Chapter 2
Research Area

2.1 Physical Geography

The area under study is situated in the northern part of the Monti di Trapani in the extreme north-west of Sicily: it is bordered to the south by the hills enclosing the towns of Trapani and Castellammare del Golfo and, to the east and west, by the Tyrrhenian Sea (Fig. 2.1). The territory is predominantly mountainous and its orographic profile is characterized by the following system of reliefs:

(a) the Mt. Sparagio ridge mainly oriented WNW-ESE, which, at 1,110 m asl, is the highest point in the Monti di Trapani;
(b) the NW-SE ridges of Mt. Palatimone–Mt. San Giovanni with their respective maximum peaks of 595 and 455 m asl and Mt. Cofano, which reaches an altitude of 657 m; and
(c) the Mt. Monaco–Mt. Speziale ridges, oriented towards the N-S and with peaks of 532 and 943 m asl respectively.

There are also some separate elevations within the Mt. Sparagio mountain system: the Prima Colma (1,007 m asl), the Colma di Mezzo (1,001 m asl), the Pizzo Bufala (861 m asl) and the Pizzo di Giacolamaro (791 m asl). Lesser elevations worth noting are the NW-SE Pizzo Corvo–Cozzo Pignatello, with peaks of 334 and 295 m asl; the complex of Rocca Rumena–Monte Bufara (323 m asl)—Mt. Zimmaria (315 m asl), which is elongated in the direction of NE-SW and the small isolated elevation of Cozzo Cataruccia (279 m asl). There are areas of plain or semi-plain land in the more extended Purgatorio plain, where heights above sea level range from 240 to 290 m. Similar topography is also to be found in: (a) the areas of Piano Zubbia–Scaletta–Assieni–Piano dei Tribli, with elevations from 180 to 240 m asl; (b) the Cornino plain in the stretch of land from 0 to 100 m asl and bordered to the S-W by the Forgia stream, to the N-E by the slopes of Mt. Cofano, to the east by the rocky cliffs of Scurati–Cerriolo–Rocca Rumena and to the west by

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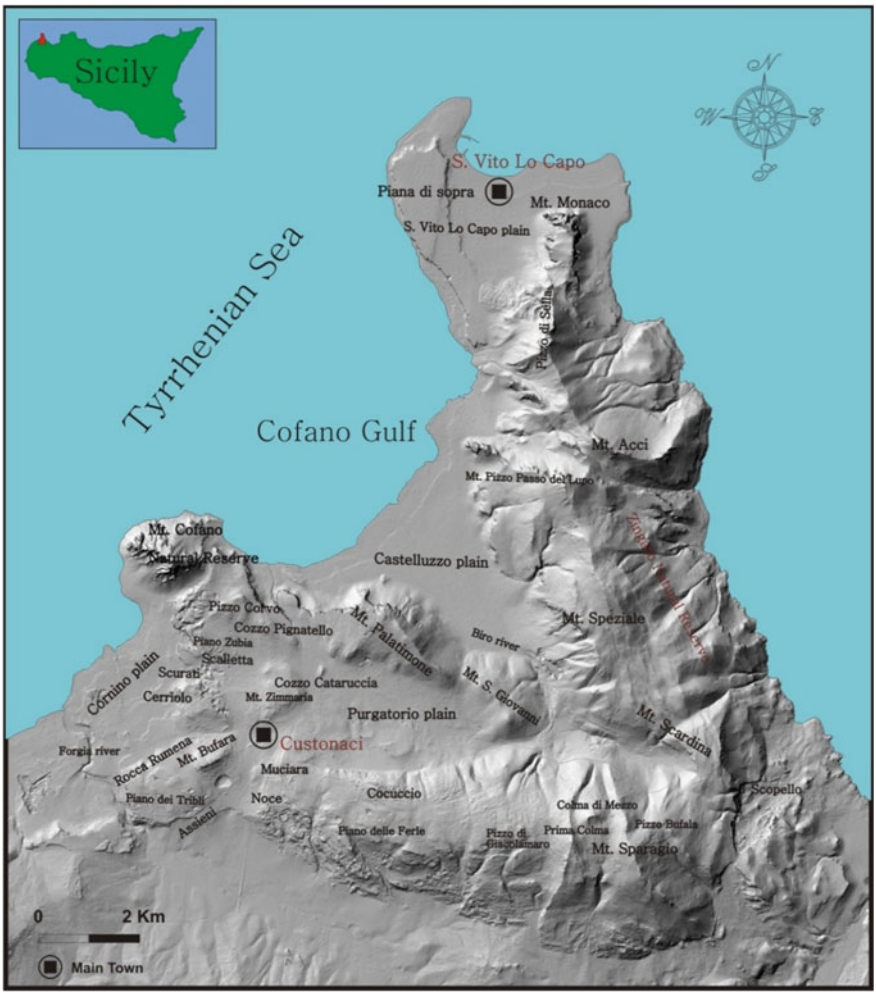


