

Disappeared medieval watchtowers in Granada (Spain). Workflow and standards for the survey of a vanished architectural heritage

Among all the Spanish regions, the province of Granada stands out for the large number of isolated towers of which there are still remains. More than 150 are of medieval origin and preserved to a greater or lesser degree. This is due to the fact that Granada was the core of the Nasrid kingdom, the last surviving Andalusian territory in the southeast of the Iberian Peninsula. It had more than 400 km of land border with the kingdom of Castile through the Penibaetic System and another 400 km of Mediterranean coastline. This kingdom, whose centre of power was the Alhambra in Granada, came to occupy approximately 2,949,373 ha after the Pact of Jaén, the agreement signed in 1246 between Ferdinand III of Castile and the first Nasrid king, Muḥammad I ibn Nasr, which established the border between the two kingdoms. The kingdom of Granada was maintained with few modifications over the next two and a half centuries, until the War of Granada,

which caused it to collapse between 1482 and 1491. Many of these towers were reused, remade or built in the Nasrid period, but, after the Christian process of conquest, many of the towers in the interior were rendered unusable or totally or partially destroyed. This work develops the methodology of the workflow that has been followed to detect the location of many other nodes of this dense network based on the analysis of toponymy. The historical accounts show that there were many more watchtowers to survey and protect this kingdom than the ones previously known.



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Keywords:

Defensive towers; Toponymical Analysis, Photogrammetric acquisition procedures; UAS applications in different environments; environmental conservation.

1 INTRODUCTION

From 1238 onwards, when Muḥammad I founded the Nasrid kingdom of Granada, the defensive system of the last Andalusian territories in the Iberian Peninsula was perfected, as its security depended on the maintenance of its fortresses and the control over its communication routes with watchtowers.

From the end of the 13th century, the Nasrid kings always took care of the maintenance and reinforcement of the defences throughout a dense and well-equipped network formed by citadels, enclosures to protect one or several farmsteads, towers of refuge and watchtowers with their respective garrisons. Strategically positioned, they formed the defensive lines on the frontier and inland (Sánchez Gómez, 1996: 16).

Because of this period of greater instability in the late Middle Ages in eastern Andalusia, where this kingdom was developed (since 1833, the provinces of Granada, Málaga, Almería and parts of Jaén), the number of towers exceeds by far those preserved in western Andalusia (the provinces of Sevilla, Córdoba, Cádiz and Huelva) (Fig. 1).

According to the 14th-century Nasrid polygraph and vizier Ibn al-Jaṭīb, in 1347 Yūsuf I (r. 1333-1354) inspected a number of frontier posts of the kingdom in order to improve the defensive system. The number of military towers in his successor's reign, Muḥammad V (r. 1354-1359 and 1391), was estimated to 14,000 (Arié, 1984: 122 and Sánchez Gómez, 1996: 16).

This is an excessively high and unrealistic figure. If there had been such a large number of towers in this territory of almost three million hectares in its maximum expansion, there would have been one of them approximately every 210 hectares on average, almost at every 1.5 km.

Those that are still preserved, together with other towers mentioned in historical accounts, show

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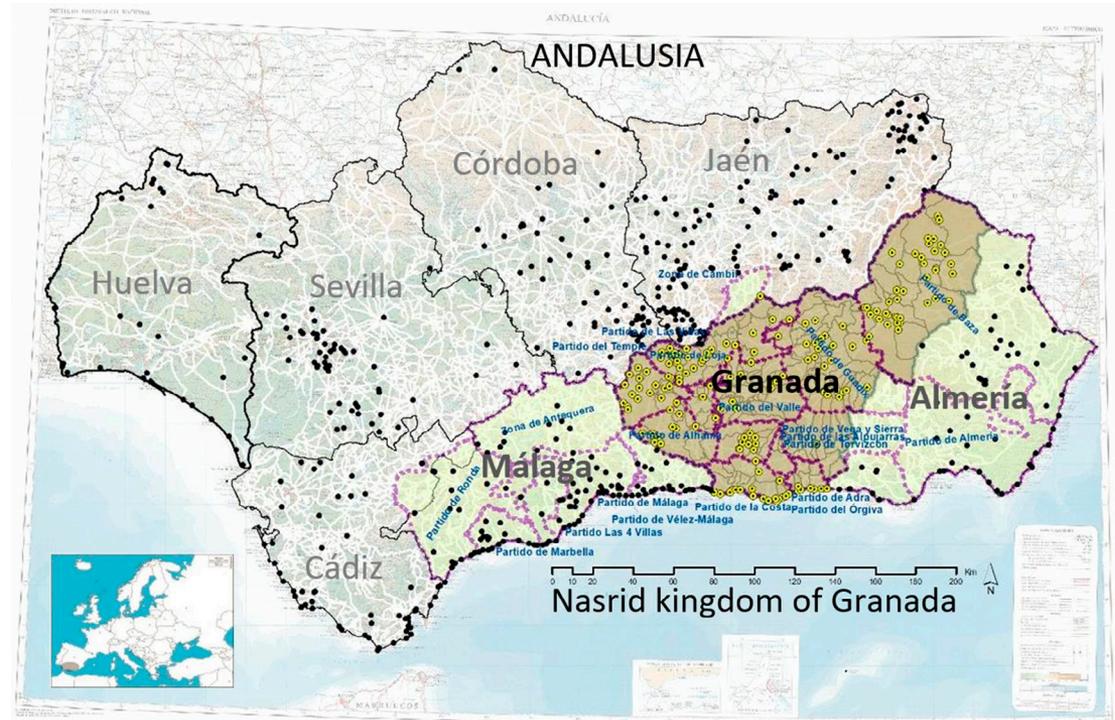


Fig. 1 - Towers in the eight provinces of Andalusia (Spain). In colour, districts of the Nasrid kingdom of Granada, highlighting the province of Granada.

that approximately half a thousand watchtowers may have been in operation in the Nasrid kingdom, of which around two hundred would have been located in the territory occupied by the province of Granada. That means one of these towers every 6000 hectares on average, almost at every 7,75 km. However, there is a higher concentration of them around border areas, roads and hydraulic networks and other fortifications.

To them must be added a large number of places with names alluding to the location of towers or watchtowers where it is difficult to find material evidence. For this reason, it has been necessary to analyse in detail more than 10,000 toponyms that

PROVINCE	MEDIEVAL TOWERS PRESERVED IN ANDALUSIA	PROVINCE	MODERN TOWERS PRESERVED IN ANDALUSIA
Granada	153	Granada	18
Málaga	73	Málaga	37
Almería	51	Almería	17
Jaén	125	Jaén	---
Sevilla	52	Sevilla	---
Córdoba	63	Córdoba	---
Cádiz	33	Cádiz	28
Huelva	12	Huelva	19
TOTAL	562	TOTAL	119

Region	Total
Eastern	401
Western	160
Eastern Total	72
Western Total	47

Table 1 – Number of towers with preserved remains in the eight provinces of Andalusia (Spain).

could be linked to the Nasrid defensive network. Around a 5% show more or less significant indi-

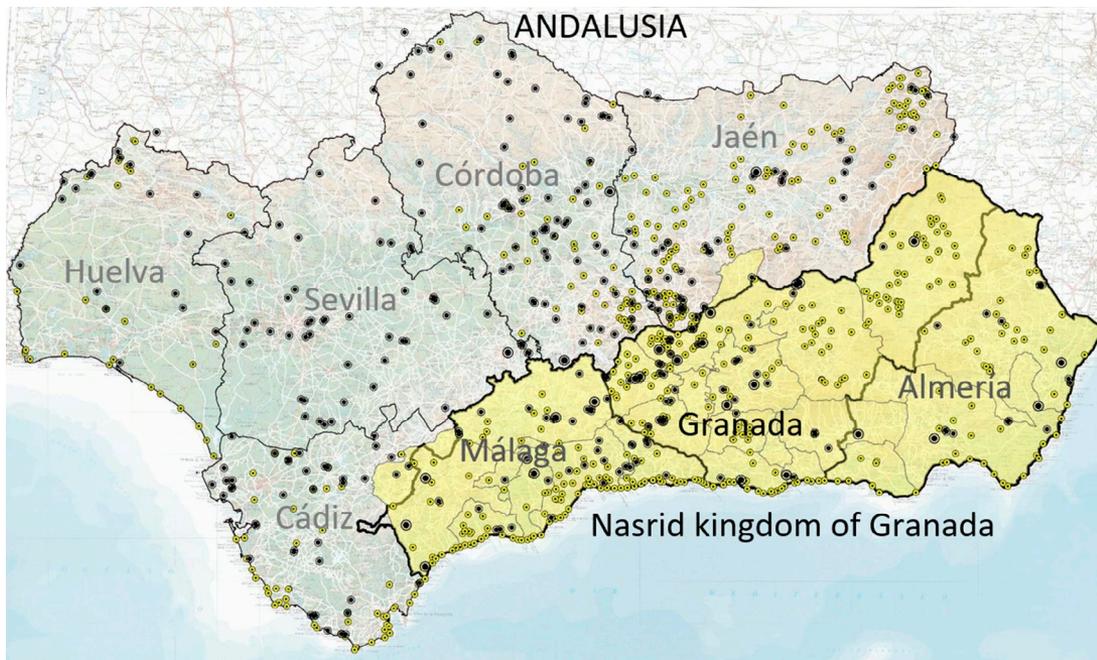


Fig. 2 - Towers in Andalusia (yellow points) and some related toponyms (black points).

