3

NATURALIZING DISASTER

From Drought to Famine in Southern India

Kathleen D. Morrison

THE RAINS OF THE SOUTHWEST MONSOON WERE VERY POOR during the summer of 1875 in the Madras Presidency, a region in southern India under British colonial rule, and the secondary rains of the northeast monsoon were anxiously awaited. As the editor of a Madras newspaper (Digby 1878:6) recalled, "Towards the end of October, no signs of the Northeast monsoon being apparent, and the effects of the failure of the south-west rains in the central districts being experienced in increasing measure, it was apprehended that a famine was nigh on hand; panic seized the people and the grain merchants. Prices rose to double and even triple the ordinary rates, and threats were made of looting the grain bazaars. In some of the up-country districts, notably Kurnool, looting did occur, and the military had to be called out." He adds (1878:6), citing a government letter,

> The public conviction of the absolute failure of the north-east monsoon was . . . necessarily, from the nature of the event, arrived at suddenly. The result was that prices sprang at a bound to a point which they have scarcely ever been known to reach before, and from which they have hardly, even now, at all receded. The rise was so extraordinary and the available supply, as compared with well-known requirements, apparently so scanty, that merchants and dealers, hopeful of enormous future gains, appeared determined to hold their stocks for some indefinite time and not to part with the article which was becoming of such unwonted value.

In the Madras Presidency, 11 million out of the total population of 16 million people were reported by authorities "to be distressed to a greater and 5 million to a lesser degree" (Digby 1878:69), with distress conceived as a scalar attribute ranging from hunger and malnutrition to displacement and migration and finally to outright starvation. In the northern district of Bellary (adjacent to Kurnool District mentioned above) the northeast monsoon had also failed the previous year, and there the famine of 1876 had particularly devastating consequences. Agricultural production in Bellary District during 1876 and 1877 averaged one sixteenth of that of a "good year" (Digby 1878:71). Throughout the usually dry and hot winter and spring, tens of thousands of people left their homes in search of food and work. The summer rains of 1876 fell in a few heavy showers, while higher than usual temperatures and strong winds withered sprouting crops in the fields. Death tolls rose, even among the rich, although those most severely affected were landless laborers and the poor. Large amounts of money were directed into government relief efforts, although a glance at land revenue records shows only a modest decline in state income (McAlpin 1983:Appendix C). Finally, September rains marked the beginning of the end of the famine period (Digby 1878:227). The colonial government, in an attempt to determine the demographic effects of the famine, commissioned special famine censuses in early 1878 which recorded population losses in the Bellary region between 7% and 21% (McAlpin 1983:60–61).[1]

The famine of 1876, while better documented than preceding disasters, was not an isolated incident. The dry zones of southern India experienced periodic famine conditions prior to the twentieth century, some of them resulting in great loss of life and dislocation of people and production. Bellary District falls within this dry zone, having a mean annual precipitation of 46 cm with an average variability of 37% (Kelsall 1872). As I discuss below, however, the existence of low and variable rainfall cannot itself account for the historical experience of famines. While they were not unprecedented, the nineteenth-century famines of India have a particular analytical salience in that they were represented in colonial scholarship both as "natural" disasters and as Malthusian checks, the latter also naturalized.[2] While "nature" certainly had a hand in the constitution of disaster in South India,

human economic and social organization also played a considerable role, and it is this *naturalization of disaster* and of human action that I consider here both in terms of archaeological interpretation of environmental data and in light of the specific archaeological record of the Bellary District between the fourteenth and sixteenth centuries A.D. I suggest that famines and other forms of "distress" in South India, and indeed in other stratified societies, were complex outcomes of political ecologies—cascades of effect that involved environmental conditions; agricultural and other land use practices; structures of access to land, labor, water, manure, seed, draft animals, and other agricultural inputs; the organization of markets and transportation; mobility options; and, more generally, power relations.

RAINFALL DEFICITS AND CONSUMPTION DEFICITS: NATURAL PROXIES FOR HUMAN DISASTERS

Rainfall deficits may be thought of as droughts and consumption deficits as famine, but the latter is by no means a direct or mechanical reflection of the former. Linking drought to famine requires consideration of both production and distribution. To begin with production, it is a reasonably common practice in archaeology to employ environmental indicators as proxy measures of cultural variables. Rainfall records, for example, thus *become* agricultural production in archaeological discussions of risk, scarcity, and abundance (e.g., Orcutt 1993:89).[3] In this vein, rainfall variability may be directly converted into measures of subsistence "risk" or production variability without regard to the complex mediations between environmental factors, productive outcomes, and their consequences for particular consumers that are a part of many economies.

I am certainly not suggesting that plants do not require water for growth or that ecological variables are unimportant to human productive strategies. On the contrary, ecological parameters are of fundamental importance in all forms of food production. However, the relevant ecology is here a *human* ecology that works through the complex ways in which land, water, plants, and animals are transformed into food and other products by human action. The move from rainfall to agricultural production is mediated by agricultural practice just as the move from production to consumption is mediated by practices of distribution. It is also not my intention to make wholesale claims for all agricultural societies. However, it is my point that the nature of disaster—drought, famine, and disease—is, in stratified societies, not entirely natural, nor can we always accurately predict disaster in such situations, even where our ecological knowledge is complete.

Although in the case of the fifteenth-century Bellary District discussed below we possess only minimal ecological information, it is possible to consider the relationship between drought and famine. However, in light of data from the nineteenth century, the association that is really being considered is between rainfall patterns and agricultural production, for clearly famine requires shortcomings in distribution as well as production. In fact, this relationship was the topic of a detailed study carried out by Harold Mann, former director of the Bombay agriculture department. Mann, horrified by his experiences during the 1918 famine, carefully correlated daily rainfall records from 1865 to 1938 with measures of agricultural productivity and periods of famine (Mann 1955). His objective was to determine a way in which famines could be predicted, particularly from rainfall data for the first part of a possible famine year. Mann wanted to trace the potential connections between rainfall patterns, crop growth, and famine, and set about devising a series of measures for the first two of these variables based on statistics compiled by the colonial government in several districts.

In general, annual rainfall proved to be a surprisingly weak measure of productivity and of famine. That is, rainfall variation did not correspond in a systematic way with famine years nor with Mann's measure of the "goodness" of a year (Mann 1955:29–35), an index of realized production of staple crops. However, as an agronomist Mann recognized the importance of the timing and duration of rainfall as they relate both to ecological requirements of particular crops and to the timing of the agricultural cycle. He thus devised a measure he called "maximum effective rainfall" that isolated rainfall of direct utility to dry-farmed crops, particularly sorghum (Mann 1955:7–14). This measure considered the timing, duration, and intensity of rainfall and the nature of soils in his study area. The measure of effective rainfall is always somewhat less than that of overall rainfall, as it eliminates rain that falls in quantities or at times that cannot be used by growing plants. In general, effective rainfall runs 85% to 88% of total rainfall. The weakness of this measure, as Mann acknowledged (Mann 1955:7), is its failure to consider water harvesting measures such as reservoirs, which may take advantage of some of the rainfall eliminated in his calculation of maximum effective rainfall.

