Geographic Profiling Applied to Italian Serial Murder's Case: Ben Mohamed Ezzedine Sebai

Magliocca D*

Independent researcher, Applied Criminology for Investigation and Security, Judicial Police Officer, Italy

*Corresponding author: Domingo Magliocca, Geographic Profiling Analyst and IA-IP Geographical Offender Profiling and Dragnet trained, Italy, Email: domimag@libero.it

Abstract

This paper is one of few studies in Italy with the use of geographic profiling software Dragnet and it presents the investigative techniques of Geographic Profiling applied to serial murder case occurred in Italy between 1996-1997. To obtain this purpose, it will be introduce some essential elements of investigative-geographic crime analysis as the behavioral geography applied to investigation, the new concept of «geographic crime scene», the decisional support system Dragnet, and the practical application of geographic profiling in criminal investigation, in particular on serial murder example case where the Geographic Profiling Dragnet software approximately predicted the offender's residence area.

Keywords: Serial killer; Geographic Profiling; Geographic Crime Scene; Criminal Investigation; Dragnet Software

Abbreviations: TA: Palagianello; FG: Cerignola; CGT: Criminal Geographic Targeting; CCTV: Closed Circuits Television.

Introduction

The geographical analysis of the criminal spatial activity of an offender can become a valid and decisive new tool in criminal investigations, and also with specificity inside the investigative method called *Geographic Profiling.* In particular, the term Geographic Profiling is related to specific investigative procedure used to search the most likely area of residence of a serial offender through the evaluation of crime scenes's geographical distribution. The importance of crime scene analysis is always recognized in criminal investigations context; in this filed, the subjective opinions and assumptions concerning the intrapersonal world of the offender can say little to support the investigative analysis and contrast with the concreteness of the investigation. In

particular, in serial crimes analysis the investigation process needs of operational assessments that can lead law agencies to the identification of suspects; it is important the technical assessment of how crime was committed on the basis of what emerged from the scientific analysis of crime scene, but at same time it is relevant to observe where the crime was committed.

The crime scene is not only a "physical container" where the traces of the crime are located. This place does not exclusively have a criminalistic value. Indeed, it is also the geographical site combined in the complex criminal analysis and becomes a criterion to observe the location of the committed crimes and to predict the geospatial pattern of criminals. For the investigation it is important to know why an offender has chosen a particular targets and not a other, and it is indispensable to border the physical and emotional perimeter within which the offender acts as well as to understand the his possible area of residence. By studying

Magliocca D. Geographic Profiling Applied to Italian Serial Murder's Case: Ben Mohamed Ezzedine Sebai. J Crim Forensic studies 2020, 3(3): 180047.

Copyright © 2020 Magliocca D.

the spatial location of crime sites, it will be possible to explore the relationship between the places, the offender and his or her usual space. According to Brantingham, the urban environments that generate crime are human "constructions", they represent the by-product of the space we use to manage the needs of daily life (home, residential area, social space, offices, shops, transport system, bus stops, roads); precisely, in this space it is possible found interconnections with the offender, useful to identify the his base and activity range. In fact, Sherman noted that "crime is six times more predictable from the address of the event rather than from the identity of the offender" [1,2].

Geographic Profiling

Geographic Profiling is an investigative procedure based on induction that contributes, through the study of the places affected by the crime, to delimit a geographical area where police agencies can concentrate the investigation on the unknown offender's residence area. The method investigates the temporal and geographical information of offensive events, provides a priority area where law enforcement can better invest and manage each investigative resource to discover the spatial pattern by the offender in a specific geographical space. In particular, the main intent of the geographical perspective of the crime will be:

- Understand the geographic configuration of the crime scene in relation to multiple crime events and/or to one with multiple related crime locations;
- Examine the mobility of the offender;
- Reduce the offender's search area on basis of the committed crimes and related locations;
- Establish the likely geographical area of residence or the anchor point of the offender;
- Establish the priority order in a list of suspects based on the place of residence, work;
- Suggest possible investigative strategies related to the output of the geographical profile and manage police activities.

The geographic profiling technique is generally applied to various types of crimes with multiple offenses, characterized by seriality of the conduct involving multiple crime scenes geographically displaced, at least five, committed by the same offender in the same geographical area and with a possible cluster relatively close to a single area/location that would involve an alleged geographical anchor, compared to the usual configuration of a "urban hot spot": burglary, robberies, murders, car theft, rape, incendiary acts, theft from motor vehicles, bomb attacks, shoplifting, vandalism, kidnappings, threatening letters. The profile is very often used in serial murder and burglary case. The main data's source used to generate a geographical profile are the sites of criminal events. The geographic profiling analyzes the geospatial data connected to an identified locations series, in particular the places where the victim's bodies were found/abandoned, the places where the victim was kidnapped, the point where it was last seen, arson sites, the scenes of the robberies, but also every geographical place associated with the crime.

From a theoretical point of view, the application of geographical indications to investigation starts from the assumption that the environment has a certain action on human spatial behavior because the evaluation of the choice of criminal sites by an offender is based on a principle conceptualized by George Zipf called least effort principle [3], applied to different human activities. In practice, in similar behavioral choices, an individual will opt for the one that requires less effort. This consideration translated into a criminological-investigative field is known as nearness principle: if a person will chooses between the different possibilities to gain a specific goal/purpose, he will prefer the option that it will entail the least waste of time, also intended as the distance to travel. In the case of the selection of multiple targets, selection of any roads or movement to commit a crime, at the same desirability, an offender will prefer the shortest route and will prefer an easily accessible target located near to residence area. This principle is based on hypothesis that there is a stable relationship between the positions of crimes and the home base of the offender.