cations of the real or hypothetical positioning of an isolated tower, which would double the number of known cases by their remains or documentary evidence (Fig. 2).

2 CATEGORISATION OF THE TOWERS IN THE PROVINCE OF GRANADA

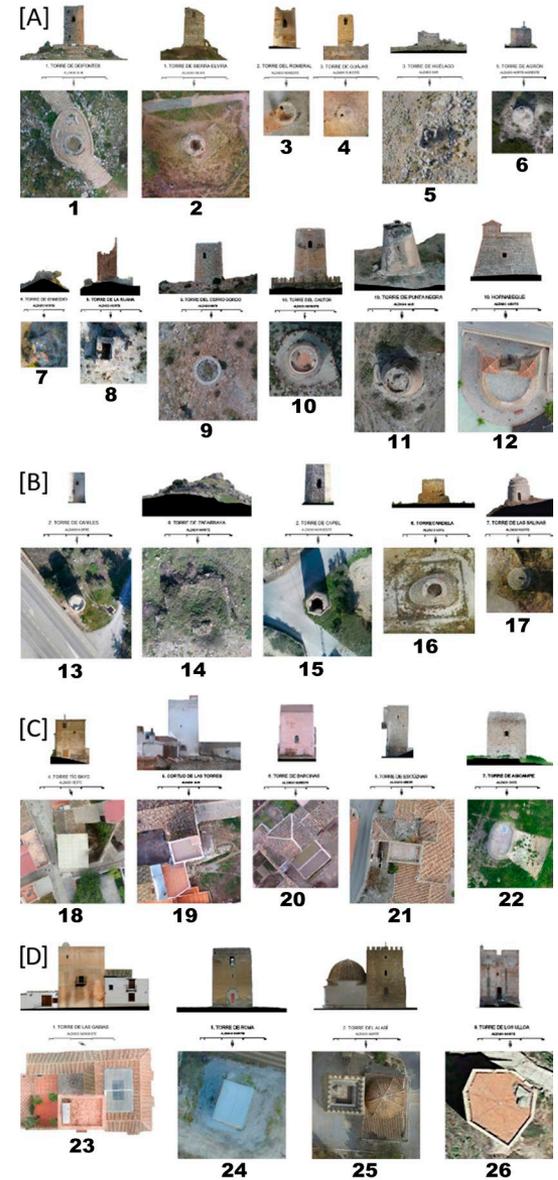
In order to design workflows and survey standards for the enormous task of comprehensively documenting the tower related toponyms, this complex and diverse architectural and archaeological heritage can be classified according to several parameters, such as the functionality for which they were created (Fig. 3), their location, their materiality and form, their state of preservation...

2.1. Out of all the original functions that the towers

that are now isolated may have had (García-Pulido, Ruiz-Jaramillo & Peñalver Martín, 2022: 3-8), this article focuses on the Nasrid watchtowers in the province of Granada.

The name *atalaya* (watchtower) derives from the Arabic *al-ṭalī'a* (pl. *al-ṭalā'i*), in reference to a high up lookout point. In Spanish it has been used to

Fig. 3 - Different types of isolated towers in the province of Granada. [A] Watchtowers from the 13th to 18th century: (1) Deifontes, (2) Sierra Elvira, (3) Romeral, (4) Guájar, (5) Huélago, (6) Agrón, (7) Enmedio, (8) Rijana, (9) Cerro Gordo, (10) Cautor, (11) Punta Negra, (12) Hornabeque. [B] Towers for the surveillance of important infrastructures (routes, mills...) or natural resources (springs, saltpans...): (13) Caniles, (14) Zafarraya, (15) Capel, (16) Torrecardela, (17) Salinas. [C] Farmstead towers: (18) Tío Bayo, (19) Cortijo de las Torres, (20) Escúznar, (22) Agicampe. [D] Towers built by the elites: (23) Las Gabias, (24) Roma, (25) Alabí, (26) Los Ulloa.



designate the tower usually built on a high place to survey the countryside or the sea and to give notice of what is discovered (Franco-Sánchez, 2017: 183).

Watchtowers differ from other types of towers in that their main purpose is to provide a safe place from which to carry out surveillance and military observation. As a result, they are generally isolated structures. In some cases, other towers that were designed for different purposes, such as residential (houses and tower-palaces), religious (minarets and bell towers), funerary (mausoleum-towers) or orientation and guidance (light-houses), may have been used as watchtowers.

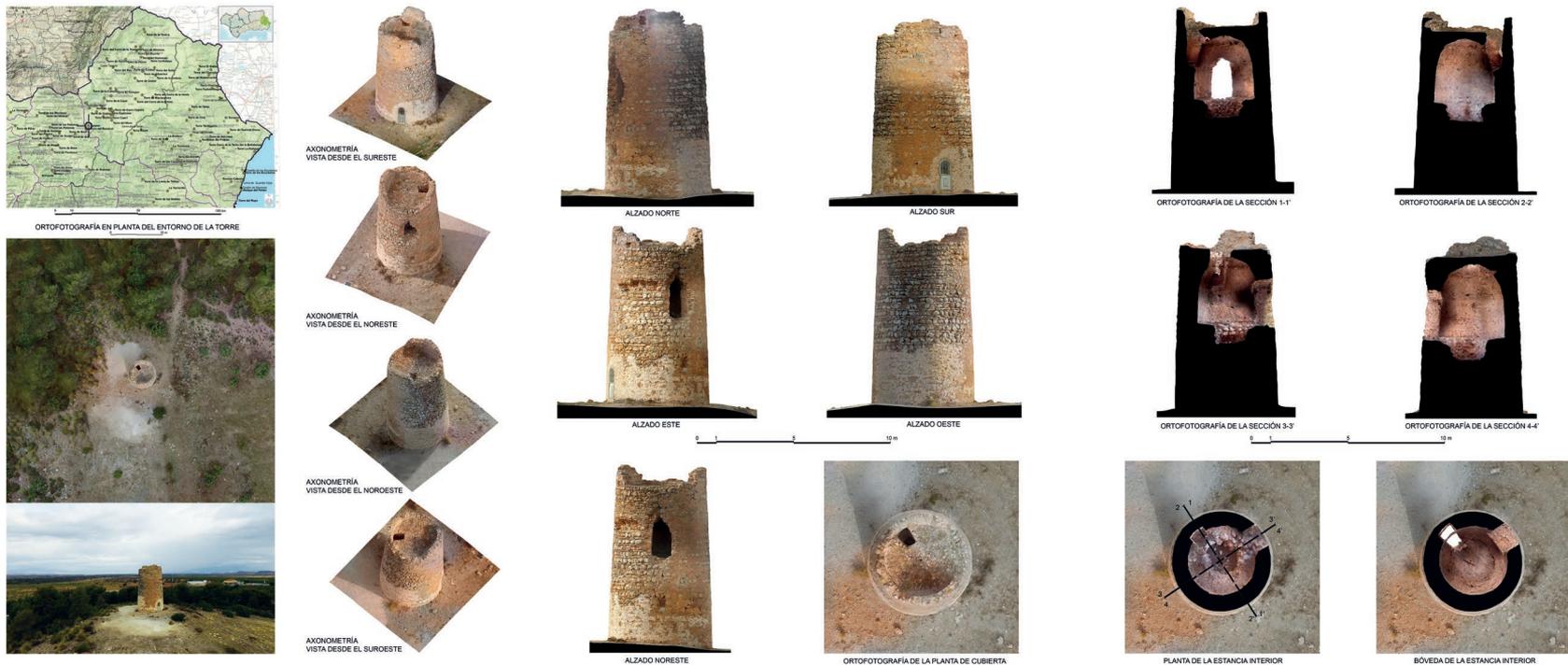
The Nasrid kingdom was strengthened by the construction of new towers in particularly important locations, forming complex surveillance systems. They usually had a solid base and a single chamber with a raised access for the tower-keeper, from which the plume of smoke could be sent through a hole in the terrace, like a chimney (Fig. 4), while the upper part was used to keep watch and, if necessary, to light a beacon.