Here it may be noteworthy to mention that during the famine of 1876, fields watered by runoff-fed reservoirs actually fared worse than dry-farmed fields. While this seems counter-intuitive, it was apparently the case that crops in dry fields were able to use the little rain that did fall while the more complex water routing technology of reservoir systems ensured that the scant precipitation and runoff dried up before ever reaching a field (Digby 1878:69). Thus, complex irrigation technology does not necessarily give the best results in case of drought; however, reservoir-irrigated fields are certainly more productive than dry ones in the main.

To return to Mann's study, he found a complex cyclical pattern (although no overall trend) in effective rainfall for the 70 years of his study. Figure 2 illustrates five-year moving averages of maximum effective rainfall—what he calls mean effective rainfall—for Sholapur District.[4] Mann noted further that all the serious famines of the Bombay Deccan (1896, 1899, 1918, and 1920) coincided with periods of declining five-year moving averages in mean effective rainfall (although not all periods of decline were famine periods). Clearly, then, neither annual rainfall nor effective rainfall proved to be very robust indicators of famine occurrence.

This pattern is somewhat complicated by Mann's further attempt to correlate effective rainfall with records of actual agricultural production, which met with mixed success. He found that crop yields varied much less than rainfall in famine-prone areas,[5] whereas the opposite was the case for areas with higher rainfall (Mann 1955:38). For example, the overall correlation coefficient between the "goodness" of the season (a measure of realized production, Mann 1955:29–34) and effective rainfall for Sholapur District was only 0.341 (Mann 1955:34). In general, the amount and distribution of rainfall proved a poor measure of crop success, although soil moisture measurements had more robust predictive value. Soil moisture relates both available moisture and substrate to agricultural practices such as terracing, mulching, and manuring (and to runoff characteristics influenced, for example, by deforestation). Furthermore, the association between severe famine and cycles of decline in five-year means of effective rainfall points to the important role that storage of agricultural products plays in evening out short- and medium-term fluctuations in the availability of produce. The careful work of Horace Mann, then, shows us both the complexity of the relationship between rainfall and famine and its partial mediation by agricultural practices and local conditions.

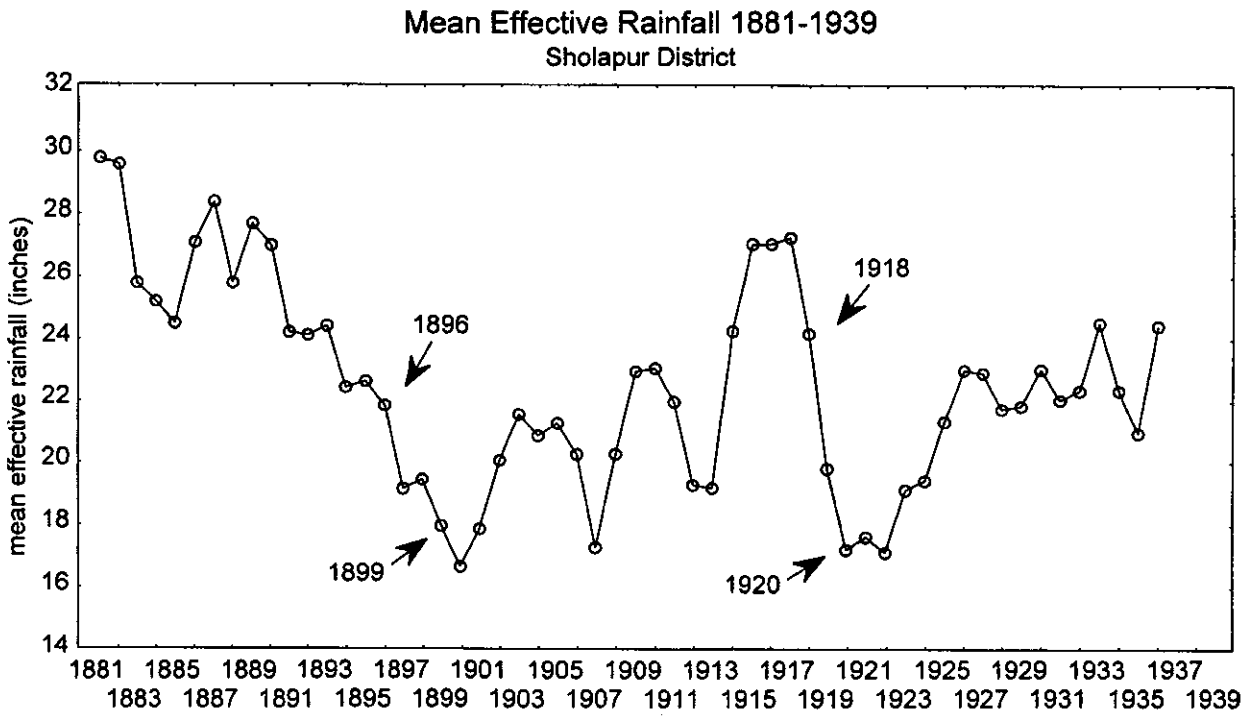

Figure 2. Variation in five-year moving averages of effective rainfall, 1881–1939, Sholapur District, Bombay Presidency. Data from Mann 1955.

INDIAN FAMINES: NATURALIZING DISASTER IN THE COLONIAL STATE

British colonial attitudes that "naturalized" famine extended beyond official recognition of the low and variable rainfall of the peninsular interior. Famine was represented as an essential condition of the land and the people (Loveday 1914), India being "prone" to famine (cf. McAlpin 1983). The view that famines were primarily "natural" disasters rested to a great extent on their perceived correlation with variations in rainfall. However, this view also runs through two other proxy measures for famine evident in the colonial literature—population movements and price. Archaeological assumptions that agricultural production is an essentially natural process, assumptions underpinning the unproblematic transformation of environmental parameters to realized production without the intervention of human action, find their corollary in the cultural logic that views market "forces" as natural rather than as products of specific culture-historical conditions. According to this naturalization, then, production shortfalls transform themselves into differentially distributed starvation and distress, again without the intervention of culturally organized human action. Differential distress is simply to be expected, being just the natural consequence of market forces operating on a (further) natural order of inequality.

