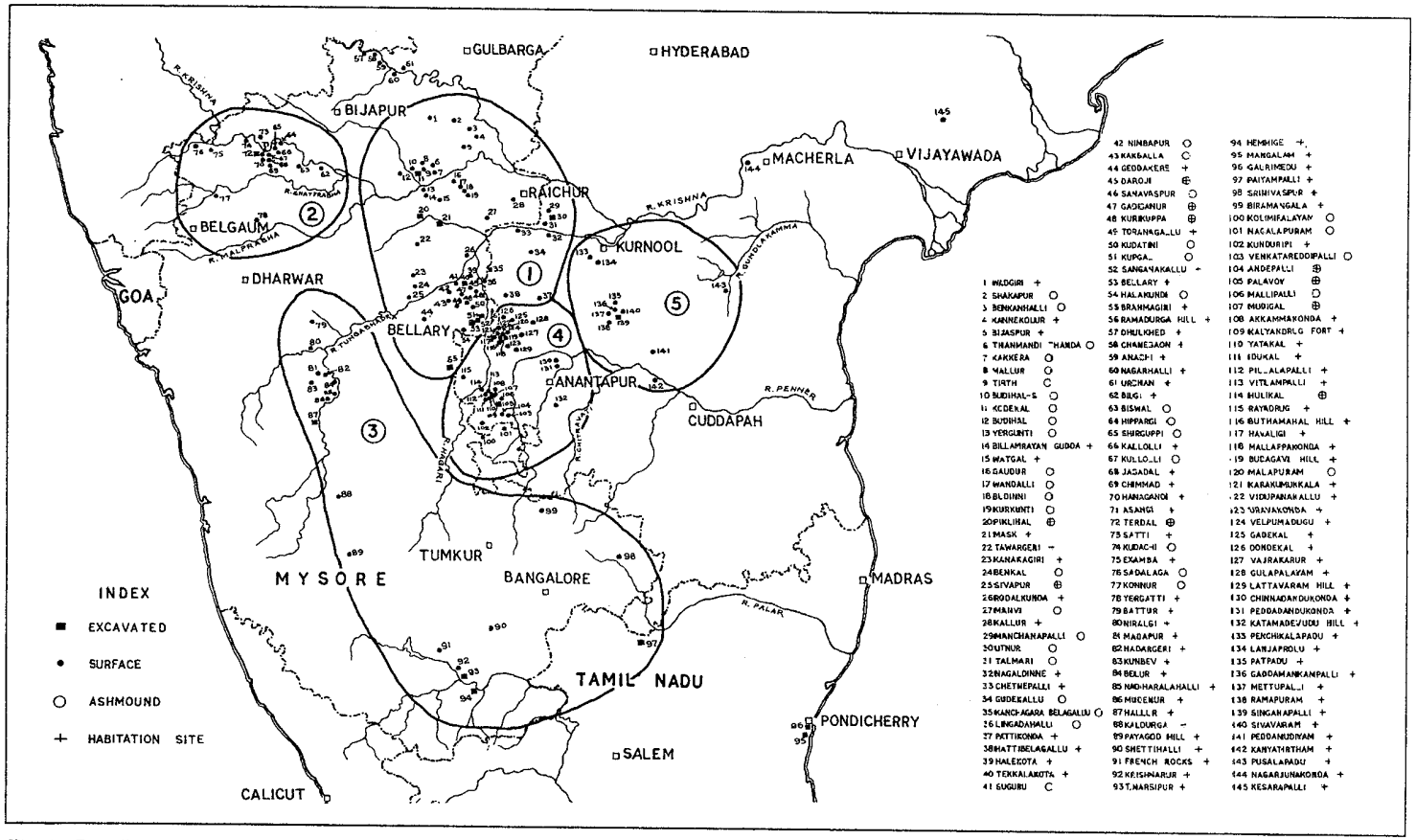


Fig. 7: Distribution of Southern Neolithic sites as known *c.* 1970 (after Paddayya 1973).

which has been remedied through the more recent survey work of David Raju (1985, 1990) and Venkatasubbaiah (1992).

In the late 1960s and the 1970s comparative study began to address the relationships between the Southern Neolithic and village cultures further north. Since the mid-1960s the northern Deccan witnessed very intense archaeological research (Sankalia 1974, 1977; Allchin and Allchin 1968, 1982; Dhavalikar 1988, 1994; Dhavalikar et al. 1988; Shinde 1989, 1994) with major excavations at Chalcolithic sites in the Godavari, Pravara, Ghod, Bhima and Nira river valleys (Deo and Ansari 1965; Deo and Mujumdar 1969; Dhavalikar 1970, 1988; Dhavalikar et al. 1988; Sali 1986; Shinde 1989). The material culture from these sites raised possibilities of contact with the south, and provided a potential source region for some of the 'intrusive' elements that earlier work on the Southern Neolithic had revealed (see, e.g. Allchin 1960, 1963a). At this time only Daimabad among the Maharashtra sites had yielded material of comparable age to the Southern Neolithic, and it was compared to the upper part of the Neolithic (Allchin and Allchin 1968: 190-2). In the third phase of the Neolithic, possible 'intrusive' elements were noticed (ibid.: 163), including slow-wheel-made pottery with red-painted decoration, often compared to the Jorwe ware of the northern Deccan. However, the features that linked this pottery with the northern peninsula were not compared in detail, in terms of decorative motifs or details of vessel construction, and thus direct parallels were few. In addition, the dating evidence for a spread from earlier in the north to later in the south was not available, although the possibility of diffusion or migration from south to north was not entertained.

Discussions of the economy of the ashmound culture became explicit and contradictory during these decades. The Neolithic people have been considered fully sedentary farmers clearing jungle (e.g. Wheeler 1959: 90; Sankalia 1977: 139; Venkatasubbaiah 1992), or, alternatively, largely nomadic with cultivation initially not forming a major part of their economy, although at least some cultivation was always assumed (Allchin 1963a: 162; Allchin and Allchin 1982: 123). More recently, Paddayya (1993a, 1993b) has argued for sedentary pastoralism without cultivation. Fürer-Haimendorf (1948) compared the Neolithic with a tribal group, the Reddis, who live in small hamlets gathering wild plants, raising livestock and cultivating millets and pulses with digging sticks and shifting slash-and-burn cultivation. Allchin (1963a, 1963b) drew on a wide range of ethnographic parallels as well as archaeological observations to argue that Utnur, Kudatini, and other ashmounds represented a special category of sites which were probably not inhabited year round but were seasonal cattle-camps (also, Allchin and Allchin 1968: 261-4). The duration and intensity of habitation at the various kinds of Neolithic sites has remained an important and somewhat divisive issue, to which we will return in later sections of this paper. However, apart from faunal evidence for a predominance of cattle, presumably domesticated, there was little other hard evidence for subsistence and cultural ecology. A more nuanced understanding of these issues was to wait until much more recent projects.

THEORIZATION AND RECONSIDERATION: RECENT AND FUTURE DIRECTIONS IN NEOLITHIC ARCHAEOLOGY

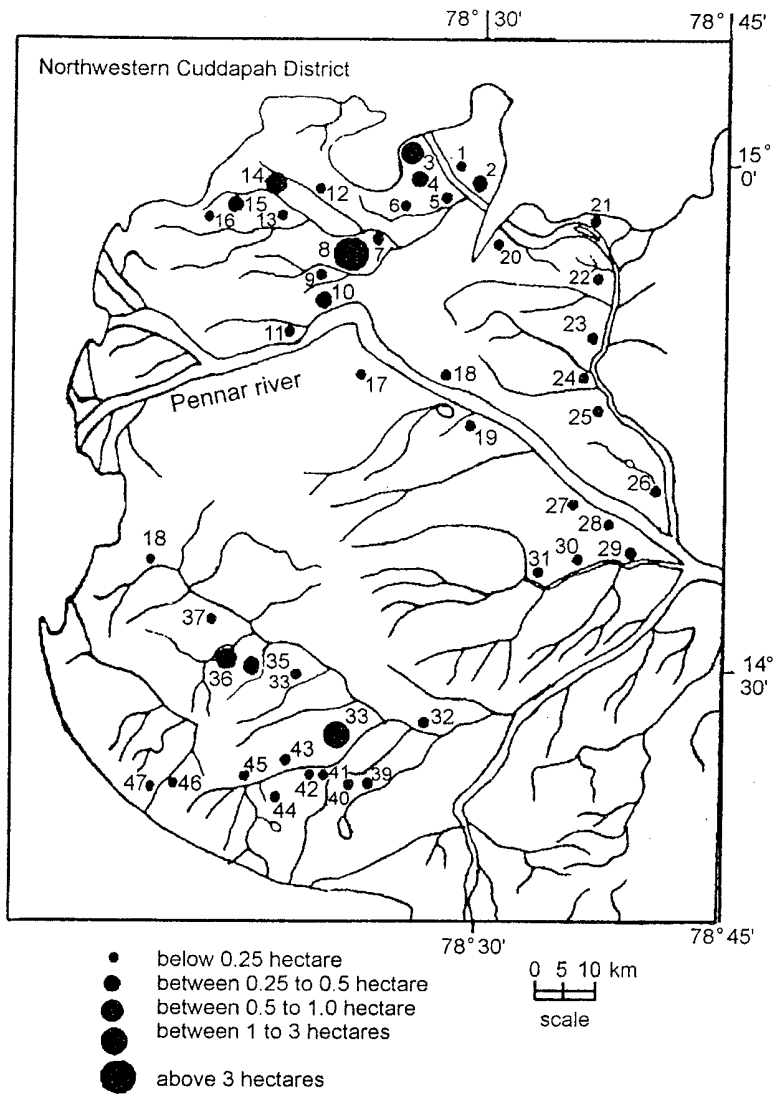
In the past two decades, within Indian archaeology generally, a greater interest has been taken in issues of cultural ecology and the collection of evidence relating to it. There is still relatively little such evidence for the Southern Neolithic. While this archaeological culture is fairly well characterized in broad geographical and chronological terms, i.e. *c.* 2800-1000 cal. BC (Allchin and Allchin 1968: 161-70; 1982; Agrawal 1982: 110-22; Liversage 1991; Possehl and Rissman 1992; Deveraj et al. 1995), little is understood about social organization or land-use at that time. Although evidence exists for animal husbandry (Subbarao 1956: 36; Allchin 1963a, 1963b; Alur 1971a, 1971b; Paddayya 1975; Badam 1984; Sahu 1988; Paddayya et al. 1995; Joglekar, in press), equivalent evidence for the extent of cultivation does not, although the few chance finds of the odd charred crop seed as well as grindstones are suggestive (Allchin 1963a: 43; Vishnu-Mittre 1971; Nagaraja Rao 1971: 135-6; Paddayya 1973: 76-7; Agrawal 1982; Allchin and Allchin 1968, 1982; Nagaraja Rao and Malhotra 1965: 66; Kajale and Venkatasubbaiah 1991; Venkatasubbaiah 1992). There is relatively little firm evidence for the timing and cultural context of the adoption of various species of domestic plants and animals, whether as domesticates originating elsewhere or species genetically transformed in south India itself. This evidential gap can only be remedied through the systematic collection of bio-archaeological data.

