

The Shifting Tides of Empires: Using GIS to Contextualize Population Change Within the Landscape of Seventeenth to Nineteenth-Century Mani, Greece

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Abstract This study investigates the changing social landscape of the Mani Peninsula, Greece, from 1618 to 1829. Five primary sources of population data are combined in a GIS database, and spatial analyses are used to track patterns in population and settlement distribution. The results show that the preparations for war in Mani led to population loss, settlement fracturing, and a heightened potential for physical and visual connection. The processes of imperial conquest and resistance left a different imprint upon the Maniate landscape than in other parts of the Ottoman Empire, where settlements were occasionally relocated into more mountainous terrain for increased protection.

Keywords GIS · Spatial analysis · Population records · Ottoman empire · Greece

Introduction

The Mani Peninsula, located in the Southern Peloponnese of Greece, was officially annexed by the Ottoman Empire in 1479 (Kapetanakis 2011, p. 31), although the extent of Ottoman influence in the region was supposedly limited (Fig. 1). Its mountainous geography and repeated attempts at rebellion earned Mani a reputation for resisting external authority. Over the years, dozens of European travelers recorded their observations as they ventured through Mani's remote villages, and many of these documents have since been translated and published (Komis 2005). Five, in particular, record detailed information about the population of Maniate settlements between the years 1618 and 1829, spanning the first period of Ottoman rule in the Peloponnese (1460–1685), its temporary loss to the Venetians (1685–1715), and its reinstatement before the Greek revolution began in 1821. These records provide an opportunity to explore the

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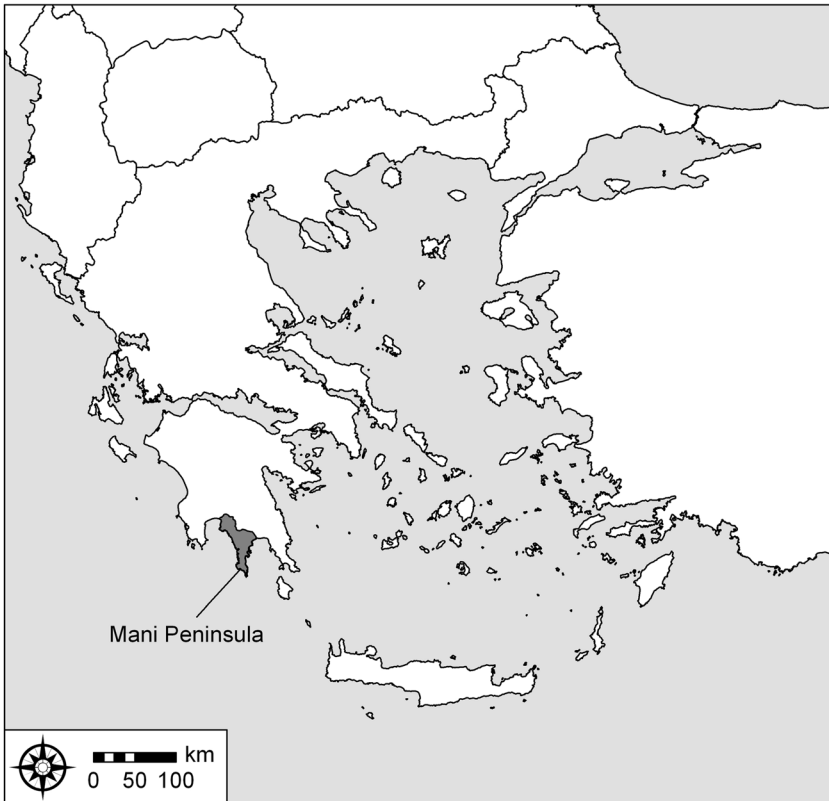


Fig. 1 The Mani Peninsula, Greece

deep connection between a region's population, its historical context, and its geographical characteristics. The changing patterns of human settlement that are detectable through spatial analysis may even provide new insights into these historical events. This study shows that despite its resistance, imperial expansion and the shifting tides of empires still had a palpable effect upon the Maniates.

By demonstrating how geospatial analysis can be used to reinterpret historical records from an archaeological perspective, the study also contributes to the more specific context of historical archaeological research in Greece. The first scholars to open a discussion of the post-medieval landscape were those in the Braudelian Annales School. These authors, including Antoniadis-Bibicou (1965), Asdrachas (1978), Panagiotopoulos (1985), and to some degree Laiou (e.g., 1977), looked to the *longue durée* to explain human history, in which “resounding events are often only momentary outbursts, surface manifestations of these larger movements and explicable only in terms of them” (Braudel 1972, p. 21). More recently, archaeologists working in the area have begun using Ottoman-period historical records to reconstruct demographic trends over the past several centuries. Most notably, the Pylos Regional Archaeological Project in Messenia published a volume that includes the reproduction, transcription, and analysis of an Ottoman tax register from year 1716 (Zarinebaf et al. 2005).

This interest in the later periods of Greek history has had many important methodological effects upon archaeological projects, especially in regards to the

documentation and analysis of medieval artifacts and settlements. Increasing numbers of publications about the Byzantine and post-Byzantine world demonstrate that the later historical periods have attracted interest from archaeologists, either as components of diachronic studies (e.g., Bintliff and Sbonias 1999; Forsén and Forsén 2003; Hayes 1992), or as standalone research topics in themselves (e.g., Athanassopoulos 2010; Caraher et al. 2008; Davis 1991; Jameson et al. 1994; Lock and Sanders 1996; Sutton 2000; Vroom 2003). At the same time, few archaeologists working in the more recent historical periods in Greece have taken full advantage of the potential that GIS applications offer (with a few notable exceptions, including Sanders and Whitbread 1990; Dann and Yerkes 1994; Bevan et al. 2003; and Crow et al. 2011).

The Mani Peninsula

Mani is a particularly enigmatic topic for historical archaeology. Its landscape is unlike most other parts of Greece, and its isolated geography created a unique sociopolitical trajectory that allowed it to remain independent during the period of Ottoman rule over Eastern Europe, at least according to local lore. Today, Mani is known as the region that provoked the Greek War of Independence, when a band of Maniates—in league with the Greek general, Theodoros Kolokotronis, and led by Petrobey Mavromichalis—attacked and liberated the city of Kalamata from the Ottomans (Kapetanakis 2011, pp. 509–511). Locals still reminisce about their ancestors' reputation for fierce resistance to the Ottomans.

Limited archaeological excavations have been carried out on the peninsula, targeting prehistoric settlements (Papathanassopoulos 1996; Papathanasiou 2005; Papathanasiou et al. 2000), ancient ruins (Le Bas 1888; Winter and Winter 1983), and selected Early and Middle Byzantine churches (Drandakes 1986, 1995). As a result, historical population records from the seventeenth to nineteenth centuries are some of the only sources of information about this key period in Maniate history. While these records have been studied from a historical and demographic perspective (Frangakis-Syrett and Wagstaff 1992; Komis 2005; Wagstaff 1977, 1978), they contain far more than just numerical data. They are simultaneously a list of inhabited settlements that can be used to understand the population's relationship with its landscape: where people chose to live, at what elevations, and so on. It is precisely these pieces of information that are the target of the present study.

Geography and Ecology

The landscape of Mani is rugged and at times inhospitable, but it has been home to generations of farmers and herders reaching as far back as the Neolithic. With the exception of a small patch of low quality agricultural land in the northeast, the Greek Soil Institute has classified most of Mani as having very low agricultural potential and a very high risk of desertification, considered generally unsuitable for agro-pastoral activities (Yassoglou 2004). Despite these qualities, farmers have managed to transform Mani's rocky soils into life-sustaining crops, building step-terraces across the entire landscape to make use of every inch of fertile soil (Fig. 2). As far back as the records stretch, farmers have practiced dryland agriculture, forgoing irrigation in favor of



Fig. 2 Step-terracing around the town of Vathia, looking north

utilizing natural rainfall. By the eighteenth century, a variety of subsistence crops were being grown in Mani, including corn, wheat, barley, and sorghum (Wagstaff 1965, p. 298). Farmers also cultivated a limited amount of olives and participated in long-distance trade networks, exporting olive oil, beans, cattle, honey, wax, quails, valonea, silk, vermilion, and salt (Wagstaff 1965, pp. 298–302). Beginning in the early twentieth century, the export trade in olives took on heightened importance, and almost all the terraced fields were dedicated to olive production. Still, despite their hard efforts, the Maniates “normally lived only a knife’s edge away from starvation” (Wagstaff 1965, p. 299).

The Taygetos Mountains begin north of the peninsula and continue south, forming a spine that stretches to its southernmost point and acting as a buffer between the peninsula and the rest of the Peloponnese. The southwestern region is particularly isolated by these mountains. In total, four sub-regions can be delineated that correspond to historical, ethnographic, and colloquial boundaries (Fig. 3). Outer Mani comprises the northwestern region, stretching from just outside Kalamata in the northwest to Oitylo at its southern boundary. Inner Mani lies south of this—the region most notorious for its local clan-based rivalries and impressive war towers (see Kalamara and Roumeliotis 2004, pp. 127–151). The entire eastern coast is referred to as Lower Mani, and Vardunia lies across the Taygetos Mountains to the north. Before these sub-regions were distinguished, the Venetian records from the seventeenth and eighteenth centuries used three slightly different terms: *Alta Maina*, *Bassa Maina*, and *Vardugna*.