Large-scale population movements were often seen by the British as a reliable indicator of true or severe famine, as people moved away from their home districts in search of work, fodder, food, or markets for household valuables.[6] Migration was, McAlpin notes (1983:46), a strategy of last resort for many agriculturalists. Patterns of population movement, however, seem to have varied significantly by occupation and class. Those not experiencing distress might not move at all, while large numbers of the "respectable" classes of cultivator might be forced to migrate in search of food and work. The more destitute, the aged, and the ill had the fewest options. In 1876 many of these people came to feeding stations or charitable institutions, but others made up the first ranks of the dead (Digby 1878). A British journalist (quoted in Digby 1878:99) described the town of Kalastri, North Arcot District, during his visit in March of 1876:

> The general appearance of the town deserves a remark. It struck me as being under-populated. There were a great many well-to-do people—Brahmans, shopkeepers, and adherents to the palace. These looked sleek and comfortable and many of their women and children were lavishly dressed. But there did not seem to be the usual number of the poorer classes of residents, and I incline to the opinion that emigration to a considerable extent must have taken place. There is certainly little to keep such people here; there is no cultivation except in the bed of the stream, and most of the cattle have died. On the other hand, the streets were lined with paupers, mostly from the surrounding villages, and many from the jungles, who were waiting for the hour for the daily distribution of food.

Indeed, in an attempt to make certain that those working on government-sponsored projects such as road and reservoir constructions were truly in need, such relief projects were deliberately sited away from areas of residence and workers were forced to live in the project camps (see discussion by Dasgupta 1993:61–62).[7]

The migration of people in search of work in times of famine is closely connected to the issue of exchange entitlements, discussed below. It is further connected to the migration of foodstuffs themselves. Grain markets were seen by the British to operate according to natural laws. That merchants could gain more by selling grain to England than they could in local markets—even at famine prices—was viewed as simply an outcome of economic principles and not a product of political domination. Britain's *laissez-faire* policy regarding the operation of grain markets depended on specific views of political economy influenced by John Stuart Mill and in particular by Adam Smith (Dasgupta 1993:64–65), who argued that government involvement in grain markets, such as fixing prices, would only make famines worse by reducing supply. An anonymous article in the *Calcutta Review* in 1867 pointed to some limitations of this argument, noting that the rice-surplus countries of Southeast Asia, India's trading partners, did not themselves adhere to free-trade principles (quoted in Dasgupta 1993:65):

> Unfortunately for India, Political Economy is not much studied in these quarters. On the first symptoms of scarcity His Majesty of Burmah and his compeers stop exportation and India cannot therefore count with certainty on relief in that direction. The upshot is that Mill's argument will not apply to this country.

The prices of food grains historically show a closer correlation with famine conditions than do ecological measures, except where the latter reach extreme values (e.g., Alamgir 1980; Sen 1981; Watkins and Mencken 1985). Prices, as illustrated by the Madras newspaper editor's remarks in the opening paragraph, are, however, not "natural" reflections of availability (supply and demand) but may be subject to considerable manipulation (e.g., "speculation"). Where natural laws and not cultural practices are seen to underlie the operation of markets, the transformation of production to price is unproblematic. Adam Smith's "unseen hand" ensured that a proxy measure of famine such as price could be conceived of as being as natural—and hence as far out of the realm of legitimate political control—as rainfall.

More than price, the structure of market access itself is at issue. Those without direct access to productive land—and in nineteenth-century South India that included many people, both rich and poor—used cash to purchase food and thus were at the mercy of price fluctuations. That the landless poor should suffer disproportionally under such circumstances seemed only "natural," a displacement that takes unequal access to basic resources as a given. Clearly, then, the structure of access to resources, or what Amartya Sen (1981) referred to as exchange entitlements, mediates food availability at a level removed from actual production, which is itself removed from rainfall parameters. Obviously, the structure of suffering in nineteenth-century Indian famines was closely related to the nature of stratification, politics, and the division of labor. The cultural aspects of this "natural disaster" are conditions particular to market economies. However, they may also be relevant to all stratified societies with complex divisions of labor. Where stratification and division of labor exist, it is difficult to justify simple transformations of ecological data into quasi-cultural measures such as famine incidence. Environmental parameters are indeed fundamental, but are profoundly mediated by cultural practice.

ARCHAEOLOGICAL PATTERNS AND THE HISTORY OF FAMINE AND UNREST IN SOUTH INDIA

Moving to the archaeological record of southern India, the same region affected by the famine of 1876, we begin with relatively scanty information on environmental variability, including rainfall, and it is impossible to match climatic variables with famines as Mann did for the Bombay Deccan in the nineteenth century. Nevertheless, the ecological data we do have (Caratini et al. 1991; Morrison 1995) suggest no major climatic shifts after 1500 B.C., and attempts to locate "little ice age" changes in South Asia have met with little success. Thus, we can probably assume a cyclical regime of low rainfall and high variability such as that described by Mann (Spate 1954). In this broad context, then, we can employ understandings of the interventions between rainfall and agricultural production based on both historical evidence and contemporary observation.

During the time period considered here, the fourteenth to sixteenth centuries A.D., all of this part of southern India lay under the at least nominal dominion of the Vijayanagara Empire (Figure 3). The Vijayanagara Empire was a large, if somewhat loosely organized, empire that expanded by both military conquest and the incorporation of local elites (see Morrison and Sinopoli 1992; Sinopoli and Morrison 1995 for more detail). The capital of the empire was the eponymous city of Vijayanagara, sited on the banks of the perennial Tungabhadra River amid the dry and rocky hills of the Karnatak Plateau.

The traditional founding date for the capital city, based on historical accounts, is A.D. 1336, but it is clear that settlement in the area around the city predates that. Thus, A.D. 1300 may be used as a convenient marker for the beginning of the Early Vijayanagara period. Similarly, although the capital city was sacked, looted, and burned in 1565, leading to its almost total abandonment, periodic repopulation attempts and the continuity of building styles make it convenient to employ the end of the sixteenth century as the terminal date for our analysis. Although the empire continued in a somewhat reduced form for several hundred years after 1565, the capital city, which had been located near the northern frontier of the empire, was no longer part of the Vijayanagara polity, and I will not discuss this later period here.

