Agriculture and Colonialism: Tell Brak in the Uruk Period

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Summary: One of the earliest instances of the social phenomenon that might be called colonialism was the Uruk expansion, which brought material culture from the southern Mesopotamian plain out into the surrounding mountains. This is the report of an examination of charred botanical material from the site of Tell Brak, which is located near the northern edge of the Mesopotamian plain, and shows evidence during the Uruk expansion of an increase in southern pottery types, typical southern artefacts, and southern architectural themes. The botanical material examined comes from levels that both predate and are contemporary with the influx of southern pottery. It gives no indication that the increase in southern pottery was paralleled by any discernable change in dietary, agricultural, or economic practices. Since, however, this report provides some of the first empirical data to shed light on the economic parameters of the Uruk expansion, the results are is discussed both in relation to the perceived picture of the sociopolitical situation at the time and in terms of what archaeobotanical conclusions can be drawn from the data currently available

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Abbreviations:

ASL 1–4	Archaeological Studies in the Levant I–IV, van Zeist and Bakker-Herres (1985, 1986a, 1986b, and 1988)
F. Iraq	*Flora of Iraq,* Townsend and Guest, eds. (1966–1985)
F. Palest.	*Flora Palestina* Zohary (1966–)
fl. & fr.	flowers and fruits
N	absolute number of specimens in a sample or group of samples
Post	*Flora of Syria, Palestine, and Sinai* , Post (1932)
sp.	species (plural, spp.)
U	ubiquity; = (number of contexts in which a sample is present (total number of contexts sampled)

Tolerances:

Volume tolerances:	
1–10 ml	±0.1 ml
10–100 ml	±1 ml
100–250 ml	±2 ml

Mass tolerances:	
0.01mg–0.1g	10%

C coarse fraction:	>1mm
M medium fraction:	1mm–0.5mm
F fine fraction:	0.5mm–0.3mm

Author's Preface

Because the research behind this paper had to be completed in a single year—effectively in four months—a comprehensive survey of the literature was impossible, and there is a large body of relevant literature that I have either been unable to obtain and read in time or that there has not been enough space to discuss while restricting this paper to a reasonable length. For the latter reason, I have also been forced to incorporate relevant ideas and references in narrative footnotes or relegate them to this preface. I apologize to the reader breaking up the text in this way, but the necessity of holding to a word-limit makes the conciseness of narrative footnotes indispensable.

'Harvard' or in-text references, which have become nearly ubiquitous in academic writing, in addition to their astonishing ability to turn text into an unreadable jumble of names and dates, fail to distinguish between (1) references intended as authority for or source of facts mentioned in the text, (2) attribution of direct quotes to their sources, (3) discussion of particular works, (4) citations that give credit for an idea to the place from which is derived or to its perceived original source, and (5) works to which the reader can refer for additional information in a particular area. I have attempted to employ them only for the first three purposes, which are identifiable from context, and I have tried to refrained from the common practice (e.g. the review articles in *Annual Reviews of Anthropology*) of giving the entire history of an idea in a string of citations that make the text look so 'scholarly', i.e. unreadable. Instead, I discuss below what I consider to be the sources of the most important concepts I have used. Where it has seemed appropriate, I have also referred to particular works in the text that contain references which the reader might wish to pursue. In addition the discussion below identifies other relevant works and topics that for want of space could not be included in the text. The final, and perhaps most important, purpose of a bibliographic essay is to show the author's intellectual background, affiliations, and the train of thought that has led him to the stance he adopts. As mentioned in note 8, this can be irrelevant to the main point while remaining of inherent interest. Relegation of it to a bibliographic essay is therefore appropriate.

Of the general surveys of the archaeology of the Near East, all out of date, the two that I found most helpful were Oates and Oates (1976) and Lamberg Karlovsky and Sabloff (1979), though my preference may come from the fact that they were both coauthored by people under whom I have studied and whose judgements I implicitly trust. Redman (1978), Nissan (1988), and Lloyd (1984, original edition published in 1978) all provide roughly the same data. Three recent books by Charles Maisels (1990, 1993, 1999) covering the same basic material were useful because they provided a more modern perspective and some alternate viewpoints, but they are very poorly organized and quite repetitive. I do, however, appreciate Maisels's frequent use of block quotations from excavation reports.

The arguments of Gallagher and Robinson and their seminal article (1953) were introduced to me by Mr. David S. Grewal, and I have unfortunately not had time to investigate the 'Dependency Theorists' or the historiographical tradition on which they drew.

For world systems theory and related sociology, I referred initially to the excellent review article by Kohl (1987), and subsequently relied on Wallenstein's original book (1974) and the volume of *Peasant Studies* (Jan., 1977) devoted to reviewing it. My initial reference to the sociology of food and colonialism was Mennell, et al. (1992), whence all the references discussed in the text derive.

There are several articles dealing with the debate over the Uruk expansion, Schwartz (1988), Johnson (1975, 1988), and Steadman (1996) that I have not had time or space to address.

There are basically three chapters for which the research has been largely completed but which had to be omitted for want of space: one on environmental reconstruction, both palynological (Bottema, 1975, 1989; articles by Bottema and Woldring, Baruch, and Behre in Bottema, Entjes-Nieborg and van Zeist, 1990; van Zeist and Bottema, 1991 is only a small selection of the relevant references) and geomorphological (papers by Wilkinson, Larsen and Evans, and Vita-Finzi in Brice, 1978) . A related topic is settlement and human land use in the Jazira (Oates, 1973, 1982; Meijer, 1986; Wilkinson, 1990a; Wilkinson and Tucker, 1995).

Second is an appreciation of the available comparative archaeobotanical data (Miller, 1991; van Zeist, 1988) both synchronic (from the same time, but from different regions in Mesopotamia; Helbaek, 1969; Bakhteyev and Yanushevich, 1980; Miller, 1981; Hopf, 1983; Lamberg-Karlovsky and Beale, 1986), and diachronic (from different periods in the northern Mesopotamian plain; Algaze, et al. 1995; Chernoff and Harnischfeger, 1996; Miller *apud* Stein and Misir, 1994; van Zeist, Stein, et al. 1996; Stein, et al., 1998 and many others cited in Miller, 1991 and van Zeist, 1988). This is discussed programmatically in the concluding chapter, but will have to form the basis of future research.

Third, several other data sets were collected from the flotation samples including information on sample fragmentation, small finds, and small animal remains. Again, this could not be dealt with due to space limitations but will form the subject of future work.

Journals that proved particularly valuable were *Iraq* and *Anatolica,* whose back issues from the past several decades I systematically examined, though there has not been space to discuss in the text the issues raised by this examination. Also, the *Bulletin on Sumerian Agriculture,* and issues 29 and 33 of the *Bulletin of the Canadian Society for Mesopotamian Studies* proved particularly useful. For botanical information I relied when possible on the *Flora of Iraq* (only some volumes of which have hitherto been published), but it was also necessary to refer to Post's brief and old *Flora of Syria, Palestine and Sinai* and occasionally Zohary's *Flora Palestina.* Unfortunately it was impossible to get routine access to Mouterde's *Nouvelle Flore du Syrie et de la Liban* or to the *Flora of Turkey*.

The 'traditional' dates used in most of the sources cited are based originally on placing the relative framework of pottery sequences into an absolute framework by guesswork and more recently on uncorrected (and therefore incorrect) radiocarbon determinations that happen not contradict the pottery sequences. Many of the calibrated radiocarbon dates seem to be between five hundred and a thousand years too early (though others conform with the pottery framework). This is a contradiction that has not yet been faced, much less solved, by most Near Eastern archaeologists. The only radiometric dates from the TW trench at Brak are listed below:

Radiocarbon results with 1 σ error:

TW 472 (grain) of 4660±35 calibrated to 3500–3410/3385–3370 (BM-2900)
TW 472 (grain) of 4570±35 calibrated to 3500–3410/3385–3379 (BM-2901)
TW 474 (wood) of 5670±60 calibrated to 4665–4640/4595–4460 (BM-2914)

(from Oates and Oates, 1994)

Three dates from two contexts are not sufficient to make any comparisons between radiocarbon and seriational chronologies and none of the conclusions discussed in this paper require or benefit from an absolute chronological framework. Since I do not wish to show allegiance either to the ‘traditional’ or the ‘early’ chronology, neither of which provides well-supported calendrical or absolute dates, I have attempted to avoid using dates at all. This is not as difficult a task as it might seem: the floating seriational chronology discussed in §1.1 is perfectly adequate.

Of debts to teachers and colleagues, most important is that to Dr. Joan Oates who not only provided the samples and copious help with interpreting the excavation records from Tell Brak, but foresaw from the beginning and guided me towards many of the essential questions and issues with which I have dealt. She also treated with extraordinary tolerance my ignorant and muddy footsteps in an area where her knowledge is encyclopaedic, and has influenced my intellectual trajectory throughout the past year. Any ability to identify charred seeds that is manifest in this report is due to the supervision and pedagogy of Dr. Alan Clapham and Mr. Dorian Q Fuller who along with Mr. Victor Paz, Dr. Marco Madella, and Dr. Christopher Stevens have provided stimulating arguments on quantification of botanical material, migration and colonialism, Critical (and hypercritical) Theory, and numerous other archaeological and botanical topics, while Dr. Liliana Janik is solely responsible for the extraordinary easy and convenient facilities for research with which I have been favoured. My supervisor, Dr. Charles A. I. French, besides accommodating himself to my most outrageous requests, provided some of the background to Chapter 2 both in lectures and conversations. My comprehension of the material in §1.2 is largely due to arguments with Mr. David S. Grewal; memories of discussions with and lectures of Professor Carl C. Lamberg-Karlovsky have also been extremely influential. Correspondence with Dr. Wilma Wetterstrom and conversations with Dr. Susan Colledge and Dr. Mark Nesbitt on archaeobotanical topics have also proved helpful.

Chapter 1: Introduction

In considering the development of human societies from the earliest occurrence of anatomically modern humans through the emergence of the modern world there is little disagreement at least among archaeologists about which were the two most important developments: the Neolithic Revolution, and the emergence of cities together with all their attendant aspects, of which colonialism was one.

Together with cities and colonialism occurred the first empires. Not empire in the eponymous sense of polity ruled by an Emperor, but the class of social phenomenon into which both the Roman empire and the ‘imperialism’ of the classical Greek city-states fall. Because the empire is part of—perhaps the end member of

—a continuum of increasingly integrated social organizations, it is meaningless to lay down strictures about exactly what characterizes an empire, or count how many there have been in human history. But we can make some broad generalizations about them: they originate in a central area that includes a city or cities and subsequently expand to incorporate areas that were peripheral; they have an economic and a sociopolitical relationship with these peripheral areas, and these relationships are dynamic, not fixed; and they last on the order of centuries—none shorter than a century, nor longer than a millennium. Of course we know much more about recent empires, but on one hand it is difficult to take a dispassionate view of more recent examples, while on the other hand serious arguments have been made that changes in communication technology and industrialization make post-mediaeval examples qualitatively different from anything in the ancient world. But classical antiquity provides useful and relatively well-understood, albeit much-romanticized, archetypes, so in order to avoid imbroglio in the primitivist-substantivist debate (see note 12) I have attempted throughout to draw examples from pre-modern times.

The first empire which we can definitely identify from its archaeological or historical traces—probably the first empire ever—was the result of the Uruk expansion from southern Mesopotamia into the Tauros and Zagros mountains, and the question that this report attempts to approach is: 'What were the social and economic effects of colonization on the areas influenced by the Uruk expansion?' Answering this question, of course, is not yet possible; comparable economic data from dozens of sites and more consensus on the social dynamics of the Uruk expansion, for which I believe we have a good description extant, is needed. This report can only try to answer the simplest questions about what the southern influence at the site of Tell Brak entailed economically; to describe, not define, colonialism in the first empire.

Since hitherto very little empirical data has been published that could reveal economic aspects of the Uruk expansion, it is necessary to take a very simplistic and specific approach: it is only possible to examine the botanical samples available, which span Uruk and pre-Uruk levels, and see whether there is evidence for a substantial change in agricultural or dietary practices accompanying the Uruk influx. At best, it will be possible to determine whether the southern influence at Tell Brak affected the practices of the inhabitants; extrapolation to Uruk expansion dynamics in general can only come in the future, with data from other sites.

1.1 Prolegomena to the Uruk Expansion

In order to understand a colonial expansion at even the grossest level, it is necessary to investigate the geopolitical situation whence it arose. For instance, it would be ludicrous to discuss the Roman conquests of the final two centuries b.c. without a general understanding of the way Rome developed from one of many Italian towns amongst Greek and Phoenician trading colonies to a hegomonic city-state. Similarly in order to understand the Uruk expansion, we must at least try to imagine what the geopolitical situation that produced the Uruk period was like. This is made particularly difficult by the poor dating resolution of much of our pre-historic data. Because our basic chronology and virtually all correlation between sites is based on relative pottery sequences and the cultures that they define, it is difficult to be sure that we are envisioning the correct expanses of time. As Childe wrote: 'In dealing with the remote beginnings of progress, a year or even a century is too small a unit. We must be accustomed to count in millennia—thousands of years. Yet each millennium was ten centuries or a hundred decades. And each day, year, decade, or century was as crowded with events as the last to be recorded in the newspapers, year-books, or histories.' (Childe 1936:44). We must deal with events that took decades or centuries, not millennia, using dating methods that cannot be tied to an absolute framework with more accuracy than a century or so, though frequently they can provide a much more precise relative chronology. Therefore imagination or analogy must fill in the gaps in any narrative. The other essential caveat, embodied in the dictum that 'pots are not people' is that the cultures that play roles in any developmental sequence are defined primarily on the basis of pottery assemblages, with occasional data from other artifacts and architectural or artistic styles. They almost certainly do not represent polities, and their connections to societies or civilizations in the sense that we know them is difficult, in some cases impossible to determine. Furthermore, it can be difficult to disentangle the three main types of variation in pottery styles: utilitarian, geographical, and chronological. For instance, if we should look at the occurrences of porcelain based on the Chinese styles of the Ming dynasty, we might plausibly find that the highest concentration was in nineteenth—century Britain. This is an extreme but salutary example of how deceptive the data we are considering could be.

Figure 1.1a TW Trench Stratigraphic Summary (modified from Oates n.d.)

With these provisos let us imagine a possible prologue to the Uruk expansion. The neolithic revolution is several millennia in the past. Throughout the Near East, from Jericho on the Dead Sea to Hacilar in southeastern Anatolia to Ganj Darah in the Zagros foothills, agriculture and domestic animals form the basis of a settled life either in villages and towns or in pastoral communities surrounding them. Pottery is ubiquitous and sophisticated, but not yet manufactured on a fast wheel. Metallurgy based on native metals is beginning to be widely available.

Though the traditional perceptions of the Near Eastern neolithic are undergoing a period of revolution, the 'phylogeny' (though he does not call it that) produced by Maisels (Figure 1.1b) is a reasonable way of envisioning the traditional view of the period. It clearly shows the relationships between the Hassuna, Samarra, and Halaf and Ubaid cultures that have been considered important while the looseness of its connections leaves open space to insert hitherto undiscovered links and influences. Its laudable bushiness represents the importance of parallel trajectories (e.g. the Choga Mami 'Transitional') that have clear affinities with, but need not be directly ancestral to subsequent cultures.

Figure 1.1b Phylogeny of Uruk Origins (from Maisels, 1990)

The immediate predecessor to the Uruk expansion was the 'Ubaid culture, which probably represents an earlier expansion outwards from southern Mesopotamia but has not been documented as fully as the Uruk period. Oates (1983) and Sürenhagen (1986) give references for a distribution of 'Ubaid pottery from the Arabian shores of the Persian Gulf , east to Qalinj Agha in central Iraq, and north to Degirmentepe, near Arslantepe in southeastern Anatolia. As for the influence that this pottery represents, 'the latest Ubaid temples at [Tepe Gawra, in northwestern Iraq] parallel those known at Eridu far too closely for the similarity to be dismissed as coincidental. This evidence alone would seem to require some southern "presence" in the north at this time' (Oates and Oates, 1976:126). Thus, the Uruk expansion may in fact be the second, not the first documented empire.

Figure 1.1c Reference Map of Mesopotamia (modified from Anastasio, 1995)

1.2 Core and Periphery

The framework that archaeologists use for dealing with the relationships between a complex, developed, or civilized centre (or centres) and its more rustic surroundings is a mixture of theory borrowed from history, sociology, political economy, developmental economics, and 'post-colonial' philosophy and psychology. In the introduction to what is in essence merely an archaeobotanical report, there is no hope of sorting out this body of theory (as should be done). It is only possible to discuss the archaeological syntheses that are currently in vogue, which—in the few cases where I am able to evaluate them properly—do little justice to the disciplines on which they draw. In his review of world-systems theory in archaeology Philip Kohl asks, 'since archaeologists already can dip into a well-stocked conceptual bag replete with models for explaining intersocietal interactions,...why introduce a new buzz word?' (1987:4) Why indeed? The jargon adopted by archaeologists in the past three decades: Interaction Spheres, Core (or Centre) and Periphery, World Systems Theory, Cluster Interaction, and Peer Polity Interaction all describe essentially the same dynamics. The simple reason for the proliferation of jargon for dealing with concepts of contact between societies seems to be naked fear of the words 'diffusion' and 'migration'. Luckily, the words 'interaction sphere', 'cluster interaction', and 'peer polity' have not (yet) been applied to the Ancient Near East, so we can conveniently ignore them here. 'Core-periphery' and 'world systems theory', however, must be treated more fully.

The words 'core' and 'periphery' have been most extensively used in several papers and edited volumes by Michael Rowlands and Kristian Kristiansen during the past two decades (1987, 1998). The intellectual heritage of the 'core-periphery' dichotomy is obscure. One account (Rowlands 1987) is that it is a reaction against the simple economic doctrine, which dates to Ricardo (mentioned in Rowlands) but most famously to Adam Smith, that the most efficient strategy for production, the one produced by 'free trade' is for each society to produce only the good in which is has the greatest comparative advantage and then exchange its surplus of this good for its other necessities. In any case, during the first quarter of the 20th century, a group of economists and historians with Marxist leanings who came to be called 'Dependency Theorists' began to argue that a mutually beneficial symbiosis was less common than the imposed exploitation of dependent and peripheral areas by more developed centres. Another possible view (D. S. Grewal, pers. comm., 1999) is that it comes more directly from Marx's notion that economic relations, even when entered into freely, can be oppressive and coercive, thence through Childe's known interest in Marx into his formulation of 'diffusionism'. Certainly, Marxist elements are visible both among the 'dependency theorists' and in the origins of 'world-systems theory'.

The source of 'world-systems theory' is much less obscure. It comes directly from a 1974 book by the leftist American sociologist Immanuel Wallerstein, who perhaps in a reaction against neo-classical economics that paralleled Marxist (or 'neo-marxist') critiques of capitalism, attempted to provide a more historical and social perspective of the development of modern, industrial society (Nell, 1977). It is ironic that the archaeological applications of Wallerstein's theories have focused on economic explanations for culture change, while Wallerstein 'started with an interest in the social underpinnings of political conflict in [his] own society' (1974:3).

Application of his ideas to archaeology seems to be attributed to the sociologist Jane Schneider in the 1977 issue of *Peasant Studies,* which is entirely devoted to reviewing Wallerstein's book, who argues that Wallerstein's theoretical basis is applicable not only to the modern world-system, but also to many pre-modern world-economies. Subsequently the notion of a world-system has been used by archaeologists to describe any super-political, usually economic agglomeration; in this sense, the world-system seems to provide exactly the same notion as Renfrew's 'peer polity interaction'.

The other interesting aspect of application of Wallerstein's theories to the ancient world is that 'Wallerstein can be placed firmly in the substantivist camp' (Rowlands 1987:3), though subsequent elaboration of his views (pers. comm. cited in Kohl, 1987:3) indicates that while seeing the modern world-system as qualitatively different from its predecessors, Wallerstein did not object to the application of his theories to earlier societies.

There seem basically to be three concepts of importance to archaeology that came from the theorizing that is discussed above:

First of all, it seems now to be accepted that no centre can develop without a periphery on whose resources it can draw; if no periphery is available, economic or political subjugation provides it. As Trigger writes of the contribution of 'world systems theory', 'what is of general importance is the growing realization that societies are not closed systems with respect to neighbouring ones;...the development of a society or culture may be constrained or influenced by the broader social network of which it is a part' (1989:333). Trigger also correctly observes that this realization was anticipated or presaged by the 'diffusionism' of Childe (following Montelius). This can also be seen as a rejection of Fried's (1967) notion of the 'pristine state' as a generally applicable model because it only (if ever) existed at two or three times in the past.

Second, the relationship between the core and its periphery does not consist solely of reaction by the periphery to endogenous change in the core, but is an interaction that affects both core and periphery. Though I cannot document the source of this contention in archaeology, I suspect that it comes from studies of pastoral nomads, all modern ethnographic examples of which both depend upon and affect the settled agricultural societies with which they have contact. It is difficult to imagine the sort of itinerant societies that must have preceded settlement and did not serve as this sort of periphery.

Third, it does not matter (from the perspective of the periphery) whether the core consists of a single political entity or whether it is a group of competing polities like the Greek city-states or the Western European nation-states. This point comes to archaeology equally from notions of 'peer polities' and from 'world systems theory' and is extremely relevant to the discussion that follows of the Uruk expansion. It is related to a fourth theoretical point, which represents Guillermo Algaze's contribution (see below, §1.3) to archaeological discussions of culture contact in general and the Uruk expansion in particular.

This final point is taken from a seminal paper (1953) by the economic historians John Gallagher and Ronald Robinson who, comparing different areas subject to Western European colonialism, pointed out that there was no significant difference between imperialism *sensu stricto* (political control by an imperial government) and economic domination for the benefit of a centre. They also observed that non-political imperialism, or ‘milking’ trade networks that were already in existence (which were famously lacking in, for instance, the European colonization of the New World), was more profitable because it did not involve the imperial centre in the costs of administration. The centre could merely extort as much as possible in the way of profits from native elites. Wallerstein (1974) also emphasizes the costs of an imperial bureaucracy, so we are left with a picture of political control as the reluctantly accepted responsibility of an empire that would much prefer nominal ‘free trade’. This is a very appealing model for prehistory and early historical societies, which we have difficulty believing could support the complex bureaucratic infrastructure necessary for political domination, and it provides an economic or functional explanation that is independent of but complementary to any social or ideological explanations that can be offered for early expansion.

1.3 The Uruk Expansion

The main framework for examining the Uruk expansion comes from the work done by Guillermo Algaze for his PhD dissertation at the University of Chicago in the 1980s and subsequently published as an article in *Current Anthropology* (1989a) and the book *The Uruk World System* (1993). This work is certainly the most specific and extensive appreciation of the dynamics of the Uruk expansion, so it seems reasonable to adopt Algaze’s terminology and examine his conclusions in some detail. To summarize, he examines the distribution of Uruk material outside southern Mesopotamia and from the patterns he observes, divides the Uruk expansion into two main thrusts, the first to the east into Susiana, the second north into northern Mesopotamia with a third, subsidiary, extension into the Taurus and Zagros mountains far to the north and east. Based on the differences between these two thrusts and on the variability in the peripheral Uruk assemblages, he concludes: (1) that the Uruk expansion was primarily economic in nature and based on lack of resources in the southern alluvial plain (though he admits that this conclusion may be due to the type of archaeological evidence available); (2) that the influence on Susiana can be seen as ‘colonization’ and the northern influences as an ‘informal empire’ or ‘world system’; (3) that this expansion was a critical aspect of the development of social complexity in Sumer.

Since this paper represents an attempt to elaborate on the northern influence that is visible at Tell Brak, not to explain the Uruk expansion or the development of south Mesopotamian civilization, we are not particularly concerned with conclusions (1) and (3). In any case, the importance of economic motivations for the Uruk expansion is a very old contention (dating at least to Childe) and demonstration of its importance compared with social motives does not depend on archaeological data so much as on a subjective appraisal of the earliest urban societies in the south. Likewise, the role of trade and exchange in the evolution of social complexity is a vital and interesting endeavour, but not a present concern.

What is relevant to this discussion is what exactly the northern Uruk influence consisted of. Algaze divides the northern Uruk sites into three categories: *enclave, station,* and *outpost.* Enclaves are ‘composed of a central settlement of urban proportions [the enclave] surrounded by a varying number of smaller satellite villages [its associated *cluster*], and they appear to be significantly larger and presumably more complex than indigenous Late Chalcolithic sites in their vicinity’ (Algaze, 1989a:577). The best example of these is the unique site of Habuba Kabira-süd/Tell Qannas and the nearby Jebel Aruda on the Tigris, but Algaze also identifies four other clusters (some including more than one enclave). Tell Brak is the enclave at the centre of one of these. ‘Away from the larger enclaves just described are found much smaller isolated Uruk settlements serving as links or “stations” alongside overland routes between the enclaves and the alluvium and also along important routes into the northern plains.’ (ibid.:579) Finally, north and east of the northern Mesopotamian plains in the Tauros and Zagros mountains, ‘are small isolated outposts...similar in size to the stations just described’ (ibid:580). Godin Tepe in the Iranian Zagros mountains is the best example of an outpost. Wattenmaker (1990) makes the legitimate point that neither Brak nor the other enclaves mentioned by Algaze show Uruk presence on the scale of Habuba Kabira because there is only limited horizontal exposure at the relevant levels, but this is essentially only an argument of scale. It is perfectly true that Habuba may be unique for its size amongst Uruk enclaves; it was clearly not the only urban settlement with a very large amount of Uruk material—Sürenhagen (1986) mentions nine—and that is sufficient for Algaze’s scenario.

The essential element of Algaze’s argument seems to be that either the Uruk colonists or natives who had become artefactually indistinguishable from the Uruk culture lived at these enclaves controlling (presumably water-borne) trade with the south while the stations guarded overland routes of strategic importance to this network of trade. Who the inhabitants were is actually not particularly important to the model: Andrew Sheratt has argued that ‘the formation of early states was often accompanied...by the development of semi-independent opportunist mobile populations [who] occupied an articulating role in the economy (which later on was taken over by specialist merchants)’ (1999:20). Though this is entirely speculation, it is a reasonable notion that there was a range of middle-men with different levels of integration to the core that they served.

The influence on the natives, what Algaze draws from Gallagher and Robinson and calls the ‘view from the periphery’ can be compared with the forms of imperialism that we are so familiar with in British India, and (the particular case-study culled by Algaze from the historian Phillip Curtin) Portuguese West Africa in the sixteenth and seventeenth centuries. Merchants of the imperial power, whether working privately or under the auspices of the state, find it more profitable to support a cadre of the native elite, providing cooperative local rulers with luxury goods that are often of little inherent value, but which gain a prestige value from their association with the imperial power. Control of prestige goods, along with the threat or actual application of military power gives local rulers who cooperate with the empire an effective advantage over their rebellious peers, and in exchange, the local elites—knowing and having long controlled the local economies—can extract the resources needed by the empire much more efficiently from the local hinterlands than could the imperial merchants directly. At the imperial centre, the dynamics consist of rival city states vying with each other and potentially with erstwhile colonies (e.g. Susa) for advantageous colonial spheres of influence.

Many of the criticisms that have been levelled against this picture can be dismissed out-of-hand. For instance Rothman, et al. (1998) make much of the relative development in the north before the Uruk expansion and criticise the assumption that ‘the presence of artifacts made in classic Uruk (Southern) style meant the physical presence of Southerners’ (1998: 72f). These objections do not show appreciation of the model described above, which positively requires enough development amongst the colonized to provide functioning trade networks that can be ‘milked’ and does not distinguish between the colonial merchant (the ‘White’) and a member of the native elite who adopts the culture of, and becomes indistinguishable from the coloniser (the ‘Brown-White’). Rothman’s point that the southern polities could not have been ‘so integrated that they could create colonial administrations sufficient to control the Susiana or the North’ (1989:281) is conveniently dismissed by Algaze’s response: ‘They were not integrated. They were competing polities and there was no master plan.’ (ibid.) A more difficult point to answer is that ‘it is hard to imagine that an international economic network based on the transport of only lapis, gold, silver, and other markers of status had such a huge impact’ (Rothman 1998:73). There is no scope here to demonstrate importance of trade in luxury goods in the development of civilization, but see note 11. Any ideas about what commodities were traded must be largely speculative because there is no direct evidence on that question; Oates (1993) makes the somewhat hyperbolic, but valid point that ‘no single shred of evidence attests any form of “trade”’. We know, of course, that extensive trade took place, but only from the indirect evidence of intrusive pottery.

Butterlin (1998) provides a useful review of alternatives to Algaze’s model and best documents the point (which is also made elsewhere, e.g. Rothman, 1993; Knapp, 1989) that Algaze’s model is not supported in detail by the available archaeological evidence: the taxonomy of enclave, station, and outpost is more rigid and speculative than can be justified by the available data, and many other variations on the same theme are equally valid. As Adams writes about settlement patterns in southern Mesopotamia, ‘to distil a single harmonious and consistent pattern out of the many unstable and discordant elements that have been described would not only do violence to many of them individually but would have the more pervasive effect of suppressing one of the main sources of dynamism accounting for the region’s historic creativity and importance.’ (1981: 242)

Another weakness is the limited scope: Algaze does not discuss in much detail either the three other post-Uruk expansions from the Mesopotamian alluvium called ‘conjunctions’ by Lamberg-Karlovsky (1985) or the earlier ‘Ubaid expansion which may have been ‘the earliest attempt by the inhabitants of Sumer to control the trade routes on which depended their acquisition of raw materials’ (Oates and Oates 1976:126). Nor does he mention the wider possible range of Uruk connections (to Egypt, Dilmun, and Central Asia) and the interaction of these long-range trade networks with the Persian and Anatolian Uruk sites. In his defence, it can be said that the evidence for such discussions is not really yet available, and his stated focus (1989b) is on the ‘view from the periphery’.

Finally, it is not clear whether ‘world-systems theory’ is relevant enough to the discussion to justify the importation of its jargon into what is essentially comparative social history. This is a criticism that is made quite vehemently by Brentjes (1989) and unfortunately ignored by Algaze: though ‘world-systems theory’ may provide the personal intellectual heritage for Algaze’s investigations, it does not provide any more convincing support than more traditional comparative history and it embroils the discussion in the ‘primitivist-substantivist’ debate. A more detailed look at, for instance, Greek colonialism in the first millennium b.c., such as is suggested by Zagarell (1989), might provide a less theoretical and jargon ridden picture of what the Uruk expansion looked like.

However, if we ignore Algaze's presentation of his model as a 'testable hypothesis' and realize that his account of the Uruk expansion is only supported by the archaeological data in general terms, we can nevertheless appreciate his application of the ideas of Gallagher and Robinson as an elegant, vivid and persuasive way of envisioning a time about which we would otherwise be unable to form a coherent picture. With some additional data it might even be possible to integrate, as do histories of more recent imperial expansions, the social and economic forces at work.