Mani’s geography distanced the peninsula from the rest of Greece, allowing it to develop a kind of “frontier” culture characterized by piracy, smuggling, and local rivalries (Blumi 2003; Lightfoot and Martinez 1995; Schon and Galaty 2006). In part, the rocky coves of Mani’s coast were known to harbor bands of pirates who led frequent attacks on passing cargo ships. The stories of Maniate pirates in the Ottoman

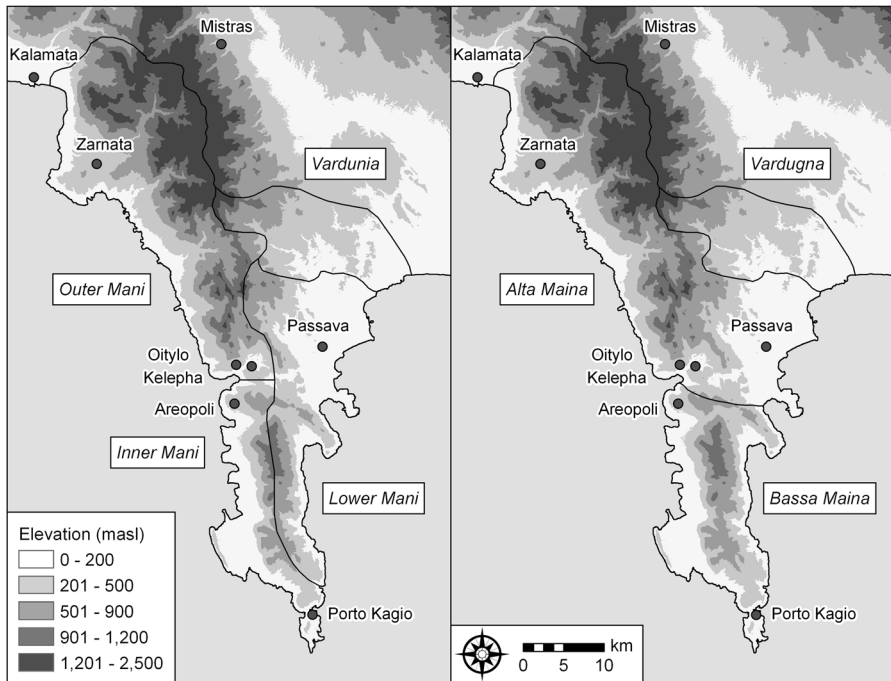


Fig. 3 Regions in Mani: Modern (*left*) and Venetian (*right*), with important locations mentioned in the text

period, including Limberakis Gerakaris, Nikolos Sassaros, and Michalis Maniatis, attest to the fact that locals occasionally took to the high seas to supplement the meager living they could make on dry land (Karizoni et al. 2010, pp. 87–117). Because the Taygetos Mountains insulated the Maniate communities from other parts of mainland Greece, a strongly clan-based social organization developed that ultimately became imprinted in the spatial layout of the towns, many of which were divided into distinct neighborhoods defined by clan membership up until the early twentieth century (Kalamara and Roumeliotis 2004, p. 143; Saïtas 2001, pp. 118–120). Beginning in the seventeenth century, feuding and rivalries led the clans to erect multistorey towers (Kalamara and Roumeliotis 2004, pp. 58–62), which were reportedly used to launch cannon and rifle fire against enemies in neighboring structures (Fermor 2006 [1958], pp. 109, 116). Even after the Ottomans appointed *beys* (regional officials) in Outer Mani, it appears that local, clan-based governance continued throughout the period. The rebellious attitude that the Maniates took toward the Ottomans was very likely influenced by the region's geographic insularity.

The Narrative of Independence

Despite the historical narrative that points to Maniate resistance, it seems that the local residents remained connected with the rest of the empire and never experienced true isolation from Ottoman influence. Parallels can be drawn with northern Albania, an even more remote and mountainous region that was located on the periphery of the Ottoman Empire. Here, the archaeological work of the Shala Valley Project points to “a

complex, diachronic interplay of isolation *and* interaction, that is, the gray areas... never were the people of Shala locked into a process of culture change that they did not, at least partially, control. Rather, they chose their own destiny” (Galaty et al. 2013, p. 3). The residents of such mountain territories were aware of the tenuous hold that foreign bureaucrats had on such remote landscapes, and used this to manipulate the degree to which they participated in larger economic and political processes.

Mani is located close to the former Byzantine capital of Mistras and the Ottoman stations in Kalamata and Gytheio, and just off an important maritime trade route passing south around the Peloponnese. The Ottomans maintained armed forces at four fortified sites within Mani: Zarnata, Passava, Kelepha, and Porto Kagio (for debates about the earlier Frankish fortress of the Grand Magne, see Burridge 1996, p. 22; Komis 2005, pp. 377–379; Kriesis 1963, pp. 313–316; Traquair 1905/06, pp. 275–276; Wagstaff 2009). Zarnata, in the north, is a very small fortress that overlooks the modern town of Stavropigi (Fig. 4) (see Coronelli 1687, pp. 87–88; Andrews 1953, pp. 24–27; Kriesis 1963). The fortresses of Passava and Kelepha are situated on either end of a key mountain pass, with Passava atop a cliff above the pass, and Kelepha overlooking the port of Limeni to the west (for Passava, see Coronelli 1687, pp. 92–93; Traquair 1905/06, pp. 274–275; for Kelepha, see Coronelli 1687, pp. 88–91; Andrews 1953, pp. 36–39; Kriesis 1963; Wagstaff 2009). In the south, the fortress at Porto Kagio was well positioned as a base to guard shipping lanes from other parts of the Mediterranean to the Greek islands. Overall, the primary role of these forts was to house small garrisons that could control local populations (Andrews 1953, pp. 25, 36; Wagstaff 2009, p. 118), although more impassioned accounts suggest that seventeenth-century Maniates lived under “oppression” from the troops stationed in these fortresses (Kapetanakis 2011, p. 43).

The establishment of imperial structures like forts may be linked with the construction and maintenance of a network of *kalderimia* (cobble roads) that run along the length of the peninsula (Fig. 5). Labor-intensive features like *kalderimia* require some



Fig. 4 The fortress of Zarnata



Fig. 5 *Kalderimi* leading from Areopoli to Kelepha, looking northeast

degree of administrative organization to amass the skill and labor necessary for their construction and maintenance. In other parts of the empire, the large-scale governance of the Byzantine and Ottoman Empires was responsible for the construction of *kalderimia*, which were used to expedite the movement of troops and overland trade (Ágoston 2011, pp. 127–128; Forsén 2003; Pikoulas 2008/09). However, the role of the *kalderimia* in Mani is still unclear. Research is currently being conducted to refine their construction types and chronology and to examine their geospatial attributes (i.e., their relationship with fields, settlements, churches, and fortresses; and their alignment with pathways predicted by least-cost path analysis). Preliminary findings from Inner Mani suggest that their primary role was to provide a direct pathway between settlements and the Ottoman fortress of Kelepha, while non-cobbled paths were used to access fields and smaller villages. Writing in the seventeenth century, Evliya Çelebi reports that the Ottomans had first prepared to attack Mani by “clearing all the roads along which the armies and cannon were to pass” (Kalamara and Roumeliotis 2004, p. 186). This comment suggests that the *kalderimia* were Byzantine-period constructions that were maintained by the Ottoman military, at least in part. It is entirely possible that the construction of *kalderimia* in Mani was completed by individual towns and smaller regions in order to facilitate localized trade networks, rather than by an imposed, imperial authority. But regardless of who built the *kalderimia* in Mani, the labor required to maintain them raises interesting questions about its integration within larger trade networks and the degree to which the Ottomans maintained an infantry on the peninsula.

While the local historical narrative suggests that Mani maintained its independence throughout the Ottoman period, the fortresses and *kalderimia* are material testaments to at least a limited Ottoman presence on the peninsula. The population records from the

seventeenth to nineteenth centuries hold additional clues about Mani's past, clues about where people lived and how the distribution of population changed over time. It is these changing patterns of human settlement that can reveal the degree to which Mani was affected by the events of history.

The Population Records of Mani, 1618–1829

Two main types of population records were compiled over the centuries to document information about Mani's settlements. The first is a series of *tahrir defters* (tax registers) that were maintained by Ottoman administrative officials to assess the size and productivity of villages in the realm. The documents list the number of households and expected amount of agricultural produce of each settlement (for research applications, see Lowry 1992). At least seven *tahrir defters* were recorded for Mani between 1500 and 1715 (Başbakanlık Osmanlı Arşivleri 2007). At present, these documents have been translated and are in the process of being studied more fully. The second group—the main source of data for this study—includes five published Venetian and French records that list population data for the entire peninsula between the years 1618 and 1829 (Table 1). These records were later published in a single volume that correlates the settlement names and groups the sites by the Venetian geographical categories (Komis 2005).

