MIGRATION RESEARCH IN SALADOID ARCHAEOLOGY: A REVIEW

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Originally, I was asked to prepare a review of the current state of Saladoid archaeology in the West Indies. As I began working on this assignment, it became clear that given my space constraints it was not possible to adequately review the full range of investigations currently underway in Saladoid studies. Therefore, I decided to focus on one major topic that seems to be the primary theme within this field today: migrations, population dispersal, and adaptive radiation. I will first present a short historical sketch of the development of Saladoid studies to place my discussion in an appropriate framework. This review will be short, since there are a number of other such presentations already available (Rouse and Allaire 1978; Rouse 1986:117-120; Carbone 1980; Roe 1989:273-277).

Historical Development of Saladoid Studies

As in other areas of the Americas, the development of Saladoid studies has followed a standard trajectory that may be characterized by the scheme presented in Willey and Sabloff (1974). Their outline provides a useful framework within which large changes in the field may be evaluated and described. Like Carbone (1980), I will not consider here the speculative period in the development of Saladoid archaeology.

The classificatory-descriptive stage is represented by such studies as de Hosto's (1919) descriptions of Puerto Rican ceramics. The work done by de Hostos (1919) and others prefigured the classificatory-historical period of archaeological research in the Caribbean, beginning with Hatt's (1924) work in the Virgin Islands and continuing with important studies by Lovn (1935), Rainey (1940), Rouse (1948, 1951, 1952a, 1952b, 1964, 1974, 1976), Howard (1943, 1947), McKusick (1960) and others. Willey and Sabloff (1974) argue that the classificatory-historical period may be divided into two stages: first, a concern with chronology followed by a concern with context and function.

In terms of chronology the work by Irving Rouse has been the most explicit, wide-ranging, and synthetic in the Caribbean. On his own, and in collaboration with other scholars, Rouse has established, and modified as new data became available, the major chronological outline for the Caribbean in general, and specific areal sub-sections in particular (Rouse 1951, 1952a, 1952b, 1964, 1982, 1986, 1989a, 1989b; Cruxent and Rouse 1958-1959; Rouse and Cruxent 1963; Rouse and Allaire 1978; Rouse and Alegria 1990). There certainly have been challenges and counter-proposals by researchers to particular regional chronologies, but this is to be expected (e.g., Chanlatte Baik 1981; Chanlatte Baik and Narganes Storde 1983; Sanoja and Vargas 1983; Rodriguez and Rivera 1987).

Chronology-building was the main focus for archaeologists working in the Caribbean roughly until the 1970s. Classificatory-historical studies, with a chronological emphasis, remain a central concern for many of the investigators working in the Caribbean. However, by the late 1970s a variety of other topics began to be addressed, thus bringing the field into the "context and function" stage of the classificatory-historical period, as well as into the explanatory period.

As new theoretical interests and interpretive frameworks entered the realm of Caribbean archaeology different approaches were required for the way regions were investigated, sites excavated, and artifacts analyzed compared to the classificatory-historical studies. These interests include settlement and subsistence patterns (Wing et al. 1969; Goodwin 1979, 1980; Jones 1985; Keegan 1985; Wing and Reitz 1982; deFrance 1988, 1989; Morse 1989; Wing 1989), community organization (Versteeg 1989; Siegel 1989a), frontiers and group interactions (Rouse 1986, 1989a; Roe 1989; Siegel 1989a, 1989b), and studies in artifact technology (Walker 1980; Carini 1989; Donahue et al. 1990). Discussing these additional interests is beyond the scope of the present paper. One of these issues that bridges the classificatory-historical and explanatory periods in Caribbean research is population dispersal and migration.

Population Dispersal, Migration, and Adaptive Radiation

Population dispersal, or migration, is a concern that understandably has been of great importance for archaeologists working in the Caribbean. As in any insular setting, a fundamental question is when were the islands occupied, and was cultural development autochthonous or a result of additional migrations.

Even de Hostos, in his early study of Puerto Rican pottery, confronted the problem when he discussed the supposed "monkey heads" adorning many of the ceramic vessels he found:

> Where did the native find a model for the monkey heads which predominate over all other animal forms? Monkeys were not known in Porto Rico. They must have been familiar, however, to the continental Arawaks, whose descendants the Porto Rican Indians probably were, and to the Caribs, who were in the habit of assaulting by sea the natives of Porto Rico [de Hostos 1919:386].

Although de Hostos was not specifically concerned with the peopling (or repeopling) of the Caribbean Islands, his astute observation regarding probable cultural affinity between Puerto Rico and South America foreshadowed major research programs in years to come.

At this point, I do not need to review the history of research concerning the peopling of the islands by Saladoid colonists. The reader is referred to recent works by Rouse (Rouse and Allaire 1978:432-436; Rouse 1986:118-120, 1989b) and Carbone (1980) for such discussions. I will present ideas currently entertained by researchers regarding the dispersal of Saladoid groups into the Antilles. This discussion will be framed within two broad sections: (1) Descriptive models. This section will review the major cultural historical schemes currently debated concerning the migrations of early ceramic age groups into the Antilles. I will conclude this presentation with an alternative proposal for how we approach the problem. (2) Explanatory models. Major ideas concerning the processes and motivating circumstances behind the migrations will be reviewed.

