

Land Use and Settlement in the Vijayanagara Metropolitan Region: Results of the Vijayanagara Metropolitan Survey

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The first capital of the Vijayanagara empire was founded in the mid-fourteenth century and grew with extraordinary rapidity to one of pre-modern India's largest cities. The city of Vijayanagara (modern Hampi) was abandoned with even greater haste in A.D. 1565, resulting in large-scale depopulation of the region and ending a period of dramatic demographic change. In the rugged granitic outcrops and dissected landscape of the semi-arid uplands of the Karnataka plateau, the rulers and inhabitants of Vijayanagara undertook massive construction projects, both to create the monumental urban vistas so well known to scholars and tourists, and to alter the natural landscape to meet their needs for security, transport, and the production and procurement of food stuffs and craft products. The Vijayanagara Metropolitan Survey (VMS) archaeological research project seeks to document and analyze this pattern of regional development and abandonment and to examine the impact of the imperial capital on its surrounding region.

THE VIJAYANAGARA METROPOLITAN SURVEY :

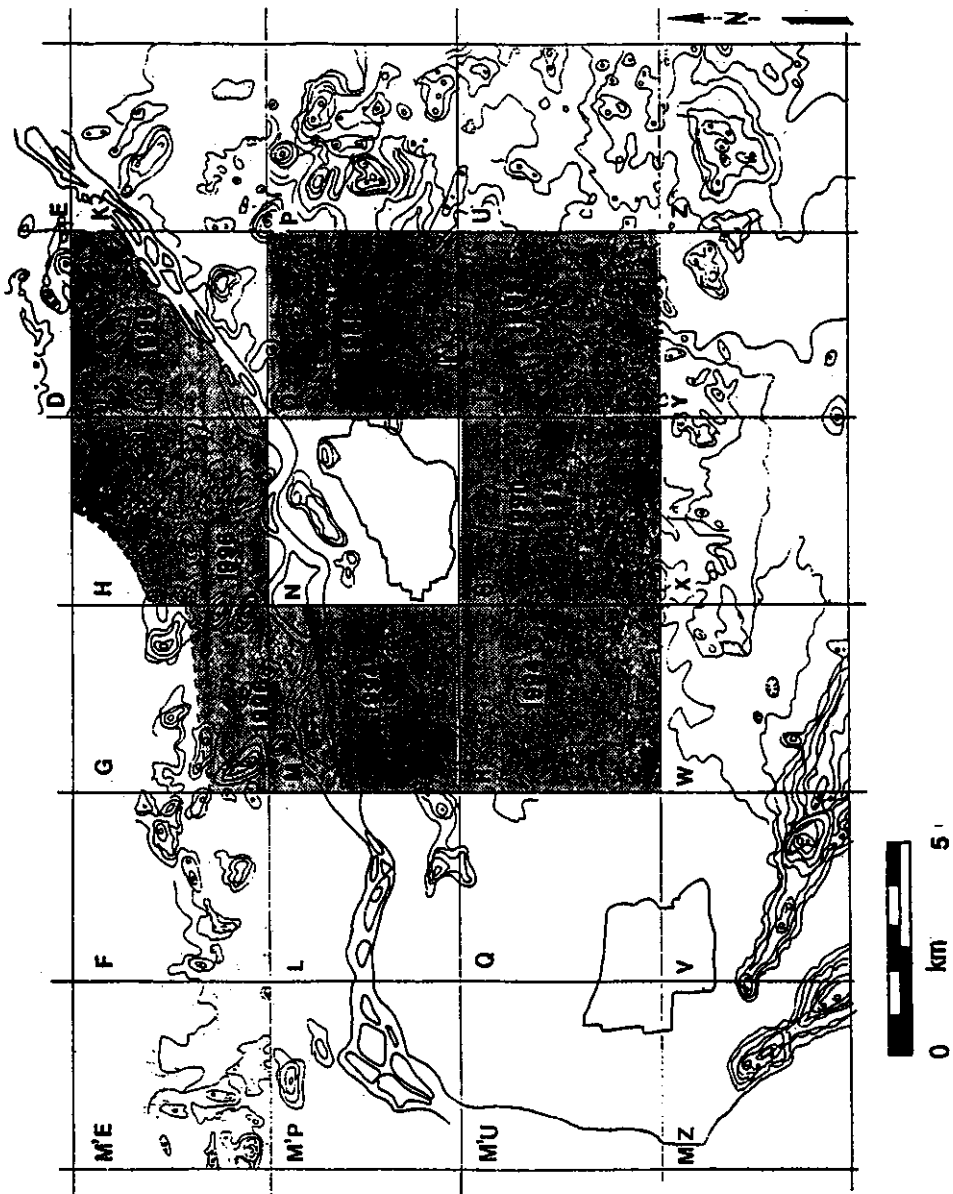
GOALS AND METHODS

The Vijayanagara Metropolitan Survey was initiated in 1987 as an outgrowth of the intensive archaeological research undertaken in the urban

core by the Archaeological Survey of India, the Government of Karnataka, and teams of foreign scholars. While these earlier projects have focused on the monumental remains and artifacts of the densely settled center of Vijayanagara, the VMS has sought to examine the city's suburban area or "greater metropolitan region". We have defined the metropolitan region as encompassing an area of c. 350 sq. km., delimited by a combination of topographic (the high outcropping hills to the north of the river) and cultural (the outermost fortification walls) features. The region has been further subdivided into 28 blocks, each 4.5 km. on a side, following the mapping scheme developed by Fritz and Michell¹ for the urban core. Our survey project has focused most intensively on the eight blocks immediately surrounding the Vijayanagara urban core (Block N) – Blocks O, S, T, M, R, G, H, J — with more limited exploration in the outlying blocks² (Map 3).