The purpose of three of these latter documents was to assess the number of armed men in Mani who could be called upon to wage war against the Ottomans. The first of these is a record from 1618. A Maniate of Italian heritage, Pierre de Medici, compiled the list on behalf of Charles II Gonzaga, Duke of Nevers. The Duke was a descendant of the last Byzantine emperors, and was considering providing military assistance to the Maniates to stage a revolt against the Ottomans and thereby reclaim his lands (Buchon

Table 1 Summary of the published historical records

Year	Author	Type of data	Number of settlements ^a	Multiplier	Total population	Annual population growth rate
1618	Medici	Hearths	125	4.1	21,660	–
1695	Muazzo	Combatants	90	3.5 (Alta), 3.8 (Bassa)	35,625	0.65 %
1700	Grimani	Families, Age Groups, Total Population	87	–	14,678	–16.25 %
1813	Roussel	Soldiers and Combatants	111	3.5 ^b	57,372	1.21 %
1829	Expédition Scientifique de Morée	Households	192	4.1	26,867	–4.63 %

^a The raw number of settlements listed in the published texts. The records often divided a single settlement into two counterparts (e.g., “Upper” and “Lower” Nikovos), where only a single settlement is recognized in modern times or in other historical records. In such cases, the two entries were combined prior to analysis. The figures in Table 2 are therefore smaller, reflecting the combination of entries whenever necessary

^b The most conservative multiplier was chosen for the 1813 record, although it still provided the highest total population estimate for any period

1843 p. 253, 283–286; Komis 2005, pp. 39–42). The original manuscript (or at least an early version of it) is kept in the National Library of Paris and lists the number of hearths in each village (Komis 2005, p. 41, note 15). Buchon (1843, pp. 241–295) published the data in French (with transcription errors; Komis 2005, pp. 41–42), and Wagstaff (1977) later mapped and analyzed the settlements. The second record of interest is the 1695 catalog of Francisco Muazzo, which lists the number of potential combatants in each village. An original and two copies of this document are held by the Marciana Library in Venice (Komis 2005, pp. 46–47). Third is a report submitted to the French Foreign Ministry in 1813 by the French consul in Patras, Joseph Jean-Baptiste Roussel. The original source for the report was a military list compiled by a Maniate chief, detailing the number of potential combatants and professional soldiers in Mani (Komis 2005, pp. 52–54).

Two additional documents are essential companions to these military reports. In 1700, the Venetian Provedditor General of the Morea from 1698–1701, Francesco Grimani, compiled a highly detailed report on the total population, number of families, and demographic composition of Mani's settlements (Topping 1976–78, pp. 122–125; Topping 2000, pp. 32–34). Recorded just after the temporary Venetian conquest of the Peloponnese in 1685, the report is unparalleled in its detail and geographic breadth, listing the number of males and females according to several age categories. Not surprisingly, it has received a fair amount of scholarly attention, including being published in its entirety by Panagiotopoulos (1985), cited by Wagstaff (1977), and later reanalyzed by Komis (2005). This document is also the source of the Venetian administrative zones, *Alta Maina*, *Bassa Maina*, and *Vardugna*.

The final major catalogue of the Peloponnese was compiled by the French *Expédition Scientifique de Morée* in 1829 (Bory de Saint-Vincent 1834, pp. 81–82, 89–92), although local rebellions delayed the completion of the team's work in Mani until 1831 or 1832. By far the most numerous list, it records the number of households reported to the research team by the “captains of Magne” (Frangakis-Syrett and Wagstaff 1992, pp. 440–441).

Of course, censuses and other enumerative documents are often less accurate than they report to be; it is therefore important to approach them not as scientific records but as “the material outcome of a series of expeditions and activities, including the all-important encounter between colonial official and colonized villager” (Given 2007, p. 146). Undoubtedly, the goals of the different authors of these five records played a significant role in structuring the population data they recorded, and the very fact that the authors were representatives of a foreign power likely influenced the figures reported by locals. The first three reports are explicitly geared toward enumerating the number of potential fighters that the Venetians and French could rally to arms. These authors had little interest in recording a demographic profile of the region. Aside from the rather obvious omission of women, children, and older men in the communities, the figures should be considered only rough estimates of the fighting-age male population, counting these individuals with a general degree of accuracy required by such military projects. The final, 1829 list was compiled for “scientific” purposes, but one still wonders at the intentions of the Maniate captains who reported the number of people living under their influence.

Two additional issues affect the 1700 census, which, despite its breadth, provides the lowest population estimate of the region in the entire period of study (Topping 1976–

78, pp. 123–124). First, after the Venetians conquered the Peloponnese in 1685, it is clear that they had difficulty adjusting to the landholding system that had been in place under the Ottomans, as well as in managing the native and immigrant populations of the area (Malliaris 2007, pp. 98–99). Although they had sent emissaries to count the Maniate soldiers earlier in the century, it is possible that their lack of administrative familiarity with the region of Mani led to an undercount of its population. The second issue is the possibility that the Maniates were attempting to evade taxation by underreporting themselves or “abandoning” villages before the census takers arrived. After all, as Given (2007, p. 141) reminds us, censuses “represent intrusions of census officials and the tax collectors who would follow them... It was no honor to be counted and incorporated into the imperial domain.” The Maniates had been eager to assist the Venetians in overthrowing Ottoman rule, but they were still obliged to pay an annual flat tax to the Venetians (albeit, one that was reduced as a reward for their military service; Komis 2005, pp. 44–46). As a result, they were probably less willing to participate in an official enumeration of their population—whether the 1700 Grimani list, or earlier Venetian attempts to assess the taxable communities of Mani. These points are essential to keep in mind when interpreting the demographic data provided by the 1700 list.

The differences in the goals and recording methods of these reports made it challenging to correlate and locate the settlements in the real world, but this task was necessary to undertake before building a GIS with the population data contained in the records. The starting point was Komis’ (2005) correlation catalogue, which traces the changing settlement names through time, while Pikoulas’ (2001) lexicon of settlement names was a useful source for connecting modern and ancient names. Nevertheless, a few settlements could not be reconciled with modern place-names. Of the 235 discrete settlements in the historical records, 172 of them were located using Google Earth and a 1:50,000 atlas of the Peloponnese (Adamakopoulos 2009). In general, the later settlements were much easier to locate, since their names have changed less drastically through time. Overall, the success rate was 73.2 % (Table 2). While this is generally a good sample, the earlier settlements are slightly underrepresented in this study due to the fact that many of them were abandoned by the nineteenth century.

In order to standardize the disparate types of data in the original records (e.g., households, combatants, or “hearths”), multipliers were applied to the base data to derive a total population figure (see Table 1). Population multipliers have been the

Table 2 Number of located historical settlements

Year	Located settlements	Total settlements	Percent
1618	82	118	69.5 %
1695	74	89	83.1 %
1700	67	80	83.8 %
1813	103	110	93.6 %
1829	160	186	86.0 %
Total	172	235	73.2 %

subject of avid debate among archaeologists, who are often forced to use site size or density as a way of estimating population (see, e.g., Carothers and McDonald 1979, pp. 435–436; Catling 2002, pp. 205–206, table 5.5; Renfrew 1972, pp. 250–251). However, even those working with more explicit data about households and families use multipliers in their analyses. For those dealing with Ottoman-period records, the number tends to be between four and six. Working with the Ottoman *defsters*, Erder (1975, table 4) proposes a series of multipliers between three and four that are derived from preindustrial age pyramids. Beldiceanu and Beldiceanu-Steinherr (1980, p. 41) use a figure of six persons per hearth, but note that this figure would differ for polygynous Muslim populations and monogamous non-Muslim population. Davis et al. (2005, table 4.1) use a multiplier of four people for every tax-paying male. The *Expédition Scientifique de Morée* used a multiplier of 4.75 to estimate the total population of Mani in 1829 (Bory de Saint-Vincent 1834, p. 89). But these numbers are highly contextual; in eighteenth- and nineteenth-century Albania, a multiplier of between six and nine is used to reflect the large, extended family structure of the period (Lee et al. 2013, pp. 76, 80). The exact multipliers used in the present study are based upon the demographic snapshot in the Grimani list from 1700—the only year in which households, “combatants” (i.e., men of fighting age), and total population were all enumerated.

Assessing the Settlements of Mani with Spatial Analysis

In themselves, population records like these can be used to trace demographic changes at the broader, regional level. Most of the historians that have analyzed these data have treated Mani as a cohesive region, comparing its total population to that of other, disparate regions in Greece. Some, like Komis (2005), have worked to connect the settlements in each of the records, making it possible to discuss the changes in more specific locations. Thanks to the Venetian geographical distinctions—*Alta Maina*, *Bassa Maina*, and *Vardugna*—the correlation lists also allow us to see how the sub-regions fared over the span of several generations.

Drawing connections between the settlement lists is only the first step, opening the door for another possible line of inquiry using spatial analysis. Where were these settlements located in the landscape? Were people drawn to certain geographic qualities, such as mountainous terrain, proximity to coastal bays, or distance from other settlements? More broadly speaking, did the historical events that marked the settlement patterns of other regions also affect Mani and its sub-regions? Spatial analysis assumes that settlements are not haphazardly located; rather, they are established at purposefully chosen locations. An isolated settlement on a hillside may reflect the residents’ desire to avoid coastal attacks or gain a good view of major pathways, while a tightly clustered group of settlements along the coast may illustrate a preference for quick and easy communication with neighbors.