Although the diversity of the Southern Neolithic has been acknowledged through chronological and geographical subdivisions, there has been little consideration of potential differences in social organization or cultural ecology through time or across space. The Allchins divided the Neolithic into three phases, characterized in part by changes in technology, especially in pottery production, as well as increases in plausible long-distance imports (Allchin and Allchin 1968, 1982; cf. Lahiri 1992: 171-215). The role of trade in the development of Neolithic social complexity and how this was related to or impacted other aspects of society, such as agriculture, craft production, and animal husbandry has not really been explored. Although copper and bronze objects are present in low frequencies in Neolithic phases II and III, there is no evidence for the production of copper locally. Although there are hints that gold mines in the Shorapur Doab were exploited (Allchin 1962b; Paddayya 1973), hard evidence is lacking in terms of the ceramics recovered near these mines; the only gold recovered from a Neolithic site was a pair of coiled earrings from Tekkalakota (Nagaraja Rao and Malhotra 1965; Agrawal 1982: 115, Fig. 16). As sparse as the evidence for gold may be, it has been suggestive, and some authors have suggested that it was traded to regions as far distant as the Indus Valley, presumably through intermediaries (Allchin and Allchin 1968: 270, 284-5). Which role, if any, either of the above crafts, if practiced, played in the subsequent development of iron metallurgy in south India, if evolved locally, is unclear. The early dates for a few iron objects from the Southern Neolithic, apparently predating 1000 BC and perhaps as early as 1300 cal. BC (Chakrabarti 1992; Allchin and Allchin 1997: 227), would tend to support the suggestion of a local development of this technology (see also Sundara 1975:

178). The older belief that iron-working was introduced to South Asia with a wave of horse-riding Indo-Iranian speakers (e.g. Banerjee 1965; Allchin and Allchin 1968: 327) and subsequently diffused with Black-and-Red Ware and 'megalithic' burial practices onto the peninsula, suggested by many to accompany the spread of Dravidian languages (e.g. Fürer-Haimendorf 1953; Leshnik 1974; Maloney 1975), can no longer be realistically sustained. The processes of local evolution and diffusion must have been complex, and more theoretical work is needed on these issues.

Recent archaeological studies have begun to incorporate new methodologies and theoretical perspectives. Especially notable is the recent excavation programme of Paddayya and his colleagues at the site of Budihal which has an explicit interest in cultural ecology and the spatial patterning of archaeological evidence on site (Paddayya 1993a, 1993b, 1998; Paddayya et al. 1995). The extensive open excavations have revealed spatial patterning of refuse that can be interpreted in relation to specific sets of behaviours, such as an apparent butchering floor (Paddayya et al. 1995), a lithic manufacturing area (Paddayya 193a, 1993b), and a probable cattle pen (Paddayya 1998). In addition, the Budihal excavations have clearly demonstrated the presence of a habitational site in direct association with ashmounds, although whether this pattern can safely be transferred to all ashmound sites, as Paddayya (1991-2, 1993) asserts, remains to be established (see further discussion below). Other important excavation programmes include the ongoing work at Watgal (Devaraj et al. 1995), which is clarifying aspects of the cultural historical sequence through the quantification of finds categories, in addition to providing faunal and botanical evidence (e.g. Kajale 1998), and Elchuru in the lower Krishna Basin which revealed the earliest iron-smelting furnace (in post/late-Neolithic levels) in south India (Thimma Reddy et al. 1990). All of the above studies have more or less explicitly included the collection and analysis of bio-archaeological remains, whether plant, animal or human. Other settlement pattern studies have also incorporated these data sets through the selective sampling at representative sites, including past and present research by the authors (e.g. Venkatasubbaiah and Kajale 1991; Venkatasubbaiah et al. 1992; Walimbe et al. 1993; Fuller et al., n.d.).

A number of recent studies have compiled settlement distributions in order to understand cultural ecology and socio-political structure of Neolithic regions. While distribution maps of sites have been a part of Southern Neolithic archaeology since the time of Bruce Foote, these new studies are distinct by their explicit interest in social and economic issues. Murty (1989) produced a synopsis of pre-Iron Age economy based on a tabulation of sites in relation to local soil and vegetation types, utilizing the same categories as Moorti's (1994) study of the Megalithic/Iron Age. Such complementary studies provide the raw materials for understanding long-term trends on southern settlement patterns. David Raju (1990) discussed the subsistence implications of a regional settlement pattern in the lower Krishna valley. Venkatasubbaiah, in his thesis, *Protohistoric Investigations in the Central Pennar Basin, Cuddapah District, Andhra Pradesh* 1992), submitted to the University of Poona, discussed the site size hierarchy in the Cuddapah district, in relation to local soils and vegetation (Fig. 8). In addition, one of the sites identified as a regional centre, Hamanuraopeta, was considered in terms of its site catch-



1. Peddamudiyam-1
2. Peddamudiyam-2
3. Nagarajupalle
4. Paluru-J
5. Chinnamudiyam
6. Boditippenapadu
7. Bodupalle
8. Hanumantaraopeta
9. Porrivemula
10. Veparala
11. Mylavaram
12. Kamballadinne
13. Madhavapuram
14. Jangalapalle
15. Vaddirala
16. Dannawada
17. Gudecheruvu
18. Danavulapadu
19. Kanyathirtham
20. Vellala
21. Idamadaka
22. Gadeguduru
23. Tondaladinne
24. Upparapalle
25. Chapadu
26. Vedururu
27. Kokatam
28. Sambaturu
29. Akkempeta
30. Tippaluru
31. Koduru-K
32. Ramireddipalle
33. Balijapalle
34. Paluru-P
35. Inagaluru-2
36. Inagaluru-1
37. Koraguntapalle
38. Nidivelagala
39. Chagaleru-2
40. Chagaleru-1
41. Gollalaguduru-2
42. Gollaguduru-1
43. Timmapurampeta
44. Bokkudupalle
45. Ulimella
46. Kottapalle
47. Kottagundavaripalle

Fig. 8: Neolithic sites in the Cuddapah district, shown in size categories based on estimated of site extent from surface material (after Venkatasubbaiah 1992).

ment. Current research of the present authors considers sites and groups of sites in relation to their local geographical context and attempts to address the ancient relationship between particular communities and locales through datasets such as archaeobotanical remains and lithic raw materials.

Venkatasubbaiah (1992) departed from the traditional approach to studying the Neolithic cultural remains in a normative framework by drawing models and methods from processual archaeology. He developed an explanation of the similarities and differences between the Neolithic culture in the area under his consideration (Pennar Basin, Cuddapah district) and the rest of the Southern Neolithic province. He explained the absence of ashmounds in the Pennar valley as a result of a different subsistence system relying on mixed farming and pastoralism which included cereal cultivation and the herding of cattle, sheep and goats. The river valley setting of the settlements, as opposed to the hill tops of the core Neolithic region (Shorapur-Raichur-Rayalaseema), and the recovery of archaeobotanical remains from a couple of sites suggested an economy of millet and pulse farming (Venkatasubbaiah and Kajale 1991; although millets themselves were not recovered until the more recent study, Fuller et al., n.d.). Within this agricultural system he suggested that cow-dung was put to effective use as manure and consequently the use of cow-dung for ceremonial and other reasons was not practiced. Indeed, a similar explanation can probably be extended to Paddayya's Zone 1, which includes sites on the upper Tungabhadra, such as Hallur, and sites in southern Karnataka, areas where ashmounds are also lacking and sites occur on river banks. Although the chronological situation is yet to be fully clarified, it is possible that these regions of Neolithic sites without ashmounds represented the later expansion of agricultural settlement during a period in which dung burning at ashmound sites has also ceased, or was on the decline, in the core region due to the intensification of agriculture there (Fuller et al., n.d.). It is also equally possible that the Kunderu valley Neolithic sites represent a separate cultural tradition into which agriculture was adopted but aspects of ritual activities of the ashmound tradition were not.

