

The Use of Remote Sensing Methods for Studying of the Ancient Greek Land Division System of Tauric Chersonesos on the Mayachnyy Peninsula of the Crimea Peninsula



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Abstract A detailed analysis of the 1940s archival aerial photographs and a 1966 satellite image, has shown that the earliest land division of the ancient Tauric Chersonesos affected the Sredinnyy Peninsula of the Crimean Peninsula, as well as the territory to the southeast of the fortification on the isthmus of Mayachnyy, which is on the outside the Mayachnyy Peninsula. Before, it was believed that such division had affected only the territory of the Mayachnyy Peninsula. Land surveying of the Sredinnyy Peninsula probably began from the Great Chersonesos road, as evidenced by the parallel orientation and the regular square shape of the blocks of sections adjacent to the road. Thus, the area of the initial land surveying was probably 930–940 hectares, almost twice of the territory of 460–470 hectares, as it has been previously assumed.

Keywords Tauric Chersonesos · Ancient greek land division system · Mayachnyy peninsula · Remote sensing methods

1 Introduction

The townsite of Chersonesos and its nearby agrarian surroundings (the chora) are now the rare example of a well-preserved ancient Greek cultural landscape in the Mediterranean and the Black Sea region. In 2013, owing to its worldwide scientific importance, the archaeological site of the ‘Ancient city Tauric Chersonesos and its chora’

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was included in the list of monuments protected by UNESCO. The Mayachnyy Peninsula constitutes the north-western extremity of the Heracleian Peninsula protruding to the open sea and separated from the latter by the Kazachya Bay deeply cut into the coast from the north (Fig. 1a). It is exactly here, as many researchers suppose, that the earliest Chersonesean land division was carried out in the first half of the fourth century BC. The neck of land 760 m wide, formed by the endpoint of the bay, and the sea is raised 20–36 m above sea level and dominates the entire adjoining area of the Herakleian Peninsula. At this isthmus, not later than at the end of the first—beginning of the second quarter of the fourth century BC, a fortification was erected constituted by two lines of defensive walls with towers (Shcheglov 1993).

The prominent Russian archaeologist Mikhail I. Rostovtsev, informed by Strabo about ruined Old Chersonesos (VII 4. 2), has presumed that the site had been situated on the isthmus of the Mayachny Peninsula and only subsequently was transferred to the place where now the Chersonesean townsite is located (Rostovtsev 1914; Nikolaenko 2018). The discovery of the fortifications on the isthmus of the Mayachny Peninsula by Karol Kościuszko-Waluszyński in 1890 initiated the discussion on their character. The scholars considered the hillfort on the isthmus as one of the Chersonesean strongholds mentioned in the Chersonesean Oath (IOSPE I², 401), a shelter site barring access to the settled Mayachny Peninsula. Shcheglov (1994) has reconstructed the general plan of the fortifications on the isthmus, drawn their detailed plan, and defined their purpose as a combination of a military fortress viewing the Herakleian Peninsula, the agricultural territory, a dwelling district with a specially allocated sacred area in the south and a haven in the north. An investigation of fortified structures conducted on the isthmus by Dem'yanchuk and Nessel' confirmed the Shcheglov's supposition that the fortification here combined the function of a fortress and a settlement (Dem'yanchuk and Nessel 2011). Based on the aggregate evidence, Nikolaenko (2018) has succeeded in the reconstruction of the history of the chora of the Mayachny Peninsula on the isthmus where, in the second quarter of the fourth century BC, a fortified settlement was built. According to Zedgenidze (2019), the purpose of the fortress was that of the protection of the land plots on the Mayachny Peninsula, preventing the necessity to construct fortified towers in the estates, like it was within the other area of the Herakleian (надо: Herakleian) Peninsula (Zedgenidze 2019).

