaffirmed by one of MacGregor's (1932) consultants who stated that the "sau always lived in (a) victorious district, weak defenders gave up sau quickly." The inference I draw is that the sauship could be won through warfare and that the present sau or newly appointed sau would go and live in the victorious district. Wood (1877) states that the "sau always resided in the second most powerful tribe." Alternatively it was suggested that the sau resided in the fakpure's district (MacGregor 1932).

Duration of Sau's Tenure

There is further inconsistency surrounding the length of the sau's incumbency. The first person to mention the subject was Lesson (1838-9) who wrote that the sau was elected for twenty months. Allen wrote in 1895 that the sau was elected for six to twelve months, and Hocart (1912) maintained that the sau ruled for twelve months. Three of MacGregor's (1932) consultants state that the sau was elected for six months, for twelve months, or for three to twenty-four months. Gardiner (1898:461) suggested that the sau was elected for six months or "continued as long as he liked, or as long as he could manage to get together the great masses of food that he was required to provide." Allardyce (1895-6) wrote that "some generations ago the sau was appointed when a mere boy, and often reigned for some thirty or forty years." Howard's (1985) analysis of the narratives indicates that the length of the sau's incumbency changed from 2.5 years during the early historic period to 0.6 years just before the position was abolished in 1871. Howard (1985:70-71) suggests that the negative affects of acculturation might have prompted the Rotumans to question the strength of the individuals who held the position of sau. The chiefs and commoners of Rotuma might have employed the institutionalized mechanism for replacing the sau more frequently in the hopes of inhibiting the problems associated with Europeans.

Creation of the Sauship and its Relation to Island Wide Political Integration

Several researchers have speculated about the formation of the position of sau. Based on his analysis of the recorded oral traditions and ethnographic studies, MacGregor (1932) proposed that "there is no reason to believe... that the sau as he existed later as the symbol of high chieftainship occurred in the first part of Rotuman (pre)history." Gardiner (1898:460) came to a similar conclusion when he suggested that the sau and fakpure were at some point in the past one position, but through time the positions became distinct.

Although there is little physical evidence to support these speculations, the sequence of leadership specified in MacGregor's (1932) notes suggests that Rotuma was initially ruled by the mythical founder of the island, Raho, and then leadership passed to the position of mua. Following this initial period there was a time when district chiefs ruled semiautonomous districts, followed by a period when the fakpure ruled the entire island with the aid of the mua and sau. Trouillet's (n.d.) account is slightly different. In the first period of prehistory the fakpure ruled with the aid of the mua. This was followed by a period where the mua was supplanted by the position of sau. Trouillet (n.d.) recounts the establishment of the position of sau:

> Tukmasui built his house in Solmea; when it was finished he wanted all of Rotuma to come to the Katoaga (festive gathering) of completion. At that time Funfama, who lived at Vakoi in Pepse (Pepjei), was married to Uaffearotuma and had a great number of children, among others Muriraki, Aferakim, Kumkifag, a daughter married to a voyager from Samoa by the name of Keikeitot, Tuitafaga, Kaurgamuatover. The entire family of Funfama came to the Katoaga of Tukmasui at Malaa (Malhaha); before arriving at Malaa (Malhaha) they picked coconuts; Malaa (Malhaha), not pleased with such

behavior, did not give them any part in the Katoaga; they returned furious to Pepse (Pepjei), raised the entire country of Ragaouta (Fag'uta) and waged war on Malaa (Malhaha) which was conquered. Tukmasui died and it was then that the mua was eclipsed by the sau. For the children of Funfama wanted to compensate Keikeitot who had assisted them, but since they (he) were (was) not Rotumiens (Rotuman) they did not wish to give him the authority but gave it to his wife Kumifag with the title of sauane, and it was then that was inaugurated the dignity of sau, and Kaurfonua was established a great chief (fakpure).

Howard's (1985:63) interpretation of this and other narratives is useful with regard to the differentiation of the mua and sau.

> Overall the evidence suggests that the positions of sau and mua symbolize complementary aspects of sacred chieftainship... Rotuman conceptions thus seem to be sequentially oriented, such that the initial position of mua is differentiated into mua and sau. There is linguistic support for such an interpretation inasmuch as mua means 'to be or go in front or before or first - either in place or time' (Churchward 1940:268). In this case mua might be interpreted as 'the first sau', or 'the one who proceeded the sau'. This notion of differentiation parallels a conception of chiefs emerging as persons of a different order from common Rotumans. They are of the people of the land, but are different from them... (T)he primary concept of mua incorporates the notion of sauship in Rotuman thought (i.e., that the mua and sau were initially one and the same, with mua the unmarked category), but that from this undifferentiated state emerged the positions of mua, associated with Raho and incorporating the principle of first occupancy, and sau associated with Tokaniua and incorporating the principle of military vitality.

In sum, MacGregor's (1932) interpretation of the Rotuman myths is that at one time the Rotuman political system consisted of semiautonomous districts and that the position of sau, as a symbol of high chieftainship and political integration, did not initially exist. This early period was followed by a time when the island was integrated into a single polity ruled by the fakpure, sau, and mua. The myth related by Trouillet suggests that the island was politically integrated for the first time when the sau was established. At the very least, the integration occurred on a symbolic level, and according to other traditions, undoubtedly had material ramifications. Howard (1985) notes that the sau was associated with Tokaniua, a political usurper from Tonga, and that both the sau and Tokaniua incorporated the principle of military vitality. The myth related by Trouillet indicates that the sauship was created by the victorious side of a war to oppose the incumbent mua. The myth suggests that the position of sau was created and the island became politically integrated as a result of interdistrict warfare.

Trouillet's passage on the origin of the sauship is instructive for a number of other reasons. The tradition begins with the mua Tukmaui in power. Tukmaui lived in Malhaha, a district with high agricultural productivity potential (see Chapter 5). The people of Pepjei, a less productive district, go to a celebration in Malhaha and inappropriately begin to take food from the host district. The leaders of the prosperous district try to halt this inhospitable display but with foreign aid the people of the less productive district are able to win the war and establish the new political position of sau.

The tradition establishes several common themes. First is the tension over the relative allocation of subsistence goods. This is played out by the antagonism between the people of a productive district of the island and those of a less productive district. The mua who is associated with commoners and the production of food (Howard 1985) is overthrown by a new order of chiefs associated with the sau who are from less productive agricultural areas. Finally there is the introduction of a foreign influence as a possible "structural excuse" for internal political changes (Spriggs 1988).

Symbolic Relationship Between the Mua and Sau

Howard (1985, 1986, 1989) concludes from his analysis of the narratives that the mua and sau are dialectically opposed. The mua was associated with the mythical founder of Rotuma, Raho, and the first indigenous people of the island. In Rotuman conceptions the mua represented the commoners as producers of an agricultural surplus that was used to support the chiefly elite. The mua was associated with fertility, the productive interior and west side of the island. The mua derived his power from the gods who resided in Limari, the mythical home of the gods off the west side of the island. In contrast, the sau was associated with the mythical figure Tokaniua and represented foreign usurpers of power. As a representative of the chiefs, the sau was a consumer of commoner produce. The sau was associated with the sea and sky, and the relatively unproductive eastern side of the island. In part, the position of sau derived its power from the foreign chiefs of Tonga.

Secular Relationship Between the Fakpure and Sau

There is some ambiguity concerning the role and relative position of the sau with respect to the fakpure. Hocart (1912) suggests that the:

> Pure was a new thing since the war in Saukam (1840). He puer se itu'u te ma te ne garue ne sau. Before only pure ne itu'u. Puer ne Rotuam (Rotuma) does not puer all island, it rested for sau. If sau nin, he must tell all round the island the things to be done, but each man pure his own itu'u.

These remarks can be roughly translated to suggest the position of fakpure did not exist before the war of Saukam in 1840. The fakpure did not rule the entire island, but this was done by the sau. The sau dictated what was to be done on the island, but each district chief ruled his own district. Brief remarks by Dillon (1829), Lesson (1838-9), and Bennett (1831) in the early 1800s substantiate the position that the sau held preeminence over the fakpure. Bennett (1831) and Dillon (1829:95) wrote that a council of chiefs selected the sau, and made no mention of the fakpure. This omission could mean that the position of fakpure did not exist, was of little importance, or that the fakpure was unobtrusive during their visits. Similarly, Lesson (1838-9) wrote that the island was ruled by the sau and never mentioned the fakpure. In 1895 Allen (1895) suggested that the sau chose the fakpure, indicating that the sau was preeminent. Further inconsistency is introduced by an occurrence of rebellion specified by Trouillet (n.d.). He notes an instance where a fakpure was "overcome by ambition and killed the sau." The old fakpure relinquished his former position and proceeded to proclaim himself sau. Trouillet's statement suggests that the position of sau held pre-eminence over the position of fakpure but that the latter might hold designs on the former. Furthermore, there is another instance in Trouillet's (n.d.) account where the position of sau and fakpure were filled by a single leader. This again emphasizes the somewhat flexible nature of the sau's position. Finally, Gardiner (1898:462) lists the fakpure as one of the sau's attendants and indicates that the fakpure was lower in rank. However, in other places Gardiner (1898:460) does propose that the fakpure outranked the sau. Regardless of the sau's ranking in relation to the fakpure, it is clear that in traditional Rotuman society the sau was a chiefly position that influenced the entire island (Howard 1964:28).

Lists Specifying the Past Sau of Rotuma

Several researchers have collected a number of lists of the past sau of Rotuma (Table 6.1). These include (1) a list derived from Trouillet's (n.d.) narrative; (2) a list MacGregor (1932) entitled "Liste des chefs, des sau et des mua en regard"; (3) a list Evans (n.d.) provides as "Table 1"; (4) a list MacGregor (1932) entitled "On Kauratag ne fupug ne sau e Rotuam (sic.).."; and (5) a list from page 4578 of Hocart's (1912) notes. These five lists appear to be derivatives of two basic types. The lists by MacGregor (Liste...), Evans ("Table 1"), and Trouillet are all quite similar, and MacGregor's "On..." and Hocart's list are similar. Evans' list and MacGregor's "Liste..." are the same with the following exceptions: 1) spelling; and 2) the hanua specified for sau 13, 14, and 15 differ. Evans and MacGregor's "Liste..." are the same as that stated in Trouillet's narrative with a few exceptions. First Trouillet does not include Morseu (sau 18), and second, Trouillet's narrative ends with Asaimuri (sau 98). MacGregor's "On..." and Hocart's list are the same with the following exceptions: 1) spelling; 2) MacGregor's list includes Moa (sau 66) whereas Hocart does not; and 3) Hocart lists Sukamasa as sau 104 and 105.

There are several differences between the two types of lists (MacGregor's "Liste...", Evans "Table 1", and Trouillet's on the one hand, and MacGregor's "On..." and Hocart's on the other). The MacGregor "On..." and Hocart's list begin with 13 names that are mua and not sau. The 14th sau in their list appears to be the first sau in the other lists. From the 14th sau on, the two types of lists roughly correspond but there are several instances where names have been added or deleted.

TABLE 6.1 A comparison of the different lists of <u>sau</u>.

	Trouillet	MacGregor Liste...	Evans	MacGregor On...	Hocart 4578
1	Sauane	Sauane	Sauane	Lapatemasui	Tui Te Rotuma
2	Muriraki	Muriraki	Muriraki	Tuirotuma	Lapatemas
3	Aferaki	Aferaki	Aferaki	Tuitupu	Tuitupu
4	Kaurfonua	Kaurfonuo	Kauffonuo	Saparere	Saparere
5	Rimkao	Rimakao	Rimkao	Muamea	Muamea
6	Kaufose	Kaurfose	Kaufose	Muaeirere	Muatoirer
7	Toio	Toio	Toio	Ipiuri	Rifuri
8	Fonmon	Fonemon	Fonmon	Ifituaga	Ifituaga
9	Varomua	Varomua	Varemua	Fesaitu	Fesaitu
10	Toipo	Taifu	Taipo	Niua	Niua
11	Tui	Tui	Tui	Saurotuma	Saurotuma
12	Malafu	Malafu	Malafu	Muamea	Tafaki
13	Pau	Pau	Pau	Tukumasui	Tukumasui
14	Kauata	Kauata	Kauata	Sauhani	Sauhani
15	Irava	Irava	Irava	Kaurefanua	Kaurefanu
16	Tausia	Tausia	Tausia	Riamkau	Riamkau
17	Askava	Aikava	Askava	Kaufose	Karupose
18	Fiu	Morseu	Morseu	Taio	Taio
19	Terep	Fiue	Fui	Fonomanu	Fonamanu
20	Tua	Tereu	Tereu	Varamua	Varomua
21	Sokman	Tua	Tua	Tiu	Tiu
22	Pora	Sokmen	Sokineu	Marafu-kauat	Marafu
23	Suakmasa	Pora	Pora	Irava	Irava
24	Faregfon	Tuakmaso	Suakmasa	Toloara	Toloara
25	Vakaera	Fagrogfou	Faregfon	Asesekava	Asikava
26	Tuitafaga	Nakaora	Vakaera	Mariseu	Maruseu
27	Irava	Tuitafaga	Tuitafaga	Sakanane	Sakman
28	Tua Otse	Irava	Irava	Turemanufiu	Puremanuf
29	Olifiri	Tuaotse	Tuaotse	Tausia	Tausia
30	Tokoare	Oltiri	Olijiri	Sukmaasa	Sukamasa
31	Olifiri	Tokoara	Tokoara	Sautapuaki	Sautapuak

TABLE 6.1 (Continued) A comparison of the different lists of sau.

	Trouillet	MacGregor Liste...	Evans	MacGregor On...	Hocart 4578
32	Irava Gogofog	Oftiri	Oftiri	Paka	Paka
33	Fatafesi	Iravagogofog	Iravagogofog	Tokoniua	Tokainiua
34	Fonomon	Fatafesi	Fatafesi	Titafag	Titofaga
35	Vuna	Fonomon	Fonomon	Irava	Irava
36	Fatafesi	Vuna	Vuna	Ravak	Ravaka
37	Varomua	Fatafesi	Fatafesi	Tuaofo	Tuaofo
38	Manava	Varomua	Varomua	Saogaagaga	Gaogaofag
39	Tuasolvol	Manava	Manava	Fatafesi	Fatafesi
40	Rimakao	Tuasolvol	Tuasolvol	Funojo	Tua ojo
41	Fatafesi	Rimakao	Rimakao	Fonman	Fonomanu
42	Tiarsok	Fatafesi	Fatafesi	Fuatatnefou	Fuatanefa
43	Atervao	Tiarsok	Tiarsok	Vuna	Vuna
44	Rogafuat	Alervao	Atervao	Fatafesi	Fatafesi
45	Mora	Ragafuat	Ragafuat	Taimanava	Folmanava
46	Varaoti	Mora	Mora	Solovalu	Solovalu
47	Uafoto	Vavaoti	Vavaoti	Riamkau	Rimakau
48	Petpet Vavian	Uafotse	Uafotse	Tirasoko otorov	Tirasoko
49	Rursefaua	Petpetvavian	Petpetvaviau	Otorovao	Atevao
50	Tuirotorave	Funsefaua	Fursefaua	Ragafua	Ragafuata
51	Irava	Tuiritonave	Tuiritonave	Vaurasi	Kaurosi
52	Magao	Irava	Irava	Vavaoti	Vavaoti
53	Sokmen	Magavo	Mogao	Ufat	Ufata
54	Tuatoko	Sokmen	Sokineu	Patipati vavani	Patipativ
55	Mou	Tuatoko	Tuatoko	Sorogsau	Garagasau
56	Kausiliafe	Mou	Mou	Furisefua	Furisefau
57	Tuipuroto	Kaualiafe	Kausiliaje	Tirotorava	Tuirotora
58	Tokaniua	Tupuroto	Tupuroto	Marafu	Marafu
59	Garassau	Tokaniua	Tokaniua	Pogisemose	Pogisemao
60	Malafu	Garagseu	Garagseu	Tirupea	Tiarupea
61	Matagtag	Malafu	Malafu	Kausirafe	Kausiriaf
62	Tuivaive	Matagtag	Matagtag	Sauamaso	Sakamasa

TABLE 6.1 (Continued) A comparison of the different lists of <u>sau</u>.

	Trouillet	MacGregor Liste...	Evans	MacGregor On...	Hocart 4578
63	Sokogtau	Tuivaive	Tuivaive	Tavo	Tavo
64	Vavaoti	Tokagtau	Sokogtau	Tuoporotu	Tui Purot
65	Sautiak	Vavaoti	Vavaoti	Fokafataa	Sokofatau
66	Voimomoko	Sautiak	Saotiak	Moa	Matagitag
67	Katoagtau	Vavaoti	Veimomoko	Matagatage	Manava
68	Kauteg	Katoagtau	Katoagtau	Manava	Vavaoti
69	Fonogrotoi	Kauteg	Kauteg	Vavaoti	Vaimomoko
70	Tuipuota	Fonagrotoi	Fonorotoi	Vaimanoko	Katoagata
71	Fonemon	Tuipurotu	Tupsurotu	Katogatau	Kautane
72	Aaf	Fonmon	Fonmon	Kautane	blank
73	Tui	Uaf	Uof	Fonogarotoi	Fonogarot
74	Tuatoko	Tiu	Tiu	Fakosire	Fakosirik
75	Tuipo	Tuatoko	Tuasoko	Fonomanu	Tui
76	Kaniak	Toipu	Toipu	Tiu	Uliamorat
77	Urakmata	Kamiak	Kauiak	Ufamorata	Taipo
78	Malafu	Urakmata	Urakmate	Taipo	Kauika
79	Ravaka	Malafu	Malafu	Kauika	Marafu
80	Ufamorat	Ravaka	Ravaka	Marafu	Sauroro
81	Irava	Ufamorat	Ufamorat	Sauroro	Soasoatau
82	Teao	Irava	Irava	Sorsorotau	Soarasoot
83	Ufagatu	Teao	Teao	Sarasoratau	Teau
84	Kavsakmua	Ufagatu	Uragatu	Tiau	Ufiagata
85	Saumativa	Kavsakmua	Kausakmua	Ufagatau	Kavasakem
86	Fotagfuru	Taumativa	Saumativa	Kavasakamua	Taiku
87	Kaumsuak	Fotagfuru	Fotagfuru	Taipo	Hotogafur
88	Fotorito	Kaunufuak	Kaunufuak	Fotoafuru	Kaunofoak
89	Varea	Folorito	Kolosito	Kaunofooki	Famauri K
90	Ravaka	Varea	Varea	Famaurikotoaga Sauhani	
91	Vutermaoi	Ravaka	Ravaka	Sauhani	Ravaka
92	Fonemon	Veitirmaoi	Veitirmaoi	Ravak	Moraa
93	Fatafesi	Fonemon	Fonmon	Moara	Fonomanu

TABLE 6.1 (Continued) A comparison of the different lists of sau.

	Trouillet	MacGregor Liste...	Evans	MacGregor On...	Hocart 4578
94	Kautoluafe	Fatafesi	Fakafesi	Fonomanu	Fatafesi
95	Sokagaitu	Kauloluafe	Kauloluafe	Fatafesi	Kauturuaf
96	Muakitau	Sokagaitu	Sokagaitu	Kauturuafe	Sokogaitu
97	Kava	Muaketau	Muakiteu	Sokagaitu	Ragafuata
98	Asaimuri	Irava	Irava	Ragafua	Irava
99	Asootemuri	Asootemuri	Irava	Asohatemu	
100	Urakmata	Urakmata	Hanifiro	Tuipenau	
101	Tifarea	Tigarea	Taipenau	Tiugarea	
102	Vasea	Vasea	Tingarea	Vasea	
103	Tagfutia	Tagfutia	Vasea	Togafutia	
104	Suakmano	Suakmusa	Maraia	Sukamasa	
105	Varea	Varea	Sukamasa	Sukamasa	

For my analysis I have relied extensively on MacGregor's "Liste..." because (1) it is the most complete, (2) MacGregor spent a long period of time on the island, (3) it is confirmed by several other lists.

Comparison of Content of Sau Lists

MacGregor's "Liste..." of sau contains a column entitled hanua which Churchward (1938:216) translates as "land, country, place; native land or place, home." By comparing the names and places that are specified in MacGregor's "liste.." with other historical accounts written by MacGregor (1932) and Trouillet (n.d.) it is possible to determine that MacGregor interpreted the term hanua as referring to the place where the sau came from and not where he resided. It should be noted that MacGregor's historical account is based upon Trouillet's narrative. The first instance of relevance is where the list states that the first, second, and third sau all came from Pepjei. MacGregor's (1932) history states that these three individuals were the children of "Fonfonua, who dwelled at Vakoi in Peptsei (Pepjei)." Other incidences of coincidence between the list and MacGregor's historical account include the following statements made by MacGregor: (1) "...a Noatau man named Fonmon (sau 8)... (2) "...Tua (sau 21) of Malhaa became sau, and was succeeded by Sokmen (sau 22) of Oinafa" (3) "...Tuitafanga (sau 27), a man of Saukamo in Tsutsu (Juju) district..." (4) "...Fatafesi (sau 34) who came from Itu'ti'u..." (4) "Fonemon of Malhaha..." (5) "...Fatafesi of Pepjei..." These passages clearly indicate that MacGregor thought the term hanua in his list of sau referred to the sau's district of origin and not where he may have subsequently resided.

Analysis of the Homeland of Sau Based on Lists

MacGregor's (1932) "Liste..." list of sau was analyzed to assess presence or absence of a pattern in terms of the ruling elite's home district (Table 6.2). MacGregor's list of sau and their hanua was used instead of other lists of fakpure or mua for a number of reasons. While the names of the fakpure are provided in several of the lists, their origination was not documented. While MacGregor's list provides the name and hanua of the mua, this listing is much less complete than his documentation of the sau. Also the hanua of the mua seems less variable than the sau listing. During the prehistoric period the mua are always listed as coming from the eastern district of Noatau.

MacGregor's list was divided into two time periods to determine if there was a shift in which district the ruling elite came from between the prehistoric-protohistoric period and the later historic period. AD 1822 was chosen as the point in time when European contact began to have a marked influence on Rotuman society. Prior to this time very few European ships visited Rotuma (Lesson 1938-9) and the indigenous political economy was still largely intact. After the early 1820s a number of European deserters were living on the island and significantly more European ships stopped at the island for supplies. This contact with Europeans undoubtedly affected the economy of the island and may have contributed to shifts in political power.

When analyzing MacGregor's list of sau, district groupings were formed which correspond to the northern, southern, eastern, and western portions of the island. The district groupings are based on oral traditions which suggest that during

Table 6.2 MacGregor's list of sau with their associated district or village.

Number	Sau	District or Village
1	Sauane	Pepjei
2	Muriraki	Pepjei
3	Aferaki	Pepjei
4	Kauffonuo	Noatau
5	Rimkao	Noatau
6	Kaufose	Noatau
7	Toio	Noatau
8	Fonmon	Noatau
9	Varemua	Noatau
10	Taipo	Noatau
11	Tui	Noatau
12	Malafu	Noatau
13	Pau	Gasav
14	Kauata	Aga
15	Irava	Savlei
16	Tausia	Oinafa
17	Askava	Oinafa
18	Morseu	Noatau
19	Fui	Pepjei
20	Tereu	Itu'muta
21	Tua	Malhaha
22	Sokineu	Oinafa
23	Pora	Oinafa
24	Suakmasa	Oinafa
25	Faregfon	Oinafa
26	Vakaera	Oinafa

Table 6.2 (Continued) MacGregor's list of sau with their associated district or village.

Number	Sau	District or Village
27	Tuitafaga	Saukama
28	Irava	Malhaha
29	Tuaotse	Malhaha
30	Olijiri	Itu'ti'u
31	Tokoara	Noatau
32	Oftiri	Itu'ti'u
33	Iravagogofog	Motusa
34	Fatafesi	Gasau
35	Fonomon	Malhaha
36	Vuna	Itu'ti'u
37	Fatafesi	Saulei
38	Varomua	Saulei
39	Manava	Malhaha
40	Tuasolvol	Lepograsi
41	Rimakao	Sutsu
42	Fatafesi	Pepjei
43	Tiarsok	Sutsu
44	Atervao	Pepjei-Noatau
45	Ragafuat	Pepjei
46	Mora	Sutsu
47	Vavaoti	Oinafa
48	Uafotse	Oinafa
49	Petpetvaviau	Oinafa
50	Fursefaua	Saukama
51	Tuiritonave	Noatau
52	Irava	Oinafa

Table 6.2 (Continued) MacGregor's list of sau with their associated district or village.

Number	Sau	District or Village
53	Mogao	Pepjei
54	Sokineu	Blank
55	Tuatoko	Saukama
56	Mou	Oinafa
57	Kausiliaje	Oinafa
58	Tupuroto	Oinafa
59	Tokaniua	Pepjei
60	Garagseu	Noatau
61	Malafu	Pepjei
62	Matagtag	Saukama
63	Tuivaive	Saukama
64	Sokogtau	Saukama
65	Vavaoti	Pepjei
66	Saotiak	Pepjei
67	Veimomoko	Pepjei
68	Katoagtau	Saukama
69	Kauteg	Oinafa
70	Fonorotoi	Pepjei
71	Tupsurotu	Pepjei
72	Fonmon	Pepjei
73	Uof	Malhaha
74	Tiu	Sutsu
75	Tuasoko (tirsek)	Noatau
76	Toipu	Noatau
77	Kauiak	Noatau
78	Urakmate	Pepjei
79	Malafu	Pepjei

Table 6.2 (Continued) MacGregor's list of sau with their associated district or village.

Number	Sau	District or Village
80	Ravaka	Saukama
81	Ufamorat	Saukama
82	Irava	Pepjei
83	Teao	Noatau
84	Uragatu	Noatau
85	Kausakmua	Pepjei
86	Saumativa	Sutsu
87	Fotagfuru	Sutsu
88	Kaunufuak	Noatau
89	Kolosito	Noatau
90	Varea	Pepjei
91	Ravaka	Pepjei
92	Veitirmaoi	Saukama
93	Fonmon	Saulei
94	Fakafesi	Noatau
95	Kauloluafe	Lopta
96	Sokagaitu	Motusa
97	Muakiteu	Tualoi
98	Irava	Malhaha
99	Asootemuri	Itu'muta
100	Urakmata	Feavoi
101	Tigarea	Malhaha
102	Vasea	Salvaka
103	Tagfutia	Saulei
104	Suakmusa	Malhaha
105	Varea	Feavai

certain periods the island was divided into five districts (Trouillet n.d.). At one time Itu'ti'u and Itu'muta were part of a single district called Fau, and Pepjei and Juju were part of another district called Fag'uta. The oral traditions also note a strong alliance between Oinafa and Noatau with no instances of warfare between the districts (see Chapter 7). However, the oral traditions do not suggest that they were united as a single district. Therefore, for analytical purposes, Oinafa and Noatau are combined into a single group in the east, Itu'ti'u and Itu'muta are combined to form another group in the west, Pepjei and Juju are combined to form a third group in the south, and Malhaha forms a fourth separate group in the north.

