

The chronology of the Neolithic ditched settlements of the Tavoliere and the Ofanto valley

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INTRODUCTION

The chronology of the southeast Italian Neolithic may appear a rather over-worked subject, since there are several relatively recent treatments of various aspects (Alexander 2005; Skeates 2000; 2003), as well as a range of earlier articles (Pluciennik 1994; 1997; Sargent 1985; Skeates 1994; Whitehouse 1994: 86–90). It therefore may seem not to need additional attention now. Nonetheless, ‘rethinking’ – which is the avowed aim of the present volume – involves updating and adjusting of existing knowledge as well as iconoclasm and the opening up of new areas of research. In the case of chronology, new excavations are taking place, new radiocarbon dates are being published, Bayesian analysis is being introduced and there are several other issues that are worth further consideration. In the present volume, the paper by Keri Brown and Craig Alexander considers the chronology of the beginnings of the Neolithic in southeast Italy using Bayesian modelling, while Robin Skeates includes a discussion of the chronology of the later part of the period in his paper on Neolithic Italy at 4004 BC. My own contribution in this paper relates specifically to the dating of the so-called *villaggi trincerati*: the Neolithic ditched settlements characteristic of the Tavoliere plain of northern Puglia and the Ofanto valley that forms its southern border (Fig. 1).

THE NEOLITHIC DITCHED SETTLEMENTS

The Tavoliere is a large dry plain in northern Puglia, famous in general for its production of high quality wheat grain and among archaeologists for its large number of Neolithic settlements, first discovered from the air during WWII. The general features of these sites are well known and I will not provide a detailed description here. They are enclosures surrounded by single or multiple ditches and often contain smaller internal enclosures,

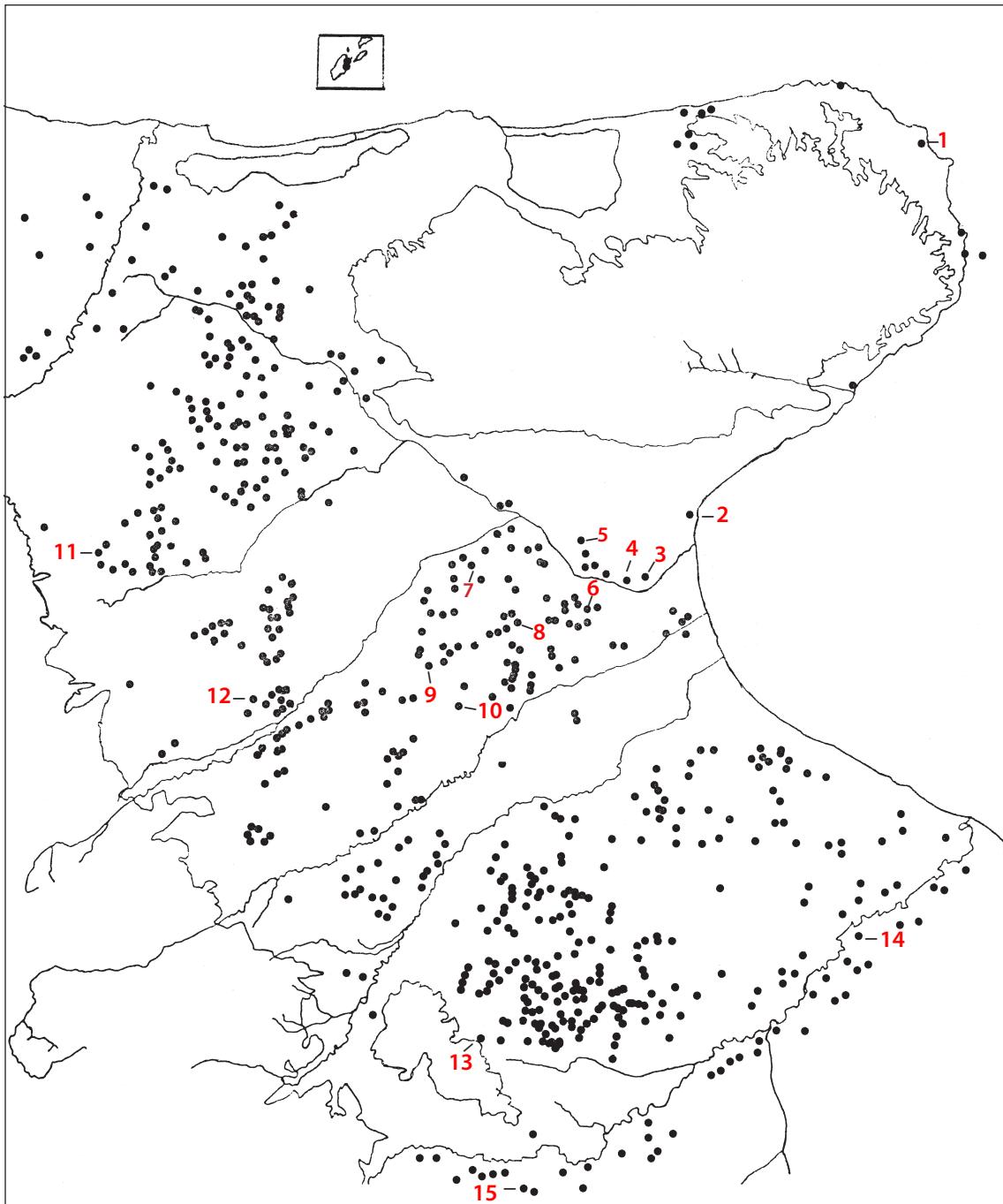


Fig. 1 Map of the Gargano Promontory, Tavoliere Plain and the Ofanto River, showing distribution of ditched sites and locations of sites with ¹⁴C dates. 1: Defensola (flint mine); 2: Grotta Scaloria (cult cave); 3: Coppa Nevigata; 4: Fontanarosa Oliveto; 5: Masseria Candelaro; 6: Masseria Santa Tecchia; 7: Passo di Corvo; 8: Scaramella di S. Vito; 9: Villa Comunale 10: Masseria Giuffreda 11: Cava Petrilli; 12: Ripa Tetta; 13: Lagnano da Piede; 14: Palata; 15: Rendina

after Brown 2001–2003: 140, with additional sites from Cipolloni Sampò 1980: 304 and elsewhere

described as C-ditches; some sites have attached outer enclosures, sometimes labelled annexes (a few examples of site plans are shown in Fig. 2). While sites of broadly similar type in the Matera area of eastern Basilicata had been recognised and explored from early in the 20th century (Rellini 1919; Ridola 1926), those of the Tavoliere remained unknown till the 1940s when John Bradford recognised them from vegetation marks visible on aerial photos taken by the RAF and USAAF (Bradford & Williams-Hunt 1946; Bradford 1949; 1957: chapter 2).