A 50% random sample was selected for survey in each of the eight intensively studied blocks. Each block was subdivided into 18 north-south transects (250 m. wide x 4.5 km. long) and half (nine transects) were selected for survey using a random numbers table. Teams of 3-6 members, spaced 20 meters apart, systematically walk each transect, using compasses to align along north-south orientations. This close spacing and systematic coverage assures that even very small sites will be located, allowing for a much more complete understanding of human use of the metropolitan region than would be possible through a less rigorous research strategy.

Once sites have been located, they are mapped and photographed and a textual description is prepared on standardized forms. Artifacts are collected and detailed analyses are conducted on ceramics, lithics, and other materials. Site location is recorded on 1:25,000 base maps, and is measured using a hand-held Global Positioning System (GPS), which uses satellite signals to precisely calculate latitude and longitude.



ARCHAEOLOGICAL REMAINS IN THE METROPOLITAN REGION

More than 600 archaeological sites have been recorded in the Vijayanagara metropolitan region over six seasons of survey (from 1987-1996). They range from very small features including isolated structures, shrines, or erosion control walls, to massive sites such as settlements, temples, roads, reservoir embankments, and fortification systems. The frequencies and distributions of these various site types provide evidence for a complex use and transformation of the landscape throughout the Vijayanagara period, with intensive investment in defense, agricultural production, sacred monuments, and settlements. This investment was temporally discontinuous, with an initial burst of construction occurring in the mid-late 14th century following the founding of the capital, and a second major period of expansion of settlement, agricultural activities, and other constructions occurring in the sixteenth century, under the Tuluva dynasty.³ In the discussion that follows, we briefly describe the kinds of remains identified in the metropolitan region and consider some of general patterns in their spatial and temporal distribution.

AGRICULTURAL PRODUCTION

The semi-arid and rocky landscape of the region around the city of Vijayanagara poses particular difficulties for agriculturalists. Among these are low and uncertain rainfall, shallow soils, and the danger of erosion on the steeper slopes. However within this challenging environmental context, Vijayanagara was situated in an area particularly suited to the development of intensive irrigated agriculture, along a section of the Tungabhadra River characterized by small alluvial plains caused by river bends and by a low degree of downcutting. These natural features, along with concerted efforts made by generations of farmers, laborers, and others, allowed for the development of a zone of highly productive irrigated agriculture both east and west of the city on both river banks.

The Vijayanagara canal network is well known and, as others have already noted,⁴ it was a product of several hundred years of growth. However, not all canals can be securely dated and the continued use of the entire system (and its subsequent enlargement) have obscured many physical features that might aid in such reconstructions. In spite of this, it is possible to outline the tempo of canal construction. These parallel the

general patterns of urban growth discussed above, with major periods of construction in the mid-fourteenth and the early sixteenth centuries.

Some archaeological features related to the pre-modern configuration of the Turtha canal⁹ (Hiriya Kāluve,) and the Ānegundi channel have been documented in the course of the Vijayanagara metropolitan survey. Among these are VMS-472 and VMS-473, the diversion weir or anicut that diverts water from the river to feed the Turtha canal. Although much repaired, some of the original construction of the low walls of granite blocks and slabs, sometimes joined by iron clamps, is apparent. The Ānegundi anicut (VMS-585) has been similarly modified, but it is clear that its construction was somewhat different. Situated in a smaller river channel than the Turtha anicut, this weir was built as a low platform or paving of flat slabs and blocks. Like its counterpart on the south side of the river, the modest height of the weir allowed excess water to flow over the top and protect the canal from scouring floods and the weir itself from damage. Other archaeological features associated with these two canals include VMS-484 and VMS-586, massive constructions of stepped masonry that both created a base for elevated portions of the canal and provided outlets for water to fields below. One fragmentary section of the Ānegundi channel (VMS-564) even had two bastions built into it.