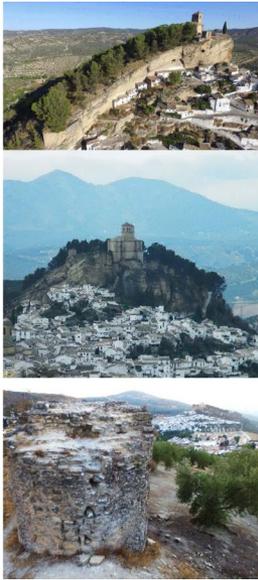
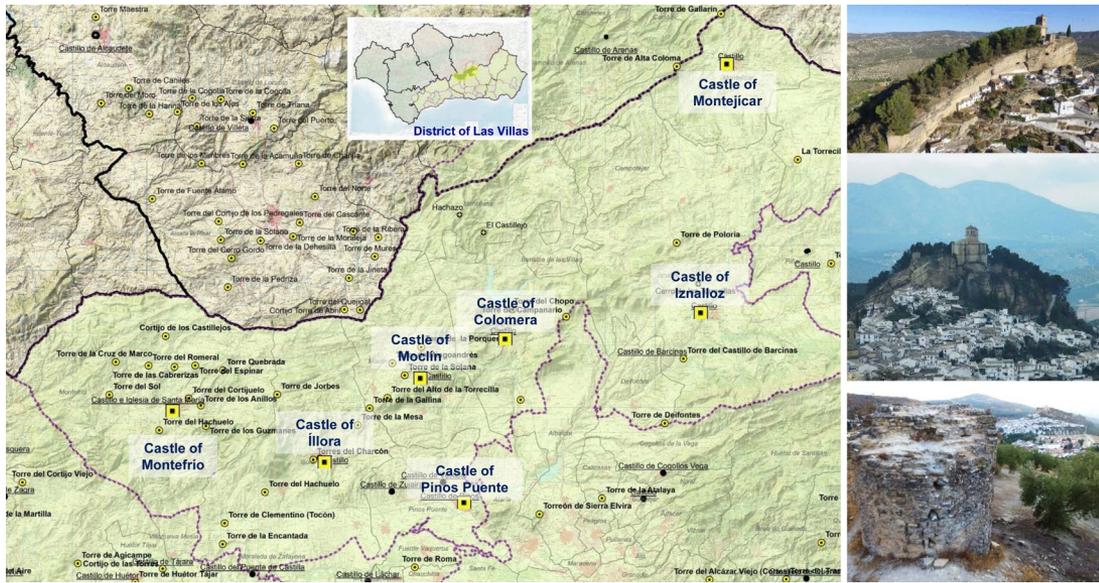
This network allowed information about what was happening in the confines of each Nasrid district to reach the citadels of the main medinas (Fig. 5). In addition, this system was interconnected throughout the kingdom with high points on which

robust and permanent structures were not built, but whose existence can be traced through toponymy. They may not always have had a tower, but they may have had a sporadic structure for a guard, from which light signals could be emitted.

2.2 The watchtowers can be grouped according to their location (Fig. 6) into different levels, ranging from those located on flat areas because of the need for specific or alternative control to those that occupied orographic summits with a wide difference in altitude, the most iconic image of the isolated towers. The visibility from them in optimal weather conditions can be very good, although this can be greatly reduced or completely cancelled out in rain, snow, fog and mist. The strong winds

Fig. 4 - El Romeral Watchtower, one of the best preserved in the province of Granada.





that lash them for many hours of the year could also hinder both their construction and maintenance, and of course, the optimal conditions for effective surveillance.

Because these towers are located on sites with a steep and tortuous access, the greatest complications for data collection come from the difficulty of reaching them. These sites are highly exposed to weather conditions and are often located in areas with high seismic activity. As a result, they are often badly damaged.

2.3. With regard to the techniques used in the construction of fortified enclosures, the rammed earth walls predominate, often with masonry foundations. The main towers were also often made of rammed earth, although it is common for the solid lower half, which acted as a podium, to be made of masonry in stone courses, with two face ashlar at the corners. On other occasions they also show repairs, reinforcements and extensions of masonry and previous structures built in rammed earth. The watchtowers from the 14th century were mainly built in stone, and most of them are cylindrical with a slight slope.

2.4. The state of preservation can also be parameterised, based on the existing vestiges on the ground and the archaeological potential of the subsoil, from the complete preservation of these architectural structures to the disappearance of their vestiges (Table 2). This work focuses on the last category and on the flow of data that can be obtained from the toponyms that allude to the possible presence of a surveillance post from which to transmit and receive optical signals.

3 METHODOLOGY FOR THE DOCUMENTATION OF MISSING WATCHTOWERS THROUGH TOPONYMY

The detailed analysis of the toponym relating to these structures was based on a review of the list of georeferenced place names included in the Geographical Gazetteer of Andalusia (Nomenclátor Geográfico de Andalucía). It contains over 140,500 records with more than 190,000 locations, most-

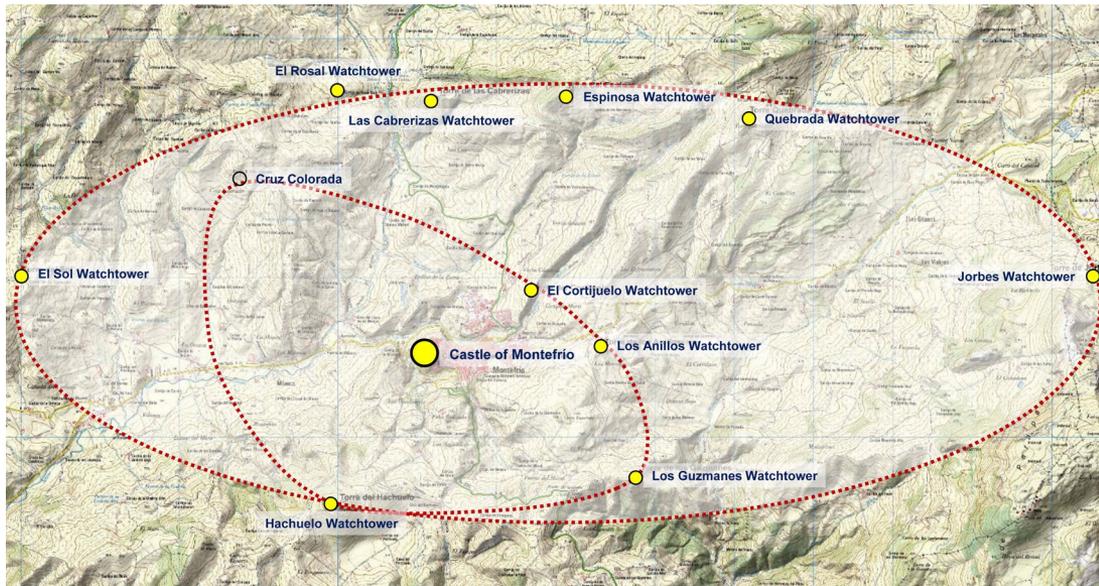


Fig. 5 - (Above) Watchtowers around the main castles in the Nasrid district of Las Villas. (Below) Watchtowers for the surveillance of the territory of Montefrío.