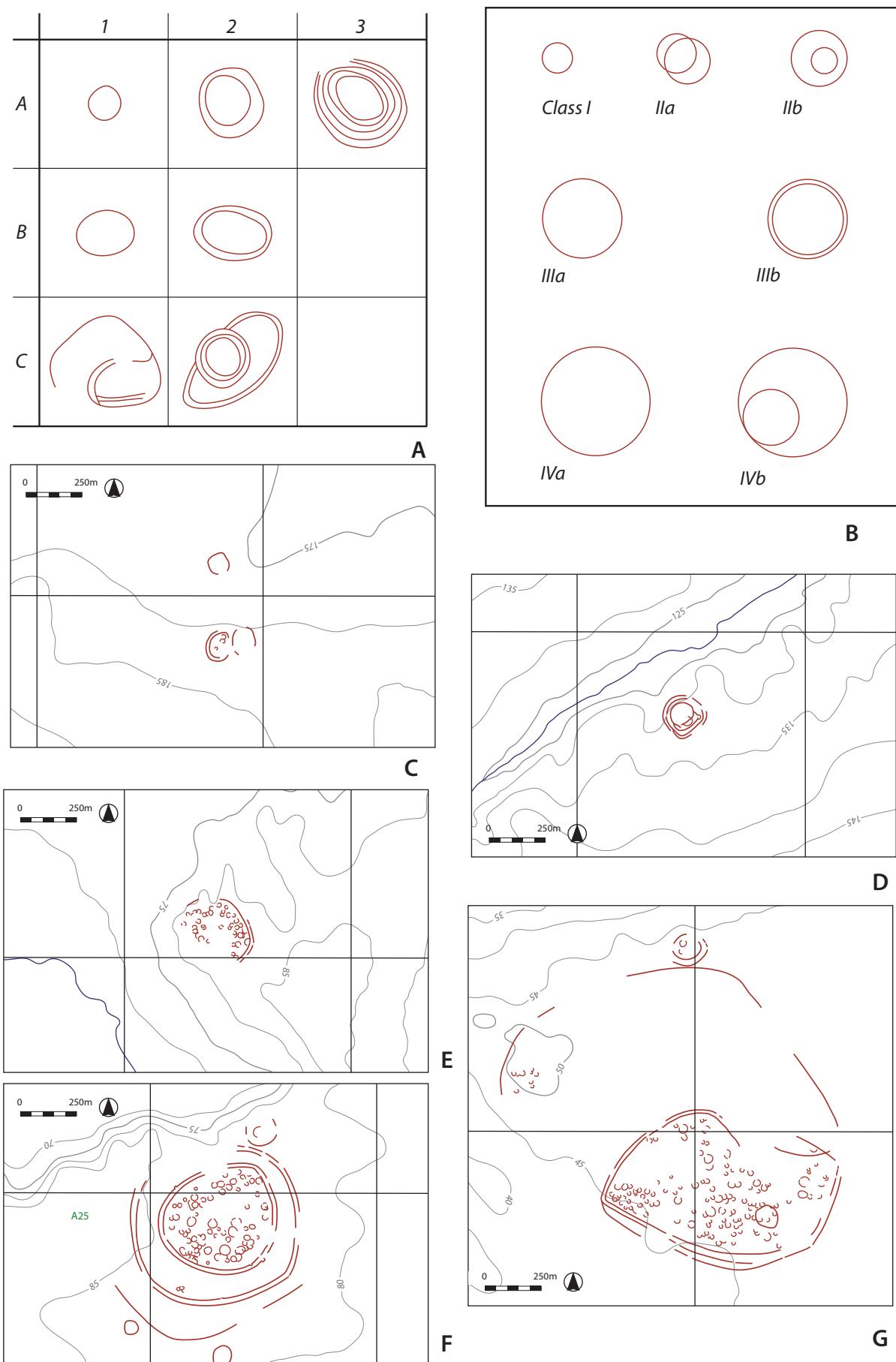


Fig. 2 A-B: typologies of ditched settlements after Tiné 1983: 24 (A) and Jones 1987:180 (B); C-G: examples of site plans. C: small single- and double-ditched sites in the Pozzo Terraneo area (including Jones sites 121 and 122); D: multi-ditched site of Masseria Pozzelle (Jones site 250); E: double-ditched site of Masseria S. Giusta (Jones site 218); F: large multi-ditched site of Masseria Schifata (Jones site 19); G: largest site on the Tavoliere, Passo di Corvo (Jones site 198)

mapped and drawn by Mike Seager Thomas

Since their first recognition, the sites have been identified as settlements, with many scholars accepting Bradford's subdivision into 'homesteads' (the smaller sites) and 'villages' (the larger ones). The only scholar to suggest any other interpretation is Alasdair Whittle, who has argued that the enclosures were "rarely occupied, either throughout the year or from year to year", that they may have been places of fixed interest in a landscape of mobility "chosen for gatherings and aggregations of people, for social negotiation and transaction as much as the meeting of subsistence needs" (Whittle 1996: 311). Whittle's interpretation is based on comparison with the Neolithic ditched enclosures of Britain (which are different in many ways) and demonstrates a lack of detailed knowledge of the Italian sites, especially the information now available on structures and on subsistence economy. Skeates (2000: 176–7) provides a fuller refutation of Whittle's claims. My own view is that the sites were undoubtedly settlements, used by practitioners of mixed arable and stock farming, though the issue of how permanent or otherwise occupation was remains an open one. Although other types of site, such as open settlements and occupied caves and rock-shelters are known from elsewhere in Apulia, the ditched enclosure is overwhelmingly the dominant settlement form of the earlier part of the Neolithic throughout the Tavoliere and the Ofanto valley.

The number and density of the Neolithic sites in the Tavoliere has always been recognised as remarkable. From an initial assessment of 150–200 sites (Bradford & Williams-Hunt 1946: 192), the number has steadily increased and in 1975 Odetti offered an estimate of 1000. However, producing a list of documented and georeferenced sites has proved a slow process. In 1987 Jones documented 253¹ sites, while in 2004 Brown documented 566, including examples from the Italian air photo archive and aerial reconnaissance by Derrick Riley (Brown 2001–2003). Finally the work of the Tavoliere-Gargano Prehistory Project, carried out by the present author and colleagues from 2002 to the present, has documented many more sites: some of these have been identified on existing air photos but had not been recognised previously (before the application of image-enhancing techniques) while others have been identified on new photos published by GoogleEarth (Hamilton *et al.* forthcoming a). We now have a total of 570 georeferenced sites in the areas covered by the original RAF and USAAF air surveys (less than 50% of the total area of the plain), to which we can add 206 known sites that fall outside these mapped areas (these include sites recognised in surface surveys, as well as from a variety of aerial archaeology sources, including those documented in Brown 2001–2003). Given that the areas outside the zones covered by RAF and USAAF have much more sporadic aerial coverage and only limited surface survey, the combined figure of 776 has to be considerably lower than the original number present in the Tavoliere as a whole. Moreover this total does not include the 60+ Neolithic sites, many of the ditched form, recorded by Mirella Cipolloni Sampò in the Ofanto valley, to the south of the Tavoliere proper, but clearly constituting part of the same Neolithic world (Cipolloni Sampò 1977–1982; 1980). These numbers suggest that Odetti's estimate of 1000 sites was almost certainly conservative. While the sites were certainly not all occupied at the same time – and this aspect is discussed later – we have here a density of Neolithic sites that is unparalleled anywhere in Europe.

CHRONOLOGY

Ceramic chrono-typology

The southeast Italian Neolithic is normally subdivided into phases based on ceramic typology, tied to an absolute chronology by the attachment of a small number of radiocarbon dates to specific ceramic styles. The simple version of the scheme has three major phases: Early, Middle and Late (*e.g.* Bernabò Brea 1962; Cipolloni Sampò 1992), while a more elaborate version (Tiné 1983: 161–6) has subdivisions into 11 phases (four Early Neolithic, six Middle Neolithic and one Late Neolithic); of these 11 phases, the last two are represented only

Phase (Tiné 1983)	Pottery style (Tiné 1983)	Absolute chronology	Ditched enclosures
Late Neolithic	VII Diana-Bellavista	4000 cal BC	
Middle Neolithic	VI Serra d'Alto	5000 cal BC	
Middle Neolithic	V Scaloria alta		present
Middle Neolithic	IVd Cassano Ionio		present
Middle Neolithic	IVc Scaloria bassa		present
Middle Neolithic	IVb Passo di Corvo tipico		present
Middle Neolithic	IVa Passo di Corvo arcaico		present
Early Neolithic	III Masseria La Quercia		present
Early Neolithic	IIb Lagnano da Piede		present
Early Neolithic	IIa Guadone		present
Early Neolithic	I Prato Don Michele	6000 cal BC	

Table 1 Summary of Tiné's chrono-typological scheme for the Neolithic of the Tavoliere, with approximate dates of beginning and end of sequence relating to use of the ditched enclosures *after Tiné 1983: Tav. 126, simplified*

sparsely on the Tavoliere sites and probably represent a time after the ditched enclosures had largely fallen out of use. A summary of this scheme is presented in Table 1. I have long argued that this system does not really work and that there are fundamental problems with using the ceramic sequence to define precise phases in this way (Whitehouse 1969; 1986). In 1986 I suggested a simplified scheme that rejected most of the subdivisions, but reallocated some of Tiné's Early Neolithic phases to the Middle Neolithic and also introduced a fourth phase, a Late Neolithic, to include the later phases of Tiné's Middle Neolithic, while I re-labelled the last phase (Tiné's Late Neolithic) Final Neolithic.