1.4 Colonialism, Diet, and Agriculture

The problem with these theoretical models is that they have little to say about the other subjects with which this paper must grapple: agriculture and diet. The terminology of trans- and acculturation, which has already been borrowed from social anthropology by Irving Rouse (1986) for dealing with migrations is slightly more helpful because if the idea of 'cultural identity' is equated with archaeological assemblages (as Rouse intended it to be) it provides anthropological terminology to accompany the geographical terminology of enclave, station, and outpost: if the Uruk assemblage at Brak is indistinguishable from its southern counterparts, then the interaction can be called 'acculturation'. But it can be seen as irrelevant whether the Uruk presence at Brak counts as 'transculturation' or 'acculturation'; our need is not classification so much as description. That is the strength of Algaze's model for the Uruk expansion as a whole, but it does not help with envisioning what went on at Brak on a microscopic scale.

An obvious place to turn is the modern sociological literature on food and colonialism (Mennell, et al., 1992; Davidson, 1983; Goody, 1982; Calvo, 1982). At first glance, this is profoundly disheartening: studies of 'ethnic' cuisines in developed nations compared with the attempts of colonial powers to impose a sanitary or nutritious diet on their colonies leave the overwhelming impression that the core is far more prone to adopt exotic dishes from peripheral areas than vice versa. If this were universally true, then we would not expect to see significant changes in the diet or culinary practices at Brak whatever type of colonialism the Uruk expansion involved. On reflection, however, it appears that all the ethnographic or sociological studies that were discovered in an admittedly shallow examination of the literature dealt with cultural contacts in which the Western industrial world played the dominant role. Thus, it is perfectly possible that the routine adoption of exotic cuisines is a peculiar aspect of Western European colonialism.

Despite the bias and potential irrelevance of virtually all these sociological studies examined, the beginnings of a pattern did emerge: two examples of foods adopted by native populations from their colonisers (sardines and canned tomatoes in Ghana, Goody, 1982; and powdered milk as a replacement for suckling, Mennell, et al., 1992) are both inexpensive, mass-produced, and of low quality (i.e. not generally used by elites). Though not enough data has been examined to support a contention that these characteristics are generally typical of things adopted by native societies from their colonisers, nevertheless they are in striking accord with our perceptions of the role of Bevelled-Rim Bowls in the Uruk economy.

The Bevelled-Rim Bowl is a small conical bowl with an eponymous bevelled rim, made of coarse chaff- or mineral-tempered clay and fired at low temperatures. Their uniformity and reliable appearance at Uruk sites make them diagnostic of the Uruk period and at least some sort of contact with southern Mesopotamia. Preliminary chemical analysis (Berman, 1989) seems to indicate that, at least in Susiana, they were made primarily of local, not imported clay. There does not seem to be consensus either on how they were produced (hand- or mould-made) or on their use (grain ration, container for votive offering, yoghourt bowl, disposable party cup, or bread mould—this final and most convincing suggestion from Millard, 1988, q.v. for other references). But whatever their original function, their ubiquity makes it likely, as Millard (ibid.) argues, that they were used for many purposes in addition to that for which they were originally intended, and there is no doubt that they represent one the crudest and at the same time most numerous pottery types found in the Near East. Crudity and mass-production: could the Bevelled-Rim Bowl have been the sardine-tin of the Uruk empire?

The Landscape

There are essentially two reasons to attempt reconstruction of the landscape around Tell Brak: first, from an acultural or purely ecological perspective, the soils and climate have an obvious impact on the flora of an area, and therefore on the macrobotanical remains found on-site, which form the subject of this report. Second, however, interpretation of the botanical remains in an agricultural context, not to mention the archaeological and cultural interpretations discussed in the preceding chapter, requires some notion of what the northern Jazira of the Uruk period looked like.

Figure 2a Map of NE Syria and the Environs of Tell Brak (from Oates, 1982)

2.1 Post-glacial Climate

The difficulty with reconstructions of palaeoclimates in general is that our quantitative data consists of only two scalar variables: temperature and rainfall; and it is rare to be able to determine even these with accuracy and attached to a useful chronological scale. Knowledge of the ancient vegetation, of course, can tell us more about the climate, but only at the expense of ecological data or with the acceptance of circularity. That is, if we determine that the ancient landscape around Brak was covered with *Artemisietea herbae-albae mesopotamica* steppe, that gives us a better notion of the climate than comes from oxygen isotope data from Mediterranean sea cores, but we cannot then postulate changes in agricultural practice due to climatic variation. The agriculture itself will affect the *Artemisia* scrub far more than any change in climate.

Accepting a degree of circularity, however, recent palynological (Bottema, 1989, etc.) and faunal/archaeobotanical (Helmer, et al., 1998) studies agree with the broad current consensus (e.g Blackburn, 1995; Ergenzinger, et al., 1998) that the climate has not changed dramatically since the Younger Dryas, if indeed there was significant perturbation then. There is no space here to pursue the palynological and geomorphological evidence for past climates further; see the bibliographic essay in the preface for other references.

Today's climate can be seen from the records of the meteorological recording station at El Haseke (36°

32’ N, 40° 44’ E, elev. 295 m.), which recorded a mean annual rainfall of 290.5 mm from 1951 to 1969, with monthly temperature and rainfall shown as a hydrothermic curve in figure 2.1a (data from Takahashi and Arakawa, eds., 1981). The prevailing surface winds are northwesterly and Taha et al. (1981) classify the area as ‘mid-latitude steppe climate with dry summer’. Winters are comparatively cold and summers completely dry, which generally prevents spring sowing of cereals. Since there is no conclusive evidence for substantial changes in the climate since the period with which we are concerned—probably none since the retreat of the last glaciation—we must assume that approximately modern conditions prevailed then. The strong north-south climatic variation along the Khabur ranges from the north, where ‘two good wheat crops can be obtained each three seasons and a summer crop of pulses can be grown in rotation with winter cereals’ to ‘marginal lands...utilized for growing barley or grazing’ (United Nations reports quoted in Ergenzinger, et al., 1998). The southern limit of this marginal area roughly coincides with the 200 mm isohyet (see Fig. 2.1b); thus the limit of effective rainfed agriculture lies somewhere between the 200 and 300 mm isohyets; allowing for a certain degree of mobility in the rainfall patterns, somewhere within the 100 km south of the town of Hasseke.

Figure 2.1a Hasseke hydrothermic curve (from data in Takahashi and Arakawa, eds., 1981)

Figure 2.1b Mesopotamian Isohyets (from Oates, 1982)

2.2 Geology and Soils

Tell Brak lies in ‘a very gently undulating clay loam plain which extends some 2.5 km to the east and south and c. 3.5 km to the west’ (Wilkinson, et al., in press). This plain is near the edge of the Quaternary alluvium that has been carried down onto the Mesopotamian plain by run-off from the (predominantly calcareous) mountains of southeastern Anatolia. The alluvium, whose edge lies roughly in an east-west line through the modern town of Hasseke, lies immediately on top of Tertiary sediments, and is pierced by two extrusive basalt outcrops in the vicinity of Brak: about twenty kilometres to the south-west a formation of seven post-glacial volcanos called the Kaukab, and forty kilometres due west, the larger Ard esh Sheikh, dating to the Paleogene. The Jebel Sinjar and Jebel ‘Abd al-’Aziz represent a Miocene ridge between 500 and 1000 meters high, broken by the Khabur river, but otherwise parallel to the edge of the alluvium and about thirty kilometres south of Brak (Wolfart 1967). Effectively, it is this ridge that separates the north Jazira from the southern plains at the longitude of Brak and, though somewhat north of the 200 mm isohyet, is roughly equivalent to the southern limit of effective rain-fed agriculture.

Wolfart (1967) describes the soils in the Brak area as sub-arid Brown Soils formed on calcareous sands while the 1: 5,000,000 UNESCO World Soil Map calls them calcic xerosols. Wilkinson, et al. (in press) explains the soils represented by these different terminologies as ‘semi-arid soils with weak horizon development and a horizon of calcium carbonate enrichment within 75 to 125 cm of the ground surface.’ Chemical assay and particle-size analysis of some relevant Syrian soils can be found in Muir (1951). The entire range of soils in the catenary from the Anatolian mountains to the edge of the desert (from true Mediterranean Brown Earths in Turkey to the Sierozeims that begin 30–40 km south of Haseke) is considered indefinitely fertile under crop rotation or fallowing, the presence of water being the limiting factor on agriculture.

2.3 Ecology and Phytogeography

The study of plant ecology can be pursued in two complementary, but distinct ways: plant synecology, or phytosociology (the study of botanical communities) frequently must assume the existence of stable 'climax' ecosystems, which is a controversial notion even among botanists, attracting most of its support from continental phytogeographers. English and American botanists of the past three decades have tended to examine plants autecologically or choristically, by measuring the abiotic influences on each plant species (soil chemisty, climate) and then constructing more flexible notions of communities based on the geographical overlaps between individual species rather than on stable, bounded communities. Phytosociology is especially questionable when dealing with the highly 'degraded' (anthropogenically modified—usually impoverished by agriculture) communities that now prevail in northern Mesopotamia (Wilkinson, 1990b). There has, however, been some application of phytosociology to archaeology (e.g. Jones, 1992), and archaeobotanical reports routinely discriminate between predominantly or obligatorily segetal weeds (crop weeds) and wild indigenes, though as pointed out by Küster (1991) this constitutes a phytosocological assumption that can be problematic. In other words, it is not possible to determine *a priori* whether a weed taxon in an archaeological assemblage comes from its indigenous ecosystem or via a secondary association with crops.

The only work that has treated the plant ecology or phytogeography of the Near East comprehensively is Zohary's (1973) *Geobotanical Foundations of the Middle East,* which has a strong phytosociological slant, so to some extent our consideration of north Mesopotamian ecology is limited rather by the previous scholarship than by choice of phytosociology as opposed to choristics. Phytosociology essentially divides the world up into areas defined on the basis of the plant communities that grow there, but delimited geographically. Here, for instance, we are dealing here with the Mesopotamian and Irano-Anatolian 'provinces' within the Irano-Turanian 'region'. The plant communities that characterize these areas are classified hierarchically into classes, orders, alliances, and associations, mostly named after the genera and species that dominate them; of these we need only consider the class *Artemisietia herbae-albae mesopotamica.* Within this class, the plant communities of northern Mesopotamia fall on the boarder between two orders: the order *Artemisietalia herbae-albae mesopotamica,* which appears in northern Africa and the Sinai, as well as Palestine and the Syrian Desert, consists of true steppic communities that are tolerant of the low precipitation (under 200 mm./year) in the Mesopotamian plain. The order *Phlomidetalia bruguieri,* on the other hand, is characteristic of northern Iraq, the Kurdistan piedmont and appears in southeastern Turkey. It therefore represents less drought-tolerant communities. Below is a simplified list modified from Zohary (1973) of the associations that might appear in the immediate vicinity of Tell Brak:

Class Artemisietia herbae-albae mesopotamica

- Order Artemisietalia herbae-albae mesopotamica
  - Alliance Artemision herbae-albae deserti-syriaci
    - Assoc. Artemisia herba-alba–Prosopis farcta: on 'deep brownish loessial stoneless soil; fallow fields. Artemisia is re-established in abandoned fields. Cover. 70 %.' (ibid.:480)
    - Assoc. Poa sinaica–Ranunculus asiaticus: a degraded association abundant in northern Iraq on grey or brownish loessial steppe soils.

Alliance Artemisia-Achilleion confertae

Assoc. Achilleetum confertae: 'common in and particularly characteristic of gypsum soils of the Jazira' (ibid.) Cover. 60%.

Order Phlomidetalia bruguieri

Assoc. Phlomis syriaca–Cousinia ramosissima: on stony calcareous ground in southeast Turkey. Cover. 60%.

Assoc. Asphodeletum aestivi: on low terraces or in slight depressions on gentle slopes in the north Jazira. Cover 80–90%.

Assoc. Centaureetum behen: extensive in north Jazira, further south, confined to depressions with compact silty soil; shows little anthropogenic influence.

Also, the hydrophytic (wetland) classes *Lemnetea* and *Phragmitetea* may be relevant in discussions of the banks of the Jaghjagh and the swamp found along the wadi Radd to the east of Brak. The segetal association *Prosopidetea farctae halo–segetalia* may is believed to indicate salinization due to past irrigation.

The potential archaeological significance of these associations is their connection with (or independence of) anthropogenic influence: for instance, from the descriptions in Zohary (1973), the presence of the *Centarueetum behen* association should be taken as an indication that there has been less cultivation than in areas where the *Artemisia herba-alba–Prosopis farcta* association is found. Ergenzinger, et al., for instance, come to the highly questionable conclusion based on the affinity of the *Prosopidetea farctae halo-segetalia* association for saline soils that 'large areas in the vicinity of Tell Seh Hamad [south of Haseke on the Khabur] are characterized by *Prosopis farcta...*and indicate that in these areas agriculture based on irrigation existed in the past' (1998:114). The uncertainties in this sort of approach need hardly be emphasized: there are no controls on the short- and long-term effects that various agricultural practices have on different ecosystems, nor can it be determined whether later use erases earlier signatures. Even brief, low amplitude, or small-scale climatic changes can drastically effect local plant communities in unpredictable ways, and the communities themselves may change significantly over the relevant periods of time. For these reasons, it seems better to use the observed phytosociological associations of plant species not as evidence of palaeoecology or previous cultivation but only as a null hypothesis for on-site archaeological material. That is, if a taxon that is significant in a local community is found on an archaeological site and its presence cannot otherwise be explained, then it may reasonably be treated as a part of the known local plant community that has arrived on site purely accidentally. This is the argument used of several genera in the family Compositae (see § 4.2.4)

Other Elements and Issues

3.1 Cultural Geography: Location, Hollow Ways and 'Halo'

In addition to its position in an area of marginal rain-fed agriculture, Wilkinson et al. (in press) observe that Brak is 'unusual in that it is not directly situated on a water course, the normal practice in this area'. Instead, the tell is roughly equidistant (2–3 km) from the wadis that flank it to the east and south (Jaghjagh), and west (unnamed seasonal wadi), neither of which seems to have moved significantly since prehistory. The position of Brak, the largest tell in northern Mesopotamia (Oates, n.d.) in an odd choice of location settlement can best be explained by the argument that it was originally founded not as an agricultural community but as a political or commercial nexus. Sherrett speculates that ‘it is at choke points, convergence nodes, and transshipment (break-of-bulk) points along [prehistoric trade] routes that spectacular accumulations of wealth may occur’ (1999:21). Brak lies near the furthest upstream limit of water-borne transportation and roughly at the latitude of the only possible east-west overland routes and in this context it has been called a ‘gateway city’ (Oates, n.d.). Its location at several kilometres distance from the water might reflect its local political role as a regional centre from before the Uruk expansion: it could have controlled several riverine ‘ports’ like Tell ‘Atij, just south of Haseke on the Habur, which Blackburn (1995) and Fortin (1998) interpret as a ‘station commerciale’.

The presence of a radial network of ‘hollow ways’, common features of north Mesopotamian tell sites that are generally interpreted as footpaths (most recently discussed by Wilkinson, 1993, where earlier references can be found) is convincing evidence that there has been considerable routine travel to and from the tell within its immediate area (see fig. 3.1a), though the notion that the extent of these networks can show regimes of land use or political control (Wilkinson, 1994) is highly speculative. The alternative interpretation of the hollow ways as irrigation canals is topographically untenable, though it is probable that they have been accentuated by ephemeral flow.

Figure 3.1a Map of the immediate area of Tell Brak (modified from Eidem and Warburton, 1996)

The final distinctive feature of the landscape is a depression around the tell, referred to by Wilkinson, et al. (in press) as a ‘halo’. This is an area of disturbed ground immediately around the tell which may represent excavations of sediment for mud-brick manufacture and may have served as opportunistic reservoirs, collecting run-off from the tell during the winter and preserving it longer into the spring than would otherwise be possible, an interpretation that is supported by identification of sediments from the depressions as lacustrine (ibid.) Routine collection of water in these depressions would probably lead to a higher proportion of hydrophytic (wetland) or aquatic taxa found on site. In the absence of comparative data from other sites, however, it is not clear what proportion of hydrophytes should be considered unusually high.

3.2 The Site; the Seasons; the Samples

The site of Tell Brak was first opened by M. E. L. Mallowan in 1937, since which time it has revealed occupation deposits from PPNB through Byzantine times. The current excavations have been directed by Professor David Oates since 1976 under the auspices of the Institute of Archaeology at University College, London and latterly of the McDonald Institute of Archaeological Research at Cambridge University and the British School of Archaeology in Iraq. During the three year period from 1994–1996, Dr. Roger Matthews took over as field director of a new excavation with different research aims (Matthews, et al., 1994, Matthews, 1996). A bibliography of preliminary reports can be found in Oates and Oates (1994) and the first volume of the final report has now been published (Oates, et al., 1997), while the second volume is in press (Oates, et al., in press). In 1997, Dr. Geoffrey Emberling took over as field director of the original excavations, and will be returning to the site in the spring of 2000. The material analysed here consists of samples from the 1993 and

1997 seasons, while the samples that were taken between 1984, when flotation on the site began, and 1992 were examined by Dr. Michael Charles and Dr. Amy Bogaard (Charles and Bogaard, in press) at Sheffield University. Material from 1994–1996 was analysed by Dr. Susan Colledge at University College, London, and has not yet been published. Miss Helen McLevy carried out the floatation on site during the 1997 season with a Cambridge froth-type machine.

Of the 96 samples from 1993 and 1997 seasons, three were from irrelevant periods and two were empty. This paper describes the analysis of 26 flotation samples and two finds of mineralized seeds from the 1997 season; one sediment sample (1993.004), five finds of carbonized seeds (1993.001, 1993.002, 1993.003, 1997.041, 1997.224), and 13 flotation samples remain to be examined. A further 44 flotation samples from the 1997 season are being examined by Miss Patrice Vandorpe at Sheffield University as well as 1/2 splits (subsamples) of samples number 1993.001, 1993.002, 1997.041, 1997.046, 1997.050, 1997.200, 1997.212, and 1997.224.

Figure 3.3a Map of TW trench

All of the samples analysed are from trench TW (see Fig. 3.3a) and come from phases 11–19 of the excavations, spanning Northern Early Uruk through Late Uruk periods (see Fig. 1.1a). The fullest description of the stratigraphy so far published is in Oates and Oates (1993), though the following description is drawn primarily from Oates (n.d.) In the levels that interest us, it is primarily important to discriminate three horizons:

I Early material from phases 18, 19, and below in the East (Main) TW Trench.
II The phase 16 building (including levels 13–17) in the East (Main) TW trench.
III The phase 11/12 buildings in the West TW trench (TW Extension)

Pottery from the first two horizons, with the exception of level 13, was almost entirely in the local tradition, though a few Bevelled-Rim Bowl sherds were found in level 16. Level 13, from which no botanical samples are available, produced an interesting mix of local chalcolithic and Middle Uruk pottery. Level 12 consists of an elaborate fill of pits and gully that underlie the phase 11 house and is filled with thousands of Bevelled-Rim Bowl sherds. On top of this destruction level, the phase 11 house whose typical Late Uruk architectural plan and 'frying-pan' hearths can be seen in figure 3.3a is also filled with sealings and other Late Uruk material. Thus, although three horizons have been described, it is really only the horizon II/III (or phase 13/12) transition that is relevant to the question of Uruk influence at Brak: pottery before it is almost exclusively local, and after it 'no in situ, local, chalcolithic pottery has as yet been found in association with the well-stratified Late Uruk material' (ibid.) It will be demonstrated in the following chapter that the botanical material shows no such change.

3.3 Methodology and Quantification

Like many branches of physical science applied to archaeology, archaeobotany seems to oscillate between conservatism and optimism about the amount that can be said from botanical materials and the reliability of the methods used. Even stranger, these oscillations are not discipline-wide, but attach to particular questions within the discipline: for instance, many of the archaeobotanists of the 1950s and 60s were confident about identifying irrigation from on-site botanical remains; now we realize—what should have been obvious from the beginning—that hydrophytic plants can occur in locally damp patches among crops that were not irrigated, and it is highly dubious to identify irrigation based on hydrophytic 'indicator' species. Conversely, some contemporary (particularly British) archaeobotanists who are very careful about making ecological statements on the basis of 'indicator species' are now extremely liberal in their claims about what can be discovered about cereal processing practices. Furthermore, while the ability to identify specimens to a given taxonomic level (and the related belief in the possibility of so doing) differs from person to person, it has become obvious that some earlier archaeobotanists, as well as some contemporaries, have published identifications that they could not possibly have justified.

Current practice in archaeobotany dates basically to the early 1970s when flotation began to be practised regularly as a method of recovery of charred plant remains. Previous work was largely based on plant impressions in mud-brick and pottery, and is largely useless from today's perspective either because the identifications cannot be trusted (criteria used for identification were seldom published) or because the data is limited to a list of the species found on the site. The reason that the latter is not of much use is that we already have a good sense of what species are found on Near Eastern sites, and it is now necessary to attempt to discriminate areas, periods, and ultimately agricultural practices based on relative proportions and subtle patterns of presence or absence in different contexts.

An early and influential attempt to go beyond 'laundry-lists' of the crops present was by Dennell (1974, etc.) who identified patterns in samples from different archaeological contexts on the basis of differences in relative proportions of the taxa present and the overall size and shape of the seeds. Then the groups that appeared could be equated (with various degrees of probability) with stages in the processing and use of a crop. To take a simple example, a sample that proved to be pure grain of a single taxon and all of a similar size is likely to have been cleaned ready for consumption or sowing, while a sample full of small weed seeds probably represents the refuse that has passed through a 'fine sieve'. This approach was called 'internal' by Gordon Hillman (1981, etc.) to distinguish it from his own results because Dennell's interpretations were based on the 'internal' evidence of archaeological context, while Hillman's were based on extensive ethnographic observation of crop processing among Turkish peasants. Too much could be made of this distinction between 'internal and 'external' approaches, but essentially the difference is whether the archaeobotanist begins by looking for patterns that have been discovered ethnographically or attempts to discover what patterns exist in the data first, and then tries to tie these patterns to a framework based to some extent on the archaeological context in which the samples were found. Both approaches rely overall on the 'logic of crop processing', in other words, that there are only a limited number of ways that crops of a given type can be processed, and that the differences between them can be identified by quantitative study of archaeological assemblages. In particular, Hillman's approach was adopted by Glynis Jones and sanctified by the application of multivariate statistics to her work at Amorgos, Greece (1984, etc.) so that it has become nearly a 'new orthodoxy' in Britain and no archaeobotanical report is considered *au fait* if it does not deal with crop processing.

These studies have been criticised *ab initio* as overly optimistic: Hubbard (1976) initially pointed out some of the flaws in Dennell's approach such as the perturbation caused by distortion of seeds during carbonization and mixture of seeds from different sources. Ethnographic studies of agricultural techniques like Sigaut's (1988), which examines less intensively a wider range of cultures than Hillman or Jones, reveal a wider range of possible practices than Hillman and Jones consider. More importantly, Hubbard and Clapham (1992) observe that archaobotanical assemblages that are excavated in the context where they were carbonized in catastrophic conflagrations (which they call 'class A' samples) should be treated differently from 'class C' samples whose only archaeological context is 'fill' or 'pit'. 'Class B' samples have an intermediate amount of contextual information, like an hearth full of charred grain, from which it can be inferred how the sample was charred but which may have involved a degree of mixing. As they point out, 'the overwhelming majority of archaeobotanical sample belong to [class C], though the wishful thinking of archaeobotanists and archaeologists alike may disguise this' (1992:119). Behind this scheme of classification lies a degree of pessimism about the amount that can be learned from quantifying class C assemblages; as they argue somewhat hyperbolically: 'the precise composition of an archaeobotanical sample has no relationship to the economy from which it is derived—other than establishing that certain plants were present.' (1992:118). Nor are they alone in holding this view among archaeologists in general, though among (British) archaeobotanists they definitely represent a small minority. A similar point is made by Paul Halstead, though not specifically in reference to botanical material: 'on-site bioarchaeological evidence for past economy is essentially qualitative: it sheds light on which plants and animals were raised and how, but estimates of scale largely depend on off-site archaeology' (1994: 506).

Warnings against ecological interpretations of on-site botanical material are even older: as early as 1941, the geographer Harry Godwin and plant ecologist ArthurTansley co-authored an article pointing out that charcoal found on archaeological sites could not generally be used to make statements about ecology because the variation due to human choice would swamp any variation due to ecology. Though clearly this is sometimes true (as in the case study criticized by Godwin and Tansley), it is also not valid as a general criticism: there are situations where the mere presence of a certain species could provide ecologically interesting information, regardless of how it arrived on site. The dangers of trusting 'indicator species' for ecological information have already been alluded to and even if several members of a known plant community can be identified in an assemblage, it is still necessary to deal with the problems inherent in phytosociology that were described above (§2.3).

So what can be learned from class C assemblages? Are we limited to compiling 'laundry lists' except on the rare occasions when we are lucky enough to come across samples in well-understood contexts? Perhaps not: admitting that the perturbation of class C assemblages may be much greater than the signal we are trying to measure, there may still be ways of discovering some of the signal.

One notion, in particular, seems promising: the things that it would be interesting to determine are economy and ecology—naturally enough, these are also two of the main sources of variation in the material. Other sources of variation include differential preservation, and physical sorting, but by far the most important is an unknown degree of mixing; all count as perturbations because we are not interested in knowing about them. Almost by definition, though, these are stochastic with respect to the economic and ecological variation that we wish to observe. Another way of putting this is: we can divide all sources of variation in archaeobotanical samples into the things we do want to know and the things we do not care about. The things we do care about ultimately are those that allow us to discriminate temporal or geographical differences so that we can compare sites and cultures; the sources of variation that exist at all sites and all time periods are irrelevant to archaeological interpretation. Therefore, if we do truly find systematic differences between sites or between time horizons on a site, we have interesting data to explain. In a way this is an 'internal' approach but on a larger scale: let us look for patterns in the data and then try to explain them by reference to ethnographic analogy, to the logic of crop processing, or to ecological uniformitarianism. But this is much more likely to work on the scale of sites because the most confusing perturbation is absent: there can be no mixing of assemblages unless trade accounts for a large proportion of the archaeobotanical material preserved.

So as a programmatic summary that will in so far as possible be adhered to in the following chapter: we must explicitly distinguish class A, B, and C assemblages; class A and B samples should be quantified and interpreted at the microscopic scale of archaeological contexts; class C samples can but need not be quantified. They should, however, certainly be scored for presence/absence in as many contexts as possible so that ubiquity figures can be calculated for all taxa at the site; this seems to be the best metric by which to compare sites. It is also important to understand the actual physical and temporal relationships between the contexts, because the phasing provided by the excavator can be arbitrary or weakly supported. In addition, it is perfectly reasonable to advance *ad hoc* arguments about crop processing practices or any other possible or probable conclusions that can be drawn from the data at hand. What should be avoided is routine application of any standard scheme or method of analysis. Crop processing studies have not yet progressed, and I believe can never progress, to the point of routine, general applicability, and any separation of samples into crop processing stages, fine or coarse sieve residues or routes to charring must be supported by reference to *prima facie* evidence not deductive, *a fortiore,* arguments based on general or ethnographic comparison.

A final methodological note is on the conventions used for reporting botanical identifications. The abbreviation cf. for *confer* = 'compare' is widely used to indicate that an identification is tentative. Here, cf. has been used in a slightly narrower sense, to indicate that the specimen under consideration has been compared to and could potentially be attributed to a particular taxon, but that related taxa have not been examined in order to eliminate other possible identifications. Instead, I have used 'prob.' as a prefix to identifications that seem probable but have not been checked against multiple, well-identified, modern reference samples from the relevant area. In particular, this includes identifications from botanical illustrations, photographs, or modern reference material from other parts of the world, all three of which have perforce been relied upon in these analyses. Unprefixed identifications are limited to taxa for which multiple examples of local reference material have been examined and closely related taxa eliminated from consideration, or which are so distinctive that they can be identified without ambiguity. Finally, one of the most useful and at the same time dangerous techniques of archaeobotanical identification is the practice of identification by elimination. Of course this is employed implicitly whenever a local flora is consulted, but I have used the prefix 'elim.' especially with specific identifications when it is particularly clear that it is not morphological criteria but elimination of other possibilities that has led to the identification.

Space limitations prevent the inclusion of a proper methods section, but in brief, the minimum mesh size used was 500 microns; heavy residues were examined in the field, and light material was sorted under stereoscopic microscope at magnifications ranging from 6 to 25 times. None of the samples reported here was sub-sampled. Archaeobotanical identifications were made on the basis of comparisons with European reference material in the McDonald collection, Near Eastern reference material obtained from the United States Department of Agriculture National Genetic Resources Program, Near Eastern material at the Institute of Archaeology, University College, London, and illustrations and photographs of archaeological and modern material.

Data, Analysis, and Interpretation

The natural and obvious way of presenting the data for an entire site is in a pie chart, which would show the relative proportions of the different taxa identified measured either by ubiquity or by absolute abundance. Unfortunately there are 115 categories measured (though fewer botanical taxa are represented), and this is too many to represent on a pie chart. Thus in order to display all the data for the site, it is necessary to produce a 'ubiquity curve' (Fig. 4a), which shows in descending order, the ubiquities of each category identified. The concavity of this curve and its standard deviation may prove characteristic of a site or of an assemblage.

This representation, however, does not provide any intuitive sense of the constituents of the samples, so several abridged or composite data sets have also been plotted: figure 4b is a pie chart of the absolute frequencies of various totals (the ubiquities of these totals were all near 100%), while figure 4c shows the proportions of different crops by sample. Since this proportional bar chart, however, gives no indication of the density or diversity of the sample, figure 4d shows both the absolute number of identifiable specimens and the diversity index (100 * number of categories present/total number of categories) as a percentage. Data were not scaled for absolute densities, but this can easily be done and should not affect the results significantly.

Figure 4a: Ubiquity curve for Tell Brak

Figure 4b: Pie chart of Absolute Site Totals by Aggregate Category

Figure 4c: Proportional Abundances of Crop Plants by Sample

Figure 4d: Number of Identifiable Elements and Diversity Index by Sample

The answer to the question posed in the introduction about changes due to the Uruk expansion appears in figure 4c: there is no observable change between the three horizons. The same lack of a pattern appeared in dozens of similar graphs plotting the relative proportions of different measured quantities. Statistical algorithms like cluster-analysis could surely—by systematically surveying all the relationships between the 115 measured variables—find some quantity that did distinguish the three horizons. But this would not be convincing evidence for agricultural, dietary, or ecological change.

4.1 Crops

An unfortunate tendency among readers of archaebotanical reports is to assume that any taxon that can be utilized by people does indeed appear on site as a direct result of human actions and decisions. There are only three taxa about which this can be said with any degree of certainty: wheat, barley, and flax. The presence of hackberry (*Celtis*) is also probably anthropogenic, and fig, melon, and jujube (*Ziziphus*) are possible or even likely. Many other taxa, especially the legumes in the tribe Trifolieae, poppy, and purslane (*Portulaca oleracea*) were probably used by people in the ancient Near East, as they are today, but the samples presently under consideration provide no evidence for or against their utilization.

