

Settlement Location in the Murge, Apulia, Southern Italy

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Mørch, Henning: Settlement Location in the Murge, Apulia, Southern Italy. *Geografisk Tidsskrift* 93:69-79. Copenhagen 1993.

This is a study of the settlement pattern of part of Apulia, southern Italy, where the population is concentrated in large rural towns. As the topography is very gentle, other factors determining the location of settlement have been suggested in the past. In this article, the main locational factors are suggested as being related to natural resources. This hypothesis is supported statistically (G-test).

Keywords: settlement location, geology, Apulia (southern Italy).

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This study concentrates on accounting for the location of settlement in an area in Apulia, S. Italy. In the area two facts are especially evident; the population is highly concentrated in villages or rural towns, and the terrain is very level. All the settlements are rural in origin. Until very recently, the whole area was fundamentally dependent on agriculture which is still generally the most important industry. An agricultural population tends to be fairly uniformly distributed. Should agglomerations occur, the distribution of the villages may, likewise, be uniform, as long as the conditions influencing settlement are isotropic. However, the distribution is influenced by a range of natural and socio-economic factors. In the study area, the settlements are clearly not uniformly distributed. As the

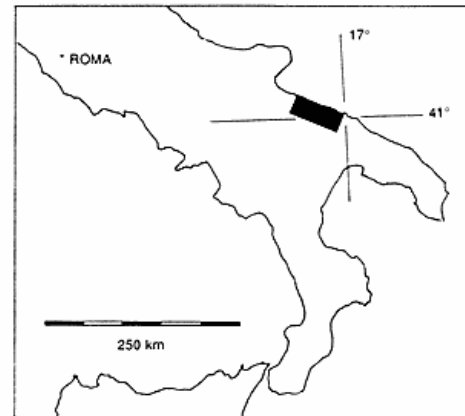


Fig. 1. Location of the study area.

land is very level, then a topographical explanation, including that of strategic hill-top location, is to be discounted at macro-level when trying to account for the settlement location. At micro-level, the topography may have induced the exact siting of the settlements, but this is not to be treated here. The villages in the area have shared common socio-economic conditions. Against this background, the task here is to examine alternative locational factors and decide whether other conditions, such as geology and related factors, might have influenced settlement location.

THE AREA

The study area is arbitrarily delimited and is part of Bari province in Apulia. It covers approximately 60 km of the Adriatic coast. It is 30 km wide and has an area of 1845 km² (Fig. 1). It comprises the western part of a tableland with a very level topography. From the coast the land rises

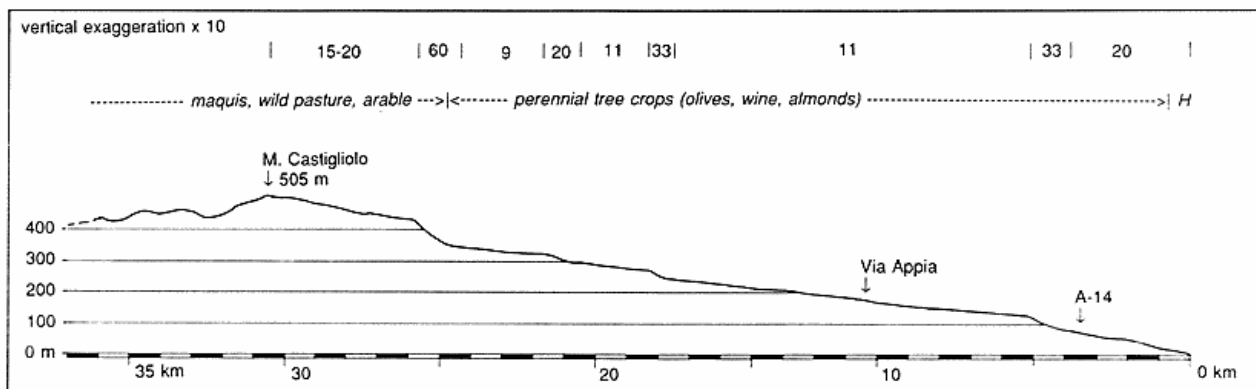


Fig. 2. Profile of the study area inland from the coast, midway between Molfetta and Giovenazzo to Monte Castigliolo (cf. Fig. 3). Vertical exaggeration is 10. The top-row numbers indicate

average gradients (per thousands) for sections of the surface. The next line indicates the dominant landuse (H = horticulture). The profile is based on IGM map 1:50,000 foglio 437 & 454.