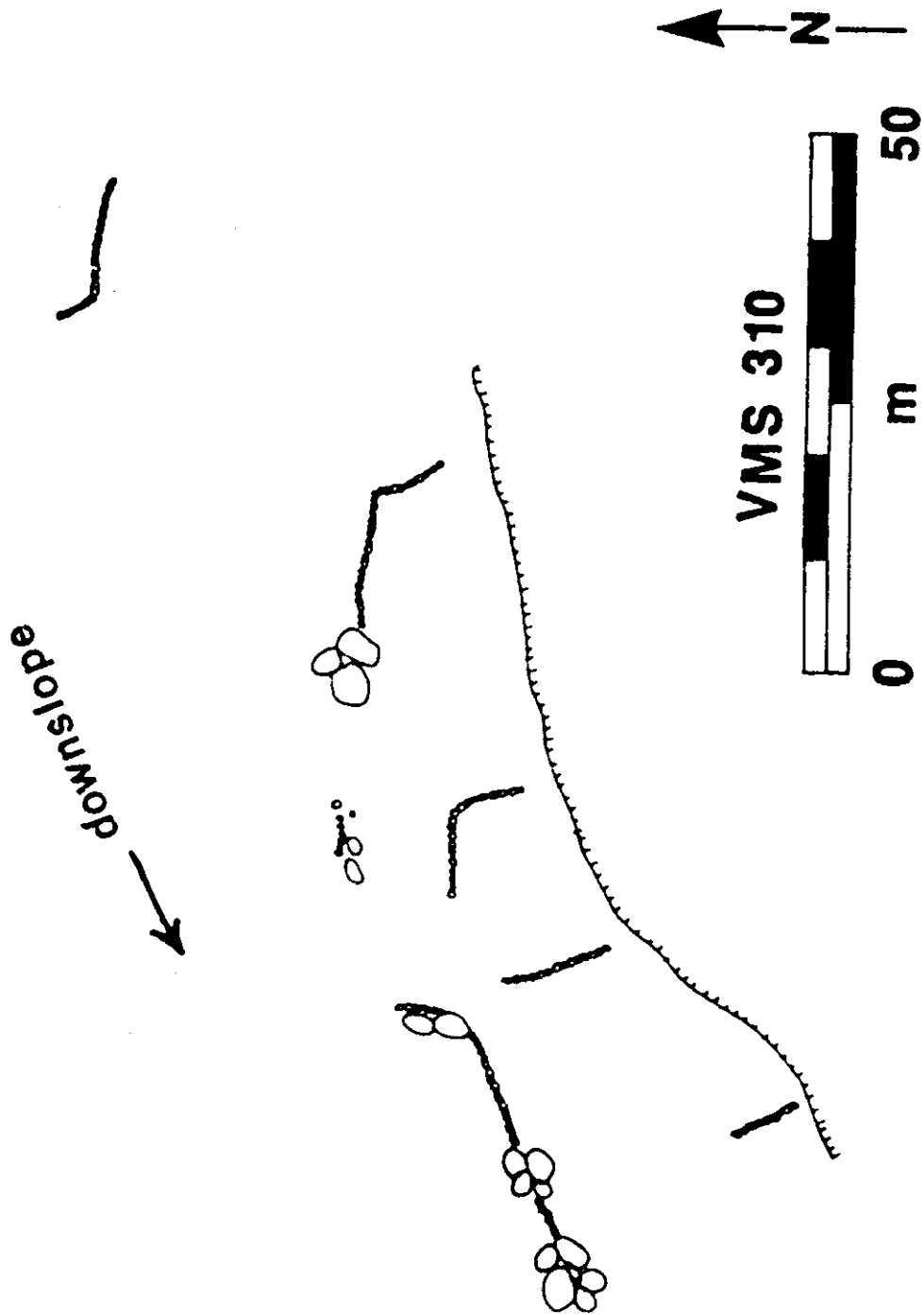
The Vijayanagara canals and associated features such as a massive aqueduct that brings water to an island north of city, and the canal-fed reservoirs at Sangapuram and Kamalapuram, provided a reasonably secure water supply, sufficient for double cropping and for such water demanding crops as rice, vegetables, and coconuts. That the irrigated areas were considered important is apparent by their integration into the defenses of the city, especially on the southern river bank, by the placement of settlements near but not on irrigated land, and by the low artifact densities in wet fields, suggesting that few nonagricultural activities took place there.

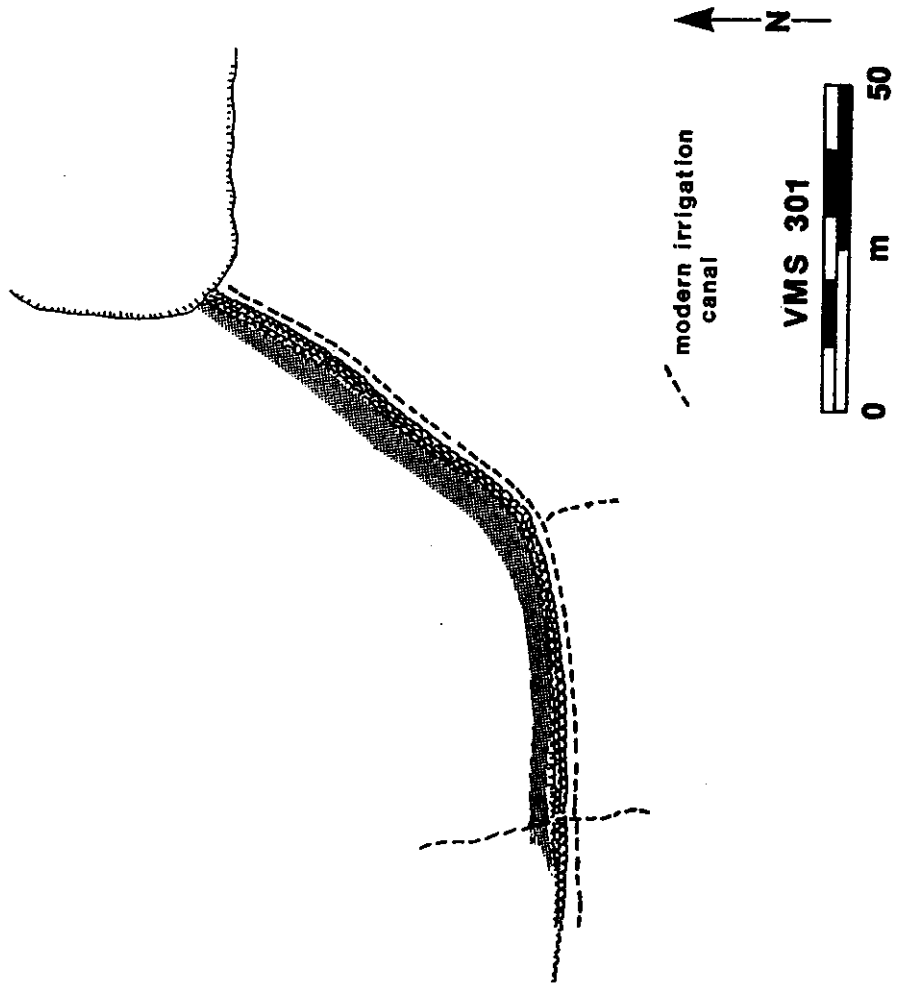
As important as perennial irrigation was the Vijayanagara economy, it characterized only a small portion of the land under cultivation. Perhaps most extensive were the dry fields that relied solely on rainfall for their maintenance. These are little reported upon in contemporary inscriptions or texts, but are nonetheless abundantly evident archaeologically. Among the many features related to dry farming are check-dams (wall placed