Descriptive Models: Cultural Historical Outlines

In reviewing the available evidence, the sloping aspect of the Saladoid series is clear (Rouse and Allaire 1978:435). Probably the only consensus among Caribbean archaeologists today is that the early ceramic age populations originated in the Orinoco Valley of Venezuela. The timing of the dispersal, the number of migrations, and even the series (or horizon) designations are hotly disputed, frequently resulting in elevated blood pressures at International Conferences.

In order to adequately evaluate the dispersal into the West Indies, we must consider the major arguments concerning cultural development and change in the South American lowlands, with particular emphasis on the Orinoco region. Depending on which major perspectives entertained has direct implications for the Caribbean situation.

Lathrap-Rouse Model

In 1970 Donald Lathrap published The Upper Amazon, in which he presented a major statement on the lowland cultural history. The important point for the present discussion is his treatment of the Orinocan cultures. Lathrap argued that drainages connecting the Amazon and Orinoco Basins, especially the Casiquiare Canal, facilitated the movement of people and ideas between those two regions (Lathrap 1970:73-74, 111-112). Citing distinct similarities in ceramic vessel shapes and surface decorations, lathrap suggests that the ancestors of the Orinocan Saladoid peoples originated in the Upper Amazon Basin, specifically in the montaña region of eastern Peru (Lathrap 1958, 1970; Collier 1958).

The Tutishcainyo site, on the Central Ucayali, has revealed two cultural complexes: Early and Late Tutishcainyo. Based upon cross-dating to the Kotosh site, roughly 200 km to the southwest, Lathrap contends that Early Tutishcainyo dates between 2000 and 1600 B.C. (Lathrap 1970:89). Citing a 1000 B.C. date for Saladero, the type site of the Saladoid series, Lathrap makes the case for a cultural dispersal, roughly between 1000 and 2000 B.C., from the Upper Amazon to the Orinoco (Lathrap 1970:111-112).

Certain details of Lathrap's argument are important to mention here because they have central relevance for another model to be discussed below. Distinctive characteristics of Early Tutishcainyo pottery include the use of such features as broad, labial and sublabial flanges; concave sides ; and sharp corner points at one or more locations on a vessel wall. Surface treatment includes broad U-shaped incision, rows of punctuation, and zone-incised crosshatching (Lathrap 1970:86-87).

By the late Nazaratequi tradition (this pottery is apparently cognate to Tutishcainyo but much simpler), the fine-line crosshatching disappeared (Lathrap 1970:89-90). Lathrap argues that there is a clear cultural affinity between Early Tutishcainyo and the Antillean Saladoid, Rio Guapo, Lower Ronquin on the one hand, and Saladero and Nazaratequi on the other (Lathrap 1970:112).

Irving Rouse, in focusing closely on the details of the Orinocan and Antillean cultures, argues that by the time of Christ, bearers of Saladoid pottery had dispersed into the West Indies (Rouse 1986, 1989a, 1989b). This scenario accommodates well Lathrap's hypothesis for a dispersal from the Upper Amazon to the Orinoco between 2000 and 1000 B.C. It is useful to note in this regard, that since 1985 a number of carbon samples from good cultural contexts in early West Indian deposits suggest an earlier dispersal of saladoid peoples out of the Orinoco than what was previously thought. Recently obtained dates from Martinique (Schvoerer et al. 1985), St. Martin (Haviser 1989), Vieques (Chanlatte Baik 1983; Narganes Storde 1989), and Puerto Rico (Chanlatte Baik 1976; Narganes Storde 1989; Rodriguez 1989; Siegel 1989a, 1990) indicate that Saladoid groups must have entered the Caribbean by 400-500 B.C. (Table 1).

Meggers/Evans-Sanoja/Vargas Model

An alternative perspective to the Lathrap-Rouse model is presented in the writings of Betty Meggers, Clifford Evans, Mario Sanoja, and Iraida Vargas. These investigators have long argued for a relatively late appearance of the zoned incised crosshatch (ZIC) and white-on-red (WOR) painted horizons to the Orinoco Valley, which they assert are derived from Andean styles (Evans and Meggers 1968:107-110; Meggers and Evans 1958, 1961:381-388, 1973; Sanoja Obediente 1979:282-286; Vargas Arenas 1979:227-230; Sanoja and Vargas 1983:237). Evidence cited in sup-