gently inland, with the exception of a few step-faults parallel to the coast (Fig. 2 - cf. also Dickinson 1955, fig.9). 30 km from the coast the land level is 300-500 m.o.s.l. Towards the west and south, the topography changes, and so do the conditions for settlement location. Eastwards, the structure is quite similar to that of the study area for a further 10-20 km.

Geologically, four-fifths of the area is composed of cretaceous limestone. The remainder is composed of younger deposits; clays and sands from the pleistocene and holocene, with some recent alluvium. The limestone is massive, but permeable due to karst characteristics causing hyper-drainage and low watertables. The groundwater is drained by wells along the coast, or even by off-shore submarine springs. There is no open water: neither lakes, nor streams. The possibility of finding water for domestic use is generally difficult. The hydrological condition of the younger deposits is the same as they lie on top of the cretaceous limestone. Formerly the water supply for domestic use and the maintenance of livestock (sheep and draught animals) was substantially based on rain collected in cisterns. Now almost every home in the area, as in all of Apulia, get the water supply from the 'Acquadotto Pugliese' (constructed 1906-39 to distribute water from the Apennines). The soils are mostly red Medi-

terranean soils (chromic luvisols, 'terra rossa'), with rendzinas and lithosols in the higher areas.

The Italian name for the whole region is 'le Murge', which is plural for 'la Murgia', of which there are three sub-regions parallel to the coast; Murgia Costiera, Murgia Bassa, Murgia Alta (resp. Coastal, Lower, and Upper Murgia). The intensity of agricultural landuse and the population density decrease inland from the coast, a fact which is generally reflected these zones. The agricultural utilization is denoted on the CNR map (CNR/DGC 1959 - supplemented by Colamonico 1960). Although rather old, this map, nevertheless, gives an acceptable general description of the present landuse pattern (cf. also Gambi 1976).

The Murgia Costiera is the coastal sub-region. It is a narrow zone, alternating in width from some hundred metres to a few kilometres. This area is rather intensively cultivated due to the comparatively deep soils and easy accessibility of the groundwater. Crops are grown on a rotational basis with the focus on a wide selection of vegetables and fruits. A large share of the land is irrigated.

The Murgia Bassa is 20-25 km wide and is almost completely used for perennial tree crops; vines, olives, and some almonds. In some 'comuni' (municipalities) the tree crops occupy even more than 90 % of the area.