The first detailed plan of the Chersonesean land division system was compiled in 1786 by the topographer I.O. Pepelev by the order of Academician K.I. Hablitz. The second,—unique in its information richness,—plan of the remains of the ancient land-division structures on the Mayachny Peninsula was drawn by lieutenant-colonel L. Serristori in 1825 (Nikolaenko 2018). The next research stage included a recording of the scheme of ancient land plots in the half-verst map (1 versta = 0.5334 km) of 1886 (scale 1:21,000). Rostovtsev recognized the great significance of the discovery of the ancient land-division system for the entire Black Sea and Mediterranean region. In 1911, Pechenkin, after a recommendation by Rostovtsev, realized a corrected plan of the ancient land plots on the Mayachny Peninsula (Shcheglov 1993). In the 1960s, Strzheletskiy in collaboration with Shcheglov, Kutykina (Nikolaenko), and Zhrebtsov drafted field drawings of blocks nos. 49–54 on the Mayachny Peninsula

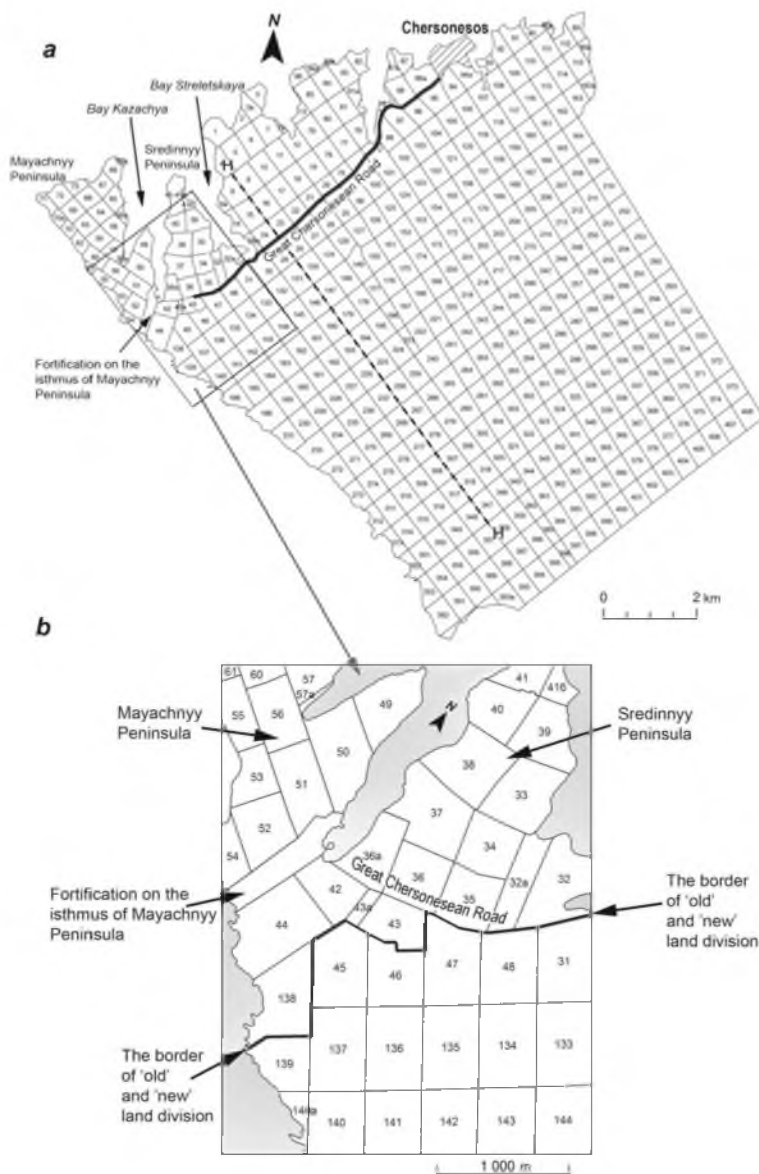


Fig. 1 a—plan for the land division of the Herakleian Peninsula created based on archival aerial photographs of the 1940s and satellite image of 1966; b—an enlarged part of the ancient land division in the area of the Mayachnyy and Sredinnyy peninsulas

(Nikolaenko 2018). Later, in 1969–1983, the collection of detailed drawings on location was supplemented by topographic plans fulfilled by Ye.N. Zherebtsov on several blocks in the south of the Mayachnyy Peninsula (1985).