Site a	Lab Sample Number	Complex	Uncorrected Age (B.P.)	Uncorrected Age (B.C./A.D.)
Cedros	IVIC-642	Cedros	2140+70	190 B.C.
Cedros	IVC-643	Cedros	1850+80	A.D. 100
Fond Brule	Nancy	Horizon I	2480+140	530 B.C
Fond Brule	Nancy	Horizon I	2215+115	265 B.C.
Fond Brule	Ly-2197	Horizon I	2100+210	150 B.C.
Fond Brule	BDX-156	Horizon I	2010+300	60 B.C.
Fond Brule	BDX-161	Horizon I	1865+200	A.D. 85
Indian Creek	I-7980	Indian Creek 1	1915+80	A.D. 35
Indian Creek	I-77981	Indian Creek 1	1855+30	A.D. 95
Radio Antilles	Beta-18491	Trant's	2390+60	440 B.C.
Radio Antilles	Beta-18490	Trant's	2210+70	260 B.C.
Trant's	Beta-18489	Trant's	2140+80	190 B.C.
Radio Antilles	Beta-18581	Trant's	2120+60	170 B.C.
Hope Estate	Pitt-0219	Hope Estate	2275+60	325 B.C.
Hope Estate	Pitt-0220	Hope Estate	2250+45	300 B.C.
Hope Estate	Pitt-0450	Hope Estate	2510+40	560 B.C.
Hope Estate	Pitt-0449	Hope Estate	2300+55	350 B.C.
Hope Estate	Pitt-0446	Hope Estate	2225+40	275 B.C.
Sorce	I-11322	La Hueca	1945+80	A.D. 5
Sorce	I-13428	La Hueca	1930+80	A.D. 20
Sorce	I-12859	La Hueca	1880+80	A.D. 70
Sorce	I-15241	La Hueca	1880+80	A.D. 70
Sorce	I-11321	La Hueca	1845+80	A.D. 105
Sorce	I-13425	Hacienda Grande	2110+80	160 B.C.
Sorce	I-11319	Hacienda Grande	1915+80	35 B.C.
Punta Candelero	I-14979	La Hueca	2120+80	170 B.C.
Punta Candelero	I-14978	La Hueca	2020+80	70 B.C.
Tecla	I-13856	Hacienda Grande	2380+80	430 B.C.
Tecla	I-13867	Hacienda Grande	2050+80	100 B.C.
Tecla	I-13921	Hacienda Grande	2020+80	70 B.C.
Tecla	I-13855	Hacienda Grande	2020+80	70 B.C.
Tecla	I-13820	Hacienda Grande	1950+80	0 B.C.
Tecla	I-13930	Hacienda Grande	1950+80	0 B.C.
Tecla	I-13929	Hacienda Grande	1920+80	A.D. 30
Tecla	I-13866	Hacienda Grande	1900+80	A.D. 50
Tecla	I-13868	Hacienda Grande	1850+80	A.D. 100
Convento	I-11266	Hacienda Grande	1865+80	A.D. 85
Maisabel	Beta-14380	Hacienda Grande	2060+60	110 B.C.
Maisabel	Beta-14381	Hacienda Grande	1960+90	10 B.C.

a Site locations: Cedros: Trinidad; Fond Brule: Martinique; Indian Creek: Antigua; Radio Antilles, Trnat's: Montserrat; Hope Estate: St. Martin; Sorce: Vieques; Punta Candelero, Tecla, Convento, Maisabel: Puerto Rico.

Table 1. Early C-14 Dates Associated with Saladoid Deposits in the West Indies.

port of this argument and ceramic specimens adorned with zoned hachuring form the early deposits at Valdivia (Meggers et al. 1965) and from the Puerto Hormiga site in Colombia (Reichel-Dolmatoff 1965; Evans and Meggers 1968:88-92; Ford 1969:152-154). The earliest WOR painted pottery, according to Meggers, is derived from the Chorrera complex on the coast of Ecuador (cited in Sanoja and Vargas 1983:239). Sanoja and Vargas then argue that the incised and painted styles found in the Orinocan sites are late intrusions, discounting any early C-14 dates as unreliable (e.g., Vargas Arenas 1979:226-227). They use a C-14 date of 655±85 B.C. (I-9519) from La Gruta as the best estimate for the arrival of "Middle Formative" complexes into the Orinoco (Sanoja and Vargas 1983:234-235, 239). It is curious that in their most recent position statement that I ma aware of, published in 1983, Sanoja and Vargas do not even reference Lathrap's (1970) counter-proposal of the Amazonian origins of the lowland styles.

Sanoja and Vargas bolster their late-arrival hypothesis by referencing the presumed late radiocarbon assays of Antillean Saladoid deposits, "all of which date within the Christian era" (Sanoja and Vargas 1983:235). As I noted above, old good-context dates have recently been obtained in the Lesser Antilles and Puerto Rico (Rouse 1989a:Table 1), thus providing further support for the early inception of Saladoid and Barrancoid cultures in Venezuela (Lathrap 1970:110-112; Rouse and Allaire 1978:441-443; Roosevelt 1980:193-196).

Chanlatte/Narganes-Rodriguez Model

A third migration/diffusion model relates more exclusively to the Lesser Antilles and Puerto Rico than the two previous formulations. In 1979 Luis Chanlatte Baik reported on initial test results derived from the Sorce site on Vieques Island. Since that first report, Chanlatte Baik and Yvonne Narganes Storde have conducted massive excavations at this site. According to their numerous publications in the Caribbean Congress Proceedings, museum catalogs, and private printings these researchers argue that the Sorcé site consists of 21 "deposits," distributed roughly in a horseshoe configuration (Chanlatte Baik 1979, 1981, 1983, 1984; Chanlatte Baik and Narganes Storde 1983, 1986, 1990). They claim that the decorated pottery in 14 of the deposits consists exclusively of painted wares, most notably the elaborate WOR styles (Saladoid series), whereas the remaining seven deposits have only the incised pottery styles. Based upon radiocarbon evidence, which is unclear to me, Chanlatte has made a pitch for a pre-Saladoid migration of ceramic-using Indians up the Antilles from South America, and who produced unpainted pottery. He refers to this horizon as the Huecoid series, named after the La Hueca cultural complex.