There is undoubtedly a general validity to Tiné's ceramic sequence: simple impressed ware dominates the earliest part, followed by more elaborate impressed wares, accompanied by painted decoration (Guadone, La Quercia, Lagnano da Piede pottery styles); refined light-surfaced 'figulina' wares appear later, initially with red-painted designs (Passo di Corvo), later with red and black or dark brown designs (Scaloria Alta); still later Serra d'Alto painted ware and then Diana-Bellavista plain wares make an appearance. However, the successive pottery styles overlap in their usage and in the Tavoliere there is variation between different parts of the plain and between different sites in the same area; moreover dark-surfaced plain wares appear throughout the sequence, sometimes in considerable quantities. It is likely that geographical and functional considerations, as well as chronological ones, are relevant to these patterns.

There is one important point that I have not made in my previous articles. Between the three main phases generally recognised – Early, Middle and Late Neolithic – or the four I recognised in 1986 – Early Middle, Late and Final Neolithic – there is only one strongly marked transition, which is that between the Middle and Late Neolithic (Tiné) or between the Late and Final Neolithic (Whitehouse). In ceramic terms this line is drawn between the elaborate decorated wares, Trichrome and Serra d'Alto wares, and the plain wares, Diana-Bellavista.² This really marks a major change, characterised by the abandonment

of village life, expansion of settlement into new areas, greater emphasis on pastoralism, the development of burial and other ritual sites and what John Robb has called “the great simplification”, in terms of pottery styles and other artefact types (Robb 2007: Chapter 8). The date of this change and whether it was sudden or gradual is not very clear but it happened at some time after the Tavoliere ditched villages went out of use. By contrast, the earlier phases seem to develop imperceptibly from one to another, with no clear change in settlement type, subsistence economy or ritual practice, indeed in anything but pottery styles – on which the evidence is ambiguous. It is worth noting that the sequence established by Tiné for the Tavoliere villages is based on stratigraphies of excavated ditches (including both larger settlement ditches and smaller compound ditches), with a small number of associated ^{14}C dates. I have several times argued that at best these stratigraphies reflect local sequences only and cannot reliably be extended to create phases valid for the whole Tavoliere. Moreover, even in terms of local sequences, the stratigraphies can be problematic, since there are sometimes indications of inversions in the sequence, *e.g.* ^{14}C dates in the wrong order (*Villa Comunale*: Simone 1977–82: 160), bone racemisation dates in the wrong order (*Masseria Santa Tecchia*: Belluomini & Delitala 1983) or OSL dates in the wrong order (*Cava Petrilli*: Sanderson & Murphy 2010). These ‘wrong’ sequences can be explained in terms of the way the ditches were filled in, involving earlier deposits – sometimes including the original material excavated from the ditch – being incorporated at later stages. There is detailed evidence for this at Cava Petrilli (Sanderson & Murphy 2010: 301–4) and it is a plausible interpretation of the other sequences also. In any case it is clear that these sequences need careful interpretation and cannot be taken to reflect ceramic development in a straightforward manner.

Radiocarbon dating

Analysis by Robin Skeates

The available alternative to chrono-typology is radiocarbon dating. Robin Skeates is the only scholar so far who has attempted to move away from ceramic typology entirely in his discussion of the ditched settlements and to use instead absolute chronology derived from ^{14}C dates (Skeates 2000). Using only the sites that have produced ^{14}C dates, he subdivides the thousand years between 6000 and 5000 cal BC, during which the ditched enclosures were in use, into four periods of 250 years each and documents changes in the use of the sites through this sequence (Table 2). In brief, his earliest Neolithic phase, *c.*6000–5750 cal BC represents the earliest Neolithic on the Tavoliere, with ditched sites and the use of Impressed Ware, but little detailed information on other aspects of life. The next phase, *c.*5750–5500 cal BC continues with ditched enclosures and internal features such as C-ditches, huts and cobbled areas, are documented. More elaborate pottery styles appear (Guadone, La Quercia and Lagnano da Piede wares). Ditches sometimes demonstrate ritual elaboration with burials and other special deposits. The following phase, *c.*5500–5250 cal BC demonstrates much continuity from the previous stage. The previous pottery styles continue, but the fine light-surfaced *figulina* ware makes an appearance. The social and symbolic significance of enclosure ditches is maintained and enhanced. In the fourth main phase, *c.*5250–5000 cal BC, new features (‘hollows’, ‘cavities’ and ‘pits’) were dug into earlier deposits; these contain a variety of material: primary and secondary burials, food remains, and special artefacts, including figurines and elaborate painted vessels. This phase is characterised by elaboration of material culture and related ritual practices.

While the aims of Skeates’ exercise are admirable, the nature of the ^{14}C evidence really does not support the suggested subdivisions. In the first place, the margin of error of radiocarbon dates generally precludes this level of precision, and this general situation is made worse in this case because several of the dates for the Tavoliere sites have standard deviations of 100 years or more. Secondly, Skeates’ sequence is based on 19 dates (of which he rejects 4 as “junk dates”) from 11 sites. Given that we now know that the number of

Phases (Skeates 2000)	Characteristics	Ditched sites with ^{14}C dates
5000–3000 cal BC	End of ditched enclosures; new pottery styles: elaborate painted wares and plain Diana-Bellavista wares. New types of burial in slab cists. Tavoliere possibly became 'landscape of the dead' (Robb 1994)	
5250–5000 cal BC	New features ('hollows', 'cavities' and 'pits') dug into earlier deposits; these contain a variety of material: primary and secondary burials, food remains, and special artefacts, including figurines and elaborate painted vessels. Phase characterised by elaboration of material culture and related ritual practices	Masseria Candelaro (ditch F, stratum 4 and above; inner area, strata 3–1) Passo di Corvo (area α , phase IVa2)
5500–5250 cal BC	Much continuity from previous stage. Continuation of previous pottery styles, but also introduction of figulina ware. Social and symbolic significance of enclosure ditches maintained and enhanced.	Scaramella S. Vito A (sounding 11, spit 7) Masseria Santa Tecchia (Structure A, spit 4) Masseria Candelaro (stratum 4) Masseria Fontanarosa Oliveto (inner enclosure ditch, level 6)
5750–5500 cal BC	Ditched enclosures; C-ditches, huts and cobbled areas. More elaborate pottery (Guadone, La Quercia and Lagnano da Piede wares). Ritual elaboration of ditches with burials and other special deposits	Ripa Tetta (earlier phase) Coppa Nevigata (ditch) Villa Comunale, Foggia (structure A, level 8) Lagnano da Piede Masseria Candelaro (stratum 4 and ditch 2, strata 7–5)
6000–5750 cal BC	Earliest Neolithic on the Tavoliere, with ditched sites; little detailed information; impressed pottery	Masseria Giuffreda (ditch G) Scaramella S. Vito A (sounding 1)
8000–6000 cal BC	Sparse Mesolithic traces	

Table 2 Summary of Skeates' chronological scheme for the Neolithic of the Tavoliere, based on ^{14}C dates
summarised from account in Skeates 2000

ditched sites on the plain is at least 776, plus 60+ in the Ofanto valley (see discussion above; Hamilton *et al.* forthcoming a) and that more are being documented each year by new aerial photography and surface survey, a sample of just 15 dates from 11 sites is clearly inadequate to derive a sequence supposedly valid for the whole plain. Moreover, as is apparent even from Skeates' own discussion, the material evidence in general suggests a continuous gradual development, which does not lend itself to division into four distinct phases, with clear boundaries between them.

What can we do with the radiocarbon dates?

If we also exclude three of the four dates that Skeates omitted,³ we have available at present 30 ^{14}C dates from 13 ditched sites, including the sites of Rendina and Palata, in the Ofanto valley, just south of the Tavoliere; there are also dates available from contemporary non-settlement sites in nearby areas, including the burial and cult cave of Scaloria, in the foothills of the Gargano and the flint mine of Defensola (Vieste) in the Gargano Promontory itself. The dates are shown in Fig. 3 and Table 3. The calibrations of the ^{14}C dates have been calculated using the 'intercept' method, criticised by Brown and Alexander (this volume: 42–4). However, I make no apology for using this method here, since my aim is to provide a simple visual image of the spread of dates available for the ditched settlements, rather than refining the chronology in any way.