Archaeological survey, excavation, and palaeobotanical data, as well texts from the region surrounding the city of Vijayanagara, in Bellary District, provide good evidence for the tempo of settlement and agricultural expansion and intensification between the fourteenth and twentieth centuries (Morrison 1995). During the Vijayanagara period, settlement grew rapidly in an area that had not seen any significant population concentration for the previous 500 years, with peak periods of growth in the fourteenth and sixteenth centuries. Of particular interest here is the Middle Vijayanagara period, corresponding roughly with the fifteenth century, in which we see a number of significant changes in the tempo of construction of monumental architecture, in settlement, agricultural

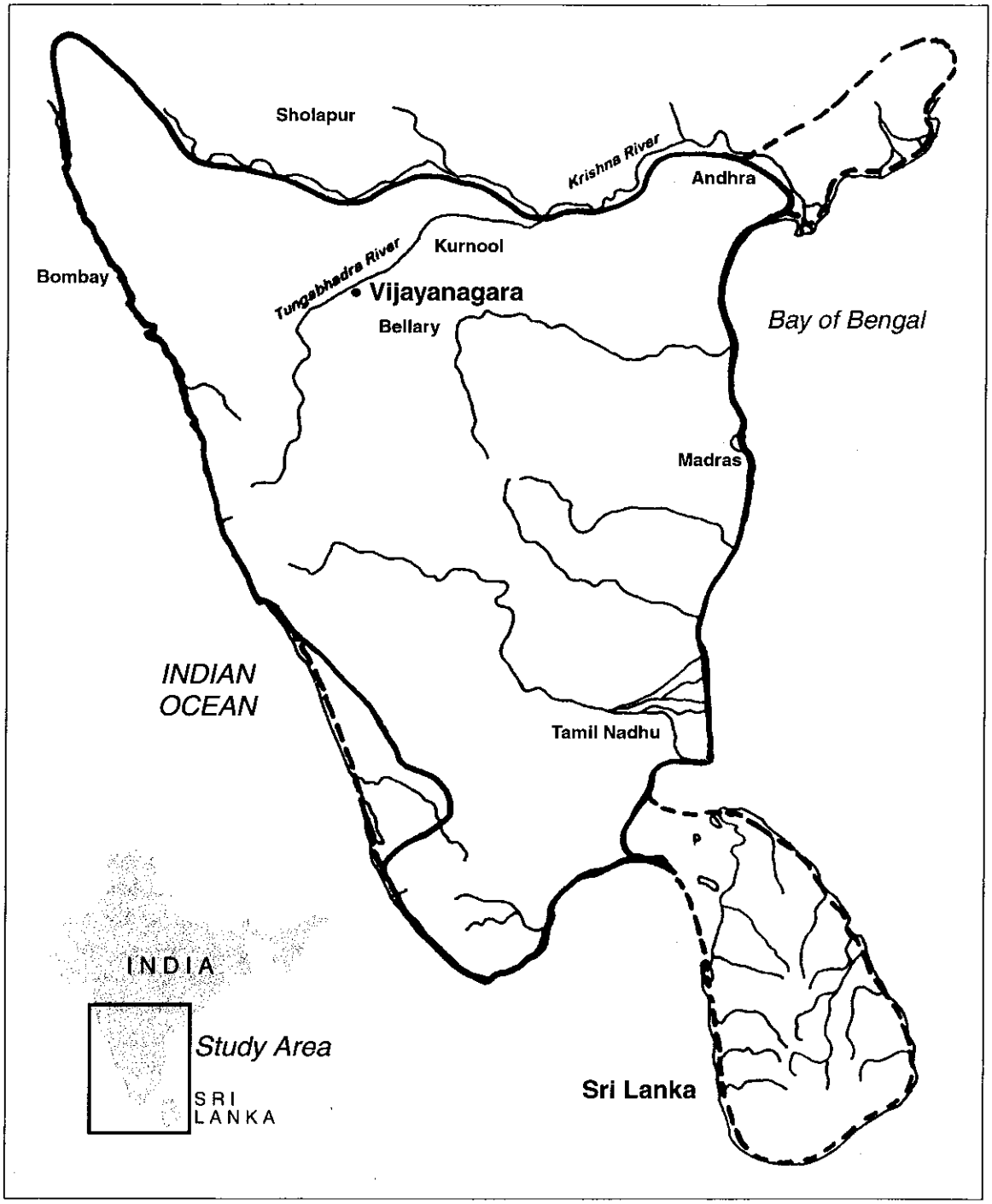

Figure 3. Southern India. The boundaries of the area under direct political control of the Vijayanagara Empire (A.D. 1390–1485, based on Schwartzberg 1992) are indicated with a heavy solid line; areas paying tribute to or acknowledging Vijayanagara suzerainty are indicated with a heavy dashed line. These areas should be seen as maximal. Place names mentioned in the text are indicated.

expansion and intensification, and inscriptional activity. These changes are temporally correlated with various forms of unrest and with a series of recorded famines. In the following sections, I briefly sketch the nature of our evidence for changes in the fourteenth and sixteenth centuries, both periods of expansion in the Vijayanagara region (more details are given in Morrison 1995; Morrison and Lycett 1994, 1997). I then move to a closer consideration of the fifteenth century, about which much less has been written.

THE FOURTEENTH CENTURY

The initial Vijayanagara settlement expansion in Bellary District dates to the mid-fourteenth century. This growth is visible in the construction of the massive core-and-veneer masonry walls of the urban core of the city and in the establishment of a number of large temple complexes, themselves resembling small cities. Early settlements, most of which continued to be occupied throughout the Vijayanagara period (and several into the twentieth century), tend to cluster nearer the river and near the city of Vijayanagara. Although such settlements are found across a reasonably large area, parts of the region were not permanently settled during the fourteenth century. The walled town of Kamalapuram was established about this time, as was a large canal-fed reservoir which may have provided some water to the city as well as supporting a large expanse of irrigated rice fields (Morrison 1995). In our roughly 120 km^2 survey area, we have identified more than 30 reservoirs that were partly or wholly constructed at this time, most of them supplied by seasonal rainfall and runoff. Most settlements, in fact, are spatially associated with reservoirs. Other agricultural facilities associated with the Early Vijayanagara period include at least five canals that drew water from the Tungabhadra River by means of *anicuts* or long diversion weirs. Rainfall farming of millet was, however, probably the mainstay of most agricultural populations. The pace of growth was rapid, and much early expansion was apparently fueled by immigration to the capital city of this emergent imperial power.

The archaeological record of Early Vijayanagara settlement growth and agricultural expansion is complemented by historical and palaeobotanical data that reflect similar trends. Pollen and microscopic charcoal data from reservoir cores indicate a relatively open, treeless landscape and intensive regional burning during the Early Vijayanagara period, consistent with the archaeological interpretation of intensive agriculture and field clearance (Morrison 1994).