Forty-three of the 105 sau listed in MacGregor's list were in power before 1822 and 62 sau reigned between 1822 and 1871, at which time the position of sau was abolished. The hanua of the 43 sau that reigned during the prehistoric-protohistoric period was a locatable district or village in all but one case. The hanua of Tuasolvol, sau 40, is Lepograsi and I have been unable to determine the district for this village. Table 6.3 and Figure 6.1 summarize the data on the homeland district of the sau during the protohistoric-prehistoric period. During this period the greatest number of sau came from Noatau, the second highest number came from Itu'ti'u, and the third highest came from Oinafa. A Mann-Whitney test for equal averages indicates that when the eastern districts of Noatau and Oinafa are grouped together a higher number of sau came from these districts in comparison to the other five districts ($p=0.095$, $T=4$). While the probability level is too great to accept as significant and therefore is somewhat ambiguous, it does suggest a general pattern.

Table 6.3 The number of sau and NSAATPI from each district.

District	Number of Sau Before 1822	NSAATPI Before 1822	Number of Sau After 1822	NSAATPI After 1822
Malhaha	5	0.0109	3	0.0065
Pepjei	5	0.0155	17	0.0527
Juju	4	0.0109	13	0.0353
Oinafa	7	0.0373	8	0.4265
Noatau	11	0.0696	13	0.0822
Itu'ti'u	9	0.0104	6	0.0069
Itu'muta	1	0.0067	1	0.0067
Unknown	1		1	
Total	43		62	

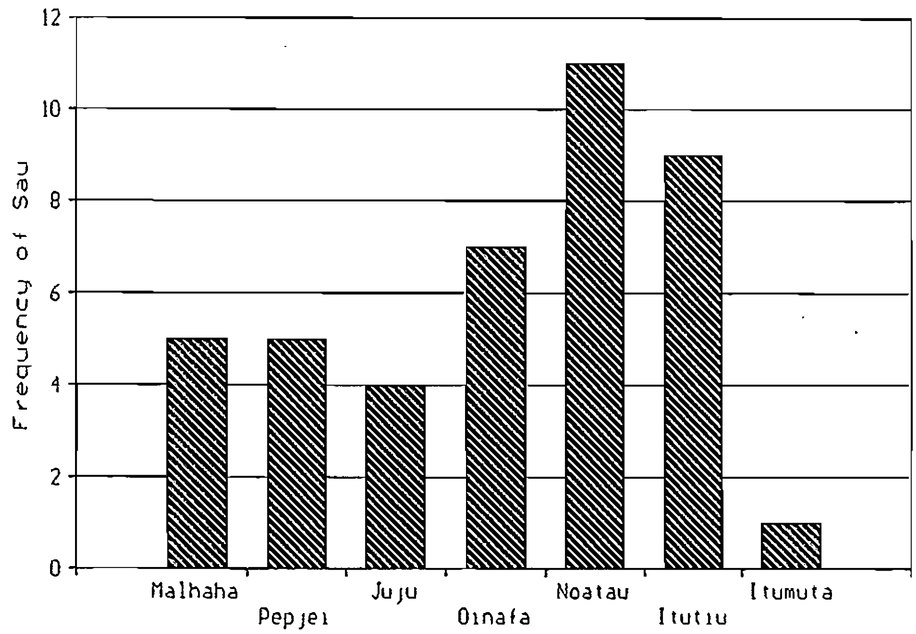

Figure 6.1 The frequency of sau from each district during the prehistoric-protohistoric period.

This pattern is graphically displayed in the district group results (Table 6.4 and Figure 6.2). It is clear that during the prehistoric-protohistoric period the greatest percentage of sau came from the eastern districts of Noatau and Oinafa. In contrast, far fewer sau came from the southern districts of Juju and Pepjei, the western districts of Itu'ti'u and Itu'muta, and the least number of sau came from the northern district of Malhaha.

To compensate for differences in area and productivity of districts and district groups, the number of sau divided by the area adjusted terrestrial productivity indices (AATPI) was calculated for each district and district group (see Tables 5.3 and 6.3). This index is termed the number of sau area adjusted terrestrial productivity index, or NSAATPI for short. It is a measure of the number of sau from a district adjusted by the overall area and productivity of the district. Higher NSAATPI indicate that a relatively higher number of sau came from a relatively less productive district. Conversely, lower NSAATPI indicate that fewer sau came from a more productive district.

During the prehistoric-protohistoric period, Noatau and Oinafa have the highest NSAATPI (Figure 6.3). The indices suggest that relatively more sau came from these relatively less productive districts in comparison to the other districts. The NSAATPI of Pepjei, Malhaha, and Itu'ti'u are all about the same, and that of Itu'muta the lowest. The ranking of the district group NSAATPI are similar, again suggesting that relatively more sau came from the less productive eastern districts (Figure 6.4).

Table 6.4 The number of sau and NSAATPI from each district group.

District Group	Number of Sau Before 1822	NSAATPI Before 1822	Number of Sau After 1822	NSAATPI After 1822
Northern	5	0.0109	3	0.0065
Southern	9	0.0130	30	0.0435
Eastern	18	0.0520	21	0.0608
Western	10	0.0098	7	0.0069
Unknown	1		1	
Total	43		62	

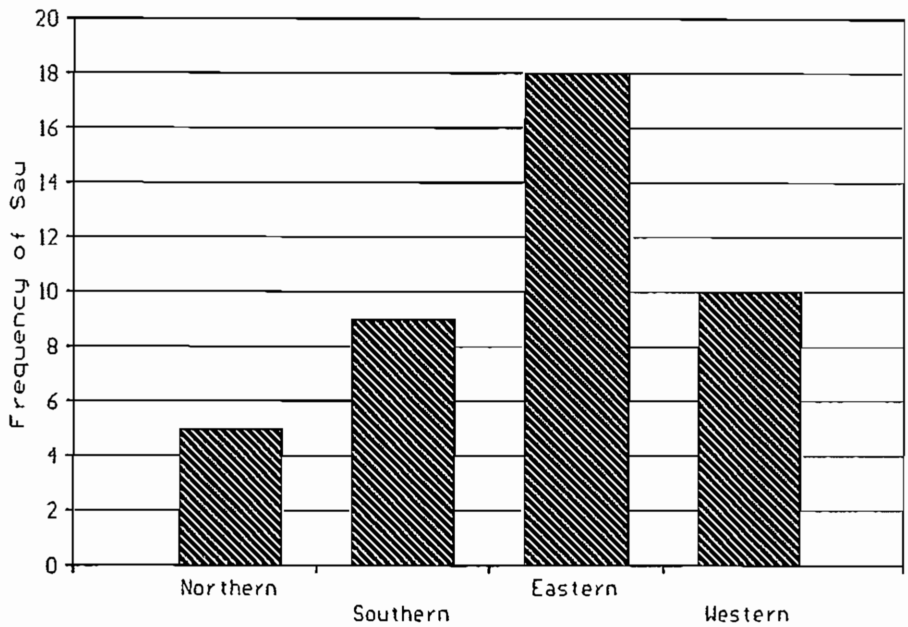

Figure 6.2 The frequency of sau from each district group during the prehistoric-protohistoric period.

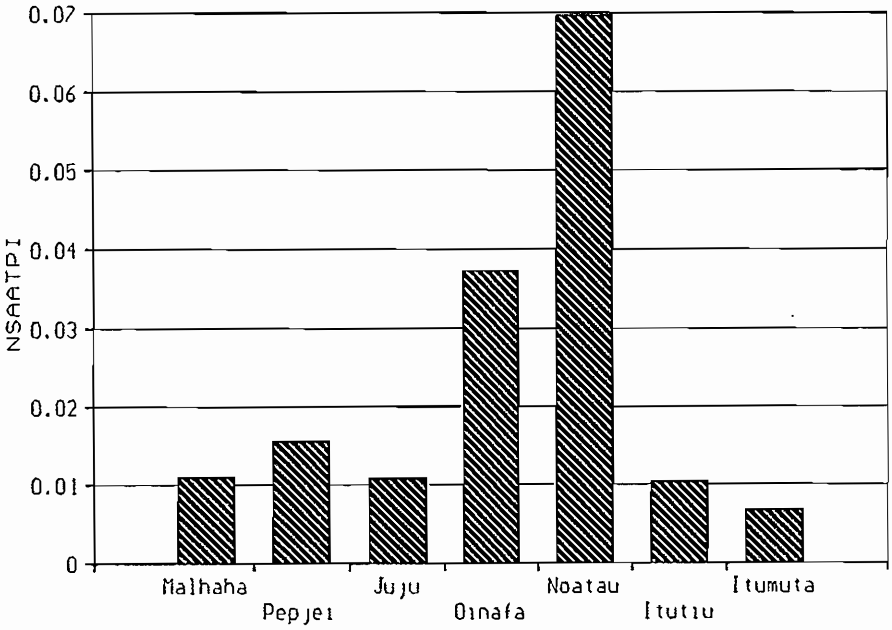

Figure 6.3 NSAATPI for each district during the prehistoric-protohistoric period.

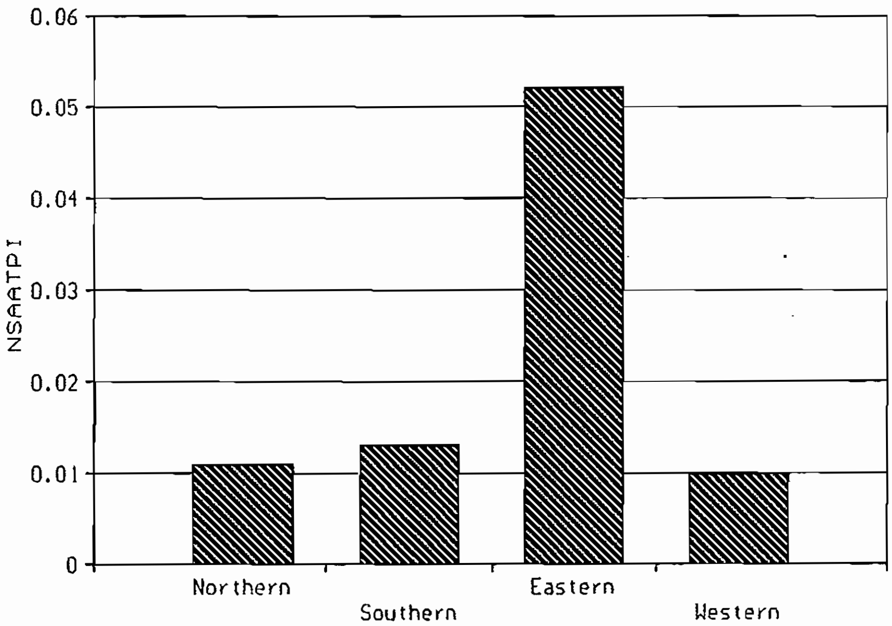

Figure 6.4 NSAATPI for each district group during the prehistoric-protohistoric period.

MacGregor's list specifies the hanua of all the sau during the historic period (1822 to 1871) except for Sokmen, sau 54, which is blank. Tables 6.3 and 6.4, and Figures 6.5 and 6.6 summarize the data on where the sau came from during the historic period. The greatest number of sau came from the southern districts of Juju and Pepjei, and the second highest number of sau came from the eastern districts of Noatau and Oinafa. In comparison to the southern and eastern districts, far fewer sau came from the northern and western districts. The district and district group NSAATPI during the historic period indicate that there was an increase in the number of sau from the southern districts of Juju and Pepjei, almost rivaling the indices for the eastern districts of Noatau and Oinafa (see Table 6.3 and 6.4, and Figures 6.7 and 6.8).

Political Geographic Code of Rotuma

In his analysis of the mythical narratives, Howard (1986:4-5) notes that different social status positions are consistently associated with particular regions of the island, and he proposes that there was a "geographical code" on Rotuma. Howard (1986:4-5) observes:

> That portion of the island to the west of the isthmus is called Fa'u, "back," and is strongly associated with the indigenous people. This contrasts with the remainder of the island, which is termed mua, "front." (The west end of the island is also referred to as sio, "down," the east end as se'e, "up.") The eastern segment is further divided into an end and middle section. The end section includes Oinafa and Noatau, which, being at the extreme eastern part of the island, is most closely associated with stranger-chiefs. The midsection includes Malhaha, Fag'uta, and the portion of Itu'ti'u east of the isthmus. In the myths, contrasts between the extremities of the island (e.g., between Oinafa/Noatau and Fa'u) imply strong opposition; contrasts between either end and the midsection a somewhat weaker form.

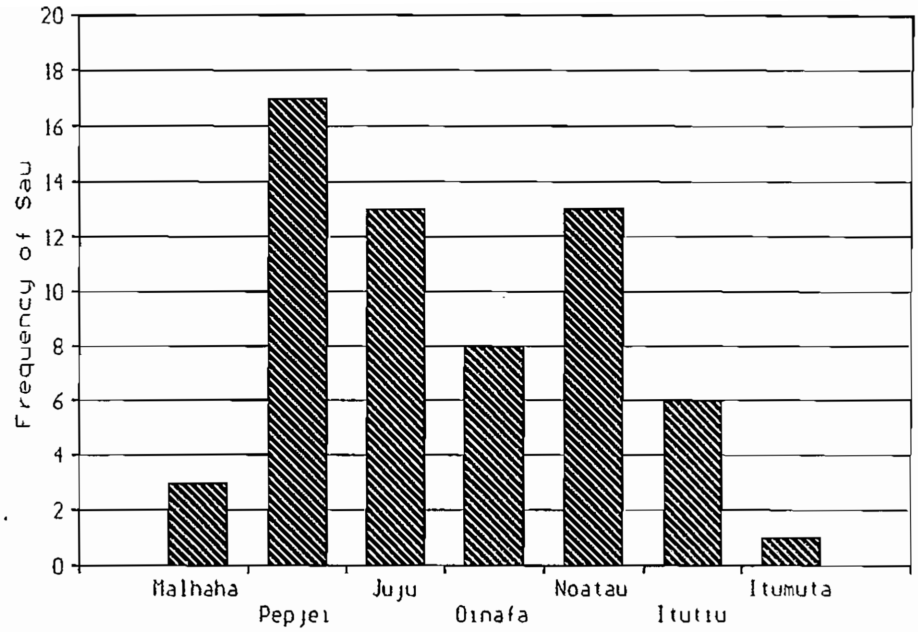

Figure 6.5 The frequency of sau from each district during the historic period.

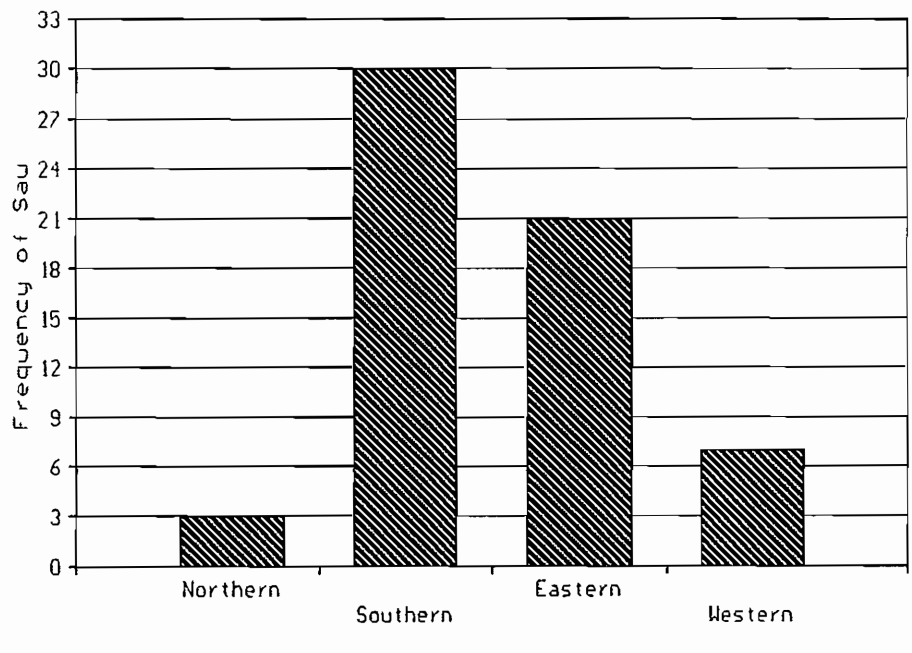

Figure 6.6 The frequency of sau from each district group during the historic period.

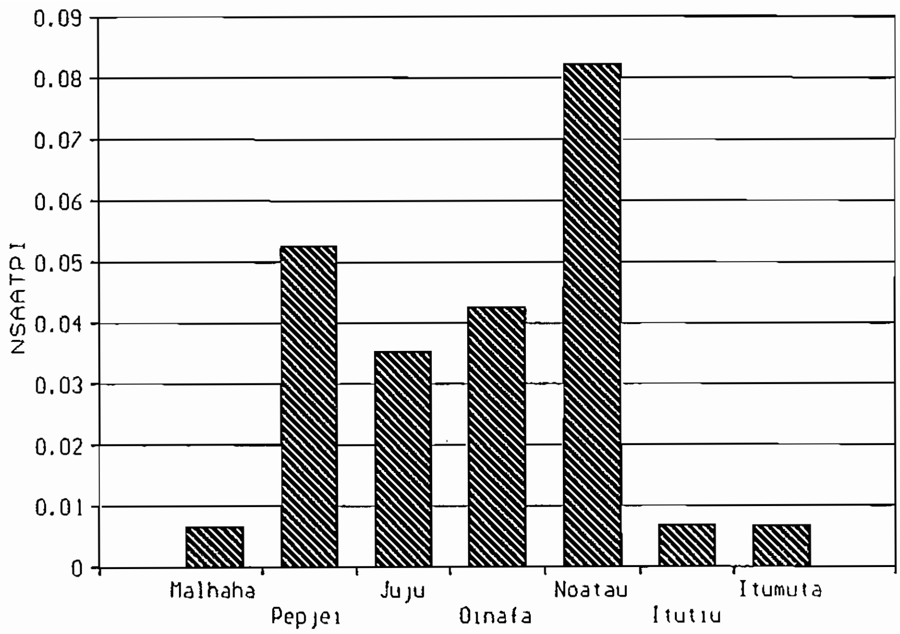

Figure 6.7 NSAATPI for each district during the historic period.

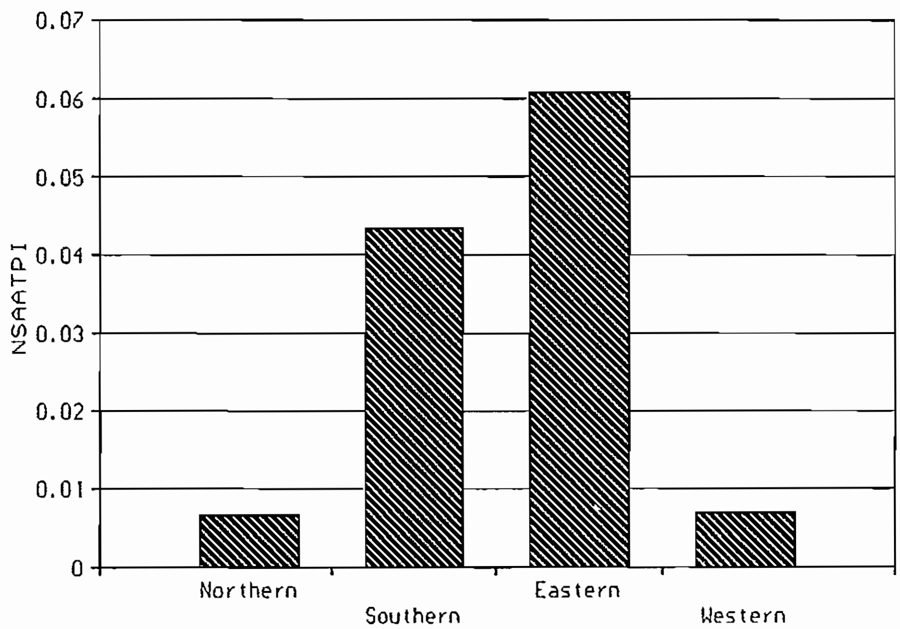

Figure 6.8 NSAATPI for each district group during the historic period.

The opposition between the eastern chiefs and the western commoners is consistent with the analysis of the homeland of the sau just presented. Howard notes a second weaker opposition throughout the narratives between the north and south of the island. The north side of the island is associated with chiefs and the south with commoners. This weaker opposition is not confirmed by my analysis of MacGregor's list. The final opposition in the geographic code was a distinction between the coast which was associated with the chiefs, and the inland which was associated with the people of the land or commoners.

The Relationship Between Commoners and Chiefs With Respect to Agricultural Resources and Corvee Labor

Howard's (1985, 1986) detailed analysis of several oral traditions clearly shows that during the prehistoric-protohistoric period the pan-Rotuman chiefs of sau, mua, and fakpure, were differentiated from the common people of the island. Chiefs and commoners had unique roles and prerogatives that were associated with their respective status. Commoners were considered "the people of the land" and were responsible for producing the agricultural staples that supported the pan-Rotuman chiefly hierarchy (Howard 1986). In return for the commoners produce and corvee labor, the pan-Rotuman chiefs provided a link to the supernatural world of the deities which ensured the prosperity of the island. In prehistoric-protohistoric Rotuman society an abundance of food was indicative of a proper religious-political order and the fulfillment of chiefly duties (Howard 1985:67)

The relationship between the chiefs and commoners vis-a-vis agricultural resources and corvee labor is reiterated in several oral traditions. The following two myths exemplify a number of Rotuman cultural ideals:

> Once there was a (sau) king called Saurotuma who lived at Noa'tau. All the toa - the strong men or giants - of Rotuma agreed to build him a tower - Rikolagi...
>
> Foea, the toa from Lopta who lived at Ki ne Hi'e (see archaeological description in Chapter 8), arranged to send a message all round Rotuma to tell the others what they should do. One day Foea went to give the information to the two toa from Fahapa near Tarsua. When he arrived there, he told the two toa that one should bring a tuturu house post and one should bring a sasaga rafter. The two toa agreed, and Foea told them of the day appointed for the building of the tower...
>
> When the appointed day came, the two toa from Fahapa went to Noatau but they did not take the tuturu (house post) and the sasaga (rafter). When they arrived, all the toa from Rotuma except Faume started to build the tower. Faume who was then living at Solroroa was considered to be too young to be allowed to come. The toa of Rotuma went on building until they saw that only two pieces of timber were needed to complete the tower - one tuturu (host post) and one sasaga (rafter). But they were too frightened to tell the two toa of Fahapa that they had failed to bring their share of the timber.
>
> Now while they were building the tower, Faume left Solroroa and came over to Noa'tau, following the Hapmafau side of Itu'ti'u district. When Faume reached Rukuallata, he saw a bird - a jea. He took a piece of stick and threw it at the bird, and then he followed the bird. As he hurried after the bird, he made the ground muddy and so caused the rano swamp around Noa'tau.
>
> Faume ran as far as Maragteu, where the rano ends, and then he walked back to Rikolagi, between Lepi and Fekeoko. When he arrived, Faume asked what had happened. Some of the toa told him that two pieces of timber were needed to complete the tower - one tuturu (house post) and one sasaga (rafter).
>
> Faume then tried to find out who had not brought their share. The toa told him that the two toa from Fahapa had failed to bring their share. So Faume was greatly annoyed, and he went out and seized one of them and asked the others to bring the second one.
>
> This they did, and they made one of the two toa from Fahapa to be the tuturu (house post) and the other to be the sasaga (rafter), and they tied them together, one on top of the other. After that, the toa of Rotuma came and sang a fagi (Parke 1964).

The myth reiterates a number of important points. The first is that the preeminent chief of the island, Saurotuma, who according to one of MacGregor's lists was the eleventh sau of the island, lived in the eastern district of Noatau. This is the side of the island that Howard (1985) notes is associated with the preeminent chiefs of the island, and the side from which the previous analysis suggested the pan-Rotuman chiefs generally came from. The term "toa" is defined as a "person strong in fight, valiant person, champion, hero, conqueror" (Churchward 1940:334), is a common metaphor for the chiefs of the island, and a west Polynesian cognate for the position of warrior. The first paragraph establishes the theme of the myth in that the lesser chiefs from throughout the island have agreed to contribute their labor, and by association the labor of their people, to construct a monument for the preeminent chief of the island who lives in the east. Foea, another chief from the eastern district of Oinafa, is responsible for arranging the labor of the other chiefs, and goes to talk to the chiefs of Fahapa who live in the western district of Itu'ti'u. Faume is a chief from a western district, although in other myths he is associated with the eastern districts. Faume circles the island and while in the eastern district of Noatau interacts with a bird, a metaphor for an intermediary between the chiefs and the deities. With the assistance of the supernatural intermediary, the chief creates the rana swamp of Noatau, a valuable agricultural zone where swamp taro, papai, is grown. When Faume returns to where the monument is being built he finds that the lesser chiefs from the west are not contributing their fair share of the labor. In retaliation, Faume turns the western chiefs into the foundation posts of the house, symbolically forcing the lesser chiefs to "support" the sau. The myth delineates the common pattern of the eastern chiefs being supported by the labor and produce of the western chiefs and people. If the western chiefs do not comply, the eastern chiefs use force. In return for the labor of the western chiefs and people, the eastern chiefs ensure the fecundity of the land by interacting with the deities to create new agricultural resources.

A second myth reiterates some of the same themes:

> ...an individual by the name of Oiatos lived in Uea; he was lifted up into the clouds by a spirit...and soon dropped a genus called Papai (swamp taro) for the times of scarcity, a net to be used in fishing, and a kind of wood called Moioir, a small tree of great medicinal properties...One day an individual from Noatau found (the swamp taro) and took it to Noatau and planted it in a place called Rane, from which place it spread all over Rotuma. (Trouillet n.d.)