Settlement pattern studies of the sites in the central Pennar Basin involved the study of sites in terms of settlement size and spacing between sites, their distribution in relation to physical features, etc. The settlement organization revealed a linear pattern forming a string of settlements. Sites were separated on the basis of size from which population sizes were estimated. On the basis of nearest neighbour analysis regional centres could be identified. The settlement pattern revealed that the eastern valley and southern elevated sectors were marginally occupied, with a greater density of sites in the north-western sector with vast expanse of black cotton soil. The site-size and inter-site distance analyses confirmed that all the sites were linked together in a network comprising different sizes that were defined as hamlets, small villages, large villages and a regional centre, Hanumantharaopeta. Venkatasubbaiah (1992) observed that out of 47 sites, 41 are located on the tributary streams referred to as *nalas* and only 6 were situated on the Pennar proper. These nalas have seasonal waterflow during the monsoon and the post-monsoon seasons, during which traditional *kharif* cropping is carried out. In the dry season they

are dry. Indeed the archaeobotanical evidence examined to date (Fuller et al., n.d.) reveals that monsoon crops are ubiquitous in samples from sites in this region, although there is some quantity of winter cereals (at least wheat) in the upper portion of Hanumantharaopeta.

Our interest in Neolithic settlements and settlement patterns began in 1995 with the planning of a small project to recover cultural material from Neolithic sites in southern Deccan. These sites, as observed by us, as well as Paddayya (1996) are being destroyed at an alarming rate by quarrying and digging by local villagers for plastering material. In a few years time the Neolithic record from the hilltop sites will be largely erased. That is the unfortunate state of Neolithic heritage after some 50 years of India's Independence. Therefore in order to use limited time and resources to provide as much fresh evidence as possible, we decided to look at the Neolithic sites from the perspective of agricultural economies and the patterns of settlement, including in particular through systematic collection of archaeobotanical data as this has been neglected in excavations in the past (the recent work at Budihal and Watgal being notable exceptions). And thus attempt a history of agriculture as well as considering the Neolithic landscape and settlement pattern from a social perspective. We have managed to collect archaeobotanical material from eleven sites, and laboratory studies are forthcoming. We have visited some 20 of sites in the Rayalaseema region of the southern Deccan recording our observations, some complementary to those of Paddayya and some new observations, as discussed below in relation to the ashmounds.

EXPANDING FRONTIERS OF THE SOUTHERN NEOLITHIC: GEOGRAPHICAL SCOPE AND SPECIALIZED ANALYSES

The lasting result of the above-mentioned researches was the expansion of the Southern Neolithic frontiers, especially in geographical terms. The area recognized as being covered by the Southern Neolithic has grown out of the small area covered by Foote: '. . . within the limits of old Bellary district, lately divided into two, Bellary and Anantapur. The greater number of settlements lie within a triangle of which the Madras Railway between Bellary and Gooty (Gutti) is the hypotenuse and Uderpy Droog the apex of the opposite angle' (Foote 1887a). There is some disagreement about whether coastal Andhra sites (Fig. 9) and Tamil Nadu sites should be considered part of the Southern Neolithic. Narasimhaiah (1980) tends to separate the Tamil Nadu evidence from the ambit of the Southern Neolithic. While David Raju (1988) and Thimma Reddy et al. (1994) tend to include the east coast evidence in the 'Eastern Neolithic' group, Vijaya Prakash et al. (1994) considered them as part of Southern Neolithic. The eastern Indian group comprises Neolithic sites in Bengal, Bihar and Orissa, and indeed in the latter there are some cultural traits comparable to the north coastal Andhra Pradesh sites. We agree with Vijaya Prakash et al. (1994) inasmuch as all of these regional groups need to be considered in comparison and contrast to understand the large scale socio-economic processes and cultural traditions involved in the early development of villages on the southern Indian

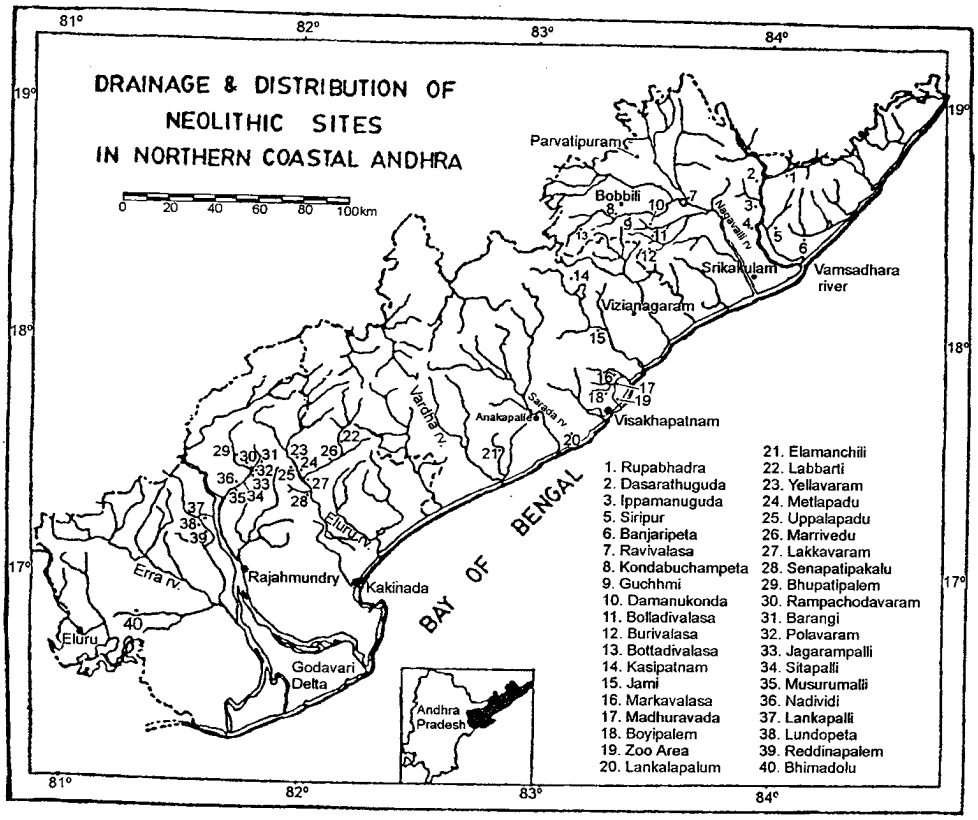


Fig. 9: Distribution of Neolithic sites in north-eastern Andhra Pradesh (after David Raju 1988).

peninsula. Nevertheless, it can be readily observed that as one moves away from the core area (e.g. Bellary district, Raichur, and Shorapur Doabs), that differences become apparent in terms of local and regional elements of artefactual assemblages. In addition, regions outside the core region lack the distinctive ashmound sites (cf. Paddayya 1973). Since the distribution of the Southern Neolithic province was mapped by Paddayya (1968, 1973), who himself identified regional variants in the ceramic traditions, the peninsular Neolithic has been extended into the major part of Andhra Pradesh (Middle and Lower reaches of the Godavari and Krishna basins) excluding the uplands of the Eastern Ghats, the whole of the east and south-east coast, mainland Tamil Nadu excluding the Nilgiri and Western Ghats plateaus in Karnataka. Meanwhile the west coast, excepting the Goa region (Bhatsuri 1990; Goudeller 1993), still draws a blank and remains largely unexplored. Within such a vast area, spanning as it does several bioclimatic zones (cf. Puri et al. 1983; Meher-Homji 1990, 1996), differences in cultural ecology and economy are likely to be revealed once detailed evidence is available. It will be of great interest to understand how the various local strands of cultural and economic development are interwoven into the prehistoric tapestry of southern India during the periods in which agriculture, pastoralism and sedentary communities emerged.

Neolithic archaeology has also expanded in analytical scope over the past several decades. The published reports of excavations have included detailed descriptive studies of the stratigraphy, stone tool typology and technology (often including inferences about function), with little attempt to move beyond mere typology. The Budihal excavations, however, have been explicitly problem-oriented (see the section on ashmounds, below), with the hopes of revealing economic and social patterning (Paddayya 1993a, 1993b; Paddayya et al. 1995, 1998). Spatial patterning within the site highlights the socially proscribed nature of certain activities, for example through finds of a butchery spot, a cattle pen and a possible factory area for blade production. The butchery spot is marked by the scatter of smashed and butchered bones of cattle across a plastered surface along with chopping tools. The interpretation of this plastered surface as a butchery floor is reinforced by the body part representation. The skeletal parts include those bearing low meat, such as skull fragments and the distal portions of limbs and long bone ends, suggesting that shafts were utilized for marrow. The bone assemblage is said to differ from that associated with habitation structures (Paddayya et al. 1995; Fuller 1996).

In the absence of absolute dating techniques ceramics provided the initial chronological framework (e.g. Wheeler 1947-8; Subbarao 1948; Allchin 1960, 1961, 1963a; Allchin and Allchin 1968). Pottery occupied an important place in archaeological trait-lists, utilized for geographical correlations as well as its implications for the origin and spread of the culture. With the advent of radiocarbon dating (see Soundara Rajan 1964; Allchin and Allchin 1968; Paddayya 1971b; Nagaraja Rao 1972; Nagaraju 1973; Agrawal 1978, 1982; Liversage 1991; Possehl and Rissman 1992), other aspects of the archaeology began to gain emphasis as sources of information on past life-ways, including burial practices, rock-art, exchange network, floral and faunal remains, and human skeletal remains. Several of these datasets will be discussed separately below, including lithics, ceramics, burials, physical anthropology, archaeozoology, and archaeobotany. In

addition, important studies relating to other particular datasets deserve to be mentioned, including rock art research (Gordon 1951; Gordon and Allchin 1955; Rami Reddy 1971; Sundara 1974, 1984; M.S. Krishnamurthy 1977; Neumeyer 1978, 1991; Chandramouli 1989, 1991; Bhat 1981; Allchin and Allchin 1995), and the chemical analysis of anthropic soils and animal bones (Deotare 1981; Joshi and Deotare 1980; Kshirsagar 1983; Joshi and Kshirsagar 1986; Deotare and Kshirsagar 1993; Kshirsagar and Gogte 1990).