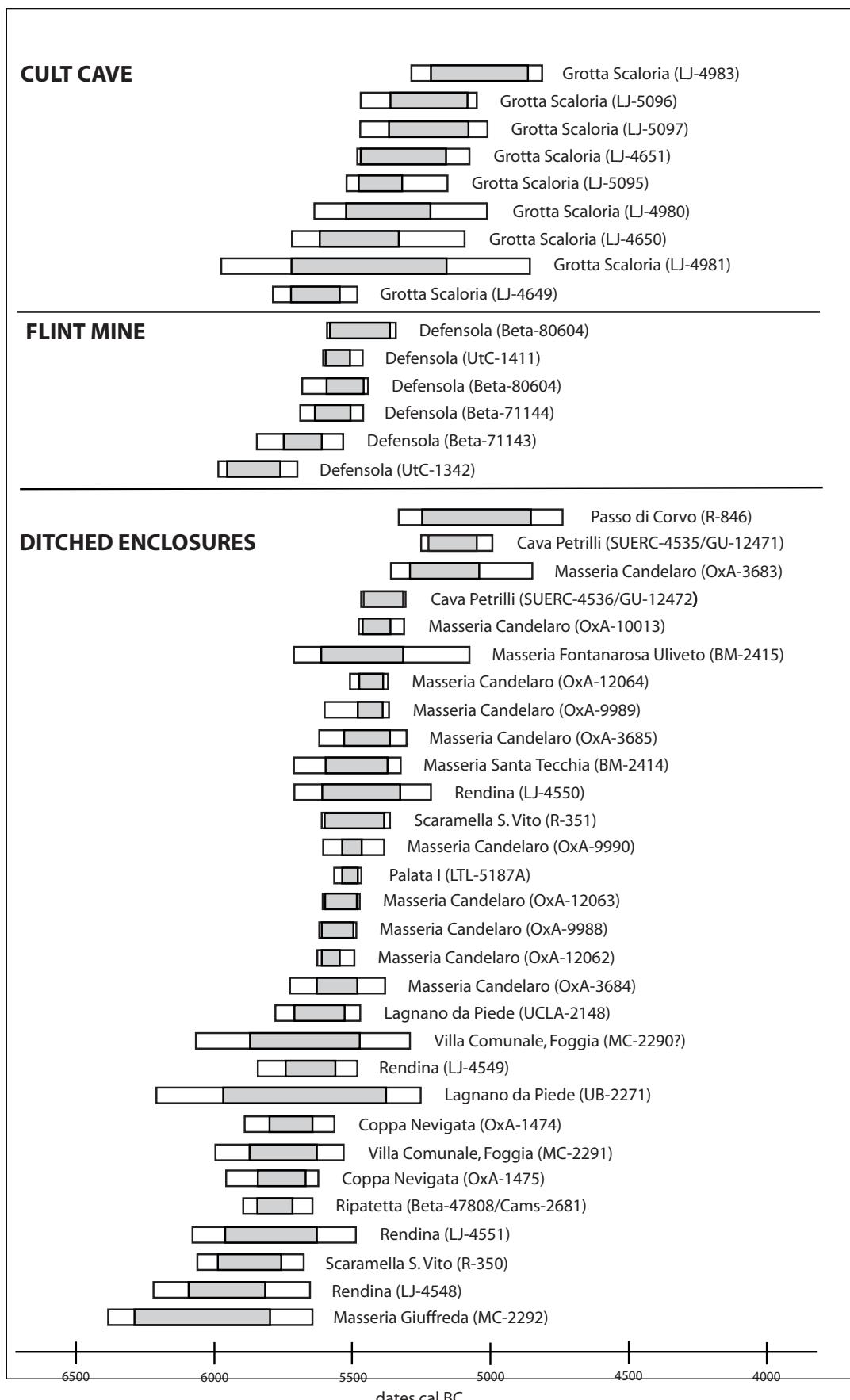


Fig. 3 Radiocarbon dates for Early–Middle Neolithic sites in northern Puglia and Basilicata. Dates are shown as cal BC; the outer hollow box shows the 2 σ date range; the inner shaded box shows the 1 σ date range. The dates were calibrated using the CALIB Radiocarbon Calibration Programme, version 7 (Stuiver, M., Reimer, P.J. & Reimer, R.: calib.qub.ac.uk/calib/ – accessed 22/07/2014)

Date BP	1σ cal BC	2σ cal BC	Sample type	Site and context	Associated pottery	References
8150±200 Pi-	7453–6830	7568–6642	marine shell	Coppa Nevigata, Manfredonia (FG)	Impressed ware	Tongiorgi <i>et al.</i> 1959
7780±320 BM-2557	7072–6269	7472–6060	carbonised grain	Coppa Nevigata, Manfredonia (FG); deposit of plant material in ditch	mostly Impressed ware	Ambers <i>et al.</i> 1989: 26
7600±100 ?	6588–6382	6636–6250	mixed animal bones	Masseria Santa Tecchia; compound ditch	Impressed ware, La Quercia ware and Passo di Corvo painted ware	Belluomini & Delitalia 1983: 266
7125±200 MC-2292	6214–5811	6393–5659	charcoal	Masseria Giuffreda (FG)	Impressed ware	Simone 1977–82: 160; Guilaine <i>et al.</i> 1981: 155–6
7110±140 LJ-4548	6201–5812	6324–5571	charcoal	Rendina: C-shaped ditch, 4		Linick 1980: 1040; Galiberti <i>et al.</i> 2001: 95
7000±100 R-350	5985–5792	6058–5709	charcoal	Villaggio Scaramella S. Vito (FG), outer ditch	Impressed ware and La Quercia ware	Alessio <i>et al.</i> 1969: 486
6990±80 Utc-1342	5979–5792	6009–5727	charcoal	Defensola A (FG); flint mine	Impressed ware and incised ware	Di Lernia <i>et al.</i> 1992: 195
6900±150 LJ-4551	5971–5664	6054–5544	charcoal	Rendina: last level of ditch 14		Linick 1980: 1040
6890±60 Beta-47808/ Cams-2681	5840–5721	5962–5660	carbonised grain	Ripatetta, Lucera (FG); Area B, cobbling	Impressed ware and incised ware; proto-figulina and painted pottery	Tozzi & Verola 1991: 47–8; Grifoni & Tozzi 1996
6880±90 OxA-1475	5867–5671	5978–5630	carbonised grain	Coppa Nevigata, Manfredonia (FG): ditch	Impressed ware and 1 sherd impressed and painted	Manfredini 1987: 51; Hedges <i>et al.</i> 1989: 226; Whitehouse 1994: 86–7
6850±130 MC-2291	5875–5671	5990–5540	mixed charcoal and carbonised grain	Villa Comunale, Foggia (FG): sounding 1, level 7	Passo di Corvo and Scaloria Bassa painted pottery	Guilaine <i>et al.</i> 1981: 156; Simone 1977–82: 160
6850±80 OxA-1474	5832–5661	5966–5621	carbonised grain	Coppa Nevigata, Manfredonia (FG): lip of ditch	Impressed ware and 1 sherd figulina	Hedges <i>et al.</i> 1989: 226; Whitehouse 1994: 86–7
6820±80 Beta 71143	5772–5635	5887–5568	charcoal	Defensola (FG): flint mine		Galiberti <i>et al.</i> 2001: 95
6790±255 UB-2271	5973–5486	6215–5227	bone collagen	Lagnano da Piede (FG): bottom of ditch	Guadone Impressed ware, incised ware and Lagnano painted ware	Mallory 1984–7: 249–50, 271; Marshall Brown 1984–7: 279–89
6780±100 LJ-4549	5766–5569	5882–5517	charcoal	Rendina: C-shaped ditch, 4		Linick 1980: 1040;
6750±220 MC-2291 [?2290]	5876–5481	6069–5230	charcoal and carbonised grain	Villa Comunale, Foggia (FG)	Impressed ware, La Quercia ware and white band painted ware	Guilaine <i>et al.</i> 1981: 156; Simone 1977–82: 160
6720±100 LJ-4649	5717–5558	5804–5478	charcoal	Grotta Scaloria, Manfredonia (FG): in burial	Undiagnostic Neolithic pottery	Linick 1984: 99
6700±100 UCLA-2148	5706–5541	5787–5474	bone collagen	Lagnano da Piede (FG): upper part of ditch	Guadone Impressed ware, La Quercia and Lagnano painted ware	Mallory 1984–7: 249–50, 271; Marshall Brown 1984–7: 279–89
6670±70 Beta 71144	5642–5532	5706–5485	charcoal	Defensola (FG): flint mine		Galiberti <i>et al.</i> 2001: 95