The myth affirms the theme that agricultural crops are introduced to Rotuma via supernatural connections. Uea is a small island to the northwest of Rotuma and as such acts as an intermediary point between the heavens and the main island. The crop that is introduced to the island is taken to the eastern district of Noatau. It is only after the swamp taro is grown in this chiefly district that it is distributed to the rest of the island.

Both myths reiterate the prevalent belief that through the intervention of chiefs from the eastern side of the island with the supernatural world the island will prosper. This intervention ideologically justifies the chiefs appropriating the agricultural surplus and labor of the commoners.

Although Rotuman chiefs were entitled to a share of the agricultural surplus they could not be too demanding or else the commoners would rebel (Howard 1985).

Howard (1985:52) has analyzed several myths that focus on this theme and notes that the "impetus towards the founding of Rotuma is rooted in an issue of chiefly prerogative versus commoner rights with regard to food." The founding myth is about a quarrel between the children (people) of Roa and his brother over agricultural produce in Samoa. Roa is forced to leave Samoa and creates the island of Rotuma. Other examples of disputes over agricultural resources include instances where the people rebelled because the sau took more than his fair share of the produce (Howard 1986; Trouillet n.d.). While chiefs were able to obtain material gains at the expense of the commoners this exploitation could not be too extreme or else the commoners would try to rebel and replace the sau.

Summary

The analysis of the recorded oral traditions and ethnohistorical literature suggests that Rotuma was a chiefdom with three island wide political positions, the fakpure, mua, and sau. There is some inconsistency in the narratives concerning the precise behavioral characteristics of each position. The sau has been referred to as the "king" of Rotuma, a position that was symbolic of the authority of the chiefs. The narratives suggest that the sau was either selected by the fakpure, the council of chiefs, a single district chief, the incumbent sau, or by the common people. There is further inconsistency concerning where the sau resided, and the duration of his tenure. The narratives do indicate that the position of sau was created by a segment of society to impose a ruling strata of elite over the people of Rotuma. Sau were clearly associated with the chiefs whereas the mua were associated with common people.

The relative rank of the sau vis-a-vis the fakpure is unclear. This could reflect a temporal shift in the sau's importance from the prehistoric to the historic period. All of the narratives agree that the sauship was not a permanent position. Several of the narratives suggest that the sauship was a rotational position, held by members of each district in turn. My analysis of the lists of sau indicates that the position was not held in strict rotation, rather was more often held by individuals from the east side of the island. This analysis coincides with Howard's (1985, 1986) specification of a "geographic code" on the island. It is clear that the eastern side of the island was more often associated with the pan-Rotuman chiefs and the western side was associated with the commoners. The myths suggest that it was through the intervention of the pan-Polity chiefs that the island prospered. This chiefly function partly legitimated the chiefly prerogative of appropriating agricultural resources and labor.

CHAPTER 7

DISTRICT POPULATION DENSITIES AND INTERDISTRICT AGGRESSION

Introduction

To evaluate the propositions of the proposed model, two additional aspects of traditional Rotuman society need to be examined. Proposition three tenet two is concerned with the disparity in population densities throughout the island, and proposition one tenet two, proposition two tenet three, proposition six tenets three and four, consider intergroup aggression. The pertinent data for these aspects of traditional Rotuman society are discussed in this chapter. The data concerning population densities are examined first and then I turn to a discussion of interdistrict aggression.

District Population Densities

Proposition three of the proposed model suggests that the political integration of Rotuma could have occurred if the disparity in environmental contexts throughout the island was small enough so that relatively similar population densities were supported. If the environmental differences were extreme, highly disparate population densities might have been supported and political integration through warfare might have been inhibited. The relationship between population density and the success rate in warfare is discussed in Chapter 9. This section of this chapter reviews the ethnohistorical sources to determine if the population densities throughout Rotuma were relatively even.

Early population estimates for Rotuma range from 5000 made by Tromellin (1829) in 1829, to between 2000 and 3000 made by Lucatt (1851) in 1851. Based on these estimates and the contemporary ecological context of Rotuma, Howard (1964:27) proposed that the indigenous population was between 3000 to 4000. However, all of these estimates may well be considerably low, as recent research in Hawai'i (Stannard 1989) and the Americas (Ramenofsky 1987; Stannard 1992; Dunnell 1991) suggest that indigenous populations dramatically decreased immediately after European contact and the population estimates made by early Europeans were typically underestimates.

The first census on Rotuma was taken in 1881 when the island was ceded to the British Government, and thereafter censuses were taken every 10 years (Fiji Government 1881, 1911, 1921). Population figures for each district were obtained from the 1881, 1911, and 1921 censuses (Table 7.1 and 7.2). The 1881 census includes only Rotumans and does not include the 25 "natives of other south Pacific Islands" and 11 Europeans who were living on the island. These 36 people were not included because their residences were not specified. The 1911 figures do include 16 Europeans and 25 "Half-castes", and the 1921 figures include 259 non-Rotumans.

Table 7.1 Demographic data from each district for 1881, 1911, 1921.

District	1881	1881 Density (pop./km^2)	1911	1911 Density (pop./km^2)	1921	1921 Density (pop./km^2)
Malhaha	240	45.62	190	36.12	182	34.60
Pepjei	136	30.80	186	42.12	133	30.12
Juju	242	56.89	229	53.84	304	71.47
Oinafa	472	53.02	410	46.06	363	40.78
Noatau	409	68.77	412	69.28	375	63.05
Itu'ti'u	765	72.88	655	62.40	851	81.07
Itu'muta	227	79.21	211	73.63	143	49.90
Total	2491		2293		2351	

Table 7.2 Demographic data from each district group for 1881, 1911, 1921.

District Group	1881	1881 Density (pop./km^2)	1911	1911 Density (pop./km^2)	1921	1921 Density (pop./km^2)
Northern	240	45.62	190	36.12	182	34.60
Southern	378	43.60	415	47.87	437	50.40
Eastern	881	59.33	822	55.36	738	49.70
Western	992	74.24	866	64.81	994	74.39
Total	2491		2293		2351	
Mean S.D. Range		55.70 14.20 43.60-74.24		51.04 12.12 36.12-64.81		52.27 16.45 34.60-74.39

Detailed district information from a number of censuses were not available, but Fatiaki (1991:3) cites population figures for the entire island from 1891 to 1966 (Table 7.3). The data cited by Fatiaki for the years 1911 and 1921 are slightly different than the population counts listed in the censuses. Therefore the census data are used in Table 7.3 for 1881, 1911, and 1921, and the data cited by Fatiaki (1991:3) are used for 1891, 1901, 1936, 1946, 1956, and 1966.

The demographic data exhibit a temporal trend which documents a population decline in the late 1800s and early 1900s (Figure 7.1). The population declined from 2491 in 1881, to 2219 in 1891, to a low of 2061 in 1901. This decline was apparently due to a measles epidemic in 1901 that killed approximately 500 people (Fatiaki 1991:3). the data indicate that the population of Rotuma has been increasing since the early 1900s. Other undocumented demographic shifts undoubtedly occurred prior to 1881 as a result of other introduced diseases.

The detailed data for district populations indicate that population densities varied throughout the island (see Table 7.1; Figure 7.2). In 1881 the mean population density for the entire island was 59.1 people/km^2. The individual district densities ranged from 30.8 people/km^2 to 79.2 people/km^2, with a mean of 58.3, a standard deviation of 17.0, and a coefficient of variation of 0.29. The relatively low coefficient of variation indicates that the spread between the district population densities is relatively small. However, the population density in Itu'muta (79.2 people/km^2) was over two and a half times the population density in Pepjei (30.8 people/km^2).

Table 7.3 Demographic data for 1881 to 1966.

Year	Total Island Population
1881	2491
1891	2219
1901	2061
1911	2293
1921	2351
1936	2816
1946	3313
1956	4422
1966	5797

If the larger pattern of district groups is considered, then the disparity between the population densities in each district group is less (see Table 7.1 and Figure 7.3). In 1881 the four district groups had a mean population density of 55.7 people/km^2, with a range from 43.6 people/km^2 to 74.2 people/km^2, a standard deviation of 14.2, and a coefficient of variation of 0.25. The largest disparity in population densities was between the western district group and the southern district group. The population density in the western district group was 1.7 times the density in the southern district group.

To determine if the relative differences in population densities throughout the island were consistent through time, the 1911 and 1921 data were considered. The

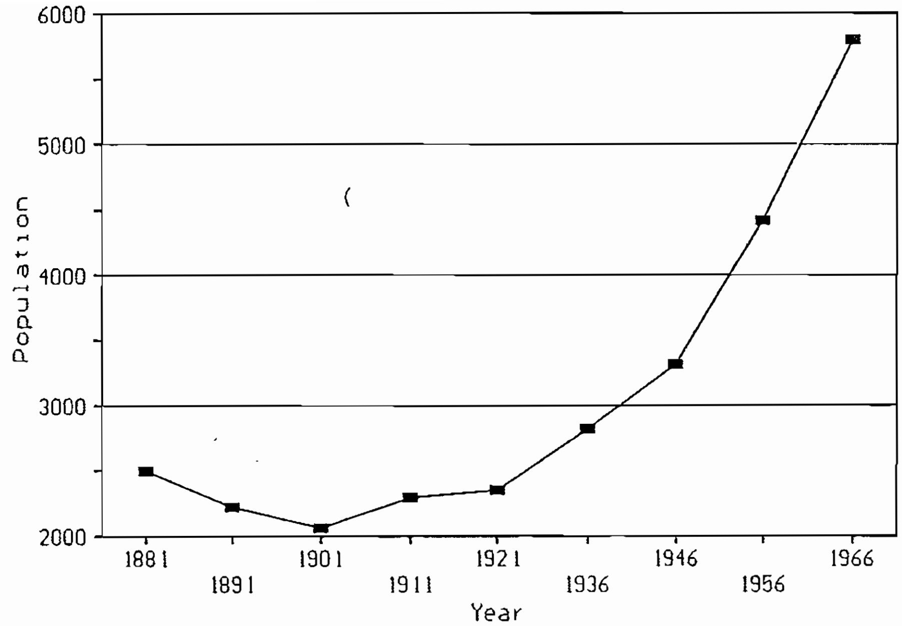

Figure 7.1 Demographic data from 1881 to 1966.

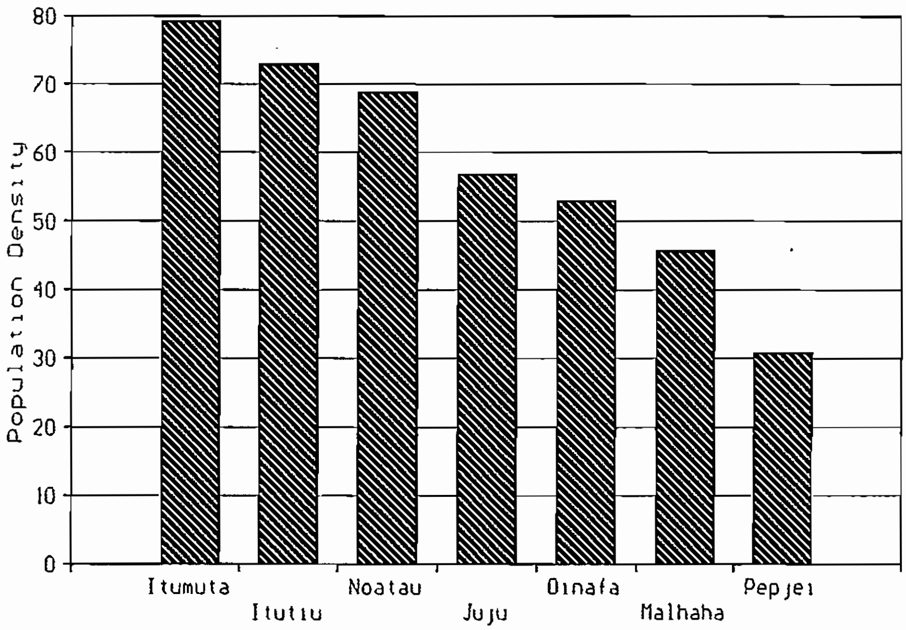

Figure 7.2 District population densities in 1881.

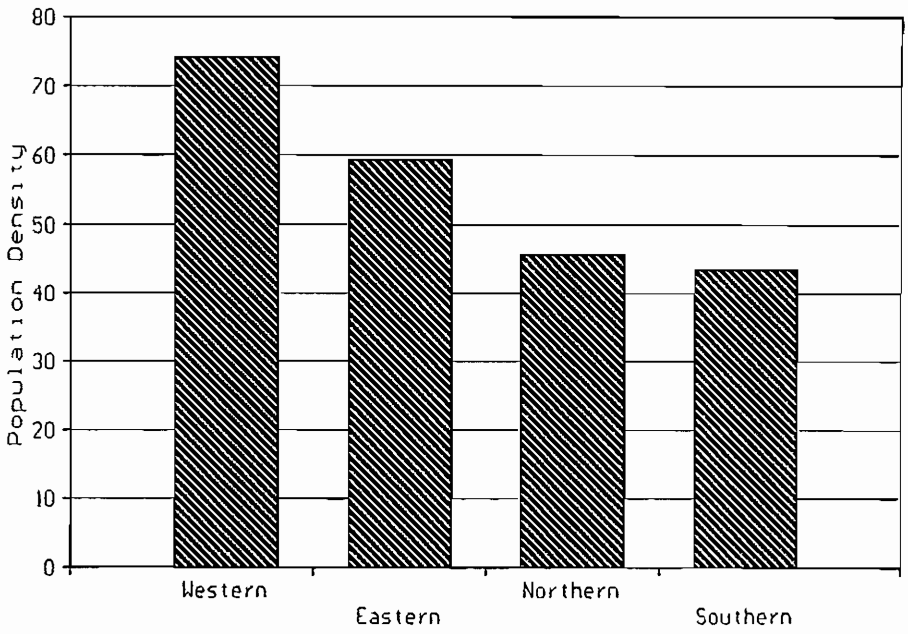

Figure 7.3 District group population densities in 1881.

assumption is that if the 1911 and 1921 data show a pattern similar to the 1881 data perhaps the pattern is a general trend that was maintained through time.

The data from 1911 do have a similar pattern to the 1881 data (see Table 7.1 and Figure 7.2). The mean population density for the entire island in 1911 was 54.4 people/km^2. The individual district densities ranged from 36.1 people/km^2 to 73.6 people/km^2, with a mean of 54.8, a standard deviation of 14.2, and a coefficient of variation of 0.25. A Pearson product moment correlation indicates that there is a significant correlation between the district population densities in 1881 and 1911 (Pearson correlation coefficient=0.89, p=0.006). This correlation suggests that the relative population densities of the districts during the two periods were similar. The 1921 data are somewhat different from the 1881 and 1911 data. Although the district mean (53.0 people/km^2), range (30.1 people/km^2 to 81.1 people/km^2), standard deviation (19.4), and coefficient of variation (0.36), are somewhat similar, the relative rankings of the districts have changed with the population density in Itu'muta dropping and the density in Juju rising.

At the district group level, the relative rankings of the population densities associated with each district group changed between the three time periods (see Table 7.2 and Figure 7.3). During all three time periods, the western districts had the highest population density on the island and the eastern districts consistently had the second highest population density. The relative position of the northern and southern district groups changed between 1881 and 1911. The data suggests that the pattern of population densities at the district group level of analysis is somewhat consistent through time although two district groups did change their relative positions.

Although the population data are from the late nineteenth and early twentieth centuries and exhibit temporal variation between the three censuses, the general patterns of the 1881 data might be indicative of the population densities during the late prehistoric and proto-historic periods. The district population densities indicate that some of the districts had densities over 2.5 times as high as other districts. At the district group level the disparity was less, with the highest population density being 1.7 times that of the lowest density. While these differences indicate that people were not evenly distributed throughout the island, the disparity in population densities are not extreme.

Interdistrict Aggression

Several propositions of the proposed model consider interdistrict aggression (see Table 2.1). In proposition one tenet two it was stated that successful intergroup aggression enabled people to make material gains associated with subsistence resources. Proposition two tenet three stated that the stimulus for intergroup aggression was greatest in those areas of Rotuma that had the lowest productivity. An expectation of this proposition is that the people living in the less productive districts should have participated in more warfare than the people living in other districts. Proposition three stated that political integration was a possible outcome of intergroup aggression if the population densities of the districts were relatively equal. Proposition six tenet three stated that warfare was one means by which the pan-Rotuman elite could have maintained the political integration of their polity. An expectation of this proposition is that the people living in the natal districts of the pan-Rotuman elite should have participated in warfare more often than the people living in other districts. Finally, proposition six tenet four stated that the victors of war should try to redistribute the control of the land to their allies to impose a strata of non-indigenous leaders.

Proposition one tenet two considers the material outcome of interdistrict aggression and is discussed in the first part of this section of the chapter. Proposition six tenet four considers a behavioral outcome of interdistrict warfare, that is, how warfare can result in the gain of political offices that permit the control of land, and is discussed in the second part of this section of the chapter. Proposition two tenet three, and proposition six tenet three, consider the frequency with which the people living in a district participated in warfare in relation to two separate variables. Proposition two tenet three considers the relationship between the frequency with which the people living in a district participated in warfare and the productivity of that district, and proposition six tenet three considers the relationship between the frequency with which the people living in a district participated in warfare and the number of polity wide leaders that came from that district. An analysis of the frequency with which district residents participated in warfare is presented in this chapter and the relationship between the frequency and the other variables is presented in Chapter 9. Proposition three is concerned with the success rate of interdistrict aggression and the population density of the districts. The success rate in interdistrict aggression is discussed after the frequency of district participation in warfare is considered, and the relationship between the success rate and population densities is discussed in Chapter 9.

Material Benefits of Interdistrict Aggression

Howard (1964, 1966, 1985, 1986) suggested that the predominant cause of interdistrict competition on Rotuma was breaches of etiquette, including ceremonial neglect and the failure to pay the proper respect to the sau. According to this view, Rotuman warfare was motivated by status rivalry rather than economic considerations. The benefit for the elite of a successful campaign would have been the display of power and the enhancement of status. Howard (1966:63) and Gardiner (1898:470) suggest that Rotuman warfare was never a means of territorial aggrandizement, and

Gardiner (1898:470), concludes that "There was no great advantages to be gained from war by the winning side."

While not denying the motivational force chiefly status competition can have on interdistrict competition, I suggest that there were indeed material benefits for success in warfare. Durienzies (1824) wrote in 1824 that interdistrict warfare resulted from "jealousy and badly defined boundaries," and accounts by Osborn (1834) and Eagleston (1834) collaborate that land was fought over. Gardiner (1898:470) notes that pigs were regarded as legitimate spoils of war, and that the victors claimed first fruits and assumed everything they could sack. Several recorded myths emphasize that warfare was often motivated by a chief's failure to distribute agricultural crops in a fair manner (Trouillet n.d.; Howard 1986). Finally, Gardiner (1898:470) notes that warfare was occasionally prompted by a chief failing to send the proper amount of tribute to another chief. All of these accounts suggest that the control of land, subsistence resources, and tribute were often the motivating factors behind warfare.

Gardiner (1898:471) notes that villages were seldom burnt and plantations were rarely destroyed as a result of Rotuman warfare. He interprets these behaviors as evidence that there were no material benefits associated with warfare. Earle (1987:293) notes, however, that "since labor (not land) is the limiting factor to production in early hierarchical societies, warfare may switch from confrontations aimed at grasping new lands to wars of conquest geared to capture new populations." Researchers have documented this processes in Hawai'i where the prize of warfare was control over the productive units consisting of land and labor (Hommon 1986;

Earle 1978; Kirch 1990a). When considering Rotuma, it would appear that Gardiner (1898) did not appreciate this process and failed to realize that the control of villages and plantations as a productive unit was one of the most important spoils of war, thus they would not have been destroyed in war. In Rotuma, the leaders of the conquering districts would have had a vested interest in keeping the productive units of the vanquished districts intact. It was the control of these productive units, rather than their destruction, that was needed to sustain the conquering leaders power and provided them with material resources for their support and further campaigns.

The Redistribution of Chiefly Titles

Controlling chiefly titles was another benefit of war that had material consequences. This control occurred at several levels, each level having different material prerogatives. At the intra-district level, holding a ho'aga title provided a person with a measure of control over a small section of land within a district (Gardiner 1898:429). At the island wide level, holding the title of sau, mua, or fakpure, gave a person power throughout the polity. At the very least these pan-Rotuman elite, their entourage and associated chiefs, were supported by the agricultural surplus of the districts. Furthermore, it is likely that these positions conferred additional powers and prerogatives. If these district and island wide titles were obtained through interdistrict aggression a strata of extra-district leaders would have been imposed on the people living in a district.

There is ethnohistorical evidence that this was a common, but not entirely successful strategy. A consultant of MacGregor (1932) stated "If a hoag (ho'aga) or district was conquered in war, the victors took away the important men of the district with high titles. The losing district gave up these titles." Gardiner (1898:470) reaffirms this statement when he states, "The victors might depose the conquered chiefs, and put nominees of their own in their place." In general, it appears that the titles were won by killing the incumbent title holder (MacGregor 1932). At the island wide level the right to appoint the sau and reap the associated benefits was often obtained through warfare (MacGregor 1932). Howard's (1985, 1986) analysis of Rotuman mythology suggests that although acknowledging the reign of a sau from an outside district was the norm, rebellion often occurred and new sau were named.

While chiefly titles were appropriated through warfare, the strategy was only partially successful in establishing a stratum of non-local elites. The sau, mua, and fakpure are examples of extra-district elites established through interdistrict aggression. At the more regional level the ethnohistorical literature suggests that ho'aga titles were obtained through warfare but this practice was apparently not developed to the extent that a permanent strata of administrative extra-district managerial chiefs was established.

The Frequency With Which Districts Participated in Interdistrict Aggression

To assess the validity of proposition two tenet three and proposition six tenet three the relative frequency with which the districts participated in interdistrict aggression must be determined. Trouillet's (n.d.) legendary account of Rotuman prehistory and history was used for this purpose. An assumption of the analysis is that the frequency with which a social phenomenon, such as warfare, is mentioned in the legendary accounts is indicative of the frequency with which the phenomenon occurred. This does not mean that the events specified in the narratives actually took place, rather that events that were similar in nature to those specified in the narratives were important and occurred with the same relative frequency to which they are mentioned in the narratives.

Trouillet's (n.d.) narrative of the legends spans the time period from when the mythical founder of the island, Raho, created Rotuma by pouring baskets of sand into the sea, to 1868, when Trouillet left the island. For the time period between 1797 to 1868, Trouillet (n.d.) calculated the approximate dates of some of the events specified in the narrative based on the length of time the successive sau were in power. With these dates it is possible to divide the narrative into two periods, the prehistoric-protohistoric period from the founding of the island up to 1822, and the historic period from 1822 to 1868. Only the occurrences of interdistrict warfare during the prehistoric-protohistoric phase are considered. The narratives included numerous instances of district rebellions, i.e., intra-district conflict, but these are not analyzed.

Districts were classified into four groups. The basis for the groupings are the historical associations specified in the narratives. Furthermore, the validity of the district groups is supported by the observation that there are no instances of interdistrict warfare between the districts that make up each group. In contrast, the districts within each group participated in interdistrict warfare with the districts of the remaining three groups. This suggests that the districts within each group had stronger alliances to each other than they had to any of the other districts.

Trouillet's narrative specifies 16 instances of prehistoric-protohistoric interdistrict warfare where it is possible to identify the participating districts. In 14 cases the conflict was between the members of two district groups, and in two cases the strife involved multiple district groups. Table 7.4 presents a matrix of interdistrict warfare. The 14 instances of conflict between members of two district groups are listed in rows two through four. The table shows that the northern and southern districts were at war two times, the northern and eastern districts were at war one time, the southern and eastern districts were at war three times, the northern and western districts were at war two times, the southern and western districts were at war one time, and the eastern and western districts were at war five times. In the two instances where district group alliances were involved, the eastern district was at war with the northern, southern, and western districts once, and the southern and western districts were at war with the northern and eastern districts once. The total number of times each district group participated in interdistrict warfare is shown in Table 7.5. The eastern districts participated in the most interdistrict wars, eleven of the sixteen conflicts, or 69%. The western districts participated in 10 of the sixteen conflicts (63%), the southern districts participated in eight of the sixteen wars (50%), and the northern districts participated in seven of the sixteen conflicts (44%). The relationship between the frequency with which a district participated in warfare and several social and natural variables is discussed in Chapter 9.

Table 7.4 The number of instances a district group participated in interdistrict aggression against another district group.

	Northern	Southern	Eastern	Western	Southern, Western
Northern	-	-	-	-	-
Southern	2	-	-	-	-
Eastern	1	3	-	-	-
Western	2	1	5	-	-
Northern, Southern, Western			1	-	-
Northern, Eastern					1

Table 7.5 A summary of the frequency of interdistrict aggression.

District Group	Participation Alone	Participation With Allies	Total Participation (%) n=16
Northern	5	2	7 (44%)
Southern	6	2	8 (50%)
Eastern	10	1	11 . (69%)
Western	8	2	10 (63%)

The frequency with which a district group was victorious in an interdistrict conflict is listed in Table 7.6. In all 16 instances the myths specified which district group won the conflict. The myths suggest that overall the western districts were victorious 60% of the time that they participated, the eastern districts 54% of the

Table 7.6 The frequency of success in interdistrict aggression.

District Group	Win Alone (%)	Wins With Allies (%)	Total Wins (%)
Northern	2 (40%)	1 (50%)	3 (43%)
Southern	2 (30%)	2 (100%)	4 (50%)
Eastern	6 (60%)	0 (0%)	6 (54%)
Western	4 (50%)	2 (100%)	6 (60%)

time, the southern districts 50% of the time, and the northern districts 43% of the time. The relationship between success rate in interdistrict warfare and the population densities of the districts is discusses in Chapter 9.

Summary of Interdistrict Aggression

Interdistrict strife was undoubtedly motivated by both ideational and material factors. Success in war was one means for the chiefs to enhance their status. Complementary to this goal was the achievement of material benefits. The ethnohistorical literature suggests that the elite of a district could attain significant material benefits from participating in interdistrict aggression. The victorious side appropriated spoils after a war and expected the continued payment of tribute. Warfare was one means by which the elite gained control of the productive units of society, that is the people of a district and the arable land they farmed. The strategy of imposing an extra-district elite after a district was conquered does not appear to have been extensively developed at the district level. The ethnohistorical literature suggests that the practice of appropriating low level chiefly ho'aga titles was practiced, yet it is unclear how successful this strategy was in actually achieving elite control over material resources. In contrast, however, the extra-district positions of the sau, mua, and fakpure were obtained through warfare and these positions did exert influence over the island wide polity. These positions were by no means stable and the narratives document numerous instances of rebellion. Finally the districts of the island participated in warfare to varying degrees, with the eastern districts participating the most.