4.1.1 Barley

All cultivated barleys are diploid (2n=14) members of the genus *Hordeum* and are predominantly self-pollinating so that they produce true breeding lines. All *Hordeum* species have a spike inflorescence with three spikelets at each rachis node, of which only the middle one or all three (rarely the outer two only) are fertile. These constitute 'two-rowed' and 'six-rowed' categories, traditionally *H. distichum* L. and *H. hexastichum* L. The rare 'four-rowed' plants are traditionally called *H. tetrastichum* Körn. The 'nearest wild relative' of cultivated barley is *H. vulgare* ssp. *spontaneum* (C. Koch) Thell. [=*H. spontaneum* C. Koch], and by current taxonomic practice (Zohary and Hopf 1993) is considered together with cultivated forms as a single species, *H. vulgare* L., while cultivated races are *H. vulgare* ssp. *vulgare* L. (six-rowed) and *H. vulgare* ssp. *distichum* L. (two-rowed). The presence of six fertile spikelets per node is considered a derived state obtained under cultivation and due to a single recessive mutation at the v locus. The presence of a tough rachis, which keeps the spikelets together during harvesting, is considered a reliable indicator of cultivation, because is also due to a mutation to one of two recessive alleles at the Bt1 or Bt2 loci. Some cultivated plants also have a recessive allele at the locus n, which produces grains that are not as tightly invested in their pales, so that the naked grain can be obtained by threshing and winnowing. This has sometimes been called var. coeleste or var. nudum. Brittle-rachis six rowed plants, traditionally *H. agriocrithon* Åberg. are now considered hybrids (Zohary, 1969).

From the material in a charred archaeological assemblage, the amount of six-rowed barley can be inferred from the proportion of 'twisted' grains (the lateral grains, in which the ventral furrow is twisted with respect to the sides of the grain), where in a pure sample of six-rowed grain, the fraction of twisted grains would be 2/3. This of course assumes the absence of four-rowed plants in significant numbers. It is also sometimes possible to differentiate naked grains, which have a narrower ventral groove and rounded cross-section, from hulled grains, which have a ventral groove that is narrow at the adaxial (embryo) end but widens distally and an angular or sub-angular cross-section. See figures 4.1.1a–b.

Figure 4.1.1a: Camera Lucida Drawing of Hulled Barley (*Hordeum vulgare* prob. ssp. *distichum*)

Figure 4.1.1a: Camera Lucida Drawing of Naked Barley (*Hordeum vulgare* prob. ssp. *distichum*)

In the present case, grains identified as barley but otherwise unattributable have been placed in an undifferentiated hordeum category on the basis of large size and symmetry in both lateral and ventro-dorsal views. When possible, grains have been further attributed to hord.hulled or hord.naked by the characteristics mentioned above, and the number of twisted grains has been counted for each of these categories. Since only 20 out of over 1500 barley grains were identified as twisted, it is clear that six-row barley did not form a substantial part of the crop. Grains that seem particularly small, either because they come from wild or feral populations or because they are from the top of the spike (tail-grain) have been placed in a composite category, called hord.wild and some well-preserved grains have been identified as prob. ssp. *spontaneum* on the basis of an extremely angular cross-section with lateral ridges and deep, angular groove (see Figure 4.1.1c), prob. *H. bulbosum* L. on the basis of flatness, smaller size than ssp. *spontaneum* and extreme angularity in cross-section, or. *H. murinum* L. on the basis of wide, square distal end and acuminate cross-section (see Figure 4.1.1d). Modern Near Eastern reference material was examined from all species attested in F. Iraq and F. Palest. except *H. secalinum* Schreb., *H. geniculatum* All. and *H. hystrix* Roth.

Figure 4.1.1c: Camera Lucida Drawing of *Hordeum vulgare* prob. ssp. *spontaneum*

Figure 4.1.1d: Camera Lucida Drawing of *Hordeum murinum.*

Fragments of *Hordeum* rachis (N = 193, U = 92%) are identified on the basis of the distinctive bulge opposite the attachment scar at each node; few of these are well enough preserved to discriminate between two- and six-rowed barley, but the 3 with spreading glume bases have been tentatively attributed to six-row plants. The absence of rachis segments more than an single node long does not indicate the presence of tough-rachis plants because the rachises might remain in the field if harvesting was by stripping or might be removed at an early stage of crop processing. It is interesting to note that barley rachis fragments are not very abundant compared to hulled wheat chaff, but are nearly as ubiquitous.

Both hulled and naked forms of barley were found in most of the samples (U = 75 and 67% respectively), but the vast majority of all hulled barley came from a single sample, 1997.201. There is no clear trend through time of changing type or concentration of barley (see Figure 4.1.1e).

Figure 4.1.1e: Bar Chart of Barley Types by Sample

Even without the evidence of the class A samples, which though they have not yet been quantified are predominantly composed of pure barley, it is clear that barley was a staple crop, but it is not possible to determine how it was used: whether as food for human consumption or primarily as fodder. Because of the presence of what seem on initial inspection to be grain cleaned ready for human consumption or sowing and because of the overall ubiquity (lacking only in a single context; U = 96%), the use of barley at least partially for human consumption seems probable.

4.1.2 Wheat

Both wheat taxonomy and the ability to identify different forms of wheat from the archaeological record are notoriously complicated and controversial (Nesbitt and Samual, 1996). Adopting the taxonomy of Zohary and Hopf (1993), which though not the most current source, is widely known and relatively modern, wheat spp. can be divided into four groups. Throughout, the presence of a tough rachis is considered a derived character produced under domestication.

1. Diploid (2n=14) einkorn wheat, with AA genome, including domesticated (tough rachis) and wild (brittle rachis) as well as forms with a single caryopsis per spikelet and forms with two caryopses per spikelet.
2. Tetraploid (2n=28) emmer and durum wheat, with AABB genome, including hulled wild and domestic as well as free-threshing, domestic forms.
3. Tetraploid (2n=28) Timopheev's wheat, with AAGG genome, hulled wild and domestic forms.
4. Hexaploid (2n=42) bread wheat, with AABBDD genome, both hulled and free-threshing but exclusively domestic forms.

Most problematic of all is the fact that different groups of wheats can be identified with different degrees of certainty from naked grain and from chaff: for instance, it can be difficult to distinguish hulled from free-threshing wheats from their naked grains, but the presence of rachis fragments signifies the presence of the latter while glume bases, spikelet forks and the bases of spikelet forks that are referred to here as internodes (see Fig. 4.1.2a) demonstrate the presence of the former. Only eight nodes of free-threshing wheat rachis appeared in 4 contexts, compared with thousands of glume bases and spikelet forks, so despite the common assumption that free-threshing wheats are under-represented in charred assemblages because they do not need to be parched or roasted before threshing, it is clear that glume wheats predominated in the present material, though free threshing wheat was present. All of these rachis fragments were in poor condition, but have been identified on the basis of small size and absence of a prominent wrinkle under the attachment scar as tetraploid (durum or turgidum) wheats, prob. *T. turgidum* L. *sensu lato*. Though it is considered possible to distinguish emmer from einkorn wheat on the basis of well-preserved chaff assemblages, there was not sufficient time to apply the metrical criteria that are necessary as a check on qualitative discrimination (Nesbitt and Samual, 1996), so the categories glume base, forkelet, and internode are identified only as non-hexaploid hulled wheats (spelt chaff is distinctive and almost certainly not present). Though naked grains were separated into the categories emmer (on the basis of a flat ventral margin pronounced 'hump' in lateral view, and somewhat compressed ventral groove; see Fig. 4.1.2b), einkorn (on the basis of curved ventral margin and very compressed ventral groove), and turgidum (on the basis of wide ventral groove and low length-to-breadth ratio; see Fig. 4.1.2c), these distinctions are not considered reliable without the support of metrical studies of the chaff, so they have not been included in the analysis, though numerical data were collected. For the present, the only point which should be relied upon is the qualitative statement that classic emmer grains predominate.

Figure 4.1.2a: Camera Lucida Drawing of Glume Wheat Internode (*Triticum*)

Figure 4.1.2b: Camera Lucida Drawing of prob. Emmer Wheat (*Triticumcf. diccocum*)

Figure 4.1.2c: Camera Lucida Drawing of prob. Free-Threshing Wheat (*Triticum turgidum* s.l.)

The presence of free-threshing wheat raises the question of whether there was a reason to continue using the more primative hulled wheats when free-threshing forms are available. This has been the object of extensive investigation in European Iron Age material (Stevens, 1996), where it is believed that the hexaploid spelt wheat was developed under domestication because its hulled spikelets were easier to store than the naked grain from free-threshing hexaploid types. In the present case, there is additional evidence that the hulled wheats that predominate were brought on site as spikelets: figure 4.1.2d is a log-normal plot of the absolute numbers of glume bases, spikelet forks, and internodes (the base of the spikelet fork, often broken off) in each context. Because these three categories come from the same chaff element and ought not be subject to differential preservation (thought the internodes may be destroyed more frequently, leading to their uniformly lower abundances), they must co-vary (and should theoretically appear with an approximate ratio of 2:1:1). That they do indeed co-vary, as can be see from the figure, does not tell us anything in particular, but is merely intended to demonstrate the degree of similarity that we should look for between categories that do in fact co-vary. Next examine figure 4.1.2e, which is plotted on exactly the same axes and scale for comparative purposes. Here, without examining the graph, we can be relatively certain that the three categories plotted do not co-vary as there is no reason that pulses, grain, and other crops—including fruits that may well have been collected from the wild—should appear in the same places. So this graph also is telling us nothing new; merely confirming what we already assume and showing the range of variation in graphs of this type. Finally, in figure 4.1.2f, two quantities have been plotted the extent of whose covariance is not known: wheat grains and total numbers of glume wheat spikelets represented by the preserved chaff. It is easy to see that while these two curves do not co-vary as closely as the different types of chaff, they do indeed show a comparable degree of similarity: they certainly are much more similar to the curves in figure 4.1.2d than to those in 4.1.2e. This is evidence, therefore, that the wheat grains and the wheat chaff in the samples do not derive from different sources. In other words, this pattern is inconsistent with the notion that wheat was processed en masse off site and that cleaned grain for consumption and chaff for temper or fodder were brought on site separately. It is not inconsistent with the inherently unlikely but frequently postulated notion (Miller and Smart, 1984) that charred botanical remains on Near Eastern sites come predominantly from the burning of dung.

Figure 4.1.2d: Graph of Glume Wheat Chaff Covariance

Figure 4.1.2e: Graph of Cereal to Other Crop Covariance

Figure 4.1.2f: Graph of Wheat to Chaff Covariance

Wheat caryopses appear in 22 contexts (N = 534, U = 92%), while hulled wheat chaff is the most abundant category counted (N = 2394 in 23 contexts; U = 96%). This ratio of nearly 5:1 chaff to grain is considered unusual because based on experimental work (Boardman and Jones, 1990), chaff is differentially destroyed by charring. This implies that far more chaff must originally have been burned than grain, which would happen, for instance, if the waste from daily processing of spikelets were burned, while the grain—carefully processed for consumption in small quantities—was nearly all eaten.

4.1.3 Hackberry

Two samples, 1997.A and 1997.B, are composed exclusively of mineralized hackberry stones (N =21), identified as *Celtis* prob. *tournefortii* Lam. on the basis of size, globose shape, quadrilateral fracture and lack of reticulations. Eight mineralized stones and a single charred stone also appear in the flotation sample 1997.047, from the same context as 1997.B. Thus, hackberry stones appear in only two contexts (U = 8%), but because they count as class B contexts, it is reasonable to assume that they represent single, anthropogenic deposition events. This is not certain, as small mammals might also hoard hackberry stones in such quantities, but the sweet fleshy drupe is widely eaten in the Near East and even if the caches were produced by rodents, the fruits must have been brought on site by humans. It is of course impossible to determine whether they were collected from the wild or whether they were cultivated, but the distinction is probably not of much importance.

C. tournifortii is a small tree (7–8 m.) fl. & fr. Mar.–Aug. and appearing mostly between 600 and 1500 m. elev., so there is little possibility that it occurred naturally in the immediate vicinity of Tell Brak. Either the fruit must have been collected from neighbouring highlands, or the tree must have been cultivated locally. The related *C. australis* L. is documented from archaeological sites esp. in Turkey (Çatal Hüyük and Hacilar) but this seems to be one of the most southerly archaeological occurrences of hackberry so far documented.

4.1.4 Flax

Flax has been cultivated in the Near East since the Neolithic for fibre (linen), oil (linseed oil), or both. Cultivated strains are predominantly self-pollinating and have indehiscent capsules so there are many landraces that have been bred either for fibre or oil production, but all are considered to belong to the same species, *Linum usitatissimum* L. This species is fully interfertile with its nearest wild relative, *L. bienne* Mill. (=*L. usitatissimum* ssp. *bienne; L. angustifolium* Huds.) and in archaeological assemblages, cultivated plants can only be distinguished from their wild relatives on the basis of the larger size of their seeds (Helbaek, 1959). Thus, landraces bred for fibre production could well fall outside the standard range for cultivated specimens. Here this was not an issue as the 3 complete specimens found certainly fall within the range for cultivated specimens, and other fragments were identified on the basis of the obtuse 'beak' at the embryo end, a granulate surface sculpturing, and a distinctive mode of carbonization that results in a matt black surface frequently with brown interior. Though it is possible that some of these fragments could have been collected from 11 (F. Iraq)–18 (Post) wild *Linum* species reported in the Near East, there is no reason to assume that any taxon is present except cultivated flax, which fl. & fr. in Apr.–May and is only present in the wild as feral populations. Indehiscence of the capsules and large seed size are considered derived characteristics developed under domestication.

Because flax appears as the charred contents of a pot in one of the class A samples not yet quantified (1993.001), it can be identified with certainty as a crop but amongst the class C contexts, only about 40 seeds from 7 contexts (U = 29%) were found and these do not reveal any particular patterns about its use. Though the seeds found must have been intended either for oil production or consumption, this does not imply that the same plants were not also used for fibre production. Though modern commercial production of linen harvests the plants before the seeds ripen, there is no reason to suppose that the same plants were not used for seed and fibre production in the ancient world. Only use of the seeds, however, can be confirmed from the samples considered here, though see §4.3.2 for discussion of fibre identification.

4.1.5 Pulses: *Cicer, Pisum, Vicia, Lathyrus, Lens*

Pulses, or large legumes, appear in 13 of 24 possible contexts (U = 54%), never in high enough numbers to provide entirely convincing evidence that they were being grown as crops, though that is the obvious assumption. Use of them as fodder as well as human food is also documented.

Chickpea and common pea are each represented only by a single specimen, the former identified as prob. *Cicer* L. on the basis of large size, obtuse rectangular cross-section, and prominent groove between the cotyledons, the latter very tentatively labelled as cf. *Pisum* L. because of its globose shape and small radicle. Two specimens of *Vicia* in separate contexts were identified as prob. *Vicia* cf. *ervilia* (L.) Willd. on the basis of ovate shape, small radicle, and shallow scutellum, while five vetchling seeds were attributed to prob. *Lathyrus* cf. *aphaca* L. on the basis of a deeper scutellum and more angular shape than the Vicia specimens to which they are otherwise similar.

Somewhat more common are lentils, which appeared in nine contexts (U = 38%), though still in very small numbers (N = 12). These were separated into the categories lens cul., identified as the domesticated lentil *Lens* cf. *culinare* Medik. (=*L. esculenta* Moench) and lens erv., compared with reference material of the wild relative *Lens ervoides* (Brign.) Grande., though it could represent any of the two or three other wild *Lens* spp. reported. Identification as lentils is on the basis of distinctive lenticular shape but discrimination between domesticated and wild species is solely on the basis of size and there is extensive overlap between the taxa; therefore the nearest wild relative of the domestic lentil, *L. orientalis* (Boiss.) Hand.-Mazz. (=*L. culinare* ssp. *orientalis*) and many small-seeded cultivated races will probably fall into the category lens erv., while lens cul. represents only large seeded domesticated plants. All lentil spp. are diploid (2n=14), but *L. culinare* is only fully interfertile with the certain forms of *L. orientalis*. In the wild, all spp. of lentil seem to prefer rocky, calcareous habitats. *L. culinare* also appears as ruderal presumably after escape from cultivation; it fl. & fr. from Apr.–Jun. and is grown in the northern Mesopotamian plain as a rain-fed crop.

4.1.6 Other Possible Crops: *Ficus*, Cucurbitaceae, *Ziziphus*

Fig seeds are identified as prob. *Ficus* elim. *carica* L. on the basis of small size, psilate surface and ±globose or turbinate shape (see Figure 4.1.6a); when the embryo is lacking, they appear broadly scutelliform, i.e. dimpled where the embryo is missing. They are not likely to be confused with any close relative (Morus is the only other member of the family documented as indigenous in Post, F. Iraq or F. Palest.) and *F. carica* , which includes all cultivated figs as well as many wild or feral groups is the only reported indigenous sp. There is a wide variation among *F. carica* populations, but all are diploid (2n=26), fully interfertile, and cross-pollinated by an obligatory symbiont, the wasp *Blastophaga psenes.* Under domestication, therefore, true lines can only be maintained by vegetative reproduction and some cultivars have developed (via a single dominant mutation) the ability to fruit without fertilization (parthenocarpy). Zohary and Hopf (1993), do not consider it possible to discriminate wild from domestic plants on the basis of charred seeds and certainly the present material is not rich enough or well enough preserved to make the attempt. *F. carica* is a shrub or 5 (–9) m. tree fl. & fr. Apr.–July. It is found in locally moist and rocky microclimes; common in the forest (piedmont) zone and occasionally penetrating the steppe region; generally at 500–1300 m. elev.

Fig seeds appear in 8 contexts (U = 33%), with a maximum frequency of N = 15 in TW 681 (represented by two samples: 1997.025 and 1997.026), which is a large levelling fill covering the entire west half of the phase 11/12 west trench (see Fig. 3.3a). Since a single fig can contains hundreds or thousands of seeds, this is only weak evidence for intentional exploitation, though that is the obvious assumption. It is clearly not possible to determine whether they were cultivated or collected from the wild.

A single specimen in sample 1997.018 is attributed to the family Cucurbitaceae cf. *Citrullus lanatus* (Thunb.) Mats. and Nakai., the cultivated water-melon, on the basis of its large size, flattened pyriform shape, and ridges flanking the embryo, though it could also represent *C. colocynthis* (L.) Schrad., a related melon cultivated or gathered from the wild and used as a purgative.

A single fragmented specimen in sample 1997.045 is identified as *Ziziphus* Mill. on the basis of size, shell thickness, and a two-chambered interior; the rugose sculpturing that should appear on the exterior is not visible but could plausibly have been destroyed during carbonization. It is impossible to attribute this single, poorly preserved specimen to any of the four species reported, which occur in different habitats: *Z. jujuba* Mill. in the Tauros and Zagros piedmonts and mountains and *Z. mauritian*a Lam., *Z. spina-christi* (L.) Willd., and *Z. nummularia* (Burm. f.) Wight et Arn. in more steppic or desert environments, particularly under cultivation in oases. The drupe of wild trees is frequently eaten and the genus is widely cultivated throughout southwest Asia and Egypt.

4.2 Weeds

Though 'weed' *sensu stricto* refers specifically to a segetal or ruderal individual, it was pointed out in §2.3 that it is not possible to tell merely from the known ecology of the plant whether a weedy taxon appears on site because of its association with crops or because of human exploitation of its primary habitat. Therefore, the word 'weed' is used here in a looser sense that includes wild populations. The on-site botanical data that have been analysed, however, do provide some indication of which of the weed taxa were more or less closely associated with the grain supply (see Fig. 4.2a). As would be expected, the small grasses, small legumes, other weeds, and hydrophytic taxa show in that order a decreasing degree of covariance with the grain supply.

Figure 4.2a: Graph of Covariance of Various Weed Aggregates with Cereal Grains

4.2.1 Small Grasses: *Avena, Aegilops, Lolium, Bromus,* etc.

The wild grasses, of which more than 15 spp. were recognized, though it has only been possible so far to identify 4 to generic level, are the most abundant constituent (N = 1892) after cultivated grain; they are, however, over-represented by a simple count because they include some of the smallest types recognized. Quantification of them by weight would provide a useful contrast to the counts that are presented here and would more accurately represent their relative abundance. All spp. are annual or perennial herbs.

Avena

A single fragment of awn in sample 1997.204 is identified as cf. *Avena* L. on the basis of its distinctive spiral, cylindrical shape; it could represent any of the 8 (Post)–10 (F.Iraq) spp. reported (or other members of the tribe Aveneae), which include wild, weedy, and cultivated populations.

Aegilops

Aegilops is a close relative of wheat, and the source of the D chromosome in hexaploid wheats; 267 caryopses identified by reference to modern Near Eastern material are identified as *Aegilops* L. on the basis of an extremely compressed ventral groove and generally a flat ventral margin, though note that some *Aegilops* spikelets contain one caryopsis with a concave ventral side and the other with a bulbous margin that can occasionally be confused with wheat or barley. Caryopses appear in 21 contexts (U = 88%) and 167 spikelet bases appear in 19 contexts, several still attached to intact spikelets (see Fig. 4.2.1a). Sub-generic identification seems possible because the spikelets and caryopses alike fall into two obvious groups on the basis of size, curvature of the glumes, and flatness of the grains. The botanist N. L. Bor, however, warns that *Aegilops* is 'a genus in which orthodox taxonomy is beset with difficulties owing to the frequency with which the various species hybridize with one another and with species of *Triticum*.' (1968:174) Therefore the two categories a.crassa and a.col. should not be considered specific identifications, though they are very similar to respectively *A. crassa* Boiss. and *A. columnaris* Zhuk. There are 15 (F. Iraq)–18 (Post) spp. fl. & fr. from early spring through late summer reported from various steppic to montaine habitats including segetal/ruderal environments.

Figure 4.2.1a: Cameral Lucida Drawing of *Aegilops* cf. *crassa* Spikelet

Lolium

Easily confused with naked barley, there are at least two, perhaps four species identified as prob. *Lolium* L. sp. on the basis of symmetrical cross-section in both lateral and dorso-ventral views. The categories lolium and lol.sht. are similar except in aspect ratio: the former is roughly twice as long for an equivalent breadth. Two other grass types, listed as 3b and 45f, may also be *Lolium* spp. (see Figs. 4.2.1b, c). The major difficulty in identifying *Lolium* spp. seems to be expansion on carbonization, which enlarges and smooths the cross-section of the grains. Therefore even lolium (N = 135, U = 67%) and lol.sht. (N = 59, U = 29%), which include many well-preserved grains cannot be confidently attributed to species by comparison with modern reference material or illustrations. Since, however, these categories are distinctive, abundant, and well preserved, it may be possible and valuable to create an experimentally charred reference collection in order to identify them. In particular, the separation of the poisonous *L. temulentum* L. from other 4 (Post)–5 (F. Iraq) spp. reported is of potential interest since this is a species that would not be tolerated in high proportions in samples intended for consumption; in sample 1997.047, from the pit fill TW 725, for example, *Lolium* caryopses outnumber wheat.

Figure 4.2.1b: Camera Lucida Drawing of Type 3b (Graminae)

Figure 4.2.1c: Camera Lucida Drawing of Type 45f (Graminae)

Bromus

Distinctive because of its flat shape and slightly shiny surface after charring, at least some of the specimens identified as prob. *Bromus* L. seem to be firm generic determinations. Since, however, there is a large amount of morphological variation due to ontogeny and environment, which results in a lack of clear subgeneric groups such as are present in the material attributed to *Lolium*. Figures 4.2.1d and 4.2.1e are examples of some of the best-preserved specimens. There does not seem to be any particular advantage to pursuing a specific identification amongst the 18+ spp. reported from varied habitats. 47 specimen, most of them very poorly preserved, appear in 10 contexts (U = 42%).

Figure 4.2.1d: Camera Lucida Drawing of prob. *Bromus* L.

Figure 4.2.1e: Camera Lucida Drawing of prob. *Bromus* L.

Other Types

Seven other types were well enough preserved or abundant enough to be listed as numbered types: 26b, 27a, 47a (see Figs. 4.2.1f–h), and 45a, not illustrated, are comparatively large (found in the medium and course fraction), while 40b, 45l and a composite category of small, round caryopses called millet t. (see Figs. 4.2.1i–l) were found only in the fine fraction (0.3–0.5 mm mesh). With further examination of reference material, it may be possible to identify some or all of these types to genus.

Figure 4.2.1f: Camera Lucida Drawing of Type 26b (Graminae)

Figure 4.2.1g: Camera Lucida Drawing of Type 27a (Graminae)

Figure 4.2.1h: Camera Lucida Drawing of Type 47a (Graminae)

Figure 4.2.1i: Camera Lucida Drawing of Type 40b (Graminae)

Figure 4.2.1j: Camera Lucida Drawing of Type 45l (Graminae)

Figure 4.2.1k: SEM Photograph of Type 45l (Graminae)

Figure 4.2.1l: SEM Photograph of millet type (Graminae)

4.2.2 Small Legumes: Trifolieae

After small grasses, the next most abundant group of weeds is made up of small leguminous herbs, mostly from the tribe Trifolieae. These are notoriously difficult of identification (see Butler, 1996 for an attempt to discriminate spp. on the basis of surface sculpturing, which is seldom preserved in charred archaeological assemblages), but do seem to fall into identifiable morphotypic groups. Though generic names have been attached to some of these groups, none should be taken as a true identification, but merely as an indication of what the type looks like. The types, some illustrated below in figures 4.2.2a–e are as follows: trifolium, 4a, 18a, 24b, 24c; four other types listed in Appendix B are not illustrated. Only a single legume specimen, of 24b type, preserved any surface sculpturing, which is illustrated in figure 4.2.2f.

Figure 4.2.2a: Camera Lucida Drawing of trifolium type (Papilionaceae)

Figure 4.2.2b: Camera Lucida Drawing of Type 4a (Papilionaceae)

Figure 4.2.2c: Camera Lucida Drawing of Type 18a (Papilionaceae)

Figure 4.2.2d: Camera Lucida Drawing of Type 24c (Papilionaceae)

Figure 4.2.2e: Camera Lucida Drawing of Type 24c (Papilionaceae)

Figure 4.2.2f: SEM Photograph of Type 4b Surface Sculpturing (Papilionaceae)

A total of 423 small legumes were counted from 22 contexts (U = 92%) and neither their abundance nor distribution seems to offer any answer to whether they were being intentionally grown as fodder, seeded in fallow fields in rotation with cereals to replenish soil nitrogen, or whether they were merely segetal weeds. This last explanation must be considered a null hypothesis in the absence of evidence for the former and figure 4.2.2h, a simplified version of figure 4.2a shows a certain amount of covariance between small legumes and cereals which supports this interpretation. It is interesting, however, to consider the question of what level of abundance would constitute convincing evidence that the small leguminous species were being intentionally cultivated.

Figure 4.2.2g: Graph of Small Legumes to Cereal Covariance

4.2.3 Aquatics and Hydrophytes: *Lemna*, Cyperaceae

Lemna

Identified as *Lemna* L. by reference to waterlogged archaeological material provided by Dr. Alan Clapham on the basis of obtusely cylindrical shape and helical to linear ridges; all specimens are white (as are the modern seeds) and fracture with varying degrees of brittleness. Several spp. are reported, 3 (F. Palest)–5 (Post), but all are aquatics as are the related genera *Wolffia* Horkel ex Schleiden and *Spirodela* Schleiden. 49 specimens were found in 11 contexts (U = 46%), which might indicate a large amount of stagnant water brought on site or might give support to the interpretation of the ‘halo’ around the tell as a reservoir of standing water (e.g. for mud-brick production; see §3.1). It is perfectly possible, however, that they are modern seeds introduced by the flotation process. Semiquantitative chemical analysis by electron microprobe of these specimens is under way in order to determine the type of mineralization and whether they are likely to be modern. Note that although the *Lemna* count data is listed along with the sedges as hydrophytic/aquatic, it was not included in the hydrophyte total category for the purposes of analysis because it is being treated provisionally as a modern intrusion.

Figure 4.2.3a: SEM Photograph of *Lemna* sp.

Figure 4.2.3b: SEM Photograph Showing Detail of Fig. 4.2.3a

Cyperaceae

Sedges were relatively common (N = 174) and distributed across 21 contexts (U = 88%), though over half the achenes appeared in only two contexts: 1997.026, N = 46) and 1997.047 (N = 55). The former is from TW 681, the large levelling fill mentioned above in §4.1.6; the latter is from a phase 12 (Late Uruk) pit, TW 725. The presence of two samples rich in hydrophytic taxa in a late phase is interesting but not conclusive.

Lack of appropriate reference material made identification of the various sedges a difficult and uncertain endeavour. Only the distinctive *Fimbristylis* cf. *bisumbellata* (Forssk.) Bub. should be considered a firm generic identification on the basis of small size and distinctive reticulations (see Fig. 4.2.3c). All spp. are found on stream banks, swamps, and ponds below 750 m. elev. fl. & fr. in the autumn. Five specimens were counted in two contexts (N = 5, U = 8%).

The other sedge taxon that could probably be identified to genus was prob. *Eleocharis* R. Br. (see Fig. 4.2.3d) on the basis of obtuse acuminate cross section, regular fracture into two halves, and (occasionally) scar from the enlarged style-base. Five spp. in F. Iraq appear at slightly higher elevations than *Fimbristylis* (one sp., *F. quinqueflora* (F. X. Hartmann) Schwarz as high as 2000 m.) but in similarly wet habitats. 13 specimens of which 4 were mineralized appeared in 5 contexts (U = 21%).

The remaining sedges were attributed to two categories: scirpus, which includes obtusely trigonal sedges with a sharper style base, could represent cf. *Scirpus* L., but probably includes *Cyperus* L. spp. and other genera (see Fig. 4.2.3e). All specimens in scirpus were carbonized and this was the most abundant group at N = 62 in 10 contexts (U = 42%) The final category, carex, which included more lenticular sedges with a taper to the style base, contained 26 charred and one mineralized achene in 9 contexts (U = 38%). Since all sedges are considered hydrophytic, these were included in the total for analysis even though they could not be firmly identified to genus. Further examination of these specimens and comparison to a full reference collection should improve the taxonomic resolution of identification.

Figure 4.2.3f is a graph of the hydrophyte total and total of other weed taxa expressed as proportions in each sample; the high proportion of sedges in samples 1997.026 and 1997.047 can be easily seen, but their apparent preponderance in 1997.035 should be discounted because it is due to the presence of a single undifferentiated sedge and the absence of all other weeds. It is also apparent from this graph that there is no obvious systematic difference between samples in the three major horizons.