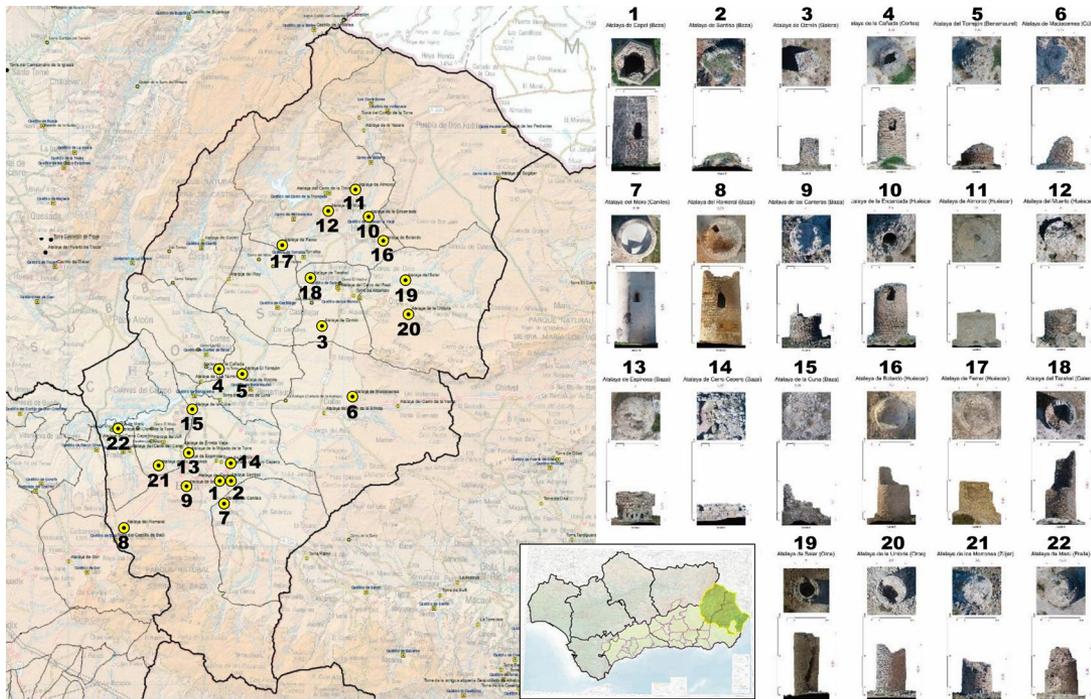


Fig. 6 - Visible remains of 22 watchtowers in the part of the Nasrid district of Baza, included in the province of Granada. (1) Capel, (2) Santiso, (3) Ozmin, (4) Cañada, (5) Torrejón, (6) Maciacerrea, (7) Moro, (8) Romeral, (9) Canteras, (10) Encantada, (11) Almorox, (12) Muerto, (13) Espinosa, (14) Cerro Cepero, (15) Cuna, (16) Botardo, (17) Ferrer, (18) Tarahal, (19) Salar, (20) Umbria, (21) Morones, (22) Marú.

entire national territory. The maps employed in this study are at the scales of 1:25,000 (MTN25) and 1:50,000 (MTN50). The first edition of the MTN50 was published in 1875, and the series was completed in 1968. In 1973, the MTN was updated exclusively on the basis of new photogrammetric minutes at a scale of 1:25,000. In 1985, efforts were concentrated on the production of the new MTN25.

The previous works for the elaboration of the MTN were carried out between 1870 and 1950, in some cases several decades after the publication of the first edition. They consisted of handwritten planimetric, altimetric and joint minutes, made with classical topography and drawn at 1:25,000 as basic plans of the terrain.

In addition to the more directly related toponyms such as watchtower and tower, there are many other place names in the kingdom of Granada derived from different Arabic or Latin roots that could indicate the location of these types of defensive structure (Table 3). Among them we can find the derivatives of *al-burÿ*, *al-manāra*, *al-nāzÿr*, *al-manẓar*, *al-şajra*, *qalaḥurra* (Franco-Sánchez, 2017: 180-183), *masyid*, *rābiḩa* (López Cordero et al. 2016-2017: 76-78), or others of Latin origin in highly elevated places, such as *hacho*, *moro*, *morro* or *cruz*, the latter (cross) to Christianise a promontory with constructions previously made by the Muslims.

For this purpose, a method of summary assessments can be adopted, consisting in this case of four groups of possible watchtowers (Table 3) and farmstead towers. Many visits have been done to these sites in order to verify the existence of a tower and categorize it according to the following:

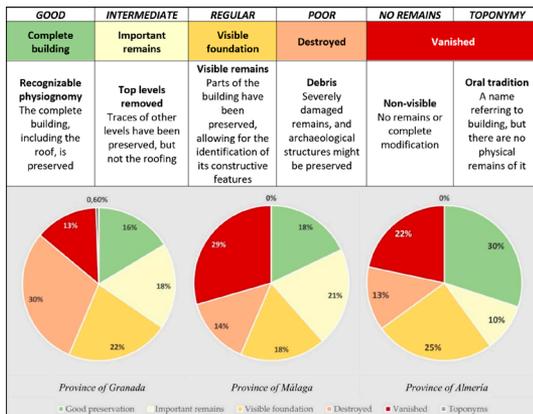


Table 2 - Five-point Likert scale to qualify the preservation of the towers.

ly from the 1:10,000 toponymic database (BTA10) of the Andalusian Institute of Statistics and Cartography. Entries have been made with the root of each of the place names that could have been initially related to the existence of a watchtower or a guard post. Their location have been checked on the 1:10,000 scale Topographic Maps of Andalusia, produced since 1993 based on restitution processes of photographic flights at scales between 1:18,000 and 1:25,000. They have also been contrasted with existing aerial images of the whole of Andalusia since the mid-1940s.

Most of these place names are also reflected in the labelling of the National Topographic Maps of Spain, produced by the National Geographic Institute (IGN). The latter consist of six series of topographic maps at different scales covering the

- [1] Existence of material remains of a watchtower or farmhouse tower.
 [2] Probable existence of a watchtower at a strategic site in the defensive network or a tower next to a settlement.
 [3] It is not known whether there could have been a watchtower or farmhouse tower at this site.
 [4] The existence of a watchtower or farmhouse tower is unlikely. The toponym must refer to another reality.

4 CASE STUDIES

4.1. The most common and obvious is *atalaya / talaya*, the preferred word for optical watchtowers in Castilian, with similar words in the other languages of the Iberian Peninsula (*atalaia* in Galician-Portuguese, *talaia* in Catalan and Basque). Variants of this name include the superlatives *atalayón/talayón* and the diminutives *atalayita* or *atalayuela/atarayuela/ataralluela/talayuela/talluela/tarayuela*.

In Andalusia we can find a total of 546 place names related to this term: 78 in the province of Granada, 55 in Málaga and in Almería, 94 in Jaén, 84 in Córdoba, 83 in Sevilla, 36 in Cádiz and 62 in Huelva. Many of them refer to an elevated geographical location where there may have been a lookout (hill, hillock, summit, peak, height, crag, cliff...) and are often also replicated in other nearby geographical features (ravines, streams, springs, hills...), buildings (houses, farmhouses, mills...) and infrastructures (threshing floors, roads, paths...).

After grouping their locations, the study has found that 39 of them allude to the presence or possible existence of a watchtower. Those that still have part of their structure can be found in 22 place names. Another 15 were not known. They correspond to locations with the possible existence of an optical tower: Cerro de la Atalaya (Alhama de Granada), Alto de la Atalaya (Bérrchules), La Atalaya (Soportújar), El Atalayón (Murtas), Las Tarayuelas (Chimeneas), Atalayuelas (Gor), La Atalaya (Iznalloz), Cerro de la Atalaya (Las Gabias), La Atalaya