Table 3 List of radiocarbon dates plotted in Fig. 3

Date BP	1σ cal BC	2σ cal BC	Sample type	Site and context	Associated pottery	References
6640±95 OxA-3684	5632–5492	5727–5384	animal bone	Masseria Candelaro (FG): structure Q, layer 4	Guadone Impressed ware, graffiti, red band painted and La Quercia ware	Skeates 1994: 254–5; Cassano & Manfredini 2004: 463–5
6638±34 OxA-12062	5618–5552	5629–5511	animal bone	Masseria Candelaro (FG): pit P3		Cassano & Manfredini 2004: 463–5
6630±70 Beta 80604	5622–5518	5666–5475	charcoal	Defensola (FG): flint mine		Galiberti <i>et al.</i> 2001: 95
6630±40 UxC-1411	5616–5537	5626–5492	charcoal	Defensola (FG): flint mine, latest phases of mine	Rendina 1	Di Lernia <i>et al.</i> 1992: 195; Galiberti <i>et al.</i> 2001: 95
6605±45 OxA-9988	5613–5495	5618–5485	seed	Masseria Candelaro (FG): structure Q, layer 3		Cassano & Manfredini 2004: 463–5
6601±37 OxA-12063	5610–5495	5616–5485	human bone	Masseria Candelaro (FG): pit P2, burial layer 8		Cassano & Manfredini 2004: 463–5
6576±45 LTL-5187A	5556–5484	5616–5476	human bone	Palata I, phase 3, human burial		Radina <i>et al.</i> 2011: 117
6555±45 OxA-9990	5542–5478	5617–5468	seed	Masseria Candelaro (FG): ditch Ze, layer 5		Cassano & Manfredini 2004: 463–5
6540±65 R-351	5609–5393	5617–5375	scarce charcoal fragments	Villaggio Scaramella S. Vito (FG): bottom of inner ditch	Impressed ware and La Quercia ware	Alessio <i>et al.</i> 1969: 486
6540±60 Beta 80603	5606–5470	5616–5376	charcoal	Defensola (FG): flint mine		Galiberti <i>et al.</i> 2001: 95
6530±260 LJ-4981	5719–5217	5980–4855	charcoal	Grotta Scaloria, Manfredonia (FG): burial floor, level 4	Impressed ware and other	Linick 1984: 100
6530±150 LJ-150	5620–5363	5738–5082	charcoal	Rendina: last level of ditch 14		Linick 1980: 1040
6520±70 BM-2414	5552–5381	5617–5345	human bone collagen	Masseria Santa Tecchia, Manfredonia (FG)	Impressed ware and La Quercia ware	Whitehouse 1994: 87–8; Ambers <i>et al.</i> 1989: 27
6510±95 OxA-3685	5548–5373	5624–5313	human bone	Masseria Candelaro (FG): ditch F, layer 6	Guadone Impressed ware, graffiti, red band painted and La Quercia ware	Skeates 1994: 254–5; Cassano & Manfredini 2004: 463–5
6510±45 OxA-9989	5527–5385	5556–5371	seed	Masseria Candelaro (FG): pit P2, layer 8		Cassano & Manfredini 2004: 463–5
6501±37 OxA-12064	5512–5385	5529–5374	human bone	Masseria Candelaro (FG): structure Q, area of skulls		Cassano & Manfredini 2004: 463–5
6490±150 BM-2415	5610–5318	5711–5078	charcoal	Masseria Fontanarosa Uliveto, Manfredonia (FG), external ditch	Impressed ware and red line painted pottery	Cassano & Manfredini 1983: 141–2; Ambers <i>et al.</i> 1989: 27; Whitehouse 1994: 87–8
6490±140 LJ-4650	5604–5321	5709–5081	charcoal	Grotta Scaloria, Manfredonia (FG): human skull	No associated pottery	Linick 1984: 99
6450±50 OxA-10013	5474–5376	5485–5321	human bone	Masseria Candelaro (FG): 45C, burial T2		Cassano & Manfredini 2004: 463–5

Table 3 cont. List of radiocarbon dates plotted in Fig. 3

Date BP	1σ cal BC	2σ cal BC	Sample type	Site and context	Associated pottery	References
6415±35 SUERC-4536 (GU-12472)	5467–5364	5471–5327	animal bone	Cava Petrilli (FG), low level in ditch	Mixed Neolithic wares (no Impressed ware)	first publication here
6410±150 LJ-4980	5511–5222	5629–5027	charcoal	Grotta Scaloria, Manfredonia (FG): level of burials	Impressed ware and other	Linick 1984: 100
6400±80 LJ-5095	5468–5321	5508–5218	charcoal	Grotta Scaloria, Manfredonia (FG): habitation debris	Impressed ware and other	Linick 1984: 99
6330±90 LJ-4651	5464–5216	5478–5064	charcoal	Grotta Scaloria, Manfredonia (FG): near human skull	No associated pottery	Linick 1984: 99
6290±90 LJ-5097	5369–5079	5470–5046	charcoal	Grotta Scaloria, Manfredonia (FG): low mortuary gallery	Impressed ware and other	Linick 1984: 100
6290±80 LJ-5096	5369–5081	5467–5054	charcoal	Grotta Scaloria, Manfredonia (FG)	Impressed ware and other	Linick 1984: 99
6200±95 OxA-3683	5295–5045	5365–4857	human bone, female	Masseria Candelaro (FG), tomb 1, ditch F		Cassano & Manfredini 1991: 34; Skeates 1994: 255; Cassano & Manfredini 2004: 463–5
6180±35 SUERC-4535 (GU-12471)	5210–5070	5224–5016	animal bone	Cava Petrilli (FG), middle level in ditch	Mixed Neolithic wares (no Impressed ware)	first publication here
6140±120 R-846	5225–4914	5352–4783	carbonised seeds	Passo di Corvo, Foggia (FG), pit	Bichrome unbordered painted ware and black 'planed' Passo di Corvo style (phase IVa)	Alessio <i>et al.</i> 1976: 333
6120±80 LJ-4983	5207–4961	5291–4841	charcoal	Grotta Scaloria, Manfredonia (FG)	Ripoli-style painted ware (Late Neolithic Scaloria)	Linick 1984: 99

Table 3 cont. List of radiocarbon dates plotted in Fig. 3

Even a cursory examination of the spread of dates in Fig. 3 shows two clear patterns. The first is that the overall duration of the dated sites covers approximately the millennium 6000–5000 cal BC. The second is that it is difficult to identify divisions into clearly separate phases, with the apparent exception of a group represented by the latest three dates, which is discussed below.

I will take the two points separately. In relation to the overall duration of the 'ditched village phenomenon', it is possible, even likely, that there are both earlier and later phases of site use still to be discovered that will extend this time range, but we probably have enough dates to indicate that the 6th millennium cal BC represents the period in which the bulk of the ditched settlements flourished. The possibility of earlier dates is discussed in the paper by Brown and Alexander (this volume: 53–4). The possibility of later dates clearly also exists, but we can return to the ceramic record for further information here: the scarcity of the later pottery types on the ditched sites (both in excavations and surface survey) makes it unlikely that their use as settlements extended long into the 5th millennium cal BC – though there is some evidence that the sites were visited at later periods, being used for burials and perhaps other rituals connected with the ancestors (Robb 1994; Skeates 2000). This evidence is discussed further below.