LITHIC STUDIES

Stone tools during the Neolithic consisted of both the characteristic ground-stone 'axes', stones for pounding and grinding, and flaked blades, bladelets, and other microliths. Lithic studies have indicated an overall uniformity in terms of technology and typology (e.g. Foote 1916: 17-24; Wheeler 1947: 245-53, 295-9; Allchin 1957; Seshadri 1956; 1960; Nagaraja Rao and Malhotra 1965). The first typology was that developed by Foote (1916: 17-24) which included celts, chisels (ranging in size), 'corn-crushers', worked scrapers, cores, and coreflakes. These types of tools were broken down into more elaborate classifications subsequently by Lal and Wheeler (1948), Subbarao (1948) and Allchin (1957). Foote (1916) estimated for stone their relative abundance and placed them in the following order—strikers, corn-crushers, mealing stones, celts and chisels (the last being rarest). Cores and flakes were also relatively rare. As Allchin (1961, 1963a) subsequently noted, there were discrepancies between ashmounds (as represented by Utnur in particular) and settlement sites in terms of the relative occurrence or rarity of different tool types; most notably edge-ground tools such as axes (Allchin 1963a: 77). This might suggest that some of the ashmounds represented a special category of site at which the full range of Neolithic activities was not carried out, by comparison to habitation sites like Brahmagiri or Sanganakallu. Consideration of the lithics beyond typology has remained rare, with little work having been done on locating workshops, sourcing raw materials, and tracing their trade, although some general comments about the potential of these approaches were made by Allchin (1957). David Raju (1988) in discussing celts from north-eastern coastal Andhra has attempted to classify the ground-stone artefacts into different use categories.

The characteristic artefacts of the Neolithic are the ground-stone edge-tools, i.e. axes (celts) and adzes (Fig. 10). Foote identified the primary source of raw material for the celts as the dolerite and basalt dykes that traversed some of the granite hills of the region and also noted that Neolithic sites clustered near these dykes (Foote 1916; Subbarao 1948; Seshadri 1956; cf. Allchin 1957: 322-3). Other material sources included fine-grained schist, gneiss, and diorite. Readily available schistose rocks were used for celt manufacture in the region of Dharwar greenstone belts (e.g. at Hallur, Nagaraja Rao 1971). On the basis of the complete artefacts and flakes he recovered, Foote was able to outline four stages of celt fabrication: chipping, pecking, grinding and polishing (the last two processes were grouped in the subsequent breakdown of Lal and Wheeler 1948). He suggested that knapping was carried out by means of a stone hammer in the first stage, pecking by means of a sharp-pointed striker leading to the third stage of achieving a

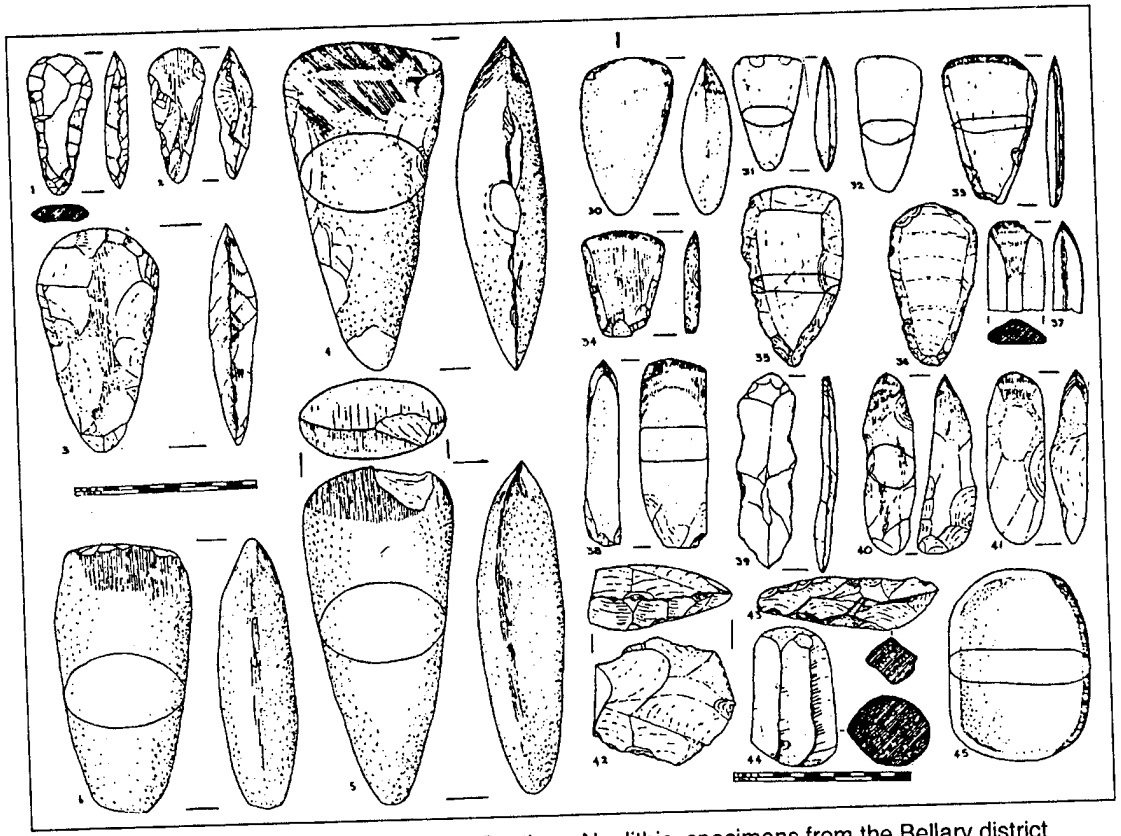


Fig. 10. Ground stone tool industry of the Southern Neolithic, specimens from the Bellary district in the British Museum (after Allchin 1957, Figs. 1 and 4).

sharp and even cutting edge by grinding and then polishing. The last two stages were executed by rubbing the pecked stones back and forth on the granite boulders which consequently developed shallow troughs (grinding grooves). Foote separated rocks and minerals exotic to the site—agate, chert, jasper (nearest source is the Krishna gravels, Foote 1887b), lydian stone (the nearest source is the Cuddapah Formation) and the locally occurring quartz. These came to Kupgal as raw material and were modified at the site. Allchin (1957) also argued that certain sites, including Kupgal were important workshops for ground-stone tools which were subsequently traded to other sites in the region. However, the ground stone tools were generally available from much shorter distances than the crypto-crystalline rocks used for blades and microliths.

In general, there are similarities in blade tool technology over a vast area of the peninsula between the Narmada river in the north and Tungabhadra in the south, arguing for the need to consider Southern Neolithic tools within the context of a broader technological tradition that also included the Chalcolithic cultures of Maharashtra (Subbarao 1955; cf. Ansari 1988). Important regional variations in the techniques of blade production and raw material, however, is becoming clearer. The crested-guiding-ridge technique (Fig. 11), which unites much of the peninsular lithic industries, is absent in the Kaveri valley and upper Tungabhadra and lower Bhima regions. In general, it seems clear that elements of the microlithic industry of the Neolithic period continued traditions that were already in place during the ill-defined 'microlithic' phase of peninsular India. The recent excavations at Watgal have revealed a sparse presence of microliths in an aceramic horizon beneath the clearly Neolithic levels of the site (Devaraj et al. 1995). This evidence is similar to what Subbarao (1948) reported from the lowest levels of his excavation at Sanganakallu. These data suggest continuity of habitation at some places from the microlithic into the Neolithic.

Chert forms the most common raw material for stone blade industry in the Raichur and Shorapur Doabs. One suspected source has been identified in the Shorapur Doab at the site of Budihal where there is evidence for an extensive area of manufacture, and chert is available locally (Paddayya 1993a, 1993b). It is also clear, however, that some cryptocrystalline rocks including varieties of chert, were traded over some distance from their localized sources. However, the source near Budihal is unlikely to have been the only chert source for the Southern Neolithic, as asserted by Paddayya (1993b; also Devaraj et al. 1995). Additional sources occur in the Kurnool and Cuddapah districts as parts of the Cuddapah geological formations (Venkatasubbaiah 1992; observations of the authors; see also Lahiri 1992: 182-215). The chert from this latter region shows a distinct range of colours from those of the Shorapur region. Chert utilized in the Bellary region must have come from one of these two sources although, provenance studies of the lithics are yet to be undertaken. Beyond the Bellary region (to the south) quartz and other varieties of crypto-crystalline silica become the medium for microliths. In some cases, quite localized sources were utilized, such as at Hattibelagallu near modern Alur town where the authors collected a core and microliths made from chalcedony which appears to occur as nodule inclusions in the large quartz vein which forms part of granite hills there.