Figure 4.2.3c: SEM Photograph of *Fimbristylis* cf. *bisumbellata*

Figure 4.2.3d: Camera Lucida Drawing of prob. *Eleocharis*

Figure 4.2.3e: Camera Lucida Drawing of cf. *Scirpus*

Figure 4.2.3f: Bar Graph Showing Proportions of Hydrophytic and Non-hydrophytic Taxa by Sample

4.2.4 Other Weeds: *Malva*, *Galium*, *Adonis*, *Papaver*, Caryophillacae, Polygonaceae, Chenopodeaceae, *Androsace*, Umbelliferae, Compositae, *Scrophularia*, *Teucrium*

Malva

Development in a discoidal schizocarp around the receptacle gives all species in the genus a distinctive crescent shape in lateral view and an obtusely cuneate cross-section on which basis all specimens were identified as *Malva* L. Discrimination between spp., of which there seemed to be more than one present, would depend upon preservation of seed coat. 5 (F. Iraq)–6 (Post) reported spp. are primarily ruderal or segetal, but habitat varies, so further ecological information depends on specific identification, which may occasionally be possible when the seed coat is preserved and appropriate reference material is available. 53 specimens of Malva appear in 7 contexts (U = 29%), all except a single specimen in the earlier two horizons. More than half (N = 33) of the seeds were found in a single sample, 1997.228.

Galium sp.

The most ubiquitous (U = 79% for 19 contexts), though not the most numerous weed species (N = 96), prob. *Galium* L. is identified by comparison with European reference material in the McDonald collection on the basis of its globose shape and a single round, sunken perforation (see Fig. 4.2.4a). Even small fragments can be attributed to the genus when the characteristic curve of the perforation is present or when the double wall of the seed is visible. Only a single sp. seems to be represented of 23 (F. Iraq)–45 (Post) reported, with extremely varied ecologies and fl. & fr. times ranging from early spring to late summer. The lack of reference material made any attempt at sub-generic identification impossible. Traditionally used for curdling milk in cheese-making, various spp. are documented as forage crops, medicinals, and ornamentals.

Figure 4.2.4a: Camera Lucida drawing of prob. *Galium* sp.

Adonis sp.

Identified as prob. *Adonis* L. by reference to the illustration of an archaeological specimen in ASL 1 on the basis of its distinctive globose achene with prominent rugose sculpturing and a single asymmetrical ridge. Lack of reference material made specific identification impossible, but only a single sp. seems to be represented of 6 (F. Iraq)–8 (Post) reported, and identification to species should be easy given appropriate comparative material. Habitats vary from steppic to piedmontaine, including segetal contexts; all spp. fl. & fr. in early spring. Eight specimens appear in six contexts (U = 25%). Medicinal and ornamental uses are reported.

Papaver

A total of 120 poppy seeds occur in 12 contexts, both charred (N = 45, U = 50%) and mineralized (N = 75, U = 13%) and are easily identified as *Papaver* L. on the basis of small size, reniform shape, and reticulate sculpturing (see Fig. 4.2.4b). 14 (F. Iraq)–21 (Post) spp. are reported including annual, biennial and perennial herbs from varied habitats from montaine to steppic including segetal and ruderal contexts, fl. & fr. from early spring to summer. More than one sp. may be represented. Cultivation as an oil crop, for human consumption, and as a medicinal is documented.

Figure 4.2.4b: Camera Lucida drawing of *Papaver*

Caryophyllaceae

The family Caryophyllaceae consists of herbs and shrubs from varied habitats. At least four genera are identified as cf. *Silene* L., prob. *Vaccaria* Wol. and prob. *Spergula* L. The *Silene* specimens are all poorly preserved, squatly cylindrical with reniform cross-section , and are sculptured with radial striations or radially elongated reticulations. They are tentatively attributed to *Silene* based on comparison with European material from the McDonald and an illustration of an archaeological specimen in ASL 1, but could also be attributed to *Arenaria* L. or *Melandrium* Roehl. Charred specimens of *Vaccaria* and *Spergula* both occur in a characteristic 'exploded' form (see Fig. 4.2.4c and illustration in ASL 1) and are discriminated from each other on the basis of two dimples present on the margin of the *Vaccaria* seed and absent in *Spergula*. Though these are presented as probable identifications due to the distinctive mode of expansion on charring, further work should be done to refine and check these attributions based on the granulate surface sculpturing that seems to be present on some specimens. 61 specimens are present in 10 contexts (U = 42%).

Figure 4.2.4c: Camera Lucida Drawing of prob. *Spergula*

Portulaca oleracea

Identified as *Portulaca* elim. *oleracea* L. from Near Eastern reference material on the basis of reniform shape and tuberculate seed coat (see Fig. 4.2.4d). *P. oleracea* is the only species reported in the family Portulaceae. An annual, glabrous, prostrate, much-branching herb of 10–50 cm., it fl. & fr. Feb.–Sept. and is eaten cooked or as salad or used medicinally. As a segetal/ruderal, it is characteristic of 'irrigated and tilled fields and orchards' (F. Palest) or 'ditches and wet ground' (Post). Nine specimens appear in 5 contexts (U = 21%).

Figure 4.2.4d: SEM Photograph of *Portulaca* elim. *oleracea*

Polygonaceae

Eight specimens from at least two spp. in the family Polygonaceae appeared in seven contexts and were identified on the basis of acute trigonal cross-section, and lateral embryo. Only three specimens were well enough preserved to attempt generic identification of which one, being pointed at both ends was attributed to cf. *Rumex* L., while the other two were compared with *Polygonum* L., but could easily also be in *Rheum* L. or another of the 7 reported genera (Post). Polygonaceae includes annual, biennial, and perennial herbs, lianas, and (rarely) shrubs of various habitats including weedy and economically valuable taxa.

Chenopodiaceae

Ten specimens in five contexts were attributed to the family Chenopodiaceae on the basis of small size and lenticular shape, of which two were well preserved and could possibly be identified to genus if reference material were available; the type, 45i, is pictured in figure 4.2.4e. 24 genera of annual, biennial, and perennial herbs and shrubs are reported (Post) from various, including desertic, habitats.

Figure 4.2.4e: Camera Lucida Drawing of Type 45i (Chenapodiaceae)

Androsace sp.

21 specimens from 5 contexts (U = 21%), most from a single sample, 1997.238, were identified as prob. *Adrosace* L. by reference to the illustration of an archaeological specimen in ASL 1 on the basis of obtuse trigonal cross-section, transverse grooves, and ellipsoidal or slightly fusiform shape. Though it is legitimate for van Ziest and Bakker-Herres, analysing material from a site in the Damascus area, to attribute their specimen to *A. maxima* L. by elimination, there are many other spp. of *Androsace* reported from the Anatolian piedmont and mountains. *Androsace* includes annual, biennial and perennial herbs from various, but predominantly montaine, habitats. Only one sp. seems to be represented.

Umbelliferae

On the basis of the five ridges on each mericarp that are characteristic of the Umbelliferae, nine specimens appearing in seven contexts were attributed to the family, and a single specimen could be identified as prob. *Ammi* L. by reference to the illustration of an archaeological specimen in ASL 1. The other specimens include three well-preserved types that may be attributable to genus and are illustrated below in figures 4.2.4f–h. *Ammi* is an annual or perennial herb fl. & fr. Apr.–July in ruderal/segetal environments. Its main economic importance seems to have been the production of toothpicks. It is identified on the basis of its deep oil duct and obtuse rectangular shape with one end slightly pointed, the other with a circumferential ridge (see Fig. 4.2.2i).

Figure 4.2.4f: Camera Lucida Drawing of Type 3c (cf. *Apium* L.)

Figure 4.2.4g: Camera Lucida Drawing of Type 45b (cf. Umbelliferae)

Figure 4.2.4h: Camera Lucida Drawing of Type 214e (cf. Umbelliferae)

Figure 4.2.4i: Camera Lucida Drawing of prob. *Ammi*

Compositae

The most abundant (N = 207) weed taxon after type 45l grasses has been tentatively identified as cf. *Artemisia* L., though virtually all specimens are very badly preserved and in most cases could be any small composite genus with a slight hook at the apex. As discussed above (§2.3) *A.herba-alba* Asso is the dominant species in many of the steppic communities in the area. Its absence on site would be more surprising than its presence. It only appears in 9 contexts (U = 38%).

The only firmly identified composite genus is *Carthamus* L., of which four specimens in three contexts (U = 13%) are identified on the basis of large size, pyriform shape, and particularly four longitudinal ridges and spine-like protuberances at the top of the achene where the pappus was attached.

A third group of specimens, almost all of which (22 of total N = 25, U = 17%) were found in a single sample, 1997.045, has been identified as cf. *Centaurea* L. sp. on the basis of round cross-section, distinct apical hook, and obvious circumferential ridge where the pappus was attached (see Fig. 4.2.4j). A single mineralized specimen of what seems to be the same taxon appears in sample 1997.214 and is pictured in figures 4.2.4k and 4.2.4l. With appropriate reference material, this should be firmly identifiable to genus or even sp.; only a single sp. seems to be present.

Finally, types 228e and 228f, each representing four specimens from respectively one and two contexts, were firmly attributed to the family Compositae on the basis of typical shape with pointed, asymmetrical apex and 'crown' for attachment of the pappus. Both are potentially identifiable to genus with appropriate reference material (see Figs. 4.2.4m, n).

Figure 4.2.4j: Camera Lucida Drawing of cf. *Centaurea* sp.

Figure 4.2.4k: SEM Photograph of cf. *Centaurea* sp.

Figure 4.2.4l: SEM Photograph Showing Detail of Figure 4.2.4k

Figure 4.2.4m: Camera Lucida Drawing of Type 228e (Compositae)

Figure 4.2.4n: Camera Lucida Drawing of Type 228f (Compositae)

Scrophularia sp.

Annual, biennial, or perennial herbs or chaemophytes identified as *Scrophularia* L. by reference to UCL and McDonald collections on the basis of ovoid or oblong shape, sometimes curved, sometimes with a slightly trigonal cross-section, with deep, distinct, pits in a transverely-elongated chequer-board pattern (see Fig. 4.2.4c). The habitats of the 10 (F. Palest.)–21(Post) reported spp. are variable. Only a single species seems to be represented, which could perhaps be identified given appropriate reference material. 37 specimens appear in 4 contexts (U = 17%).

Figure 4.2.4o: Camera Lucida Drawing of *Scrophularia* sp.

Teucrium

Identified as prob. *Teucrium* L. by comparison with illustrations of archaeological specimens in ASL 4 and European reference material from the MacDonald collection on the basis of obovoid shape and coarse reticulate sculpturing. 11 (F. Palest.)–22 (Post) spp. are reported, all herbs or shrubs of varied habitat and fl. & fr. time. 20 specimens were identified from 11 contexts (U = 46%). More than one sp. is probably represented.

4.2.5 Unknown Type

Four specimens in three contexts of a single unknown type called 3a hitherto have evaded attribution to family. The type is ovate in dorso-ventral view with curved dorsal and irregular ventral margins and is illustrated in figure 4.2.5a.

Figure 4.2.5a: Cameral Lucida drawing of Type 3a

4.3 Other Data: *Thread*

A single fragment of Z-spun thread was found in sample 1997.238 which under scanning electron microscopy and comparison with illustrations in Cook (1959) and Appleyard and Wildman (1970) proved to be a bast fibre (extracted from the stems of a fibrous plant). Hollow, and somewhat flattened rather than solid, round fibres, and absence of small transverse scales that are characteristic of wool eliminated animal hair as a possible material. Cotton fibres are helical or twisted, while the fibres in this specimen are straight. Therefore the specimen must represent a bast fibre like flax, but is not firmly identifiable as flax because there are many plants with fibrous stems from which bast fibres can be extracted for textile production. See figures 4.3.2a–c; on the left side of figure 4.3.2b in particular note the hollow fibre with its wall broken open, which is clearly a bast fibre.

Figure 4.3.2 a: SEM photograph of thread fragment from sample 1997.238

Figure 4.3.2 b: SEM photograph showing detail of figure 4.3.2 a

Figure 4.3.2 c: SEM photograph showing detail of figure 4.3.2 a

5. Preliminary Interpretations

Much of the interpretation has already been touched upon in the previous chapter, so this will serve primarily as a summary and evaluation of the conclusions that can be drawn from the current data and a description of continuing research. The first necessity, of course is to answer the question about the Uruk expansion that was posed in the introduction: did southern influence affect the agricultural or dietary practices of the inhabitants of Tell Brak? The response is: botanical data does not reflect a change—this does not mean that no change took place, but no change is demonstrated by the evidence presented here. Unfortunately, the amount of evidence is not sufficient to establish what would be an extremely interesting piece of negative evidence: the absence of impact.

This said, there are interesting conclusions that can be drawn from the data presented here. First of all is the argument that grain was predominantly brought on site and to the context where it was found in spikelet form, mixed with some weeds. Storage of grain in spikelet form on Near Eastern urban sites is unsurprising, but far from being a routine assumption. A directly related point is the argument that most of the botanical material recovered comes from household-scale, daily or weekly processing of the spikelets for consumption. The idea of dung fuel as prime source of botanical remains could also conceivably be consistent with the data if it is selective digestion, rather than anthropogenic crop processing that concentrates chaff to provide the 5:1 chaff to grain ratio. Extensive experimental work on differential preservation of chaff in modern goat faeces can perhaps be left to those who find this a convincing scenario. A final scenario that would also explain the data is that the grain was indeed processed en masse, but the chaff was then distributed along with the grain as fuel with which to cook it. Unfortunately it does not seem possible to refute this explanation by reference to the data: only Occam's Razor eliminates it.

An additional argument for the household-processing scenario would come from the presence of large numbers of small quern stones, rather than a few large ones. There has not yet been time to compile this data from the excavation records, but this will form the subject of continuing research. Since the final publication of the fourth millennium material will begin in the autumn of 1999, it will then be possible to collect not only this data, but also begin a spacial analysis of the samples, which has not been attempted in this paper because contextual information on the TW trench is currently in a form that is difficult to synthesise. For the same reason, individual contexts or samples have not been discussed in detail. Other work in progress includes semi-quantitative chemical assay of the *Lemna* seeds found to determine their type of mineralization, and various issues of botanical identification that were mentioned above under the relevant taxa.

Finally, there is the issue of comparative data; the conclusions discussed here cannot be generalized without data from other sites. In addition, comparative data may make it possible to draw further conclusions from the material found at a particular site. For instance, it is difficult to get an intuitive sense of how many hydrophytes should be seen as significant evidence for unusually damp conditions: obviously a few will appear even on a very dry site, so we cannot make generalization about the amount of wet ground in the area of a site until we have examined a range of data from sites known to be wetter or dryer. The same difficulty was mentioned above (§4.2.2) in reference to the role of small leguminous taxa: we cannot tell whether 8:1 grain to small legume ratio should be considered high or low, and indicative either merely of crop weeds or of intentional cultivation of the Trifolieae.

The only solution to this is a standard form for botanical data, so that archaeobotanical results, like archaeozoological data, can be compared across time and space. Unfortunately, this brings with it dangers as well as potential advantages. The methods of analysing crop processing devised by Hillman and Jones provided some standards for analysis (such as a classification of weed species by their physical sorting properties: e.g. SHH = small, headed, and heavy, Jones, 1984) but have imposed too rigid a framework on analysis and stifled creative archaeobotanical interpretation. In particular, one of the things that is needed is a better way to display the ubiquity information from a site visually: the 'ubiquity curve' presented above in chapter 4 is a wretched *pis aller.* Another possibility is the construction of a standardized list of taxa that can reliably be identified: publication of this list, along with minute description of the identification criteria that produce it would allow the inter-site comparisons that class C samples require without limiting or standardizing the interpretive framework whereby they are analysed.

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Appendix: Seed Counts

Illustrations

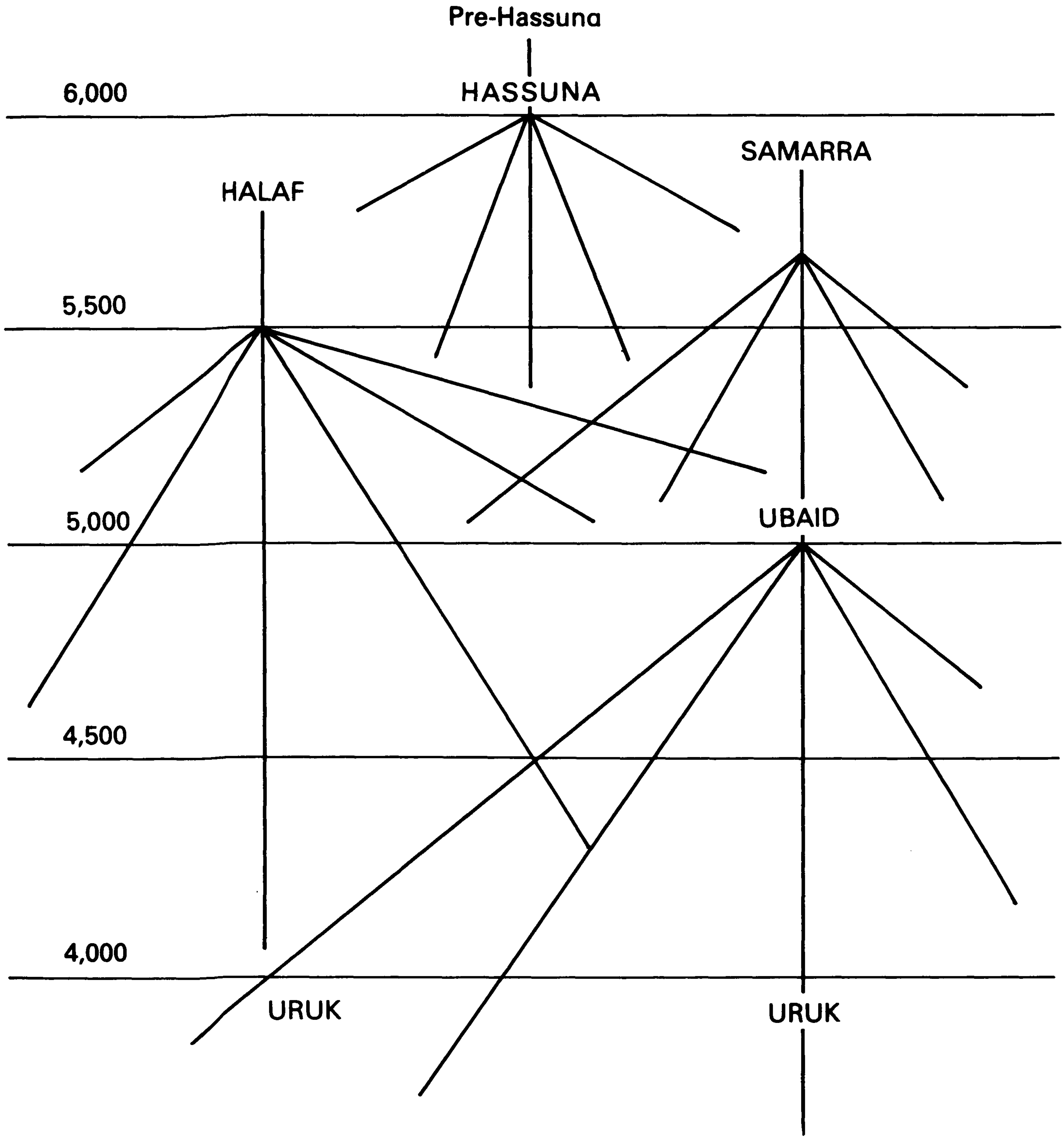

Pre-Hassuna
6,000
HASSUNA
SAMARRA
HALAF
5,500
5,000
UBAID
4,500
4,000
URUK
URUK

Figure 1.1c


Degirmentepe
Arslantepe
Malatya
Çayönü
Diyarbakır
Samsat
TURKEY
Tigris
Arbit
Tell Chagar Bazar
Tell al-Hamidiya
al-Kamishlye
Tell Barri
Tell Leilan
Tell Halaf
Tell Beydar
Tell Brak
al-Hassake
Tell 'Atij
Tell Sabi Abyad
Habuba Kabira
Balih
Euphrates
Habur
SYRIA
IRAQ
Yarim Tepe
Tepe Gawra
Mosul
Hassuna
Great Zab
Tell Qalinj Agha
Mahmur
Little Zab
Jarmo
Kirkuk
IRAN

Figure 1.1c

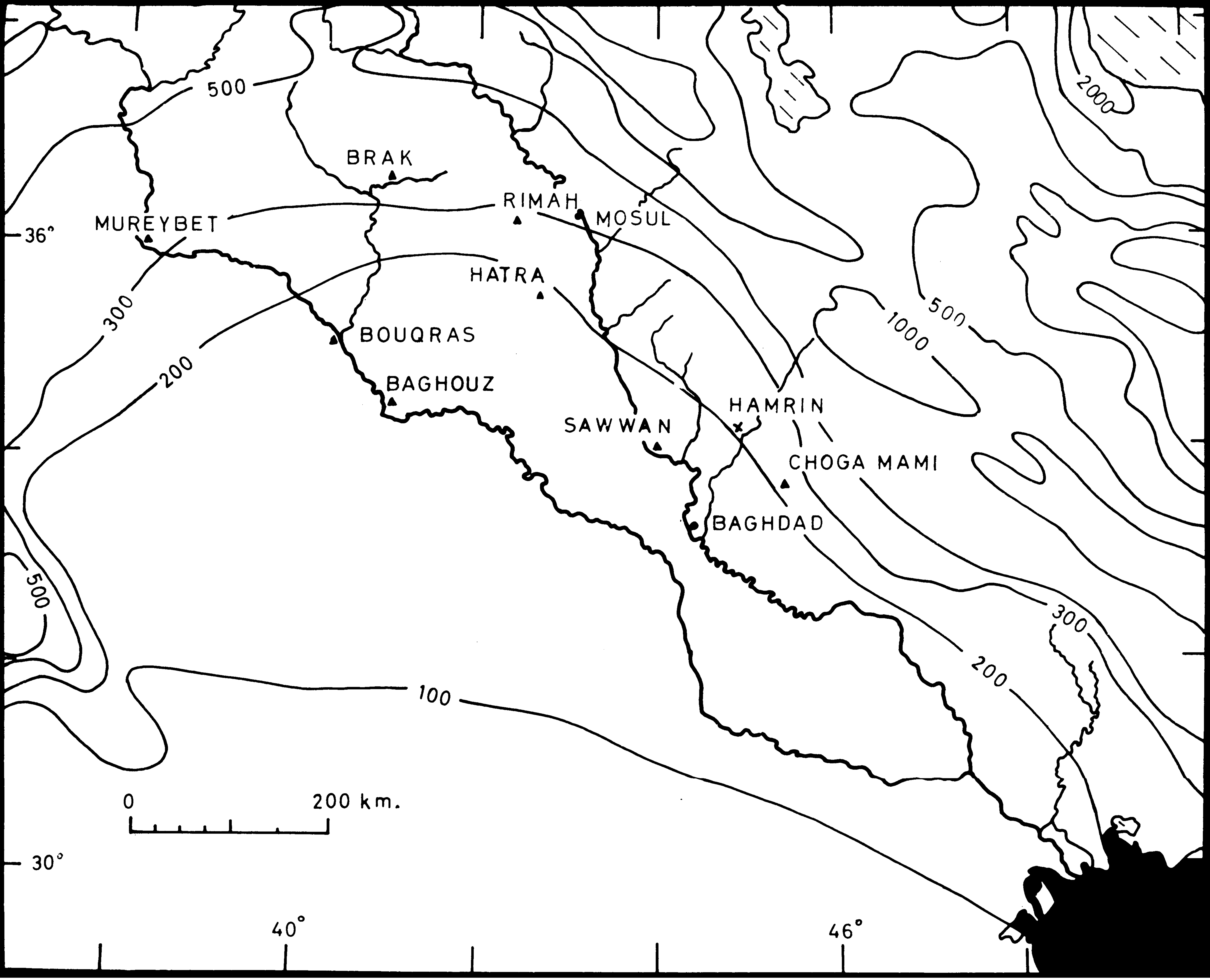

500
BRAK
RIMAH
MOSUL
MUREYBET
36°
HATRA
300
BOUQRAS
200
BAGHOUZ
SAWWAN
HAMRIN
CHOGA MAMI
BAGHDAD
500
1000
2000
500
300
200
100
0
200 km.
30°
40°
46°

Figure 2.1b

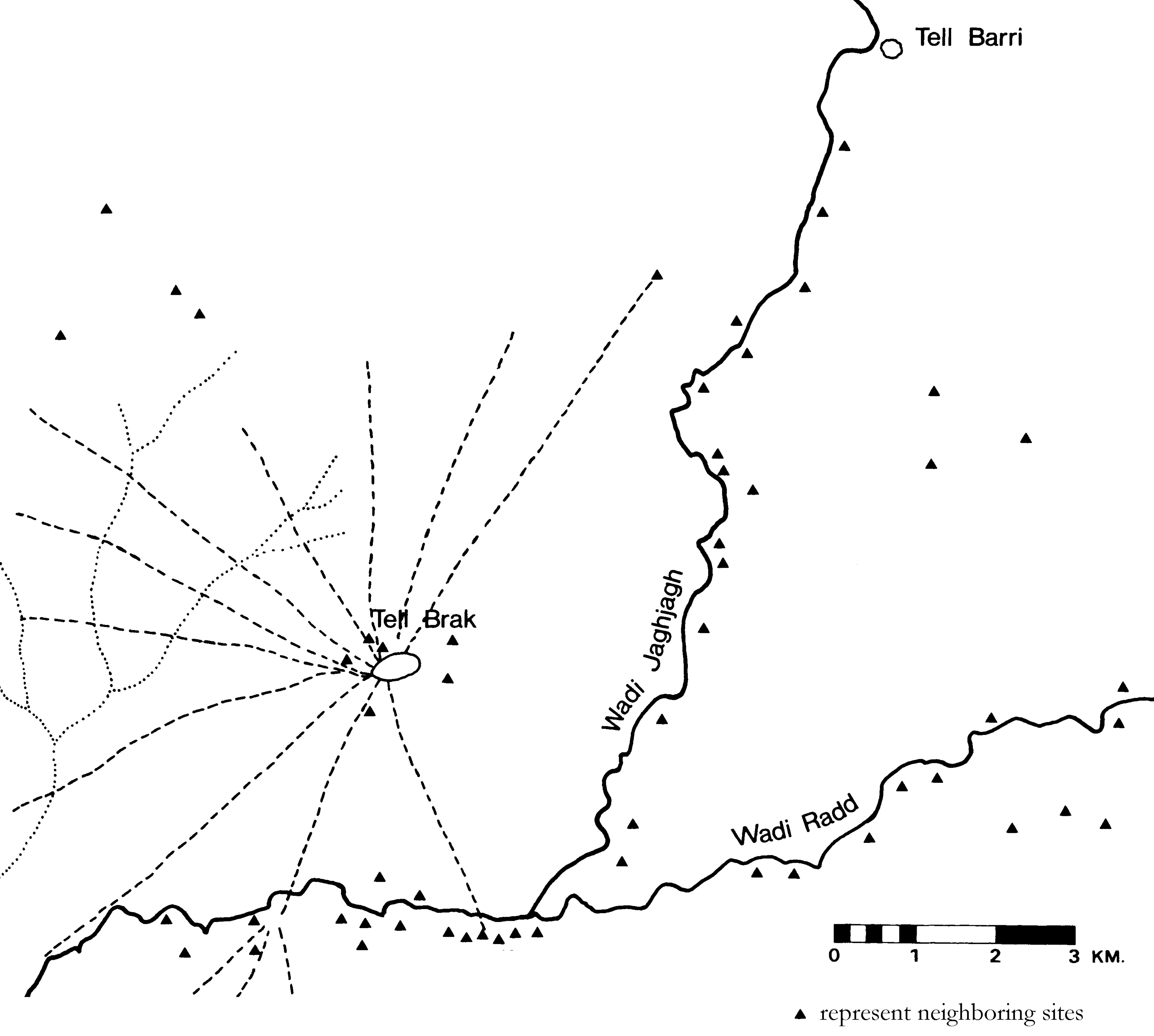
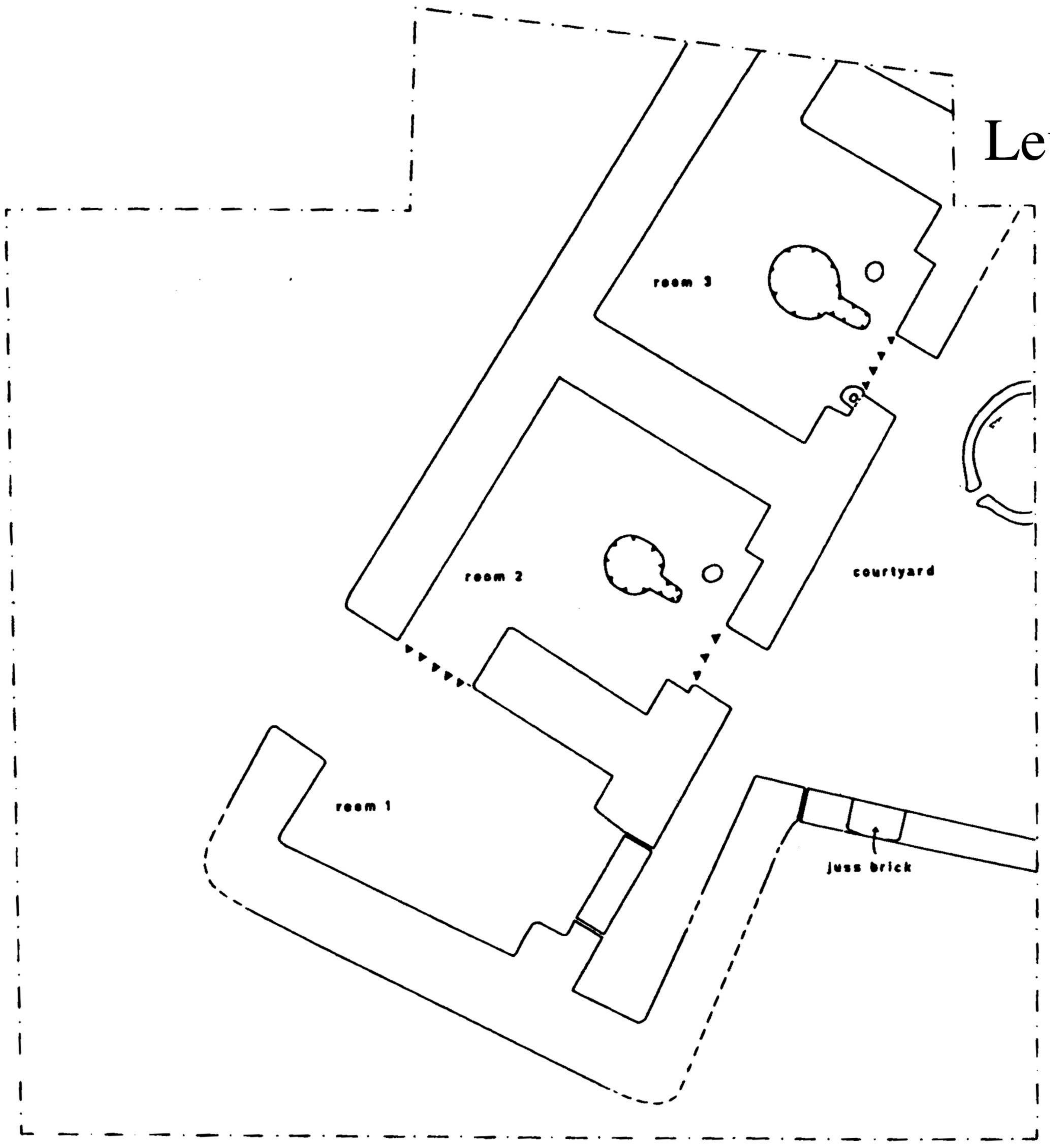
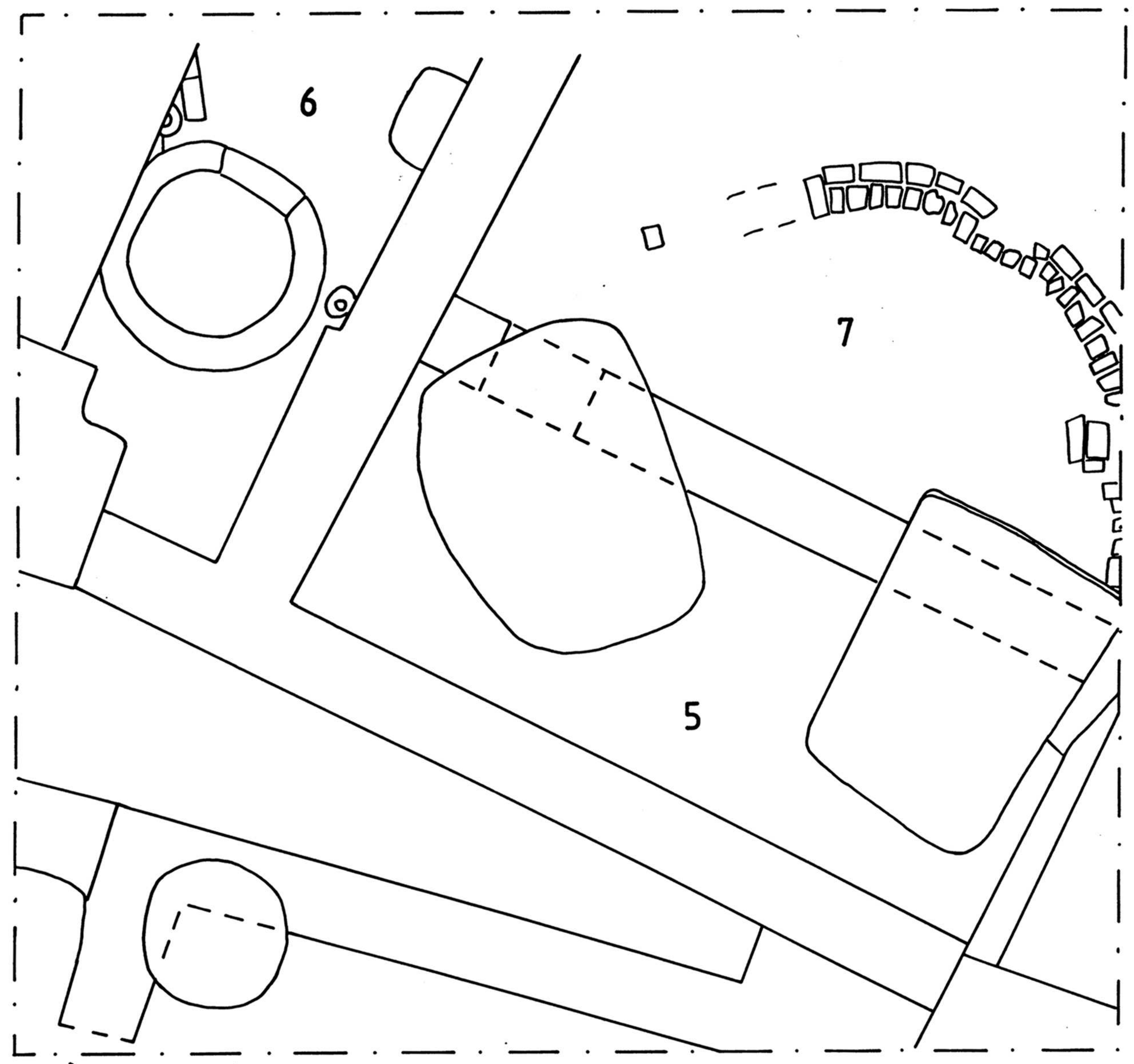
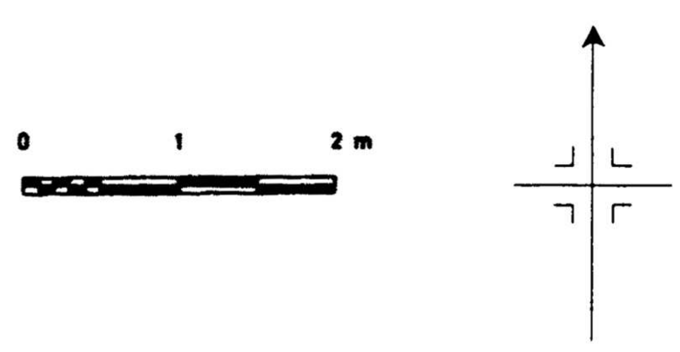