Fig. 2.1 General map of the study area Mt. di Capo San Vito (*Hillshade map from* DEM Regione Siciliana 2007–2008)

the sea; (c) the Castelluzzo plain, situated along a strip of terrain ranging from 0 to 130 m asl; and (d) the Piana di Sopra di San Vito, in the northernmost sector of the area, having altitudes ranging from 60 to 80 m asl. Plain-like zones or mildly undulating topography, less extensive than the ones described above, are also found in the Mt. Sparagio mountain system, in the Le Colme locality (920–900 m asl), Giacolamaro, Piano delle Ferle, Coccuccio and Muciara–Noce areas. From an environmental point of view the discussed territory is of extreme importance both for its natural beauty and for the biodiversity of its flora and fauna. This is further demonstrated by the fact that this area includes two of the most important Sicilian

Nature Reserves: (i) The Riserva Naturale Orientata dello Zingaro and (ii) the Riserva di Monte Cofano. However, the zone also includes the second most important marble quarrying industry in Italy, located at Custonaci which, although providing welcome local employment, has certainly brought about a general and serious degradation of the natural environment, as well as interfering with the karst features located in the quarried area.

2.2 Geomorphological Features

The main karst features, the focus of this research, are a constituent part of the general geomorphological context of the territory and traceable to different morphogenetic processes. In particular, six major areas of different landforms were recognized (Agnesi et al. 2002), all of which are described in the next chapters (Fig. 2.1).

2.2.1 Coastal Areas

These areas (Cornino, Castelluzzo and S. Vito Lo Capo plains) are characterized by a series of marine terraces, consisting of platforms at different levels, and formed by the abrasion of sea water. The terraces are, sometimes covered by continental or marine deposits and separated from each other by modestly sized banks and irregular cliffs. They have been carved by sea-notches, or more frequently, by shelters and caves, both of marine and karst in origin and reworked by hyperkarst marine processes (Antonioli et al. 1993; Antonioli and Ruggieri 2000; Ruggieri 2009; Ruggieri and Messina Panfalone 2011). Altogether seven orders of marine terraces have been observed at altitudes between about 95–105 m (I order) and 1–5 m (VII order) (Di Maggio et al. 1999).

At higher levels (200–225 m asl) the presence of other marine platforms in the Triassic-Liassic substrate has been observed. As far as the dating is concerned, the succession of the terraces has been formed after the Late Lower Pleistocene since the features are cut into deposits attributable to that period, whereas those at higher levels are, as a result, coeval or older than the Lower Pleistocene. The VI order terrace is datable to the Euthyrrhenian because of the presence of *Strombus bubonius* deposits, while the VII order terrace was cut into the previous order and is therefore younger and should presumably be considered 'Neotyrrhenian'. The presence of faunal remains relating to the *Elephas falconeri* type in the sedimentary deposits of the order II terrace, bears witness to a date older than 250 or 350 thousand years, but probably earlier than 750 or 850 thousand. The changes of levels of the inner margins belonging to the same terrace order, show differential movements in the different sectors, with a range of uplift of about 0.11–0.14 m/kyr for the Middle to Late Pleistocene and 0.01–0.1 m/kyr for the post Eutyrrhenian period (Di Maggio et al. 1999; Antonioli et al. 1999a, b, 2002).