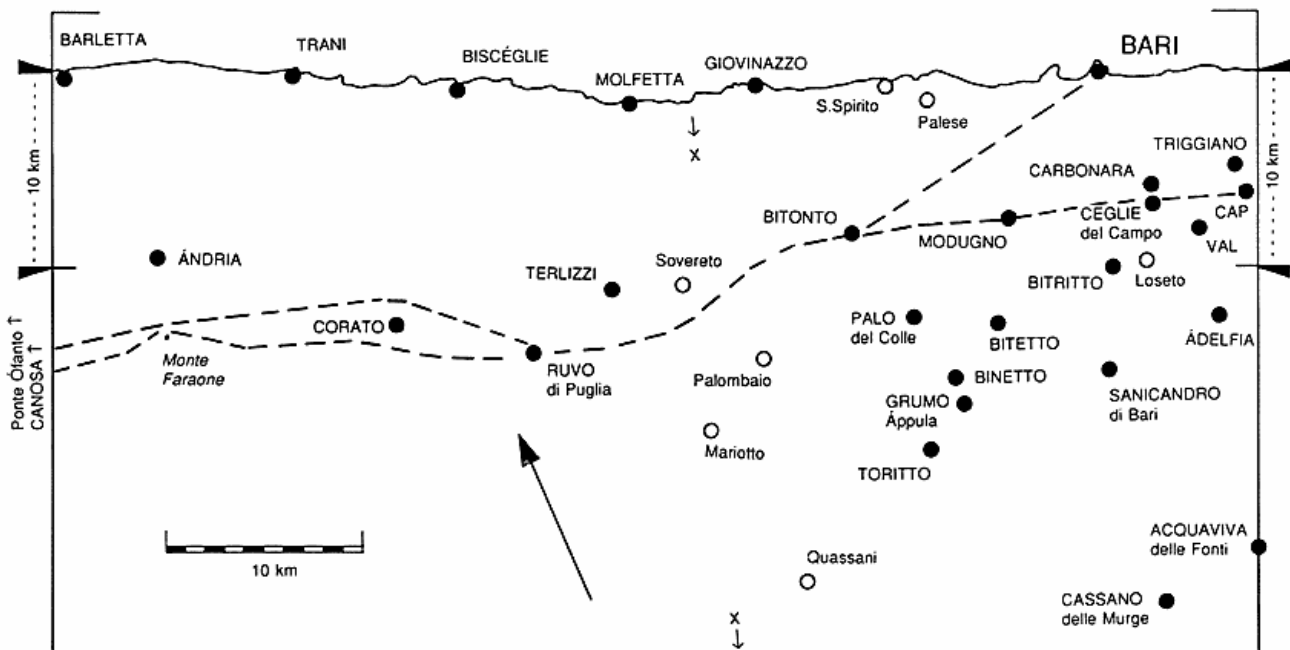


Fig. 3. Location of the settlements in the western part of 'le Murge'. The dots show the centres of municipalities i.e. the old settlements. The rings show the newer settlements. The dashed lines indicate the ancient Via Traiana. The x-arrows show the

situation of the profile Fig. 2. At the western and eastern edges of the map, two sets of triangles indicate a distance of 10 km from the coast, cf. text.

The Murgia Alta, the innermost zone, is higher than the lower level of 300-350 m.o.s.l. Towards the north a fault-line marks the boundary down to the Murgia Bassa. In the Murgia Alta, the karst scenery is more pronounced, and the soils of vast areas are rendzinas, often very shallow, accompanied by infertile lithosols. To a large extent, this area is waste-land: a poor heathland, utilized as extensive pastures for sheep. Intensive cultivation, consisting of crop rotation and vineyards, is mostly limited to dolines, dry valleys and other depressions, where soils are deeper and more fertile.

SETTLEMENT

The population is highly concentrated in the towns (98%). This concentration was a fact even before the modern processes of industrialization and urbanization. Fig. 2 shows the distribution of the towns. Most of the towns are old, having existed since Roman times (the Roman names in brackets); the origin of some (*) is even older, and probably all the towns, including those not mentioned, have a pre-Roman predecessor:

A) on the coast: Barletta (Barduli*), Trani (Tirenium*), Molfetta (*?), Giovenazzo (Iuvenis Netium*), and Bari (Barium).

B) inland: Corato, Ruvo (Rubi*), Bitonto (Butuntum*), Modugno (*?), Ceglie del Campo (Caeliae*), all these on the ancient Via Traiana (see below), and also Andria, Terlizzi (Turricium), Carbonara di Bari, Adelfia, and Grumo Appula (Grumentum). Adelfia is regarded here as one town, but was originally two separate settlements: Canetto and Montrone.

Just a handful of suburbs, cross-road towns etc. are 'new', though the origin of some is old: Loseto, Mariotto, Palombaio, Palese, Quasani, Sovereto & S.Spirito. Carbonara and Ceglie are now integrated suburbs of Bari, and are not registered separately in the census, but they are old in origin and regarded here as separate settlements. Apart from the last-mentioned 9 settlements, all the others are centres of municipalities (capoluoghi dei comuni).

Until recently, most of the towns in the area had a rural function. Agriculture has been the main industry, and several of them are still rural. Against this background many of the towns are comparatively large. In the middle of the 1970s (Corsi, 1983 - cf. also Cautadella, 1976), 17 out of the 31 towns (excl. the provincial and regional capital Bari) had more than 10,000 inhabitants, and 7 had more than 40,000; Binetto alone had only approx. 1,000 inhabitants, the others at least 4,000. Just 5 of the 17 towns were not classified as agricultural although agriculture was nevertheless of great importance. Even the largest of them all, Andria with 82,000 inhabitants, was agricultural.