across drainage channels to slow down or divert rain fall runoff; (Figure. 5), erosion control and terrace walls, and gravel-mulch fields.

Reservoirs played an important role in the Vijayanagara agricultural landscape⁶ (Figure. 6) allowing for water storage and the cultivation of crops with relatively high water requirements even in areas where canals could not be constructed. Reservoirs also supplied the domestic water needs of settlements. Reservoirs tapped seasonal runoff behind large masonry-faced earthen embankments, distributing water to fields below through tunnels built into the embankment. Water flow was controlled by sluices, which are highly distinctive in this period. Some reservoirs were less formal, having either no sluices (and thus allowing for cultivation only in the bed of the reservoir itself) or simple overflow channels consisting of large piles of boulders. Reservoirs also, by virtue of their size and ubiquity, presented opportunities and obstacles to transport, structuring the placement of roads and paths to a high degree.

The VMS has allowed us to consider the placement of dating of reservoirs in a regional context. Although space does not allow a detailed discussion here, it is apparent that there were several distinct episodes of reservoir construction in the region, the first in the mid-fourteenth and the second in the early sixteenth century. Unlike canals, however, the pace of reservoir construction was much greater in the later period. Some spatial patterns are also evident. In the area north of the Tungabhadra river, survey work suggests that reservoirs were primarily constructed during the Early Vijayanagara period (consonant with the early settlement focus in that area) and that many of these reservoirs were superseded by the construction of the Ānegundi channel. Reservoirs in the area to the immediate west, south, and east of the city appear to span the Vijayanagara sequence, with the Early, Middle, and Later periods presented. Further south and west are two regions of Late Vijayanagara agricultural expansion, expansion facilitated to large extent by systems of physically linked reservoirs. These areas are the Daroji valley to the south and the Dhanayakanakere system to the southwest of the city, near Hospet. Thus, the pattern of agricultural expansion and the forms of agricultural production in the metropolitan region were both diverse and variable, with sequences of change differing in form and timing.





NON-AGRICULTURAL PRODUCTION : CRAFT AND INDUSTRIAL SITES

Along with assuring adequate supplies of foodstuffs, through local production and trade, Vijayanagara's inhabitants also required large quantities of craft goods – both of utilitarian products to meet household needs and of luxury goods to serve the royal court and the capital's elite residents. The many thousands of fragments of earthenware ceramics that litter the surface of the urban core and metropolitan region attest to the large scale of ceramic production that must have occurred in the region during the Vijayanagara period. Although no production facilities have been identified, and are unlikely to be preserved due to the presumed nature and small scale of production facilities ⁷ the low-fired earthenware ceramics were made of locally available raw materials and are unlikely to have been transported long distances. It is likely that numerous pottery workshops were located in and around the metropolitan region.

More definitive archaeological evidence has been found for iron smelting for the production of iron implements. The Sandur Hills, one of South Asia's richest sources of iron ores, forms the southern border of the metropolitan region, and was an important source of ores for the area's inhabitants. Seven iron processing sites have been recorded in the survey. These are defined by the presence of extremely high densities of iron slag and vitrified ceramic and brick materials. More than two dozen sites with lower slag densities were also noted (often in the context of settlement sites), suggesting that metallurgical activities were relatively widespread throughout the region. Fragments of a copper crucible ⁸ were found in a midden deposit of a Vijayanagara period settlement in the Daroji Valley.

The quarrying and shaping of stone, for reservoirs, structures, and sacred images was also widespread throughout the metropolitan region. Distinctive quarry marks are preserved on outcropping boulders across the area, and indicate that building materials were typically quarried and shaped near construction sites, rather than being hauled long distances. A number of unfinished structures or images have been recorded — including one small shrine (VMS-79) whose construction was halted following collapse of an overhanging stone on top of it. Columns in various states of completion are found in association with this structure, suggesting that the sculptors had worked at the building site itself. Unfinished

Hanuman sculptures (VMS-538, VMS-567) in two sites, also attest to the mobility of image sculptors.

