



NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION MONOGRAPH 19:
Michael W. Graves and Roger C. Green (eds), *The Evolution and Organisation of Prehistoric Society in Polynesia*



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THE EVOLUTION AND ORGANISATION
OF PREHISTORIC SOCIETY IN
POLYNESIA

Edited by Michael W. Graves and Roger C. Green

19

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
MONOGRAPH

THE IMPACT OF RESOURCE DIVERSITY ON THE SOCIOPOLITICAL STRUCTURE OF ROTUMA: A GEOGRAPHIC INFORMATION SYSTEM ANALYSIS

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The prehistoric political system of Rotuma, Fiji, was thought to have been unique among Polynesian chiefdoms. Anthropologists (Howard 1964, 1985, 1986, 1989; MacGregor n.d.; Williamson 1924) have documented a system which integrated an entire island population into a single political sphere by appointing 'kings' from each district of the island in a systematic rotation. However, I suggest that the rotational pattern of power was not equitably distributed; rather there were significant patterns in terms of where the 'kings' originated. The political system appears to reflect political strategies implemented by Rotumans from certain districts to cope with environmental limitations on resource productivity. A geographic information system (GIS) is implemented to combine ethnohistorical and environmental data to delineate the relationship between resource diversity and the political system of Rotuma. This paper is based on the results of initial data analysis. A refined interpretation based on a more complete analysis of the data is presented in Ladefoged (1993).

GEOGRAPHIC INFORMATION SYSTEM

A geographic information system (GIS) is a computer based relational database with a spatial component (Allen *et al.* 1990; Star and Estes 1990). Kvamme (1989:139) notes that a GIS is "designed for the manipulation, analysis, storage, capture, retrieval, and display of data that can be referenced to geographic locations." Unlike a relational database, the definitive characteristic of a GIS is that it automatically links thematic and locational attributes (Burrough 1986; Marble 1990). The data in a GIS have locational, nonlocational and temporal dimensions (Dangermond 1990). Locational data include absolute positions or relative topological relations. Nonlocational data are the state or value of specific locational entities. Temporal data defines the time period when locational and nonlocational data are valid. These three dimensions of data are integrated to form a single layer or theme. An example of a layer might be the spatial distribution of all types of archaeological sites dating to a specific time period. Examples

of environmental layers include the spatial distribution of topographic features, soils, or vegetation patterns. Several spatially co-registered layers of distinct information are combined to form the GIS. The different themes of the GIS can be overlaid and manipulated to determine precise relationships among data represented within the individual layers. The complexity of this spatial analysis would be virtually impossible without the aid of a computer assisted GIS.

Geographic information systems are based on either raster, vector, or object oriented systems (Zubrow 1990:69). Each of these systems possesses certain advantages and disadvantages in terms of the way that data are stored and analysed. In raster systems, thematic layers are divided into grid cells with each cell assigned a particular value. Entities in the real world are depicted on the layers as individual cells or groups of cells. The GIS used in the analysis represented here is IDRISI, a raster based package produced by Clark University, Massachusetts. Each thematic layer in the GIS contains 600 rows by 1500 columns for a total of 900,000 cells. Each cell represents a 10 x 10 m square on the ground, with the 600 by 1500 matrix representing an area 6 x 15 km. This encapsulates the total area of Rotuma. Spatial information about soil types, potential agricultural productivity, district boundaries, and the number of chiefs from each district, was encoded for input into the GIS. The GIS analysis has determined patterns in the relationships between these variables.