Tell Barri
Tell Brak
Wadi Jaghjagh
Wadi Radd
0 1 2 3 KM.
▲ represent neighboring sites

Figure 3.1a

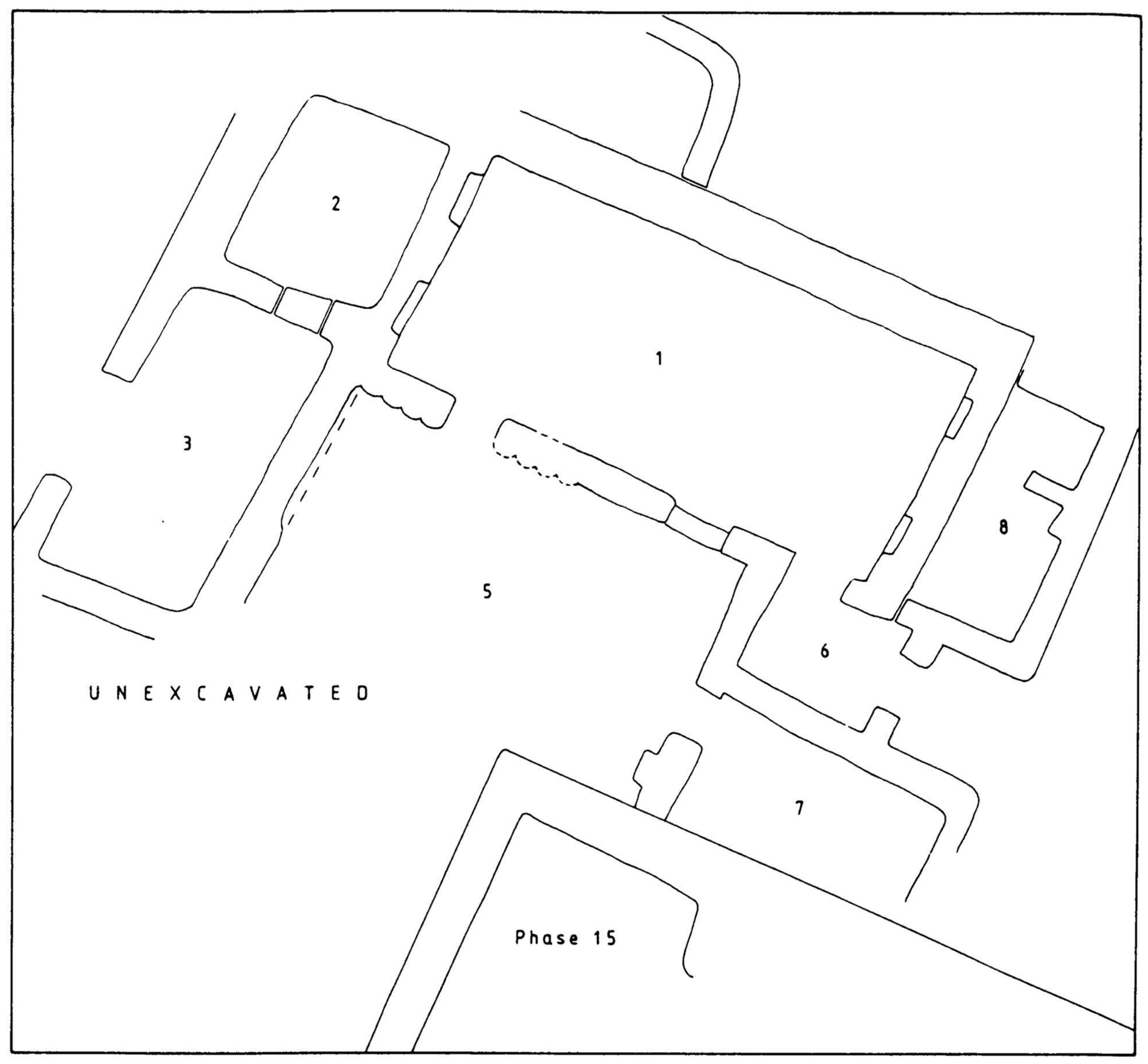
Level 11/12







Level 16/17



Level 18+

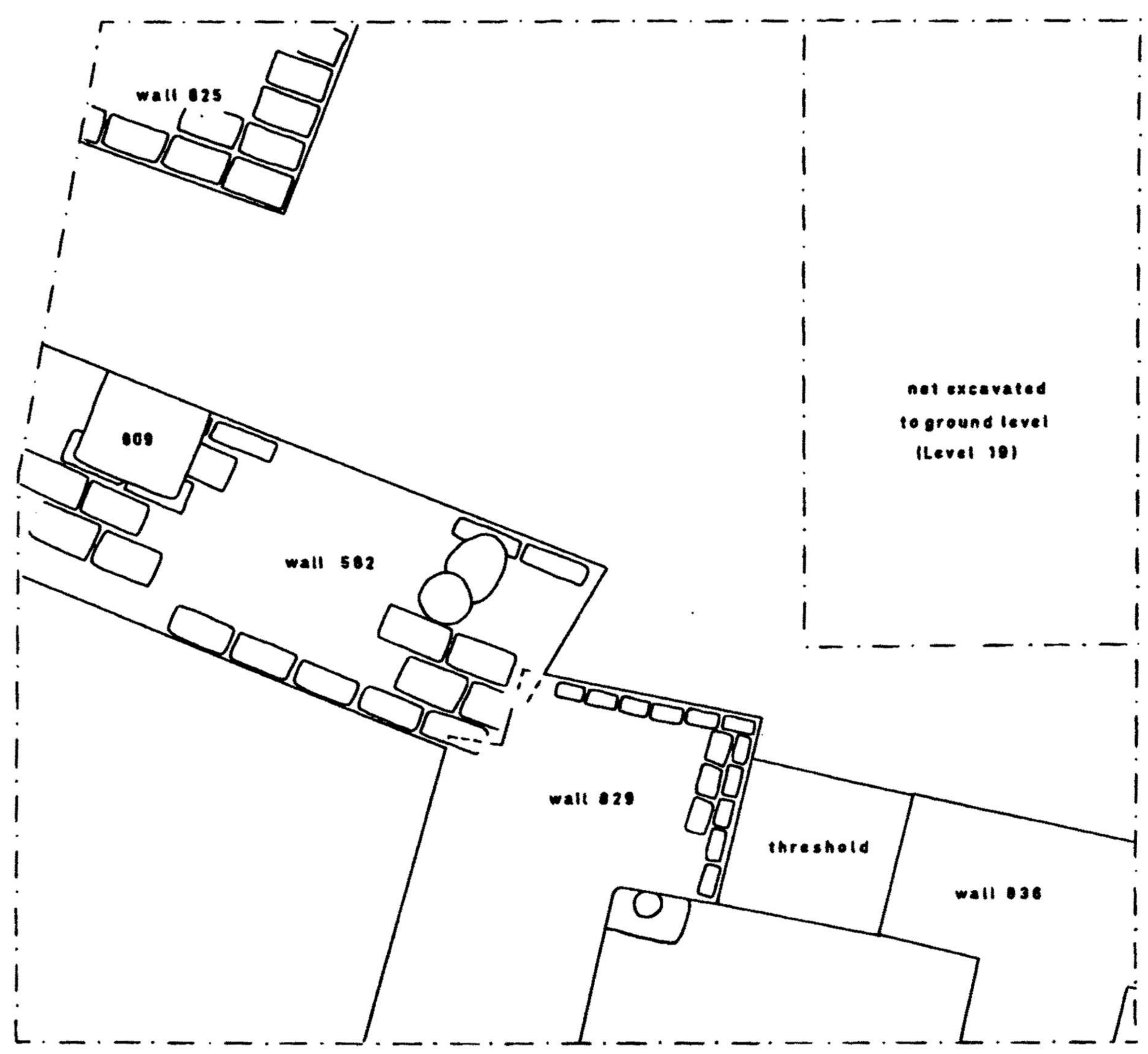


Figure 3.3a

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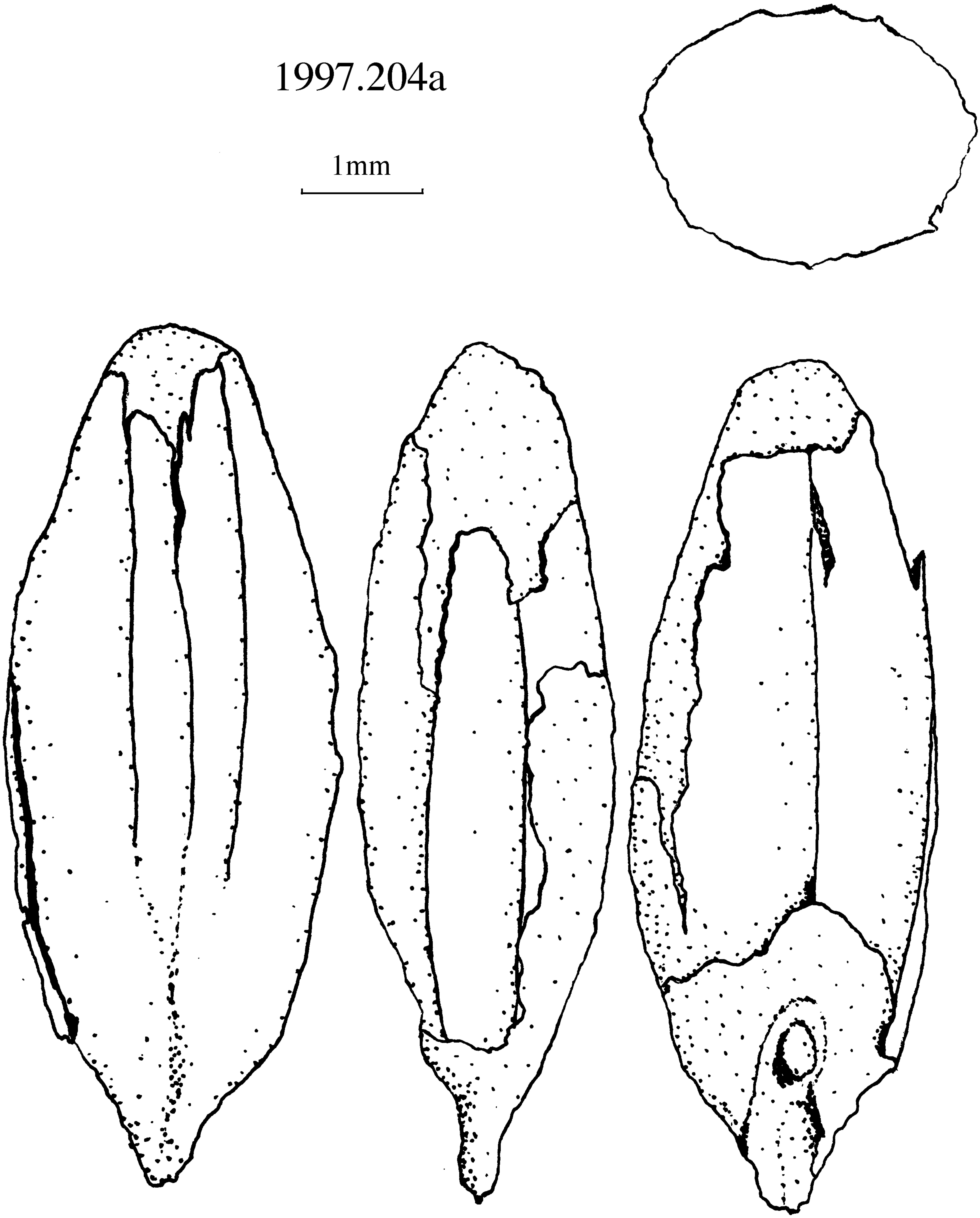

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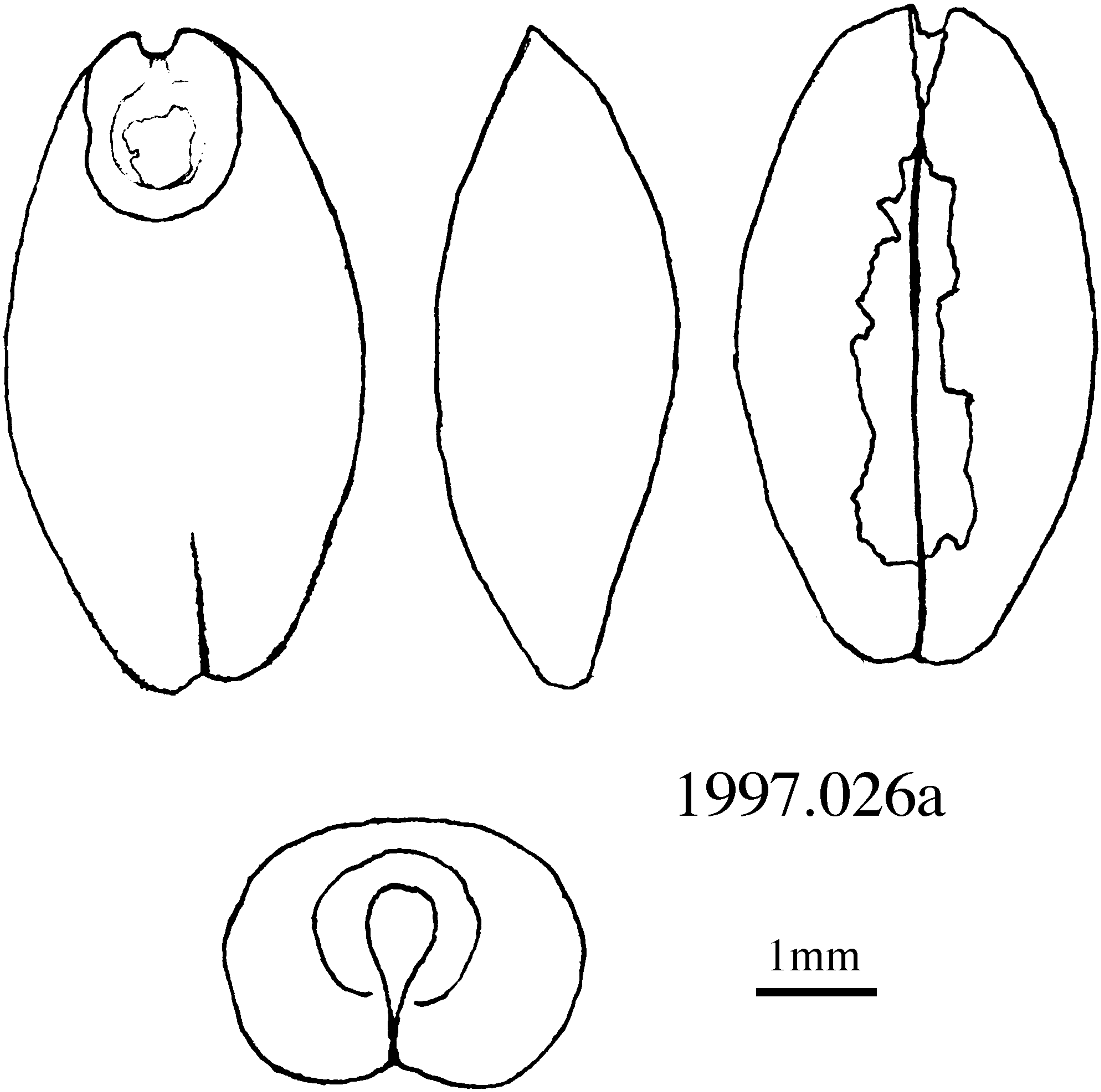

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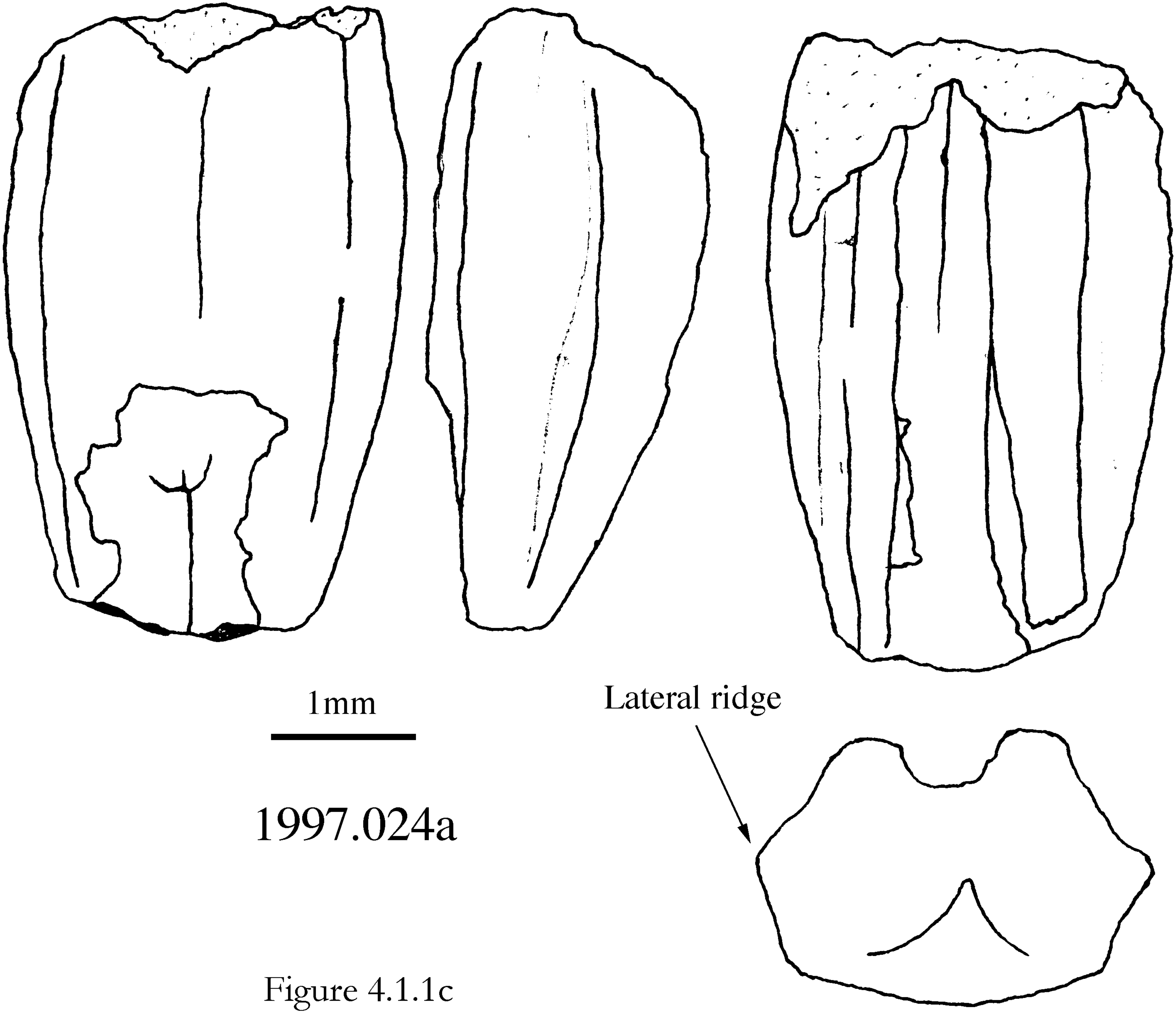
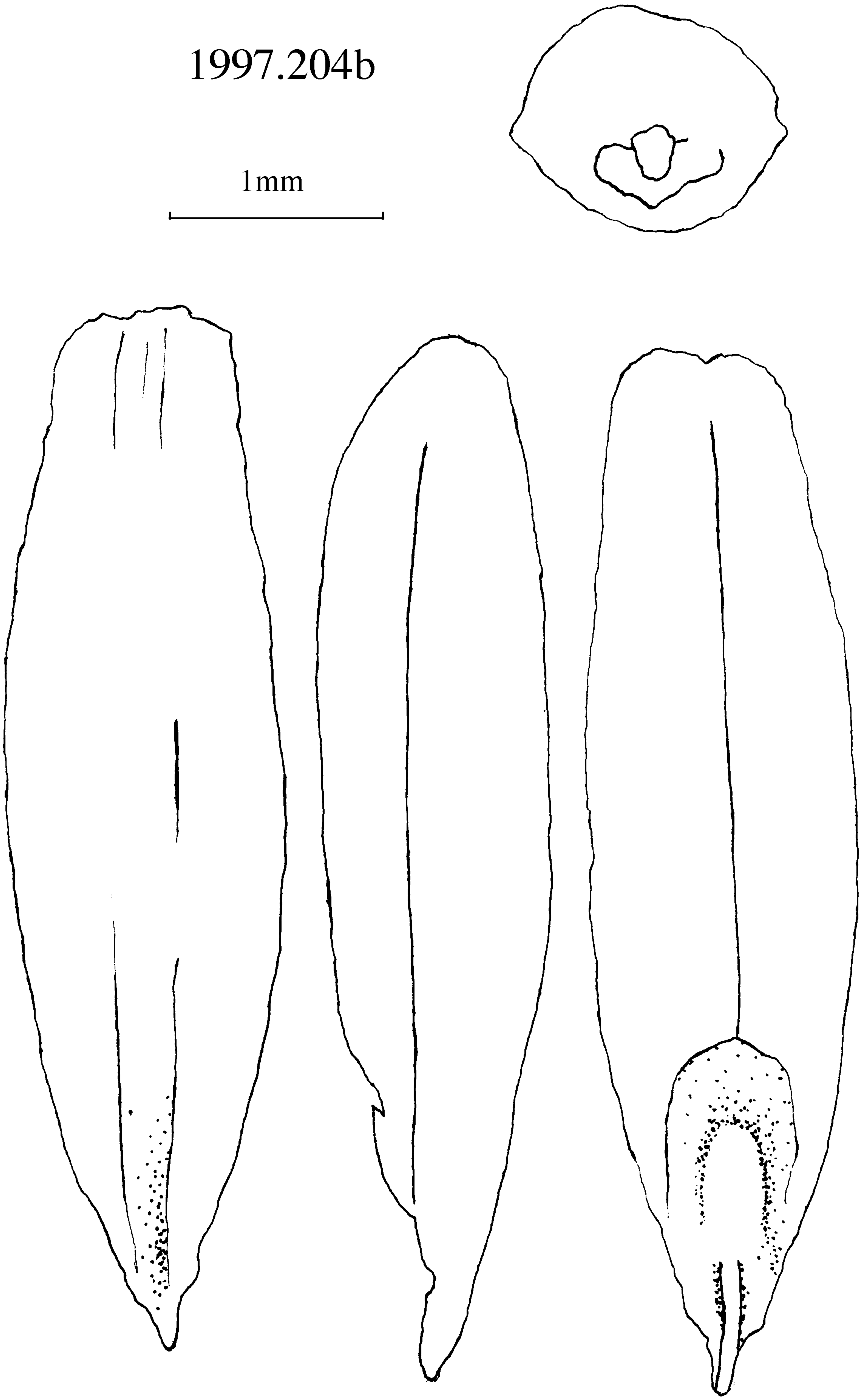