2.2.2 The Mt. Sparagio Ridge

Monte Sparagio is a ridge formation of Mesozoic carbonate rocks that develops in a WNW-ESE direction and reaches a peak of 1,110 m asl, the highest point in the Capo San Vito mountain system. Along the northern face, a large fault slope is visible, while the southern side is characterized by an eastern sector exhibiting structural slopes and a western sector constituted by an upper slope and by numerous other fault scarps. The summit areas (situated at altitudes from 190 to 900 m asl) consist of steps of more or less flat surfaces, probably formed by erosion during the 'planation' in the continental phase. Both the flat areas and the slopes, as will be described in the sections to follow, are of particular interest for their various karst morphologies, such as karren, dry valleys and deep fluviokarst canyons.

2.2.3 The Mt. Palatimone Ridge

This ridge constitutes a *cuesta* monocline relief of Mesozoic dolomite extending NW-SE and with a southern side that links up with a structural slope. In its northernmost sector the slope was eroded by the Pleistocene sea and a cliff was created. Along its southern parts, the structural slope seems to have come apart and retreated back due to phenomena of both erosion and karst corrosion caused by the flooding phases of the Purgatorio polje described hereunder. This area shows a vast amount of surface karst morphologies, particularly along the southern structural slope together with numerous vertical caves located on both sides of the ridge.

2.2.4 The Purgatorio Plain

This area consists of a large depression, including a relict polje. This landform was formed, not only due to selective processes resulting from the presence of clay and karst soluble terrains in the area between the carbonate outcroppings of Mt. Sparagio and Mt. Palatimone but also as a result of tectonic processes pointed out by systems of faults. To the south-west of Mt. Palatimone small monocline and relict relief features are to be found, all resulting from karst processes. This depression, which is opened with a deep fluviokarst gorge along its north-west margin, is particularly karstified with surface and underground morphologies, many of which are among the most interesting in the area.

2.2.5 The Mt. Acci–Pizzo di Sella Ridge

The Pizzo di Sella-Mt. Acci ridge extends as a large anticline, of which the fold-back axis plunges first N-S at Pizzo di Sella, then progressively verges NW-SE

and finally E-W towards Mt. Acci. The eastern flank of this ridge/anticline consists of a large fault slope, while the western flank is made up of a series of recumbent folds, the partial erosion of which has brought to light an alternation of hard and soft rocks. In this area the enormous energy involved in uplifting has led to selective erosion processes with carbonate rock scarps affected by collapses, and clay denudation surfaces ruined by landslides.

2.2.6 The Mt. Speziale–Mt. Scardina Ridge

These areas are prevalently made up of Upper Triassic dolomitic rocks and are essentially characterized by two types of landscape: (a) the summit areas where ancient relict forms have been preserved and (b) the slopes where the processes of degradation and denudation predominate.

The area between Mt. Speziale and Mt. Scardina is dominated by some depressions, which extend NNW-SSE at altitudes between 600 and 900 m asl. These surfaces have been initially dislocated by tectonic movements (responsible for the formation of scarps and faults) and afterwards been karstified forming uvala landforms. This area, particularly on the eastern slope, is marked by deep canyons, which have originated during the tectonic uplift (with block-faults) and with the consequential lowering of the erosional base level.

2.2.7 The Mt. Cofano Area

The Mt. Cofano relief is surrounded by extensive fault slopes and abandoned cliffs along its southwestern side. The latter have been intensely subject to processes of physical rock disintegration with the accumulation of modern and ancient debris.