ROTUMA

Rotuma is an isolated volcanic island (14 x 4.5 km) ca 485 km north of Fiji (Fig. 7.1 and 7.2). The topography consists of a series of small volcanic peaks oriented east-west along the interior of the island. The maximum elevation of the island is 255 m. Although a small portion of Rotuma was formed approximately one and a half million years ago, the majority of the island is the result of lava flows between 200,000 and 15,000 years ago (Woodhall 1987:20). Soil development is minimal on some of the more recent lava

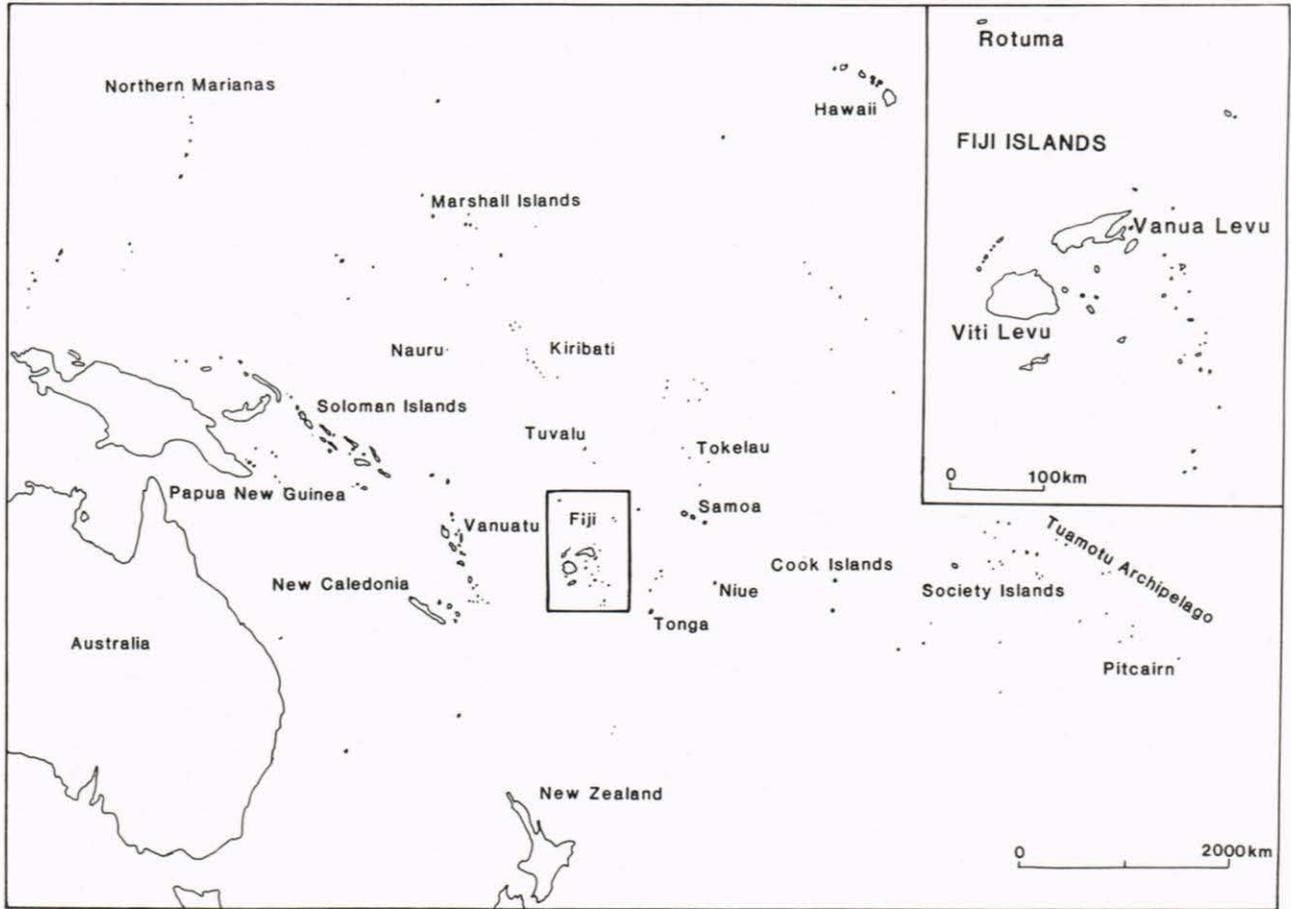


FIGURE 7.1. Location of Rotuma.

flows. The coastal calcareous sand beaches were probably formed within the last 5000 years (Woodhall 1987:21), perhaps partially as the result of human induced geomorphic processes. Despite an annual rainfall of more than 3500 mm, there are no permanent streams due to the porous quality of the island sediments.