1997.024a

Figure 4.1.1c



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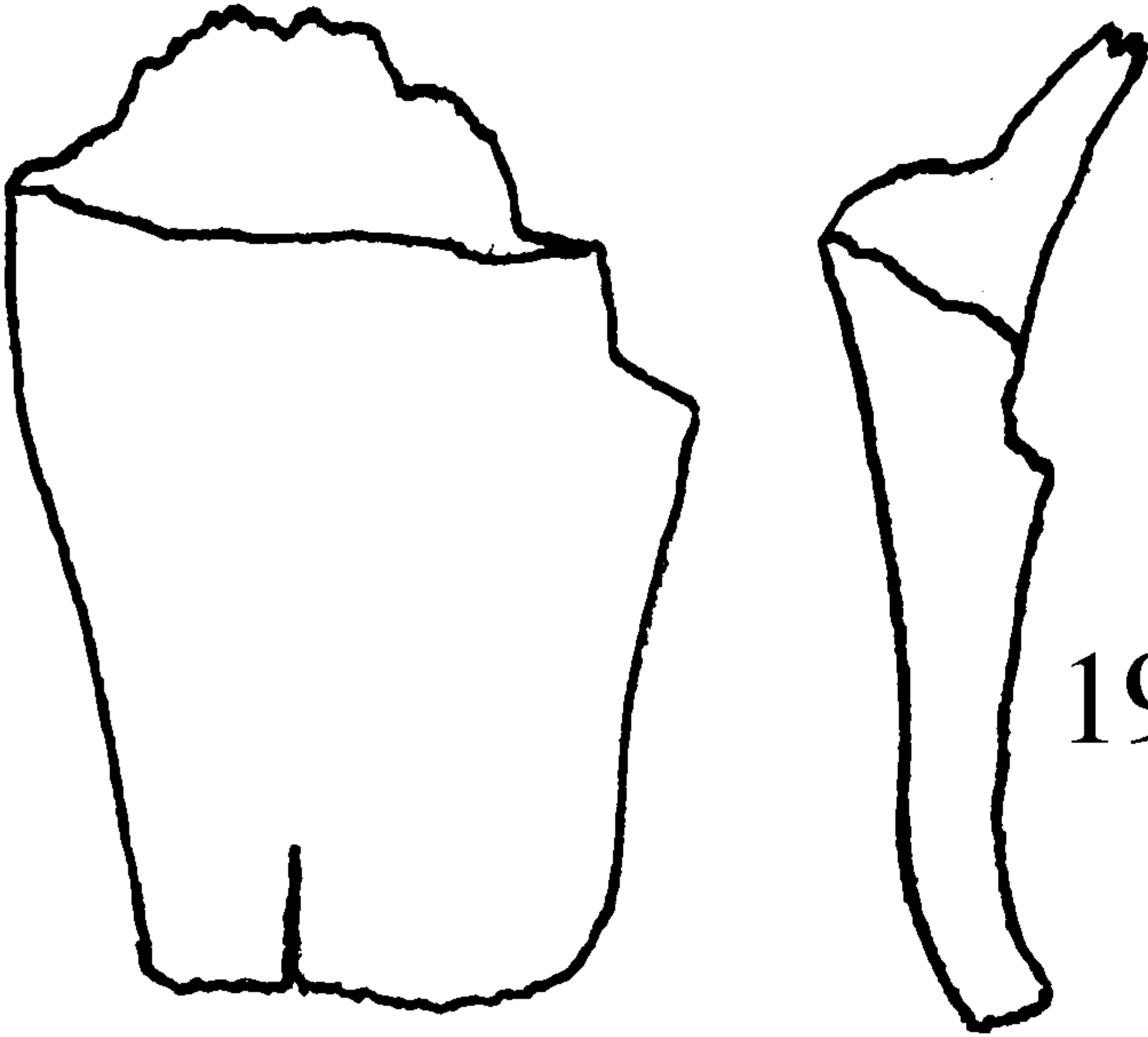
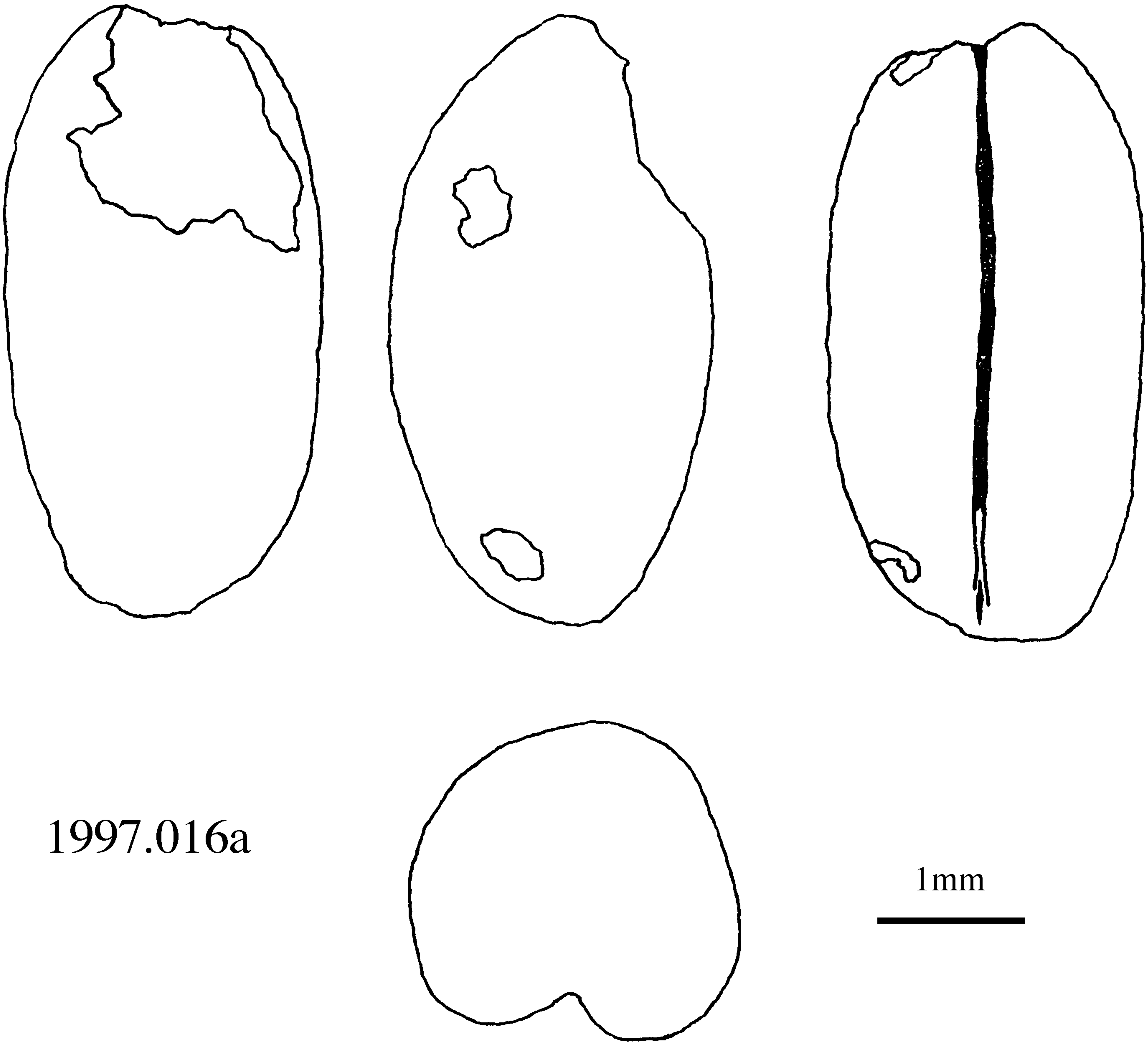


1997.204d

15 Times

Figure 4.1.2a

Figure 4.1.2b



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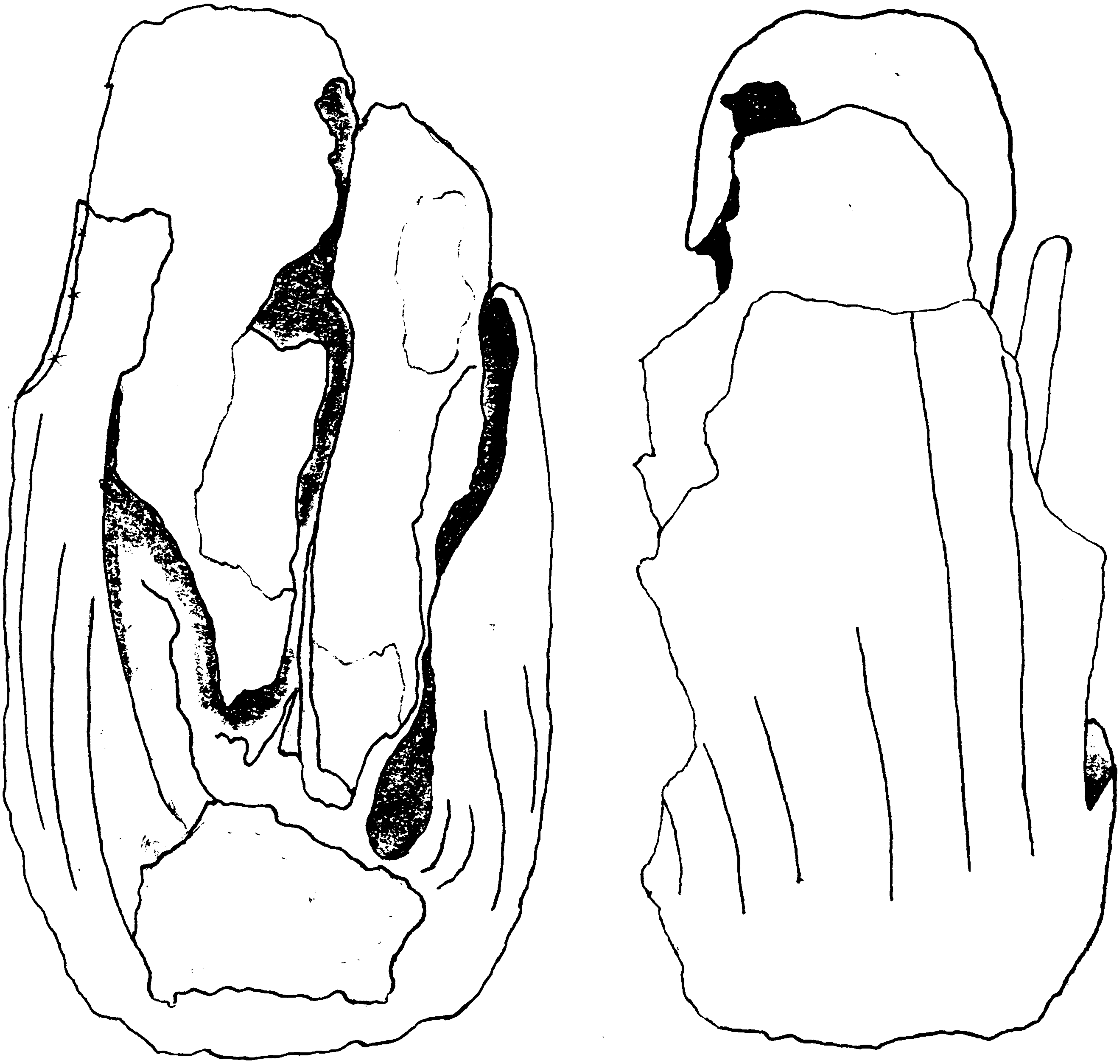

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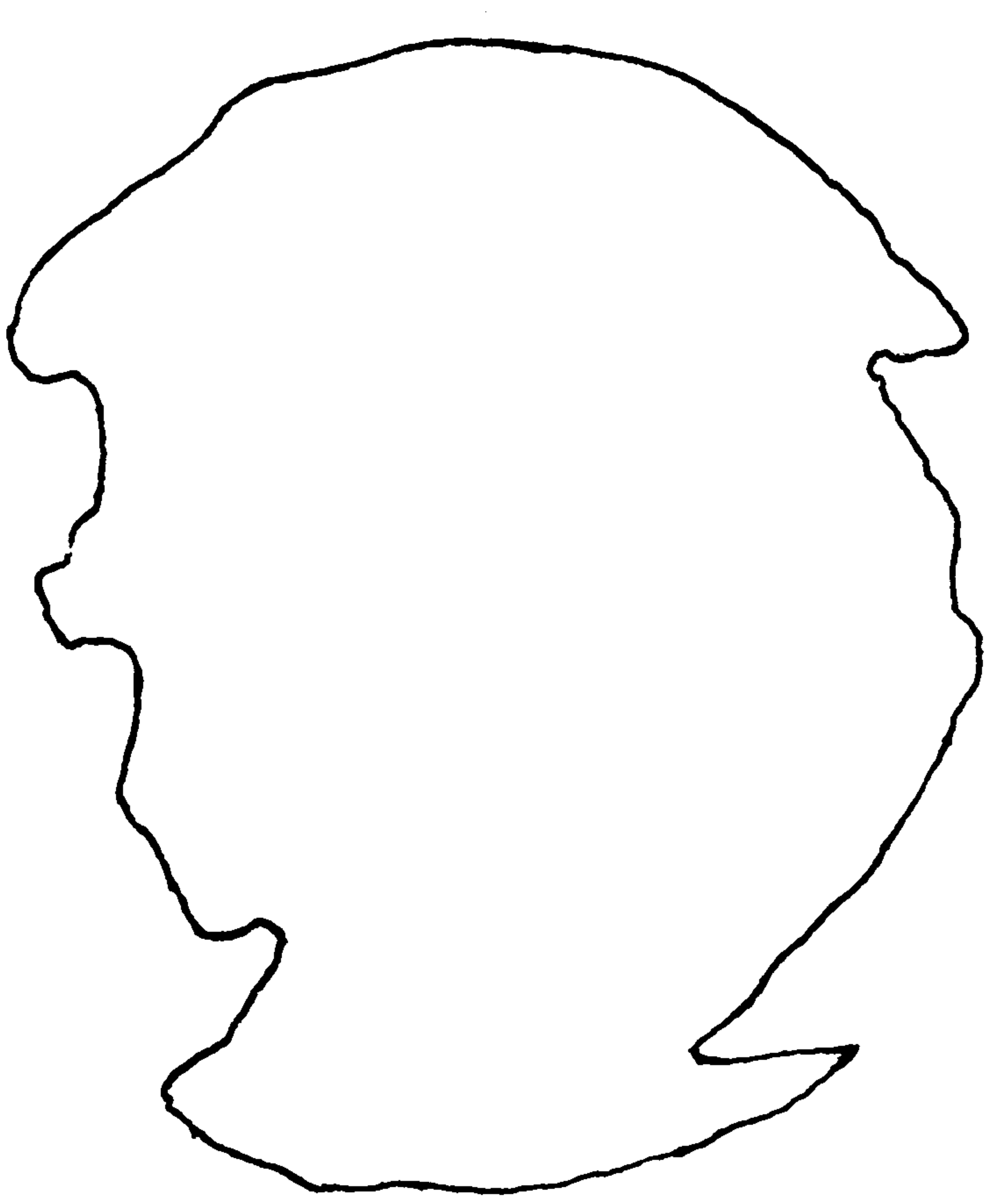
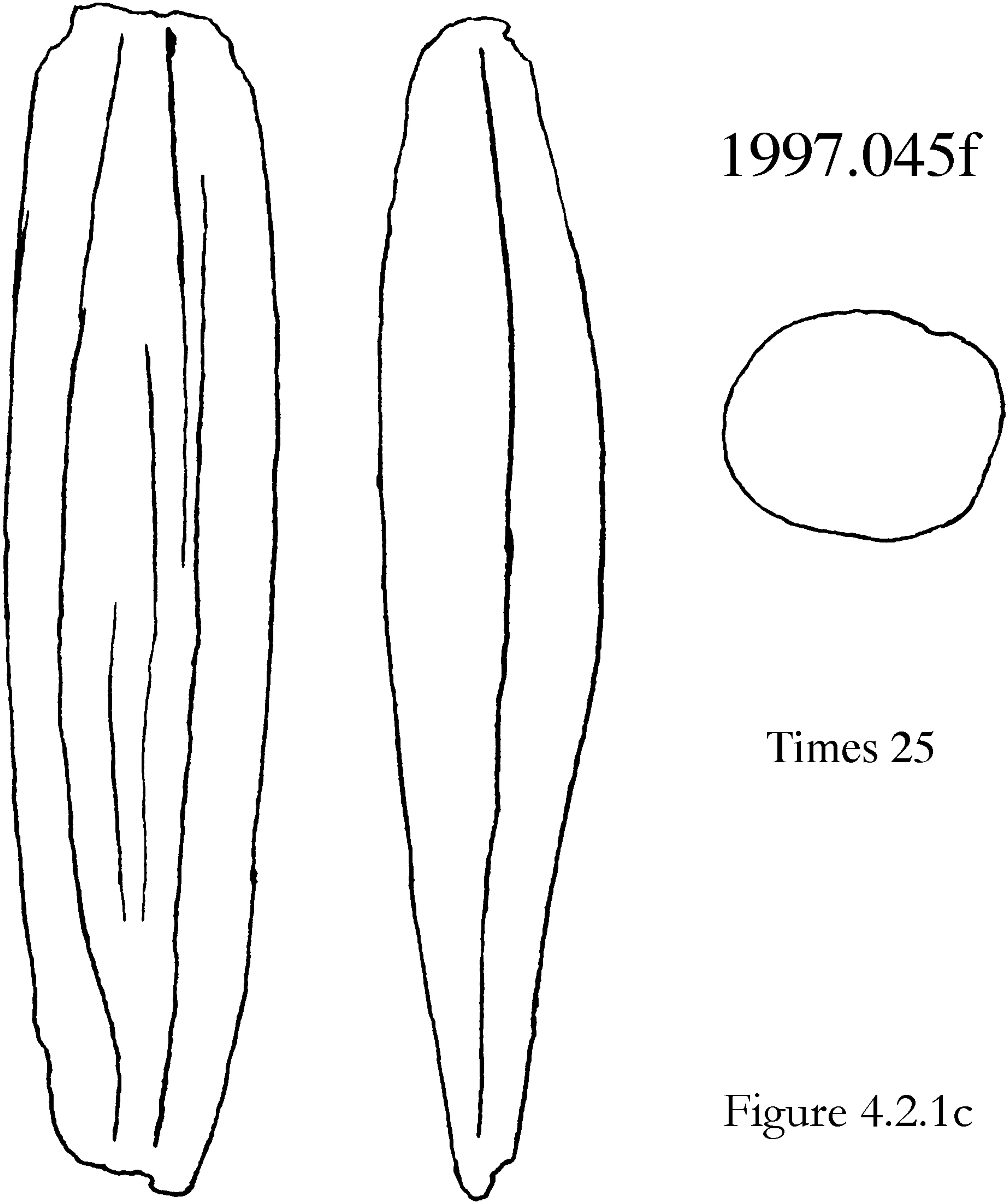


Figure 4.2.1a

Figure 4.2.1b



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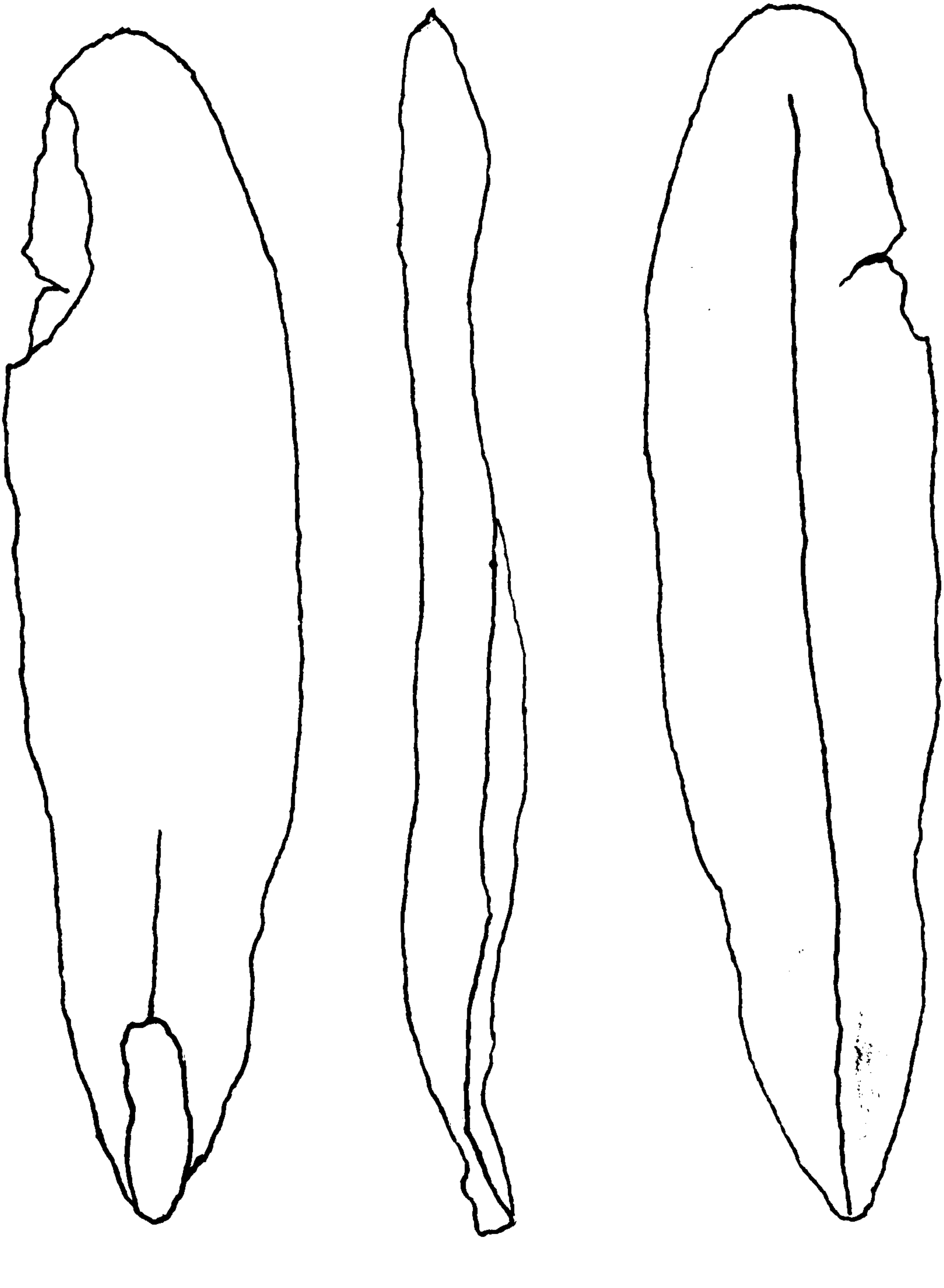

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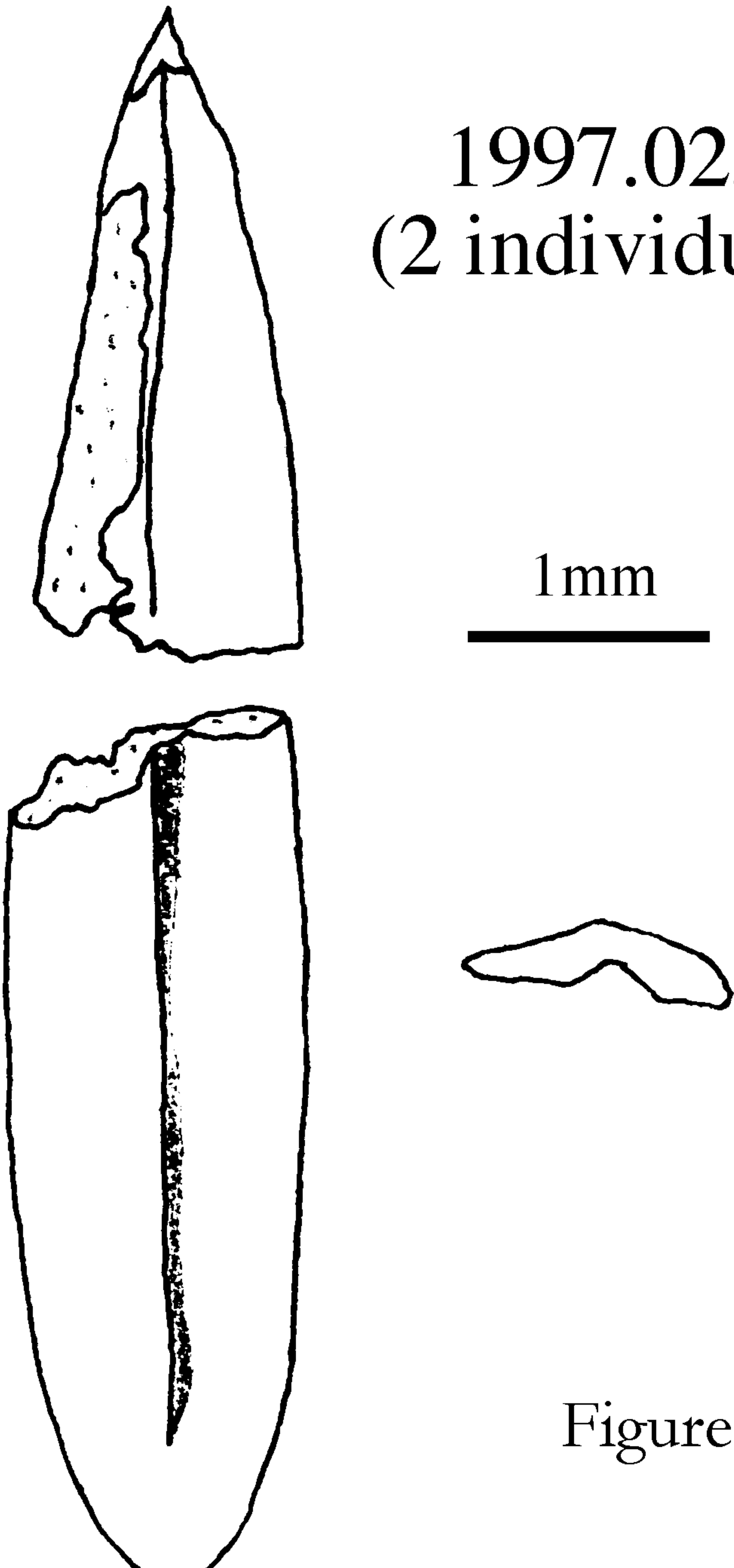

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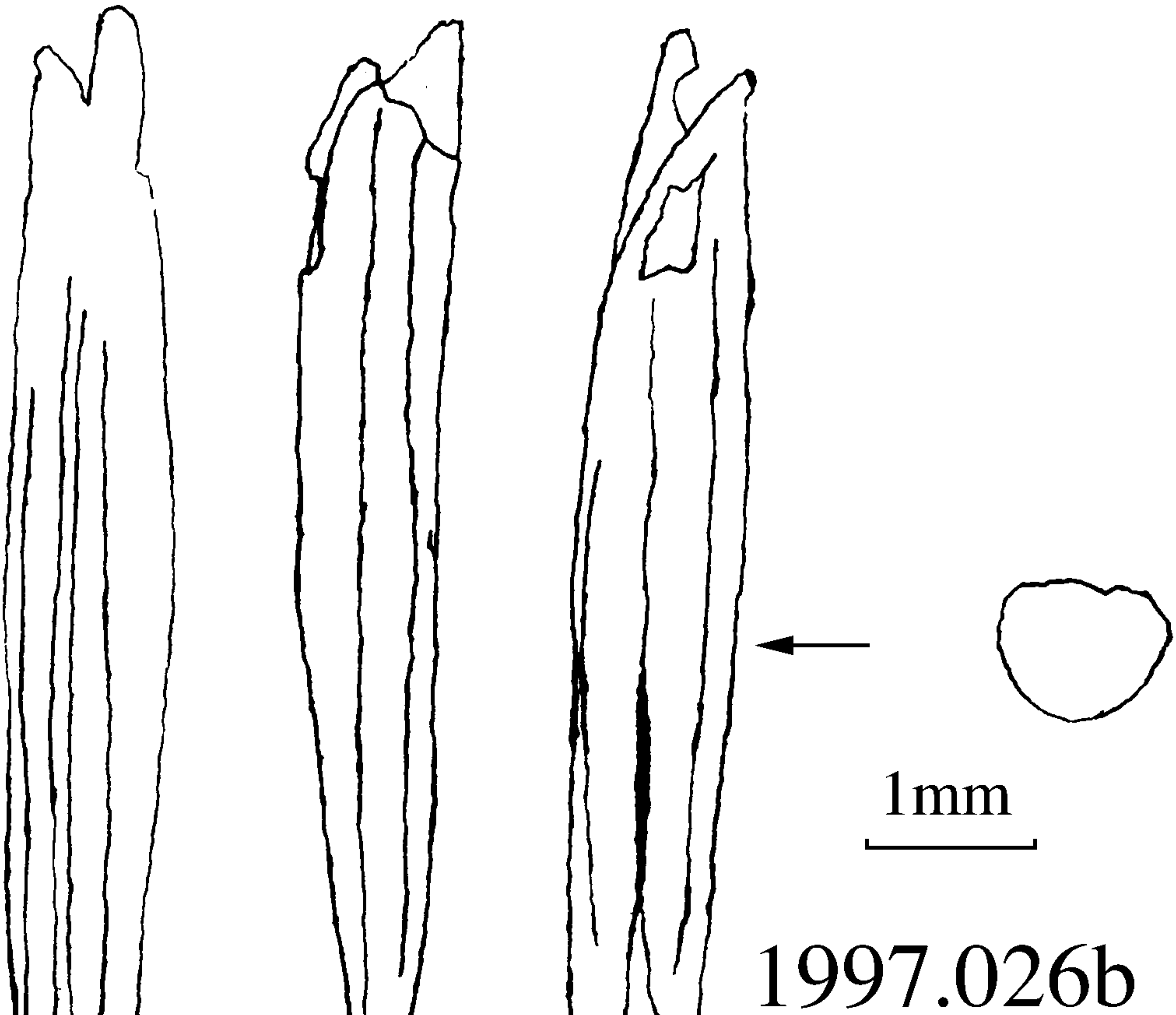

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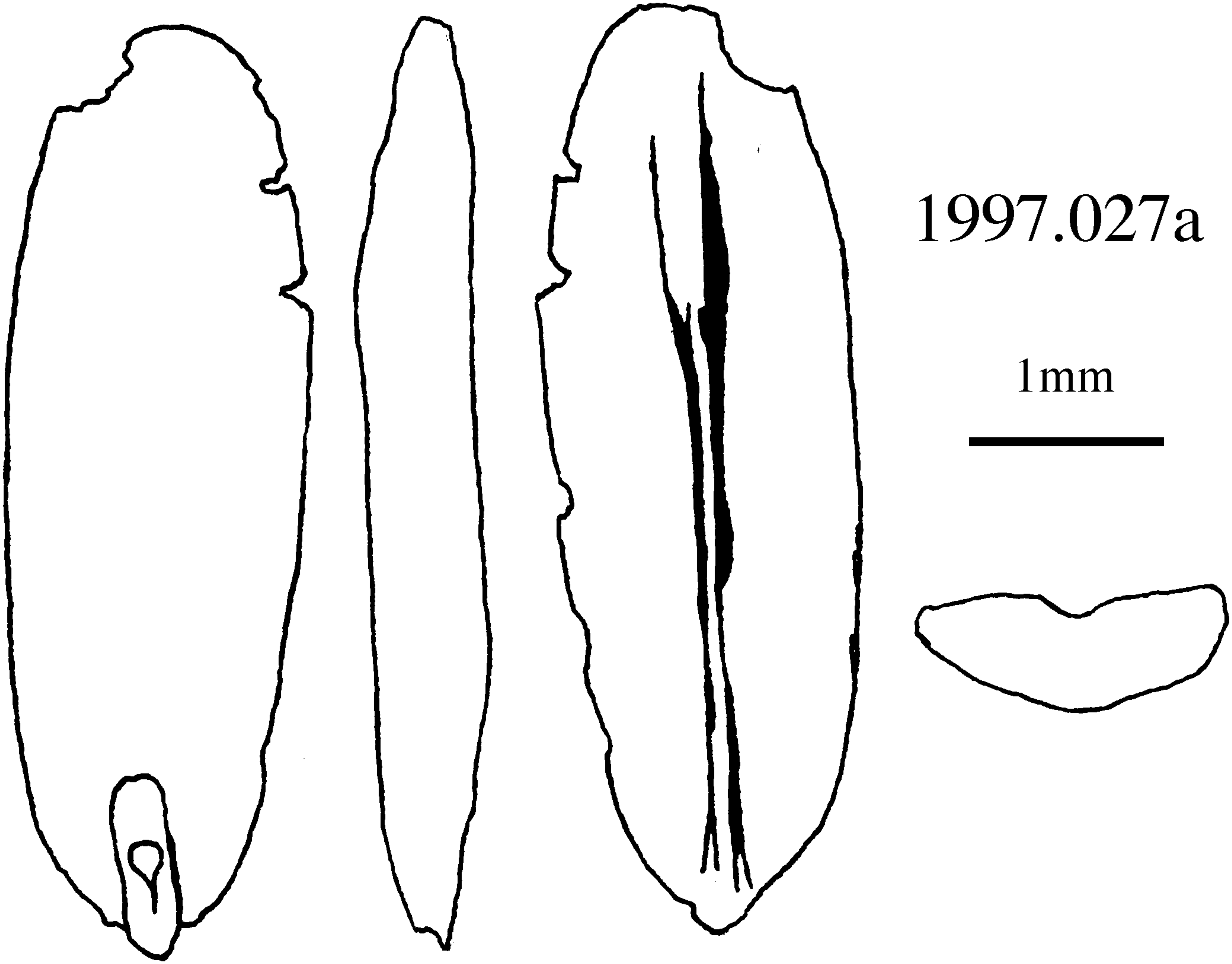