2 Materials and Methods

Despite the important attainments of the archaeological cartography in the sphere of recording the remains of the ancient land division, a critical moment in the studies of the ancient land division at the near chora of Chersonesos, including the Mayachnyy Peninsula, has come only when the collection of trophy German Luftwaffe photos of 1941–1944 kept in the National Archives and Records of the United States of America (NARA II) became available. The special importance of this source is in the fact that by the beginning of the World War II, the areas of the Heraklean and Mayachnyy peninsulas still had not been built up and, therefore, the structure of the ancient land division is visible undisturbed in these images. For plotting the grid of land lots, a CORONA panchromatic satellite photograph of 1966 with the spatial resolution of 0.5 m was used. It was obtained from the resources of the National Geological Service of the United States of America (USGS). Based on the mosaic of the geo-referenced aerial photographs of 1941–44, along with the satellite photo of 1966, the grid of ancient land division was plotted with precise geographic coordinates. The detailed plans of the internal division of blocks of the land plots over the entire Heraklean Peninsula including the Mayachnyy Peninsula, were also drawn (Fig. 1a) (Smekalova et al. 2018). The main principles of the Chersonesean land division were thus defined (Smekalova 2019). Also, the examination of the detailed aerial photographs of the 1940s has enabled us to return to the problem of the initial ancient land division which is the subject of the present article.

3 Results and Discussion

In the course of the studies mentioned above, it was established that a *hekatorygos*, i.e., a square with the side of 100 *orgyiai* or 209.4 m, was originally the unit of a singular citizen's land lot (Smekalova et al. 2018). The configuration of the plotted grid of land lots (Fig. 1a) and the direction of the division axes on the Mayachnyy and Sredinnyy peninsulas are different from the other territory of the Herakleian peninsula. The sizes of the blocks on the Mayachnyy and Sredinnyy peninsulas constituted of the four citizen's *hekatorygoi* plots also differ from those on the Herakleian peninsula where the blocks comprised 6 *hekatorygoi* each (Fig. 1b). This fact implies that the Sredinnyy Peninsula was among the first land division areas as well as the Mayachnyy Peninsula, as supposed by practically all the researchers (Nikolaenko 2018).

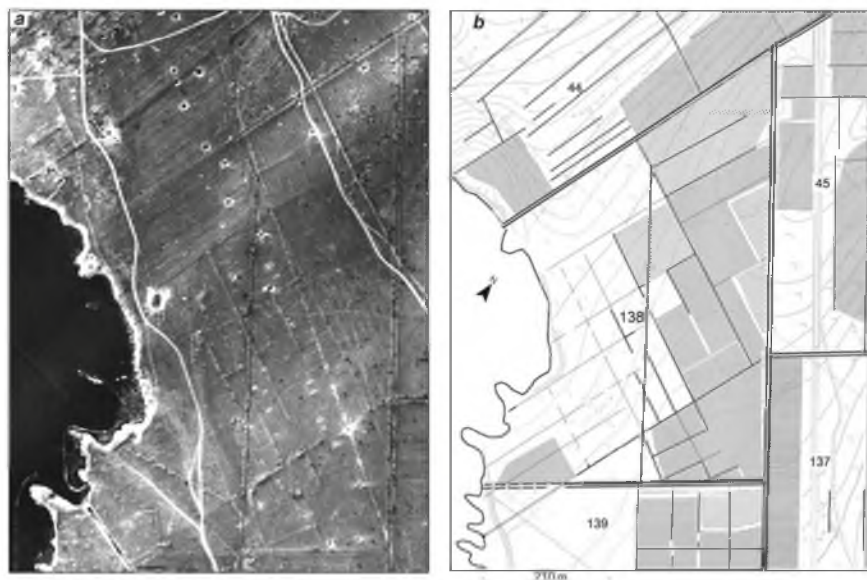


Fig. 2 Block 138: **a**—aerial photograph of April 23, 1944, from the NARA II collection. GX 1893 sd2/994; **b**—a drawing of the internal land division of block 138 against the background of the relief of the terrain

Moreover, the examination of the aerial photos of the 1940s allowed archaeologists to conclude that, according to the ‘initial’ grid, the land was divided before the construction of the fortifications on the isthmus of the Mayachnyy Peninsula on its south-eastern side and at the joint of the Mayachnyy and Sredinnyy peninsulas (Fig. 2a, b). Here, we see a critical difference between the orientations of the borders of blocks nos. 42, 44, 43, 43a, and 138, and the other vast territory of the Herakleian Peninsula.

At the same time, the orientation of the land division of these ‘borderland’ blocks coincide with the directions of the walls of the fortress on the isthmus of the Mayachnyy Peninsula (see Fig. 1a, б). Hence, the area adjoining the external side of the fortification was, possibly, divided simultaneously with the construction of the fortress on the isthmus. Block 44, the extreme one on the southwest from the seaward side, adjoins the walls of the fortification. Block 42 adjoins the fortification on one side and the Great Chersonesean Road on the other (Fig. 1a, b). Blocks 43 and 43a, located south from that road follow the orientation of the walls of blocks 44 and 42.