Data from a soil map produced by the New Zealand Soil Bureau (Laffan and Smith 1986) were incorporated into the GIS to evaluate the potential productivity of different regions throughout Rotuma. The scale of the original map is 1:25,000 and it depicts 23 different soil types which can be classified into 12 distinct series.

The coastal margin of Rotuma includes the Motusa and Rana series. The Motusa series is the sandy beaches which lack the proper nutrients to support a high productivity of root crops. The Rana series is the swamp land behind the beach berm and supports swamp taro. The volcanic ringplain soils include the weathered Kirkiri, Ono, Reree and Paptoa series which have a high productive potential. Other volcanic ringplain soils include the relatively unproductive soils of

the Hafhafu and Losa series. The low productivity of these series is due to the minimal soil development on recent, unweathered, *pāhoehoe* and 'a'a lava flows. The volcanic cone soils of the Mafua, Umea and Roroa series have all been strongly weathered and are productive for growing root crops. In contrast, the volcanic cone soil of the Vaka series is weakly weathered and has a relatively low productive potential. The zones of high and low productivity are depicted in Figure 7.3.

The tropical climate of Rotuma is ideal for growing a variety of agricultural crops. During the early historic period, the principle root crops were dryland taro (*Colocasia esculenta*; *papula*), giant swamp taro (*Cyrtosperma chamissonis*; *papai*) and yam (*Dioscorea alata*; 'uhi). Tree crops included breadfruit (*Artocarpus altilis*; 'ulu), coconuts (*Cocos nucifera*; niu) and bananas (*Musa x paradisiaca*; pari) (Gardiner 1898; Lesson 1838-39; Whistler 1989). Early historical accounts frequently stress the island's fertility and apparent abundance of food (Jarman 1832:4; Lesson 1838-39). In 1824, Lesson

(1838-39:24) remarked that the gardens were “located in the interior of the island and form a continuous series of plantations.” The primary crop in these gardens was apparently dryland taro since the lack of running water inhibited the construction of pond fields. In 1890, Gardiner (1898:420) notes that yams were grown in the rocky areas of the island and that swamp taro were grown in swampy zones behind the beach berm.

ROTUMAN SOCIO-POLITICAL STRUCTURE

In the 1800s, several visiting Europeans described the protohistoric political structure of Rotuma (Gardiner 1898; Lesson 1838-39; Lucatt 1851; Trouillet in Sumi missionary notes). In the early 1900s, Hocart (n.d.), MacGregor (n.d.), and Churchward (1937-39, 1938) conducted further ethnographic work. These descriptions have been elaborated on by Howard’s (1985, 1986, 1989) recent analyses of the recorded oral traditions.

Most accounts of the protohistoric period indicate that Rotuma was divided into seven semi-autonomous districts each led by a district chief. It was the responsibility of the district chief to settle disputes, mobilise labour for community projects, and to ensure that the district’s communal swamp land was planted with swamp taro (Gardiner 1898:430). District chiefs ruled with the aid of a council which was

composed of leaders of territorial kinship communities called *ho’aga* (Gardiner 1898:430; Howard 1964). *Ho’aga* were the basic productive units of Rotuman society and were individually led by a titled man (Gardiner 1898:484). The *ho’aga* leader allocated the land in his jurisdiction to his kinsmen and made sure that staple production levels were up to expectations (Gardiner 1898:484). Most Rotumans were subsistence farmers whose social and economic activities were influenced to one degree or another by the *ho’aga* and district leaders.

Superimposed over the district and *ho’aga* hierarchy were three pan-Rotuman positions, the *fakpure*, *sau* and *mua* (Howard 1985). The position of *mua* was not well documented by the early accounts but has generally been referred to as the spiritual priest of the island (Howard 1985; Trouillet in Sumi n.d.). Howard’s (1985, 1986) analyses suggests that the *mua* was associated with the indigenous commoners of the island who were responsible for producing basic subsistence staples.