Not surprisingly, no evidence has been found for the production of ornaments or goods of highly valued materials — since such materials would likely have been removed or carefully curated by their producers or others. Similarly, limited evidence has been found for textile production — the sole indicator being a possible spindle whorl found on the surface in a small settlement site.

DEFENSE AND FORTIFICATIONS

The Vijayanagara Metropolitan Region, like the capital's urban core, contains numerous features associated with defense and fortification. Although the popular conception, derived from the writings of foreign visitors, of "seven rings" of walls surrounding the capital cannot be sustained, it is clear that Vijayanagara's rulers were concerned with protecting routes of movement into and out of the capital. Vijayanagara's defensive features take several forms and include hilltop fortresses, defensive walls, watch towers or bastions, and "horse stones". As noted earlier, other features of the Vijayanagara metropolitan landscape, also served defensive functions. The long walls of reservoirs embankments and the seasonal ponds beyond them, as well as the complex network of canals and wet irrigated areas provided significant barriers to movement across the region, and this helped to channel movement along predetermined routes that could be monitored.

The outskirts of Vijayanagara appear to have been protected by several small hilltop fortresses, located in areas that afforded excellent views in several directions. Three such fortresses have been documented as of the 1996 field season and several more have been noted for future documentation. Particularly to the north of the Tungabhadra River these forts seem to form of line of defense, extending from east to west paralleling the river course. Forts documented to date include: VMS-6, located to the south of the urban core near the Sandur Hills (Figure. 7), VMS - 1009 on the outskirts of the settlement of Papinayakanahalli, and VMS - 591 to the north of the Tungabhadra, southwest of Ānegundi.

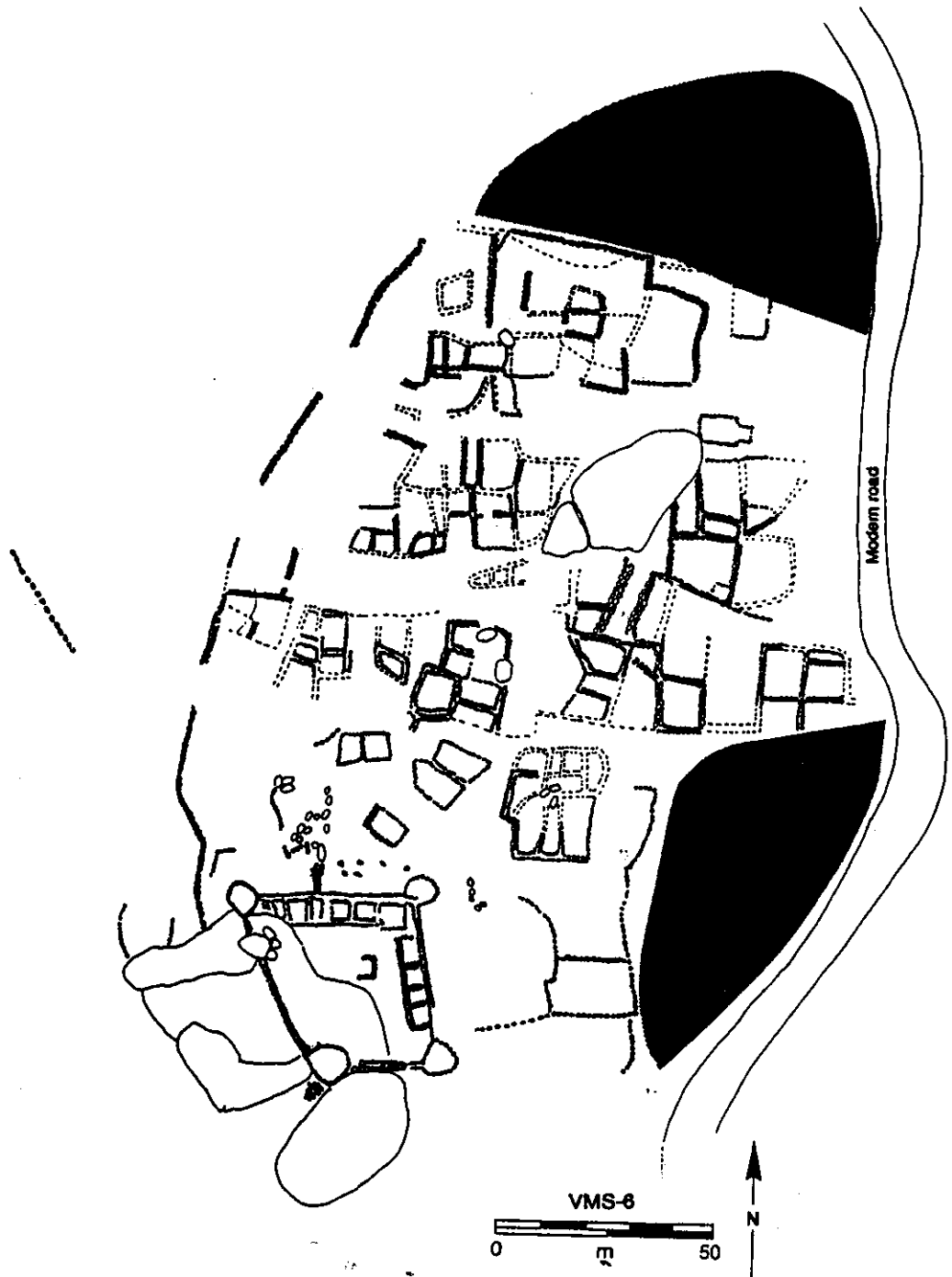


Figure - 7 : VMS-006, Fort and Associated Settlement, Hampi

Site VMS - 591 extends over an area of c. 3 ha. (310 x 100 m.) along the upper slopes of a high outcrop rising from the northwest to southeast. An extraordinary view of the urban core and terrain to its south, and the Tungabhadra river valley to the east and west is afforded from the uppermost point of this heavily fortified settlement. Within the fort walls are a number of room blocks, water tanks, and circular storage structures, suggesting that this fort was regularly occupied by personnel responsible for maintaining watch over the surrounding region.