One problematic area that requires further work is the relationship between the Neolithic

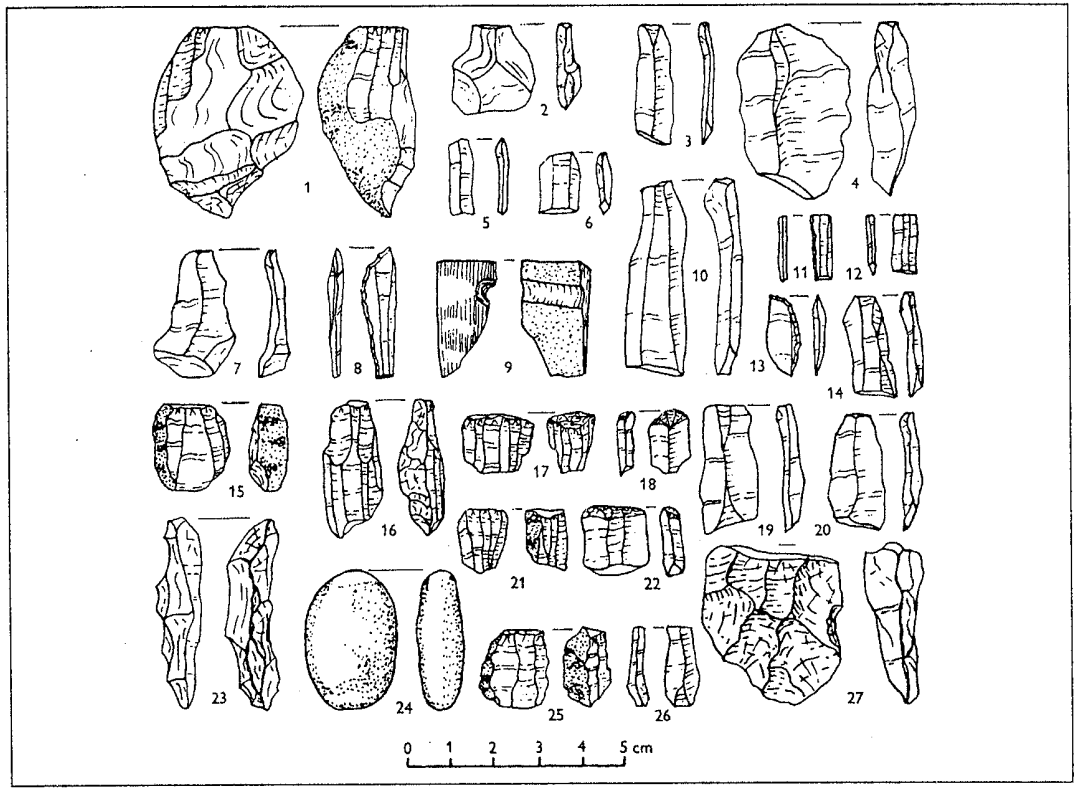


Fig. 11: Neolithic blades and cores from Utnur (after Allchin 1963a, Fig. 11).

stone industries and pre-Neolithic cultures, including the general microlithic industries of the Indian peninsula and the enigmatic 'Pre-Neolithic flake' industry identified by Sankalia (1969) in the Sanganakallu area.

These flakes of dolerite were first noted by Subbarao (1948) in his excavations at Sanganakallu, where they occurred apparently without pottery at the lowest level of this excavation immediately above the granite-derived moorum. Subsequently, similar flakes were found by Sankalia (1969) at his Banglatota excavations in a horizon below the modern soil and at the Kupgal ashmound excavated by Mujumdar and Rajaguru (1966), where such flakes occurred below a thick, dark horizon and pebble layer identified by the excavators as a palaeosol horizon (for reservations with identifying this layer as a palaeosol, see below in the discussion of ashmounds). Many of these flakes were patinated, which was taken to imply great antiquity and Sankalia (1969) suggested that they should be assigned to the Upper Palaeolithic. There is no direct dating evidence, however, either for the horizons from which these flakes have been found nor from the overlying horizons. The forms of the flakes are similar to the waste flakes from the production of Neolithic celts and it certainly seems possible that these are what patinated flakes indeed represent. That they have been found sealed by Neolithic deposits only indicated that Neolithic sites grew laterally and sealed refuse from their earlier stages, perhaps a stage when pottery was absent or infrequent. The finds at Banglatota, relatively near to the dolerite dyke raw material source at the east end of Kupgal peak, could represent a manufacturing site of Neolithic age. The problem of the age of these flakes and their relationship with the Neolithic lithic manufacture remains unresolved and radiometric dating evidence is needed.

CERAMIC STUDIES AND CHRONOLOGY

Ceramic typology is a basic archaeological approach to characterizing ancient 'cultures' and for building relative chronology. The earliest excavations in south India led to the identification of Grey and Red Wares as the typical and unifying ceramics of the Southern Neolithic culture (Krishna 1943; Wheeler 1947; Subbarao 1948; Thapar 1957; Allchin 1960, 1961). Other ceramic ware groups were also present, although they played less of a role in unifying the Neolithic sites of south India. Perforated and incised pottery is ubiquitous in the later phases of the Southern Neolithic (mid-second millennium BC), although it has recently been reported from an earlier period at Watgal (Devaraj et al. 1995). The traditional understanding of ceramic development was that Neolithic pottery was entirely handmade with some wheelmade rims being produced in the later periods and (almost) entirely wheelmade pottery coming from the Iron Age ('Megalithic') period and subsequent Early Historic era. This simple, progressive sequence now appears to be rather misleading and must be seeen in part as the product of a rigid, and reductionist typological approach which developed in the context of relatively few excavations but had nevertheless been widely applied to samples from surface collections. Discussions of typology, technology and regional variations in Southern Neolithic ceramics have

been numerous (Allchin 1959, 1962, 1966; Allchin and Allchin 1962; Sarma 1967, 1967-8; Soundara Rajan 1969; Nagaraja Rao 1970; Mujumdar 1973; Sundara 1970, 1971; Paddayya 1973; Gurumurthy 1981).

Some of the literature betrays lack of clarity in arriving at an account of similarities and differences in pottery types, forms and techniques between and among the sites in the 'nuclear area' (sensu Paddayya 1973) and other Neolithic regions outside it. For instance the identification of pottery from Maski as wholly 'wheelmade' is difficult to comprehend (Thapar 1957), given that handmade is reported to dominate at all the excavated sites in the region. The presence of irregular striation marks on the inner side of the vessels perhaps was the result of a slow turntable and not the fast wheel; it is even possible that in some cases these represent the use of the coil method of vessel construction by hand. There is a need for more explicit documentation and discussion of the criteria utilized for distinguishing hand from wheelmade, and what is meant by 'wheelmade' needs to be clearly defined. It may even be necessary to employ some more sophisticated techniques to distinguish the various formation techniques of pottery (see general discussion in Rice 1987: 124-51; Rye 1977).

The use of descriptive terms for pottery wares that rely on straightforward visual criteria is useful but inadequate on its own. While terms such as 'black-and-red ware', 'black-burnished', or 'rusticated' are useful for the ease with which these characteristics can be identified in the field and represent in many cases traits distinctive to the region or a particular period, they are inadequate for assessing the provenance of production and the extent of distribution of different pottery groups. More detailed studies of fabirc are needed. While in much of the literature of peninsular Indian archaeology the terms 'ware' and 'fabric' have been used interchangeably, there is a need to distinguish two rather different aspects of pottery, and we would recommend the standard definitions found in Orton et al. (1993: 67-75; also Adams and Adams 1991: 104, 106; cf. Rice 1987). In these definitions, ware refers to the general visual characteristics of pottery, especially its colour in section and on its surface and the colours used in decoration. Fabric on the other hand should be restricted to descriptions of the clay body (the 'body clay' of Allchin 1960: 26-7) from which the pottery is made (see also 'Clay and inclusions' in Dales and Kenoyer 1986: 62-3), and this can only really be observed on freshly broken sections, preferably with the aid of a magnifying glass or binocular microscope. Although an important preliminary study of this sort had already been part of the Piklihal report (Allchin 1960), this sort of approach has not been pursued subsequently in further detail nor on a wider sample of sites.

A relative chronological framework based on ceramics is necessary if the historical trajectories of different sites and regions are to be compared. On the basis of the Brahmagiri excavations, the Neolithic (Phase I on that site) had been divided into two phases, A and B. These two phases, could be roughly correlated with subperiods 1 and 2 of Phase II (Neolithic) at Sanganakallu (Subbarao 1948) and the Lower and Upper Neolithic phases defined stratigraphically and in terms of ceramic wares from Allchin's work at Piklihal (Allchin 1960: 123). Maski on the other hand was interpreted as only having been settled

beginning in the second/ Upper phase. Subsequently, as more Southern Neolithic material became available, a three stage chronological framework for the Southern Neolithic was developed by Allchin and Allchin (1968: 161-70,1982: 286-97; see Table 2 in this paper for a summary). In the Allchins' synthesis the three phases of the Southern Neolithic were bracketed between 2500 and 1000 BC: Phase 1 (2500-2000 BC); Phase 2 (2000-1600 BC) and; Phase 3 (1600-1000 BC). The then available dates came from a variety of sites, both ashmounds and habitation sites and many of them on animal bones, which must be regarded sceptically as they did not utilize collagen extraction nor take into account fractionation. There is need for a series of accurate dates to be able to reconstruct the developments of cultural phenomena and their relationships with other developments in the subcontinent.

The Allchins' three-phase model also incorporated an evolutionary model of the Neolithic economy and technology. They envisaged a transition from cattle pastoralism in the early phase, associated almost exclusively with the ashmounds, to agro-pastoralism. This model suggested that between 2300 BC and 1000 BC (dates were uncalibrated when the model was proposed, for calibrated equivalents, see Table 2) seasonally mobile pastoralism gradually decreased while plant cultivation became increasingly important. This process occurred together with the geographic expansion of south Indian agriculturalists (although it is unclear whether this should be seen as colonization from growing farmer populations or diffusion of agricultural techniques). Also there was increasing contact and interaction with Chalcolithic cultures in the larger Deccan province, especially Maharashtra.