Textual sources on the Vijayanagara period are diverse, but among the most important contemporary documents are inscriptions in stone and on copper that record elite investment and prestation. Inscriptions, while politically and symbolically charged, almost always refer to a material transaction (gift or sale of land, endowment of a temple lamp, remission of a tax, etc.). These texts should thus be viewed as demonstrative rather than simply reflective of economic and political activity (Morrison and Lycett 1994, 1997), but in a general way we can consider the volume of inscriptions to reflect the tempo of elite prestation about which public claims were being made. Inscriptional data show a strong overall temporal distribution (Figure 4) in the northern part of the empire. There is an early, fourteenth-century peak in the number of inscriptions followed by a trough in the fifteenth century and a dramatic expansion in the sixteenth century or Late Vijayanagara period. Thus, the archaeological record of growth and stasis in settlement and agricultural production is matched closely by the historical data.

THE SIXTEENTH CENTURY

The sixteenth century was also a period of dramatic growth in settlement in the Vijayanagara region, outstripping the fourteenth century in the scale and tempo of building activity, the number of new settlements established, and the degree of agricultural intensification and expansion. In the city itself, four major temple complexes were erected and older complexes elaborated. Other large temples were built in the vicinity of the capital. Settlement not only filled the area within the urban core walls but spilled out from them to enclose formerly outlying settlements such as Kamalapuram in a kind of urban sprawl. Evidence for agricultural change is overwhelming. Several new canals were constructed, as was a large aqueduct, and a great many reservoirs were built across the landscape, many of them in areas not formerly under permanent cultivation (Morrison 1995). Overall, the pace of settlement and agricultural expansion in the sixteenth century was phenomenal, far outstripping even the dramatic changes of the Early Vijayanagara period. Nevertheless, production of a wide variety of crops and craft items continued at a number of organizational scales, with no evidence for centrally directed production of either food or utilitarian craft goods (Morrison 1995; Sinopoli and Morrison 1995).

The sixteenth century also saw a number of significant political and economic changes in the empire (Karashima 1992; Stein 1980, 1989), including attempts to bring

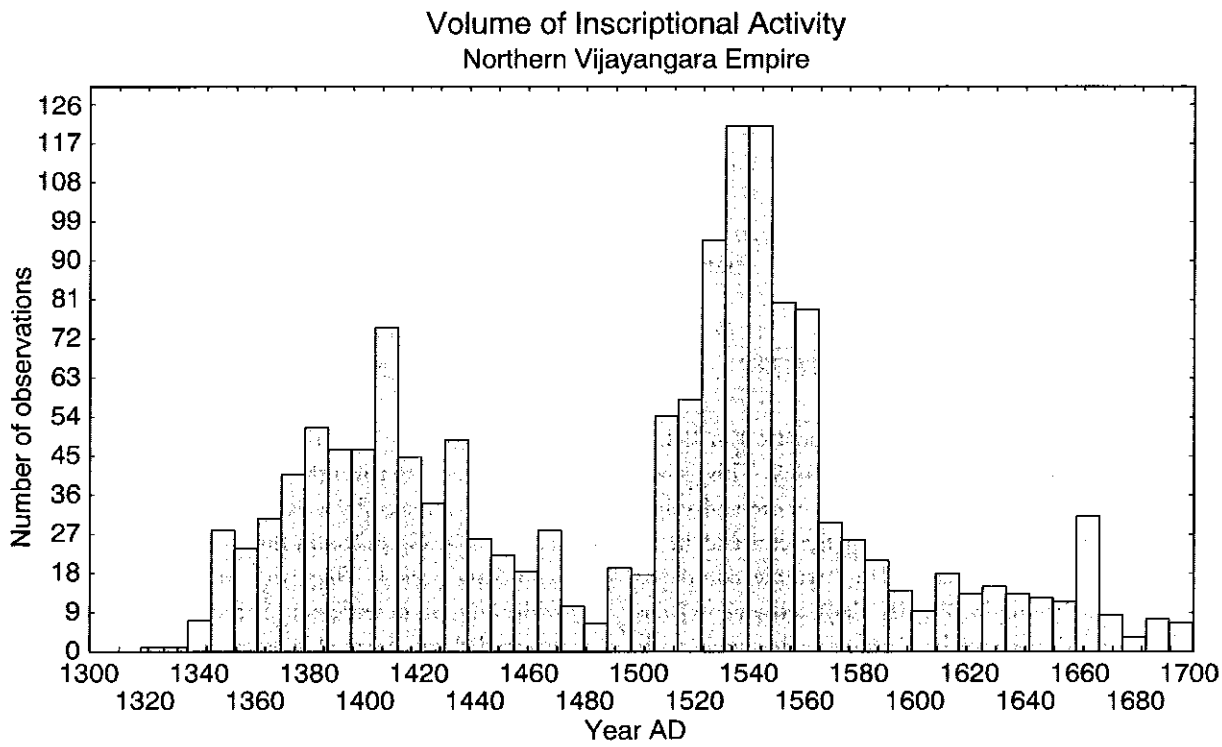

Figure 4. Number of (dated) Vijayanagara inscriptions by year. See Morrison and Lycett 1994, 1997 for descriptions of the inscriptional database.

outlying (and perhaps even nearby) areas under closer imperial control. One of the ways this was accomplished, or attempted, was through the expansion of the *nayankara* system. Often problematically described as a "feudal" system of land tenure (cf. Sewell 1900, and see Kulke 1995 for an overview of the debates over feudalism), *nayakas* were military leaders linked to the king by obligations of military service. *Nayakas* held rights to land assigned, as least nominally, by the king. In practice, the organization of the *nayankara* system seems to have varied both through time and across space, and there is little agreement about the exact roles taken by *nayakas*. However, in the sixteenth century it is clear that some *nayakas* governed particular territories or held some authority in those territories (Karashima 1992). The *nayankara* system originated before the Vijayanagara period in Andhra, a Telugu-speaking area to the east and northeast of the capital city. The system was greatly expanded in the sixteenth century and, in more distant parts of the empire such as the Tamil-speaking far south, came to be associated with the expansion of Telugu-speaking elites answerable to the imperial center (Talbott in press). Talbott (in press:6) cogently argues that not only the expansion of the *nayankara* system but also the sheer increase in the volume of inscriptions in the sixteenth century indicate that Vijayanagara rule during this period incorporated many more warriors and "penetrated more deeply into the local social and political landscape" of Andhra than it had previously, a point also made by Karashima (1992) for the far south.

THE FIFTEENTH CENTURY

Of particular interest here is the Middle Vijayanagara period of the fifteenth century, which has received less attention by archaeologists or historians than the century before or after. Because little new construction was undertaken at this time, the fifteenth century is less archaeologically obtrusive than the fourteenth or sixteenth centuries; only one settlement, Malapannagudi, and one reservoir can be definitely assigned to this period. Few of the major temple complexes or other large construction projects in and around the capital city clearly date to this period; a notable exception is the Ramachandra Temple complex argued by Dallapiccola et al. (1992:17–20) to have been built during the reign of king Deva Raya I (A.D.