LOCATION OF THE SETTLEMENTS

As topography has been ruled out as a determinant of the settlement location, other factors have obviously acted. For instance, a string of settlements is situated on the coast, along which a Roman road, the Via Litoranea, used to run. These towns were founded on the sites of a few natural harbours.

The distance relationship between towns has been speculated upon before (cf. Almagià, 1959:1178-79), presumably not as being a product of a central place system, but rather the product of several interacting factors which the past rural society used to fix the territory of each rural town, and consequently set the distances which separated them. Such factors were: quality of agricultural resources, population density, social system, means of transportation. However, there is no obvious difference in the quality of agricultural resources between the western part of the area with its comparatively widespread towns and the eastern part where settlement is much denser.

The distance from the sea (approx. 10 km) has also been suggested as accounting for the settlement location (cf. Almagià, 1959). As it appears, there is a series of settlements 10-12 km from the coast, but there is also the row of settlements on the coast, and in the eastern part of the area a handful of settlements is found rather close to the coast. In periods of piracy and instability, the settlements at a rather safe distance from the coast may have had some advantage, which might have sustained growth, but this is not likely to have played any locational role.

The ancient Via Traiana, one of the main Roman roads, connected Latium and Campania with Apulia (eg. Ashby & Gardner, 1916, and Quilici, 1989). This road branched off from Via Appia in Benevento (Beneventum) passed the Appennines to Troia (Aecae) and Ortona (Herdoniae) in Capitanata. From Ortona, the Via Traiana takes a rather straight course to Brindisi (Brundisium) where it again meets the Via Appia. In the western part of the study area two routes are shown on the figure: a southern one according to both the topographic map and Ashby & Gardner (1916), the other according to Quilici (1989); the last mentioned is based on aerial photographs and archaeological surveys (Alvisi, 1970) and is likely to be the right route. From Bitonto, a short road, the Via Gellia, branches off to Bari. As mentioned above, a series of towns in the Roman era was on the route of the Via Traiana. Other Roman towns were also situated on the road in 'le Murge': Canosa (Canusium) just west of the study area, 20 km from Andria, and just east of the study area; Noicattaro (Egetium) and Conversano (Norba).

One local opinion is that the road had a locational effect for towns in the area. This might be an over-simplification, and written sources to substantiate it are rare, (see