In the later Neolithic, wheel-thrown Black-and-Red Wares appear which foreshadow the ceramic types traditionally associated with the Iron Age. As had already been recognized by Foote (1916: 32) there was an overlap of the Neolithic and Iron Age at some sites, a situation confirmed by the systematic excavations at several sites (e.g. Wheeler 1947-8; Subbarao 1948; Allchin 1960; Nagaraja Rao 1971), although most authors were still inclined to see the Iron Age as representing an immigrant culture (see, e.g. Allchin and Allchin 1968; Maloney 1975). At Tekkalakota it has been found that handmade Black-and-Red Wares accompanied many of the burials at that site, presumably dated to the later Upper Neolithic (Nagaraja Rao and Malhotra 1965). Earlier work, under the general influence of a migrationist archaeology, assumed that there was an 'intrusion' from the north in the later part of the Upper Neolithic, bringing in pottery similar to that of the Jorwe Culture, Black-and-Red Ware and partially wheelmade pottery as well as certain distinctive metal artefacts such as the copper swords from Kallur (e.g. Allchin 1960; Allchin and Allchin 1968). However, the better dating evidence available today, does not support this. At Watgal, 'Jorwe' type ceramics have come from deposits apparently dating 2000-1500 BC (Devaraj et al. 1995), while the Jorwe Culture in the northern Deccan begins *c.* 1500 BC (Dhavalikar et al. 1988; Possehl and Rissman 1992). Thus the assumption that this ceramic style comes from the Jorwe region in the north needs to be reconsidered since the growing body of radiometric evidence points to the priority of black-painted red wares in Karnataka and Andhra (cf. Venkatasubbaiah

TABLE 2: CHRONOLOGICAL FRAMEWORK OF THE THREE-PHASE SOUTHERN NEOLITHIC

Calibrated dates from Watgal			post-1800 BC	2300-1800 cal. BC	2800-2300 cal. BC			pre-3000 BC(?)	
Watgal		IV	III	IIB	IIA			I	Deveraj et al. 1995
Paiyampalli	II	I							*IAR* 1964-5, 1967-8
T. Narsipur	Ea IA(4)		Hiat.	I (5-6)					*IAR* 1961-2, 1964-5
Hallur	III (4-7)	IIB (8-9)	IIA (10-11)	I (12-14)					Nagaraja Rao 1971
Tekkalakota		II	I						Nagaraja Rao and Malhotra 1965
Sanganakallu	III	II.2	II.1					I	Subbarao 1948
Maski	II		Hiat.	I					Thapar 1957
Brahmagiri	IA burial gr A-B	Hiat.	IB	IA				micro-lithic	Wheeler 1948
Piklihal	Ea IA	intr.	Up	Lo					Allchin 1960
Utnur				IV	III	II IB 4120BP	I		Allchin 1961
Palavoy								I	Reddy 1976
Kodekal			(1-3)	(4-6)	4285BP				Paddayya 1973
Allchin and Allchin Phases	III	II	I						References

and Kajale 1991; Devaraj et al. 1995). It also must be recognized that the detailed comparative studies of the fabrics and the decorative styles of these black-painted red wares have not been undertaken, so that the extent to which distinct regional groupings and/or interregional influences can be reconstructed is as yet unclear.

A similar problem surrounds the 'Blotchy Grey Wares' of the earlier Southern Neolithic and the early villages cultures of the northern peninsula. Blotchy Grey Ware has been found in the lower levels of several excavated sites in the Malwa Chalcolithic complex as far north as central India and the Kaveri valley in the south (Sankalia 1977: 142; Agrawal 1982; Allchin and Allchin 1982). The extent to which this widespread occurrence of pottery of similar appearance, in the broad sense of general colour, actually implies a shared ceramic tradition, as Sankalia suggests (1975: 142) is unclear. It is indeed quite plausible that these 'Blotchy Gray Wares' represent similar levels of ceramic firing technology, with relatively little, if any, historical connection. Detailed studies of fabric types, forms and the technology of production are needed to resolve this matter. Should a historical connection be established, the available dating evidence would suggest that the spread of this pottery was from the Southern Neolithic northwards, contrary to the directionality of diffusion assumed in many studies of the Southern Neolithic. This ware is dated in the southern Deccan the first half of the third millennium to the first quarter of the second millennium BC, while the Chalcolithic complex in the northern Deccan is well constrained by radiocarbon dates beginning from the late third millennium BC but largely from the whole of the second millennium BC (Possehl and Rissman 1992; Allchin and Allchin 1997). Given the apparent chronological priority of the Southern Neolithic over ceramic-using cultures immediately to the north, the possibility that pottery developed independently on the peninsula needs to be seriously considered.

There remain few secure radiocarbon dates upon which to tie the cultural sequence to absolute chronology. An important recent contribution is the series of dates from the well-described artefactual sequence of Watgal in the Raichur Doab (Devaraj et al. 1995). In addition this site provides the earliest non-ashmound Neolithic occupation yet documented, with the earliest calibrated date from 2900-2600 cal. BC. The early dates for this site call into to question the suggestion that only ashmound sites can be placed into the earliest phases of the Neolithic. The occupation sequence from IIA to IV provides a graphic account of the continuous cultural development from the early Neolithic to Iron Age, by which time red, wheelmade wares traditionally regarded as 'Early Historic' had come into use. The ceramic sequence from this site serves as a frame of reference to overcome the limitations of surface collections lacking stratigraphic context. The suite of radiocarbon dates from Watgal emphasizes the need for secure dates from a large number of sites to be able to either propose a working hypothesis or to test a working hypothesis on cultural transformation processes operating in the Southern Neolithic complex. The radiocarbon determinations from Watgal have extended the beginnings of the Southern Neolithic culture by about 500 years to *c.* 2800 BC. The well-dated stratigraphic ceramic sequence at Watgal can serve as a key to understanding the spatio-temporal evolution of the Southern Neolithic pottery traditions with implications for reconsidering

our current understanding of the evolution of ceramic types and wares (Table 3).

While ceramics have formed the backbone of Southern Neolithic archaeology there are still important areas of research that need further work. More statistical studies of the nature of the change in assemblages through time, like that of Devaraj et al. (1995), are needed to clarify the chronological patterns. These need to be compared across regions in order to understand the spatial ramifications of chronology and cultural change. In addition, changes in vessel form, especially the development or adoption of new types needs to be considered in more detail (Fig. 12). The ethnographically-based functional categories of Allchin (1960) may serve as a useful starting point, but the social implications of new forms have yet to be explored, in terms of new cooking techniques or new practices in relation to food types and the social context of serving food. Another import-

TABLE 3: THE CERAMIC SEQUENCE FROM WATGAL (quantitative data not presented, those less than 5 per cent are not included, based on Devaraj et al. 1995)

Occupation Phase	C-14 date Half-life 5730	Pottery Handmade	Pottery Wheelmade
IIA	2700-2300 BC	Burn Inc, Plain R/G, B/R Sl, R/Buff Sl, R Ocher/Buff, R Ocher/Burn G, Burn Thin, Burn Sl, Dec App, Per base	Nil
IIB	2300-2000 BC	Plain R/G, Burn Inc, Burn R/G, B/R Sl, R/Buff Sl, R Ocher/Buff, R Ocher/Burn G, Burn Thin, Dec App, Pinch Rim, Perf Base	Jorwe Bl/r Sl (small qty, but the earliest evidence)
III	Post-2000 BC	Burn Inc, R Sl Inc, R Sl, Plain RG, B/R Sl, R/Buff Sl, R Ocher Burn G, Brown Sl, Burn Thin Knob App, Pinch Rim, Dec App, Perf Base	RSW, BRW, Jorwe R/ buff, Jorwe Bl/r Sl, Andra, BRW D Rim
IV	Post-1500 BC	Burn Inc, Burn R/G, R Sl Inc, R Sl, Plain R/G, Coarse G Thin, Knob App, Pinch Rim, Dec App, Perf Base	RSW, BRW, Jorwe Bl/r Sl, Jorwe R/buff, Andra, EH grey

NOTE: The abbreviations used are as follows: Plain R/G: coarse red/grey plain; R Sl: coarse red/grey with red slip; R Sl Inc: coarse red/grey with red slip incised; Burn R/G: coarse red/grey burnished; Burn Inc: burnished incised; Per Base: perforated base; Pinch Rim: coarse red/grey pinched/finger impressed pottery; Dec App: coarse red/grey decorative/finger impressed applique; R Ocher/Burn G: burnished grey with post-fired red ocher paint; Red Ocher/Buff: buff slip with post-fired red ocher paint; R/Buff Sl: red-on-buff slip; Bl/R: black-on-red slip; urn Thin: coarse red/grey thin; Coarse G Thin: coarse grey thin; Brown Sl: coarse red/grey with brown slip; RSW: red slipped ware; BRW: Brahmagiri style black-and-red ware; Jorwe Bl/r Sl: Jorwe black on red slip; Andra: Andra ware (russett coated); EH Grey: early historice grey.