Municipal District	Watchtower (<i>Atalaya...</i> , <i>Hacho...</i>)	#
Alamedilla	El Hacho, Cortijo El Acho, El Achón/Hachón (1002 m.a.s.l.)	3
Albolote	Atalaya de Sierra Elvira, La Atalaya Cerro La Atalaya (885 m.a.s.l.)	1
Albuñol	Atalaya (100 m.a.s.l.) [Atalaya de Punta Negra]	1
Albuñuelas	Barranco de las Cuevas del Hacho (de Mizán o de las Cuevas, Alto de Orá, 829 m.a.s.l.) (Martín García, 2000: 441)	2
Alhama de Granada	Cerro de la Atalaya o de la Majada del Hollín (1371 m.a.s.l.)	4
	Alto de la Atalaya (1265 m.a.s.l.)	4
	Majada Llano de la Atalaya (1275 m.a.s.l.)	3
	Cerro de la Cruz del Hachuelo, Cruz, Fuente de Hachuelo (1056 m.a.s.l.)	2
Arenas del Rey	Atalaya de Agrón (1171 m.a.s.l.)	1
Baza	Torre de la Atalaya, Atalaya Uno, Cantera Atalaya I, Llano de la Atalaya (1228 m.a.s.l.) [Atalaya de las Canteras]	1
	La Atalaya (1238 m.a.s.l.)	3
Bérrchules	Alto(s) de la Atalaya (1178 m.a.s.l.); Barranco de la Atalaya	2
	Atalaya Majuela o Atalaya del Majuelo (1238 m.a.s.l.)	4
	La Talaya/Atalaya (1060 m.a.s.l.)	1
Cacín	Cerro de la Atalaya de Agrón (1171 m.a.s.l.) [Atalaya de Agrón]	1
Castilléjar	Cerro del Hacho (934 m.a.s.l.), frente al Cerro del Moro (973 m.a.s.l.)	3
Castril	Talayón, Cerro Talayón (991 m.a.s.l.)	2
Chimeneas	Las Tarayuelas (887 m.a.s.l.)	2
Cortes de Baza	Cerro Lacho (745 m.a.s.l.)	2
Cúllar	La Atalaya, Cañada de la Atalaya (825 / 847 m.a.s.l.), Cerro Tarquina (894 m.a.s.l.)	2
Darro	Pico de la Atalaya, Atalaya (1074 m.a.s.l.) [Atalaya de Huélago]	1
Deifontes	La Atalaya, Camino, Cañada Real y Collado de la Cruz de la Atalaya (1162 m.a.s.l.) [Atalaya de Deifontes]	1
Dílar	Los Atalayones de Dílar (1282 m.a.s.l.)	4
Ferreira	Solana de las Atalayas (2107 m.a.s.l.)	3
Gabias, Las	Cerro de la Atalaya, Camino de la Atalaya (729 m.a.s.l.)	2
Galera	El Hacho, Era Hacho (880 m.a.s.l.)	2
Gor	Barranco y Cortijo de Atalayuelas (Ataralluelas, Atayuelas) (1472 m.a.s.l.)	2
Guadahortuna	Cerro de la Atalaya, La Atalaya, Las Atalayas (1226 m.a.s.l.)	1
	Puente del Hacho, Cortijo del Hacho (El Hacho en Alamedilla) (1002 m.a.s.l.)	3
Guadix	La Atalaya [Atalaya de Culibre o de Tablar, 982 m.a.s.l., al norte del Llano de la Torre]	1
Gúejar Sierra	Atalayón Grande (2440 m.a.s.l.), Atalayón (Talayón) Chico, Puntal y Barranco del Talayón (2360 m.a.s.l.)	4
Huéscar	Atalaya del Campo, Cerro de la Atalaya de Botardo, Puerto de la Atalaya, Cortijo de la Atalaya (1169 m.a.s.l.)	1
	Cerro Atalaya (1479 m.a.s.l.) [Atalaya del Muerto]	1
	La Atalaya (1074 m.a.s.l.) [Atalaya de Ferrer]	1
Íllora	Atalaya (926 m.a.s.l.) [Atalaya de la Mesa]	1
	La Atalaya (640 m.a.s.l.)	4
	Torre, Cerro, Cortijo del Hachuelo, El Hachuelo, Baños del Hachuelo (788 m.a.s.l.) [Atalaya del Hachuelo]	1
Iznalloz	La Atalaya, Las Atalayas, Atalaya (999 m.a.s.l.)	3
	Barranco de la Atalaya (Cerro del Ataque, 1296 m.a.s.l.) [Barranco de la Alcolaya]	4
Jete	Talayón / Talallón (506 m.a.s.l.)	2

(Cúllar), La Cruz de la Atalaya (Padul), La Atalaya (Loja), Solana de las Atalayas (Ferreira), Talayón (Castri), Cerro de la Atalaya (Guadahortuna) and Los Atalayones (Dílar). In some, there are cairns and accumulations of stones that could mask the remains of these structures.

There are two more locations that correspond to high peaks on the northern slopes of Sierra Nevada, so that the name must symbolically allude to the prominence of their location rather than to the actual presence of a lookout post: Pico del Atalayón Grande (2440 metres above sea level, in Güéjar Sierra) and Las Atalayas (2425 m.a.s.l., in Lanteira).

4.2. *Almenara*, from the Arabic *al-manāra*, as an enclave from which to keep watch and send light signals. The name is less common than *atalaya*, although in Spanish the meaning of this term refers to the fire lit in watchtowers to warn of enemy troops or the arrival of ships, and, taking a part for the whole, it can also refer to the tower itself. In the province of Granada this toponym is only found in three locations, two between Picena and Cherín, in the Alpujarra, next to the Cañada Real from Ugíjar to Aldeire. The others are located between Almuñécar and Ítrabo, in the area of the Taramay rock. In the rest of the provinces of Andalusia there are 24 other instances, most notably in the municipality of Peñaflo in Sevilla with the Castillo de la Almenara, San Roque in Cádiz with the Sierra de la Almenara and Almonte in Huelva with the Torre Almenara.

4.3. Place names derived from *al-burġ* (plural *al-burġ*) referring to a tower, whether part of a wall or isolated, such as *borge*, *borja*, *alborge*, *burch*, *burgo*, *borrox* (plural), including names with the prefixes *buja-*, *burja-*, *burga-*, *borja-*, *borga-*, from *burġ al-* (tower of the). The term goes back to the Greek *πύργος*, *burgus* in Latin, a name that would have become popular from the 2nd century AD to designate the Roman towers of square or rectangular plan with access through a door located above the ground and with several floors inside.

Municipal District	Watchtower (<i>Atalaya...</i> , <i>Hacho...</i>)	#
Lanteira	Las Atalayas (2425 m.a.s.l.)	4
Loja	La Atalaya, Atalaya, Cortijo de la Atalaya (781 m.a.s.l.) [¿Atalaya del Ballestero?]	2
	Hacho, El Hachuelo, Cortijo el Hacho del Hachuelo/Hachuela, (Manantial del) Hacho Bajo (1024 m.a.s.l.)	1
	El Hacho (al oeste de la Sierra del Hacho, 600 m.a.s.l.)	3
	Hacho (junto a los Infiernos, 550 m.a.s.l.)	3
Lugros	Jacho, Loma de Jacho (2244 m.a.s.l.)	2
Malahá, La	Cerro Atalaya de Malá, Hoyo de la Atalaya (878 m.a.s.l.) [Atalaya de la Malahá]	1
Moclín	Atalaya, Atalaya de la Solana (1028 m.a.s.l.)	1
	Morrón, Cerro, Las Faldas del Hacho, El Hacho (1265 m.a.s.l.)	2
Montefrío	El Hachuelo, Torre, Cruz, Cortijo, Casa del Hachuelo, Hachuela (1142 m.a.s.l.) [Atalaya del Hachuelo]	1
Montillana	Hachazo, Cortijo del Hachazo (1444 m.a.s.l.)	3
Murtas	El Atalayón (1263 m.a.s.l.)	2
Orce	Atalaya de la Umbría (1284 m.a.s.l.)	1
Otura, Villa de	Cerro de los Hachos (836 m.a.s.l.) (Martín García, 2000: 440, "Cerro del Hacho", 857 m.a.s.l.)	2
Padul	Cerro de la Atalaya, La Cruz de la Atalaya (1241 m.a.s.l.)	2
	Cerro Hacho (840 m.a.s.l.)	3
Pampaneira	Barranco de la Atalaya, Cortijo de la Atalaya (1699 m.a.s.l.) [Atalaya de Soportújar]	2
Peligros	Cerro de la Atalaya, Torre de la Atalaya, Atalaya [de Güéjar] (896 m.a.s.l.)	2
Pinos Genil	Lomilla de Hacho (991 m.a.s.l.)	2
Rubite	Cerro, Pico del Hacho, El Hacho/Acho (631 m.a.s.l.)	2
Salar	Atalaya de Salar (977 m.a.s.l.)	1
Salobreña	Cerro Hacho, Cortijo del Hacho (75 m.a.s.l.)	2
Soportújar	Atalaya de Soportújar, La Atalaya (1699 m.a.s.l.)	2
Valle, El	Atalaya (1011 m.a.s.l.) [Atalaya de Marchal]	1
Villamena	Atalaya de Cónchar (801 m.a.s.l.)	1

Table 3 - A summary assessment index for the toponyms *atalaya* (watchtower) and *torre* (tower) in the municipalities of the province of Granada.