Summary

Late nineteenth and early twentieth century demographic data indicate that population densities were uneven throughout Rotuma. At the district level of analysis the highest district population density was over 2.5 times that of the lowest district population density. If district population densities were averaged in district groupings the disparity was less, the highest being 1.7 times the lowest. While this was a significant disparity it does not appear to have been extreme.

The mythical and ethnohistorical accounts document that intergroup aggression had material ramifications. The control of people and land, the additional access to subsistence resources, and the ability to receive tribute, were all dependent to some extent upon successful warfare. The reallocation of chiefly titles associated with polity wide positions occurred after a successful campaign, but the redistribution of district and ho'aga titles was not as prevalent. Therefore, local level administrative chiefs from outside districts were not imposed on the people living in a district but higher level pan-polity rulers were. The frequency with which the people of a district participated in warfare varied. The eastern districts participated in warfare the most, the southern and western districts to a lesser extent, and the northern district the least. The relationships between population densities and intergroup aggression and other social and natural variables is discussed in chapter 9.

CHAPTER 8

ROTUMAN ARCHAEOLOGICAL SITES

Introduction

A reconnaissance survey was conducted in select areas of Rotuma to determine if the monumental architecture on the island was preferentially distributed with respect to the districts. It was proposed in Chapter 2 that the pan-Rotuman elite should have built monumental architecture in their home districts as a means of altering the social constraints that commoners and lesser chiefs experienced. Monumental architecture acts as a visual cue for people. In some instances, the process of viewing monumental architecture reinforces specific beliefs and leads people to employ particular affiliative behavioral strategies. Given this human propensity, the pan-Rotuman elite should have built monumental architecture in an attempt to influence the beliefs and behaviors of lesser chiefs and commoners. The monumental architecture would have helped reaffirm the ideology that the pan-Rotuman elite rightfully controlled the land, were essential for continued prosperity, and were powerful figures. If these beliefs were reaffirmed, the people throughout the island might have chosen to employ behavioral strategies deemed appropriate by the pan-Rotuman elite.

Monumental architecture should have been built in the home district of the pan-Rotuman elite to establish that the polity leaders from that district were in power and able to control the island. Monumental architecture can take many forms; from large house foundations, to cemeteries, to temples. A characteristic of monumental architecture is that it takes a significant amount of energy to build. The pan-polity elite would have had access to the corvee labor necessary for building large scale monuments in their districts. In general, the commoners and lesser chiefs living in other districts of the island would not have had access to similar amounts of labor to construct similar monuments. Furthermore, those people might have been physically retrained by the ruling elite from building large scale architecture in their districts. It should be recognized that these premises are not absolute and there are instances where less powerful people try to build more extensive architecture to enhance their power and prestige (Miller and Tilley 1984). To evaluate the proposition that the leaders of the island were building more architecture in their home districts than the people residing in other districts it is necessary to determine the relative distribution of large scale architecture and "sacred" sites.

The reconnaissance survey to determine the relative distribution of archaeological monumental architecture was limited to the hills and mountains of Rotuma. This was done for a number of reasons. In Polynesia, mountains are often considered intermediary points between the sacred cosmos and the secular earth. As such, mountains are physical locations where people acquire supernaturally derived power. The peaks of mountains are also very conspicuous and can be easily seen from the surrounding countryside. Mountains would therefore be ideal locations for the pan-Rotuman elite to display their power to the commoners and lesser chiefs by constructing monumental architecture.

Furthermore, the reconnaissance survey was restricted to the mountains because it was recognized that it would be impossible to survey the entire island given the limited time available for fieldwork. If only a small sample of each district could be surveyed, I felt that it would be best to focus on the same ecological context in each district. To assess whether the mountains were distributed in the districts in an equal manner the number of mountains per hectare in each district was calculated. Table 8.1 indicates that Malhaha and Pepjei have the highest density of mountains on Rotuma, and Oinafa and Noatau the lowest. Therefore, if a higher density of mountains in a district created a sampling bias it should skew the results towards Malhaha and Pepjei. The results of the reconnaissance survey, however, do not coincide with the density of mountains in each district. The greatest number of monumental sites were found in the district group with the fewest mountains, the eastern district group of Oinafa and Noatau. The reconnaissance survey to record large scale architecture which was restricted to the mountains was not unduly biased towards any one district, based on the density of mountains.

Two other types of archaeological sites were recorded during the survey. The first was a large platform called Kinehe'e which according to recorded oral traditions was associated with a "giant" or chief of the island. The second type of archaeological site was the remains of dryland agricultural intensification. These

Table 8.1 The density of mountains in each district.

District	Number of Mountains	Number of Mountains per Hectare
Malhaha	5	0.00950
Pepjei	4	0.00906
Juju	3	0.00705
Oinafa	3	0.00337
Noatau	3	0.00504
Itu'ti'u	7	0.00667
Itu'muta	2	0.00698

archaeological sites are discussed at the end of this chapter. The chapter begins with a brief discussion of the methods used during the limited test excavations that were conducted at a number of the sites. The excavations were intended to determine the function of the features and to recover charcoal samples for radiocarbon dating. This section is followed by a short discussion of the survey methods, and then the descriptions of the individual sites on each of the mountains are presented.

Excavations

Test excavations were conducted at Kinehe'e, and at ten features located on six hills (Fiua, Lelepo, Sollaje, Solmafua, Solmaja, and Tapanna). The excavations were conducted according to stratigraphic layers with arbitrary 10 cm levels dividing natural layers that were over 10 cm in depth. Layers were numbered sequentially, and levels were designated by a number to the right of the decimal point, i.e., layer 3.2 refers to the second level of layer 3. By definition, the matrix of a layer is homogeneous but the concentration of large rocks and charcoal flecking did differ between some of the levels of a layer. These differences are noted in the excavation descriptions. Depths were measured from an artificially established datum, and are referred to as centimeters below ground surface (bgs). The matrix was screened through 0.25 inch mesh screen. Cores were taken at five features on two hills to determine the excavation potential of the features.

Reconnaissance Survey

There are 27 hills throughout Rotuma (see Figures 3.3 and 3.4). For this analysis "hills" are defined as any landform over 60 m in elevation which comes to a peak. The hills on Rotuma generally consist of volcanic cones with circular ridges around an interior crater. The ridges around the craters are typically 8 to 15 meters wide and form areas where archaeological sites were often located. The peaks of the hills were usually defined by the highest section of the crater ridge.

The hills were surveyed by ascending to the peak and making systematic sweeps of the peak, the ridges, and the associated slopes. Vegetation on the hills was often dense and in some cases cane knifes were used to cut transects and clear vegetation. The thick vegetation on some of the hills undoubtedly affected the ability to identify archaeological remains.

The reconnaissance survey was carried out on 25 of the 27 hills on Rotuma. A small hill in Malhaha, Tukai, was not surveyed because access was extremely difficult and an unnamed hill in Pepjei was not surveyed because it was so small that it went unnoticed during the fieldwork. No archaeological remains were found on 11 of the 25 hills (Fauta, Kalenga, Paho, Solaloga, Solhefu, Solhoi, Solmara, Solmea, Solpipi, Solvasasi, and Uapa). Of the remaining 14 hills, detailed transit maps were made of the archaeological features on six hills (Fiua, Lelepo, Sollaje, Solmafua, Solmaja, Tapanna), tape and compass maps were made of the archaeological remains on six additional hills (Fulia, Sisilo, Solalete, Solhafu, Solmafua-west, Solroroa), and the archaeological remains on two hills were unmapped and were documented by written descriptions (Satarua and Solele).

Archaeological Features

Most of the archaeological features recorded during the reconnaissance survey were either terraces or platforms. The criterion used to distinguish these two types of features is the extent of rock or earth facings. Platforms have rock facings or earth modifications around virtually the entire perimeter of the feature whereas terraces lack facings along at least a single side.

The platforms and terraces were assigned to morphological classes on the basis of the type of material used for the fill, the type of material used for the rock facing, and whether or not a flat area had been created by cutting into the slope of the hill and depositing the sediment downslope (c.f. Kirch 1988:45-46). The fill material of the features included terrigenous sediment, basalt rock, and calcareous sand. The facing of the features consisted of either basalt rocks or cut and dressed coral slabs. Among the possibilities created by the three attributes, six morphological classes of platforms and terraces were found on Rotuma (Table 8.2). Class 1 features have basalt rock facings with basalt rock fill and do not include cut and fill construction.

Table 8.2 A formal classification of platforms and terraces.

Class	Morphological Criteria	Functional Classification
1	basalt rock faced; basalt rock filled; not cut and fill;	residential
2	basalt rock faced; earth filled; not cut and fill;	residential
3	basalt rock faced; calcarious sand filled not cut and fill;	burial
4	cut coral slab faced; calcarious sand filled; not cut and fill;	burial
5	basalt rock faced; earth filled; cut and fill;	lookout
6	unfaced; earth filled; cut and fill;	lookout

Class 2 features have basalt rock facings with terrigenous sediment fill and do not include cut and fill construction. Class 3 features have basalt rock facings with calcarious sand fill and do not include cut and fill construction. Class 4 features have cut coral slab facings with calcarious sand fill and do not include cut and fill construction. Class 5 features have basalt rock facings with terrigenous sediment fill and do include cut and fill construction. Finally, Class 6 features are unfaced with terrigenous sediment fill and do include cut and fill construction.

Functional correlates of the six morphological classes of platforms and terraces were assigned on the basis of ethnohistorical, archaeological, and comparative West

Polynesian data. Test excavations were conducted at two Class 1 platforms, two Class 2 platforms, and three Class 2 terraces. Some of these excavations yielded midden material from the fill of the features, suggesting that they were once used as residential features. The relatively small size of the features in conjunction with other archaeological studies throughout the Pacific (Green 1986; Kirch 1988) support this interpretation. Test pits were excavated at one Class 3 platform and one Class 3 terrace. Rotuman consultants did not specify the function of these features before the excavations were conducted and there were no visible internal components. The excavations established that they were burial mounds. Once skeletal material was observed, the test excavations at the features were terminated and the units were then filled. The Class 4 platforms are known to be cemeteries by the Rotumans. Several early accounts document their existence during the protohistoric period (Bennett 1931; Trouillet n.d.). These platforms are similar to the "langi" chiefly burial mounds found in Tonga (Kirch 1988:48-50, 1990b:210). On Rotuma these platforms are associated with the burial of sau, mua, and "giants," a common Rotuman metaphor for chiefs. No excavations were conducted at Class 4 platforms. One test pit was excavated at a Class 5 terrace. The excavation was inconclusive, but the size of Class 5 terraces in conjunction with their locations, suggest that they might have been foundations for temporary or permanent residential structures (c.f. Kirch 1988:63) or possibly lookout posts on the mountains. A similar functional classification has been assigned to the Class 6 terraces although no excavations were conducted at these features. It is conceivable that these cut bank terraces were constructed for agricultural purposes, but currently Rotumans do not use terraces when growing their crops.

Based on the volume of rock and fill and the source location for this material, the amount of energy and labor needed to construct the various types of platforms and terraces would have differed. The construction of Class 4 burial platforms would have required more energy and labor than any other type of feature. In both Class 3 platforms and terraces, and Class 4 platforms, calcareous sand was brought from the coast to the top of the mountains. In Class 4 platforms, however, not only was the beach sand carried up the mountains but there was the additional labor expenditure of transporting the large cut coral slabs from the coast up the steep mountain slopes. Several legends recount the construction of these monuments and tell how the people from all over the island were called upon to help (Irava n.d in Parke 1964). The construction of Class 3 platforms and terraces would have required less energy and labor than the Class 4 platforms, although a significant expenditure of labor would have been required to transport the beach sand to the tops of the mountains. The amount of labor necessary to build Class 1, 2, 5, and 6 features would have been roughly equivalent, but much less than Class 3 and 4 platforms.

Archaeological Site Descriptions

The distribution of archaeological sites recorded on the hills of Rotuma is depicted in Figure 8.1. Each hill top is considered an archaeological site and individual features within the site were recorded. The archaeological sites in each district are discussed in turn.

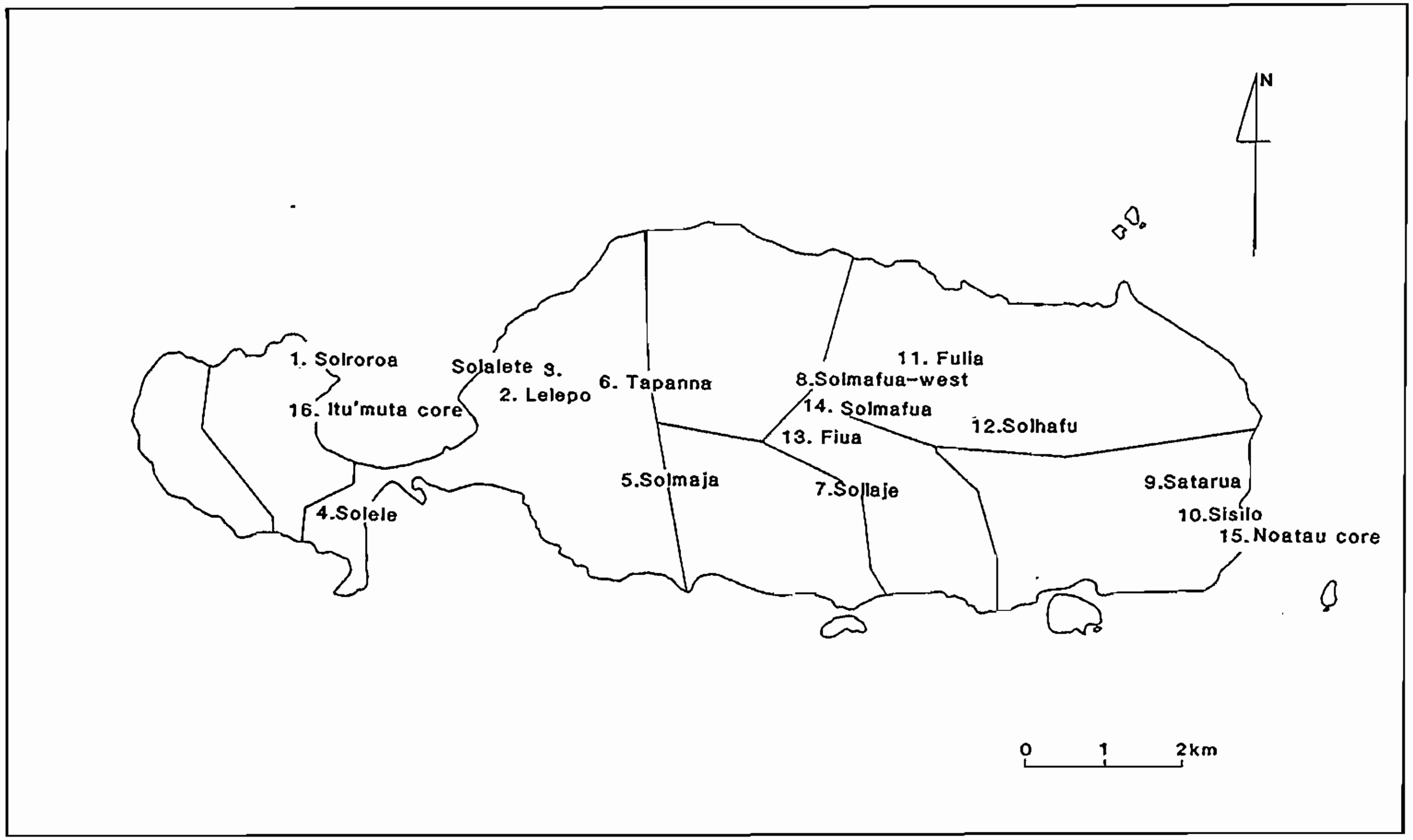

Figure 8.1 The distribution of the archaeological sites recorded on the hills of Rotuma.

The District of Itu'muta

Solroroa

Only one archaeological feature was recorded during the reconnaissance survey of Solroroa. It was a 14 x 6 m platform located on the peak of the mountain (Figure 8.2). The facing of the platform has a maximum height of 1.85 m and consists of basalt rocks ranging in size from 21 to 43 cm, stacked six courses high. The platform is comprised of two components which are separated by a one to two course high alignment. The rocks in the alignment were 37 to 52 cm in diameter. A small 35 cm black and white radar beacon is currently located on the eastern most component. A considerable amount of metal and old beer bottles are distributed throughout the area.

Rotuma consultants stated that Solroroa was used as a lookout tower during World War II (Vafo'ou Jiare, personal communication, 1991). The foundation that is on top of the mountain is probably the remains of that lookout tower. It is conceivable that the mountain was used prior to building this foundation but no surface evidence exists for this. No calcareous sand was noted in the area which suggests that the peak was not used as a burial.

The District of Itu'ti'u

Lelepo

A 14.3 x 13.3 m Class 3 terrace was located on the southwest edge of the Lelepo ridge (Figure 8.3). The fill of the terrace was a mixture of terrigenous sediment and calcareous sand. The slope of the terrace contained upper and lower

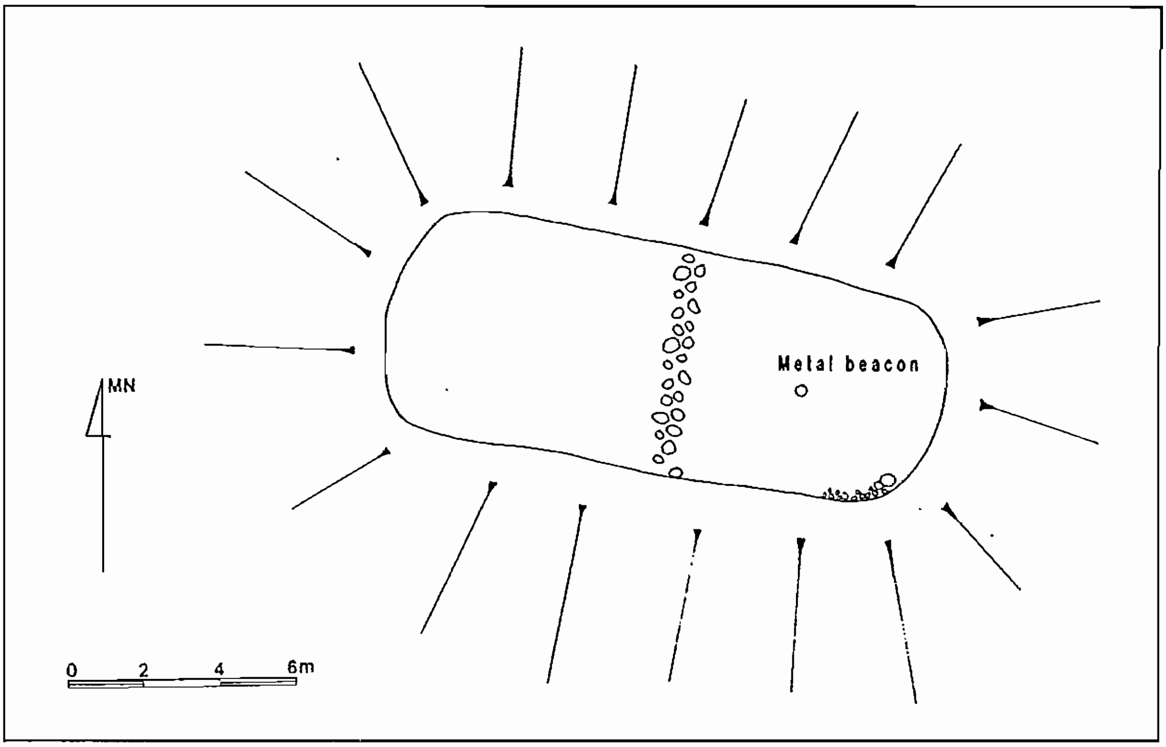

Figure 8.2 Archaeological features on Solroroa.

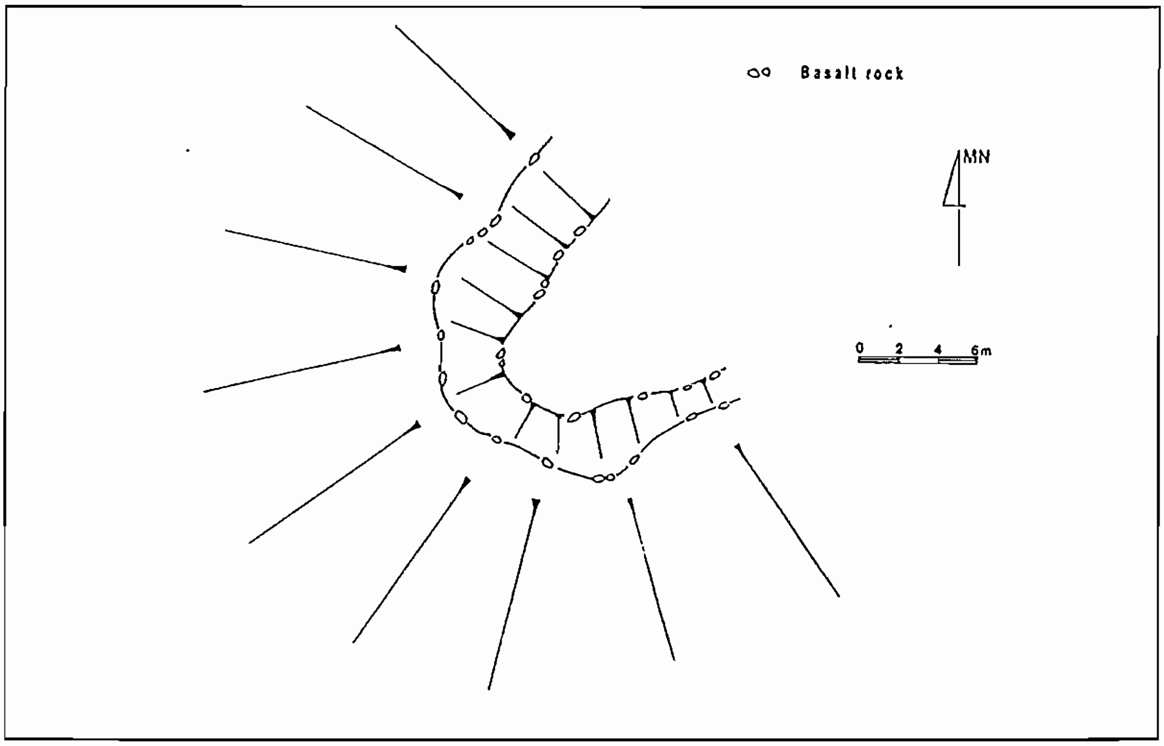

Figure 8.3 Archaeological features on Lelepo.

basalt rock facings. The upper facing delimits the edge of the flat area on top of the terrace, and the lower facing marks the base of the terrace. The facings are single course with rocks ranging in size from 20 to 30 cm in diameter. A few rocks are dispersed along the sides of the terrace in between the two facings. The fill of the terrace is a mixture of calcareous sand and terrigenous sediment. The northeast slope of the terrace has a higher concentration of calcareous sand but it is eroding from all sides of the feature. Several large trees are growing on top of the terrace and have disturbed it. The feature has no visible internal components.

A 100 x 50 cm test pit was excavated near the northwest edge of the terrace. The surface of the test pit was covered with decomposing vegetation and roots. Layer 1 extended from the ground surface to a maximum depth of 12 cm bgs. The matrix consisted of terrigenous sandy loam and calcareous sand. Slight charcoal flecking was noted throughout the layer. At ca. 9 cm bgs in the south side of the unit several small pieces of human bone, including a fragment of a human mandible, were noted. The excavation was terminated at that point.

The excavation suggests that the calcareous sand filled Class 3 terrace was a burial mound. The lack of other archaeological features in the immediate vicinity is notable, for it suggests that the area was used as a burial ground and not for residential purposes.

Solalete

Three features were noted on Solalete (Figure 8.4). Feature 1 is a 26 x 18 m Class 3 terrace located on the peak of the mountain. The fill of the terrace is

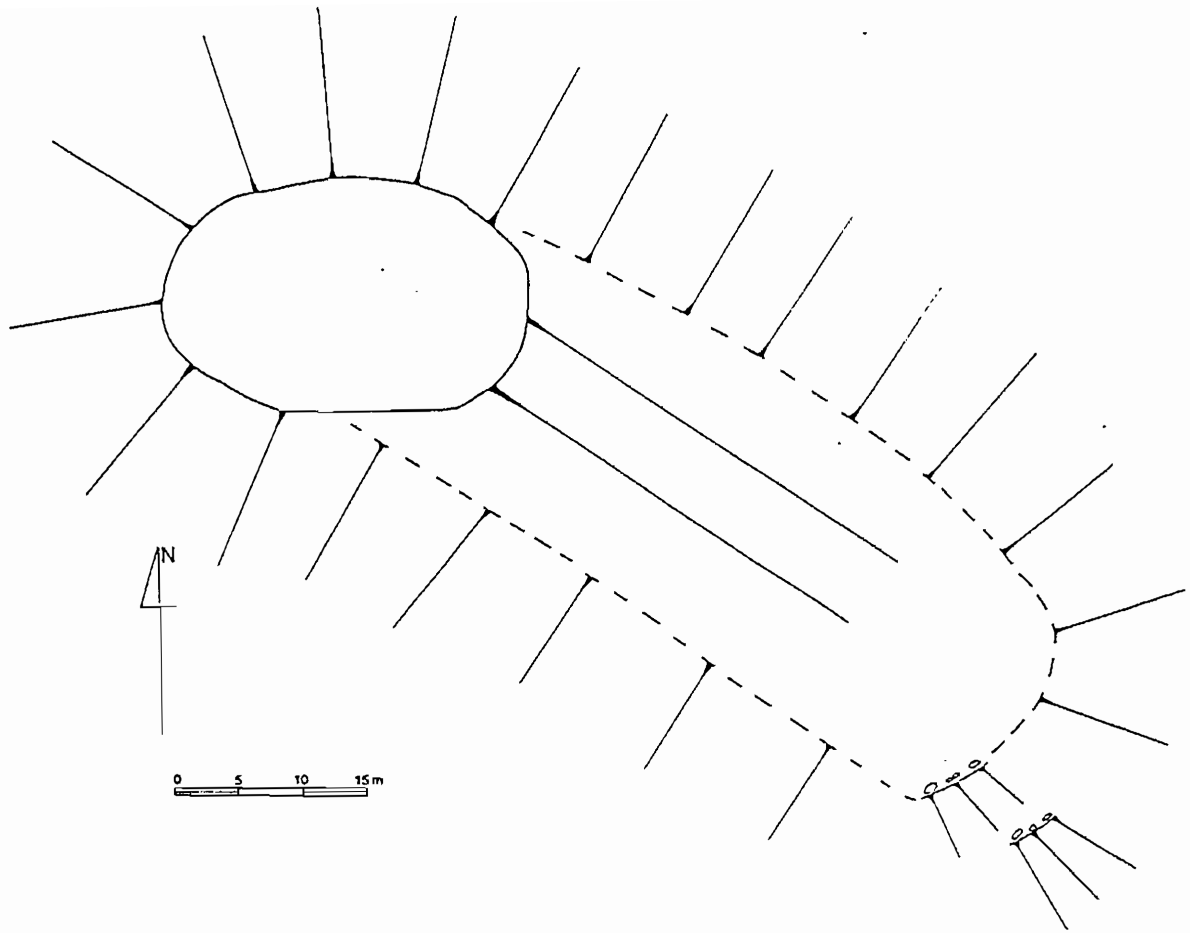

Figure 8.4 Archaeological features on Solalete

terrigenous sediment mixed with a light concentration of calcareous sand. There are no visible components on the surface of the feature. The facing of the terrace is a noncontiguous single course alignment. The rocks in this facing vary in size from 12 to 36 cm in diameter. On the southeast ridge approximately 45 meters from the peak there are at least two small Class 3 terraces. Feature 2 is 5.5 meters in length with a single course facing made up of rocks 22 to 31 cm in length. Feature 3 is immediately upslope of feature 2 and is ca. 7 m in length with a single course facing made up of rocks 16 to 32 cm in length. The fill of both terraces is comprised of terrigenous sediment with a very light concentration of calcareous sand.