The *fakpure* was referred to as Rotuma’s “emperor” (Lucatt 1851:159) or “great chief” (Trouillet in Sumi n.d.), and was apparently the secular ruler of the entire island (Howard 1985, 1986). Often the *fakpure* was the head district chief of the alliance of districts that was victorious in the last war (Howard 1986:3). In addition to the secular

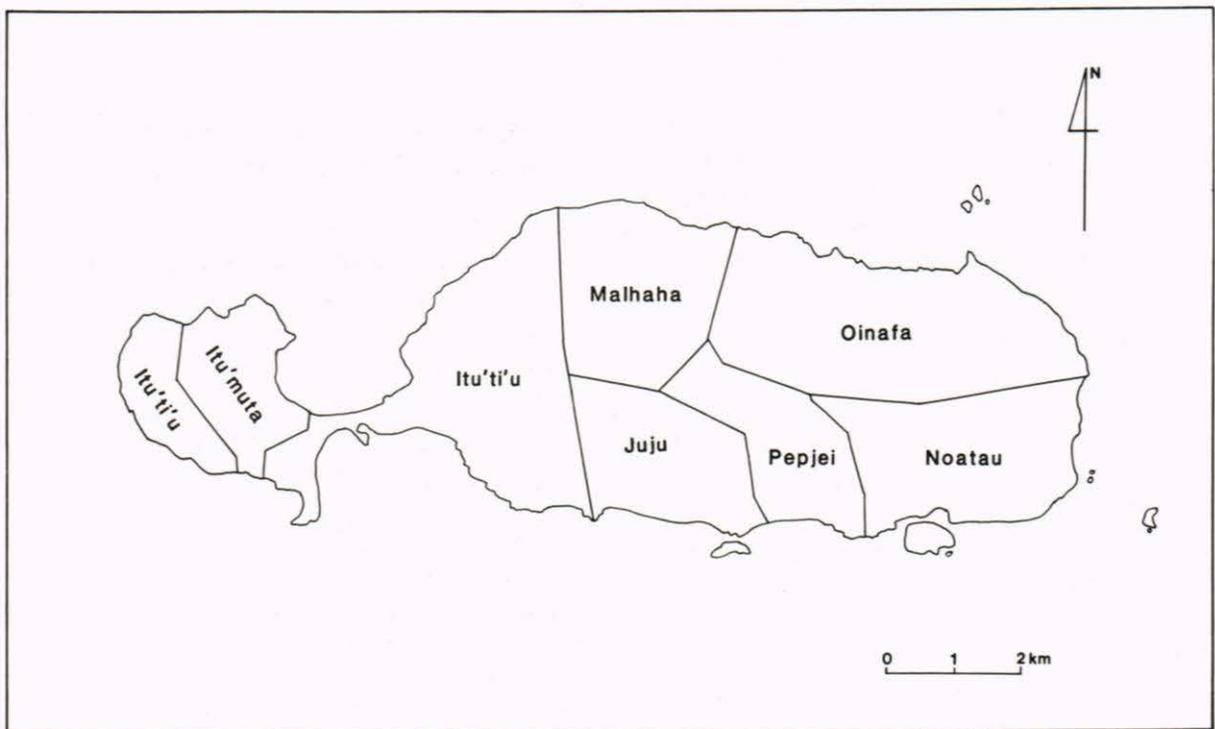


FIGURE 7.2. The districts of Rotuma.