The second pattern is the absence of significant breaks in the sequence in the millennium plus from c.6000 to 5000 cal BC. The possible exception to this is provided by the latest three dates from the ditched settlements, which do not significantly overlap with the earlier dates. I incline to think that this break is not real and is the result of a fortuitous lack of

dates falling in the relevant time period. This may appear to be special pleading, but it is difficult to identify a significant change in material culture at this point in the chronology. Moreover, the dates from the cult site of Grotta Scaloria (Fig. 3, upper) show a sequence extending across this break, without any apparent gap.

I suggest that we should regard the whole period of the ditched settlement use as constituting an 'Earlier Neolithic' and not attempt to subdivide it with a degree of precision that cannot be sustained by the evidence. This does not mean that we should not try to identify changes within this period. In fact I would argue that the way we should consider Skeates' (2000) discussion is as documenting broad *developmental trends*, rather than identifying precise phases. I discuss this further below.

DISCUSSION

In this section I discuss three main issues: developmental trends in the Neolithic settlement of the Tavoliere, the number and distribution of sites, and the end of the ditched settlements.

Developmental trends

If we study change over the thousand-year duration of the ditched settlements in terms of developmental trends, we need not restrict ourselves to the sites with ^{14}C dates, but can use the information from material collected during surface survey (Cassano & Manfredini 1983; Tiné 1983: 23–34; Volpe *et al.* 2003; 2004) – interpreted with due caution, but accepting that the ceramic sequence has broad validity and specifically that the fine light-surfaced painted *figulina* wares belong in the later part of the sequence. This gives us a considerably larger sample to deal with – Tiné (1983: 23–34) attributes nearly 200 sites to broad phases in this way – and allows us to identify some trends that may have general validity.

Trend one

One trend that can be documented, although it does not get more than a mention in Skeates' discussion, is the increase in size of sites over time, or, more accurately, the appearance of some very large sites in the later part of the period. This trend was discussed by Brown (1991) who described it in terms of a process of site nucleation; however, this interpretation is ignored by Skeates, perhaps because it is too 'processual' for his taste. Nonetheless there is probably a real trend here, however we want to interpret it. In his publication of the Bradford aerial photographs Jones (1987: 178–95) divided the ditched sites into 4 classes, largely on the basis of size (Fig. 2B). Class I sites are less than 4 hectares in area, Class II sites 4–7 hectares, Class III 7–16 hectares while Class IV sites occupy 16–28 hectares. In the table compiled by K. Maude (Jones 1987: 218–9), which ranked 146 sites for which areas could be calculated, 8 sites of Class III are listed, while there are only 4 Class IV sites (although several other large sites are not included in the table because precise areas could not be calculated for them). In a later article Brown identified 12 Class III (or III/IV) sites and 16 Class IV sites; her list includes 11 sites identified from aerial photos other than the Bradford collection (the Italian Volo Base and the Riley Archive) but also involves some reclassification of the sites recorded by Jones and Maude Brown (2001–2003). Using the survey data from Tiné (1983) and Cassano and Manfredini (1983) and excavation data from Passo di Corvo (Tiné 1983) we can say that six of Brown's Class IV sites seem to have been occupied in the later part of the 6th millennium cal BC; also the latest ^{14}C date from any of the Tavoliere ditched sites comes from Passo di Corvo, the largest of all the sites. Six out of 16 sites may not seem a large proportion, but since these six are the only Class IV sites that have been included in a survey (and therefore have produced any dating evidence), the pattern seems clear. Most of these sites were probably occupied in the earlier part of the millennium also, although two (Passo di Corvo and Posta d'Innanzi) are argued by Tiné

(1983: 29) to be new foundations at a later stage. For most of the sites with material suggesting earlier occupation, there is evidence for re-use and reconstruction and it is likely that they grew in size in the later part of the millennium. No equivalent pattern can be documented for the Class III sites at this stage. As mentioned above, Brown (1991) interpreted the development of the larger sites in terms of a nucleation process that assumed the abandonment of smaller Class I sites in the areas surrounding the large Class III and IV sites, as populations concentrated in the larger permanent 'villages'. This part of Brown's argument is weaker than the recognition of the later dates of the large sites, since the assumption of abandonment of the small sites is dependent on the absence of certain wares (mostly the more elaborate figulina painted wares) from surface collections of sherds – and arguments from absence are inherently weaker than those from presence. There are other possible interpretations of the appearance (or growth) of large sites in the latter part of the 6th millennium cal BC, but I shall postpone discussion of these to another publication.

Trend two

The main trend that Skeates identifies is the increased ritualisation of life in the Tavoliere settlements over time. The details are provided in Skeates 2000 and I shall just summarise the main elements here. One aspect is the elaboration of depositional practices and particularly the increased use of the ditches for mortuary purposes, especially for the burial of adult males. Another aspect is the addition of new symbolic elements to the artefactual repertoire, including figurines, and new elements of ritual paraphernalia. Skeates interprets these phenomena in terms of the elaboration of the symbolic demarcation of space and increasing attention to the remains of ancestors, especially adult male ancestors. It is worth noting that the main phases of ritual activity at Grotta Scaloria, situated on the northeast edge of the Tavoliere, and which may have served as a pilgrimage site for communities on the Tavoliere, seem to belong in the second half of the period of occupation of the ditched sites (Fig. 3). These activities include both burial in the upper cave and a stillicide water cult in the lower cave (Whitehouse 1992: 40–2; Hamilton *et al.* forthcoming b).

Trend three

We can identify a trend towards elaboration of material culture, which accompanies the increasing ritualisation of social life on the Tavoliere. This is most obvious in pottery, where we find increasingly elaborate decoration through time and, in the later stages, the introduction of the fine levigated and probably kiln-fired figulina wares, some decorated with painted designs of different styles. Another part of this trend is an increase in the variety of pottery found, both in terms of pottery styles and vessel shapes.

Trend 4

Yet another trend is in the growth of exchange, with an increase in the quantity of materials imported into the Tavoliere. This is clearest in the case of obsidian, which certainly increases in quantity through time, but may also apply to flint imported from the Gargano mine sources.

Number and distribution of sites

As discussed above, the total number of sites on the Tavoliere and in the Ofanto Valley is likely to have exceeded 1000. This has implications for the length of occupation of individual sites, since it is almost impossible that all the ditched sites were occupied at the same time. This can be looked at both in terms of the overall number of sites and in terms of their distribution.

Total number of sites

Using the concept of carrying capacity, John Robb has calculated the possible population levels that could be supported on the Neolithic Tavoliere on the basis of different types of subsistence economy (Robb & Van Hove 2003; Robb 2007: 98–102). On the basis of site location in relation to topography and soil types, as well as archaeobotanical and archaeozoological analyses, the most probable scenarios for the Tavoliere Neolithic sites are either the ‘Mixed Farmer-Herder’ model (48% reliance on crops, 48% reliance on herds, 3% reliance on gathered plants, 1% reliance on hunted game) or, more probably, ‘Mostly Farmer’ model (65% reliance on crops, 25% reliance on herds, 5% reliance on gathered plants, 5% reliance on hunted game) or something in between the two. These give population figures for the Tavoliere as a whole as something between 22,000 and 35,000 people. Robb works on an area of 4500km² for the Tavoliere, which gives maximum figures of 4.9 people per km² and 7.8 people per km² for the two different models.

How does this work out in terms of numbers of sites? If we assume an average village size of c.50 people, as Robb (2007: 98–102) suggests, or 60, as Monaco (2011) does), we would arrive at a maximum number of sites occupied at any one time of between 366 and 700 for the two subsistence models. Is this plausible? For comparative purposes, we may take the example of the Early Neolithic 2 phase of eastern Thessaly, considered to be exceptionally densely settled in Neolithic terms (Perlès 2001: Chapter 7; Bintliff 1999; 2012: 60–2). The Thessalian plain had approximately 120 sites distributed over an estimated surface area of c.1150km². As this area is approximately one quarter of that of the Tavoliere as calculated by Robb, a simple multiplication gives us a figure of 480 possible sites for the Tavoliere. These different calculations, rough and ready as they are, all suggest that the Tavoliere could have supported a few hundred sites of 50–60 people at any one time. If some of the settlements had smaller populations, which may have been the case with the smaller ‘homestead’ sites, a larger number of sites could have been supported. Conversely, if some settlements housed significantly larger numbers of people, as would seem to be the case with the larger ‘village’ sites, then the number of possible sites would be lower. It would be unprofitable to pursue these hypothetical calculations much further, but at least they serve to indicate that in no way would it have been possible for 1000+ sites to have been occupied at the same time.