1406–1422). Thus in terms of both regional population and monumental construction, the growth of the Early period seems to have stalled or at least stabilized in the fifteenth century.

While both the fourteenth and sixteenth centuries were periods of agricultural expansion and intensification in the region around the city,[8] little to no change in the scale or intensity of agricultural production can be detected in the archaeological or palaeobotanical records during the fifteenth century. Quite a few runoff-fed reservoirs in our survey area with sluice gates (Morrison 1993) that date to either the fourteenth or fifteenth century were remodeled in the sixteenth century. Unfortunately, our present inability to closely discriminate between reservoir sluice morphologies from the first two centuries of the Vijayanagara period seriously diminishes our ability to describe changes in this aspect of agricultural technology during the fifteenth century.

The most dramatic change in tempo during the Middle Vijayanagara period is seen in the inscriptional record, where the number of records drops off dramatically. Given the fact that each of our rather grossly delineated time periods is of equal length, there is no a priori reason to believe there should be a decline in this period. Obviously, the reason for such a change is likely to be politically and culturally complex and should not be seen as somehow reflecting simple economic or demographic change. Nevertheless, the material dimension of the inscription record, a record largely consisting of donations and gifts (Morrison and Lycett 1994, 1997), must also be emphasized, and the inscriptional lull in the fifteenth century must be partly seen as reflecting a decline in elite investment.

In apparent contrast to the record of settlement and land use around the capital, the fifteenth century saw some significant changes in military organization and a continued expansion of the empire. Stein (1989:41) explains:

> Two fundamental changes seem to have occurred around the time of Devaraya II, in the middle of the fifteenth century. First, he strengthened the military base of the kingdom by improving the quality of war horses and the training of horsemen and archers under his personal command and resources, and second, he established deeper political control over west-coast emporia, thus linking military reform with international commerce.

Changes in commercial and tax arrangements included increased demands for taxes in the form of cash and the growing use of tax farmers for the collection of revenues (Stein 1989:41–42). Further, several new territories or *rajyas* directly administered by royal agents were established on the southeast coast (Stein 1989:42) in present-day Tamil Nadu.

Among the most interesting and striking events of the early fifteenth century are several documented resistance movements by the lower classes of society in the conquered Tamil provinces. The Valangai-Idangai revolts took place in the southern part of the Vijayanagara Empire in an area recently consolidated under imperial rule (Karashima 1992) and subject to agents of the Vijayanagara conquest state. The Valangai-Idangai revolts explicitly targeted oppressive tax assessments and loss of control over land and its produce (Karashima 1992:141–158) and were directed at both local and external authorities. Although independent peasant-proprietors who owned and farmed their own land existed during this period, it appears that an increasing proportion of the agricultural land was coming under the control of a few landlords who leased it out to tenant cultivators. A powerful subtext of these revolts relates to the growing monetization of the period and resistance to expanding market mechanisms that followed both from the dependent status of tenant farmers and from demands for taxes in cash. A number of texts of the fifteenth century refer to tenants "running away" from oppressive landholders and a series of inscriptions records resistance to taxation, with taxes being levied both by the government and by landlords.

In 1429, agricultural tenants and craftspeople in the Kaveri delta of the Tamil country rose in open revolt against Brahmin and Velalla landlords and the Vijayanagara state. For a time the revolutionaries successfully negotiated lower tax rates and an end to money taxes on farmers (Karashima 1992:141–148), which forced food producers into market participation. Craftspeople, however, continued to pay taxes in cash and were thus largely dependent upon markets for food. The revolt of 1429 is described in nine inscriptions and seems to have involved a large number of people, including agricultural laborers, blacksmiths, toddy tappers, weavers, potters, carpenters, watchmen, and a variety of other professions (Karashima 1992:145–146). The primary issues of the unrest concerned oppressive taxation rates: where resolutions are known they all involve remissions of tax. Among the events that followed these revolts was the establishment of the *nayankara* system in the Tamil

country by the beginning of the sixteenth century, part of an attempt to increase administrative control over these distant provinces. Whether this was at all in response to the revolts is impossible to say.

The Valangai-Idangai revolt of 1429 as well as more limited episodes of unrest in the fifteenth century (as detailed from inscriptions dated to 1404 and 1414; Karashima 1992:151) were led by precisely those people who are most severely affected by famines in stratified, market-based societies—landless laborers and craftspeople. Furthermore, the idioms of dissent, taxation, and land control directly implicate access to productive potential, the price of food, and the problems that individuals with limited exchange entitlements face in operating within market systems.

The historical record also indicates that there were a series of famines in southern India during the early fourteenth century. The overall pattern of famines for the Vijayanagara period, while difficult to establish with any precision, is represented schematically in Figure 5. The famine of 1396 was documented as particularly severe and widespread, causing large-scale depopulation, and was said to last for 12 years (Appadorai 1936:748; Loveday 1914:17), as unlikely as that may be (cf. Watkins and Mencken 1985). The 1423–1424 famine is reported to have affected the entire Deccan, as did the famine of 1471–1472 (Appadorai 1936:748; Loveday 1914:17). The sixteenth century saw only smaller scale, more local famines, and the disastrous hungers of the fifteenth century would not be repeated again for 200 years. Not only do the famines of the fifteenth century coincide with the period of unrest just described, they also coincide with the lull in construction and settlement expansion seen archaeologically and with the trough in inscriptional activity evident in the epigraphic record.

DISCUSSION

Whether or not there is some causal link between famine on the one hand and taxpayer revolts on the other is difficult to say. However, it is certainly intriguing that issues of price and exchange entitlement, in Sen's (1981) terms—encompassing land control and market participation—were the very issues disputed and the very factors that have proven so important in the historical study of famines. The fifteenth-century famines certainly led to "distress." If that distress was differentially distributed, as is often the case in complex societies (and South India society was no less stratified, although somewhat less market-oriented, in the fifteenth century than in the nineteenth), then the primary actors in the Valangai-Idangai revolts would have been among the ranks of the most severely affected. In both the fifteenth- and nineteenth-century famines discussed here, political power as well as economic organization are clearly at issue, and both local elites and imperial/colonial rulers are deeply implicated in structures of access to land and its produce.