Yvonne Narganes Storde (1989) presented a paper at the 13th International Congress for Caribbean Archaeology, summarizing 14 years of C-14 dating at the Tecla and Sorcé sites. This work was sponsored by the Centro de Investigaciones Arqueologicas. It is clear from her charts of radiocarbon dates that the presumed "Huecoid" horizon does not in fact predate the Saladoid series (Narganes Storde 1989:Tablas 1-4). At the Sorcé site, the oldest "Huecoid" date is A.D. 5±80 (I-11322), whereas her oldest Saladoid date is 160 B.C.±80 (I-13425). It is most interesting to note further that Narganes Storde presents an even older date from Tecla, another Saladoid site in Puerto Rico. Form the T-1 deposit at Tecla, Narganes Storde (1989:Tabla 5) reports a C-14 date of 430 B.C.±80 (I-13856). This is one of the oldest insular Saladoid C-14 dates in a good cultural context.

The Punta Candelero site, excavated by Miguel Rodriguez (Rodríguez and Rivera 1987; Rodríguez 1989), presents an assemblage very similar in appearance to the "Huecoid" deposits from Sorcé. This includes the distinctively carved stone amulets and pendants, and the zoned-incised crosshatch ceramic ware. According to Rodríguez (1989:252), the earlier "La Hueca" deposit is spatially distinct from the later Cuevas (late Saladoid) and Monserrate (early Ostionoid) deposits.

Based on the similarities between the Sorcé and Punta Candelero artifact assemblages and two early C-14 dates

from the Punta Candelero site Rodríguez, like Chanlatte, argued for a pre-Saladoid migration wave, consisting of ZIC-loving people washing onto the shores of Vieques and Puerto Rico shortly before the wave of white-on-red painted potteryphiles (Rodríguez and Rivera 1987). Rodríguez concludes his paper by offering a tentative "definition" of a crosshatch horizon, extending from the Upper Amazon Basin and Western Suriname to Puerto Rico. Presumably, the Upper Amazon connection relates to the Early Tutishcainyo complex discussed earlier and Western Suriname to the Wonotobo Falls complex defined by Boomert (1983).

In this regard, it is useful to note that Lathrap (1970:111-112) does distinguish two general design traditions in the early ceramics of the lowlands. A seminal passage b;y Lathrap foreshadows the furious debate among Antilleanists today:

> The shared simplicity of the Saladero complex and the Nazatequi tradition on the one hand, and the closely similar elaborations of Antillian Saladoid, Río Guapo, Lowest Ronquín, and the Tutishcaínyo tradition ont he other, together suggest that it was a question of two waves of migration rather than one. The bearers of Saladero and the Nazaratequi tradition moved out earlier than the ancestors of those responsible for the more fully elaborated ceramics [Lathrap 1970:112; emphasis added].

Lumpers, Splitters, and Atomizers

Since the time Chanlatte proposed his Huecoid, or Agro-I, horizon a spate of publications have appeared presenting variations on his theme (Rodríguez and Rivera 1987; Rodríguez 1989; Haviser 1989; Roe 1989). The unifying aspect of these publications ins the focus primarily on specific design elements of pottery as a basis for generating different cultural complexes and series. As discussed above, Chanlatte and Rodriguez cite the spatial segregation of painted versus unpainted and incised pottery styles, in addition to the presence of distinctively carved stone amulets, as evidence for two different series, Huecoid versus Saladoid.

Recently, a new twist has been added to the debate. Jay Haviser excavated 12 m2 (12 1x1 m excavation units) at the Hope Estate site on St. Martin (Haviser 1988, 1989). Based primarily on design characteristics of 547 potsherds and on nine C-14 dates, Haviser offers us two major migrations into the Lesser Antilles from South America, and one hybridization, during the early ceramic age (Haviser 1989).

The first migratory group is called the Early Ceramic culture, which apparently predates the Saladoid series. Haviser rejects the terms "Huecoid" and "Huecan Saladoid" because he argues that the Sorcé site "represents a culture period when these Early Ceramic peoples were mixing with the Saladoid peoples" (Haviser 1989:10). He suggests that the term "Early Ceramic be used instead until a "suitable type site" is discovered.

Meanwhile, based on artifacts recovered form his "separate midden" and from the lowest levels of his "primary midden" (40-75 cm below ground surface), Haviser defines the essential features of this new "Early Ceramic" horizon. In terms of pottery, we learn that vessels adorned with small incised button lugs (25 sherds), zoned-punctation (17 sherds), curvilinear incision (25 sherds), complex zoomorphic lugs (3), the absence of painting, and the absence of ZIC characterizes the Early Ceramic horizon.