Several segments of fortification walls have been recorded by the VMS. These walls were situated to take advantage of the region's rugged terrain. They span low-lying areas between outcrops, but frequently do not extend over the top of more rugged hills, which were themselves effective barriers to movement. The scale and construction of walls (and hence labor investment in their manufacture) vary considerably, from formal well-constructed masonry block walls ten or more meters in width to smaller walls constructed of unmodified or split stones and boulders. Natural features, such as large outcropping boulders are often incorporated into the constructions. Along with these wall segments, Vijayanagara period towns and settlements were also often walled.

Fortification walls documented by the VMS include the outer walls of the urban core (VMS - 10, VMS - 123, VMS - 451, VMS - 455, VMS - 509) and of Ānegundi (VMS - 527, VMS - 529, VMS - 548). These masonry wall segments are typically well constructed, of several course of well-fitted trapezoidal blocks and range from c. three to twelve meters in width. Bastions are often present, and the walls are spanned by gates at regular intervals. The construction of the outer walls of the urban core, particularly in Blocks S and O to the southeast, seem to coincide with the dramatic expansion of settlement in that area in the early sixteenth century. Included among the less formal wall segments is a more than two kilometer long wall (VMS - 339) that extends south-southwest across Block T, terminating in the south near a fortified Vijayanagara settlement (VMS - 365). This wall is constructed of unmodified medium to large (30-60 cm) stones and boulders, and ranges from one to five meters in width. Its present height ranges from one to three meters, though it has clearly been much disturbed

from its original condition. Numerous similarly constructed, if smaller, wall segments have been recorded throughout the region.

Other defensive features include small circular or rectangular watch towers or bastions, located in or bordering settlements and along roads, and 'horse stones' — rows of parallel boulders placed in low-lying areas to impede cavalry charges. Although known from historical sources, few extant remains of horse stones remain in the metropolitan region. Site VMS - 558 consists of a c. 110 m. long section of such stones, consisting of three and four rows of c. 1 m. high boulders placed at intervals of 1 - 1.5 m. apart.

Taken together, these sites provide evidence that Vijayanagara's rulers and inhabitants expended considerable labor and resources on creating the spatial boundaries of capital which served to protect and enclose the population and fields that lay within them, and on monitoring movement and other activities both into and within the metropolitan region.

TRANSPORTATION NETWORKS

Numerous road segments and structural alignments indicating the presence of roads have been documented in the course of the survey. Perhaps the most striking are the well-defined radial roads leading into the city. In Block O, to the east of the city, a well-defined route runs through Venkatapuram (with its adjacent Vijayanagara period counterpart, VMS - 2), Bukkasāgara (VMS - 101), and beyond. Among the many features lining the route are the ornate step well VMS - 112, a gateway, VMS - 93, and a small but well-built two room structure (VMS - 64) built into the long road wall defining the north side of the route. To the southeast of the city, another long roadway runs across the northern part of Block T. This route is marked by road walls (VMS - 326, VMS - 360), an Early Vijayanagara temple (VMS - 317) and is partly defined and restricted by several large reservoirs. To the west of the city, a road runs from the city toward Hospet through the towns of Malapaṇṇagudi, Koṇḍanāyanakana-halli, and Anantasayanagudi, all of which show evidence of Vijayanagara period occupation. Numerous small shrines and wells also define the course of this road, which is closely paralleled by a modern one.

The radial roadways, while striking, are not the only roads identified in the survey. Numerous smaller roads and paths, many of them defined by

walls or with cobbled surfaces, cross the intensively surveyed blocks, particularly in areas south of the Tungabhadra river. Particularly interesting are the large number of roads identified in Block M, to the west of the city. This area is served by both the Turtha and Kalaghatta canals, as well as by their numerous branches, and is under year-round irrigated cultivation. That this situation obtained in the Vijayanagara period, seems clear not only because these two canals were constructed in the Vijayanagara period, but also because there are few artifacts or other traces of settlement or nonagricultural land use (other than a few temples) in this area. In this area, even given the hundreds of years of land surface modification, fragments of roads are found on many of the higher islands of outcropping boulders, many of them oriented east-west (e.g. VMS - 449, VMS - 470, and VMS - 471). This density of roads may relate to the movement of agricultural produce from this productive irrigated zone into the nearby city on the east. In addition to the relatively clear evidence provided by road segments, several other routes of movements can be inferred on the basis of both opportunities and constraints to traffic. The latter include fortification walls, high outcrops, reservoir beds, and low-lying irrigated ground, while the former include the raised embankments of reservoirs and natural passes on the rocky outcrops.