To return, finally, to the natural environment, one suspects that deficient monsoons were ultimately responsible for the fifteenth-century famines (and there is some sketchy documentary support for this; Loveday 1914). However, the manifestations we see archaeologically and historically (lull and unrest) have clearly been filtered through cultural practices. We don't "see" famine clearly in this archaeological record but famine clearly had consequences, consequences that are explicable only in terms of particular cultural contexts. It would be ideal, of course, to know how ecological conditions such as rainfall played out against the fifteenth-century record of famine, unrest, and stagnation in settlement expansion around Vijayanagara, but for now we can only use nineteenth-century records as weak proxies for the examination of these relationships.

In nineteenth-century South India, the correlation between rainfall variability and variability in production was not absolute, with only severe perturbations in precipitation having predictable consequences. Smaller perturbations sometimes did and sometimes did not lead to widespread subsistence distress (depending on many cultural factors) and, of course, subsistence distress was a markedly uneven phenomenon across social classes. One might note that only one European died in the 1876 famine—a revenue commissioner already suffering from malaria, while out on tour in his district (of unspecified causes; Digby 1878:275). Because we can measure ecological parameters such as rainfall more easily and accurately than production and distribution of foodstuffs does not mean that ecological parameters *directly* reflect human experience, especially where the landscape is itself partly anthropogenic and where both production techniques and networks of entitlement and distribution are complex. The dry zones of South India were in a sense "subject to famine" (McAlpin 1983) as the British believed, but the "nature" of such disaster reflected *both* human action and meteorological variation.

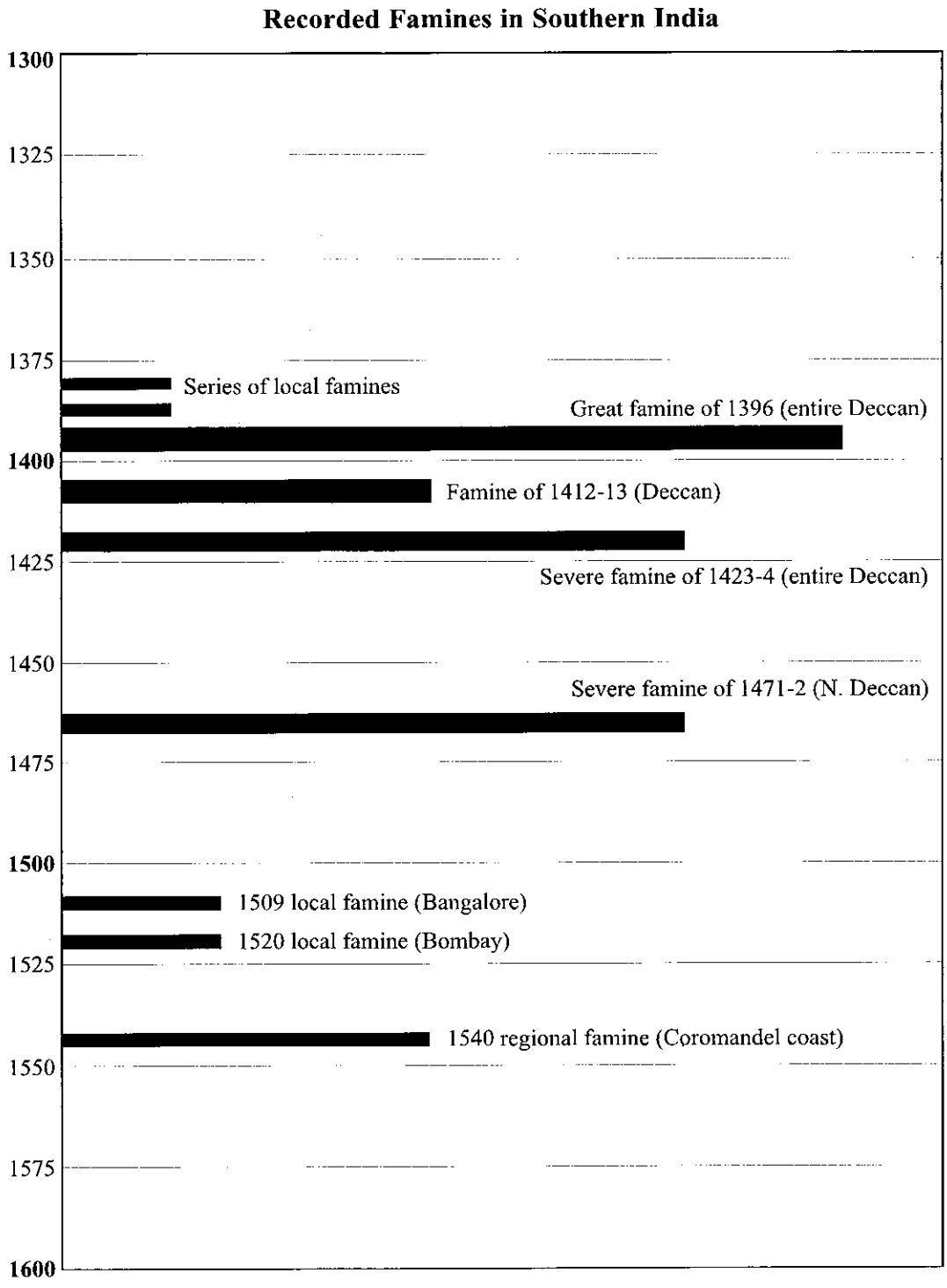

Figure 5. Schematic diagram of South Indian famines from the Vijayanagara period. Bars reflect estimated intensity and spatial extent of famine. Data from Appadorai 1936; Karashima 1992; Loveday 1914.

NOTES

1. The estimation and understanding of famine mortality is a complex issue, particularly given the close relationship between famine and epidemic disease (Alamgir 1980; Watkins and Mencken 1985).

2. Not all greeted Malthusian adjustment with unalloyed enthusiasm. Dr. Cornish, a British official working in Cuddapah District during the 1876 famine, wrote (Digby 1878:112):

> I often regret that I have not a photographer temporarily attached to my office while moving about amongst the famine stricken people of this Presidency [Madras]. Words, at best, can but feebly represent the actual facts, but if the members of Government could see the living skeletons assembled at feeding-houses as I see them, I do not think there would be much hesitation in arriving at a conclusion that the condition of the lower classes of the labouring poor of this district is most critical, and that the "weeding out" or reduction process, of which we have heard so much, may possibly have gone to greater lengths than may have been desired.

3. Orcutt (1993), for example, employs the Palmer Drought Severity Index (PDSI) for the northern Rio Grande region (Rose et al. 1982), a measure of rainfall estimated from tree-ring records. This rainfall record is then taken to stand for realized agricultural production, the latter then implicated in specific cultural reconstructions. Orcutt explains (1993:89), "The mean PDSI is a proxy for mean agricultural production. The variance is a proxy for variability in production. The autocorrelation coefficient (ACF) for lags in one to five years is a proxy for predictability in production." Whether or not production (and later consumption) can be seen to mechanically reflect rainfall is certainly something which can be empirically evaluated.