In contrast, the diagnostic features of the Saladoid pottery, resulting from a second migration, consists of D-shaped handles, red-paint, white-on-red paint, red and black paint, inverted bell-shaped pots, and annular bases. We are told, too, that ZIC develops after a mixing of the Saladoid and the Early Ceramic peoples.

A separate line of evidence "substantiating" the argument of a pre-Saladoid Early Ceramic horizon comes form the radiocarbon dates. Two dates form the "separate midden" are old (560 B.C.±40 [Pitt-0450], 350 B.C.±55 [Pitt-0449]=Early Ceramic), whereas two dates from level II of the "primary midden" are not so old (325 B.C.±60 [Pitt-0219], 300 B.C.±45 [Pitt-0220]). To Haviser's credit, he presents his case as a tentative proposal. I look forward to seeing further results from this project.

In light of the findings at Sorcé, Punta Candelero, Rio Guapo, and possibly Hope Estate, Rouse offers an alternative interpretation to the migration hypotheses presented by Chanlatte and Rodriguez (Rouse 1989a). He suggests that on the mainland of South America, pottery decorated with zoned incised crosshatching originated in Amazonia and with white-one-red painting in the Orinoco Valley (Rouse 1989a:389). He argues that when the bearers of the two design traditions combined, the resulting complexes produced what we now refer to as the Cedrosan Saladoid subseries. The Cedrosan peoples began migrating from Trinidad in two directions, one along the coast of Venezuela and the other into the Lesser Antilles. In the northern section of the Leeward Islands there was a divergence of cultural groups, reflected by the establishment of a new subseries, Huecan Saladoid. The pottery of the Huecan complex(es) lacks paint but maintains the use of elaborate incising, including the zoned incised crosshatching. This explains the presumed unique sites of Río Guapo, Sorcé, and Punta Candelero, with Hope Estate being a potential candidate for the point of divergence of the Cedrosan and Huecan subseries (Rouse 1989a:389).

I will now offer an alternative proposal to Chanlatte's Huecoid Tradition, Rodríguez's Crosshatched Connection, and Haviser's Early Ceramic Horizon. My proposal, like Rouse's, is the notion of a Cedrosan Saladoid dispersal out of Venezuela into the Antilles (Rouse 1986:Fig. 23), roughly 2,500 years ago. As in any subseries, there are a number of related, yet different, styles or complexes. Of course, the

style assignments are not immutable categories, but should be treated as working hypotheses, to be tested as new data become available (Rouse 1986:163-175). From this perspective, it does not make sense, when observing slightly different methods of technical production or forms of creative output to then surmise a major new tradition, migration, or horizon. The imagery associated with such monolithic and distinct migration waves perhaps is more a product of our own Western imperialistic methods of expansion than preindustrial tribal-based dispersal patterns.

Rather than focusing on perceived differences across assemblages or slight variants on design treatments as a basis for generating new cultural complexes and even horizons, I suggest that we consider an alternative (or complementary) mode of analysis: Start from the premise that the observed interassemblage variability is not necessarily a product of different cultural groupings, but is perhaps an aspect of the overall behavioral repertoire of a single population. We know that cultural groups do not necessarily reside in a single village, but in a functionally and socially related set of interacting villages or places (Trigger 1978:115-119). This argument is reminiscent of the Bordes-Binford debate concerning the meaning behind the interassemblage variability in the middle Paleolithic of Europe (Binford 1973; Bordes 1973).

The particulars of the Bordes-Binford debate have no relevance to the Caribbean ceramic age; we are not dealing with scraper indices. However, we do look at relative proportions of ZIC and WOR decorated pottery, etc. Furthermore, what distinguishes the Pearls (Grenada) from Horizon I (Martinique), besides location? Or Hacienda Grande (Puerto Rico, Vieques) from Prosperity (Virgin Islands), besides location? These are questions worth addressing. Clear and precise answers may go far in helping to establish spatial boundaries to a cultural complex and to delve into such issues as the dynamics of interaction networks, style zones, settlement hierarchies, and the meaning behind interassemblage variability.

Explanatory Models: Process and Motivating Circumstances

Reading Lawrence Straus's (1987) review of Rouse's (1986) recent book on migrations is strangely like stepping into an intellectual time machine and returning to the late-1960s (or 1972 to be precise), where we can read Lewis Binford castigating James Griffin for being interested in culture history. Therefore, Straus diligently selects passages out of "Migrations" in order to present us with "quaint statements" demonstrating how Rouse has not progressed in archaeology from the days of mutating artifact types.

As Straus somewhat pejoratively admits, "Rouse basically is arguing for making careful, well-documented cases for specific migrations, based on studies of assemblages of artifacts arranged geographically and chronologically" (Straus 1987:381; emphasis in original). Straus evidently emphasizes the word "assemblages" because he can then raise the flag of distasteful archaeology in the form of normativism. Much to Straus's dismay, I'm sure, Rouse focused on assemblages precisely for the reasons Straus should like. Namely, Rouse is interested in assemblage variation. As I discussed in the previous section, he is responding to studies, especially in the Caribbean, where the evidence, for or against, one or more major migrations hinges upon a small handful of artifact types. By focusing on assemblages, rather than type fossils as analytical units, Rouse is able to document the range of variability present in the archaeological record, and thus offers us alternative hypotheses for consideration: assemblage variation related to (a) status differentiation, (b) cultural differences, (c) functional variability (i.e., different ceramic wares). I may disagree with Rouse on the source of assemblage variation, as discussed earlier, but that is another issue.