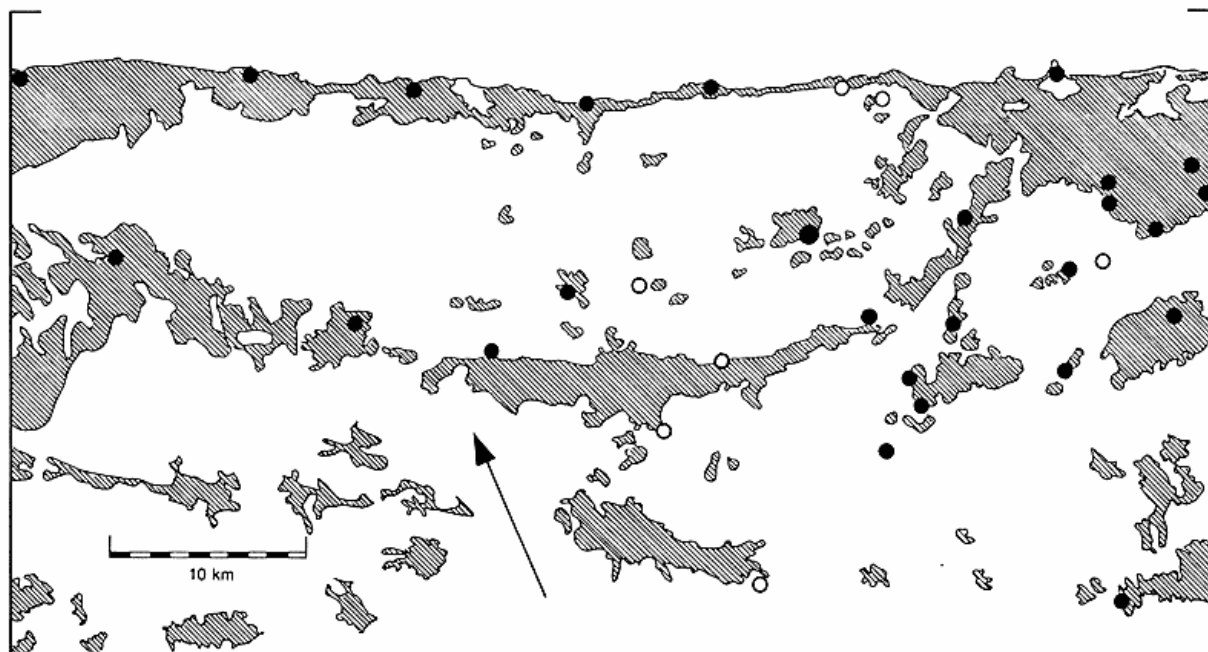


Fig. 4. Location of the settlements and main geological features. The hatched areas are younger deposits; pleistocene, quaternary,

and recent alluvium. The remaining terrain consists of older deposits; cretaceous limestone.

however, cf. Walker, 1967, p. 208). The route taken by the Via Traiana was the most economic: being a straight line across very level terrain between important nodes, Canosa (Canusium) to the west, and Bari and Brindisi (Barium and Brundisium) to the east. Being located on the Roman road might have sustained growth for some towns in the area, even for much longer periods, and parts of the road are still being used today. However, the road is not likely to have played an initial role for their location as such.

LOCATION AND GEOLOGY

As the stated factors presumably have only been of minor importance for settlement location, more important locational factors might be the subsoil and geology. The geological structure is simple, as briefly described previously; cretaceous limestone with pockets of younger deposits of clays and sands. The distribution of the outcrops on Fig. 3 is based on the geology maps; 176, 177, 189, at a scale of 1:100,000 (Servizio Geologico, 1966a, 1966b, & 1970). The distribution is expressed in percentages in Table 1. A comparison of the geology with the settlement distribution points towards a certain relationship (cf. also Colamónico, 1916). If the subsoil had no importance, then the settlements would be distributed rather homogeneously and proportionally across the different geological out-

crops. It appears from the map and Table 1 that this is not the case. While most of the settlements are situated on the younger deposits, the rest are very near. It is also obvious that the towns which lie approximately 10 km from the coast have their location connected with a tract of the younger deposits. In fact, only one older settlement and two new ones are directly situated on the older cretaceous deposits. As the total number of settlements is rather small, a statistical test was applied to support the discovery.

A G-test was therefore carried out, which is an alternative to the chi-square test and interchangeable. Mathematically it is supposed to have advantages (Sokal & Rohlf, 1991). The null-hypothesis is that the settlements are distributed proportional to the geological outcrops. To ensure against over-simplification, the observations were classified in different ways:

A) The study area: i) the whole area, and ii) by excluding the coastal zone, the two definitions give 1845 resp. 1550 km². The areal exclusion was based on half of the distances between the coastal settlements and the nearest inland settlements. This was done as the location of the coastal settlements might be primarily caused by the coastal position due to a harbour etc.

B) The settlements: i) All settlements, and ii) by excluding the new ones as these might have been established without any rural resource base.

Area	Younger deposits	Cretaceous limestone		Total
		Bz	The rest	
A. Total Study Area				
1845 km ²	21.36 %	12.25 %	66.39 %	100 %
Number of settlements				
i) Old settlements				
observed	18	7	1	26
expected	5.55	3.18	17.26	
ii) Incl. younger settlements				
observed	20	8	4	32
expected	6.83	3.92	21.25	
B. Excluding the Coastal Zone				
1550 km ²	17.25 %	12.34 %	70.41 %	100 %
Number of settlements				
i) Old settlements				
observed	13	6	1	20
expected	3.45	2.47	14.08	
ii) Incl. younger settlements				
observed	14	7	3	24
expected	4.14	2.96	16.90	

Bz is a border zone of 0.5 km or less from the contact point with the younger deposits - cf. the text.