Although excavations were not conducted at Solalete, it is assumed that feature 1 was functionally similar to the other Class 3 platforms and terraces found throughout Rotuma and served as a burial mound.

Solele

A 6 m long Class 2 terrace is located near the southeast edge of the Solele crater ridge. The face of the terrace is one to two courses high with rocks ranging in size from 12 to 26 cm. The fill of the terrace is terrigenous sediment. Rotuman consultants identified the feature as a residential site occupied in the early twentieth century. It is worth noting that nothing distinguishes this site from other archaeological sites that are presumed to have been occupied during the prehistoric period.

Solmaja

Eight features were recorded on the slopes and peak of Solmaja (Figure 8.5). Additional features were noted near the base of the mountain but these were not recorded. The eight features include one Class 2 platform, one Class 2 terrace, and six Class 5 cut bank terraces.

Feature 1 is a Class 2 terrace which forms the artificially flattened peak of Solmaja. Two terraces define the edges of the 24.2 x 12.0 m flat area. Component 1 is a 8.46 m long terrace on the southwest edge of the peak. The face of the terrace consists of 22 to 43 cm rocks stacked 1 to 3 courses high to a height of ca. 52 cm. The terrace has been highly disturbed by a large (14.93 m circumference) hifau tree growing on the west side of the terrace. The roots of the tree are growing over the rocks of the terrace face indicating that the terrace might be quite old. Component 2 is a 4.09 m long terrace on the northeast side of the flattened peak. The face of the terrace consists of 46 x 39 cm rocks stacked 2 to 3 courses high. Feature 2 is a platform located on the west ridge of the mountain. It is a 7.43 x 7.36 m terrigenous sediment filled platform faced with 34 x 27 cm rocks stacked 2 to 3 courses high to a height of 65 cm.

There are six Class 5 cut bank terraces on the slopes of Solmaja. Features 3 and 4 are located on the northeast slope of the mountain. Feature 3 is a 5.33 x 0.85 m cut bank terrace faced with rocks ranging is size from 15 x 9 cm to 33 x 28 cm stacked 3 courses high to a height of 42 cm. At about the same elevation on the mountain approximately 7.72 m west of feature 3 is another cut bank terrace (feature

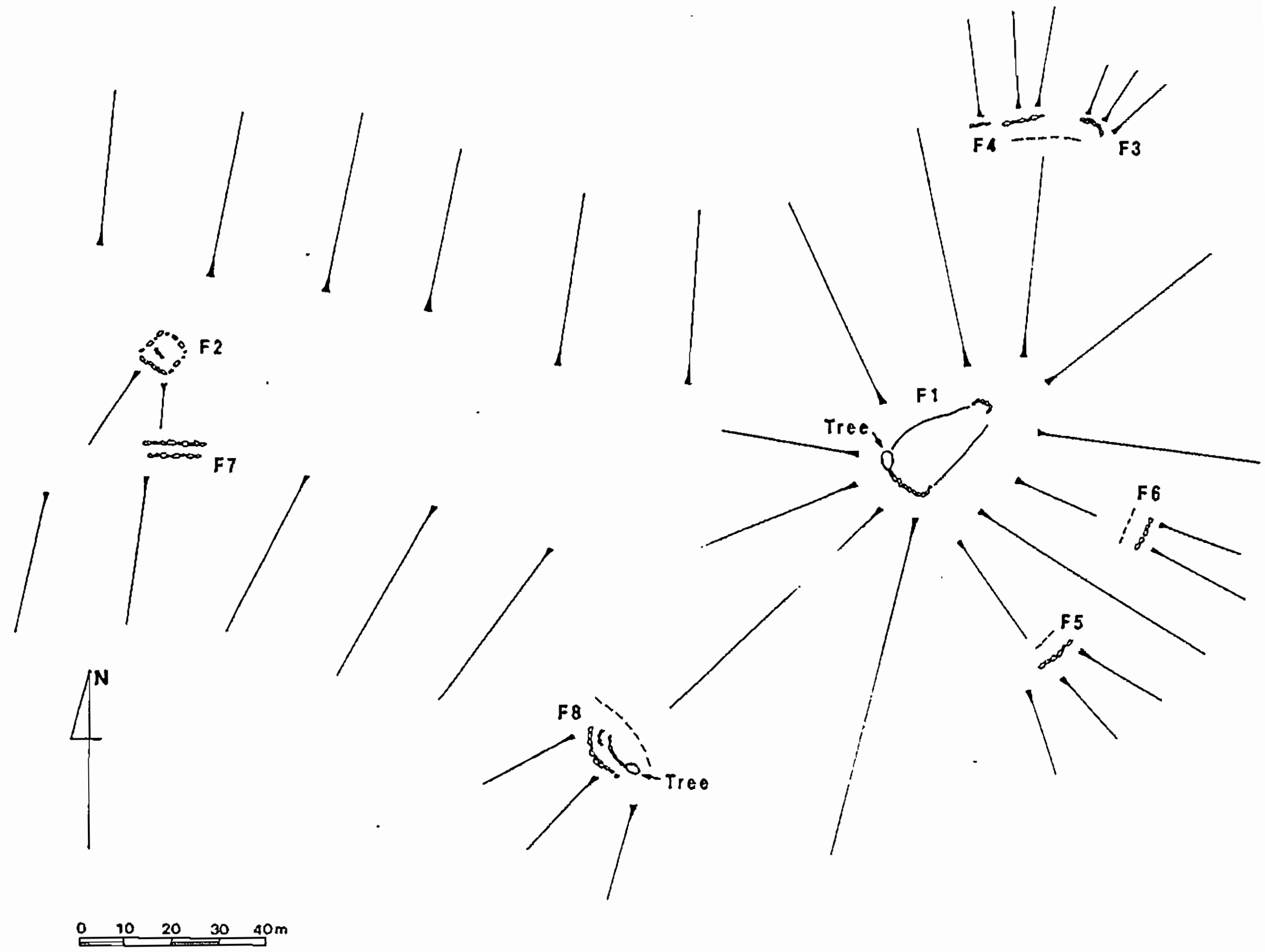

Figure 8.5 Archaeological features on Solmaja.

4). This 8.49 x 4.09 m cut bank terrace is faced with 45 x 38 cm rocks stacked 1 to 2 courses high to a height of ca. 53 cm. Features 5 and 6 are located on the southeast side of the mountain. Feature 5 is a 8.70 x 3.94 m cut bank terrace with a face consisting of rocks ranging in size from 23 x 18 cm to 42 x 33 cm stacked 3 to 4 courses high to a height of 76 cm. Feature 6 is located just to the northeast of Feature 5 and is a 7.91 x 3.76 m cut bank terrace with a face consisting of 32 x 25 cm rocks stacked 2 courses high to a height of 53 cm. Feature 7 is a 13.24 x 2.57 m long cut bank terrace located just downslope of feature 2. The terrace facing consists of 42 x 31 cm rocks stacked 2 to 3 courses high. Feature 8 is a 11.80 x 9.73 m cut bank terrace with three component facings that have been highly disturbed by a large hifau tree. Component 1 of the feature is the most substantial facing and consists of rocks ranging in size from 76 x 64 cm to 23 x 18 cm stacked 3 to 5 courses high to a height of 1.1 m. Component 2 is a terrace faced by a single course of 42 x 31 cm rocks. Component 3 is another small terrace faced by a single course of rocks averaging ca. 51 x 33 cm in size

A test pit was excavated at Feature 5. The test pit was a 50 x 50 cm unit located on the flat area behind the facings of the terrace. The surface of the test pit was covered with decomposing vegetation and roots. Layer 1 extended from the ground surface to a maximum depth of 24 cm bgs. The matrix consisted of terrigenous sandy loam with a very small amount of charcoal flecking. At 24 cm bgs several large hifau roots extended across the bottom of the whole unit and the excavation had to be terminated. Eight cores were taken at features 1, 3, and 5. The cores at features 1 and 2 were virtually sterile and provided little evidence of occupation. The core at feature 5 revealed the presence of charcoal flecking and samples were taken.

The function of the features on Solmaja is unclear. The artificially leveled peak of the mountain could have been the foundation for a residential feature or a lookout post. The cut bank terraces on the slopes of the mountain could have been used for defensive purposes. The location of the site near the Itu'ti'u and Pepjei district boundary further supports this interpretation. The general lack of cultural material in the matrix of these features suggest that they were not used extensively for habitation purposes. Feature 2, the platform on a lower ridge of the mountain, appears to have been a residential feature. In sum, a number of the archaeological features on Solmaja might have served as defensive lookouts and a few of the features appear to have been residential structures. The lack of coral slabs and calcareous sand suggests that the features were not used as burials or for ceremonial purposes.

Tapanna

Ten features are located on the southeast ridge of Tapanna (Figure 8.6). The features include small platforms and terraces. Other terraces and platforms were noted near the peak of the mountain, on the southwest ridge, and in the crater, but they were morphologically similar to the features on the southeast ridge and were therefore not mapped.

Feature 1 is a 7.49 x 6.87 m Class 1 platform. The facing of the platform consists of rocks ca. 42 x 31 cm in size stacked 3 to 4 courses high to a height of 66

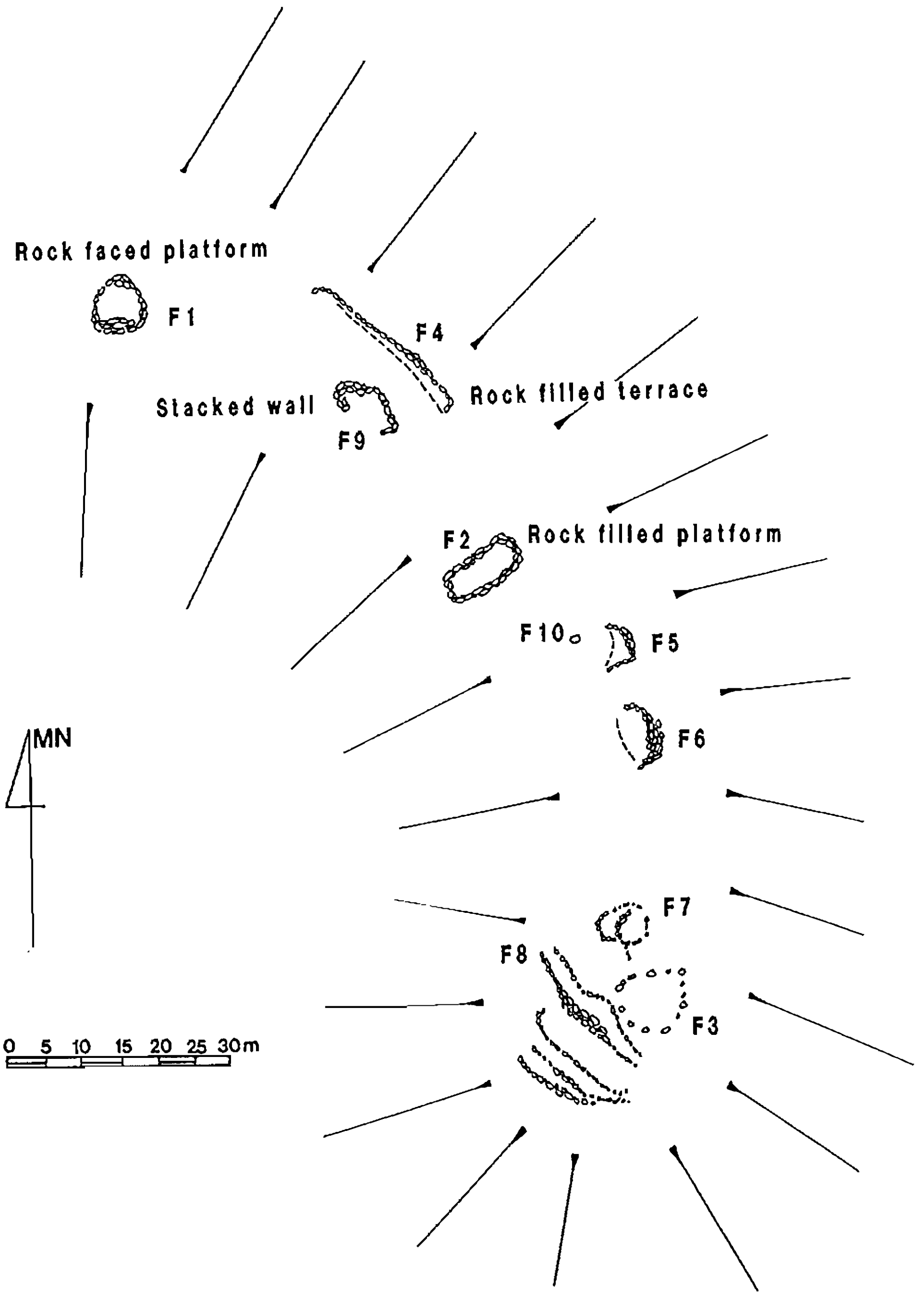

Figure 8.6 Archaeological features on Tapanna.

cm. The rocks used to fill the platform are generally smaller in size, the largest ones being ca. 33 x 21 cm. Feature 2 is an terrigenous sediment filled 11.07 x 5.17 m Class 1 platform. The facing rocks range in size from 76 x 49 cm to 32 x 24 cm, and are stacked 2 to 6 courses high to a height of 22 cm. Feature 3 is a highly disturbed 8.57 x 7.27 m rock filled platform. The facing of the platform is discontinuous and consists of a 1 to 2 courses of 31 x 24 cm rocks. The fill of the platform consists of 31 x 18 cm rocks.

Feature 4 is an terrigenous sediment and basalt rock filled 22.64 x 2.59 m terrace. The facing of the terrace consists of rocks that average 58 x 47 cm in size stacked 1 to 3 courses high to a height of 43 cm. The rocks used to fill the terrace are 8 to 12 cm in diameter. Feature 5 is a 5.36 x 5.31 m rock filled terrace. The rocks in the facing are quite large with a maximum size of 96 x 75 x 32 cm and an average size of 52 x 38 cm. These rocks are stacked 2 to 3 courses high to a height of 62 cm. The fill of the terrace consists of rocks ranging in size from 44 x 28 cm to 10 x 8 cm, with an average size of ca. 20 x 20 cm. Feature 6 is a 8.34 x 4.66 m rock filled terrace. The rocks of the facing range in size from 123 x 84 cm to 43 x 33 cm, with an average size of ca. 60 x 40 cm. They are stacked 3 to 4 courses high to a height of 80 cm. The fill of the terrace consists of 29 x 18 cm rocks. Feature 7 is a 6.19 x 5.02 m terrigenous sediment filled terrace with a rock filled paving. The sides of the terrace consist of 31 x 19 cm rocks stacked 2 to 3 courses high to a height of 40 cm. The facing of the rock filled paving consists of 43 x 31 cm rocks stacked 2 to 4 courses high to a height of 55 cm. The fill of the paving consists of ca. 16 x 10 cm rocks. Feature 8 is a series of terraces with a total size of 20 x 13 m. Component 1 is a terrigenous sediment filled terrace faced by rocks ranging in size from 41 x 33 to 12 x 10 stacked 8 to 10 courses high to a height of 48 cm. Component 2 is a terrigenous sediment filled terrace faced by 52 x 31 cm rocks stacked 2 to 4 courses high to a height of 44 cm. Component 3 is a rock filled terrace faced by 46 x 32 cm rocks stacked 5 to 6 courses high to a height of 65 cm. The rocks used to fill the terrace are ca. 40 x 20 cm. Component 4 is a disturbed rock filled terrace faced by 36 x 21 cm rocks stacked 4 to 5 courses high to a height of 30 cm. The rocks used to fill the terrace are ca. 35 x 20 cm.

Feature 9 is a 9.46 m long stacked stone wall just southwest of feature 4. It is composed of rocks ranging in size from 33 x 21 cm to 8 x 7 cm stacked 3 courses high to a height of 40 cm. Feature 10 is a flat 102 x 91 x 15 cm basalt slab with a crack down the center. It is located just west of feature 5 and Rotuman consultants identified it as a "sacred birthing stone."

Test excavations were conducted at features 1, 5, and 7. The test pit at feature 1 was a 50 x 50 cm unit located near the center of the terrigenous sediment and rock filled platform. The surface of the test pit was covered with decomposing vegetation, roots, and rocks. Layer 1 extended from the ground surface to a maximum depth of 59 cm bgs. The matrix consisted of ca. 75% sandy loam and 25% basalt rocks ranging in size from 40 x 30 cm to 10 x 10 cm. These rocks appear to have been the foundation stones for the terrace. Charcoal flecking was noted throughout the layer with the highest concentration in levels 1.3 through 1.5

Samples were recovered from levels 1.3 and 1.4. Approximately 23 grams of shell midden (Strombas, Drupa, Cellana) was recovered from levels 1.3 and 1.4. The midden is not waterworn and has been cracked, and therefore is interpreted as being the remains of subsistence activities. No other cultural material was recovered. The boundary between Layer 1 and 2 was abrupt. Layer 2 was the sterile reddish decomposing bedrock.

The test pit at Feature 5 was a 50 x 50 cm unit located 1 m upslope of the edge of the rock fill that was visible on surface of the feature. The surface of the test pit was covered with decomposing vegetation and small 1 to 5 cm rocks. Layer 1 extended from the ground surface to a maximum depth of 33 cm bgs. The layer was composed of sandy loam with 7 rocks ranging in size from 32 x 17 cm to 15 x 11 cm. The sediment of the layer included a small amount of charcoal flecking. Small charcoal samples were recovered from levels 1.2 and 1.3. No other cultural material was found in the layer. The boundary between layer 1 and 2 was abrupt. Layer 2 is the sterile reddish decomposing bedrock.

The test pit at Feature 7 was a 50 x 50 cm unit located near the center of the terrigenous sediment filled terrace. The surface of the test pit was covered with decomposing vegetation and roots. Layer 1 extended from the ground surface to a maximum depth of 39 cm bgs. The matrix consisted of ca. 80% sandy loam and 20% basalt rocks ranging in size from 32 x 27 cm to 9 x 7 cm. These rocks appear to have been the foundation stones of the terrace. A small amount of charcoal flecking was noted throughout the layer. One sample was collected from level 1.2

and another from level 1.3. No other cultural material was recovered. The boundary between Layer 1 and 2 was abrupt. Layer 2 was the sterile reddish decomposing bedrock.

The archaeological features recorded on Tapanna appear to be the remains of a residential complex. Six of the features (1, 2, 3, 5, 6, and 7) appear to be house foundations. A small amount of shell midden recovered from feature 1 suggests that people living in the area ate marine resource brought up to the mountain from the coast. None of the archaeological features had calcareous sand fill which suggests that they were not used as burials or for ceremonial purposes.

The District of Juju

Sollaje

The archaeological features on Sollaje consist of terrigenous sediment filled terraces and cut bank terraces (Figure 8.7). Feature 1 is an artificially flattened 20.7 x 14.3 m terrace on the peak of mountain. The terrace is faced on the southeast side with basalt rocks ranging in size from 112 x 68 x 31 cm to 33 x 27 cm with an average size of ca. 50 x 40 cm. The rocks are stacked 2 to 3 courses high to a height of 72 cm. Feature 1 contains an internal 7.4 x 3.1 m terrigenous sediment filled platform (component 1). It is faced with 19 to 32 cm rocks stacked 1 to 2 courses high to a height of 36 cm. A partially buried 55 gallon drum (component 2) that has been cut in half is located ca. 4.5 m southwest of feature 1.

A series of 4 cut bank terraces are located on the southeast ridge of the mountain. Feature 2 has a flattened area of 7.5 x 3.4 m and contains 2 basalt rock

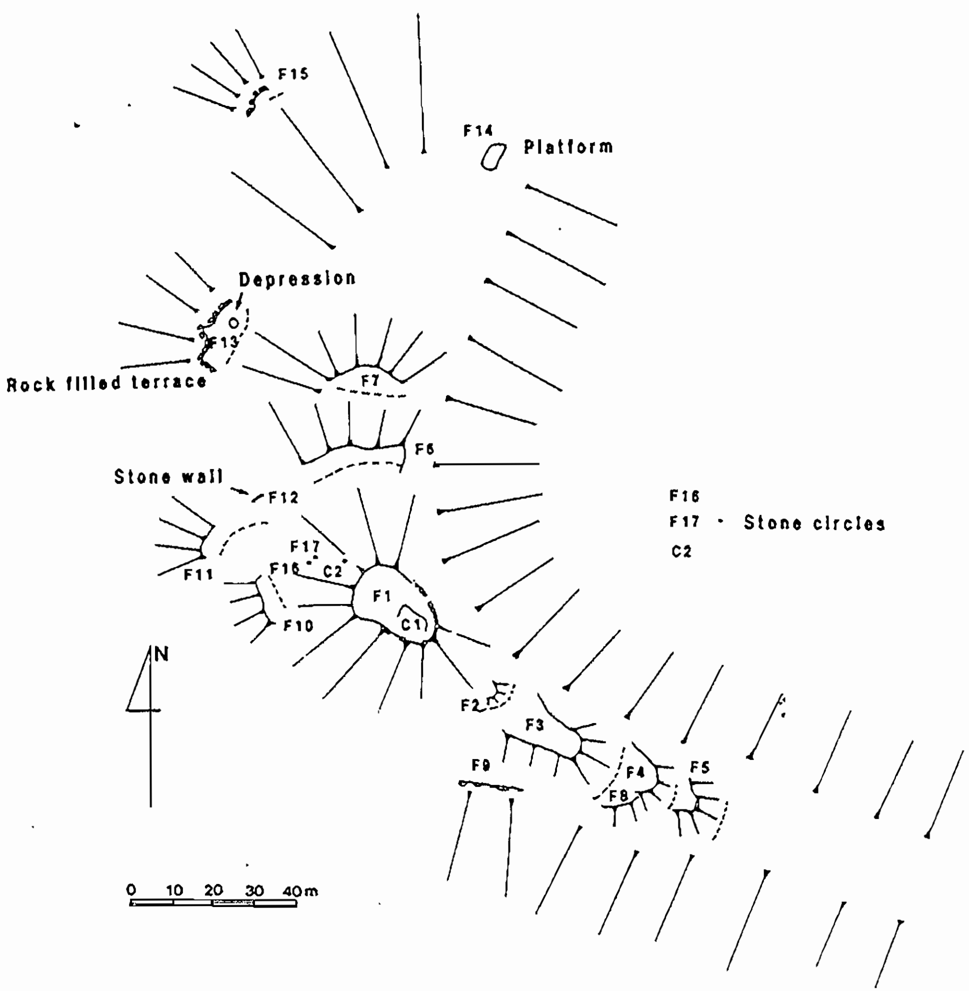

Figure 8.7 Archaeological features on Sollaje.

facings. The upper facing contains a single course of 52 x 41 cm rocks. The lower facing contains 1 to 2 courses of 26 x 19 cm rocks stacked to a height of 42 cm. Feature 3 is a 12.3 x 7.9 m cut bank terrace with a single course facing of rocks ranging in size from 83 x 32 cm to 19 x 17 cm. Feature 4 is a 8.8 x 6.9 m unfaced cut bank terrace. Feature 5 is a 6.3 x 5.5 m cut bank terrace with a 1 to 2 course facing of 48 x 27 cm rocks stacked to a height of 62 cm.

Two cut bank terraces are located on the north ridge of the mountain. Feature 6 is a 21.2 x 4.9 m cut bank terrace with a minimal downslope facing comprised of 5 rocks ca. 50 x 40 cm in size. Feature 7 is a 15.1 x 5.8 m cut bank terrace with two facings. The upper facing is comprised of a single course of rocks ranging in size from 123 x 121 x 97 cm to 42 x 38 cm. The lower facing of the terrace consists of a single course of large rocks ranging in size from 112 x 104 cm to 71 x 57 cm. On top of this terrace are two large rocks which according to oral traditions are Pep'eku, a protector of the island, and Pep'eka, a trouble maker on the island (Vafo'ou Jiare, personal communication, 1991).

Six additional cut bank terraces are located along the west slope of the mountain. Feature 8 abuts feature 4 and is an unfaced 9.1 x 6.1 m cut bank terrace on the southwest slope of the southwest ridge. Feature 9 is a 14.2 x 3.1 m cut bank terrace faced by 46 x 38 cm rocks stacked 1 to 2 courses high to a height of 54 cm. Feature 10 is a 11.2 x 3.4 m cut bank terrace faced with 32 x 29 cm rocks stacked 2 to 3 courses high to a height of 72 cm. Feature 11 is a 7.6 x 4.8 m cut bank terrace faced with 1 to 3 courses of 47 x 39 cm rocks to a height of 56 cm. Feature 12 is a small 1.2 x 1 m unfaced cut bank terrace with a terrace on it. The alignment consists of a single course of 6 rocks ranging in size from 51 x 35 to 19 x 16 cm. Feature 13 is a 15.2 x 8.7 m cut bank terrace with a highly disturbed rock filled platform located on its downslope edge. The platform consists of rocks ranging in size from 92 x 61 cm to 19 x 17 cm stacked 4 to 6 courses high to a maximum height of 1.35 m. A circular 95 cm depression is located on the north side of the platform.