SETTLEMENTS

Settlement sites recorded by the VMS take a number of forms, including isolated structures and inhabited rockshelters, artifact scatters, and nucleated settlements often enclosed within fortification walls. Settlement location was affected by a number of factors, including (1) proximity to the urban core, (2) proximity to roads, and (3) proximity to water sources, agricultural fields, and other resources.

The urban core of Vijayanagara and the associated center of Ānegundi were both the densest focus of settlement within the metropolitan region and played a significant role in influencing or determining the location of other settlements across the region. As the city's population expanded in the early sixteenth century, the area between the inner and outer city walls to the southeast of the urban core (Blocks S and T) became densely settled. The earlier town of Kamaḷapur became incorporated within the city walls,

and a new settlement, Varadadēvi-Ammana-Paṭṭana, was founded to its east.⁹ Kamalāpur and Varadadēvi-Ammana-Paṭṭana together came to form virtually a continuous band of dense occupation extending from the urban core to its south and southeast. A somewhat similar pattern of settlement on the edge of urban areas is evident in Site VMS - 550, a c. 4.5 ha. walled settlement that is located along the edge of an outcrop, adjacent to a segment of the outer fortification walls of Ānegundi (VMS - 548).

Other nucleated settlements identified by the VMS are located along major roads into the capital. As noted above, the settlements of Hospet, Anantasayanagūḍi, Koṇḍanāyanakana-halli, and Malapaṇṇagudi lay along the major radial road that extended southwest from the urban core, while the settlements of VMS-101, and Bukkasaggara lie along the northeast road (to Kampli). These settlements are typically fortified, with the c. 20 ha. settlement of Malapaṇṇagudi, for example, fully enclosed within well constructed dry masonry walls, with access *via* massive gateways on the west and east. The town thus lay along a major road leading into the urban core, and no doubt played an important strategic role in monitoring and controlling movement into that area.

The third factor that affected location of nucleated settlements appears to have been proximity to agricultural fields. Settlements VMS-35-37¹⁰ (Figure. 8), VMS-365¹¹ VMS-518, and VMS-513 are all located on the edges of outcrops near low-lying irrigated fields. This would have allowed the inhabitants to take advantage of the defensive characteristics of the outcrops while not encroaching on to potential arable areas. These agricultural settlements are characterized by rectangular rubble wall structures and small walled compounds.

Other sites provide evidence of shorter-term occupations in the metropolitan region. Rock shelters often containing pottery sherds, game boards, lithic and other remains suggesting limited occupation by travelers or herders; and low densities scatters of artifacts in or near agricultural areas may result either from discard practices (i.e., manuring) or brief occupations by small groups.