Table 1. Geological outcrops and the distribution of settlements, observed and expected.

C) The geological outcrops: A simple classification as i) cretaceous, and ii) other younger deposits according to the geology map and Fig. 4.

In sum, the three, two-way classifications offer eight possible tests. The table shows the distribution of outcrops and settlements. As some of the settlements on the cretaceous outcrop were close to the younger deposits, a border zone of the cretaceous, 0.5 km wide (Bz in the Table 1), was added to the cretaceous belt in one set of tests, and to the younger deposits in another.

The adjusted G-values were all above 10.8, the value for $P = 99.9\%$ in a chi-square table for one degree of freedom - whether or not the border zone was included for either the cretaceous or younger deposits. The statistical conclusion is highly significant and rejects the null-hypothesis, while it supports the theory that the location of settlement is closely connected to the location of the younger deposits.

INTERPRETATION AND CONCLUSION

In spite of common economic conditions and the very level topography, the area is not isotropic. The settlements in the study area are located as agricultural settlements in close connection with the young deposits. This location is presumably because of the agricultural possibilities offered by a location on the younger deposits which improve the opportunity of utilizing crop rotation in the production of basic food crops (cereals). Better

opportunities for well-digging and obtaining water generally also exist. This is not a deterministic conclusion, but a rational one, seen from a cultural-ecological or an economic point of view depending on the choice of argument. The growth of the settlements and the resulting size of the towns have been regulated by other factors; size of territory, agricultural potential, intensity of agriculture, distance to other towns, etc. In certain periods, a coastal location or one on the main roads was positive for growth, while in other periods the comparative safeness of the interior was advantageous. In modern times, with the development of a tertiary society, the size and growth of the towns probably now show an adaption to a central place system.

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expected	6.83	3.92	21.25	
B. Excluding the Coastal Zone				
1550 km ²	17.25 %	12.34 %	70.41 %	100 %
Number of settlements				
i) Old settlements				
observed	13	6	1	20
expected	3.45	2.47	14.08	
ii) Incl. younger settlements				
observed	14	7	3	24
expected	4.14	2.96	16.90	

Bz is a border zone of 0.5 km or less from the contact point with the younger deposits - cf. the text.

Table 1. Geological outcrops and the distribution of settlements, observed and expected.

C) The geological outcrops: A simple classification as i) cretaceous, and ii) other younger deposits according to the geology map and Fig. 4.

In sum, the three, two-way classifications offer eight possible tests. The table shows the distribution of outcrops and settlements. As some of the settlements on the cretaceous outcrop were close to the younger deposits, a border zone of the cretaceous, 0.5 km wide (Bz in the Table 1), was added to the cretaceous belt in one set of tests, and to the younger deposits in another.

The adjusted G-values were all above 10.8, the value for $P = 99.9\%$ in a chi-square table for one degree of freedom - whether or not the border zone was included for either the cretaceous or younger deposits. The statistical conclusion is highly significant and rejects the null-hypothesis, while it supports the theory that the location of settlement is closely connected to the location of the younger deposits.

INTERPRETATION AND CONCLUSION

In spite of common economic conditions and the very level topography, the area is not isotropic. The settlements in the study area are located as agricultural settlements in close connection with the young deposits. This location is presumably because of the agricultural possibilities offered by a location on the younger deposits which improve the opportunity of utilizing crop rotation in the production of basic food crops (cereals). Better

opportunities for well-digging and obtaining water generally also exist. This is not a deterministic conclusion, but a rational one, seen from a cultural-ecological or an economic point of view depending on the choice of argument. The growth of the settlements and the resulting size of the towns have been regulated by other factors; size of territory, agricultural potential, intensity of agriculture, distance to other towns, etc. In certain periods, a coastal location or one on the main roads was positive for growth, while in other periods the comparative safeness of the interior was advantageous. In modern times, with the development of a tertiary society, the size and growth of the towns probably now show an adaption to a central place system.

ACKNOWLEDGEMENTS

Necessary field observations have been financially supported by the Institute of Geography, University of Copenhagen. Mr. R. Barnes have improved the English manuscript.

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