Distribution of sites

Another compelling argument against the contemporaneity of all the ditched sites is their distribution in space. All subsistence farming communities require a territory of a certain size to practise their economy. This has been calculated differently by different scholars. The ‘Palaeoeconomy’ approach, associated with ‘Site Catchment Analysis’ developed in the 1970s by Eric Higgs and his colleagues (e.g. Higgs & Vita-Finzi 1972; Jarman 1972; Jarman & Webley 1975), worked on the basis of a territory of c.5km radius (equivalent to one hour’s walk), which works out as an area of c. 7850 hectares. This is generally recognised to be too large a figure and even Higgs and his colleagues recognised that the most intensive agricultural work would have taken place in a much smaller area, of c.1km radius (c.315 hectares) (Jarman & Webley 1975: 181). Many modern scholars suggest a figure larger than this, of perhaps 650–1000 hectares (e.g. Robb 2007: 98–102), indicating a site radius of rather more than 1km. This suggests that the distance between contemporary sites should be of the order of 2 to 3.5km. In the case of Early Neolithic 2 Thessaly, mentioned above, the sites were approximately 2.5km apart, giving an average radius for each site territory of 1.25km (Perlès 2001: Chapter 7; Bintliff 2012: 60–2). Bintliff points out that this density fits almost perfectly a predictive model developed to suit the progressive colonisation of a fertile landscape on the basis of a fissioning process, with a radius of 1.25km representing the endpoint of territory shrinkage (Bintliff 1999; 2012: 61–2). On this basis the overall total of 120 of known Early Neolithic sites in Thessaly must be close to the maximum number of separate communities that the area could support on the basis of the subsistence

economy and social organisation of the Early Neolithic. On the same basis we might expect contemporary sites on the Tavoliere also to be of the order of 2.5km apart at the time of maximum Neolithic occupation.

What is the evidence from the Tavoliere? In fact the distribution of the Tavoliere sites shows a strong contrast to the regularity of the pattern documented in Thessaly. GIS analysis (Dufton 2005; forthcoming) demonstrates a marked degree of clustering of sites. A series of different nearest neighbour analyses were carried out, altering different variables. In all of these analyses, the sites show signs of clustering and the clustering is significant at the 0.1% level. Then, if we look in detail at the sample of 174 sites investigated on the ground in the ‘Mass Survey’ of the Tavoliere-Gargano Prehistory Project (Hamilton *et al.* forthcoming a), we can see what this means in detail. Using the mapped aerial photographs, we recorded the distance from each site to its nearest neighbours. For the purposes of analyses, we recognised six categories of distance (Table 4). What we see instantly is that only a tiny proportion of sites has a nearest neighbour more than 2km away, which would be the expectation if the sites were contemporaneous (4 sites, 2.3% of the total). By contrast, most sites were remarkably close to one another, many only a few hundred metres apart and some immediately adjacent. Our first category is <150m and indicates sites that were very close together indeed: 150m is known as “hailing distance” and is described by Catherine Delano Smith as “the pragmatic measure of isolation for rural settlement accepted by most modern geographers” (Delano Smith 1979: 68–9). 55 sites in the Mass Survey (31.6%) have nearest neighbours this close. If these sites represent communities existing at the same time, they would have been in close visual and oral contact, as well as sharing (or competing for) the same agricultural land. Sites in all the other distance categories, except the largest (>2000m) are also too close to represent independently functioning contemporaneous settlements.

<150m	150–500m	500–1000m	1000–1500m	1500–2000m	>2000m	TOTAL
55 (31.6%)	60 (34.5%)	42 (24.1%)	10 (5.7%)	3 (1.7%)	4 (2.3%)	174

Table 4 Distances between sites and their nearest neighbours in the ‘Mass Survey’ of the Tavoliere-Gargano Prehistory Project

So what *does* the Tavoliere site distribution pattern mean? It is most likely that, in the case of sites located very close together, they were not contemporaneous, but rather that one site replaced another, or, alternatively, that the later site represented an expansion of the original settlement, perhaps occupied by a daughter community that continued to be closely associated with its parent. Multiple phases of construction and use are documented on all the main excavated sites of the Tavoliere and the Ofanto valley.⁴ In the case of unexcavated sites, examination of the aerial photographs also often suggests multiple phases of construction, evidenced by structures that seem to either cut or abut one another (29 sites in the Mass Survey, 16.7% of the total, showed definite or probable evidence of this sort). If we then consider that, as just suggested, complexes of neighbouring sites that were not physically connected, may represent the same phenomenon, it seems clear that both expansion and rebuilding were salient features of the Neolithic occupation of the Tavoliere. Unfortunately, in the case of sites known only from aerial photographs and/or surface survey, it is impossible to establish which of the two explanations – replacement or expansion – is most likely. Either way, there was clearly a strong attachment to particular locales, which were exploited over long periods.

What length of time were sites used, or re-used, over? If we return to the ¹⁴C dates, as shown in Fig. 3 and listed in Table 3, we see that several of the excavated sites have more than one ¹⁴C date, so allowing us to begin to address this question. Unfortunately, on some sites the margins of error are too high to allow us to distinguish between the different

dates. This is the case with Lagnano da Piede which has produced two ^{14}C dates and with Villa Comunale, Foggia, which also has two dates. The two acceptable dates from Coppa Nevigata are very similar (unsurprising as they come from the same deposit of grain). At other sites, however, we have data suggesting longer occupation. There are four dates from Rendina which again have large margins of error, but the overall spread suggests a span of several hundred years and, given that the earliest occupation phase at Rendina is not represented in the ^{14}C dates, the actual occupation of the site was probably even longer. The best information comes from Masseria Candelaro, where we have both more ^{14}C dates and dates with smaller margins of error (Manfredini & Muntoni 2004). Nine of the ten dates represent a relatively tight grouping indicating occupation over perhaps 200–300 years, while the last date, which comes from a burial in a ditch, may be several hundred years later, probably after the site had ceased to be used as a settlement. At this site too, the earliest occupation phase is not represented in the ^{14}C dates, so the actual occupation was probably longer. An interesting phenomenon is presented by the site of Cava Petrilli, which was investigated by a team from the Tavoliere-Gargano Prehistory Project, which found the site in the process of being quarried away. While we were unable to carry out excavations, we cleaned up some ditch sections and took two samples for ^{14}C dating; they came from two different exposed sections, which were identified from the aerial photographs as representing the same village ditch in two different locations. These dates calibrate to 5473–5316 cal BC (2σ), for a low level in the ditch and 5278–4999 cal BC (2σ) (for a higher level). There is no statistical overlap between these dates and they may be separated by a period of some 200–250 years.

It is likely that human presence, at some sites at least, lasted for several hundred years. Whether they were occupied continuously or were reoccupied after one or more gaps in settlement is harder to establish; however, the excavated sites have yielded no clear evidence of gaps in occupation.

The end of the ditched settlements

Another aspect of the pattern of dates that emerges from Fig. 3 is that the ‘ditched village phenomenon’ came to an end. How sudden or otherwise this end was is unknowable on the basis of the evidence available, given the sample size of the sites with ^{14}C dates. However, some time after 5000 cal BC village life largely disappeared. This issue is usually discussed specifically in relation to the Tavoliere. However, as Robb perceptively notes, it is a much broader phenomenon and rather few village sites are documented anywhere in southern Italy after this date (Robb 2007: 303–4). This observation clearly casts doubt on the relevance of explanations that are specific to the Tavoliere, but I shall discuss the most popular of these briefly and also consider whether they might be relevant to wider areas.