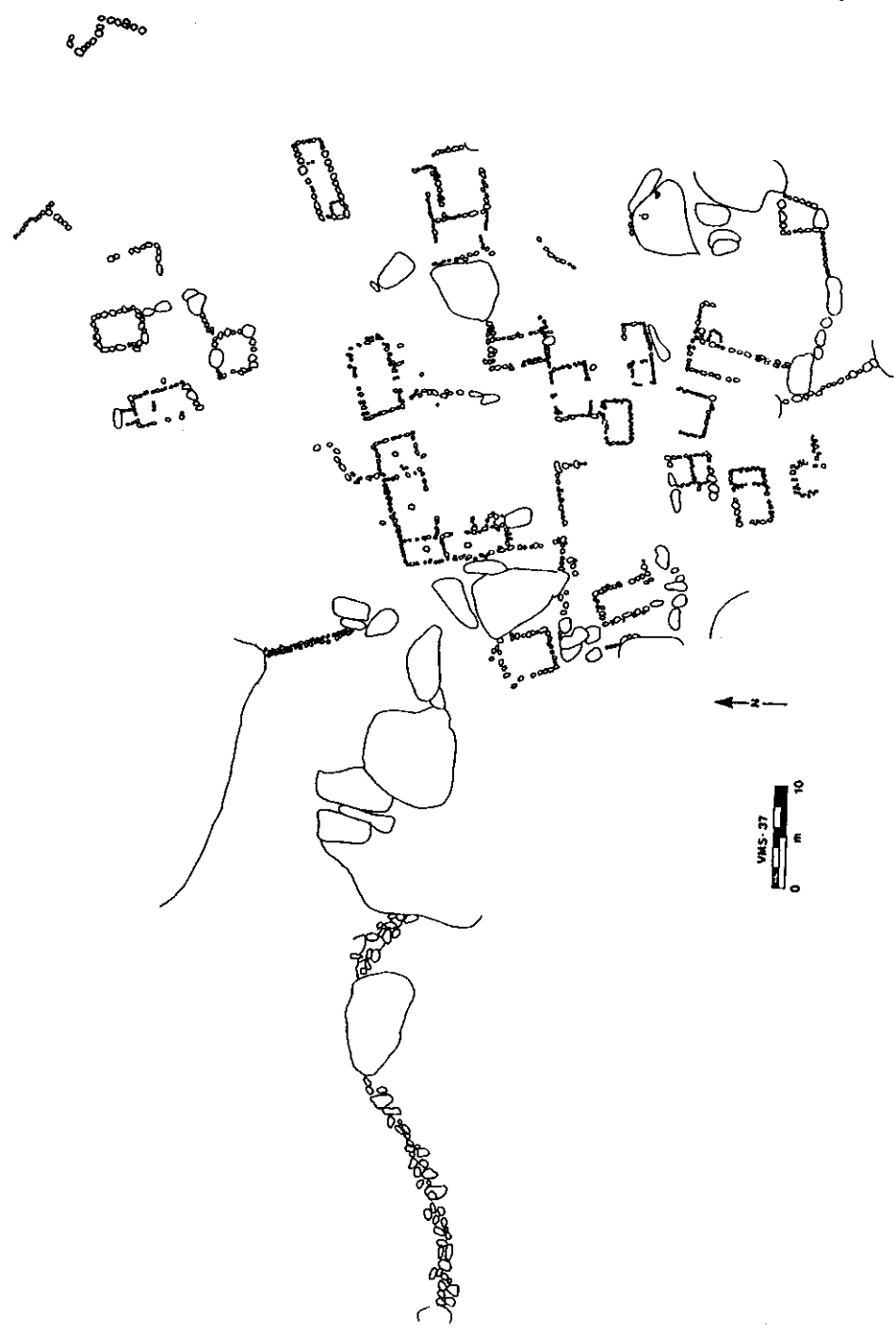


Figure - 8 : VMS-037, Nucleated Settlement, Hampi

TEMPLES, SHRINES, AND SACRED PLACES

The landscape surrounding the city of Vijayanagara contains the remains of a large number and rich array of temples and temple complexes, shrines, sculptures, tombs, and other sacred and memorial locations. Nearly one quarter of the sites recorded consist in whole or in part of sacred images or architecture.¹² Sacred sites occur in a wide range of contexts, along roads and gateways, in settlements, on hilltops, in association with agricultural sites, and in isolated locales. They vary widely in size, complexity, distributions and sponsorship, from imperial constructions such as the famous multi-hectare Paṭṭābhirāma temple complexes and other large walled multi-shrine temple complexes (e.g. VMS-142, VMS-164), to small household and village shrines, and isolated sculptures. Temples and shrines are dedicated to a broad range of Vaisnavite and Saivite deities; Hanuman, Ganesha, and Lingam and Nandi are the most popular depictions on isolated boulders, sculptures, and boundary stones found across the region. Hero and sati stones and Muslim tombs are also found.

CONCLUSIONS

The Vijayanagara Metropolitan Survey is providing important new information on land use, settlement, and economy of the imperial capital of Vijayanagara. These data provide important supplements to archaeological and architectural data from the city core, occupied predominantly by Vijayanagara's rulers and elites, and to historical sources, which also are mute about many economic practices and large segments of the region's population. Through systematic documentation of the all range of archaeological remains in the metropolitan region, we are able to document patterns of settlement, expansion and abandonment of the region as responses both to broader political changes and local conditions.

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REFERENCES AND NOTES

1. Fritz, John M. and George A. Michell, Map Series on Cultural Remains of Vijayanagara., in *Vijayanagara, Progress of Research 1983-84*, Ed. by M.S. Nagaraja Rao, pp. 164-197, Directorate of Archaeology and Museums, Mysore, 1985.
2. Sinopoli, Carla M., and Kathleen D. Morrison, The Vijayanagara Metropolitan Survey: The 1988 Season, in, *Vijayanagara: Progress of Research, 1987-88*, Ed. by D.V. Devaraj and C.S. Patil, pp. 55-69, Directorate of Archaeology and Museums, Mysore, 1991; Archaeological Survey at Vijayanagara, *Research and Exploration* 8(2): 237-239, 1992.
3. Morrison, Kathleen, D., *Fields of Victory: Vijayanagara and the Course of Intensification*, Contributions of the University of California Archaeological Research Facility, No.53, Berkeley, 1995; Morrison, Kathleen D., and Mark T. Lycett., Centralized Power, Centralized Authority? Ideological Claims and Archaeological Patterns, *Asian Perspectives* 32(2): 312-353, 1994.
4. Kotraiah C.T.M., *Irrigation Systems of Vijayanagara*, Directorate of Archaeology and Museums, Mysore, 1995.
5. Filliozat, P., and V. Filliozat, *Hampi-Vijayanagar : The Temple of Vitthala*, New Delhi, Sitaram Bhartia Institute of Scientific Research, 1988.
6. Morrison, Kathleen D., Supplying the City: The Role of reservoirs in an Indian Agricultural landscape, *Asian Perspectives*, 32:133-52, 1993.

7. Sinopoli, Carla M., Defining a Sacred landscape : Temple Architecture and Divine Images in the Vijayanagara Suburbs, in *South Asian Archaeology - 1991*, Ed. by A.J. Gail and G.J.R. Mevissen, pp. 625-636, Franz Steiner Verlag, Stuttgart, 1993.
8. Gogte, Personal Communications.
9. Filliozat, P., and V. Filliozt, *op.cit.*
10. Means, Bernard K., A Small Settlement Near the City of Vijayanagara, in, *Vijayanagara Progress of Research, 1987-88*, Ed. by D.V. Devaraj and C.S. Patil, pp. 154-164, Department of Archaeology and Museums, Mysore, 1991.
11. Sinopoli, Carla, M., Nucleated Settlements in the Vijayanagara Metropolitan Region, in *South Asian Archaeology 1995*, Ed. by B. and F.R. Allchin, Oxford and IBH Press, New Delhi, in press.
12. Sinopoli, Carla, M., and Kathleen D. Morrison, *op.cit.*