More generically, *burġ* may also have been used to designate the towers placed at regular intervals along the city walls. In the province of Granada, the single instance of this toponym is found in Lecrín —La Bujalama—, near the castle of Chite, although it is more common in other Andalusian provinces.

4.4. Place names related to *al-nāzūr*, referring to a high tower of the wall over which it stands guard. It would also include those linked to *al-manẓar*, as a place from which one looks out and also watchtower, a place name of which the feminine form is *al-manẓara*. This toponym can sometimes be

masked by the word *almazara* and its derivatives (*almazara*, *almaqara*, *almoçara*, *almacera*, *almazora*, *almazara*, *almazara...*), from the Arabic *ma'şarah*, which refers to an oil mill.

The toponym *Lomas Almazara* is only found in Andalusia in Turrillas (Almería). In Granada we can find more toponyms linked to *almazara* in Gorafe, Benamaurel, Alpujarra de la Sierra, Alamedilla and Dehesas de Guadix.

4.5. Words derived from *al-şajra*, rock, such as *zagra*, *azagra*, *zafra*, *zafara*, *şafara*, as well as the diminutives *zujaira*, *zafrilla*, *zafroñcillo*, *zafra-*

guilla, *zafarejo* or the superlatives *zagrón* or *zagrón*. As they refer to highly located rocky escarpments, they could be fortified, often with a tower, and have other associated elements such as cisterns or walls to protect the most vulnerable part.

In the province of Granada this place name is well represented in the municipality of Zagra itself, whose castle stands on a rocky outcrop. In Huéscar we can also find the Cortijo de Mazagrán, which is located to the west of Torre del Muerto.

4.6. *Calahorra*, a name that comes from *qalahurra*, from *al-qal'a*, the fortress or citadel and *hurra*, meaning free woman, lady, honest. According to the Royal Academy of the Spanish Language one of its meanings is castle. In addition, this name was also used to designate the towers that stood out in some fortresses (Elías Terés & Viguera Molins, 1981: 256-276), especially during the Nasrid reign of Granada, for example the towers of the Cautiva and the Infantas, on the eastern wall of the Alhambra. Apart of these well-known, richly ornamented residential towers, this toponym is well represented in Granada in the municipality and castle of La Calahorra. It also appears in the Cortijo de La Calahorra in Huéscar or in the Caserío la Calahorra in Busquístar.

4.7. Sometimes the nouns *mezquita* (mosque, from Arabic *masjid*), *rábital/rábida* (from *rābiṭa*) or *zagüía* (from *zāwīya*), may have their origin in an abandoned or destroyed fortification used by a Muslim ascetic. Oratories dedicated to local saints were often built in these elevated sites, and they could also serve as lookout post over the territory.

When these toponyms are associated with high promontories, they may indicate the existence of a hermitage where a defender of the Muslim faith may have settled. This may have been common on the frontier, as the vizier Ibn al-Jaṭīb noted that, after the assault and subsequent conquest of Priego de Córdoba by the Christians in 1332, it was consolidated with marabouts (Arjona Castro, 1989: 142). In this sense, in the *Libro de Repar-*

timiento de Loja (1489) there are at least two references to locations that could have had this function (Jiménez Puertas, 2002: 237-238).

The toponym *mezquita* appears in six locations in the province of Granada: in the municipalities of Bérchules, Cañar, Molvízar, Almuñécar, Busquístar and Dúrcal. In the provinces of Málaga, Sevilla and Almería it is each found in seven places, in Jaén six, in Córdoba four, in Cádiz five and in Huelva twelve.

There are five instances of place names derived from *rābiṭa* in the province of Granada. It has given rise to a settlement with this name in the municipality of Albuñol, where the watchtower and the castle of La Rábida are located, as well as the site of La Rabitilla, a toponym that can also be found in Lanjarón and Alpujarra de la Sierra. A name that could possibly derive from *zāwīya* is La Zubia, a municipality located to the south of the capital of Granada. This toponym can also be found in two places near Mecina Bombarón and Nechite.

In the province of Málaga it can be found in seven municipalities, in Almería three, in Jaén and Córdoba two, in the province of Sevilla Sierra and pick La Rabitilla is located in the municipality of Pruna, with up to five other places referring to *rábida*/*rabitilla*, and in the province of Cádiz two. Huelva is the only Andalusian province where the term *rábida* appears instead of *rábida* in four municipalities.

4.8. Among the toponyms derived from a Latin etymon, the most common is *torre*, from the Latin word *turris* and in turn from the Greek *tyrris*, possibly taken to Italy by Anatolian migratory waves, (Bergua Caverro, 2004). In Arabic it gave rise to *turrūš*.

In Andalusia, this toponym and its many variants are very widespread, with more than 2,500 records. There are 455 in the province of Granada, 309 in Málaga, 251 in Almería, 479 in Jaén, 366 in Córdoba, 257 in Sevilla, 262 in Cádiz and 139 in Huelva. As in the case of *atalaya*, many of them

refer to a main elevated place where a tower may have existed, as well as to other geographical features, buildings and infrastructures related to this location. After grouping their locations, 186 could allude to the presence or possible existence of a tower in the province of Granada, whether a farmhouse tower or a watchtower. Many of them have been updated in the latest MTN25 maps because of the research that has been carried out on these towers since the 1990s (Martín García et al., 1999; Malpica Cuello, 1996).

102 place names can be counted that directly allude to the existence of material remains of watchtowers preserved in some of the municipalities in the province of Granada. Another 25 of them refer to farmhouse towers.

There are also other toponyms on the root of tower that could be an indication of watchtowers that have disappeared, such as Torre Quebrada in Cerro Cazuela (Montefrío), where there are large accumulations of stones in cairns. The Torrequilla Castle (Alhama de Granada) was destroyed when earthworks were carried out to build a communication antenna. The Torreón de los Tajos (Salar) disappeared when the site was bombed during the Spanish Civil War. The remains of Torre de Jorbes (Illora) were destroyed and scattered in a levelling of the land carried out between 2016 and 2017. The Torre de la Atalaya (Peligros/Güevéjar) vanished around 2005 when an intensive trellised olive grove was planted. The remains of the watchtower in Llano de la Torre (Freila) were dismantled when new buildings were constructed. In the area of the Ermita de las Santas (Puebla de Don Fadrique) there was a farmhouse, protected by the existing defences of the Cortijo de la Torre, which was altered with the refurbishment of this rural building in 2003 (Carrión Sánchez, 2006: 345).

There are almost fifty toponyms relating to towers that had not previously been detected, which could increase the list of known towers:

Some 18 of them could indicate the possible loca-

tion of watchtowers: Cerro Torres (Orce), Cerro La Torreta (Cúllar), Alto de las Tres Torres (Granada/Dúdar), Cerro las Torrecillas (Iznalloz), Majada de la Torre (Cogollos de la Vega), Barranco de Torres (Albuñuelas), Barranco de Torrubia (Fornes), La Torrecilla and two Cerros de la Torre (Montefrío), Loma de la Torre (Loja), Cejo de la Rambla de Torres (Zújar), Cortijada de la Torre (Íllora), La Torrecilla (Moraleda de Zafayona), Las Torres (Albuñán), La Torralba (Carataunas), La Torrecilla (Ugíjar), La Torrecilla (Freila) and Torrequemada (Alpujarra de la Sierra).

Another 16 place names can be related to the location of farmhouse towers: Torre Alba (Guadix), Cortijada de la Torrecilla (Murtas), Cerro de la Torre (Castilléjar), Caños de la Torre Vieja (Lanteira), Casería de la Torrecilla (Otura), Torre de Dona and Torrepuerca (Alhama de Granada), Los Torres (Castril), Cortijo de las Torrecillas (Sorvilán), Cortijo de la Torre (Villanueva Mesía), Cortijo Torrehuera-Torreabeca (Pinos Puente), two Cortijos de Torres (Caniles), Fuente de la Torrecilla (Válor), La Torre (Lecrín) and Torre Marín (Pulianas).