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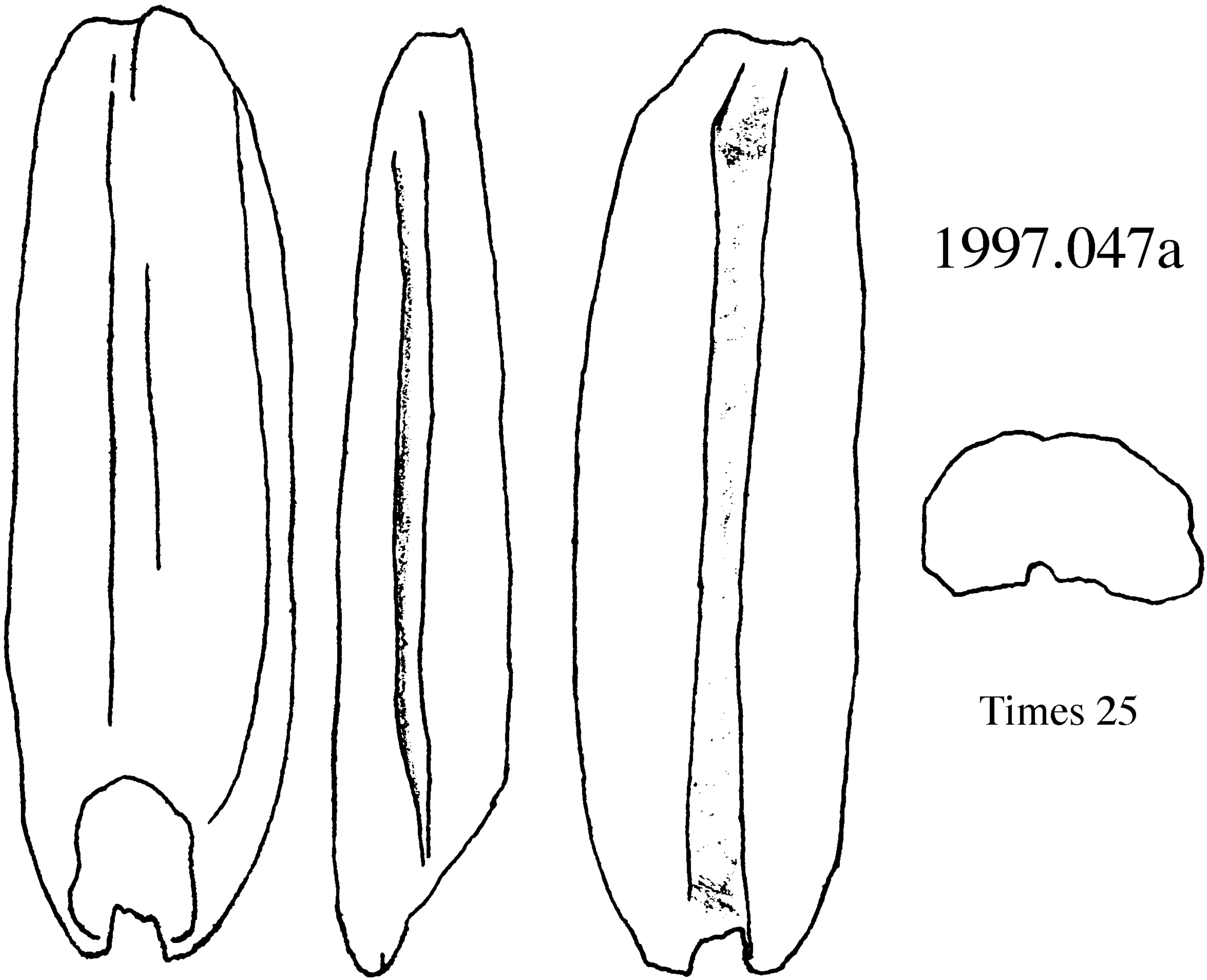

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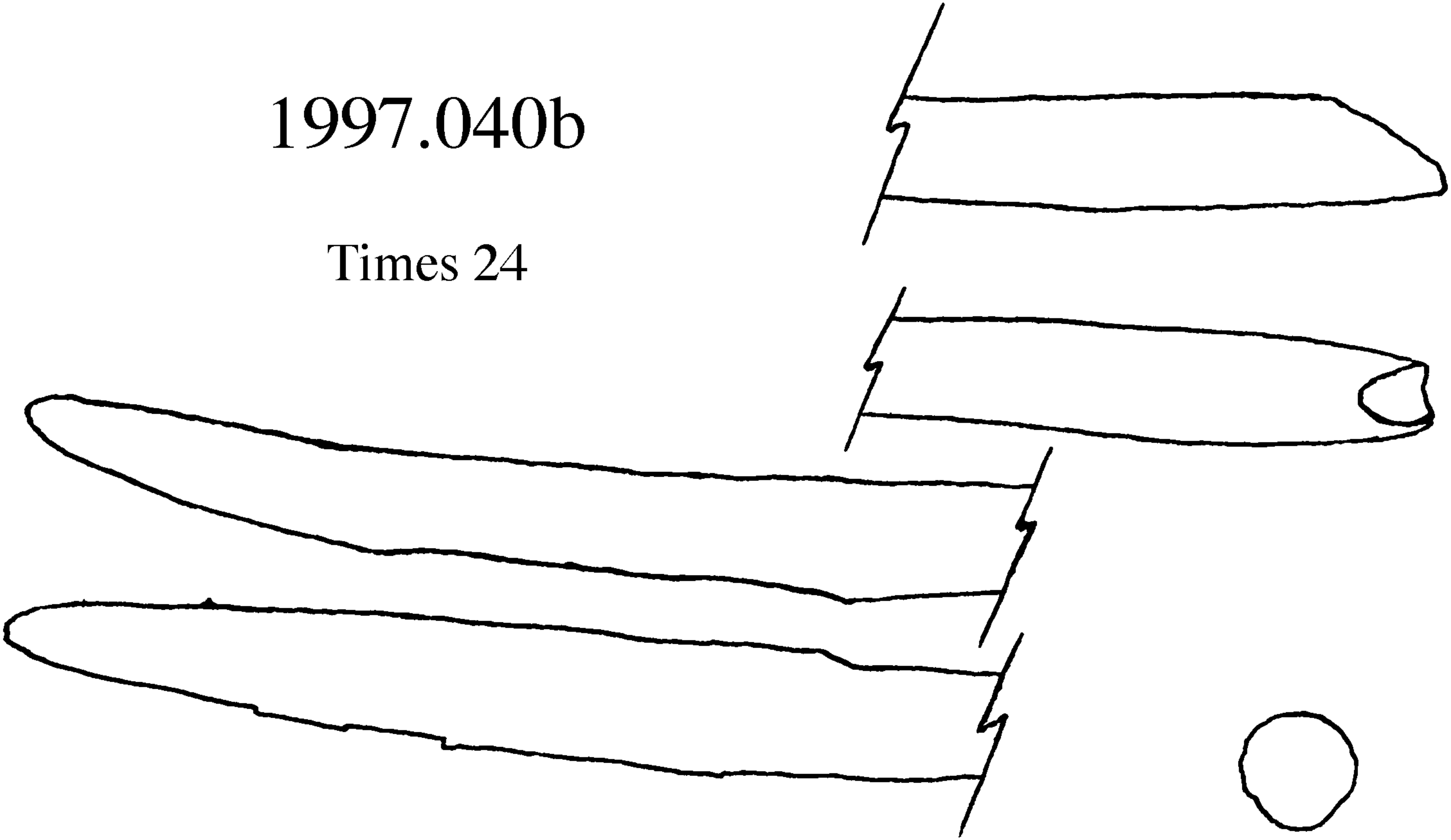
Times 25

Figure 4.2.1h

1997.040b

Times 24



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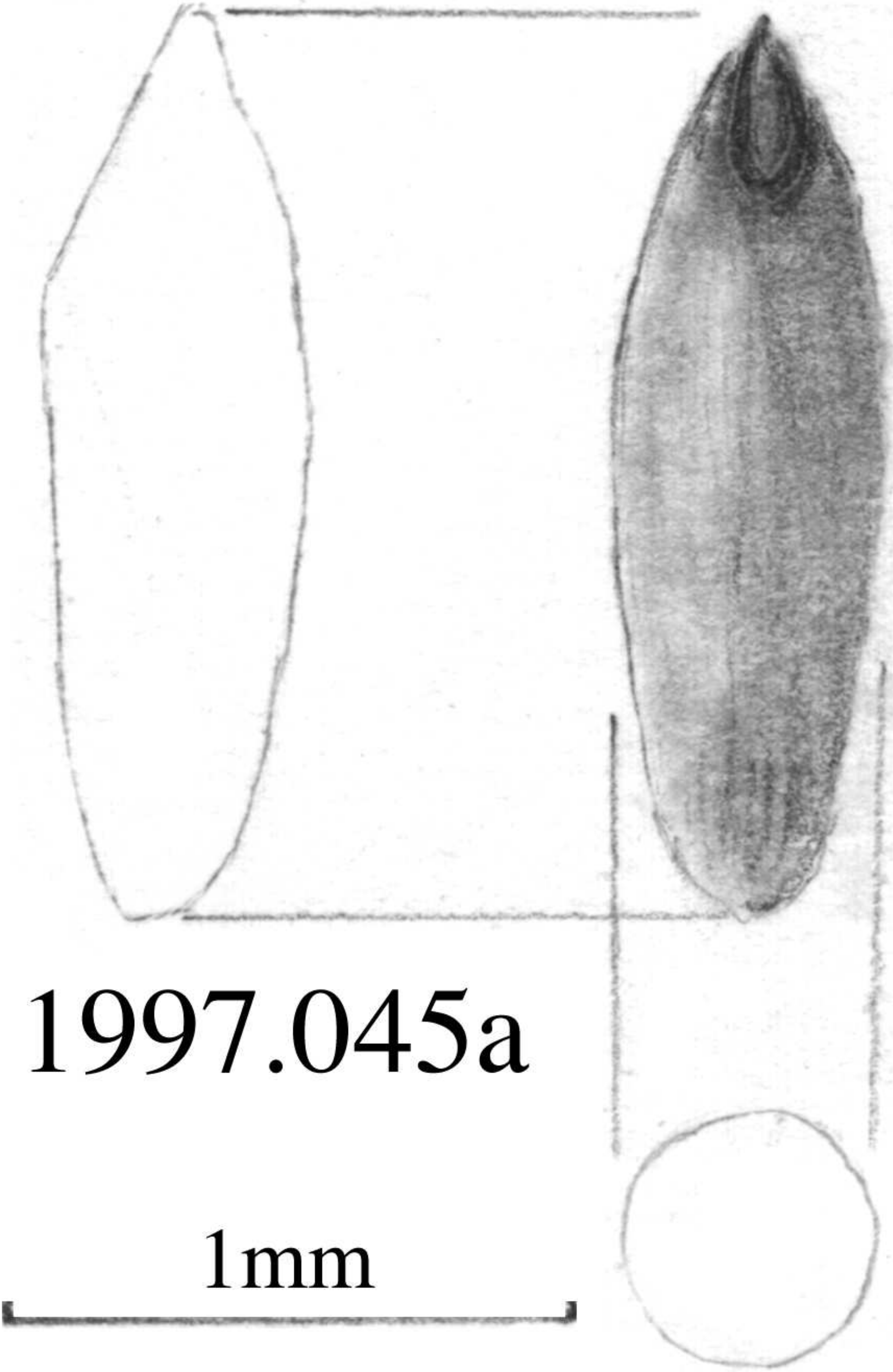
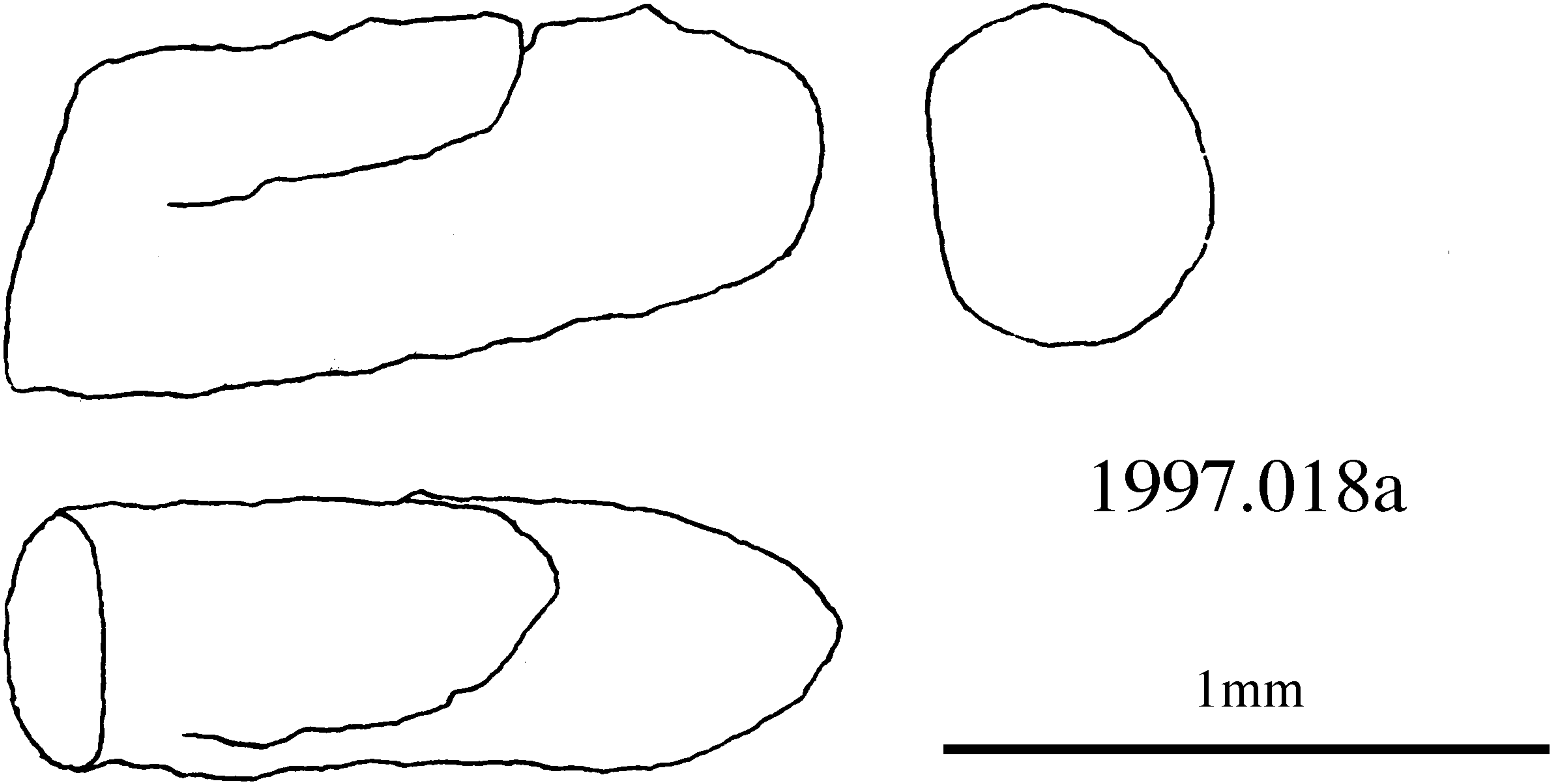


Figure 4.2.1j

Figure 4.2.2b



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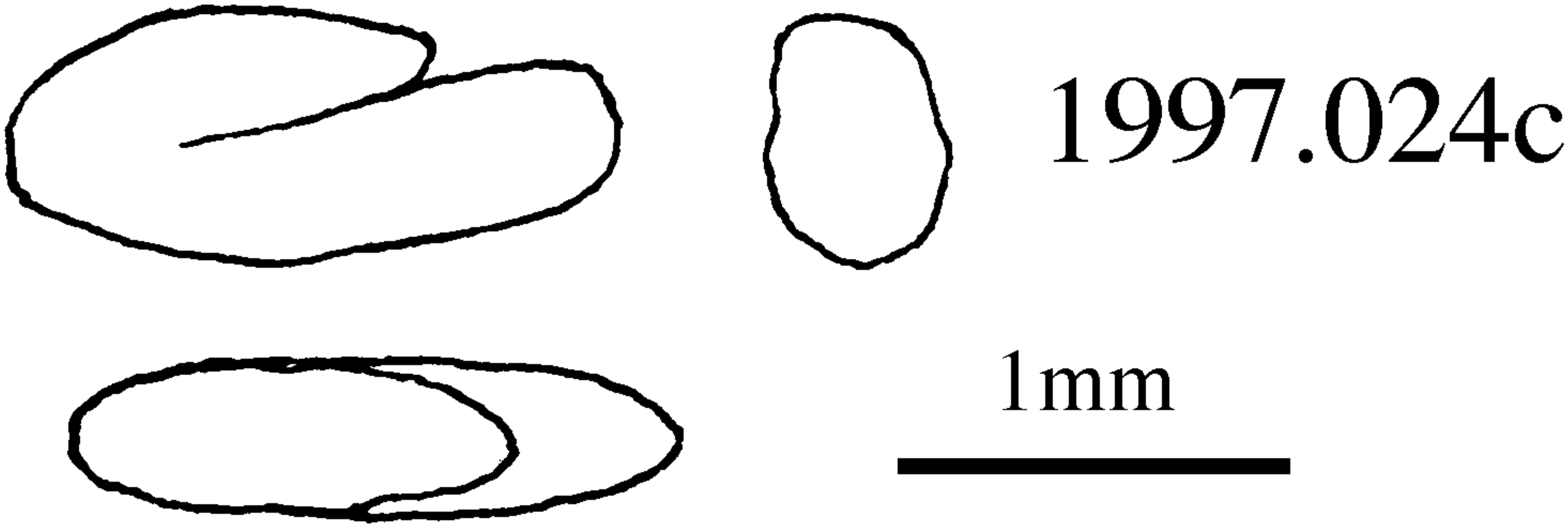

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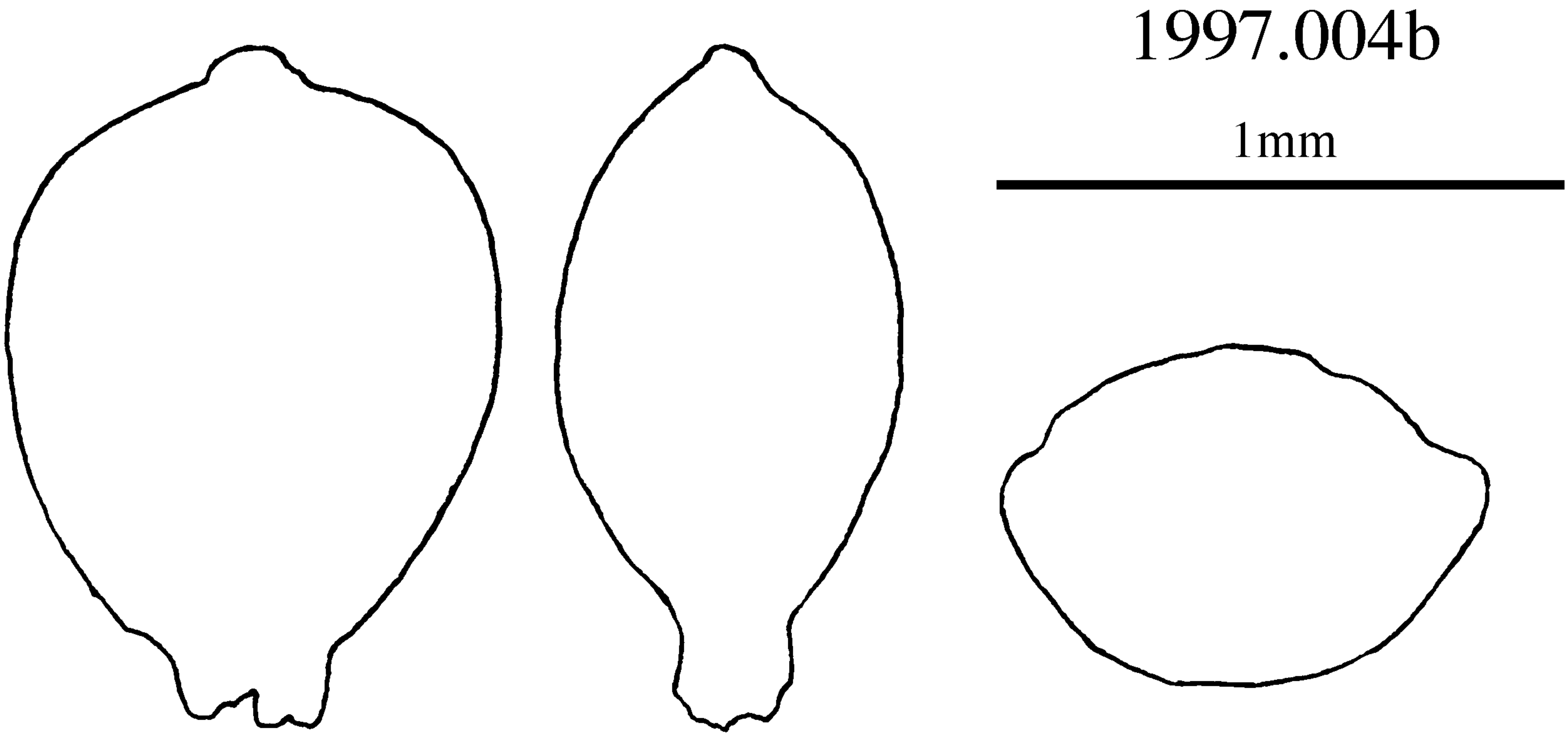

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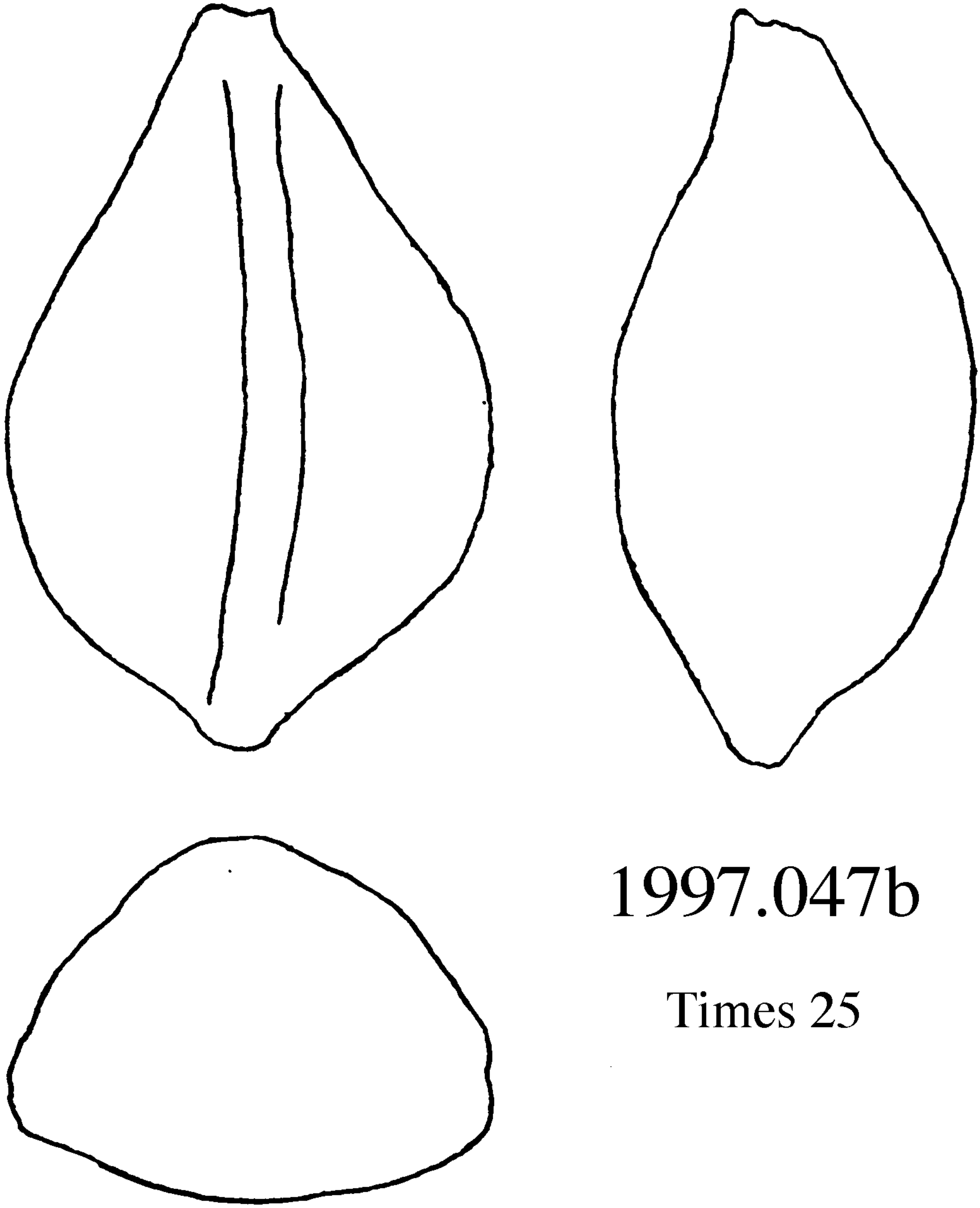

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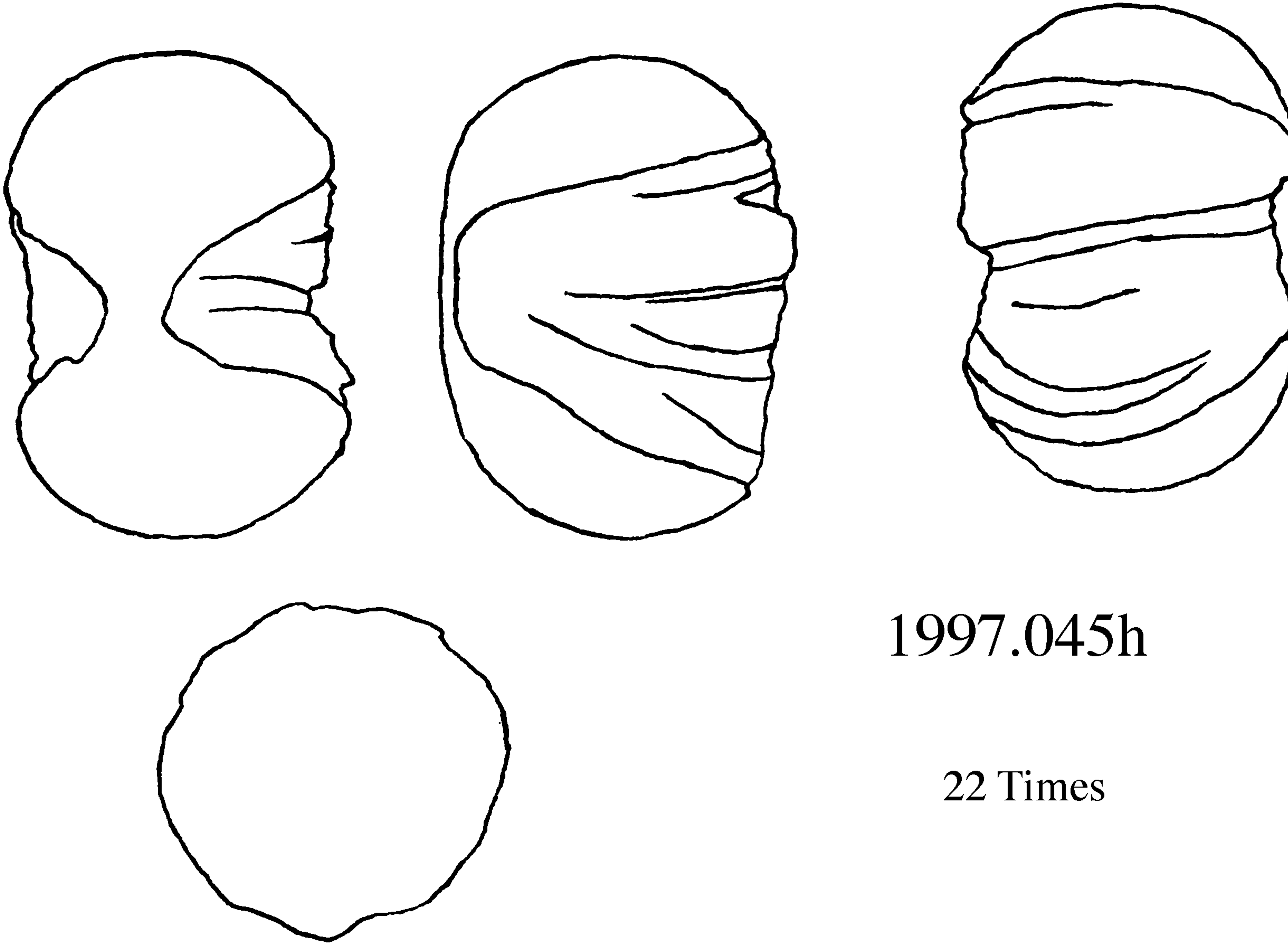
Figure 4.2.3e