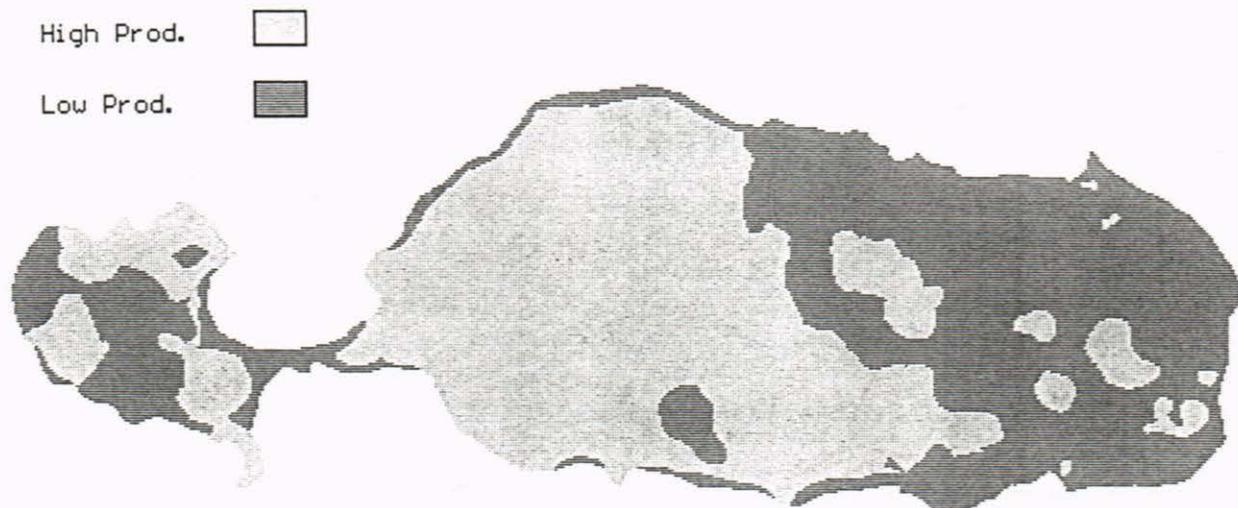


FIGURE 7.3. Zones of high and low productivity.

duties of the *fakpure*, he was responsible for appointing the *sau* or what has been translated into English as the “king” (Howard 1985:41).

The role and relative position of the *sau* is somewhat unclear but he or she was considered the island’s sacred ruler who represented the chiefs in opposition to the common people who were associated with the *mua* (Howard 1985:68). Several early accounts (Gardiner 1898; Trouillet in Sumi n.d.) report that the *sau* had no real authority and was merely symbolic of the *fakpure*’s power. It is, however, worth noting that Lesson (1824:18), who sailed to Rotuma in 1824, does not mention the *fakpure* and states that the Rotumans were led by the *sau*. Also Trouillet’s (Sumi n.d.:11) account of the recorded oral traditions notes an instance where a *fakpure* was “overcome by ambition and killed the *sau*” whereupon the *fakpure* relinquished his former position. Trouillet’s statement suggests that the position of *sau* held pre-eminence over the position of *fakpure*. There is another instance in Trouillet’s account (Sumi n.d.:16) where the position of *sau* and *fakpure* was filled by a single leader. This again emphasises the somewhat ambiguous nature of the *sau*’s position. Regardless of the *sau*’s ranking in relation to the *fakpure*, the *sau* was a chiefly position that had influence over the entire island (Howard 1964:28).

An interesting aspect of the position is that the *sau* and his or her entourage moved throughout the island living in different host districts. Churchward (1938:356) reports that the *sau* was supported by a neighbouring district, and not the one where born.

Another unique aspect is that the position of *sau* was reported to have been a rotating one with different districts taking turns in the appointment (Gardiner 1898:461). Lesson (1824:18) wrote that the *sau* “frequently changed” and Allen (1895) wrote in the late 19th century that the position alternated between five districts. In his analysis of these and other early accounts, Howard (1986:41) determined that the precise order of the rotation had not been documented but that “the *sau* was chosen from different districts in turn.” However, Gordon MacGregor, an anthropologist who worked on Rotuma in 1932, did provide a list of 105 *sau* and their home districts that is based on Trouillet’s notes. From this list it is possible to determine specific aspects about the Rotuman political system.

Leadership, districts and productivity

In discussing the interpretation of myths, Howard (1986:22) notes that the succession of *fakpure* depicted in the Rotuman myths should not be taken as a “putative sequence of historical events”; rather it should be seen as “a statement about the cultural logic of priorities in the constitution and reconstitution of the social order.” In a similar vein, an analysis of the districts from which the *sau* came from is not meant to portray definitive historical events but rather serve as a method for determining the cultural logic of chiefly succession with regard to home districts.