To assess the significance of these geographical qualities for the Maniate settlements, four variables were chosen: elevation, number of neighboring settlements, distance to the nearest accessible bay, and number of intervisible settlements. The first of these variables—elevation—was extracted from the ASTER 30 m digital elevation model (or DEM; NASA 2011). Elevation is a particularly important variable, as many

scholars have noted that it provides a defensive advantage during periods of increased conflict (Arkush 2010, p. 35; Borgstede and Mathieu 2007, pp. 195–198; Martindale and Supernant 2009), and it is often assumed that people move into more mountainous terrain during times of war. Historians and archaeologists working in Greece refer to this phenomenon as the “height-zonation” or “demographic retreat” hypothesis (Bennet et al. 2000; Forbes 2000a; Stedman 1996; Topping 1972). The hypothesis has been contested using data from Messenia (Davies 2004; Zarinebaf et al. 2005, p. 211), Mani (Frangakis-Syrett and Wagstaff 1992), and the Peloponnese in general (Kiel 1999, p. 196). Several authors have noted that the earlier medieval villages in the Peloponnese tend to be located on hilltops or in otherwise rugged terrain (Dann and Yerkes 1994, p. 300; Kourelis 2005, p. 122), and that the modern system of low-lying villages did not crystallize until the mid-eighteenth century (Kourelis 2002, pp. 59–60, 2003, p. 169; for Mani, see Kalamara and Roumeliotis 2004, p. 54). However, a case study from Methana shows that while low-lying areas were not totally abandoned, the movement toward higher elevations in the late Ottoman period indicated that locals were experiencing a heightened sense of fear and insecurity (Forbes 2000a).

The second variable was assessed by counting the number of settlements within a 3 km radius of each location. This count is a rough proxy of the physical connectedness of each site, showing how many surrounding villages were readily accessible in times of dire need. The third and fourth variables were assessed using least-cost-path and line-of-sight analysis, respectively.

Using Least-Cost-Path Analysis to Assess Coastal Access

Much of Mani’s coastline is comprised of sheer cliffs that plummet to the sea below, a characteristic of the region’s geography that offers protection to some residents while granting easy ocean access to others. Nonetheless, there are dozens of bays scattered along the coast that are suitable for docking small boats, and a few that can accommodate larger vessels. Access to the coast—and therefore, access to marine food resources and maritime trade, as well as potential danger from seaborne attacks—would have been an important factor in settlement location.

In order to gain a more realistic sense of the actual distance between settlements and their nearest coastal access point, least-cost-path (LCP) analysis was used to model and measure the least costly routes leading from each settlement to the coastline (Fig. 6). LCP analysis is designed to delineate the most ideal pathways between two or more points based upon priorities chosen by the analyst. These priorities are the total “cost” of moving across a landscape, and they can be defined by any number of variables, including slope, energy expenditure, time spent travelling, type of vegetation, and so on. The resulting accumulated cost surface can then be used to isolate the least-cost paths (de Smith et al. 2007, pp. 150–154). For this study, the least-cost paths were assessed based upon the slope of the paths leading from the settlements. It is worth noting the limitations of current LCP algorithms; although they will likely be refined and improved with time, in their present state they can produce idealized pathways that do not necessarily align with realistic or known paths. Their most relevant limitation is that they fail to model anisotropic landscapes, thus failing to take into account the direction of movement (Conolly and Lake 2006, pp. 252–257; Llobera et al. 2011, pp. 849–850). Stated another way, LCP algorithms model the path that water would follow

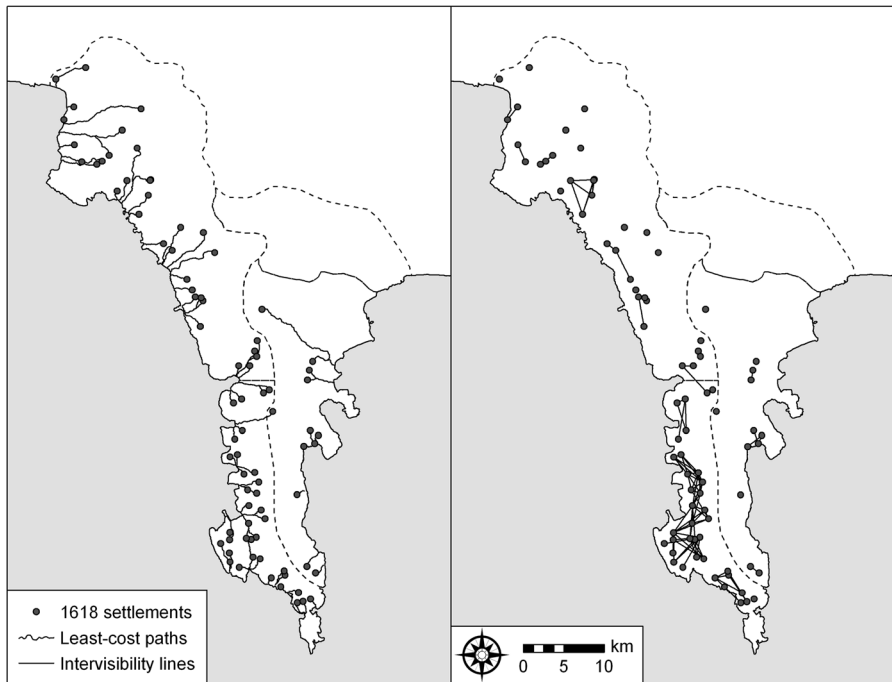


Fig. 6 Least-cost paths to nearest coastal access points (*left*) and intervisibility lines within 5 km radii (*right*), using 1618 data for demonstration

when flowing downhill, rather than the path a person would choose for walking across a landscape. While it is hoped that future applications will address this inherent limitation and provide an even more accurate prediction of ideal pathways, current LCP analysis does provide interesting insights into the significance of a settlement's location in terms of movement and accessibility.

Using Line-of-Sight Analysis to Assess Intervisibility

Visibility is another quality that can serve protective or defensive measures, while also making settlements more vulnerable in times of conflict. There are several different aspects of visibility that can be investigated: the amount of land and water visible to a settlement (i.e., its viewshed); the ability to spot the settlement from far away; or the degree to which the atmosphere, the color and pattern of surrounding vegetation, or personal visual ability obscures the settlement (Llobera 2003, p. 29; Wheatley and Gillings 2000, pp. 2–14). Another aspect that is commonly investigated in archaeological studies is that of intervisibility, or the ability for people standing on two different points in the landscape to see one another.

These visual qualities are important for archaeological interpretation only in so far as they are intentional on the part of the settlement founders. Studies of viewshed and intervisibility are quite common, and they are used, for example, to support ideological interpretations of monuments (Ruggles and Medyckyj-Scott 1996; Wheatley 1995) and militaristic interpretations of towers and forts (Caraher et al. 2010). While a good view

of the surrounding landscape or a high degree of intervisibility may simply be a happy accident, an archaeologist might infer intentionality when it is paired with other qualities—heightened warfare, defensive architecture, religious architecture, or connection with similar sites. In the case of the villages and towns in Mani, intervisibility could have served as a communicative network in times of duress.

To measure the number of intervisible settlements—a proxy for comparing the visual connectedness of the sites—line-of-sight analysis was used to verify visual connections with other sites within a 5 km radius (see Fig. 6). This buffer is a rough approximation of the distance that can be seen on a clear day from a low elevation, taking into consideration the fact that the earth's curvature limits the distance that can be seen in reality. Observer height was defined as 3 m above site elevation in order to emulate standing on the first floor of a traditional, fifteenth- to eighteenth-century Maniate house, typically constructed with a 1.5–2 m high ground floor that was used for storage and animal pens and an elevated first floor that was used as the primary living space (Saitas 2001, p. 39).

Contextualizing Mani's Population in History and Space

Once the GIS database of settlements was completed and the spatial attributes assessed, the population records from Mani could be used to measure the impact of Ottoman incorporation at a local scale. During the span of these records, four particular “events” or periods were most likely to have been imprinted upon the local landscape of Mani: (1) the increasing economic and political turmoil of the seventeenth century, (2) the temporary transfer of power from Ottoman to Venetian hands in 1685, (3) the return of Ottoman control in 1715, and (4) the collapse of the Ottoman Empire in Greece in the early nineteenth century. Keeping in mind that the documents sometimes over- or under-estimated the number of people living in Mani, Mani's population generally increased, with a temporary decrease around the year 1700 when the Venetians took control of the area. Comparing Mani with other regions under Ottoman rule shows that its population responded differently to the large-scale social, political, and economic phenomena of the time (Fig. 7). Other parts of Greece experienced the same initial population decline, including the districts of Atalanti and Boeotia in Central Greece (Kiel 1999, figs. 15.14, 15.15, and 15.10), but otherwise Mani experienced a unique demographic trajectory. Moving beyond this basic population data, locating the settlements in space allows us to identify different ways that incorporation may have affected Mani. Taking an intra-regional perspective, we can begin exploring whether the sub-regions of Mani reflect the same patterns at the regional scale, or whether they responded in more localized ways.

Event No. 1: Increasing Turmoil in the Seventeenth Century

The advent of Ottoman rule initially brought stability and centralized leadership to many areas in the Mediterranean that had been part of a flailing Byzantine Empire. In Greece, this prosperity translated to a doubling or tripling of population in some regions (Kiel 1999, pp. 196–198; Topping 1972, p. 70). However, a number of factors contributed to widespread decline in the seventeenth century, and economic difficulties further weakened the empire and depleted the population in Greece (Kiel 1999, p. 198).