Finally, Straus criticizes Rouse's study for lacking explanation. In the context of Rouse's indicated goals this criticism is out of place. As the subtitle of the book states he is interested in "inferring population movement from cultural remains." Moreover, he does this rigorously, thus presenting to us a classification of population movements and how each may be recognized. To the extent that Rouse could be criticized for not providing us with an explanation for population movement Straus may be correct. Ultimately, however, when examined from the perspective of the history of ideas, Rouse's work provides the cultural historical framework within which explanatory models may be developed. Those of us who choose to reject the validity of this notion do so at the risk of producing, at best, trivial explanatory models.

This rather long-winded preamble to my discussion of explanatory models for migrations in the Caribbean ceramic age should underscore the importance of both description and explanation. Good explanatory models must rely on a solid empirical foundation (Trigger 1978:114).

The Models

All of the explanations offered for population dispersal into the Caribbean during the ceramic age have certain common elements. Namely, population pressure within a circumscribed territory results initially in competition for scarce land or resources, or both, and ultimately in a spatially expanding population. The various formulations generally owe their inspiration to the early works of Carneiro (1961, 1970) and Chagnon (1968), both of whom developed their ideas of geographic and social circumscription while working in the Orinoco Valley.

William Keegan (1985) approaches the problem from the perspective of microeconomics. Supply and demand curves are presented in combination with the logistical growth function for population increase and with a ranking

of resources based on Caloric values. The well-documented colonization of the Caribbean is then seen as a solution (maintenance of an equilibrium relationship) to imbalances in the supply (subsistence production)/demand (population) ratio, given a specific set of constraints and resources.

Keegan indicates that in response to increasing demand (greater population) a group can either increase production by intensifying its technological base or it may expand spatially "through the colonization of new territories" (Keegan 1985:43). As Carneiro noted many years ago, a population that is geographically and/or socially circumscribed may not have the alternative for spatial expansion, and under these conditions intergroup warfare will escalate, resulting in subjugated groups and ultimately in increases in social complexity.

It is important to note here that in the original formulation of his theory, Carneiro (1961:62-63) postulated that the Circum-Caribbean chiefdoms, such as the Tainos in Puerto Rico and Hispaniola, probably developed in response to the narrowly circumscribed arable lands in the region. What is interesting for the present discussion is that Carneiro does not consider the process of expansion out of South America by the Saladoid migrants, who were the ancestors of the Tainos.

Keegan has supplied us with this aspect of the problem, by modelling the expansion into the Lesser Antilles, based on a constant growth rate and a village fissioning rule as the population doubles (Keegan 1985:58). He then calculates the probable upper and lower time limits for movement through the Lesser Antilles to Puerto Rico, using the C-14 dates available at the time of his study.

Based on the data available to Keegan, he suggest that the expansion from Trinidad to Puerto Rico took from 160 to 460 years (earliest Trinidad C-14 date: 190 B.C.+70; earliest Puerto Rico C-14 date: A.D. 120+80). Furthermore Keegan argues that

> all small islands and several of the larger islands were bypassed during the initial phase of colonization. The evidence indicates that the implicit assumption that each island was colonized in turn must be rejected. The actual pattern is of a rapidly expanding population whose productive system was focused on a specific set of resources. The distribution of resources in the optimal set would have promoted the rapid spread of population, with islands colonized to maintain a maximum rate of currency return [Keegan 1985:63].

Thus, from Keegan's perspective, the early colonists were attempting to maintain, in their insular setting, an adaptive strategy developed in the South American lowlands. This results in a search behavior by the initial migrants for a targeted set of resources and, therefore, specific environmental settings. For Keegan, the process of island colonization by the initial settlers was an optimizing strategy, given certain technological parameters. He argues that the combined effects of the intergroup competition on the South American mainland with the attractiveness of the optimal (but narrow) resource set in the Antilles resulted in the quick expansion of the colonizing population to the larger landmasses of the island chain (William Keegan, personal communication 1990).

Data collected since Keegan's study was published do not support his model. The small islands of the Grenadines, St. Eustatius, and St. Martin do contain early Saladoid sites (Table 1). The rate of expansion, however, does appear to be fast (note the old C-14 dates from Saladoid sites in Puerto Rico). I would simply suggest that the initial migrants do not seem to be selecting the larger landmasses for settling prior to the small islands. Furthermore, the distribution of known Saladoid sites must be evaluated with caution, given the unevenness of our data-base across islands.