Howard’s (1985:74, 1986:4) analysis of the oral traditions suggests that there was a fundamental division between the east and west sides of Rotuma. In the oral

| District | Number of <i>sau</i> | District size (hectare) | Geographic location |
|----------|----------------------|-------------------------|---------------------|
| Noatau | 11 | 594.73 | East |
| Oinafa | 7 | 890.22 | East |
| Malhaha | 3 | 526.05 | North |
| Pepjei | 4 | 441.61 | South |
| Juju | 2 | 425.37 | South |
| Itu'ti'u | 4 | 1049.69 | West |
| Itu'muta | 1 | 286.58 | West |
| TOTAL | 32 | 4214.25 | |

Pearson's product moment correlation statistic: $r=0.3927$; $R\text{-Square}=0.1542$; $t=0.955$; $df=5$; $p=0.384$

TABLE 7.1 The number of *sau* from each district with the district size and geographical location.

traditions, the two eastern districts of Noatau and Oinafa were associated with chiefs, and the other five districts of Malhaha, Pepjei, Juju, Itu'ti'u and Itu'muta were associated to varying degrees with commoners (see Fig. 7.2). An analysis of MacGregor's list of *sau* confirms this pattern. Of the 105 *sau* listed by MacGregor, only the 32 that ruled during the "prehistoric" era (see Howard 1985:70) are included in the analysis.

Table 7.1 shows the total number of prehistoric *sau* from each district. Eleven *sau* came from Noatau, seven from Oinafa, four from Pepjei, three from Malhaha, two from Itu'ti'u and Juju, and one from Itu'muta. These counts indicate that more *sau* were coming from the east side of Rotuma rather than the west side, but if the eastern districts of Noatau and Oinafa are grouped together on the basis of their alliance in the oral traditions and compared against the other districts, the pattern becomes even clearer. The eastern group has a mean of 9 *sau* per district whereas the other districts have a mean of 2.8 *sau* per district.

Rotuman *sau* were more likely to come from Noatau and Oinafa, but what distinguishes these districts from all others? One possibility might be that the larger districts on Rotuma would have been more dominant and therefore would have produced the greatest number of *sau*. A Pearson's product moment correlation between the size of each district and the number of *sau* that came from the district does not, however, support that proposition (see Table 7.1). The number of *sau* from a district is not statistically correlated with the size of the district.

An alternative possibility which Sanders and Webster (1978:204) proposed for the Mayan state in Mesoamerica suggests that stratification is related to environmental variability in productivity. They proposed that "those elements of the population most favorably situated with regard to optimally productive portions of the landscape initially dominated elite status positions." If this were the

case for Rotuma, one would expect that the districts where the most *sau* came from, Noatau and Oinafa, would also be the most productive districts of the island.

To test this proposition, the seven districts were grouped into four different areas and terrestrial productivity indexes were calculated for each group. The district groupings are based on oral traditions which suggest that during certain periods the island was divided into five districts. At one point 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, although the oral traditions never suggest that they were united as a single district. For analytical purposes, Oinafa and Noatau are combined into a single group, Itu'ti'u and Itu'muta are combined to form another group, Pepjei and Juju are combined to form a third group, and Malhaha forms a fourth separate group. The result is a division of the island into four areas that correspond to the northern, southern, eastern and western sections of the island (Fig. 7.4).