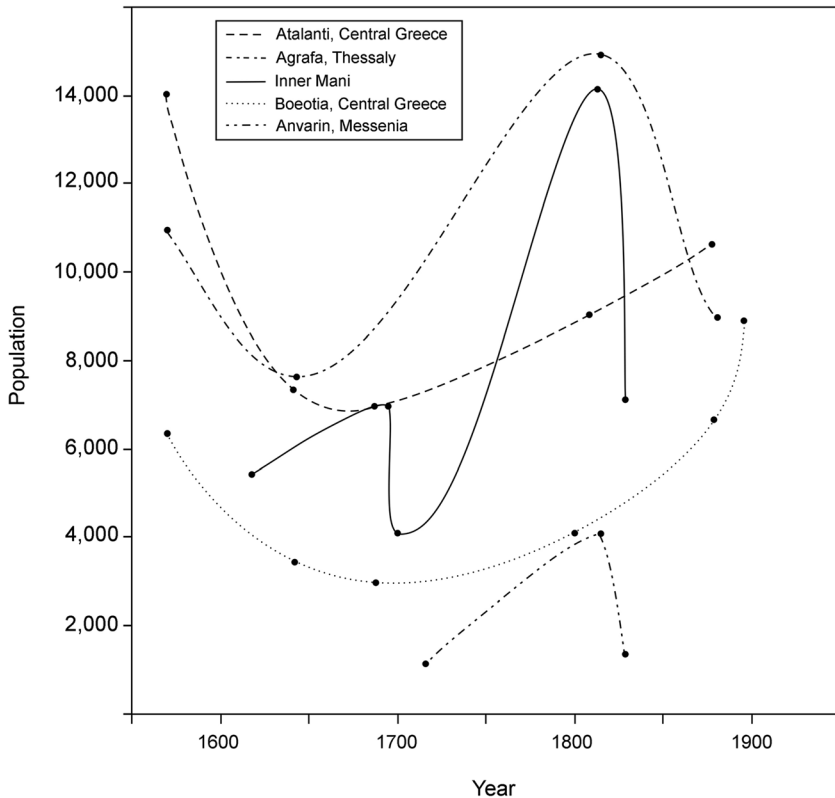


Fig. 7 Population of Inner Mani compared with four other regions in Greece: the district of Atalanti in Central Greece (Kiel 1999, fig. 15.6); the district of Agrafa in Thessaly (Kiel 1999, fig. 15.8); select villages in Boeotia (Kiel 1999, fig. 15.10); and the district of Anvarin in Messenia (Zarinebaf et al. 2005, table 4.3). When necessary, a multiplier of 4 was used to convert household data into total population figures

By the end of the century, the empire was in continual dispute over key territories with neighboring powers like Venice. In most places, the peace and prosperity ushered in by the early Ottoman Empire was punctuated by tumultuous political and economic events.

The 1618 document provides insight into the impact of the seventeenth-century turmoil on Mani's landscape. This record shows that Outer Mani was distinct in many ways. Its settlements were located at higher elevations and farther from the coast than were settlements in other parts of Mani, suggesting that accessibility to the sea was not a priority for residents (Figs. 8 and 9). At the same time, the six largest settlements recorded in the 1618 document were all in Outer Mani, including Oitylo (with 1640 people) and Kelepha (1230). These two towns are both perched on the coastal plateau just over 200 m above sea level, and they are separated from one another by a deep ravine that can only be crossed by descending to the bay and following along the coastline. Despite this divide, they are considered the heart of the early Ottoman presence in Mani, with Oitylo serving as the economic capital and Kelepha as the primary administrative center (Wagstaff 1977, p. 219). Later, in 1670, the fortress established (or perhaps rebuilt) at Kelepha would serve as the empire's primary military

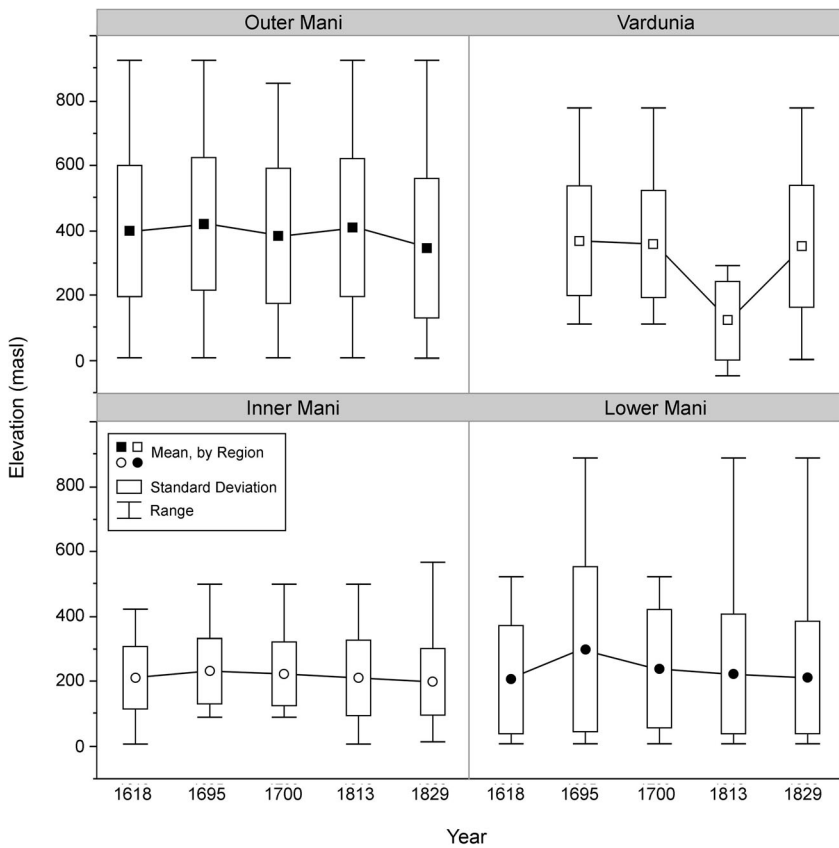


Fig. 8 Average elevation of settlements, by region

base in the region. The spatial analyses support this historical account, highlighting the uniqueness of Outer Mani just after Ottoman power had reached its apex.

The spatial analyses also show that the settlements of Inner Mani were significantly more connected, both physically and visually, than those in other regions—a pattern that would persist through most of the Ottoman period (Figs. 10 and 11). The increased connection is likely the result of a much higher settlement density in Inner Mani (0.20 settlements per km²), compared with that of Lower (0.04) and Outer Mani (0.06) (Table 3). The residents of Inner Mani seemed to deliberately select settlement locations that maximized intervisibility and nearness to others, thereby enabling residents to communicate much more efficiently and resist Ottoman forays from nearby Kelepha.

Event No. 2: The Venetian Takeover in 1685

By the end of the seventeenth century, many areas throughout the Ottoman Empire began to suffer from grain shortages, famine, and plague (Braudel 1972, pp. 593–594). In large part, these problems were due to a period of exceptionally wet and cold weather brought on by the climax of the Little Ice Age (i.e., the Late Maunder Minimum), which lasted

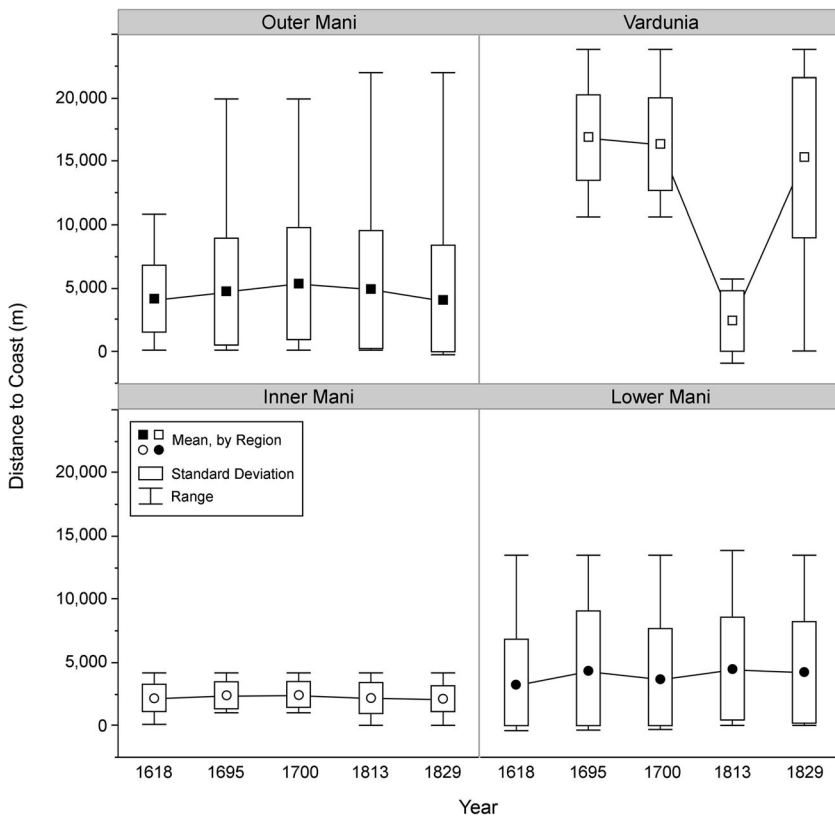


Fig. 9 Average distance from settlements to the coast, by region

from 1675 to 1715 (Braudel 1972, pp. 272–274; Grove and Rackham 2001, pp. 138–139; Luterbacher et al. 2001). Economic difficulties like inflation further weakened the empire and left its borders in the Peloponnese exposed and vulnerable to external threats (Cavanagh et al. 2002, p. 373). When the Venetians temporarily conquered the area at the end of the seventeenth century and took count of its population, they noted that many settlements had been abandoned. As in Mani, their records for Messenia indicate a period of drastic population reduction followed by slow recovery beginning at the turn of the eighteenth century (Davies 2004, p. 61). The Ottoman records from the early eighteenth century indicate a similar trend of population decline; in Boeotia, for instance, the population was reduced by nearly half (Kiel 1999, p. 198).