Peter Roe offers the flipside to Keegan's argument, in which he suggests that the Antillean island chain is a "kind of 'inverted main-river' analogue" (Roe 1989:270). In this framework, Roe suggests that if the ethnographically observed intergroup hostilities in the Amazonian lowlands were operating in prehistoric times, then this would have been a likely motivating factor in the Saladoid migration out of the Orinoco Valley. In a sense, Roe presents a "push" model (intergroup hostilities) for the island colonization, compared to Keegan who develops a "pull" model (attractiveness of the insular resources). Roe likens the push-process to the squeezing of a tube of multi-colored toothpaste. As the tube (Orinoco Valley) is squeezed (population pressure resulting in intergroup hostilities or perhaps raiding for women), paste (cultures) oozes (migration) out (to the Antilles). In terms of this dentifricial metaphor, each color of the paste represents a different cultural complex (i.e., Hacienda Grande, La Hueca, etc.). Roe uses the term "agonistic engine" to describe the process of interethnic hostilities "driving" the groups out of the riverine and into the insular setting.

Roe sees a rapid migration through the island chain by the initial colonists as a product of their attempt to maintain a mainland adaptation to the island habitats. He selects particular attributes of the artifact assemblages to argue his case.

First, he cites the use of ceramic potrests (topias) by the insular Saladoid groups as clear evidence of "culture lag" (Roe 1989:271-272), arguing that they are "functional absurdities" in an environment where river cobbles are abundant and better suited for the purpose of elevating pots over a fire. I responded to this point in an earlier draft of his paper, which now appears in one of Roe's many Notes (Roe 1989:Note 27):

> It seems to me that it makes more sense to have a potrest made out of ceramic than stone, when the potrest is going to be subjected to high heat. Stone potrests that are holding up a ceramic griddle, for example, are likely to explode after some duration of heating. You wouldn't have this problem with ceramic potrests [Peter Siegel, personal communication to Peter Roe 1988].

In responding to my point, Roe suggests that the open paste with large temper particles "was subject to overfiring," thus causing the potrests to spall and crumble (Roe 1989:299). Without belaboring this issue too much, I would simply argue that the technological properties of the topias (open paste, coarse temper particles) are ideally suited for the tool's purported function. The extensive use of grog, crushed shell, and talc as tempering particles, which have relatively low coefficients of thermal expansion, in combination with porous paste, provides the topias with optimal properties to mitigate problems of thermal stress (Rice 1987:229-230). Roe's observation that topias seem to be associated exclusively with the early Saladoid phases (to be replaced by river cobbles in the later phases) is not substantiated by evidence, and to the contrary, are found in numerous other temporal contexts as well (e.g., Allaire 1984:129).

Roe's (1989:272) second line of evidence for the reproduction of the mainland adaptation to the insular environment is derived from the subsistence remains. He cites the conventional wisdom concerning the terrestrial orientation of the first migrants as reflected by the presumed narrowly-focused dietary adaptation to land crabs and large mollusks:

> This same process of `culture lag' is also evident from the culinary remains. Thus, initially there is a dependence on large, easily accessible life-forms as sources of protein to supplement the manioc the first immigrants brought with them. The ease with which these life forms, like the blue land crab (Cardisoma guanami [sic]) and the gastropod Cittarium pica, could be procured and the susceptibility of those creatures to over-exploitation (Goodwin 1980) bespeaks a lack of adaptation to the unique energetic properties of an insular environment, and hence the recentness of the colonist's arrival from a tierra firme origin [Roe 1989:272].

It is true, the crab claws and large mollusks are very obvious attributes of Saladoid middens, from the Windward Islands through Puerto Rico. This is why Rainey (1940) coined the term "Crab Culture." One of the points emphasized by zooarchaeologists and archaeobotanists (for at least the last 25 years), however, is that it is not adequate, and in fact it is likely to be inaccurate, to base our subsistence reconstructions on only the large and obvious items in a midden (Struever 1968; Jarman et al. 1972; Payne 1972; Limp 1974; Lange and Carty 1975; Watson 1976; Dye 1978; Keeley 1978; Roosevelt 1989:34-37; Wing 1989:143).

Based upon analysis of the faunal remains from Maisabel, a large Saladoid site located on the north coast of Puerto Rico, Susan deFrance concludes:

> In contrast to previous models of Saladoid subsistence, the Maisabel assemblage indicates that the site's inhabitants were skilled at the exploitation of a range of maritime habitats. The faunal data also indicate that terrestrial resources were utilized in varying quantities throughout the occupation of the site. However, in none of the samples are terrestrial resources the major focus of exploitation in terms of either number of species or MNI.
>
> A subsistence feature the Maisabel assemblage shares with other contemporaneous sites is a characteristic decline in terrestrial crab use between the early phase of Saladoid occupation and the later Ostionoid time period...As the terrestrial crabs decline in availability, the Maisabel inhabitants intensified their well-developed maritime subsistence economy [deFrance 1988:103].

Given the results of deFrance's investigation it should be clear that the notion of terrestrial dietary emphasis of first migrants is largely an artifact of sampling bias in archaeological projects that have not used flotation. Once the data are properly collected we find that the earliest Saladoid migrants were in fact exploiting the marine resources intensively and extensively.

deFrance (1988:105) offers the interesting possibility that the Saladoid migrants were learning how to exploit the maritime habitat on their way up the Antilles, so that by time they reached Puerto Rico they were proficient in their use of the aquatic biome. This would be an example of "adaptive radiation" by the human population as it expanded spatially (Mayr 1970:372, 413). This may be so, but it remains to be demonstrated by other studies, similar to deFrance's, in the Lesser Antilles.