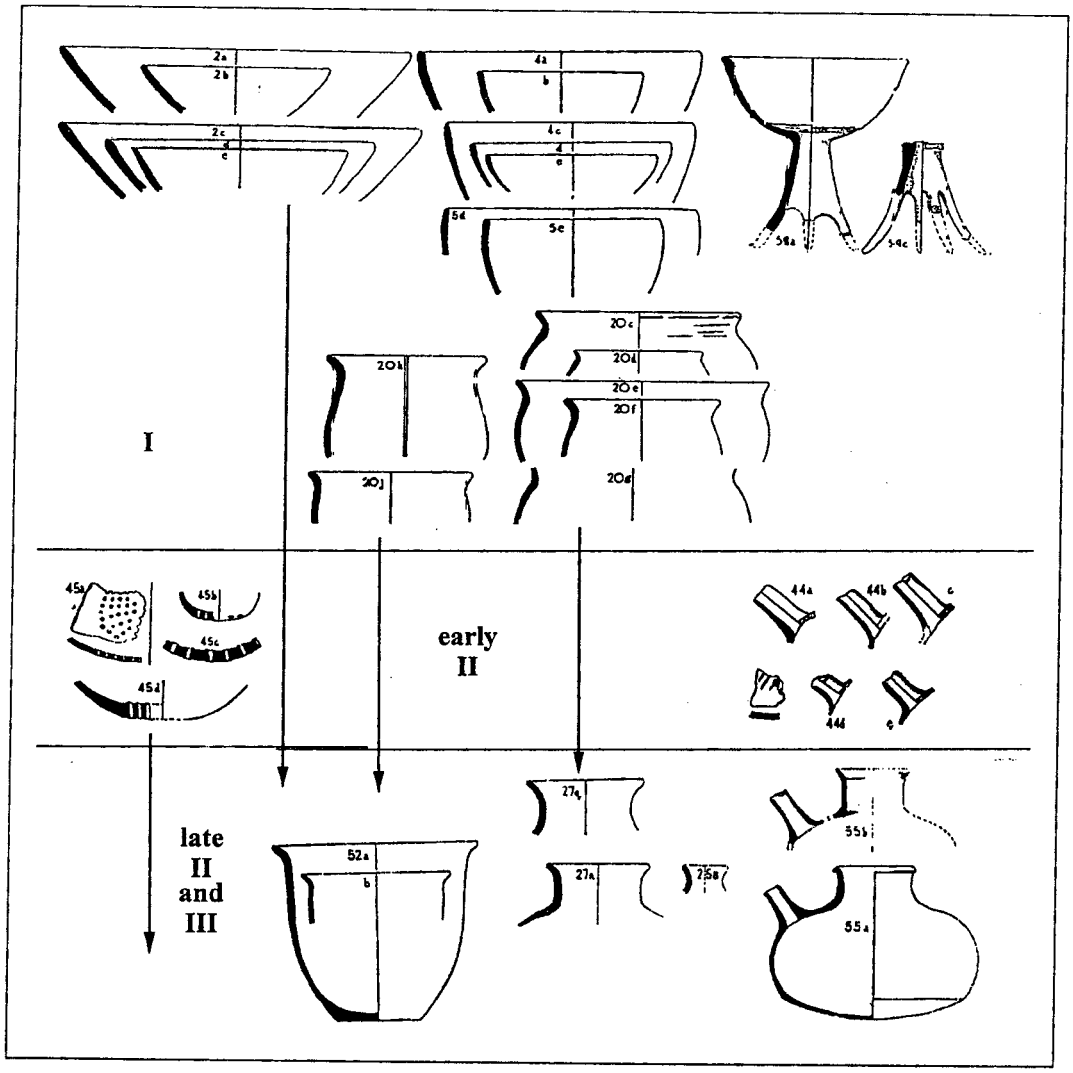


Fig. 12: Selected ceramic forms showing the gradual addition of new types through time. Note especially the addition of perforated bowls, spouted vessels and higher necked jars, as well as tall drinking (?) vessels. Forms derived from the Piklihal corpus (from Allchin 1960).

ant area that needs serious study is the fabric type of the pottery from different sites and regions. Only through the systematic identification of ceramics that share clay sources, or come from clearly distinct sources will it become possible to outline with any detail the extent of trade and interactions across the Southern Neolithic and between the south and north Deccan. As noted above, the 'Blotchy Grey Ware' and the 'Jorwe' style ware remain poorly defined in terms of how many places they were manufactured. Southern Neolithic pottery studies still have much to contribute by addressing current theoretical concerns and specific archaeological questions of a cultural-historical nature.

METALLURGY: FROM BRONZE TO IRON

The Southern Neolithic falls generally within the periodization of Indian archaeological cultures often referred to as 'Neolithic-Chalcolithic', since bronze/copper objects often occur together with ground-stone tools on early Indian village sites. As has long been clear from the excavated evidence, the quantity of metal finds from Southern Neolithic sites is extremely small, even from the later levels that are contemporary with Chalcolithic cultures further north that have abundant copper/bronze finds (Lahiri 1992: 182-215; Chakrabarti and Lahiri 1996: 75). At most sites only one or two objects were recovered, and these are usually small items, such as beads, fish-hooks, or rings. Miniature bronze axes have also been recovered from a number of sites, including Hallur (Nagaraja Rao 1971), Tekkalakota (Nagaraja Rao and Malhotra 1965), Gandluru (*IAR* 1983-4), Guntupalli (Rami Reddy 1978), and possibly Veerapuram (Sastri et al. 1984). The only large object yet found was an 'Antennae-hilted' sword from the site of Kallur in the Raichur Doab (Allchin and Allchin 1968: 153; Chakrabarti and Lahiri 1996: 79-80), an intriguing find since its type is better known from 'copper hoard' sites far to the north in the Ganga-Yamuna Doab (see, e.g. Yule 1997).

It remains unclear whether or not any copper/bronze was either processed from ores or smelted in south India at this time. No furnaces have yet been discovered. On general principle the paucity if bronze finds could have two possible causes, the first being that copper goods were extremely rare and that supply was low, or else copper that reached south India stayed in use over long periods, through the recycling of the copper through re-smelting. The lack of furnaces, and the types with parallels in north India, including the Kallur sword and the minature axes, tends to favour low supply as an explanation. The rarity of objects that would appear to have had regular functions, such as fish-hooks if one assumes they were used regularly, would suggest many other such objects did not get deposited to become part of the archaeological record, presumably because the metal was recycled. Indeed, recycling is a well-documented facet of traditional South Asian metalwork (Chakrabarti and Lahiri 1996). Within the context of a situation in which copper objects were supplied from external sources, the growth of iron metallurgy in south India, where there are numerous iron sources, might be seen in part as a response to the drop in supply in copper implements. This might help to explain why iron is apparently so much earlier in south India than further north, where Late Jorwe contexts that extend into the first millennium BC lack iron (cf. Chakrabarti 1992).

BURIALS: MORTUARY ARCHAEOLOGY

Excavations provided an increasing number of graves with skeletons that could be studied by physical anthropologists. Skeletal features and burial practices were often taken as evidence for extraneous origins of the Neolithic people or at least elements of the population (Allchin 1966; Nagaraja Rao 1970; Seshadri 1968-9; P. Singh 1967-8). Cultural interpretation of burial data revolves around mode of disposal of the dead, and the significance of the funerary goods. Both come from burials, both pit and urn burials which are typical in the Southern Neolithic province (single and double urn burials in case of infants and multiple urn burials in the case of adults). Burial evidence to date includes:

- At Brahmagiri 21 burials (18 urn burials of children),
- Piklihal 3 burials,
- Utnur 1 burial (infant),
- From Nagarjunakonda (one urn burial of a child),
- Tekkalakota 18 burials (6 child burials, the majority Tekkalakota were fractional burials imposing restrictions on a detailed study),
- Hallur 2 burials,
- Narsipur 2 burials,
- Recent evidence from Watgal,
- Recent evidence from Budihal.

Watgal records the oldest well-dated burial in south India, a stone covered burial in the time period 2700-2300 BC. Also Watgal provides the first evidence for urn-burial in the Deccan, dating to a pre-Malwa era, and thus preceding the earliest evidence yet available for the northern peninsula from this kind of inhumation.

One thing that is clear from the burial evidence from the Southern Neolithic is that it is extremely small. The available bodies produce nothing like clear demographic profiles for the ancient population as a whole. The number of excavated burials is so low that even the most generous population estimates would fail to people the Southern Neolithic regions for centuries at a time. It would therefore seem that we have to assume that much of the population, especially adults, was buried (or otherwise disposed of) in a manner (and in localities) rather different from the habitation locations from which so many of the reported (child) burials are found. Thus some interpretations, especially of a demographic nature, must be taken with a grain of salt. In general the burials remains are almost entirely of sub-adults, the reasons for this, presumably emanating from the ancient cultural system, need to be answered.

Of particular interest are tracing the historical and geographical relationships of Southern Neolithic burial customs. Evidence clearly suggests some continuity into the Megalithic burial tradition. Thus, while pit burials remained unmarked in the habitation areas, there are instances of marked burials such as a stone layered burial at Piklihal. In addition, the adult urn burials from Tekkalakota and numerous child urn burials from all the excavated sites with the exception of Sanganakallu and Maski (excavated areas did not produce

burials) both foreshadow the urn burials of the Megalithic period. In addition, the Black-and-Red Ware pottery, as noted above, links the Neolithic to the Megalithic. As Devaraj et al. (1995: 73) noted: 'Watgal's cultural sequence indicates that the concept of an independent "Megalithic cultural entity" (e.g. Gururaja Rao 1972) is invalid. Megalithism is a burial style that emerges within the Southern Neolithic context due to unknown cultural factors.'

PHYSICAL ANTHROPOLOGY BEYOND RACIAL STUDIES

Although the number of excavated Neolithic burials has remained limited, they have provided skeletons for physical anthropological study. Traditionally, human skeletal remains were analysed for racial affinities, in addition to interpretations of gender and age of death (Ayer 1960; Gupta et al. 1970; Malhotra 1967, 1971, 1977; Sarkar 1972). This early approaches drew on racial typology that had been the predominant approach in physical anthropology since the nineteenth century. As critical histories and reviews of this discipline have shown, such approaches were ill-founded by assuming that idealized, human racial prototypes existed to which ancient specimens could be compared (Kennedy 1976: Ch. 3; Littlefield et al. 1982; Marks 1995: Ch. 6; Chakrabarti 1997: Ch. 2; Walimbe, in press c). As noted by Marks (1995) such approaches are essentially non-Darwinian, as they fail to consider variation within populations. Early studies based on a purely typological (racialist) approach encountered diversity within the Southern Neolithic, forcing interpretations to account for the existence of several racial elements within the same society. For example, the skulls from Piklihal were mesocephalic and slightly prognathus, whereas the evidence from Nagarjunakonda reveals dolicocephalus variety, with a long head, robust and wide-nosed, similar to the skeletal series from Langhnaj, Nevasa and Tekkalakota (Sarkar 1972).