Two terrigenous sediment filled terraces are located near the edge of the west ridge. These two features are morphologically distinct from the cut bank terraces. Feature 14 is 6.3 x 3.2 m and is faced with rocks ranging in size from 57 x 44 cm to 18 x 16 cm stacked 1 to 2 courses high to a height of 47 cm. Feature 15 is 8.5 x 1.8 m and is faced with a single course of 52 x 43 cm rocks.

Features 16 and 17 are small circular single course alignments located ca. 10.8 m southwest of feature 1. The dimensions of the features are ca. 80 x 60 cm and they are each composed of 5 to 8 rocks ranging in size from 18 to 32 cm. The function of these features is unknown. It is conceivable that they are burials but their relatively small size would suggest that they served some other function.

Test excavations were conducted at features 1 and 6, and coring was conducted at features 6 and 11. The test pit at feature 1 was a 100 x 50 cm unit located near the center of component 1. The surface of the test pit was covered with decomposing vegetation and roots. Layer 1 extended from the ground surface to a maximum depth of 19 cm bgs. The matrix consisted of silty loam with small rocks ranging in size from 1 to 5 cm. The layer contained a rock filled hearth in the western end of the unit. Three metal nails were recovered from the layer. Layer 2 is the sterile reddish sediment which began at 19 cm bgs.

The test pit at feature 6 was a 100 x 50 cm unit located near the center of the terrigenous sediment filled terrace. The surface of the unit was covered with decomposing vegetation and loose rocks ranging in size from 1 x 2 cm to 11 x 8 cm. Layer 1 extended from the ground surface to a maximum depth of 18 cm bgs. The matrix consisted of sandy loam with a heavy concentration of 1 to 15 cm rocks and no charcoal flecking. Layer 2 extended from 18 cm bgs to a maximum depth of 49 cm bgs. The matrix consisted of sandy loam with a relatively high concentration of charcoal flecking in the upper two levels of the layer (18 to 38 cm bgs). Two charcoal samples were recovered. The lower level of layer 2 had a much lower concentration of charcoal flecking but the matrix was the same as the upper levels. Layer 3 extended from 49 cm bgs to 75 cm bgs and is composed of a similar matrix to Layer 2 with the exception that it lacks any charcoal flecking. The boundary between layer 2 and 3 is not clearly defined. Layer 3 appears to lack any culturally materials.

The precise function of the archaeological features located on Sollaje is uncertain. Rotuman consultants said that a World War II lookout was built on the peak of the mountain. The excavations at Feature 1 suggest that this platform was the foundation of that structure. Features 14 and 15 appear to be the foundations of residential features although the chronological period of occupation of these features is unknown. The function of the numerous cut bank terraces on the slopes of the mountain remains enigmatic. It is conceivable that they were constructed when the peak was occupied during World War II but they seem far too extensive. Alternative explanations include the possibility that they were constructed for agricultural purposes. This however does not seem likely as it would be an unnecessary expenditure of energy to create the terraces given the agricultural practices of the Rotumans. Alternatively the mountain could have served as some sort of district lookout or boundary marker and the cutbank terraces could have been used for defensive purposes. The district boundary between Pepjei and Juju does go through the mountain. Finally, the terraces might have something to do with the oral tradition that the mountain was a "communication center" for this side of the island to contact the sacred island of Hatana to the west (Vafo'ou Jiare, personal communication, 1991).

The District of Malhaha

Solmafua-west

On the western slope of Solmafua there is a 27 x 23 m Class 4 platform (Figure 8.8). The facing of the platform is made up of both basalt rocks and cut coral slabs. The 30 to 50 cm basalt rocks forming the facing have been stacked 3 to 5 courses high. The cut coral slabs range in size from 73 x 61 cm to 1.5 x 1 m. The fill of the platform is terrigenous sediment with a very light concentration of calcareous sand. Internal components of the feature include slab lined graves and crypt burials built out of basalt rocks and cut coral slabs. A large hifau tree is growing on the feature causing extensive damage to the southwest corner.

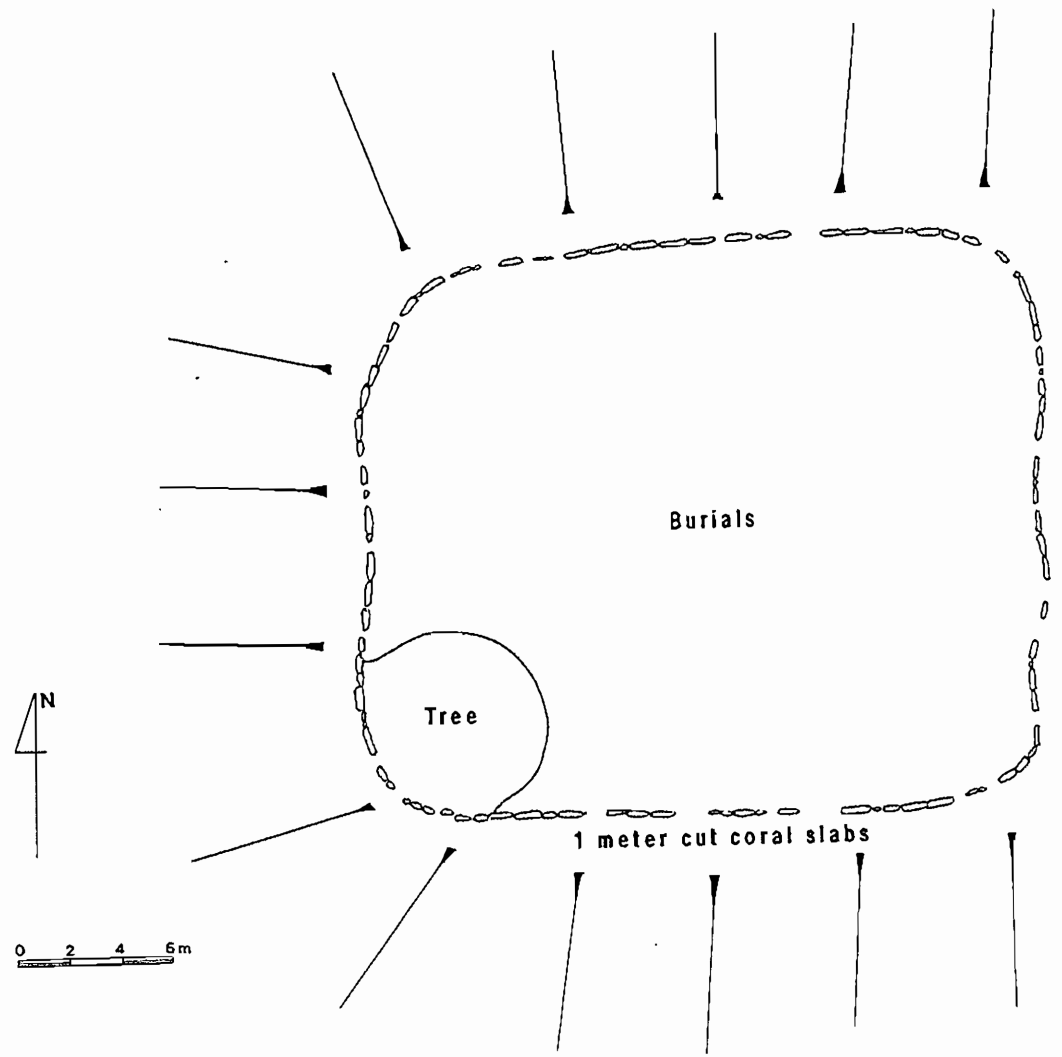

Figure 8.8 Archaeological features on Solmafua-west.

The District of Noatau

Satarua

Two small terrigenous sediment filled terraces were recorded on the slopes of Satarua. The first is a 4.2 x 3.3 m oval shaped terrace with a facing of 40 to 60 cm rocks stacked 3 courses high. The second terrace is located on the east side of the crater. It is a 4.5 x 3.1 m terrace faced with 2 courses of 30 to 35 cm rocks. Both terraces are assumed to be residential features.

Sisilo

Near the peak of Sisilo is a 26.4 x 23.3 m Class 4 platform (Figure 8.9). The east side of the platform is faced with six large cut coral slabs which average ca. 2.0 x 1.2 x 0.2 m. The south face of the platform is composed of 27 to 63 cm coral and basalt rocks which slope gently inwards. The north side of the platform is neatly faced with 18 to 42 cm rocks stacked 4 to 5 courses high. The west side of the feature is not formally faced, but rather is defined by scattered 17 to 43 cm rocks which form a rough alignment. The slope of the mountain along the west side of the platform is gentle for ca. 20 meters and then drops off sharply. The fill of the platform is a mixture of terrigenous sediment and a light concentration of calcareous sand.

The feature contains numerous internal components and only the largest and most prominent were recorded. Component 1 is a group of three large cut coral slabs. The three pieces were part of a single slab that has been broken into three. The overall size of the three slabs is 4.8 x 2.5 x 0.24 m. Component 2 is an

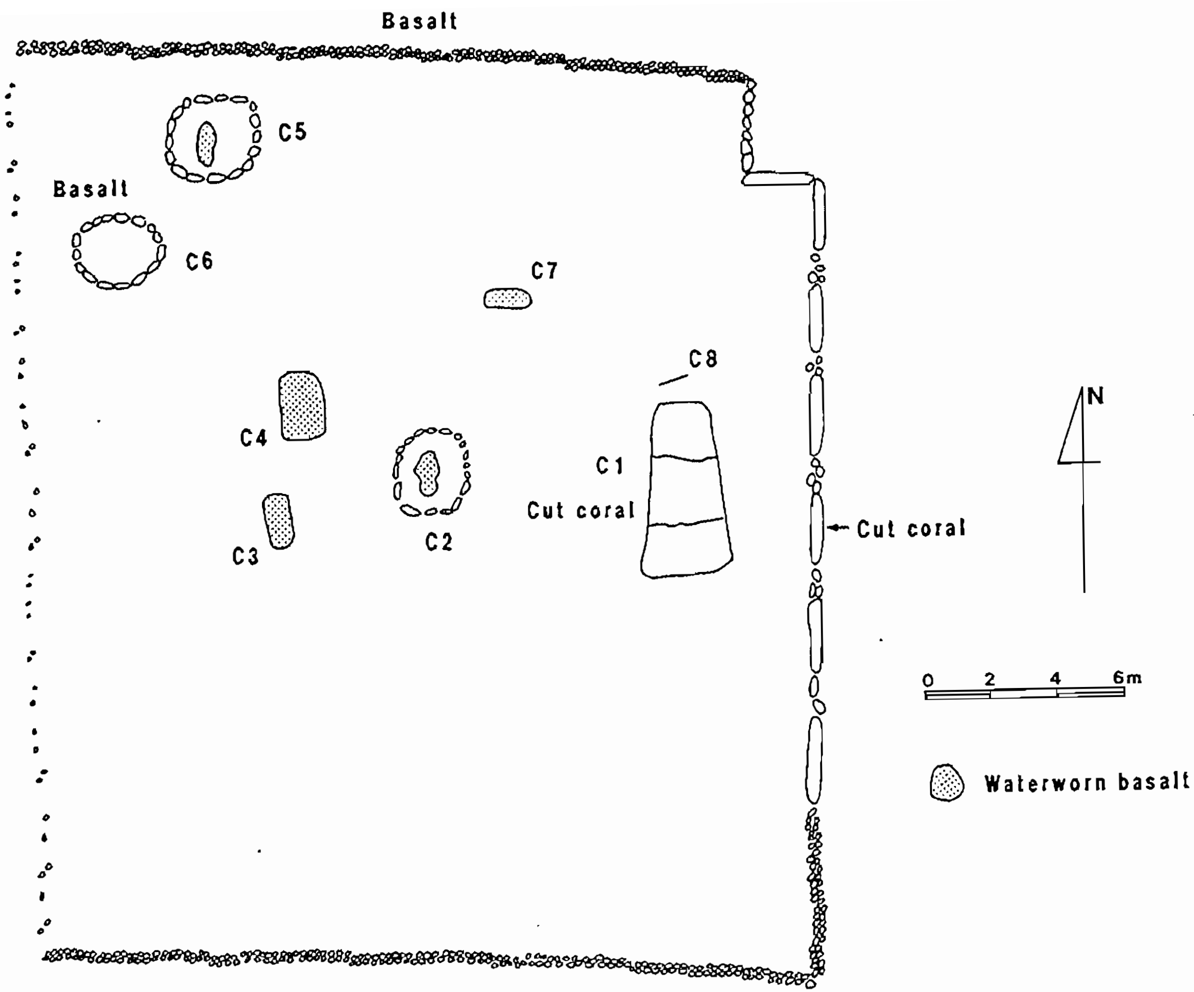

Figure 8.9 Archaeological features on Sisilo.

elliptical 2.6 x 2.2 m enclosure with a dense waterworn basalt stone in the center. The cut coral and basalt rocks of the enclosure range in size from 45 x 40 cm to 20 x 10 cm and have been stacked 5 courses high to a height of 60 cm. The waterworn basalt stone in the middle of the enclosure is ca. 1.2 x 1.0 x 0.6 m and resembles the shape of a chair. Rotuman consultants said that it was the throne where the newly inaugurated sau would sit when the dead sau was placed on component 3. Component 3 is a flat waterworn basalt rock ca. 2.07 x 1.55 x .38 m. Component 4 is a flat waterworn basalt rock ca. 1.62 x .75 x 0.17 m. Component 5 is an elliptical 3.05 x 2.30 m enclosure surrounding a 1.25 x 0.35 x 0.3 m waterworn dense basalt rock. The enclosure is composed of rocks ranging in size from 61 x 34 cm to 18 x 14 cm stacked 2 to 3 courses high to a height of 67 cm. Component 6 is an elliptical 2.9 x 2.4 m enclosure. The enclosure is composed of rocks ca. 50 x 40 cm in size stacked 4 courses high to a height of 73 cm. Component 7 is a 1.3 x 0.65 x 0.25 cm dense waterworn basalt rock that has eight 20 cm circular grinding depressions on its surface. Component 8 is a 1.2 m long cannon with "B & P" engraved on the flat portion of its base (c.f. Legge n.d.).

The platform on top of Sisilo was the burial ground for the sau who died in office (Trouillet n.d.). Bennett (1831:476) was the first European to describe the platform in 1831:

> On a hill not far distant inland from the village of Shoar, I visited the burial-place of the kings, named by the natives Shishoul;... this burial-place of the regal personages possesses nothing remarkable, either for beauty or scenery or of construction. It was simply a slightly elevated mound inclosed with stones; over the graves were placed large coral stones, marking the situations of each;...

MacGregor (1932) provides several short accounts of the ceremonies that took place when the sau was buried at Sisilo.

Despite Bennett's claims that there is nothing remarkable about Sisilo, the platform does have a number of interesting characteristics. The sides of the platform are orientated almost exactly north-south and east-west. The eastern side of the platform is oriented on a bearing of 359-189 degrees true north and the southern side is oriented on a bearing of 277-97 degrees true north. These bearings were taken with a handheld compass and therefore should be considered only approximations, but the close cardinal alignment of the platform seems more than coincidence.

Kirch (1988:43) notes that Tongan langi burial mounds are often faced with large coral slabs along a single side with the side coral facings decreasing in size. He (1988:43) suggests that the face with the largest slabs is "presumably the ritual front of the mound." The Sisilo platform conforms to this pattern. The eastern face of the mound is composed of extremely large coral slabs whereas the northern and southern faces are composed of much smaller basalt slabs. The western side is barely faced and is defined by a rough alignment of basalt rocks. There is also a notch or step located in the northeast corner. This morphological configuration suggests that the eastern side of the platform was the ritual front and the west side was the back. The geographic orientation of the feature coincides with the "geographical code" (Howard 1985:74) of the island and the predominance of the chiefs of the island to come from the eastern districts and the commoners from the west (see Chapter 6).

The District of Oinafa

Fulia

On the west side of Fulia there is a 12 x 7 x 1.5 m Class 4 platform (Figure 8.10). The facing of the platform is composed primarily of cut coral slabs which have a maximum size of ca. 1.2 x 0.8 m. The fill of the platform is terrigenous sediment mixed with a high concentration of calcareous sand. The feature contains numerous internal slablined and crypt burial components. The feature has be extensively disturbed by vegetation.

Rotuman consultants state that the platform is Muasol, the burial place of the mua. According to legend the platform was originally built during "the time of the giants" by Fuge to bury Vasea, who was the son of the giant Faoea who lived at Kinehe'e (Trouillet n.d.; see the description of Kinehe'e below). Since that time all the mua of Rotuma were buried at Muasol.

Solhafu

On the northeast ridge leading up to the peak of Solhafu there is a 34.40 x 11.20 m partially faced Class 4 platform (Figure 8.11). The rock facing of the platform is noncontiguous and only occurs along the northeast and southwest ends of the platform. The facing has a maximum height of 1.8 m, and is composed of 29 to 51 cm rocks stacked 4 to 5 courses high. The facing includes several cut coral slabs which average ca. 1.5 x 1 x 0.15 m. The fill of the platform is terrigenous sediment with a light concentration of calcareous sand. The platform has been highly disturbed by tree roots.

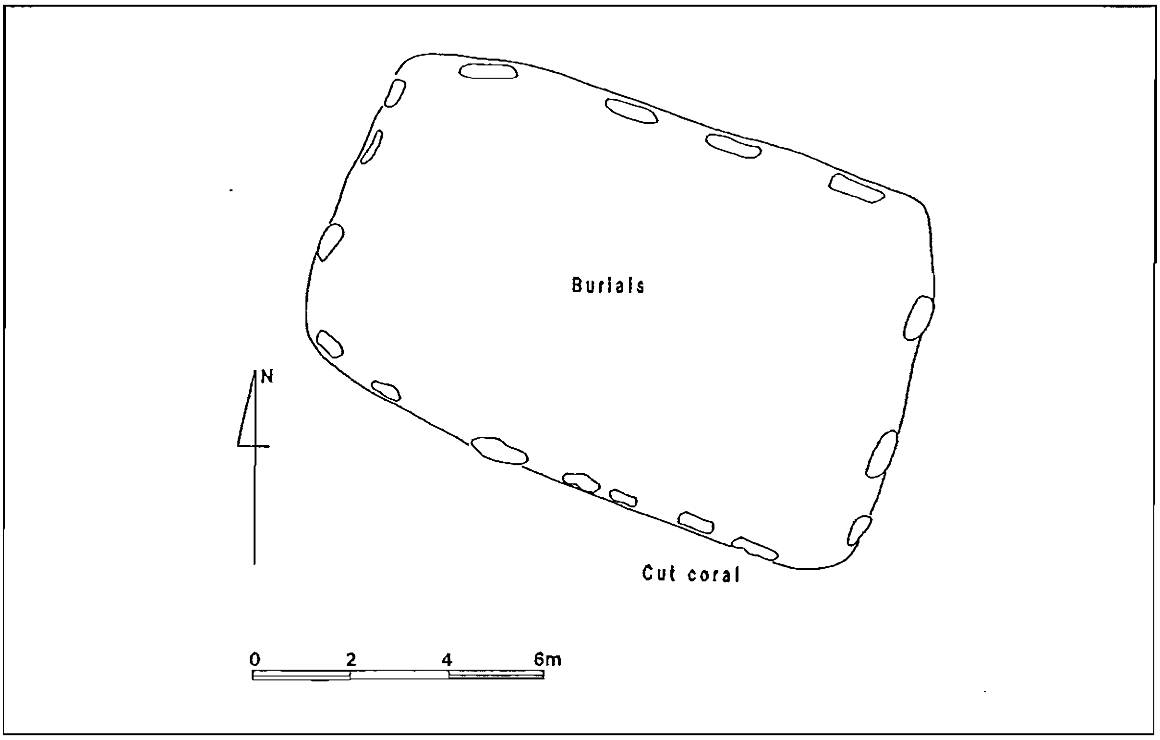

Figure 8.10 Archaeological features on Fulia.

The feature contains several internal components. On the southwest side of the feature there is a 12 x 6 m terrace. It is demarcated from the rest of the feature by its uniform flat surface, a discontinuous single course alignment, and the lack of internal grave markings. It appears to be the foundation of a house site or some sort of activity area. The northeast end of the feature contains ca. 50 graves. The graves include both slab lined and crypt burials. Basalt rocks and cut coral slabs have been used to demarcate these internal components. Oral traditions state that the cemetery was a burial ground for the "giants" of Rotuma.

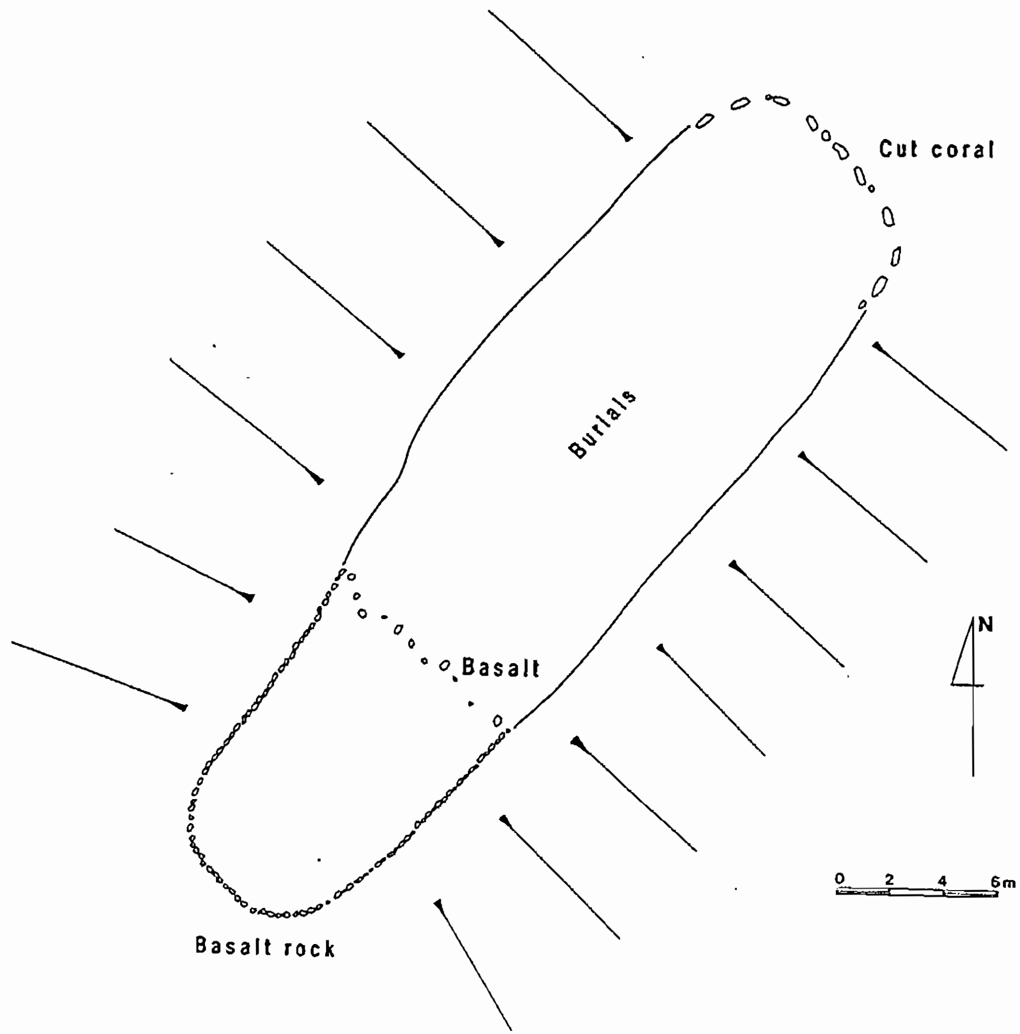

Figure 8.11 Archaeological features on Solhafu.

The District of Pepjei

Fiua

Two features were noted near the summit of Fiua (Figure 8.12). A 21.2 x 18.1 m Class 3 platform is located on the peak of the mountain. The facing of the platform is noncontiguous, two to three courses high, and is made up of rocks with a maximum size of 63 x 51 cm and an average size of ca. 35 to 20 cm. Two small coral slabs are contained in the facing, one 72 x 51 cm and the other 40 x 28 cm. Because the vast majority of the rocks in the facing are basalt and the two coral slabs are relatively small, the feature is classified as a Class 3 and not a Class 4 platform. The fill of the platform is a mixture of terrigenous sediment and a medium to high concentration of calcareous sand. Two terraces extend off the southeast side of the platform. Component 1 is a 5.1 m long, 2 to 4 course high, terrace. Component 2 is a 3.2 m long terrace with rocks stacked 2 to 3 courses high.

The second feature recorded on Fiua is a 54.3 x 5.6 m cut bank terrace located on the south slope of the mountain. The terrace is unfaced and is defined by the level area formed by cutting back the slope. A sparse amount of calcareous sand is distributed over the terrace but this material seems to be the fill from feature 1 that has eroded down the slope.