The specially marked difference between the ‘initial’ plan of the plots and the subsequent total division of the Herakleian Peninsula is discernible at the example of the scheme of the detailed inner division of block no. 138 (Fig. 2b). The external and internal borders of the block, as well as the plantation walls of the vineyards,

were traced through a German aerial photo of 1944 (Fig. 2a). Block no. 138 is demarcated according to the orientation of the walls on the isthmus of the Mayachnyy Peninsula, as well as blocks nos. 44 and 42 (see Fig. 2b). In the junction places of block no. 138 with blocks nos. 45, 137, and 139, which are divided according to the 'new' scheme, we see an abrupt disruption of the inner boundaries and division walls of the vineyards (see Fig. 26). The probable boundary between the 'initial' and 'new' division system is shown in Fig. 16. Blocks nos. 42, 44, 138, 43, and 43a were demarcated according to the 'old system'. Demarcation of blocks nos. 45, 137, and 139 was carried out according to the 'new' rules.

Possibly, the area of the 'initial' land division extended also to the territory which later comprised blocks nos. 45, 46, and 137, but subsequently, during the global surveying of the entire Herakleian Peninsula, these blocks were re-demarcated. It is unclear what induced the surveyors to retain the previous inner division at block no. 138. Perhaps, it was the proximity to the seashore with its irregular outlines, which in the case of re-planning would have compelled surveyors to solve a complicated problem of demarcation of marginal areas. It is also cannot be ruled out that blocks nos. 42, 44, 138, and others, adjoining the Mayachnyy and Sredinnyy peninsulas were owned by some influential citizens who did not want to re-plan their long-established vineyards. This fact can be indirectly suggested by the well-known Chersonesean IOSPE I² 403 inscription where large plots, presumably located in the region of the Mayachnyy Peninsula, are enumerated. Thus, the Pasicharos' land tenure comprised over 22 *hekatorygoi* or 96 ha. Promathion son of Dionysius, also owned a very large plot of land totalling over 20 *hekatorygoi* or 91 ha; otherwise unknown son of Nanon possessed a plot of over 11 *hekatorygoi* (48 ha) (Smekalova & Terekhin 2018; Smekalova et al. 2018).

The land division on the Sredinnyy Peninsula started beginning from the Great Chersonesean Road that is suggested by the parallel orientation and the regular square form of blocks nos. 35 and 36, adjoining the road, as well as blocks nos. 34 and 37 of the 'second row' (see Fig. 16). The bordering blocks nos. 32 and 32a are only blocks of the irregular form, evidently defined by the complex outlines of the Streletskaya Bay. Therefore, we should recognize the high significance of the Great Chersonesean Road that connected the settlement on the isthmus of the Mayachnyy Peninsula with Chersonesos via the shortest and most convenient land route about 8.5 km long.

4 Conclusions

A detailed examination of archive aerial photographs of the 1940s and a satellite image of 1966 succeeded in demonstrating that the earliest land division took place on the Mayachnyy Peninsula, as supposed earlier, and on the neighbouring Sredinnyy Peninsula, as well as at the outside territories to the south-east from the fortification on the isthmus. In other words, the fortifications on the isthmus defended the Mayachnyy Peninsula itself and also its neighboring territories to the southeast and east from the Peninsula. In case of the enemy's attack, people working in these lands could have

a shelter behind the fortification walls on the isthmus, together with the residents of the Mayachnyy Peninsula.

At the same time, the presence of land plots at the approaches from the external south-eastern side of the fortification on the isthmus of the Mayachnyy Peninsula strengthened its defensive capacity because it created additional obstacles against an attacking enemy. The enemy, having entered a vineyard, which was covered with plantation walls and grape spreading or twisting over the trees, had difficulty getting out from there. If the enemy had found himself in an area where the plantation walls ran perpendicularly relative to the walls of neighbouring fields, he would have finally lost the orientation in such a trap. As evidenced by Aristotle, “so rural dwellers act while planting vines arranging them for safety in crossing rows” (Arist. Pol. VII X.5. 28–30).

Thus, it may be concluded that the area of the initial land division was 930–940 hectares, almost twice the territory of 460–470 ha as supposed before (Shcheglov 1993). This figure takes into consideration the rise of the sea level and abrasion of the shores by now, which increase the area by 10–12%.

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