Figure 4.2.4a



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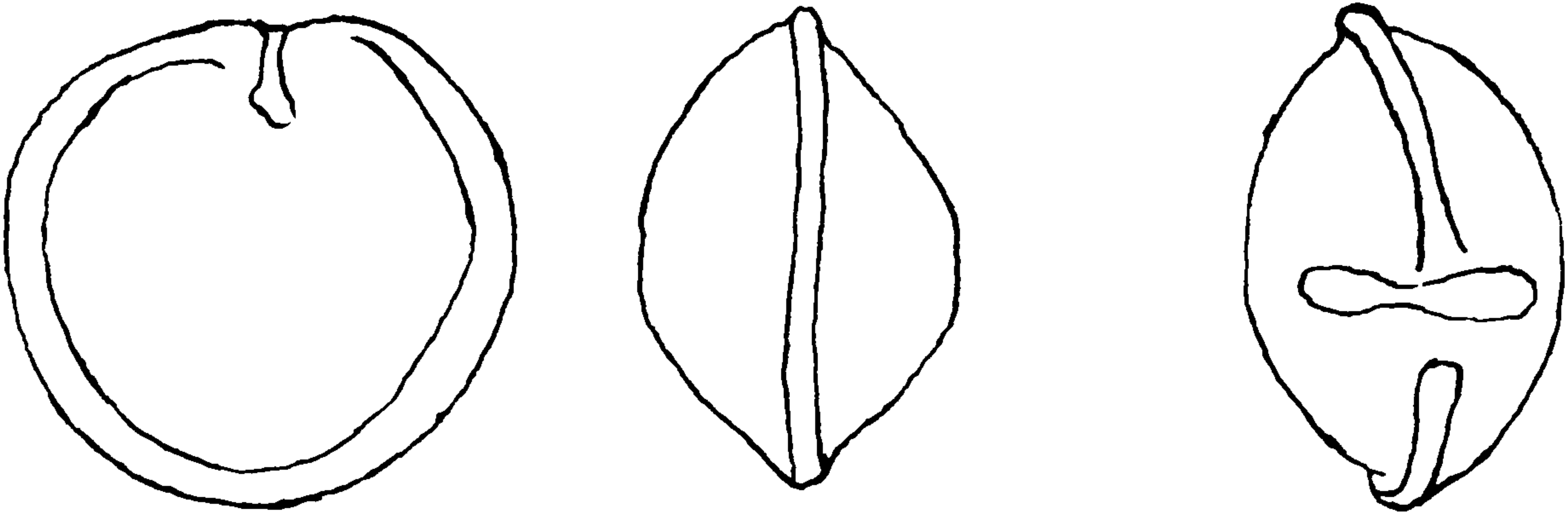
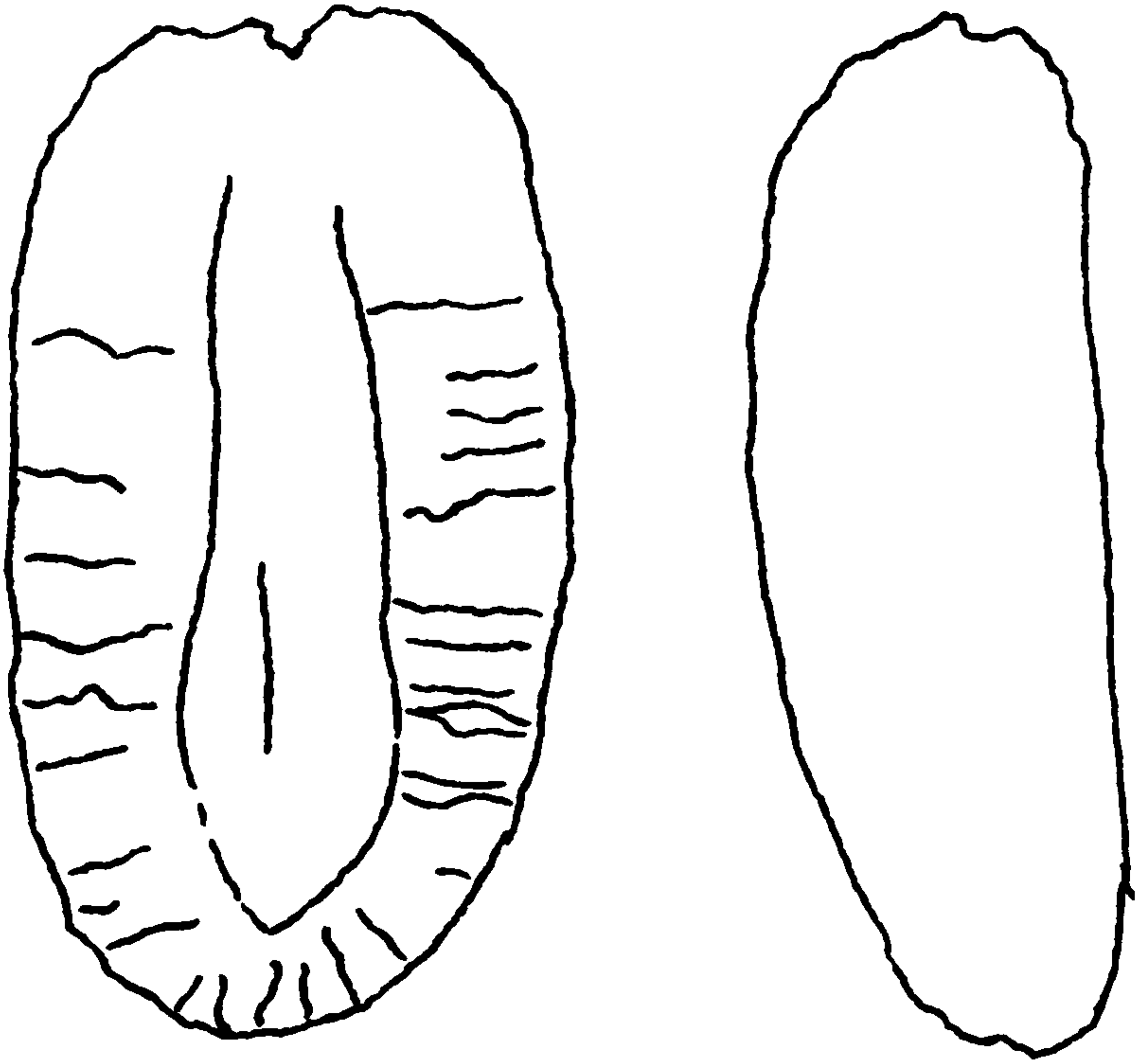
22 Times

Figure 4.2.4c



1997.045i Times 25

Figure 4.2.4e



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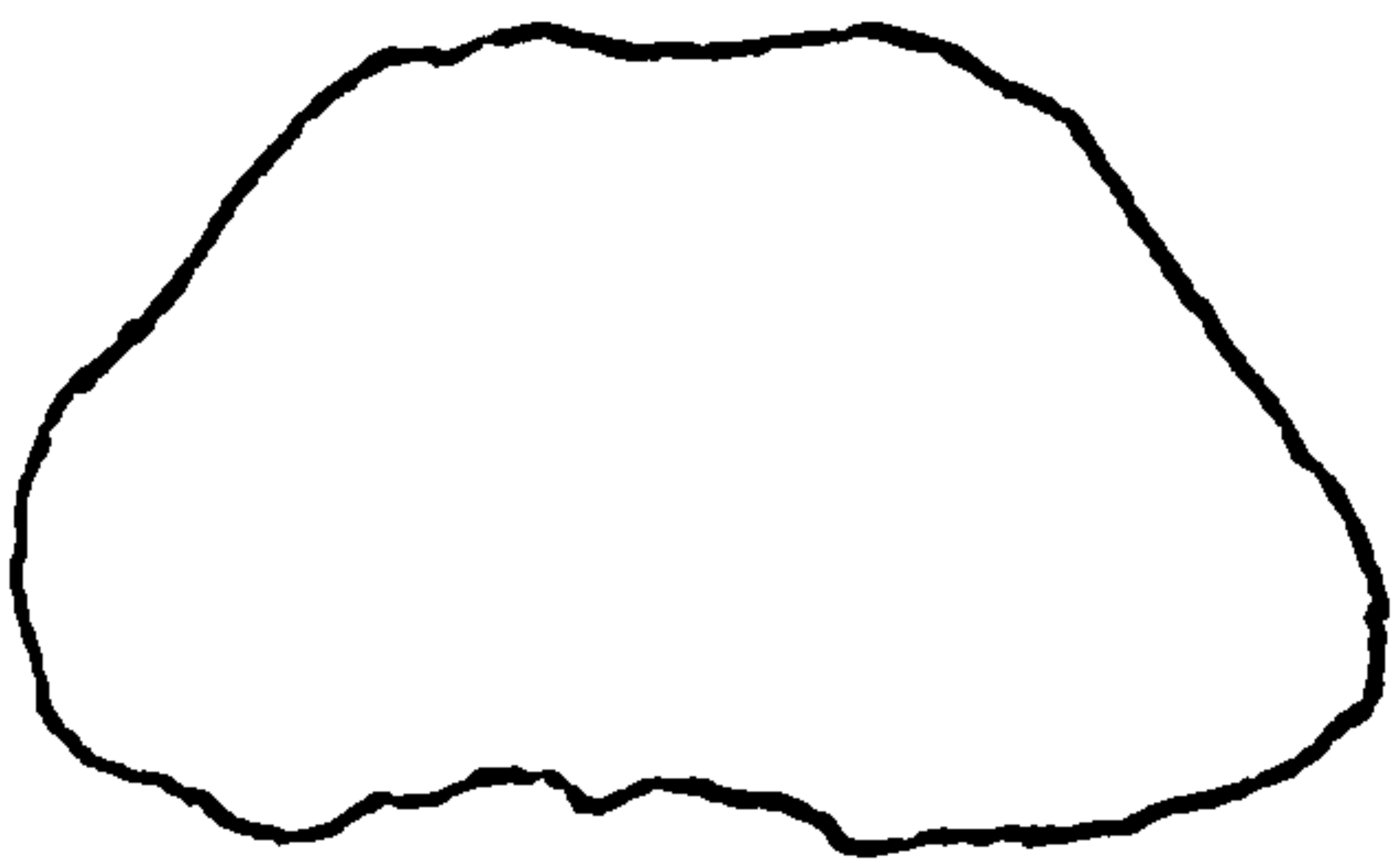
Times 38



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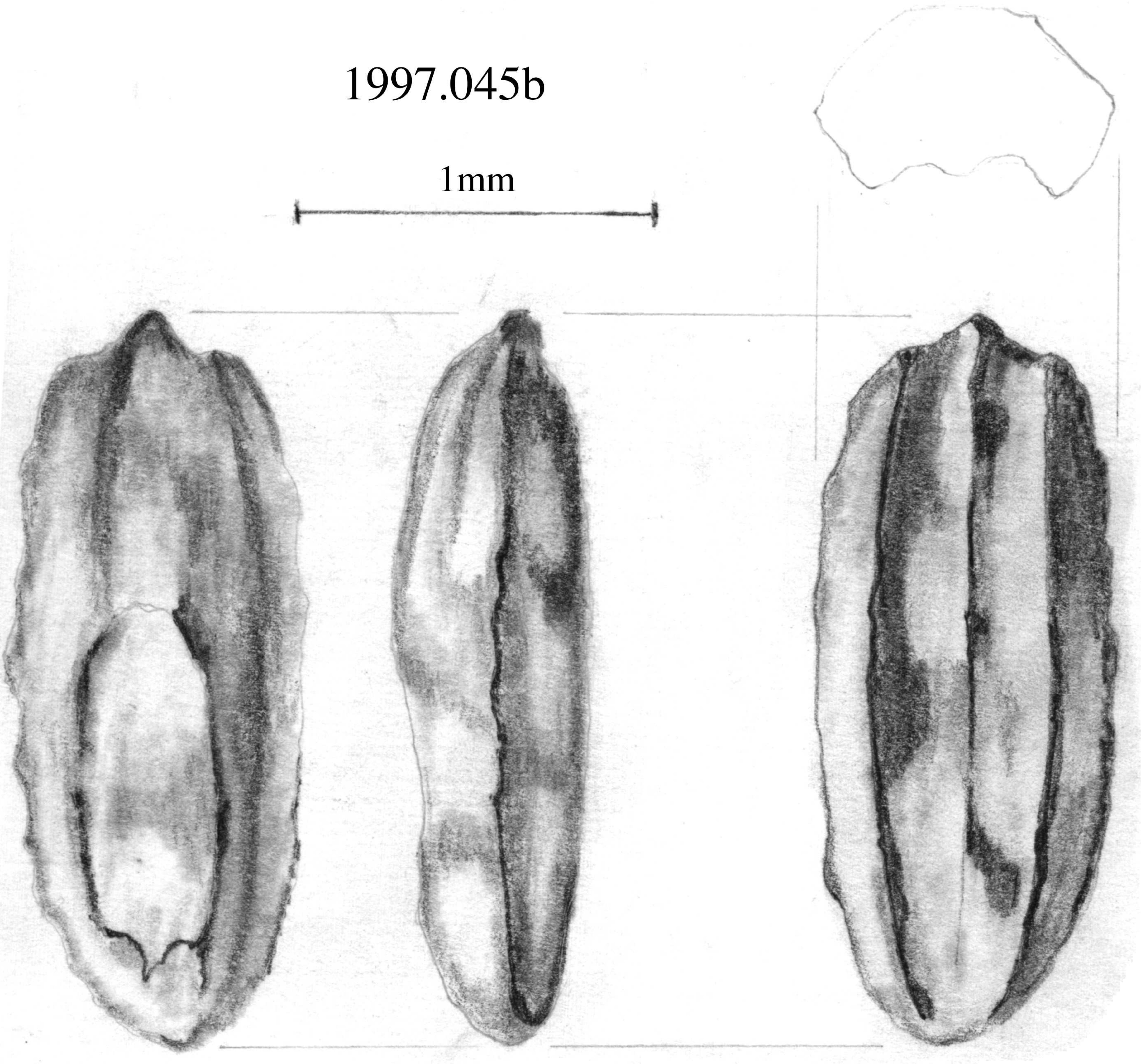
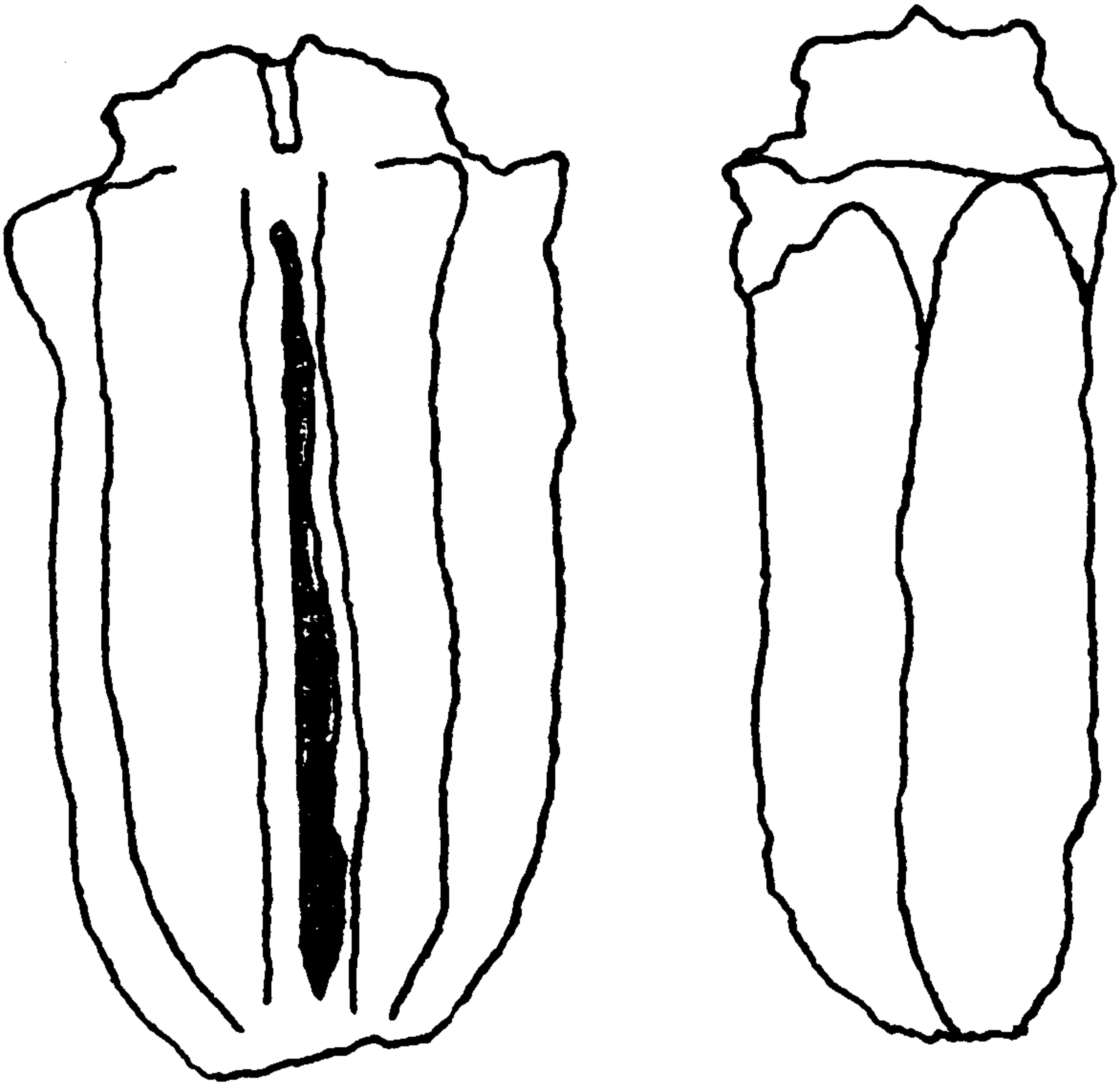


Figure 4.2.4g

Figure 4.2.4h



1997.018d

1mm

Figure 4.2.4i

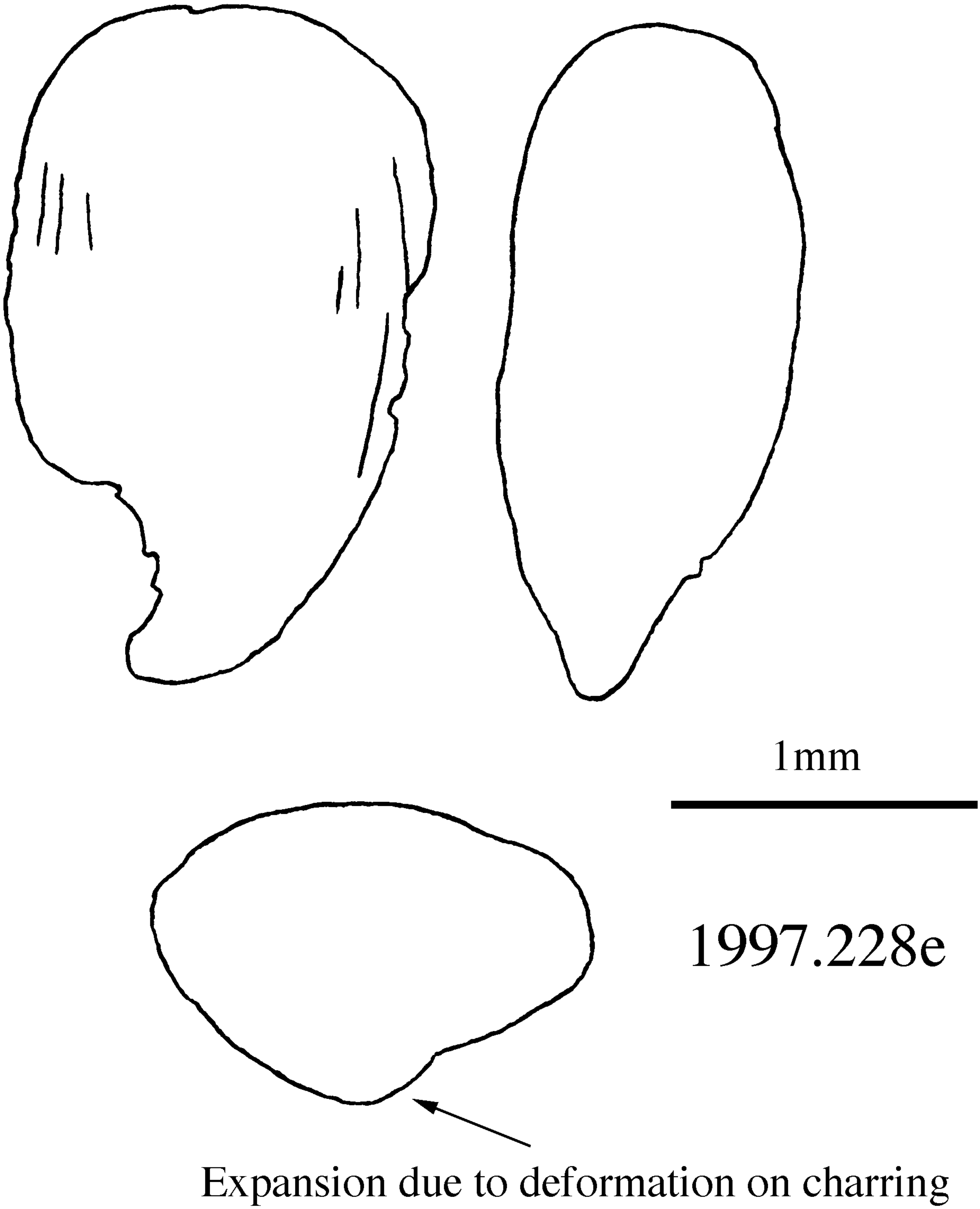


Figure 4.2.4m

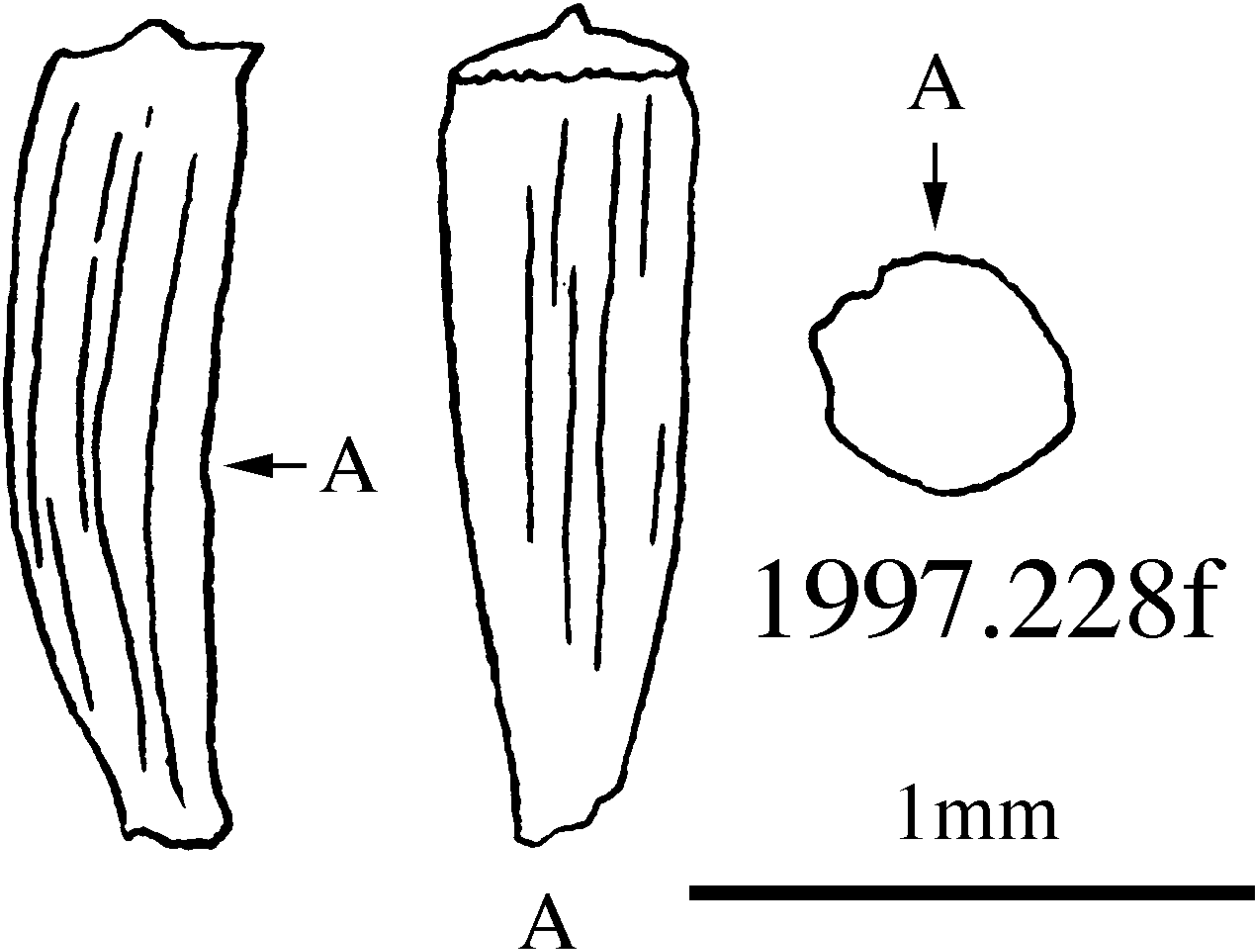


Figure 4.2.4n

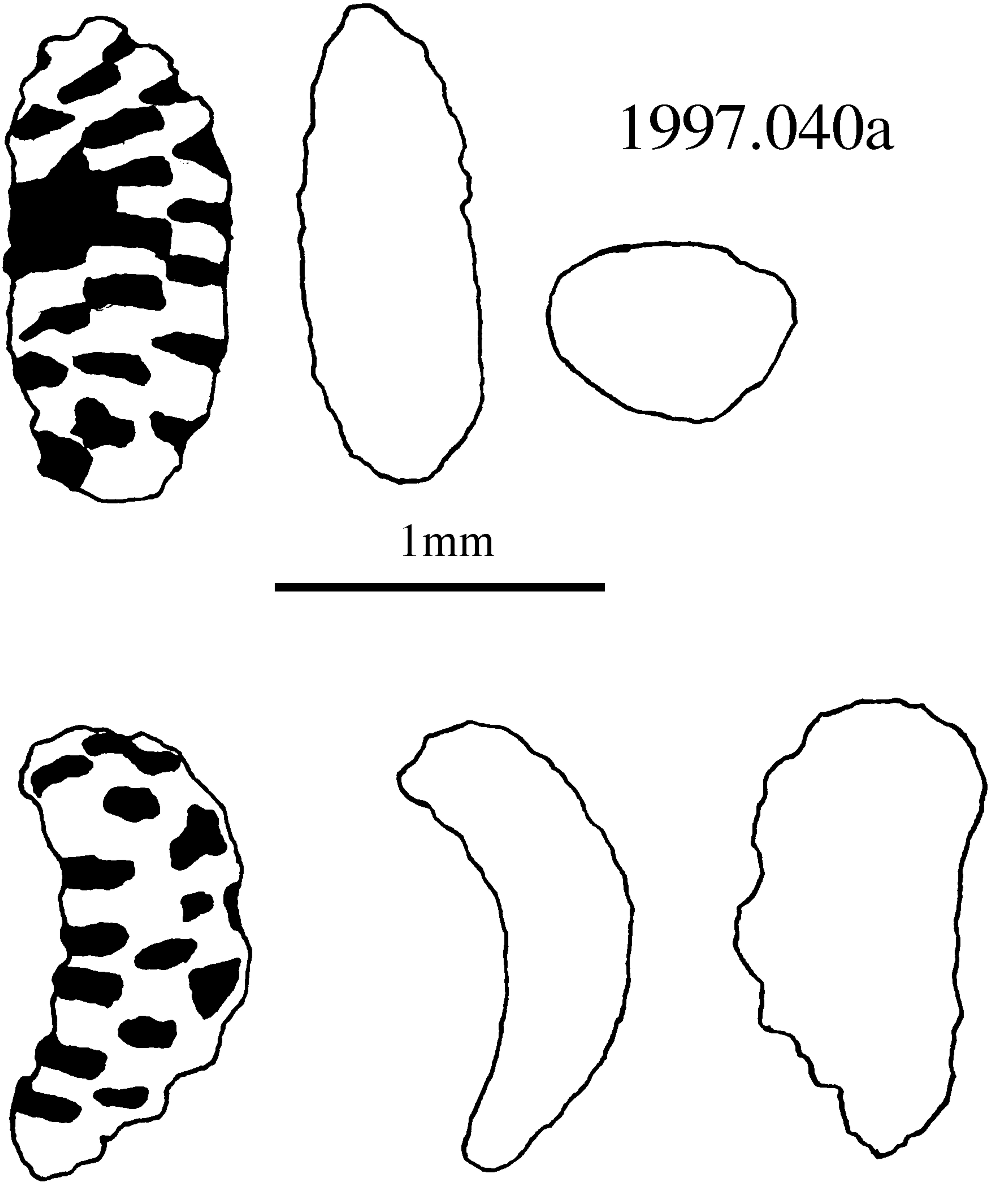


Figure 4.2.4o

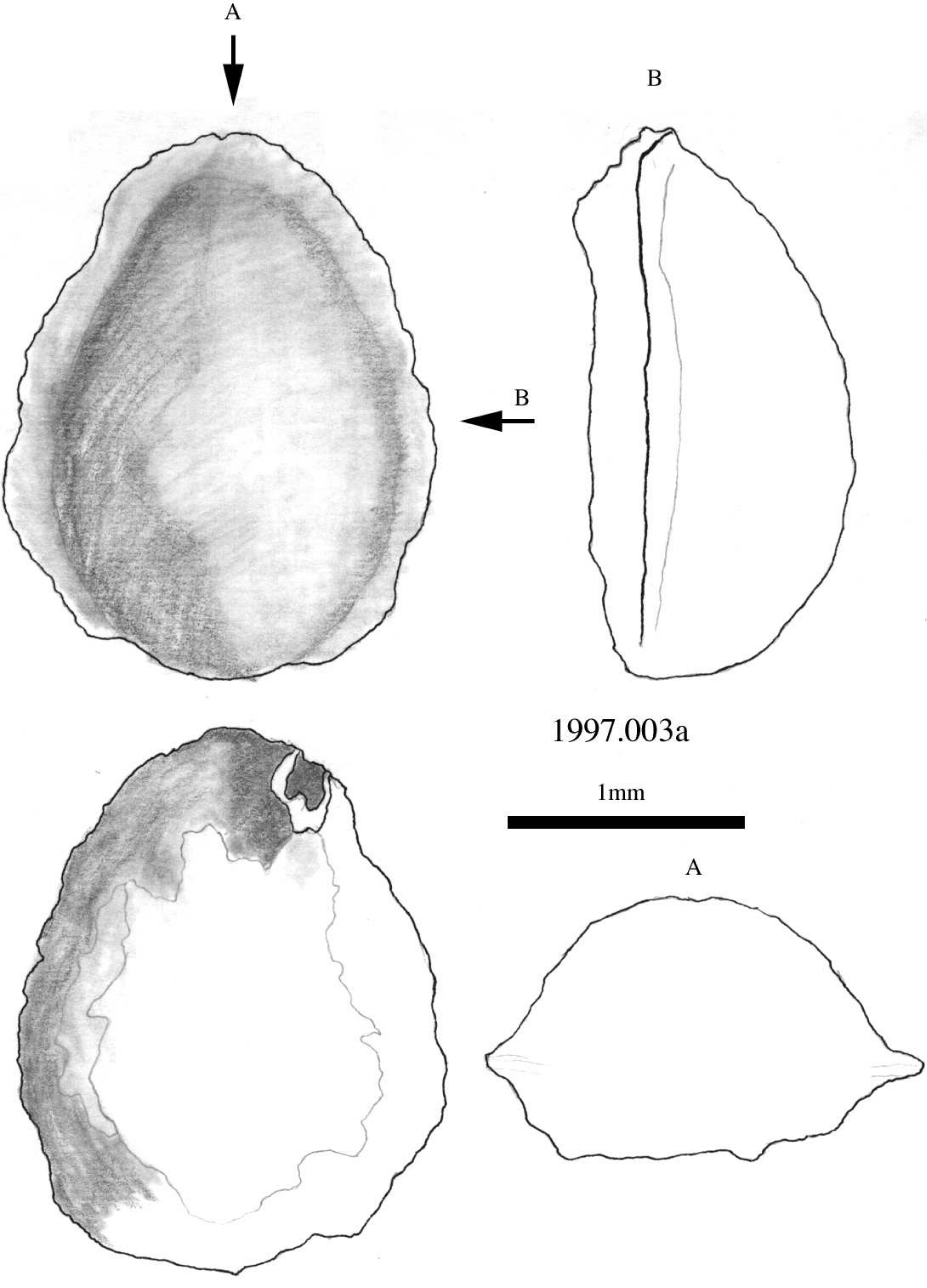


Figure 4.2.5a