One test pit was excavated at feature one. It was a 50 x 50 cm unit located on the south side of the terrace. The surface of the test pit was covered with decomposing vegetation and roots. Layer 1 extended from the ground surface to a maximum depth of 13 cm bgs. The matrix consisted of loosely packed terrigenous

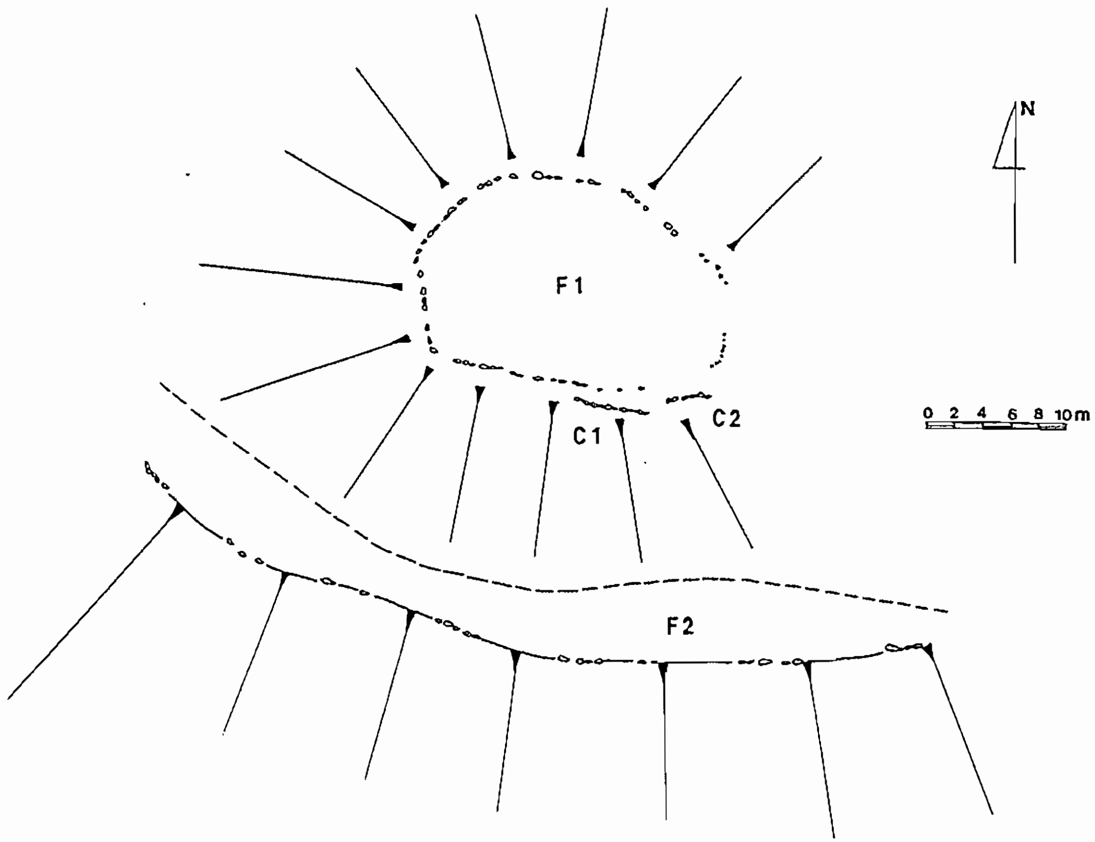

Figure 8.12 Archaeological features on Fiua.

sandy loam and calcareous sand with slight charcoal flecking. Layer 2 was a similar matrix to Layer 1 with the exceptions that it contained less organic matter and was therefore lighter in color and it contained a higher concentration of charcoal flecking. It extended from 13 cm bgs to 40 cm bgs. Several pieces of human bone were noted in this layer, including a 5 cm long mandible fragment with 2 molars. The skeletal material was not articulated and appeared to be fragmented and mixed in with the sediment. A small charcoal sample recovered from this layer at ca. 17 cm bgs produced a calibrated 1 sigma radiocarbon range of AD 1684 to AD 1955 (see Table 3.4). Layer 3.1 began at ca. 39 cm bgs and consisted of sterile orange sediment.

The morphology of the feature and the excavation reaffirms the interpretation that calcareous sand filled Class 3 platforms are burial mounds. It is not known what activities took place on the cut bank terrace. The radiocarbon range is inconclusive and suggests that the feature could have been built and used during either the prehistoric or historic periods.

Solmafua

Five features were recorded on Solmafua which were grouped into 2 complexes. The first complex consists of features 1 through 3 (Figure 8.13), and the second complex consists of features 4 and 5 (Figure 8.14).

Feature 1 is a terrigenous sediment filled 7.26 x 4.34 m platform. The facing consists of 27 x 21 cm rocks stacked 3 to 5 courses high. A 13.12 m long terrace extends off of the west edge of the feature. This component is a terrigenous sediment filled terrace with a facing composed of 62 x 38 cm rocks stacked 3 courses high.

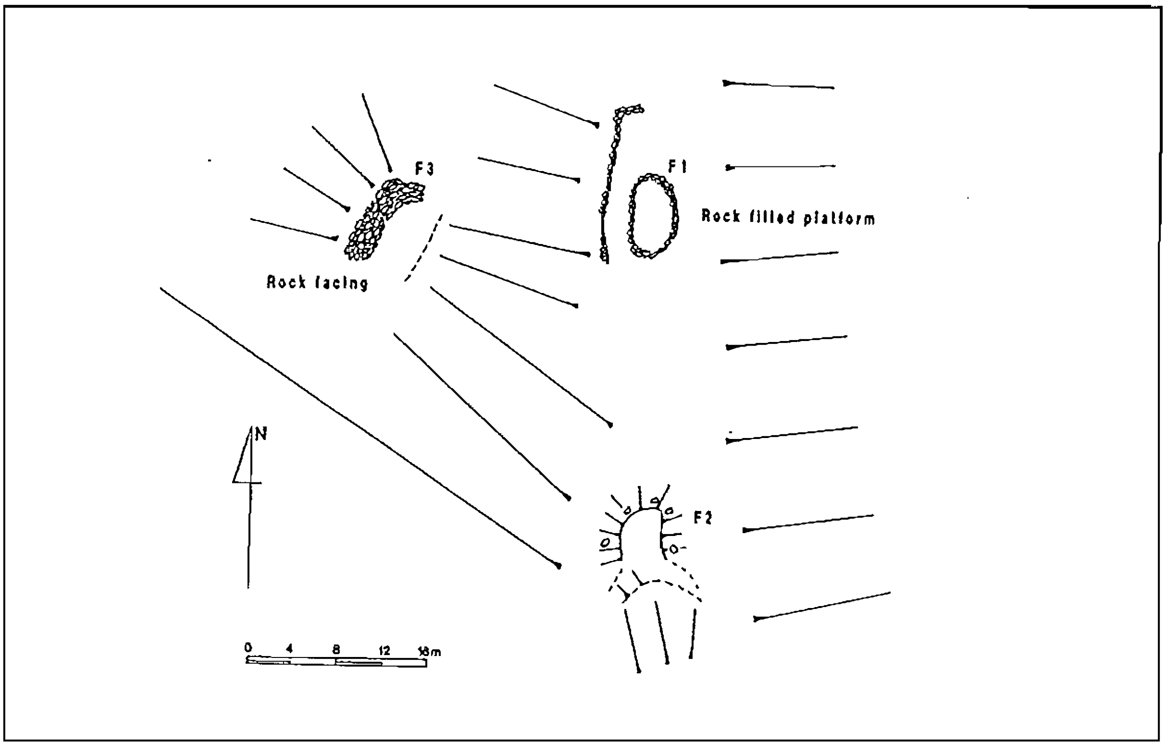

Figure 8.13 Archaeological features in Solmafua complex 1.

Feature 2 is a 6.78 x 6.42 m cut bank terrace. The face of the feature is defined by the edge of the level area and five rocks ca. 35 x 30 cm in size. Feature 3 is a 8.66 x 5.91 m cut bank terrace. The facing of the terrace consists of 32 x 23 cm rocks stacked 4 to 7 courses.

Feature 4 is a 13.48 x 8.69 m highly disturbed rock filled platform in complex 2. A large hifau tree is growing on the south edge of the feature. The feature is built on a steep slope and its facing consists of rocks with an average size of ca. 20 x 15 cm stacked at most 32 courses high. The distance from the base of the face to the highest point on the feature is 4.45 m. The fill of the feature consists of ca. 20 x 20 cm rocks. Feature 5 is a 1.34 m in diameter circular rock filled mound. The mound

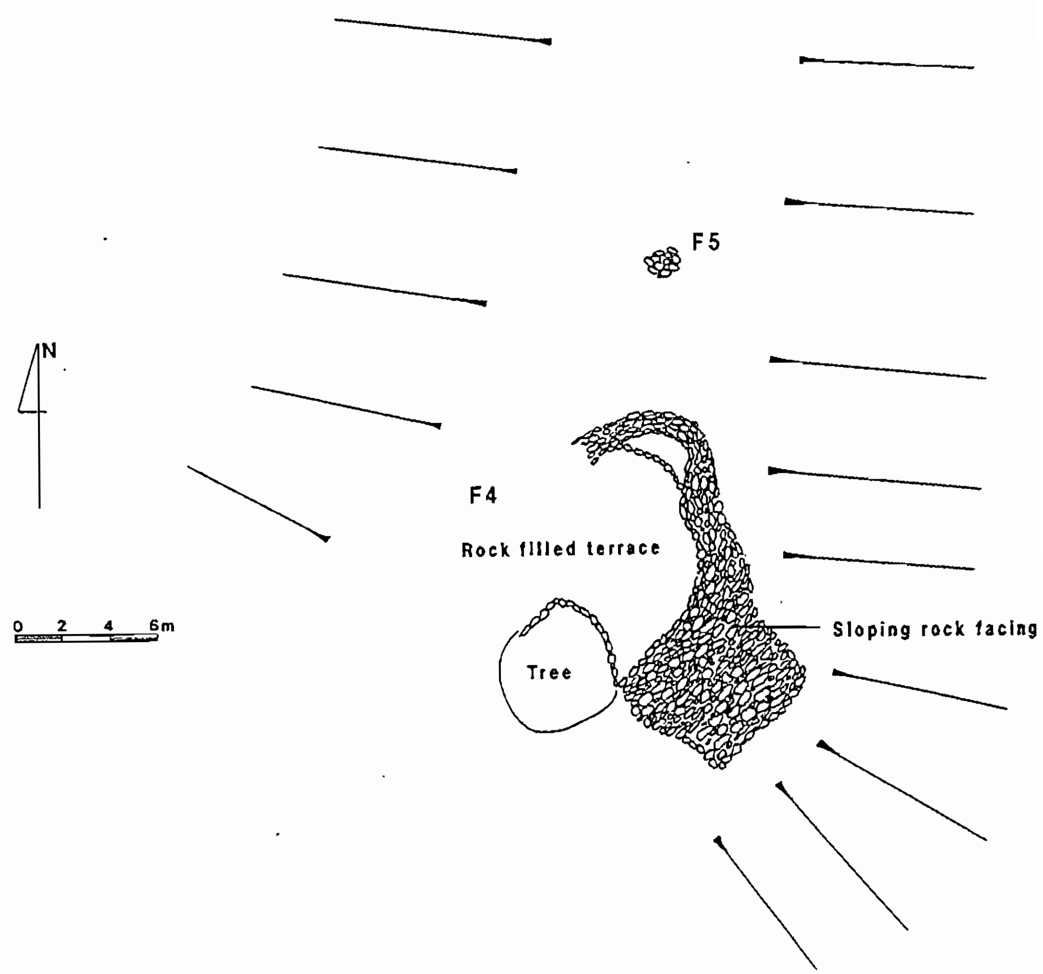

Figure 8.14 Archaeological features on Solmafua complex 2.

is ca. 2 courses high and consists of rocks ranging in size from 19 x 8 cm to 6 x 4 cm. It is probably a rock filled hearth or lovo associated with residential feature 2.

Excavations were conducted at both complexes. The test pit at feature 1 was a 50 x 50 cm unit located near the center of the platform. The surface of the test pit was covered with decomposing vegetation and small 1 to 4 cm rocks. Layer 1 extended from the ground surface to a maximum depth of 46 cm bgs. Level 1.1 consisted of sandy loam with a high concentration of 2 to 4 cm rocks. A very minor amount of charcoal flecking was noted. Levels 1.2 through 1.4 consisted of a similar matrix but with the addition of ca. 22 rocks ranging in size from 32 x 23 cm to 11 x 8 cm rocks. These rocks were the foundation stones of the platform. A moderate amount of charcoal flecking was noted and a sample was collected from level 1.3. The bottom of the large foundation stones was reached approximately halfway through level 1.4 at 46 cm bgs. From 46 cm bgs to the bottom of level 1.5 at 57 cm bgs the density of charcoal increased and a sample was recovered. Three small pieces of waterworn coral were recovered from level 1.4 and one piece from level 1.5. No other cultural material was recovered. The boundary between layer 1 and 2 was abrupt. Layer 2 is the sterile reddish decomposing bedrock.

The test pit at feature 4 was a 50 x 50 cm unit located near the edge of the rock filled platform. The surface of the test pit was covered with decomposing vegetation and roots. Layer 1 extended from the ground surface to a maximum depth of 49 cm bgs. The matrix consisted of a mixture of sandy loam and rocks. Level 1.2 contained rocks ranging in size from 23 x 12 cm to 3 x 2 cm and a minor amount of charcoal flecking. Level 1.3 contained a higher density of smaller 11 x 4 cm rocks and a higher concentration of charcoal. One charcoal sample was recovered. Levels 1.4 and 1.5 contained fewer rocks and the concentration of charcoal flecking diminished. No additional cultural material was recovered. At ca. 47 cm bgs a thin 2 cm layer of sterile orange silty loam (layer 2.1) covered a large rock which extended across the bottom of the entire unit.

The morphology of the features in each of the two complexes suggests that they are the foundations of residential features. The association of a rock filled lovo with one of the residential structures reconfirms this interpretation.

Discussion of Archaeological Hill Sites

The reconnaissance survey of the 25 hills identified 14 archaeological sites. These 14 sites are obviously only a small sample of all the sites distributed throughout the island. However, the features that were recorded as elements of each site are probably representative of the types of features that are present in the general vicinity of the site. With this information it is possible to discern the types of archaeological features that the residents of the different districts were building on the hills in their districts. The functional assignments of the archaeological sites in each district is presented in Table 8.3.

In the western districts of Itu'muta and Itu'ti'u residential sites were found on 4 of the 9 mountains. In contrast, residential features were located on only 1 of 6 mountains in the eastern districts. This difference does not imply that residential

Table 8.3 A functional classification of the archaeological sites found on the mountains in each district of Rotuma.

District	Geographical Area	Residential	Burial (Class 3)	Burial (Class 4)	No Archaeological Remains	Not Surveyed	Total
Malhaha	North			1	3	1	5
Pepjei	South	1	1		1	1	4
Juju	South	1			2		3
Noatau	East	1		1	1		3
Oinafa	East			2	1		3
Itu'ti'u	West	3	2		2		7
Itu'muta	West	1			1		2
Total		7	3	4	11	2	27

features were not built on the eastern side of the island rather that the inhabitants of the eastern side built different types of features on the mountains in their districts.

The relatively small Class 3 calcareous sand filled platforms and terraces were not distributed evenly throughout the island. Two of these sites were located on western mountains and a third was located in the southern district of Pepjei. No Class 3 platforms were found in the northern and eastern districts.

The Class 4 calcareous sand filled platforms with cut coral slab facings have an inverse distribution to that of the Class 3 platforms. Three out of four of these large monuments were found in the eastern districts, and the forth was located in the northern district of Malhaha near the district boundary between Malhaha and the eastern district of Oinafa. No Class 4 platforms were found in the southern and western districts.

In summary, there is a distinct pattern in the distribution of archaeological features on the mountains of Rotuma. The large scale burial monuments are located in the eastern and northern districts. These monuments would have required the most energy and labor to construct. It is likely that these features were built by the leaders of the island in an effort to reaffirm their chiefly status. The archaeological sites on the western mountains were quite different from the large scale burial monuments. On the western mountains there were a number of residential features and in two cases small, Class 3 burial platforms. While these monuments would have required considerable effort to construct, they are not nearly as monumental in size as those in the east.

Additional Archaeological Sites

Two other types of archaeological sites were recorded on Rotuma. The first was a large platform associated with a "giant" or chief of Rotuma, and the second were the agricultural features found throughout the island. Each is discussed in turn.

Kinehe'e

Kinehe'e is an extremely large Class 3 platform located in Oinafa (Figure 8.15). It has 29 internal components including several terraces which form the 3 tiers of the platform. The main platform is 61.91 x 58.84 m, with a maximum height of 3.2 m to the top of the main platform and 4.6 m from the base of the platform to the highest point on the feature. The face of the main platform consists of rocks ranging in size from 1.2 x .9 m to 20 x 20 cm stacked 12 courses high. The fill of the main platform consists of rocks ranging in size from 70 x 60 to 20 x 20 cm with an average size of 40 x 30 cm.

Causeways lead up to the platform from each of the four cardinal directions. The west causeway (component 1) has a maximum height of 2.9 m and is made up of basalt rocks stacked 7 to 11 courses high. The foundation rocks of the causeway range in size from 93 x 68 to 53 x 48 cm, and the rocks used to fill the causeway are ca. 40 x 30 cm. The causeway contains 21 stepping stones which range in size from 86 x 57 cm to 35 x 30 cm. The east causeway (component 2) has a maximum height of 2.5 m, and consists of basalt rocks stacked 11 courses high. The causeway contains no stepping stones. Rather, it is filled with 40 x 30 cm rocks. The south causeway (component 3) has a maximum height of 80 cm and consists of 44 x 32 cm

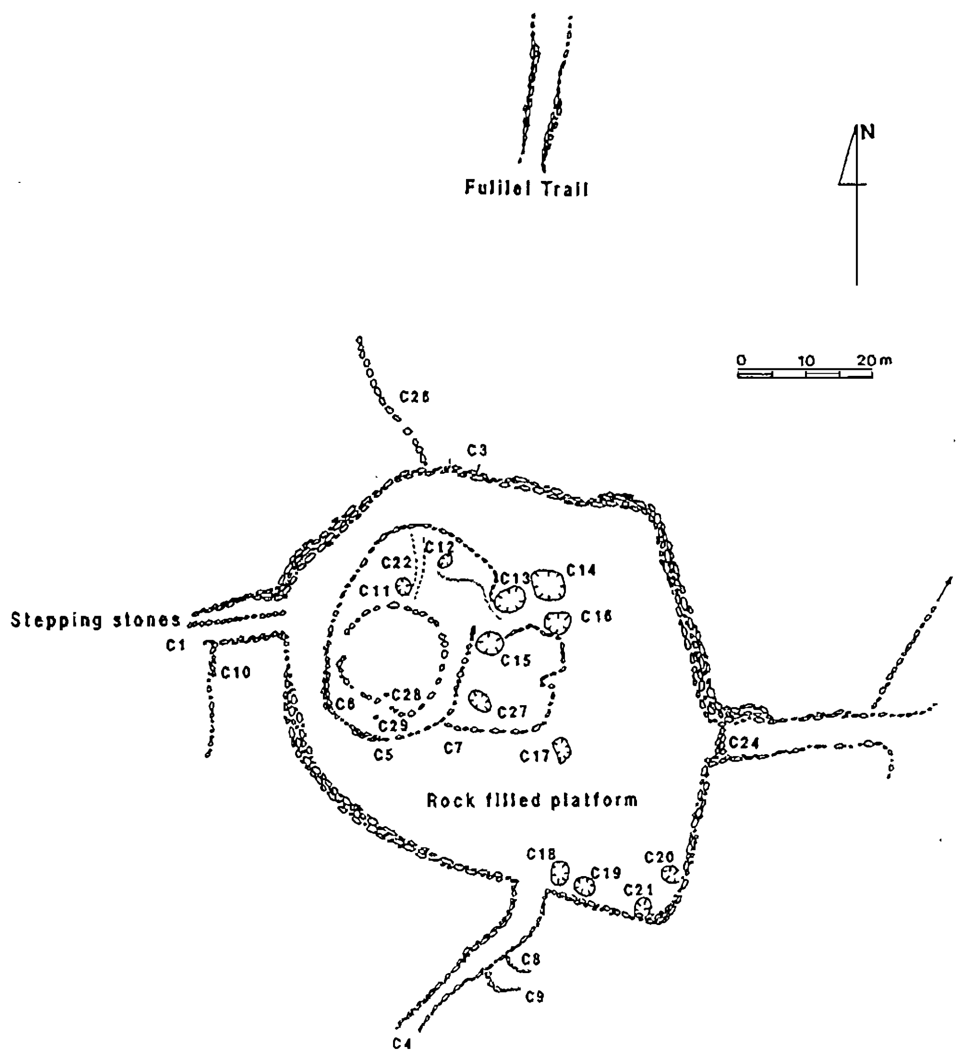

Figure 8.15 Kinehe'e.

basalt rocks stacked 2 to 3 courses high. A roughly paved curb lined trail extends from the end of the causeway to the south. The curbing of the trail consists of 30 x 30 cm rocks stacked 2 courses high, and the paving stones are ca. 60 x 60 cm. The north causeway (component 4) is less defined than the other three. The rocks and soil in the area slope up towards the base of the platform, and an alignment of rocks ca. 4 m from the base of the platform forms a step. The Fulilei trail leads into the northern causeway. This trail extends from the coastal border of Malhaha and Oinafa through the rocky 'a'a lava field to Kinehe'e. According to legend, the trail was built by a family of giants who passed rocks to one another (MacGregor 1932). The trail is roughly paved and contains several causeways, one of which is depicted in Figure 8.15. This section has a maximum height of 1.2 m and is constructed from rocks ca. 33 x 27 cm in size stacked 4 to 6 courses high.

Component 5 is the terrace which defines the second tier of the platform. It has a maximum height of 73 cm and is formed by 5 to 6 courses of basalt rocks which range in size from 75 x 50 cm to 18 x 15 cm. Approximately 6 cut coral slabs are included in the face. The face is vertically stacked along the northern, southern, and western margins, and less clearly defined along the eastern side. The fill of component 5 is a mixture of rock, terrigenous sediment, and calcareous sand. Component 6 is a terrace which defines the third tier of the platform. It has a maximum height of 67 cm and consists of rocks ranging in size from 52 x 44 cm to 23 x 19 cm stacked 3 to 5 courses high. The terrace is filled with rocks ranging in size from 62 x 39 to 32 x 24 cm. Component 7 is an intermittently faced terrace which abuts component 1. The facing of component 7 is defined by 33 x 30 cm rocks stacked 1 to 2 courses high to a height of 37 cm.

Components 8 and 9 are rock filled terraces extending off of the east side of the south causeway. The face of component 8 consists of 55 x 50 cm rocks stacked 3 to 4 courses high to a height of 60 cm. The face of component 9 consists of rocks ranging in size from 41 x 32 cm to 21 x 15 cm stacked 2 to 3 courses high to a height of 52 cm. Rocks ranging in size from 22 by 17 cm to 11 by 4 cm were used to fill both terraces. Component 10 is a rock filled terrace extending off of the west causeway. The face of the component consists of 32 x 27 cm rocks stacked 4 to 5 courses high to a height of 1.05 m. The fill consists of 21 x 9 cm basalt rocks.

Kinehe'e contains 10 faced depressions (components 11-20). They are generally circular depressions with faced sides sloping downwards at approximately 45 degree angles. Component 18 varies slightly from the other components in that its sides are nearly vertical as opposed to sloping. In most of the depressions the rocks in the upper portion of the face are larger (ca. 50 x 40 cm) than the rocks near the bottom (ca. 30 x 20 cm). The depressions vary in size from a diameter of 5.35 to 2.24 m, and a depth of 1.4 to .5 m. The number of courses of rocks varies from 3 to 10. The function of these components is unknown but it should be noted that they are morphologically distinct from the many yam planting holes in the surrounding area (see below). The yam planting holes are smaller and not as formally faced as the faced depressions.

Component 21 is a faced notch in the southeast corner of the main platform. The notch is formed by 48 x 39 cm rocks stacked 4 to 6 courses high to a height of 1.3 m. Rotuman consultants said that these types of notches were morphological features that marked chiefly residences. Notches were noted in several small platforms throughout the island.

Two trails were recorded as internal components of Kinehe'e. Component 22 is a curb lined stepping stone trail which appears to be an extension of the north causeway. The curb lining of the trail consists of rocks stacked 1 to 2 courses high to a height of 25 cm. The stepping stones consist of both basalt rocks and coral slabs, with an average size of ca. 40 x 40 cm. Component 23 is a stepping stone trail defined by 41 x 35 cm slabs.

Components 24 and 25 are low stacked rock walls crossing the east causeway. Component 24 consists of 34 x 31 cm rocks stacked 2 to 5 courses high to a height of 70 cm. The wall is not formally faced and only a small amount of moss is growing on the rocks leading to the conclusion that the component was constructed relatively recently. Component 25 continues to the north and south of the east causeway. It consists of 40 x 30 cm rocks stacked 2 to 4 courses high to a height of 66 cm. Component 26 is a stacked stone wall that extends north from the base of Kinehe'e for approximately 22 meters. The wall is made up of 31 x 21 cm rocks stacked 2 to 4 courses high.

Component 27 is a 65 cm high basalt rock mound made of up of 20 to 60 cm rocks stacked 4 to 5 courses high. The component is not faced, and its function is unknown. Components 28 and 29 are small faced cairns which appear to have been built relatively recently.

One test pit was excavated at Kinehe'e. It was a 100 x 50 cm unit located on top of the component 5 terrace. The surface of the test pit was covered with decomposing vegetation and roots. Layer 1 extended from the ground surface to a maximum depth of 24 cm bgs. The matrix consisted calcareous sand with 1 to 5 cm waterworn basalt rocks. Fragments of human bone were present throughout the layer. These included three molars, one phalange, and one 4 by 3 cm piece of mandible. The skeletal material was not articulated and appeared fragmented. A small 8 cm in diameter charcoal stain was noted at 18 cm bgs. A charcoal sample from the stain produced a calibrated one sigma radiocarbon age range of AD 1671 to AD 1955 (see Table 3.4). The excavation was terminated once it became apparent that the feature contained skeletal material.

Few accounts mention Kinehe'e. In a brief one paragraph description of the feature, Parke (1965:110) states that the platform "is known as Ki ne He'e - sepia of the cuttle fish" and suggests that it is the largest archaeological feature on the island. According to Parke (1965:110) the oral traditions suggest that Kinehe'e was the house of a giant. This suggestion is apparently based on a legend told by Irava (in Parke nd.:137) which states that the giant Foea lived at Kinehe'e. A consultant to MacGregor (1932) makes a similar reference to Fouea living at Kinehe'e. Another tradition that might refer to Kinehe'e was related to Trouillet (n.d.). It states that the founder of the island, Raho, is defeated by a Tongan usurper, Tokaniua, and flees in confusion. Raho's "foot is caught in the serpent who is called Kine, he falls down, gets up and full of shame he escapes to (H)atana. From then on Tokaniua is sole master of the island."

Although these accounts provide little detail about the feature they do suggest that the structure was associated with the "giants" or chiefs of the island. The sheer size of the feature distinguishes it from all other known archaeological features on the island and emphasizes its importance. Whether the structure served primarily as the residence of the chiefs or as a burial is unknown. The lack of large cut coral stones is noteworthy and suggests that the primary purpose of the feature was not as a chiefly cemetery. It is possible that the upper calcareous sand filled terraces which contained the burial associated with charcoal dating to the late prehistoric or historic period was a later addition to the main feature which initially functioned as a chiefly residence. These matters can only be clarified with further excavation. It is significant that the feature is located in Oinafa, the district which contained the greatest number of Class 4 cut coral slab burial platforms and a district that is associated with the pan-Rotuman chiefs of the island (see Chapter 6). The presence of Kinehe'e in Oinafa reinforces the pattern of chiefly monumental architecture being built in the eastern districts.