In terms of overall settlement patterns, the 1695 and 1700 documents show that the Venetian takeover in 1685 had less of an impact on Mani than might be expected, although many of the settlements that had been occupied in 1618 were abandoned temporarily (Fig. 12). Some of these were reoccupied later on, but by the time the final census was recorded in 1829, only 68 % of the original 1618 settlements were still in use. It is worth mentioning that elsewhere in the Peloponnese, temporary settlement “abandonment” as seen in the 1700 record may have been a normal element of rural life (Forbes 2007). Even so, this population movement did not have a notable effect on the spatial patterning of settlements when compared to 75 years prior. Inner Maniate

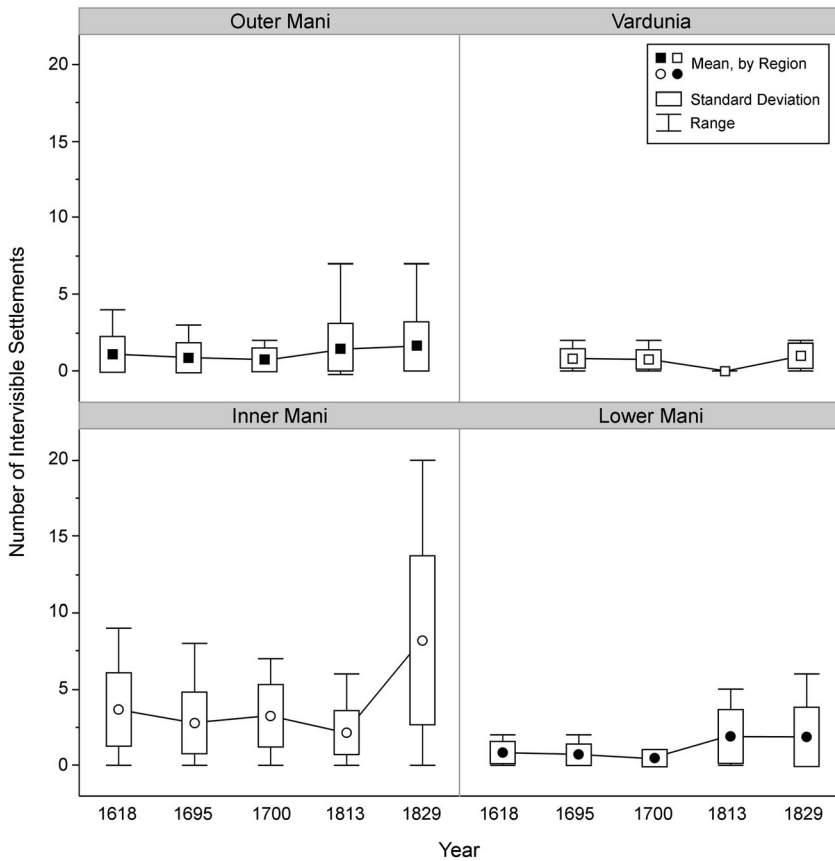


Fig. 10 Average number of intervisible settlements, by region

settlements retained their high degree of physical and visual connection, despite experiencing a drop in settlement density (from 0.20 to 0.16 settlements per km² in 1695) ($p < 0.0001$). Likewise, Outer Mani and Vardunia both had higher average site elevations than did the other two regions, as well as greater distances from the coast ($p < 0.01$). Vardunia was remarkable in this regard, as its settlements were extremely far away from the coast compared with those in Inner, Lower, and Outer Mani (see Fig. 9) ($p < 0.0001$). Just as Inner Mani stood out for its high degree of settlement connection, this particular trait continued to characterize the Vardunia settlement pattern throughout most of the Ottoman period.

While the 1695 and 1700 documents are not very different in terms of which settlements they include, they differ drastically in terms of the number of people reported in each settlement. Specifically, the 1700 document suggests a dramatic loss of population in Mani, which Wagstaff (1978) attributes to long-term socioeconomic processes culminating in the loss of territory to the Venetians. Incidentally, the document also records the depopulation of the neighboring peninsula of Messenia (Topping 1972, p. 71). This incongruity between the 1695 and 1700 documents leads to an interpretive problem when tracking changes in total population. For example, if the population estimates are taken at face value, there appears to be a dramatic growth in

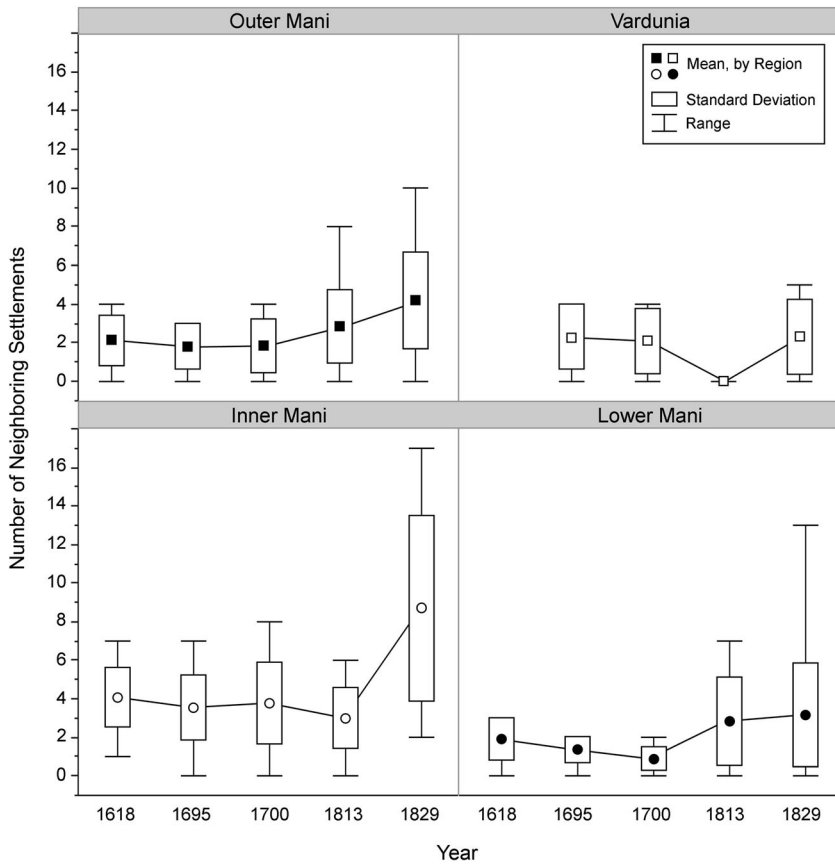


Fig. 11 Average number of neighboring settlements, by region

the 75 years after the report from 1618 (an annual population growth rate of 0.65 %), followed by a swift and catastrophic depopulation 5 years later (population growth rate of -16.25% ; see Table 1). If, on the other hand, the 1695 report is excluded, the average population growth rate from 1618 to 1700 would be -0.47% , a much more conservative figure. The documents thus lead to two rather different interpretations of what happened demographically in Mani at the turn of the eighteenth century. It is

Table 3 Regional settlement density, 1618–1829

	1618		1695		1700		1813		1829	
Region	<i>N</i>	Density ^a	<i>N</i>	Density	<i>N</i>	Density	<i>N</i>	Density	<i>N</i>	Density
Outer Mani	34	0.06	23	0.04	19	0.04	39	0.07	50	0.09
Inner Mani	36	0.20	29	0.16	27	0.15	27	0.15	56	0.31
Lower Mani	12	0.04	11	0.04	9	0.03	35	0.12	38	0.13
Vardunia	–	–	11	0.06	12	0.06	2	0.01	16	0.09

^a The number of located settlements per sq. km. The area of Outer Mani is 540 sq. km; Inner Mani, 179 sq. km; Lower Mani, 298 sq. km; and Vardunia, 188 sq. km

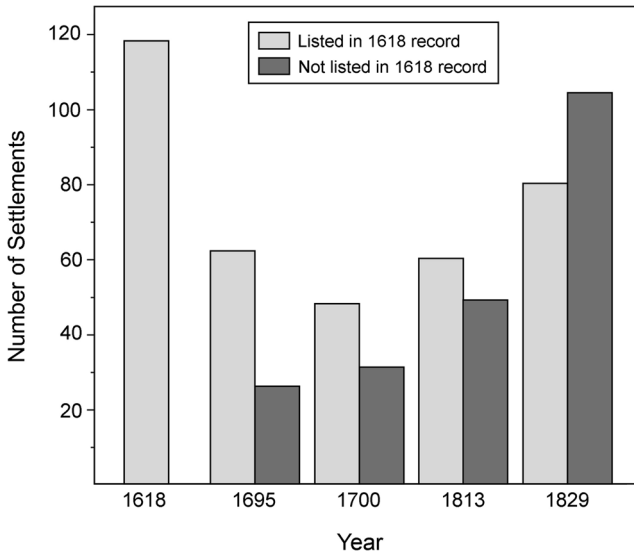


Fig. 12 Continuity of the settlements occupied in 1618, using total settlement data (see Table 1)

important to approach the total population figures with caution, both because of the differences in how and why these documents were compiled, and because of the issues stated above regarding the potential inaccuracy of the 1700 list.