4. Mann's study was based in the Bombay Presidency and thus did not include Bellary District. Here I select data from Sholapur District as an illustration of his method, partly because the rainfall characteristics of this district are similar to those of Bellary.

5. One reason for this, of course, is that local agricultural practices in areas with a high degree of variability in precipitation are oriented toward mitigating the effects of that variability, even at the cost of apparently less "efficient" production.

6. The report of the Famine Commission of 1901 (cited in Dasgupta 1993:58), for example, noted, "It may be laid down as a general rule that any unusual or aimless wandering of men or herds in search of food or water is a sure sign that famine has already begun and that relief is urgently required."

7. Digby described part of the new famine code, in which applicants for employment at public works were to be submitted to three "tests" of their suitability:

> *(a)* The distance test—which shows that he is willing to labour at a distance from his home, not returning there at night but being hutted on the work.
> *(b)* The wage test—i.e., that he receives a wage calculated to provide a bare subsistence for himself, but not enough to support any non-working member of the family.
> *(c)* The task-work test—i.e., that he performs a daily task proportioned to his strength (1878:483).

8. I distinguish between spatial *expansion* into new areas, for example, the sixteenth-century expansion of agriculture and settlement into the Daroji Valley south of the city (Morrison 1997), and changes in the organization of production that lead to more *intensive* use of a particular area. For example, in the area north of the Tungabhadra River, our survey results indicate that runoff-fed reservoirs were replaced by canal irrigation, probably in the sixteenth century.

REFERENCES

Alamgir, M.
1980 *Famine in South Asia: The Political Economy of Mass Starvation.* Oelgeschlager, Gunn, and Hain, Cambridge.

Appadorai, A.
1936 *Economic Conditions in Southern India (A.D. 1000–1500).* University of Madras, Madras.

Caratini, C., M. Fontugne, J. P. Pascal, C. Tissot, and I. Bentaleb
1991 A Major Change at ca. 3500 years B.P. in the Vegetation of the Western Ghats in North Kanara, Karnataka. *Current Science* 61:669–672.

Dallapiccola, A. L., J. M. Fritz, G. Michell, and S. Rajasekhara
1992 *The Ramachandra Temple at Vijayanagara.* Manohar and American Institute of Indian Studies, Delhi.

Dasgupta, A.
1993 *A History of Indian Economic Thought.* Routledge, London and New York.

Digby, W.
1878 *The Famine Campaign in Southern India (Madras and Bombay Presidencies and Province of Mysore).* Longmans, Green, London.

Karashima, N.
1992 *Toward a New Formation: South Indian Society under Vijayanagar Rule.* Oxford and IBH, Delhi.

Kelsall, J.
1872 *Manual of the Bellary District: Compiled under the Orders of Government.* Lawrence Asylum Press, Madras.

Kulke, H.
1995 Introduction: The Study of the State in Pre-modern India. In *The State in India 1000–1700,* edited by H. Kulke, pp. 1–47. Oxford University Press, Bombay.

Loveday, A.
1914 *The History and Economics of Indian Famines.* Reprinted (1984) by Usha Publications, New Delhi.

Mann, H.
1955 *Rainfall and Famine: A Study of Rainfall in the Bombay Deccan, 1865–1938.* Indian Society of Agricultural Economics, Bombay.

McAlpin, M. B.
1983 *Subject to Famine: Food Crises and Economic Change in Western India, 1860–1920.* Princeton University Press, Princeton.

Morrison, K. D.
1993 Supplying the City: The Role of Reservoir Irrigation in an Indian Urban Landscape. *Asian Perspectives* 32:133–151.
1994 Monitoring Regional Fire History through Size-Specific Analysis of Microscopic Charcoal: The Last 600 Years in South India. *Journal of Archaeological Science* 21:675–685.
1995 *Fields of Victory: Vijayanagara and the Course of Intensification.* Contribution No. 53. Archaeological Research Facility, University of California, Berkeley.
1997 Agriculture at the Edges: Archaeology and History in the Vijayanagara Hinterland. In *South Asian Archaeology 1995,* edited by B. Allchin, pp. 783–791. Oxford and IBH, New Delhi.

Morrison, K. D., and M. T. Lycett
1994 Centralized Power, Centralized Authority? Ideological Claims and Archaeological Patterns. *Asian Perspectives* 32:327–350.
1997 Inscriptions as Artifacts: Precolonial South India and the Analysis of Texts. *Journal of Archaeological Method and Theory* 4(3/4):215–237.

Morrison, K. D., and C. M. Sinopoli
1992 Economic Diversity and Integration in a Precolonial Indian Empire. *World Archaeology* 23:335–352.

Orcutt, J.
1993 Villages, Field Houses, and Land Use on the Southern Pajarito Plateau. In *Papers on the Early Classic Period Prehistory of the Pajarito Plateau, New Mexico,* edited by Timothy Kohler, pp. 87–104. Reports of Investigations 65. Department of Anthropology, Washington State University, Pullman.

Rose, Martin R., William J. Robinson, and Jeffrey S. Dean
1982 Dendroclimatic Reconstruction for the Southeastern Colorado Plateau. Final Report submitted to the Division of Chaco Research, National Park Service. Laboratory of Tree-Ring Research, University of Arizona, Tuscon.

Schwartzberg, J. E.
1992 *A Historical Atlas of South Asia,* second printing. Oxford University Press, New York.

Sen, A.
1981 *Poverty and Famines: An Essay on Entitlement and Deprivation.* Clarendon Press, Oxford.

Sewell, R.
1900 *A Forgotten Empire (Vijayanagar): A Contribution to the History of India.* S. Sonnenschein, London.

Sinopoli, C. M., and K. D. Morrison
1995 Dimensions of Imperial Control: The Vijayanagara Capital. *American Anthropologist* 97:83–96.

Spate, O. H. K.
1954 *India and Pakistan: A General and Regional Geography.* Methuen, London.

Stein, B.
1980 *Peasant State and Society in Medieval South India.* Oxford University Press, Delhi.
1989 *Vijayanagara.* The New Cambridge History of India, Vol. 1, part 2. Cambridge University Press, Cambridge.

Talbot, C.
in press The Nayakas of Vijayanagara Andhra: A Preliminary Prospography. In *Structure and Society in Early South India: Essays in Honour of Noboru Karashima,* edited by Kenneth R. Hall. Oxford University Press, Delhi.

Watkins, S. C., and J. Mencken
1985 Famines in Historical Perspective. *Population and Development Review* 11:647–675.