Another seven toponyms in the close proximity to a tower could also be linked to hydraulic or road infrastructures: Molino la Torrecilla (Granada), Casa Torres (Puebla de Don Fadrique), Molino de la Torre (Loja), Cortijo de la Torreta (Vegas del Genil), Cortijo del Torreón (Güéjar Sierra), Hoya Torres (Monachil) and Torrecillas (Íllora).

On the other hand, seven more toponyms alluding to towers have also been detected in places where no medieval defensive structures seem to have existed. In that cases, the name of the place might refer to other issues or have been changed of position: Cerro La Torreta (Guadahortuna), Cerro del Torrezo (Loja), Cerro de las Torrubias (Alhama de Granada), Las Torres (Alhama de Granada), Cuesta Torre (Zújar), Cortijo Torre Colorada (Gor) and La Torrecilla (Juviles).

4.9. *Morro(s), morrón(es), morrote(s)...* These are nouns which in Spanish can refer to a small hill or

rounded crag or to a steep promontory that serves as a marker for navigators on the coast. As landmarks in the landscape with a wide visibility, they may have contained lookout posts. These place names are widespread, with 146 cases in the province of Granada, some of which allude directly to the existence of a watchtower, such as the Torre de los Morrones in Zújar or the Morrón del Hacho in Moclín. These toponyms, replicated on several

occasions, can be found in 55 municipalities, some of which may also have had a watchtower.

4.10. *Hacho* (from *hacha*, candle, and this from the Vulgar Latin *fascūla*, a crossing between *facūla*, small torch and *fascis*, bundle) and its derivatives *acho*, *lacho*, *jacho*, *hachón*, *hachazo*, *hachuelo...* A toponym referring to "(...) a dominant hill from which, by indication of a nearby fortress or cas-

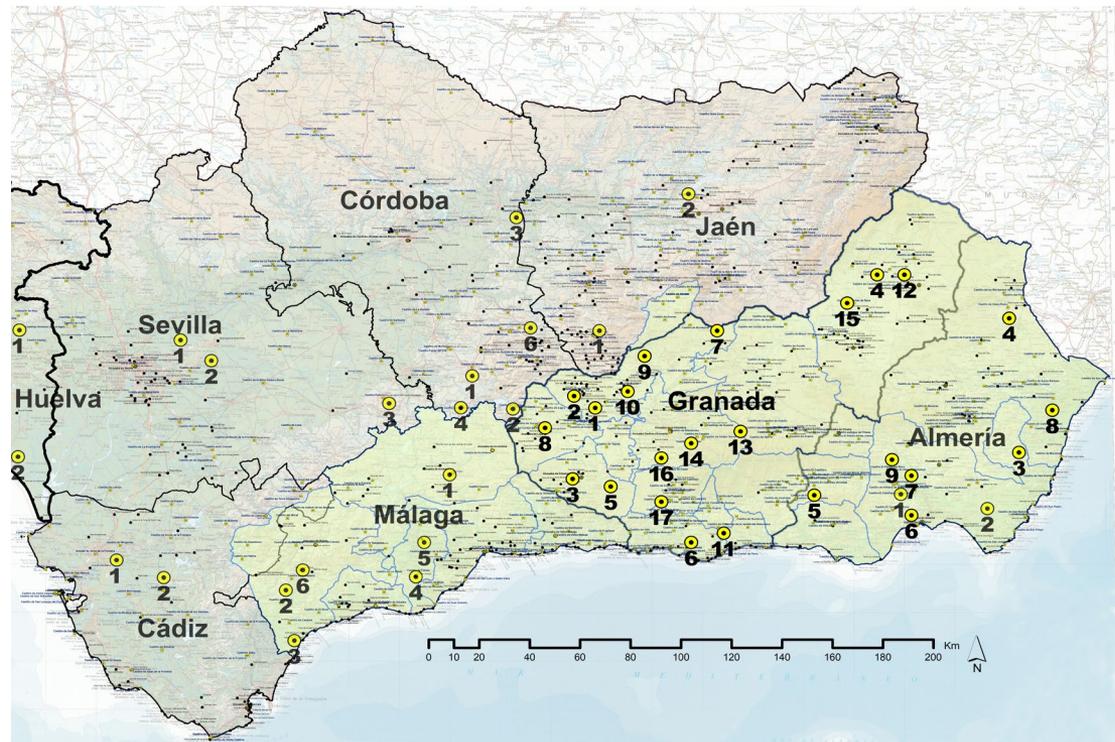


Fig. 7 - Towers (black small dots), fortresses (yellow small dots) and some toponyms related to hacho (yellow big dots) in the Nasrid kingdom. Granada: (1) Cerro del Hachuelo, (2) Cerro del Hachuelo or Hachuela, (3) Cerro de la Cruz de Hachuelo, (4) Cerro del Hacho, (5) Cerro Hacho, (6) Cerro Hacho, (7) El Hacho, (8) Cerro Hacho, (9) Hachazo, (10) Morrón or Cerro del Hacho, (11) Cerro or Pico del Hacho, (12) El Hacho, (13) Jacho, (14) Lomilla de Hacho, (15) Cerro Lacho, (16) Cerro del Hacho and (17) Barranco de las Cuevas del Hacho. Málaga: (1) Torre Hacho, (2) Sierra del Hacho, (3) El Hacho, (4) Sierra del Hacho, (5) Hacho, (6) Hacho. Almería: (1) Cerro del Hacho, (2) Cerro del Hacho, (3) Cerro del Hacho, (4) Cerro del Hacho, (5) Cerro Hacho, (6) El Hacho, (7) El Hacho, (8) El Hacho, (9) Achillos. Jaén: (1) Cerrillo del Hacho, (2) El Hacho. Córdoba: (1), (2), (3), (4), (5), (6), (7), (8), (9). Sevilla: (1) El Hacho, (2) Cortijo Torrachuelo, (3) Hacho or El Hachillo. Cádiz: (1) Cerro Hacho, (2) Casas de las Hachuelas. Huelva: (1) Alto del Gacho, (2) Casa Jachuelo.

tle, signals were sent with fire to warn farmhouses and rural areas in the surrounding area of the existence of danger, in order to warn, so that the inhabitants of the place had time to seek refuge" (Martín García, 2000: 431-432, Carrión Sánchez, 2006: 371-374). In the province of Granada, this toponym exists in 17 locations. In Málaga there are six instances, in Almería nine, in Jaén two, in Córdoba six, in Sevilla three, in Cádiz two and in Huelva possibly another two. It is showing how this toponym prevails in the easternmost provinces of Andalusia, and especially in the areas that belonged to the kingdom of Granada (Fig. 7).

The promontories linked to this place name are: Cerro del Hachuelo (where the remains of a watchtower are preserved, Íllora), Cerro del Hachuelo or Hachuela (with vestiges of another watchtower, Montefrío), Cerro de la Cruz de Hachuelo (Alhama de Granada), Cerro del Hacho (Castilléjar), Cerro Hacho (Padul), Cerro Hacho (Salobreña), El Hacho (Alamedilla/Guahortuna), Cerro Hacho (Loja), Hachazo (Montillana), Morrón or Cerro del Hacho (Moclín), Cerro or Pico del Hacho (Rubite), El Hacho (Galera), Jacho (Lugros), Lomilla de Hacho (Pinos Genil), Cerro Lacho (Cortes de Baza), Cerro del Hacho (Otura) and Barranco de las Cuevas del Hacho (Albuñuelas).

4.11. *Cruz* (cross, from the Latin *crux*). Of the 257 place names containing this noun in the province of Granada alone, two of them refer directly to the presence of a watchtower: Collado de la Cruz de la Atalaya (Cogollos de la Vega) and La Cruz de la Atalaya (Padul). In addition, special mention should be made of the toponym Cerro/Cerrillo (de la) Cruz, which appears 36 times in numerous municipalities in the province of Granada.