Relative rankings of potential resource productivity for these district groupings were based on which soils were best for growing the primary root crops of dryland taro and swamp taro, and which soils were more marginal and could have been used only to grow yams and assorted tree crops (see Fig. 7.3). The Kirkiri, Ono, Reree, Paptao, Mafua, Umea and Roroa series could support the production of dryland taro, the Rana series could support the production of swamp taro, and therefore all of these soils have been classified as having a high productive potential. In contrast, the Motusa, Hafhafu, Losa and Vaka series had relatively low productive potential. A terrestrial productivity index was calculated for each district group to provide a standardised measure of productivity. This index is calculated by dividing the area of land with high productive potential

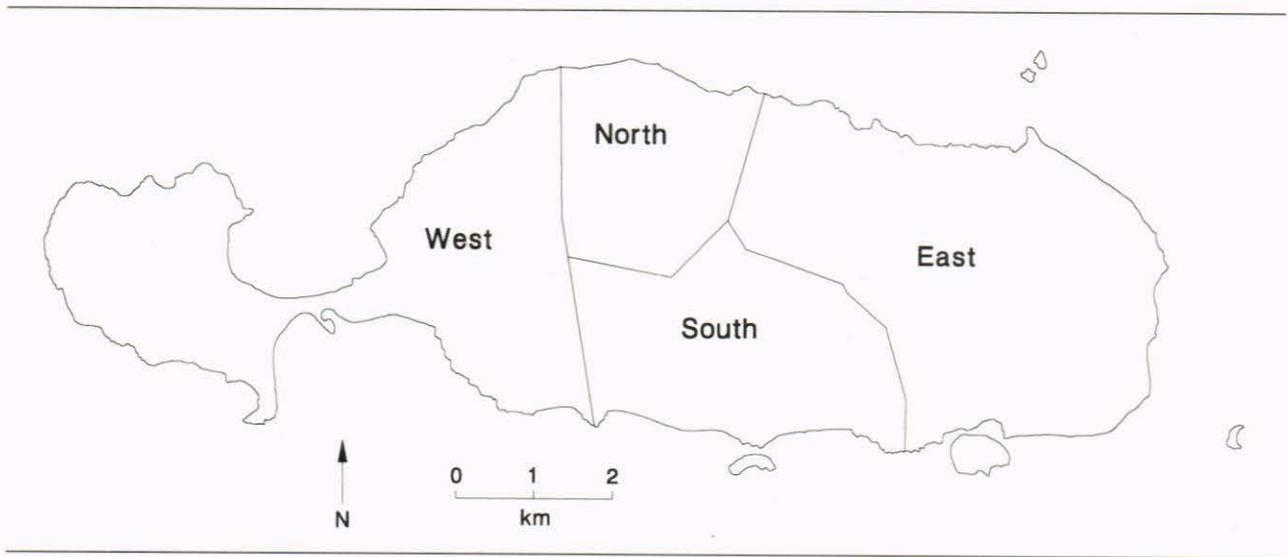


FIGURE 7.4. District groupings in Rotuma.

by the area of land with low productive potential. A histogram of these indexes clearly shows that the eastern districts have lower values than the other districts (Fig. 7.5).

Sanders and Webster (1978) suggest that there should be a positive correlation between where the ruling elite came from and the productivity of that area. The results from Rotuma, however, are just the opposite as there is a strong negative correlation between the number of *sau* from a district group and the terrestrial productivity index of that district group (Table 7.2). The Pearson's product-moment correlation (r) is only significant at the 0.09 level, but the general trend is strongly suggested by the high coefficient of determination. The analysis indicates that during the prehistoric period the *sau* of Rotuma were not randomly rotating amongst equally productive districts but were consistently coming from the districts with relatively low productive potential, i.e., Noatau and Oinafa.

DISCUSSION

Earle (1987) proposed that chiefdoms are associated with competition for materially based power. In the Rotuman context, the quest for power and resource control manifested itself as a political system where the elite often came from areas with low productive potential, thereby allowing them to incorporate more productive districts into their political sphere. This system provided the chiefs of the marginal eastern districts with several advantages.