First we need to establish which of two scenarios we are concerned with: was the Tavoliere abandoned for settlement or did its inhabitants simply stop digging ditches? It has usually been assumed that the Tavoliere was actually abandoned and some scholars have suggested that the plain was not resettled on a significant scale until the Iron Age (e.g. Trump 1966: 56). However, although ditched enclosures cease to be constructed, there is still some evidence of human presence in the plain. Skeates describes the period of 5000–3000 BC as characterised by the use of the ditched sites for mortuary related practices, which he interprets as indicating the continuing importance of these locales as significant places in ancestral memory. The fact that this phase occupies 2000 years in Skeates’ scheme, in contrast to the 250 years allotted to each of his subdivisions of the earlier Neolithic, is eloquent testimony to the weakness of our understanding of this long period. The archaeological evidence is indeed thin. Burials of Late or Final Neolithic date are documented at Masseria Candelaro, associated with Serra d’Alto ware (Manfredini & Muntoni 2004: 464) and at Fontanarosa Oliveto, associated with Diana-Bellavista pottery (Quojani 1983: 283–5); it is possible that some other burials found without grave goods

might also belong to these late phases. In terms of activities other than burial, Tiné refers to a pebble pavement associated with Diana-Bellavista pottery at the site of Scaramella San Vito (Tiné 1983: 32). Field survey has produced some evidence of later occupation. Tiné (1983: 31) lists 23 Tavoliere sites yielding material of his phases V-VI-VII (the later parts of his Middle Neolithic and his Late Neolithic), all but 5 of which also have evidence of use in earlier phases.⁵ The Celone valley survey has also recorded 5 sites with Final Neolithic material, all on the same sites as earlier Neolithic material (Volpe *et al.* 2003: 364).

While Late and Final Neolithic material has mostly been documented on sites of earlier ditched villages, in the Copper and Bronze Ages, new settlements were established. Quojani, in her discussion of the survey material from the Amendola plateau lists 8 sites which have produced Copper Age or Bronze Age material, only three of which are sites which have also yielded earlier Neolithic material (Quojani 1983). One of the three is Coppa Nevigata, which was apparently resettled in the Early Bronze Age after a long gap in occupation (see Cazzella *et al.* 2012, with full bibliography). The Celone valley survey has also documented Copper Age (2) and Bronze Age (25) sites (Volpe *et al.* 2003: 364). It is likely that these finds will be augmented by future work, but much less likely that the general pattern will change. It does seem that, as Skeates (2000) described, in the 5th and earlier 4th millennia cal BC the formerly densely settled plain became a largely deserted area visited for ritual purposes, probably also for sheep and goat pasturage, and possibly for hunting and gathering. Resettlement probably began in the Copper Age (later 4th to 3rd millennia cal BC) and intensified in the Early Bronze Age (later 3rd and early 2nd millennia cal BC), when the major walled site of Coppa Nevigata was established on the coast. There is evidence that abandonment of the plain was paralleled by the spread of settlement into adjacent upland regions, both the Apennine mountains to the west and the Gargano promontory to the north, but this is too large a topic to deal with here.

So why was the plain largely abandoned for settlement in the later Neolithic? The most widely favoured explanation has been environmental change, specifically the development of a more arid climate, but until recently detailed supporting evidence has been lacking. However, in the last fifteen years work by geologists from the University of Bari in the Salpi lagoon, on the coast south of Manfredonia, has produced evidence of a phase of sabkha formation, corresponding to a period of arid or semi-arid climate (Boenzi *et al.* 2001; Caldara *et al.* 2002). The date of this climatic change is not very well established but a single ¹⁴C date suggests that the sabkha was established by the early 4th millennium cal BC (Boenzi *et al.* 2001: 101). The process may have begun significantly earlier. Another possible explanation for the abandonment of the Tavoliere villages is over-exploitation of suitable agricultural soils by a millennium of relatively intensive settlement by farming communities; such over-exploitation could only have been exacerbated by a climate that was becoming more arid. Against this, Robb and van Hove's (2003) analysis of land use in Neolithic Italy suggests that arable land was probably never the limiting resource on Neolithic settlement; however this study does not explicitly consider the issue of soil exhaustion through over-use. Unfortunately, there is little environmental evidence available to bring to bear on this question, although there are some indications that the Tavoliere landscape of the later 6th millennium cal BC was largely open rather than wooded: excavated environmental remains indicate an emphasis on cereal production and the domesticates of cattle, pig, sheep and goat, and very low percentages of wild animal remains, with those occurring being open ground species such as hare (Castelletti *et al.* 1987; Ciaraldi 2004; Costantini & Stancanelli 1994; Curci *et al.* 2004), as well as the presence of open-ground molluscs (Thomas forthcoming). If this was the case, it would have been harder for soils to regenerate, at least without active human intervention. In any case, for whatever reason, a way of life that seems to have been relatively stable for a thousand years, disappears after the 6th millennium cal BC.

As suggested above, it is probably misguided to seek explanations that are specific to the Tavoliere, since the change in settlement evidence occurs far more widely. Of course climate change would have affected the whole of southern Italy, although it may have

impacted most severely (and perhaps earliest) in the Tavoliere which is today, and probably was also in the Neolithic, the most arid area of Italy, with the lowest annual precipitation. Over-exploitation of the soils favoured for early cereal agriculture might also have applied elsewhere, particularly in areas that seem to have been relatively densely occupied, such as the Materano (using the admittedly problematic, but probably not entirely misleading, criterion of the number of known sites). To address this issue further we clearly need more evidence, particularly environmental evidence.

CONCLUSIONS

In view of the above discussion, we can come to some reasonably firm conclusions:

- The ditched village phenomenon lasted for about a thousand years, *c.*6000–5000 cal BC, during which there were gradual changes in settlement and ideology but no sharp breaks.
- During that millennium, settlement of the plain was exceptionally dense in Neolithic terms.
- Expansion and rebuilding of sites were salient features of the occupation of the plain.
- Developmental trends documented over the millennium include growth in site size, increasing ritualisation of life, elaboration of material culture and increase in exchange.
- Some time after 5000 cal BC there was a drastic reduction in the density of settlement on the Tavoliere and a change in its nature, with the disappearance of the ditched village form. The most likely reason for this development is climate change, taking the form of increasing aridity, and perhaps exacerbated by soil exhaustion through over-use over a period of a millennium.

It is clear that, if we wish to refine the chronology and gain more detail on the issues discussed in this paper, we need more and better ^{14}C dates: from more sites, from well documented contexts, preferably related stratigraphically to one another, from better samples and using modern methods that produce smaller margins of error. Once we have these we can move on to gain the full advantage of Bayesian modelling.

NOTES

- 1** The list of sites in Jones 1987 numbers 256 but three of these sites are in the Gargano and are not ditched settlements.
- 2** Even this is not absolutely clear-cut since there is some overlap of Serra d'Alto and Diana wares, but the degree of overlap is not great.
- 3** I reject three of Skeates' 'junk dates' for the same reasons he does: the earliest date for Coppa Nevigata (Pi-?) was produced very early on a sample of shell; the second date for Coppa Nevigata (BM-2577) was done on a sample of grain that was subsequently dated by AMS and produced a considerably later date (OxA-1475); the Masseria Santa Tecchia date (R-?) was on a sample of mixed bones, is very early in date and inconsistent with another date from the same ditch fill which is nearly 1000 years later (BM-2414). The fourth date rejected by Skeates is for Foglia, Villa Comunale (MC-2290) and is rejected because it is in the wrong order stratigraphically, in relation to the other date from this site. I accept this date because we have evidence from several sites of inversions in the ditch fill sequences, which can be explained in terms of the way the ditches were filled in, involving earlier deposits – sometimes including the original material excavated from the ditch – being incorporated at later stages. There is detailed evidence for this at Cava Petrilli (Sanderson & Murphy 2010: 301–4).
- 4** The main excavated sites, with selective bibliography, are: Masseria Candelaro (Cassano & Manfredini 2004), Monte Aquilone (Manfredini 1968; 1972), Passo di Corvo (Tiné 1983), Ripa Tetta (Tozzi 1984; 1988; Tozzi & Verola 1981), Lagnano da Piede (Mallory 1984–7a), Rendina (Cipolloni Sampò 1977–1982)
- 5** Tiné's list has 28 sites of this period, but 5 are in the Tremiti islands or the Gargano promontory, not on the plain.

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