4.12. *Moro/morón* (from Latin *maurus*, Mauritanian). After the conquest of the territories of al-Andalus by the Christian kingdoms, many place names were attributed to the Muslims who inhabited the Iberian Peninsula from the 8th to the 15th century. Among them are those that had a defensive function, especially when they were located

on high ground. In some of these cases, there might have been a watchtower or a farmhouse tower, as in the following 54 place names in Granada: Cerro y Calar del Moro (Montejícar), Torre del Moro (Caniles Watchtower), Llano y Casilla del Moro (Caniles), Castillo del Cerro del Moro (Beas de Guadix), Castillo de los Moros (Castillejo de Poqueira, La Taha), Castillo de los Moros (Órce), Cerrillo Moro (Santa Cruz del Comercio), Cerrillo Morón (Murtas), Cerro Almorox and Salto del Moro (Huéscar), Cerro and Cortijo del Moro, with two more different hills called El Moro and Loma del Moro (Baza), Cerro del Moro (Castilléjar), Cerro del Moro (Chimeneas), Cerro del Moro (Íllora), Cerro del Moro (Loja), Cerro del Moro, El Moro and Cortijo del Moro (Montillana), Cerro del Moro (Órgiva), Cerro del Moro (watchtower in Zafarraya), Cerro Moro and Cortijo del Moro (Castril), Cortijo Cerrillo del Moro (Ugíjar), Cortijo de los Moros (Motril), Cortijo el Moro (Dehesas Viejas), Cortijo la Parra del Moro (Torvizcón), Haza del Moro (Iznalloz), Loma del Moro Santo (Algarinejo), Peñón de El Moro (Zújar, Carrión Sánchez, 2006: 197), Cortijo del Moro (Gualchos), Puerto del Moro and Tajo del Moro (Alhama de Granada), Tajo del Moro (Moraleda de Zafayona), Sepultura del Moro (Arenas del Rey), Suspiro del Moro (Otura), Tajo del Moro (Huétor Tájar), Torrón del Moro (watchtower of Maruq in Freila), Venta del Moro (Huéneja/Dólar), Silla del Moro (Torre de Santa Elena), Cortijo del Moro and Pilar de la Fuente del Moro (Granada).

5 CONCLUSIONS

The systematisation of work processes and standards for the survey of a very large sample such as the one in question, based on multi-criteria variables for classification, makes it possible to optimise the time and material resources invested in the workflow and in the survey process.

However, this sampling was incomplete, as the watchtowers preserved represent a much smaller percentage of those that may have actually existed. This can be seen in the case of the municipalities of Loja and Baza in their still surviving

books of surveying, demarcation and division of the lands in these districts, drawn up shortly after the Castilian conquest in 1486 and 1489. Some of these sources from the period immediately after the Nasrids refer to the existence of a number of other towers that have now disappeared, some of which can be positioned with approximation given the geographical references provided. Others examples present many unknowns.

In the case of the district of Loja, there are fewer than ten watchtowers of which material remains have been preserved. They are all destroyed down to the base, which might have happened in the process of conquering this city, or during the attempt invasion that took place two years earlier. A few days after Loja surrendered in 1486, Ferdinand the Catholic appointed two surveyers and commissioned them to determine the borders of the city. In the demarcation of this territory, watchtowers were often used as boundary markers. Those that were used for this purpose increase the number of known instances by a further fifteen, and in some cases they can be linked to the toponymy that is still in use.

The establishment of standards in the systematic study of toponymy that can offer clues for the location of new case studies has become a crucial aspect. It allows us to know the true dimension of this complex network of watchtowers in the Nasrid territory, the largest of all those established in the Iberian Peninsula during the Middle Ages.

Given the multitude of variables that could have defined the choice of locating these watchtowers and the tortuous orography of the land and coastal borders of the Nasrid kingdom, this toponymic study has proved to be more precise and accurate than other numerical correlation processes generated by means of algorithms. The analysis of the place names has revealed that the reality was much more complex, as the location of some of these watchtowers does not correspond to any of the premises that could be established a priori. In fact, in some cases, it is only possible to explain

their location after they have been identified, by analysing factors that determined the choice of these sites, which would have been unlikely in the first instance.

In this way, many more toponyms have been reviewed than could be directly related to the nouns watchtower and tower, as there are many others derived from different etymologies that could indicate the location of this type of defensive structures. All of them have been processed by reviewing the complete cartographic series of the territory under study, as well as the aerial flights available. An assessment was made on a scale of 1 to 4 of the plausibility of the place name presenting the existence of a watchtower or a farmhouse tower on the site, giving a list that doubles the one already known. This graduation makes it possible to choose the cases that will have to be prospect-

ed directly in the field. Some of them have already been surveyed, a time-consuming procedure due to the difficulty of accessing these remote and steep sites. They contain very few material remains in situ or are delocalised, which makes it difficult to discern whether an optical surveillance post could really have been established there. This task will undoubtedly have to be carried out in the future and new technologies will have to be employed to reveal what is no longer visible.

In addition to the historical interpretation of the construction techniques, the morphological changes resulting from advances in poliorcetics and the systematisation of the processes in the graphic representation of these variables, the systematic analysis of the place names adds a new dimension that makes possible the holistic interpretation of this network of watchtowers (Fig. 8).

The precise graphical survey has been fundamental to get to know this architectural heritage and for the subsequent elaboration of intervention proposals (Mascort-Albea et al. 2014; Almagro Gorbea & Orihuela Uzal, 2015: 287-290; Orihuela Uzal & Molina-Fajardo, 2021: 6; Rodríguez-Navarro & Gil-Piqueras, 2012: 87-89; Rodríguez-Navarro, 2012: 100-111; Rodríguez-Navarro et al., 2016: 104; 2018; Rodríguez-Navarro & Gil-Piqueras, 2019: 76-91). However, usually the processes of representation are focused on the material aspects of cultural assets. This article highlights the importance of adding new dimensions to the global study of a phenomenon for which it is known that not all the specimens that originally existed have been preserved. In addition, this information is an essential starting point in the preventive protection of many other places that could be hiding evidence of these Sites of Cultural Interest.

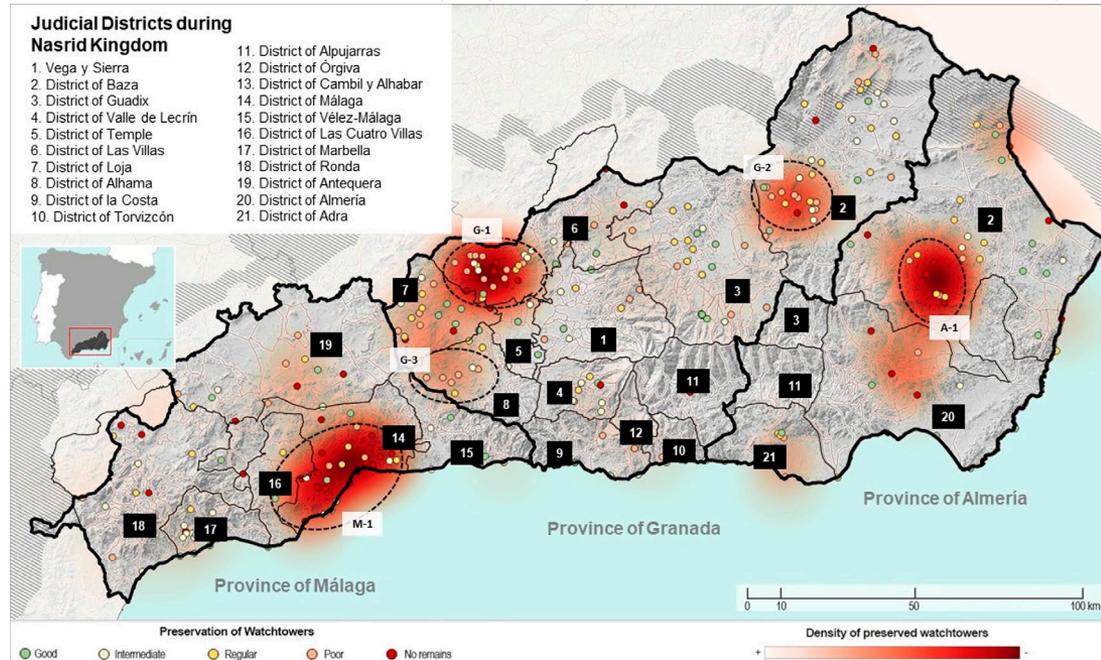


Fig. 8 - General identification of areas with a lower density of preserved towers in the Nasrid kingdom of Granada.

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