Agricultural Features

There is archaeological evidence that dryland agricultural intensification took place in the past. This intensification did not include permanent field borders or agricultural terracing. The only form of dryland intensification noted on the island

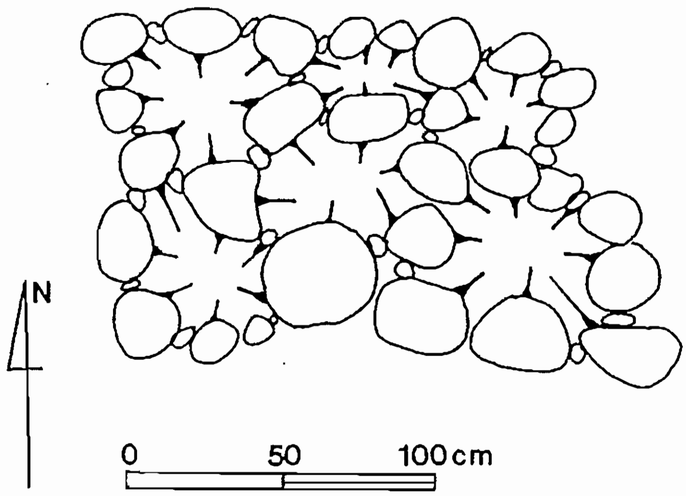

Figure 8.16 Yam planting depressions.

were the hundreds of yam planting depressions in the Lepjea region of Oinafa. The depressions were created in the rocky 'a'a lava flow and were usually found in clusters of 20 or more. The depressions were generally circular and ranged in size from 1.3 to .6 m in diameter (Figure 8.16). They had an average depth of 55 to 85 cm and were formed by stacking rocks 3 to 5 courses high. Rotuman consultants identified them as yam planting mounds and said that the interiors of the depressions were mulched with vegetation to support the yam sett. They said that the technique was not currently used and no occurrences were noted. During the reconnaissance survey I walked through many areas of Rotuma, including the rocky pahoehoe and 'a'a lava flows on the west side of Itu'ti'u, but these depressions were only seen in the Lepjea area of Oinafa.

Summary

A reconnaissance survey of 25 hills on Rotuma located 14 archaeological sites. The predominant features in these sites were terraces and platforms. These features were probably used for a number of activities, including residential sites, burials, and perhaps as defensive lookouts. The distribution of the different types of sites varies from district to district.

The mountains in the western districts contained a disproportionately high number of residential features and completely lacked any large cut coral Class 6 slab burial platforms. The burial platforms that were found on the western mountains were of the smaller Class 3 type. In contrast, the hills of the eastern districts contained 3 of the 4 cut coral burial platforms and a relatively small number of residential features. Furthermore, the largest known archaeological feature on the island, Kinehe‘e, a chiefly residence and burial, is located in the eastern district of Oinafa. In sum, a higher percentage of monumental architecture requiring large amounts of labor and energy appears to have been built in the eastern districts in comparison to the rest of the island. The archaeological evidence of dryland agricultural intensification is also found in the eastern districts. While similar agricultural features may exist in other parts of the island they were not noted.

CHAPTER 9

EVALUATION OF PROPOSED MODEL

The previous chapters presented data to evaluate the model of interdistrict aggression and political integration proposed in Chapter 2. Some propositions of the model are supported by the data, while others are not. A number of the propositions consider the relationship between various lines of evidence. In this chapter the individual propositions of the model are evaluated and these relationships are considered.

Evaluation of Model

The model suggested that intergroup aggression on Rotuma was in part materially based. It was proposed that there were subsistence resources on Rotuma worth competing for, and that through successful intergroup aggression some people achieved material benefits associated with those resources. The data supporting this suggestion were presented in Chapter 4 and included an inventory of the kinds of resources on Rotuma to determine if they were distributed in a dense and predictable manner. Additional data were presented in Chapter 7, and included mythical and ethnohistorical accounts enumerating the motivating factors underlying warfare and the material benefits that could have been achieved.

Chapter 4 illustrated that Rotuman terrestrial resources included agricultural crops such as dryland taro, swamp taro, yam, breadfruit, and coconut. In most Pacific islands these crops provide dense and predictable resources. In particular, swamp taro was a predictable resource that could have been stored in the ground for several years. Swine provided an additional terrestrial resource. In contrast to agricultural crops, swine were distributed less densely throughout the landscape. Furthermore, because of their mobility they were less predictably located. As with swine, marine resources surrounding Rotuma were generally distributed in a less dense and predictable manner.

The mythical accounts and ethnohistorical literature suggest that Rotuman warfare was motivated by several factors. Howard (1964, 1966, 1985, 1986) and to some extent Gardiner (1898) stressed status rivalry. The myths and ethnohistorical literature, however, suggest that additional causes of interdistrict aggression included disputes over land boundaries and subsistence tribute such as pigs and agricultural crops. Furthermore, wars were fought when chiefs failed to redistribute crops in an appropriate manner.

The analysis of subsistence resources grown on Rotuma indicates that the presence of dense and predictable resources made interdistrict warfare a viable collaborative strategy. The mythic narratives suggest that warfare occurred in order to dominate these resources and that intergroup aggression was more than simply a means of displaying status.

In the model it was hypothesized that interdistrict aggression occurred initially and was greatest in the least productive regions of Rotuma. This hypothesis relies on the assumption that people living in less productive areas would have reached the inflection point of the cost curves associated with their subsistence strategies before people living in highly productive areas. The inflection point is the point at which the amount of energy invested in subsistence practices rises dramatically in relation to the amount of output. At this point populations inhabiting less productive areas might have employed alternative subsistence related options such as intergroup aggression. If the proposition is correct, Rotuma should contain diverse environmental contexts with different marginal costs for subsistence strategies. Furthermore there should be evidence indicating that populations living in less productive areas of the island had reached the inflection point of the subsistence cost curves, whereas people living in other parts of the island had not. Finally, the people living in less productive areas should have participated in more interdistrict aggression than the people living in other parts of the island.

A geographic information system (GIS) was used to determine that different regions of the island had different agricultural productivity potentials. The GIS analysis demonstrated that the eastern districts had the lowest terrestrial productivity index. The costs of producing agricultural crops in areas with low terrestrial productivity indices would have been greater than the costs of producing crops in areas with higher indices because in areas of low terrestrial productivity energy intensive dryland agricultural practices are the most viable strategy. Extensive archaeological evidence indicating intensive dryland agricultural practices was located in the eastern districts, whereas the same density of these features were not found in other areas of the island. Therefore, it was determined that eastern districts had low terrestrial productivity indices and the archaeological evidence suggested that intensive dryland agricultural techniques were utilized. These lines of evidence support the hypothesis that the people living in the eastern districts had reached the inflection point of their subsistence cost curves.

If the stimulus for interdistrict aggression was greatest in the least productive regions of Rotuma, there should be a negative correlation between the frequency of participation in interdistrict warfare and the relative productivity of a district group. The terrestrial productivity indices were used as a measure of relative productivity and the myths were analyzed to determine which district groups participated in the most intergroup aggression. A Spearman test of rank correlation between the frequency of interdistrict warfare and the productivity of the district group indicates that the variables have a significant negative relationship (r_s = -1.00, significance level = 0.042). The correlation indicates that the districts with lower productive potentials generally participated in more intergroup aggression than the districts with higher productive potentials.

Intergroup aggression may have led to political integration if the disparity between the environmental contexts on Rotuma was great enough to stimulate intergroup aggression, but not so large as to support vastly disparate population densities. The extent of intergroup aggression would have been affected by the degree of environmental disparity between two competing areas. If there was little difference between the material resources in two areas there would have been less motivation for one group of people to attack the other. Furthermore, the two groups would have had relatively equal resource bases providing no clear economic or demographic advantage to any one area. In this case political integration would have been unlikely. On the other hand, if extensive environmental differences existed between various areas of an island there would have been an incentive for intergroup aggression by populations living in less productive areas. However, political integration might have been inhibited because highly disparate population densities could have been supported. A high population density in one area would have given that area an unsurmountable advantage in warfare. Due to the disparity in numbers, the people living in the less densely populated areas may have been incapable of conquering the people inhabiting the more densely populated areas. Alternatively, political integration would have been a possible outcome of intergroup aggression if the environmental disparity was large enough to stimulate intergroup aggression but not so large as to support disparate population densities.

The data evaluating whether or not there was a large disparity between environmental contexts on Rotuma were presented in Chapter 5 where it was demonstrated that the eastern districts had relatively low agricultural productivity potentials in relation to the other districts. The northern, southern, and western district groups had much higher terrestrial productivity potentials than the eastern district group. However, the distribution of reef resources differed from the terrestrial resources. The western and eastern districts had fairly extensive reef resources, the northern district had moderate reef resources, and the southern districts had poor reef resources. To some extent the differences in terrestrial and marine resources could have been counterbalanced by each other. For instance, the low agricultural potential of the eastern district group may have been counterbalanced by its extensive reef resources. Furthermore, the poor reef resources of the southern district group could have been counterbalanced by its high terrestrial productivity potential. The western districts have extensive reef resources and high terrestrial productivity potential. The northern district has moderate reef resources and high terrestrial productivity potential. Therefore, although there were large differences in agricultural potential between districts which could have stimulated intergroup aggression, the differences were offset to some extent by the differential distribution of reef resources. This counterbalancing of resources might have meant that relatively equal population densities could have been supported throughout the island.

The issue of differential population densities was addressed with the late nineteenth century data presented in Chapter 7. While the data from 1881 are less than optimal because they come from a period 90 years following European contact, they may be indicative of the general trend of population densities during the prehistoric-protohistoric era. Population densities in 1881 ranged from 74.2 people/km^2 in the western districts to 43.6 people/km^2 in the southern districts. The highest population density in a district group was therefore 1.7 times the lowest population density.

Although population densities differed throughout Rotuma, the areas with the highest terrestrial productivity potential did not have the highest population density. A Spearman test of rank correlation indicates that there is no significant correlation between the terrestrial productivity indices of the district groups and the 1881 population densities (r_s = -0.6, significance level of 0.20). In fact the correlation indicates that there is a tendency towards a negative correlation which is the opposite of what was expected. However, there is a significant positive correlation between the reef resource index of a district group and its population density (r_s = 1.0, significance level of 0.042). The correlations suggest that the moderate disparities in population densities throughout the island correspond with differences in marine resources but not terrestrial resources.

The relatively higher population densities could have provided an advantage during interdistrict conflicts. This assumption was assessed by considering the relationship between the population densities of a district group and the number of times the district group was successful in an interdistrict conflict relative to the total times it participated, i.e., the victory percentage of the district group. A Spearman test indicates that the two variables exhibit a positive correlation (r_s = 0.8). However, due to the small sample size the correlation is only significant at the 0.167 level. While this level is well above the norm for accepting the results as significant, it is indicative of a general trend that districts with higher population densities were more successful in interdistrict conflicts.

The data suggest that the disparity in the distribution of environmental resources would have been sufficient to motivate interdistrict aggression. However, district deficiencies in one type of resource could have been counterbalanced by the presence of other types of resources thereby giving no district an overwhelming advantage. The population densities of district groups varied by as much as 170%. These differences in population densities do not appear to be related to differences in terrestrial productivity potential, rather they were positively correlated with the amount of reef resources a district group was associated with. The correlation between population density and success in interdistrict conflict suggests that higher population densities provided some sort of advantage during interdistrict wars. However the differences in population densities do not appear to have been so extreme that interdistrict aggression could not have led to political integration.

The model proposed that political integration was the result of successful interdistrict aggression. While there were undoubtedly other factors involved in the emergence of political integration, I suggest that through interdistrict aggression smaller semiautonomous districts could have been dominated and integrated into an island wide polity.

Chapter 6 reviewed the myths concerning the creation of the <u>sauship</u>. Before the <u>sauship</u> was created the island was divided into semiautonomous districts with no island wide leaders. With the creation of the institution of <u>sau</u> the island was integrated into a single polity. The myths indicate that the inception of the <u>sauship</u> was the result of an interdistrict conflict with the position of <u>mua</u> being usurped by the position of <u>sau</u>. Howard (1985:68) notes that the myths consistently refer to the <u>sau</u>'s association with military vitality. The myths suggest that military vitality exhibited in interdistrict aggression created the island wide polity.

Howard (1964, 1985, 1986) suggested that the traditional Rotuman ideal dictated that the incumbency of the <u>sauship</u> rotated, with representatives from each district taking turns to hold the position. In this ideal, the <u>sauship</u> symbolized the social unity of the island in the absence of stable political integration. As an institution it helped mediate the contradiction that the people living in the individual districts were being ruled by extra-district chiefs. This ideal of the <u>sauship</u> promoted the belief that representatives from all districts participated in the island wide government to an equal extent. In contrast, the model proposes that the practice of holding the position of <u>sau</u> varied from the ideal, and that the people who held the position of <u>sau</u> generally came from a specific area of Rotuma.

The data to test this proposition were presented in Chapter 6 and demonstrated that during the prehistoric-protohistoric period the greatest number of <u>sau</u> came from the eastern district group of Noatau and Oinafa. In contrast, far fewer <u>sau</u> came from the northern, southern and western district groups.

The eastern pan-Rotuman elite should have tried to perpetuate the political integration of Rotuma by re-formulating social constraints so that commoners and lesser chiefs benefitted from polity membership and chose to participate. The pan-Rotuman elite could have done this by altering the economic, ideological, militaristic, and administrative constraints experienced by the commoners and lesser chiefs. A primary economic constraint for individuals was a reliable subsistence base. People would have been more apt to comply with the wishes of the pan-polity leaders if the leaders controlled the means of subsistence production. One way that the pan-Rotuman elite could have controlled subsistence production was by managing the fertile land. If the pan-polity leaders controlled the productive land, commoners and lesser chiefs would have been more likely to cooperate in pan-Rotuman integration. The pan-Rotuman elite should therefore have tried to integrate as much productive land into their polity as possible in an effort to reduce the alternative options available to their subjects.

A Spearman test of rank correlation indicates that there is a significant negative correlation between the number of sau from a district group and the associated terrestrial productivity indices (R_s=-1.00, significance level=0.042). This correlation suggests that while the pan-Rotuman elite came from the marginal areas of the island, they worked to integrate the more productive regions of the island into their own polity. This suggestion is collaborated by the NSAATPI indices which suggest that a relatively higher frequency of sau came from the districts with relatively lower productive potentials (see Table 6.3 and Figures 6.3 and 6.4). By integrating the more productive zones into their polity the elites would have limited the options of the lesser chiefs and commoners thereby forcing them to become members of the polity.

The social constraints that commoners and lesser chiefs experienced would have been further altered by the pan-Rotuman elite who promoted an ideology stressing their divine right and role in the continued success of society. I argue that to bolster this ideological belief the pan-Rotuman elite built monumental architecture on the mountains of their home districts. The construction of the monumental architecture would have been interpreted as a physical manifestation of the power of the ruling chiefs. As such, the architecture promoted the belief that the people who built or controlled the architecture had supernatural connections with the deities. The architecture also indicated that the leaders of those districts had enough hegemonic power to extract the corvee labor necessary for building the monuments. The proposition suggests that there should have been more monumental architecture on the mountains of the districts where the pan-Rotuman elite came from than on the mountains in other districts.

I have shown that the sau of Rotuma generally came from the eastern district group rather than the other individual district groups. The distribution of monumental architectural on the mountains of Rotuma coincides with this pattern. The largest percentage of Class 4 burial platforms and terraces was located in the eastern districts. An additional Class 4 monument was located in the northern district, but none were found on the mountains in the southern and western districts. Smaller Class 3 platforms and terraces that would have taken less energy to construct were located in the southern and western districts but were not found in the northern and eastern districts. Furthermore, the largest known monumental structure on Rotuma, the chiefly residence of Kinehe'e, was constructed in an eastern district. This distributional pattern supports the proposition that the pan-Rotuman elite were constructing large scale monumental architecture in their home districts to reaffirm the ideology that they had supernatural connections and were essential for the continued prosperity of society.

The model posits that the pan-Rotuman elite should have engaged in militaristic activities to constrain the options of their subjects. In some instances physical coercion can be an effective strategy for sustaining political hegemony. If this were the case, then the districts from which the pan-Rotuman elite originated should have participated in interdistrict warfare to a greater extent than the other districts. A Spearman rank correlation between the number of sau from a district group and the frequency with which that district group participated in interdistrict warfare shows that there is a significant positive correlation ($r_s = 1.00$, significance level=0.042). The strong positive correlation suggests that the district groups from which the pan-Rotuman elite came participated in warfare more often than the other districts, perhaps as a means of maintaining the political integration of the island.

The model proposed that the pan-Rotuman elite should have tried to gain access to chiefly titles through interdistrict aggression in an effort to impose a stratum of extra-district leaders. The ethnohistorical literature reviewed in Chapter 7 indicates that this might have been a successful strategy at the island wide level, but not at the lower district and ho'aga levels of administration. At the lower level, the narratives suggest that ho'aga and district titles were occasionally appropriated after a victorious war. Allies of the conquering group were bestowed with the chiefly titles and were presumably allotted the associated prerogatives to rule and administer. If this practice had been taken to extremes it would have resulted in the imposition of a strata of extra-district chiefly managers. However, for unknown reasons the process was not widely practiced and the ethnohistorical narratives suggest that people were still genealogically related to the local leaders and chiefs. At the higher level, however, the practice was successful in imposing extra-district leaders. The narratives suggest that the right to hold the position of sau was often achieved through warfare. The appropriation of this title imposed an island wide ruler onto the individual districts of the island. The reign of extra-district leaders would have meant that genealogically unrelated or distant people were imposing their influence, no matter how limited, throughout the island.

It was proposed in the model that political integration persisted on Rotuma because some members of the polity benefitted in relation to alternative strategies. As suggested in Chapter 2, the costs and benefits associated with political integration varied for the members of different social classes, and for the populations inhabiting different areas of the island.

The political integration of Rotuma with the eastern chiefs occupying the pan-Rotuman positions provided the chiefs from the less productive eastern districts with several advantages. The first advantage was that the sau and his entourage from the eastern districts could have been sustained using non-local resources. Hosting a sau required a sizable investment and there are instances recorded in the myths where the burden became too great leading the host district to rebel. By gaining access to the subsistence resources of the more productive districts, the Noatau and Oinafa sau were not only supporting a segment of their elite without using their own resources, they were also depleting the resources of potential rivals. This political structure meant that the Noatau and Oinafa sau reduced the ability of rival chiefs living in other districts to finance a successful rebellion and name their own sau. Political integration also provided the pan-polity rulers from the eastern districts with additional corvee labor which could have been used for their own advantage. Furthermore, the Noatau and Oinafa sau obtained a new avenue for displaying their supernaturally sanctioned fecundity. In the eastern districts the sau were restricted by environmental conditions in terms of demonstrating chiefly powers whereas in other more productive districts of the island they had greater opportunities to display proof of divine right. The cost of maintaining political integration for the eastern pan-polity chiefs included the energy invested in attempts to control the economic, ideological, militaristic, and administrative constraints of the commoners and lesser chiefs.

The chiefs from the other districts might not have been motivated to employ similar strategies to those used by the Noatau and Oinafa chiefs. The GIS analysis suggests that the eastern districts were not as productive as the western districts. While Noatau and Oinafa could have undoubtedly supported extra-district elite, there were far fewer resources in these districts to control in comparison with the other districts. The chiefs from the other districts could express their supernaturally sanctioned fecundity, and control a relatively large percentage of the overall resources of the island, by simply staying in their own districts. The people and chiefs of the other districts had the added advantage that the political system was inherently unstable due to the weak resource base of the ruling Noatau and Oinafa sau. To some extent the success of an eastern sau was contingent upon the resources distributed throughout the island. If an eastern sau became too oppressive, the other districts might have been able to successfully overthrow him because of his own weak domestic resource base.

Political integration would have benefitted the common people living in the less productive eastern districts if they were granted agricultural use rights in adjacent districts. The poor soil conditions in the eastern districts meant that it would have been cost effective for the populations from the eastern districts to walk to agricultural plots located in productive, adjacent districts. The amount of time it took to walk to the more productive land would have been compensated by the lower marginal costs of growing crops in a more productive area. This strategy would have disadvantages for the people living in the more productive areas only if highly productive land were limited in these districts. If there was a relative abundance of productive land then granting use rights to people from outside districts would not have been disadvantageous. Furthermore, political integration may have incurred additional costs for the commoners in that they were subjected to increased tributary demands to support the pan-Rotuman elite. Finally, with political integration the social distance between the commoners and the pan-Rotuman elite probably increased, with likely material ramifications.

Political integration imposed additional costs and benefits upon most residents of Rotuma. Political integration would have lowered the incidence of warfare related mortality in comparison to the mortality rate if the districts were autonomous and continuously at war. Furthermore, political integration of the island into a single polity would have provided a measure of social insurance against periodic natural disasters. If separate regions of the island were differentially affected by natural disaster, such as a hurricane or drought, then subsistence resources could have been redistributed throughout the island to provide assistance. Even if the whole island was affected by a natural disaster, the subsistence crops grown in one area of the island might have proven more resistant to the disaster than those grown in another. Yams were probably the predominant crop grown in the eastern districts, whereas dryland taro was abundant in the rest of the island. Yams are more tolerant of drought conditions than dryland taro. Under drought conditions, those portions of the island reliant on yams for subsistence would have been less affected and might have provided assistance to other parts of the island. The swamp taro grown in the eastern district of Noatau and the western districts of Itu'ti'u and Itu'muta could have provided a similar buffer against temporary food shortages. Swamp taro is unique among Rotuman cultigens since it can be "stored" in the ground for years and utilized when necessary. Environmental differences would not have had to have been that great and social buffering (i.e., resource sharing as insurance) would not have had to occur frequently for political integration to have conferred significant benefits to its members.

The political integration of the island may also have provided a means for redistributing resources between areas with differential productivity potentials (c.f.

Sahlins 1958). While this was a possibility, there is little indication that large quantities of food were redistributed on a day to day basis.

Political integration does not occur just because the environmental conditions make it a viable option, rather, it must confer some benefits to the members who participate in it. On Rotuma the question becomes whether a population of ca. 3000 to 4000, and possibly considerably more, people could have survived as successfully with a political system at the village or district level of organization, or whether an island wide political organization conferred significant advantages.

People living throughout Rotuma would have benefitted from the social buffering that political integration provided against natural disasters. Furthermore, political integration might have allowed some of the commoners to reduce the marginal costs associated with their subsistence activities. Perhaps more important, however, were the advantages that political integration conferred upon a select group of people, the eastern pan-polity rulers. Although political integration provided some benefits to all members of society it was the eastern pan-Rotuman chiefs who seemed to have benefitted the most. The chiefs and commoners from other districts benefitted, but not to the same extent as the residents from the eastern districts. The integration of Rotuma into a single polity was maintained because the environmental constraints were such that the costs of complying for the lesser chiefs and commoners throughout the island were minimal and there were potential long term benefits. The benefits for the eastern pan-polity elite were significant and they sought to promote political integration.

Conclusions

The model used in this study adopts a multidisciplinary approach to address some of the limitations of previous explanations concerning intergroup aggression and political integration in Oceania. The model, which is based on evolutionary ecology and political economy, distinguishes between the factors involved in the emergence of intergroup aggression and political integration from the factors that perpetuated these behavioral strategies. Instead of merely describing the behavioral strategies, the model offers an explanation of how and why they developed and were maintained. In particular, the model focuses on the natural and social constraints where specific behavioral strategies would have conferred benefits to the people who employed them.

The model stresses that competition and interdistrict aggression could have material ramifications. To complement Howard's (1964, 1966, 1985, 1986, 1989) and Goldman's (1970) suggestion that competition was motivated by status rivalry, this study demonstrates that people in traditional Rotuman society engaged in warfare to gain access to material goods, such as agricultural crops, swine, land, and to mediate the burden of providing tribute. On Rotuma, neither cultural nor material motivations for interdistrict aggression were irrelevant, rather it was a dialectic between the two which precipitated warfare.

The environmental conditions of Rotuma meant that strategies of intergroup aggression and political integration were feasible and cost effective. The terrestrial resources were distributed in a dense and predictable manner, consequently they were controllable through warfare, and worth fighting for. However, resources were not homogeneously distributed throughout the island. The moderate disparity in resource distribution was sufficient to stimulate interdistrict aggression. This resource variability meant that political integration was a possible result of intergroup aggression. Furthermore, the disparate and relatively circumscribed nature of the terrestrial resources made them a controllable entity which the polity rulers could manage in an effort to perpetuate other individuals' membership in the polity.

Goldman (1970:486) suggested that the leaders of society should come from the most productive regions of an island. In a similar vein, Sanders and Webster (1978:204) proposed that in the Mayan state of Mesoamerica "those elements of the population most favorably situated with regard to optimally productive portions of the landscape initially dominated elite status positions." Webster (1990) later refined his position and suggested that social stratification and political integration developed because an emergent elite were able to attract and retain the labor of other people. Webster (1990) opined that people living in productive regions of a polity were able to attract followers because their productive land provided a measure of increased economic security. The leaders of these productive zones therefore became the leaders of society.

The situation on Rotuma appears to have developed differently, as populations from the less productive zones often held the pan-polity leadership positions. The myths suggest that during the early prehistoric era, when the districts were more autonomous and less integrated into a single polity, the mua or spiritual leader associated with fertility, came from the highly productive district of Malhaha. With integration and the creation of the <u>sauship</u>, leadership shifted from the most productive district to the relatively less productive eastern districts.

Political integration provided Rotumans with socially and naturally defined benefits. The greatest material benefits, however, were bestowed upon the eastern chiefs and to a lesser extent the eastern commoners. Because of these benefits, the eastern chiefs employed behavioral strategies to perpetuate the political structure. People from other districts participated in the hegemonic political structure because there were long term benefits to the structure, minimal costs, and relatively fewer advantages for them to obtain the pan-Rotuman positions. By evaluating the environmental and social constraints of traditional Rotuman society it was possible to determine the costs and benefits conferred on populations who participated in interdistrict aggression and political integration.

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