Finally, Roe argues that the ceramic iconography denotes a mainland homeland (1989:272). I believe this is a valid point. However, I believe also that the iconography does just that: it denotes a mainland homeland. This does not mean that the Saladoid migrants are attempting to reproduce that homeland in this drastically different setting. As we know, cosmology and world-view, to which the rich iconographic elements of Saladoid pottery are undoubtedly linked, are rather conservative (Eliade 1959:69-72, 87-91, 1965:10-11, 46-48). Therefore, while there may be shifts in resource procurement and settlement strategies, it is likely that the myths, with the associated actors, do not change so readily. Roe certainly recognizes this point; I believe he simply cites it as evidence for the wrong process.

I disagree with Keegan and Roe regarding the methods employed by the Saladoid populations in their colonization of the West Indies. However, I believe they are correct in their assessment of the motivating circumstances behind the dispersal. That is, the competition over scarce, but attractive, main river frontage in the South American lowlands resulted in large-scale hostilities between groups vying for the land. The losers in these competitive interactions had one of three choices: (1) Remaining on the floodplain and becoming subjugated to the winners. This is Carneiro's (1961) model for the development of cultural complexity in a circumscribed environment. (2) Move off the floodplain into the interfluvial regions of the rain forest. (3) In northeastern South America the losers of the intergroup hostilities have the added choice of moving into the insular environment of the West Indies.

We know from ethnographic observations that the lowland adaptation is based upon flexibility and a certain degree of opportunism. Thus, a group who loses in one round of competition over prime river land will take up the backwoods interfluvial adaptation. At some later time, the same group may find the opportunity to displace another group from the river, thus taking up the main river lifestyle again.

A good example of this process was recorded for the Waiwai Indians, who were occupying northeastern Brazil in the latter part of the nineteenth century. In the 1880s the Waiwai were observed inhabiting the interior forests and did not use canoes (Fock's [1963:6] description of Coudreau's account). By 1925 they were using woodskins, which Roth (1929:X) notes were quite serviceable. These observations document a shift in lifeways by a single group, from a backwoods interfluvial existence to an upriver/tributary stream adaptation. Apparently, the Waiwai were moving into a void left by the Taruma Indians, who went extinct due to diseases (Evans and Meggers 1960:240). These observations highlight the ease with which lowland groups shift their survival strategies, settlement pattern, and subsistence economy depending on proximate factors and constraints (Lathrap 1970:19-20; Siskind 1973:38-40, 46).

If we accept this notion of flexibility as an integral component in the adaptive strategy of South Amerindian lowland societies, then the colonization of the West Indies is simply part of this larger process. It is likely that the mainland Saladoid populations were preadapted, in a sense, to the insular setting. Canoe travel would have been a highly developed skill from their riverine existence. The Lower Orinoco River, especially, would be a good "training ground" for maritime traveling.

I believe the evidence currently available supports the model of flexibility and opportunism on the part of the initial Saladoid migrants to the West Indies. Survival strategies cannot be subsumed into, or characterized by, a single Caribbean-wide pattern (Watters and Rouse 1989). Subsistence and settlement patterns for the Cedrosan Saladoid populations probably vary depending on local circumstances.

Summary and Conclusions

Dispersal of ceramic age groups into the West Indies is a major topic of research among Caribbeanists today. Evidence currently available suggests that by 400-500 B.C. the earliest pottery-bearing groups entered the Antilles; this is roughly 500 years earlier than what we believed five years ago (Rouse 1986).

There is considerable debate regarding the associations of the migratory groups, and ultimately on the degree of cultural similarity of dissimilarity reflected by the artifact assemblages. It appears to me that the evidence at this point favors the scenario offered by Rouse; that is, there was a population dispersal into the Caribbean by a single series of cultures, referred to as the Cedrosan Saladoids.

Models presented recently to explain the dispersal process owe their inspiration to schemes developed by researchers in the South American lowlands. Thus, the consensus among Caribbeanists is that fierce competition over the alluvial silts on the river flats resulted in the radiation by human groups into the islands. I suggested, contrary to previous ideas, that the survival strategies employed by lowland groups in general, and the Saladoids in this case, were based upon flexibility and opportunism. Therefore, rather than attempting to reproduce their South American homeland in the insular environment, as well as keying into a narrow (but optimal) resource set, the pioneering groups were quite able to recognize and take advantage of the numerous habitat types available in the West Indies (Watters and Rouse 1989).

As noted at the beginning of this paper, discussions concerning prehistoric migrations in the West Indies probably are the greatest source of elevated blood pressures at Congresses for Caribbean Archaeology. However, scholars are certainly addressing other topics as well, which include settlement and subsistence patterns, community organization, frontiers and group interactions, and artifact technology. Saladoid archaeology is on a healthy developmental track.

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