The 1695 document suggests that population increased throughout Mani despite growing unrest in the Ottoman Empire and increased conflict as the Venetians struggled to take hold of the Peloponnese. As in 1618, the settlements of Outer Mani had a much higher average population in 1695 than in any of the other regions (Fig. 13) ($p < 0.001$). Again, the five largest settlements were all in Outer Mani, however none of these were the former Ottoman strongholds of Oitylo and Kelepha. Instead, population shifted to a cluster of settlements more than 10 km to the north (Milia, Platsa, Nomitsi, and Lagkada) and to another settlement over 30 km away (Kampos). It seems the gravitational center of the region shifted toward the Messenian Peninsula, where the Venetians had established firm control.

Meanwhile, the sixth largest town in the peninsula was the rising capital of Inner Mani, Tsimova (modern-day Areopoli), which may have attracted some of the population from nearby Oitylo and Kelepha. While Inner Maniate settlements were comparatively smaller and denser than in the other regions, its overall settlement pattern was beginning to change, foreshadowing the pattern of small, densely clustered villages that would characterize the region in 1829. This pattern would reflect the pronounced clan-based social organization of Inner Mani that would ultimately make it critical in the fight for freedom, since the structure of the Maniate rebel groups was much more fluid than that of the formal Ottoman army. In short, the 1695 document shows signs of the region's later transformation into a key area of protest and resistance against the empire.

The 1700 document paints an entirely different picture than its predecessor, with overall population loss particularly in the north and less marked regional differences in average settlement population. Specifically, settlements in Outer and Lower Mani are only slightly larger than those in Inner Mani and Vardunia ($p < 0.05$; see Fig. 13) One

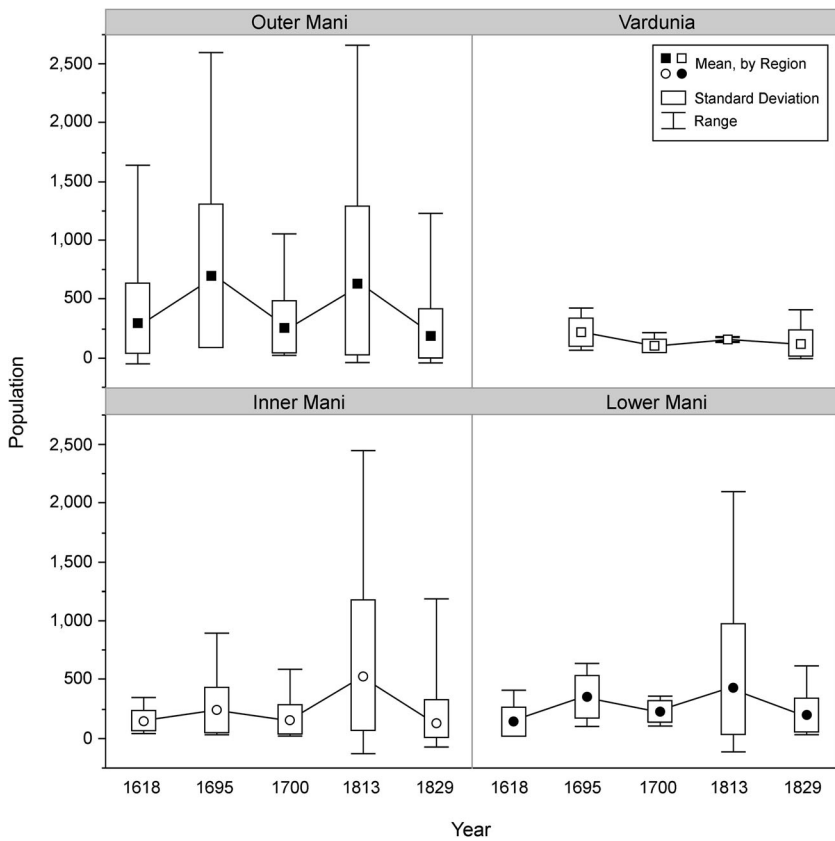


Fig. 13 Average settlement population, by region

possible reason for this discrepancy with the 1695 record is that three of the largest settlements in 1695 are not listed here (Platsa, Nomitsi, and Langada), while Milia is reported to have a mere 157 people (compared with an estimated 2597 in the 1695 record). Perhaps this particular settlement—listed as “Maltizza” in 1700 and “villa Milea” in 1695—was correlated incorrectly, but even a mistake like this does not account for the fact that the 1700 authors omitted a number of large and important settlements in the northern part of Mani.

Although the two records seem at odds with one another, they agree on one point: Lower Mani was undoubtedly growing at the turn of the eighteenth century. Both records list three of its largest settlements (Lagia, Vata, and Siderokastro), and they also document an increase in overall average settlement population (see Fig. 13). Interestingly, the two largest settlements are located in the southern part of the region. Lagia lies in the mountains about 6 km north of the Ottoman fortress at Port Kagio, but like many of the towns in Inner Mani, it is well known for its clan rivalries and tower constructions (e.g., Kalamara and Roumeliotis 2004, p. Fig. 94). Vata, on the other hand, guards a large bay and relatively fertile valley, and it sits at one end of the pass leading across the Taygetos Mountains to Tsimova. This particular pass is one of the best ways to cross into Inner Mani from the east, although its eastern opening is

protected by an arm of the Taygetos that stretches to the sea and protects the town to its north. At this point in time, the prosperous towns that would come to dominate the northern part of Lower Mani had not yet appeared.

Event No. 3: The Return of the Ottomans in 1715

Following the reinstatement of Ottoman control in the Peloponnese in 1715, many regions experienced steady population growth during the eighteenth century (Kiel 1999, p. 199; McGowan 1981, p. 171). However, archaeological research in Laconia, Boeotia, and the Argolid have identified many settlements that were depopulated or entirely abandoned by this time, as well as a few that had become nucleated (Cavanagh et al. 2002; Stedman 1996). In many areas, agricultural production came to be dominated by monasteries and large estates, rather than remain in the hands of small-scale landholders (Forbes 2000b). Travelers' accounts from the period just following independence, particularly the accounts of Sir William Gell (2011 [1823]) and William Martin Leake (1830), are often cited to support a model of depopulation in the later Ottoman period.

Although many of Mani's seventeenth-century settlements were abandoned by this time, the region does not appear to have suffered the same depopulation as elsewhere in eighteenth-century Greece. This divergence may be related to the changing land tenure system that affected other parts of the Peloponnese, but from which Mani was seemingly removed. Once they reestablished control, the Ottomans instituted a new system of commercialized tax-farming to replace the former prebend system, which involved temporary grants of land from the state called *timars* (McGowan 1981, pp. 47–51; Barkey 1996, pp. 467–469). The *timar* system was an intricate part of the Ottoman state's expansion strategy. Individuals granted military fiefs were also allowed to maintain their Christian faith, thereby providing ideological incentive to accept the new economic system (Necipoğlu 2009, p. 27). In turn, the *timar* system came to fill the structural role once occupied by the Byzantine *pronoia* (see Laiou 1973, p. 144).

The most common form of land tenure employed under the new system was a hereditary, private estate called a *çiftlik* (Laiou 2007; McGowan 1981, pp. 58–73; Zarinebaf 2005, p. 29). The transition from state-owned *timars* to privately-owned *çiftliks* was partially promoted by the Ottoman state, but it was also likely aided by the early eighteenth-century population decrease and the subsequent availability of abandoned farmland in most of the Peloponnese (Zarinebaf 2005, p. 42). The *çiftlik* system was closely associated with monoculture crops intended for faraway markets, reflecting the increasing integration of the Ottoman Empire within the emerging capitalist world-economy (McGowan 1981, p. 46; see Wallerstein 1974). On the other hand, the privatization of land under this new system had devastating effects on the lower class. Peasant land was often confiscated and transferred to former *timar*-holders, and peasants were subjected to unbearable taxes (McGowan 1981, pp. 66–71). The *timar* system, however, was never implemented in Mani (Sugar 1977, p. 42), and the *çiftlik* system that replaced it was limited. Ongoing research on the Ottoman *tahrir defters* shows that only two *çiftliks* existed in Mani in the year 1715, but they were restricted to the northeastern part of the region near modern-day Gytheio (Başbakanlık Osmanlı Arşivleri TT878). This evidence suggests that Mani largely avoided the oppressive socioeconomic context in which most Greek peasants lived during the eighteenth

century, perhaps helping to explain why Mani's population temporarily increased while that of its neighbors did not.