The *sau* and an entourage from the eastern districts could be fed and maintained using non-local resources. Hosting a *sau* was a sizeable investment and there are

instances in the myths where the burden became too much and the host district rebelled (Howard 1986). By controlling more productive districts, the Noatau and Oinafa *sau* were not only supporting a segment of their elite, but were also depleting the resources of a potential rival. This strategy meant that the Noatau and Oinafa *sau* effectively reduced the ability of rival chiefs to fund a successful rebellion and to name their own *sau*. The Noatau and Oinafa *sau* also obtained a new avenue for displaying supernaturally sanctioned potency and fecundity. In the eastern districts, *sau* were restricted by environmental conditions in demonstrating their chiefly powers, whereas in the more

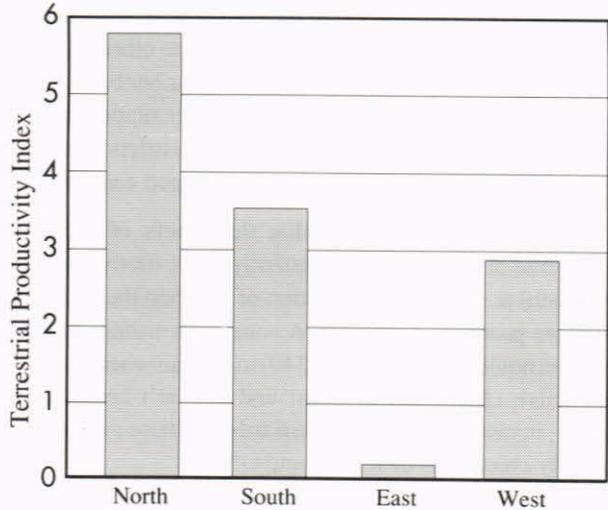


FIGURE 7.5. Histogram of terrestrial productivity indices for each district grouping.

| District group | Number of <i>sau</i> | Terrestrial productivity index |
|----------------|----------------------|--------------------------------|
| North | 3 | 5.730 |
| South | 6 | 3.419 |
| East | 18 | 0.171 |
| West | 5 | 2.833 |
| TOTAL | 32 | |

Pearson's product moment correlation statistic:
 $r=0.910$; $R\text{-Square}=0.8274$; $t=3.10$; $df=5$; $p=0.090$

TABLE 7.2 Terrestrial productivity ratios of district groupings.

productive districts they had greater opportunity to display proof of divine right.

The chiefs of the other districts were not motivated to employ similar strategies to those used by Noatau and Oinafa. The GIS analysis suggests that the eastern districts could not produce the same quantity of surplus staples as the other districts. While Noatau and Oinafa could have undoubtedly supported non-indigenous elite populations, there were far fewer resources in these districts to control in comparison with the other districts.

The chiefs from the more productive districts could express their supernaturally sanctioned fecundity and control a 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 dependent upon the resources of the more productive districts. If an eastern *sau* became too oppressive, the other districts might be able to successfully depose him or her because of a weak domestic resource base. In return for supporting the eastern *sau*, the population of the other districts received divine intervention from the ritually charged eastern *sau*.

This analysis suggests that the chiefs of the less productive districts were consistently more motivated and successful at attaining the position of *sau* than the chiefs of the more productive districts. A somewhat similar pattern has been noted by Kirch (1990:340) in Hawaii where the less productive chiefdoms of Maui and Hawai'i engaged in hostile, invasive manoeuvres towards the more productive westerly chiefdoms of Kaula'i and O'ahu.

While some might interpret the Rotuman concept of *sau* as a means of integrating the resources of the island into a unified political sphere, this system would more accurately

be described as the manifestation of an elite group's effort to exploit a potential resource base. The advantages and disadvantages of participating in the political system were not the same for the residents of all districts. The productive potential of the districts influenced the strategies that groups of people chose to exercise. The results of the analysis suggest that political processes on Rotuma were significantly influenced by conditions imposed by the material resources.

ACKNOWLEDGEMENTS

It is impossible for me to acknowledge all the people on Rotuma who assisted me with my research but I would like to thank Vafo'ou Jiare, the Kamoe family, the Silatou family, the Susau family and the Rotuma Council. The Fiji Museum also provided assistance. Sarina Pearson, Michael Graves, Roger Green, Alan Howard, Patrick Kirch, Terry Hunt and Peter Ladefoged provided helpful comments and criticisms.

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