Moving beyond the racialist/racist approach of typologising skeletons, more recent work has focused on variation within the dataset, especially as it relates to issues of demographics and disease. Since the 1970s systematic bio- and dental-anthropological studies have been carried out in India. Such methods were not available prior to 1970 and the output of skeletal material from excavation in the south has been small in comparison with the northern Deccan sites. Woefully there are no major excavations between 1970 and 1980, with the exception of Veerapuram. Whereas the northern Deccan Chalcolithic sites, excavated since mid-1960s, have been subject to major bioanthropological analysis in all its ramifications (see Walimbe and Kulkarni 1994; Walimbe and Tavares 1995). In the context of southern sites there are only couple of instances of modern anthropological study (Malhotra 1967; Walimbe et al. 1993) and we anticipate the studies on the material from Budihal and Watgal and expect to know more about biological affinities, demography, nature of adaptive strategies and human ecology, as well as impact of agricultural adoption on human osteology. It is gratifying to note that S.R. Walimbe has been involved in the study of skeletal remains from Hulikal (in press b), Aija (in press a), and now Budihal (in press c) and has some interesting inferences on palaeopathology in addition to morphological data (S.R. Walimbe: personal communication).

A typological, osteological analysis based on identifying descriptive, 'racial' features was always ill-founded and inadequate scientifically. Walimbe (in press c) argues that it is necessary to place the skeletal evidence against the cultural-technological and ecological background of society, including the mobility level of the population. In fact, a statistical approach to cranial measurements as well as non-metric traits indicates that in the Southern Neolithic skeletal series a range of metrical variation possess uniform features that is shared over the larger Deccan peninsula, the region south of the Narmada, and can thus be seen as representing a single population-grouping in prehistory. In addition, this broader physical population continued into the Iron Age. Malhotra (1977) had noted similarities in the morphology of skeletons from Megalithic sites (Adichanallur, Brahmagiri, Yelleswaram) and those then known from the Neolithic, and he drew an anology between the groups in the present populations of Karnataka. According to Walimbe (personal communication), the rural base of the Southern Neolithic populations samples has been taken into account for carrying out demographic and pathological studies so that the biological adaptive strategies of the ancient populations of the Deccan can be understood as far as they might relate to changing climatic and environmental conditions. Such studies are now being pursued by Walimbe on the Neolithic skeletal material from Budihal (in press c).

Skeletal series should be able to contribute to our understanding of Neolithic society once more of them have been subject to rigorous palaeodemographic and palaeopathological studies. Such analyses are desirable for the insights they might provide into disease loads and physical adaptations. In addition, they should allow for comparison with the Harappan evidence and Ganga valley Mesolithic populations, and thus provide a more complete picture of ancient human physical diversity in South Asia. Unfortunately, given the incomplete cross-section of past populations represented by Southern Neolithic materials to date, it may prove difficult to understand demographics in detail and to address issues of population growth or pressure from the skeletal evidence alone. One priority, however, should be to try to identify dietary stress and the extent to which this, if present, correlates with cultural change. This information can then be combined with other evidence—from chemical analyses of bones, stable isotope studies, archaeozoology and archaeobotany—in order to understand long-term trends in diet and their relationship with subsistence changes, cooking technology and other cultural factors.

ARCHAEOZOOLOGY

The study of animal remains by zoologists or veterinary scientists became an important constituent of excavation reports that were published from the 1950s (Nath 1957, 1968a, 1968b 1971; Srinivasan 1961; Alur 1969, 1971a, 1971b, 1971c, 1973a, 1973b, 1976; Shah 1973; Clason 1977; Thomas 1984; Venkatasubbaiah et al. 1992). Occasional reviews relating to the faunal background of the Neolithic culture also appeared (Allchin 1969b; Allchin and Allchin 1974; Alur 1973a, 1973b; Thomas 1974; Paddayya 1975; Thomas and Joglekar 1994). Till the 1970s archaeozoology involved collecting a small number of larger bones discarding the smaller, fragmentary and microscopic ones in the absence

of a specialist archaeozoologist, and as a result much information that could be recovered was lost. Early reports often consisted only of lists of animal species. Owing to a purely zoological-taxonomic approach, the full potential of faunal data for delineating various facets of man-animal relationships was lacking. The archaeological study of collected bones nevertheless helped in inferring the meat components in human diet. Other secondary products from the domesticated animals, such as milk, wool and hides were never addressed directly. Milking has been argued to have been introduced (or developed) in peninsular India only in the second millennium BC (Simoons 1970; Fuller 1996), which highlights the need for systematic attention to this subject in Southern Neolithic archaeozoology. One secondary product which has already been considered, is traction, the use of live cattle as a source of labour. Alur (1973a, 1973b) noted 'anhylosis', osseous growth on carpal and tarsal ends which he interpreted as pathological growths caused by harnessing for heavy work; such bones were noted from amongst the remains at Utnur, Palavoy, Hallur, and T. Narsipur. Unfortunately, further details about this condition, such as its prevalence in the samples, was not reported; this area deserves renewed research. The presence of bone tools (such as arrowheads, scrapers, awls, needles, points, harpoons, chisels) in the absence of metal technology was noted, although these objects have yet to receive more detailed treatment as artefacts.

With the flowering of archaeozoology in the 1970s in India it is gratifying to note that faunal data from Neolithic Veerapuram and Budihal excavations and other related Chalcolithic sites in the northern Deccan have been studied by P.K. Thomas and his colleagues (Thomas 1984; Thomas and Joglekar 1994; Paddayya et al. 1995). The faunal studies of northern Deccan early farming Chalcolithic cultures have provided us with much new knowledge relevant to understanding man-animal relationships in peninsular India generally, and provide an important comparative dataset against which to compare Southern Neolithic assemblages (Thomas and Joglekar 1994).

The full range of domestic animal taxa have been reported from Southern Neolithic sites, although in some cases it is not entirely clear whether these represent domesticated forms or local, wild relatives that were occasionally hunted. Taxa such as the water buffalo (*Bubalus bubalis*) and the pig (*Sus scrofa*) have been reported occasionally and in rather small quantities. Either species could have been widespread as a component of the wild fauna, and thus their occurrence on the archaeological sites could indicate nothing other than occasional hunting of these taxa. Nevertheless, the careful analysis of assemblages from Banahalli (Joglekar, in press) suggests that some domesticated individuals of these taxa were present during the Neolithic. Thus it remains unclear at what stage these species were domesticated, either introduced in domesticated form from the north or else herded and bred from local wild stock. Further archaeozoological study is needed, especially of a morphometric approach that can attempt to develop reliable criteria for distinguishing wild from domesticated types, which has in the past proved difficult for these species (as noted for *Bubalus* by Allchin 1969b). In addition, the fowl (*Gallus* sp.) may be either the domesticated *G. gallus* or the local wild green junglefowl (*G. sonnerati*) (Zeuner 1963; Crawford 1984). Circumstantially, however, it can be argued that the *Gallus* remains represent the domestic chicken, since the domesticated chicken was already present outside its native range in the Harappan Civilization (Fuller 1996).

TABLE 4: MAMMALIAN SPECIES AT DIFFERENT SOUTHERN NEOLITHIC SITES IN INDIA (after Thomas and Joglekar 1994)

Species/Sites Author	BR	MK	NG	PH	SK	TK	KK a	KK b	HL	TN c	TN d	PV	TD	PY	UT e	UT f	VP
Bos indicus	+	+	+	+	+	+	+	+	+	+	+	+	+	+?	+	+	+
Bubalus bubalis	+	+	+	-	-	-	+	+?	+?	-	-	+	-	+?	-	-	-
Capra hircus	+	-	+	+	+	-	+	+	+?	-	+?	+	+	-	+	+?	+
Ovis aries	+	-	+	+	+	+	-	-	-	+?	+	+	+	+	-	+?	+
Sus domesticus	+	-	-	-	-	-	-	+	+	-	-	-	-	+	-	-	+
Canis familiaris	+	-	-	-	-	-	+	+	-	-	+?	+	-	-	-	-	+
Equus caballus	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
Equus asinus	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Bos gaurus	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+
Equus sp.	+?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B.tragocamelus	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A.cervicapra	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+
Axis axis	+	-	+	-	-	-	+	-	-	-	-	-	-	+	-	-	-
Cervus duvauceli	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	+
Cervusunicolor	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Deer family	-	-	-	-	-	+	-	+?	-	-	-	+	-	-	+	-	+
Sus scrofa	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-
Felis chaus	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Rattus rattus	-	+	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-
Hystrix indica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Squirrel	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Elephus maximus	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhinoceros unicornis	-	-	-	-	-	-	-	-	-	-	-	-		+	-	-	-

NOTE: + Present - Absent ? Species doubtful

BR Brahmagiri (Nath 1963)
PH Piklihal (Allchin 1960)
TK Tekkalakota (Nagaraja Rao and Malhotra 1965)
HL Hallur (Alur 1971)
PV Palavoy (Reddy 1978-9)
PY *IAR* (1967-8)
VP Veerapuram (Thomas 1984)
MK Maski (Nath 1957)
SK Sanganakallu (Alur 1969)
KK Kodekal a (Shah 1973), b (Classon 1979)
TN T. Narsipur c (Nath 1971), d (Alur 1990)
TD Terdal (Alur 1971)
UT Utnur e (Allchin 1963), f (Alur 1990)
NG Nagarjunakonda

In addition to the large fauna discussed above, some communities also ultized aquatic resources at least on a small scale. A small number of fish bones and river mussel shells were recovered by the authors from Sanganakallu. One contribution of archaeozoological studies to our understanding of Neolithic trade comes from the presence of some marine shell, and marine-shell artefacts, as at Watgal (Devaraj et al. 1995), that indicates exchange with coastal areas, probably from the West.

As has long been noted, cattle (*Bos indicus*) dominate all Southern Neolithic assemblages (Allchin 1963a; Paddayya 1975; Clason 1977; Thomas 1984; Sahu 1988; Venkatasubbaiah et al. 1992; Thomas and Joglekar 1994). Cattle bones are dominant in both the habitation and ashmound sites. Not much information on the breed(s) of cattle is available for the Southern Neolithic. It is notoriously difficult to distinguish these on the basis of fragmentary bones, at least without statistical analysis of extensive collections.