Ideally, the impact of the reinstatement of Ottoman control would be explored using historical data from the early or middle eighteenth century. Currently, however, the only available document that discusses Mani following the return of Ottoman power to the region is the 1813 record. The sub-regions of Outer and Lower Mani did not experience dramatic changes at this time. As with the previous records, the settlements of Outer Mani were consistently located at higher elevations ($p < 0.0001$) and slightly further from the coast than other regions ($p < 0.05$). Its settlements, along with those in Lower Mani, experienced a slight increase in the degree of physical and visual connection compared to previous years. ($p < 0.05$ for all variables except neighbors in Outer Mani, with $p < 0.01$). In addition, Lower Mani experienced an increase in settlement density (0.12 settlements per km²), rivaling that of Inner Mani (0.15). Altogether, these were relatively minor changes.

The other two regions, by contrast, experienced dramatic changes that highlight potentially interesting interactions with large-scale phenomena. The case of Vardunia is unusual because of the lack of representation it received in the 1813 record. This list omits ten mountain settlements in the western part of the region, all of which were noted in the 1695 and 1700 records and again in 1829. The omission is curious because the document records a number of nearby mountain settlements, no more than 2 km away, that happen to fall within the borders of Outer and Lower Mani. These locations would have been reached by paths that ran through the missing towns, or else passed very nearby. Again, one may be tempted to treat the omission as a recording error. If it is not, then the temporary abandonment of the Vardunia highlands—and the region, as a whole—is an intriguing, albeit mysterious, phenomenon. The only two settlements that are listed in the 1813 account, Lagio and Trinisa, appear for the first time in this record, but their combined population (about 315 individuals) cannot account for the people recorded over a century earlier (Table 4). Also interesting is the fact that these two settlements are relatively low in elevation and near to the coast, contrary to the previous, more mountainous settlement pattern in the region. Their size is also consistent with the earlier pattern, an oddity in that the average population of all the other regions skyrockets in 1813.

The most dramatic change took place in Inner Mani. For the first and only time, the settlements here did not have a significantly higher degree of physical or visual connection than the other three regions. For the most part, this pattern is the result of the temporary abandonment of many settlements that were listed in the 1695 or 1700

Table 4 Regional population, 1618–1829

Region	1618	1695	1700	1813	1829
Outer Mani	9930	16,027	4807	24,406	9334
Inner Mani	5412	6972	4091	14,151	7128
Lower Mani	1693	3881	2063	15,033	7527
Vardunia	–	2414	1221	315	1850

Data from located settlements only

records. Perhaps the Maniate chief who compiled the figures overlooked some of these settlements and recorded only a patchy list of places in Inner Mani. But if the spatial pattern is reflecting a real phenomenon, the decrease in connectivity has interesting implications. Antagonism toward the Ottoman Empire was coming to a head, and the war for independence would be sparked, in part, by a group of Inner Mantiates only eight years later. Because of this dramatic historical event, one might expect the Inner Maniate settlement pattern to reflect the build-up prior to revolution, particularly in terms of a high settlement density. Together with increased physical and visual interconnection, these attributes would have enabled the communities to more efficiently coordinate their attempts at armed resistance. Instead, the patterns reveal a marked *decrease* in settlement connection. In other words, this record seems to reflect more the declining political and economic climate of the previous century than the communities' preparations for war.

Another notable pattern that was identified during the LCP analysis supports the interpretation that the buildup to revolution did not mark the landscape in terms of a defensive settlement pattern. Many of the settlements that are closest to the coast—including the quaint fishing villages that are now frequented by tourists—were uninhabited prior to the nineteenth century. Before that time, people tended to live in areas further from the coastal bays and beaches. Of all the settlements that appear only in the 1813 or 1829 lists, almost half of them are located within 2 km of a bay suitable for docking small boats. By contrast, only 30 % of the settlements that appear in one of the earlier lists are within that distance (Fig. 14). This pattern may reflect the higher threat of attacks from the sea prior to the nineteenth century, or an increase in reliance on fishing and local maritime trade after the return of Ottoman control.

Event No. 4: The Fight for Freedom

The final document from 1829 indicates that of all the historical events, the collapse of the Ottoman Empire in Greece in the early nineteenth century left the strongest material imprint upon the landscape of Mani. As a whole, Vardunia seemed relatively unaffected; its settlements returned to the mountainous pattern seen in 1695 and 1700 ($p < 0.0001$ for both), with an average distance from the coast of around 15 km. Yet the overall impact is clearer. For one, the entire peninsula experienced a significant population decline, with an annual growth rate after 1813 of -4.63% (see Table 1). This population loss affected Outer Mani the most severely, despite the fact that the number of settlements actually grew. The region's settlement density increased to 0.09 settlements per km^2 , further heightening the degree of physical and visual connection that the region first experienced in 1813. However, the population loss meant a reduction in average settlement population to its lowest point in the entire Ottoman period (see Fig. 13) ($p < 0.0001$). In other words, settlements "fractured" into smaller but more numerous communities. A similar change affected Inner Mani, which experienced an explosion in settlement density (0.31 settlements per km^2) despite an overall population loss (see Table 4). The added settlements contributed to a huge gain in settlement connection.

Time and again, the settlements of Inner Mani stood out as having a particularly high degree of physical and visual connection, but the extreme change in 1829 reflects just how seriously a regional landscape may be affected by large-scale phenomena like

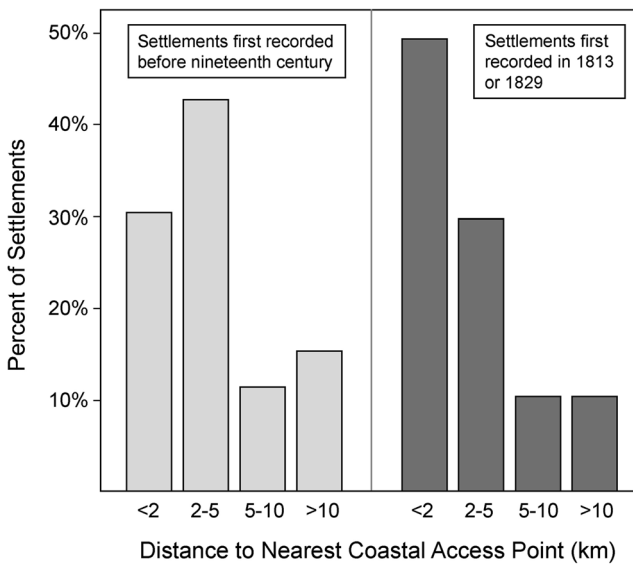


Fig. 14 Distance to the nearest coastal access points, comparing settlements occupied before the nineteenth century with those first recorded in 1813 or 1829

warfare and political conflict (see Figs. 10 and 11). As mentioned above, the residents of Inner Mani were involved in leading the first attack against the Ottoman forces stationed in Kalamata, and their eventual victory was even commemorated by renaming their regional capital after the Greek god of war. The town to its south, Pyrgos Dirou, is also famous for thwarting the Ottoman navy when it tried to land forces in the bay to attack the Maniate rebels from behind. Most of the local men had left to fight in the war, leaving the local women to fend off the navy with stones and sickles. Their victory continues to be celebrated every summer in a local festival. All along the western coast, isolated towers and fortified complexes were erected to repel Ottoman forces, stretching from the settlements deep in Inner Mani all the way north to Outer Mani. These preparations for war left an indelible impact upon the structure of the Maniate settlement system, fracturing villages into smaller and more numerous localities that could more easily communicate with one another.

Perhaps the most interesting result of this study is the discovery that the average site elevation did not change significantly in any of the four regions, and as such, this analysis provides another case study that contests the “height-zonation hypothesis.” The spatial analysis of Maniate settlements also demonstrates that conflict may leave fewer material traces upon a landscape than might be expected. The period of Venetian rule from 1685–1715 left its mark in the form of temporary settlement abandonment, but the populations of these communities relocated and founded new settlements with remarkably similar spatial attributes to the ones they had left behind. More intense conflict, however, did leave a lasting impact upon the Maniate settlements, just not in the way that the height-zonation hypothesis predicted. In Mani at least, the Greek revolution did not shift people into mountainous areas, but it did cause settlement fracturing, a heightened degree of physical and visual connection, and overall population loss.

Conclusion

The methodology presented in this study allows scholars to visualize the way large-scale phenomena, including imperial expansion and conflict, are imprinted upon the local human landscapes in which they take place. It begins with historical demographic records, snapshots of a region's settlements and population at a particular point in time, and combines them into a powerful analytical database that can be used to track changes in spatial variables like elevation. Tools like line-of-sight and least-cost-path analysis also allow for more complex assessments of settlement intervisibility and pathways to coastal bays. This particular study of the Ottoman-period settlements in Mani demonstrates the utility of the approach in uncovering new relationships between large-scale processes and local responses. Contrary to what might be expected for a territory embroiled in armed conflict in the later Ottoman period, residents did not retreat to the mountains to protect themselves; instead, they responded in different ways that became clear only after studying the spatial distribution of settlements. In this way, spatial analysis is a useful way to model the changing environment in which people lived and died, allowing us to bring demographic data to life by painting them upon the canvases of three-dimensional landscapes.

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