2.2.8 The Scopello Area

The overlapping of carbonate rocks (display a fragile behavior) onto pelagic deposits (have a plastic behavior) allowed for the genesis of deep-seated gravitational slope deformations (DPGV) (Agnesi et al. 1984, 1987, 1989, 1995, 2000, 2002), which are particularly evident in the Scopello area (Agnesi et al. 1987). The result of these processes is an extremely jagged landscape with extensive detached scarps subject to collapse or overturning, large unattached blocks prone to movement and deep trenches, sometimes open and sometimes filled with detritus.

References

Agnesi V, Macaluso T, Monteleone S, Pipitone G (1984) Fenomeni di deformazione gravitativa profonda (deep-seated gravitational slope deformations) osservati nella Sicilia occidentale. Boll Soc Geol It 103:671–679

Agnesi V, Macaluso T, Pipitone G (1987) Ruolo delle deformazioni gravitative profonde nell'evoluzione geomorfologica dell'area di Scopello (Trapani). Boll Soc Geol It 106:231–238

Agnesi V, Macaluso T, Monteleone S, Pipitone G, Sorriso-Salvo M (1989) Tipi e dinamica delle deformazioni gravitative profonde in relazione alle strutture geologiche. I casi di Monte Genuardo e di Scopello (Sicilia occidentale). Boll Soc Geol It 108:379–389

Agnesi V, Di Maggio C, Macaluso T (1995) Deformazioni gravitative profonde e superficiali nella penisola di Capo San Vito (Sicilia occidentale). Mem Soc Geol It 50:11–21

Agnesi V, Di Maggio C, Macaluso T, Rotigliano E (2000) Genesis and evolution of Deep Seated Gravitational Slope Deformation phenomena in Western and Central Sicily. Mem Soc Geol It 55:363–371

Agnesi V, Di Maggio C, Macaluso T, Madonia G, Rotigliano E (2002) Schema geomorfologico della Penisola di Capo San Vito (Sicilia nord-occidentale). Speleologia Iblea 10:37–47

Antonioli F, Ferranti L, Sottosanti G (1993) Le grotte sommerse della Riserva dello Zingaro. Speleologia n. 29:36–42

Antonioli F, Cremona G, Immordino F, Puglisi C, Romagnoli C, Silenzi S, Valpreda E, Verrubbi V (1999a) Quaternary and Holocene differential movements in a mediterranean coastal area (San Vito Lo Capo, Sicily-Italy). Phys Chem Earth 68

Antonioli F, Cremona G, Puglisi C, Silenzi S, Valpreda E, Verrubbi V (1999b) Quantitative assessment of post Tyrrenian differential crustal movements in a Mediterranean coastal area (San Vito Lo Capo, Sicily-Italy). Phys Chem Earth (A) 24(4):343–347

Antonioli F, Cremona G, Immordino F, Puglisi C, Romagnoli C, Silenzi S, Valpreda E, Verrubbi V (2002) New data on the Holocenic sea-level rise in NW Sicily (Central Mediterranean Sea). Glob Planet Change 34:121–140

Antonioli F, Ruggieri R (2000) Geomorfologia e speleogenesi nell'area carsica di Monte Palatimone (Custonaci Tp) ed interconnessioni con il livello di base marino. Speleologia Iblea 8:213–223

DEM Regione Siciliana. Modello digitale del terreno passo 2 m derivato da dati LIDAR volo ATA 2007–2008 in UTM-WGS84 fuso 33 N

Di Maggio C, Incandela A, Masini F, Petruso D, Renda P, Simonelli C, Boschian G (1999) Oscillazioni eustatiche, biocronologia dei depositi continentali quaternari e neotettonica nella Sicilia nord-occidentale (Penisola di San Vito Lo Capo - Trapani). Il Quaternario 12(1):25–49

Ruggieri R (2009) Karst Itinerary and cave discovery in the Zingaro Reserve. Azienda Foreste Demaniali. Priulla, Palermo, pp 207

Ruggieri R, Messina Panfalone D (2011) Dentro e fuori la montagna. Priulla, Palermo, pp 182 www.google.com/intl/it/earth/index.html

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