The places where the crimes are committed, the sites where the bodies of the victims are disposed or deposited are not chosen by the offender without any criteria and they are not random. In fact, a distance decay phenomenon is displayed according to which the crimes committed by a serial criminal decrease as the distance between the place of the offense and his home increases. Geographical profiling exploits the geographical components (distance, mobility, mental map, locality sociodemographic) of crimes and constitutes an appendix of investigative-behavioral analysis of the crime scene; compared to behavioral analysis, geographical profiling directs the investigation on what Magliocca termed **«***geographic crime scene***»** [4]. Between the point of first encounter with the victim and the dump site, the latter site will be the "classic" crime scene because it represents the appropriate place for criminalistic analysis. In effect, the two sites (as well as other locations possibly involved in the crime) interact spatially with each other, creating the "geographic crime scene". So, the geographic crime scene is:

- the crime site correlated to particular or specific geographic area of crime (indoor or outdoor place, urban site, proximity to frequented place by people);
- the locations of all sites related to crime (e.g. victim's last known location, the place of starting anonymous phone calls and/or the purchase's site of offensive instruments correlated to crime) and locations of serial offenses,

both intended as the geographical general structure of crime events in relation to the socio-demographic-economic context, to presence of physical (lakes, sea, mountains) or psychological barriers (inopportunity to travel in neighborhood inhabited by an ethnic group different from one's own in order to avoid suspicion), to the road system (presence of urban roads, highway, suburban roads), to time of the commission of the crimes, to backcloth characteristics of the environment in which the victims move or the targets are located. Once the geographic positions of the crimes have been acquired by analyst, the concerned sites are entered into sophisticated geographic profiling computer systems as Rigel or Dragnet. The software uses a complex algorithms to produce a colored map of probability (the offenders' geoprofile), the area will most likely contain the offender's home base, about the analyzed crime series.

In this way, the tool develops the quantitative aspect of geographic profiling. Instead, the analyst makes the qualitative component through a criminological inspection of geographic crime scene. For many offenders, the home base is the residence area. In geographic profiling field, however, the term "home base" is indiscriminately used because this base also coincides for some offenders with work's place or with the area located near the past residence; other offenders use "social" places, meeting places as a starting point for their criminal activity. On the other hand, some criminals are nomadic or mobile offenders and they haven't a stable physical anchor point. The analyst should always consider these circumstances, as well as the type of crime, the environment in which it is committed. The geographic profiling is not an investigative panacea in criminal investigation, it does not lead the investigator to the exact offender's residence but at same time the geographic profiling is not a simple and mere geographical map with particular visual effect.

Behavioral Geography Applied to Investigation

Environmental criminologists consider that crime sites are generally determined through a search and selection activity, and are influenced by perpetrators's activity space and offender's base position [5]:
Offender residence → Activity Space → Mental Map → Target Selection → Crime sites

Spatial and Environmental Consistency

The spatial and environmental consistency/stability indicates the condition according to which an offender would not move very far from his home area within a series of crimes: he would choose similar crime circumstances

and environmental characteristics (including the physical, contextual and temporal elements of the crime) during the crime sites selection, behind the level of randomness. Rossmo indicates that serial murderers show a high level of consistency in their "geographic modus operandi" in serial crimes [6]. Serial offenders often use the same geographical space within which they move and tend to model themselves geographically. Lundrigan, Czarnomski and Wilson suggest that "offenders are not selecting environments randomly but that whatever might be influencing the selection of one environment is also influencing the selection of subsequent environments" [7].

In other words, if an offender attacks a victim at the encounter site and leaves the his/her body at the same location, he is likely to use again the same crime location set. Likewise, if an offender abducts a victim and disposes the body in a different location, it is likely that this pattern remains consistent across a crime series. The environment in which the offender acts and the selection of the crime site can be considered as a reflection of people's knowledge and geographical experience in that same environment/area of activity. Canter emphasised that stability related to offender spatial behavior and as well as to environment selected to commit a crime is more evident in serial criminals because they spent the criminal activity within a limited space, preferring environments that are more familiar obtained from their daily routines [8]. In short, if an offender does not commit crimes near to his residence, he is very likely to search targets in surrounding areas; subsequently, when he has to choose from the various nearby areas, he will choose the one closest to places where he lives.

Mental Map

Mental maps, also called cognitive maps, are a mental description of an environment. According to Canter and Hodge, a cognitive map contains the internal representations of the world that people use to find their way around and make decisions about what to do and where [9]. A personal mental map does not inevitably indicate that an individual has a detailed knowledge of area but a person has a mental image of the geography of specific area that allows to orient himself in the space. Everyone has a "mental road schemata" of the area where they live, an image of city and of all those places where we move during daily activities. The same also applies to criminals, which they uses it to go in specific places, to select a certain target, to search and leave from crime places. Each cognitive map is personal and acts on personal movements; different people may have different mental maps, even if they live in the same area because the mental maps are built upon the personal and past experience, the social and cultural conditions, the interpretation of surrounding environment, the meaning of places where the

person lives and moves. An individual builds his mental maps using two main information's sources related to geographical characteristics of place and also to arguments linked to social relations: the individual geographical experience corresponding to a specific location and how it interacts within a larger area (routes, streets, general environment, people who reside there); - the perceptions of the area itself through the mass media, the considerations of others, the view of maps. The mental map works on the crime scene selection: this site could not otherwise be observed and "used" by offender if he had not first been aware of it. The physical sites appear as a mirror of learned behavior and they form the offender's objective geographical response becoming a crime location. On practical hand, the diagram shows the interaction between mental map and crime site choice Figure 1.

Figure 1: Interaction Mental Map/Crime Sites.
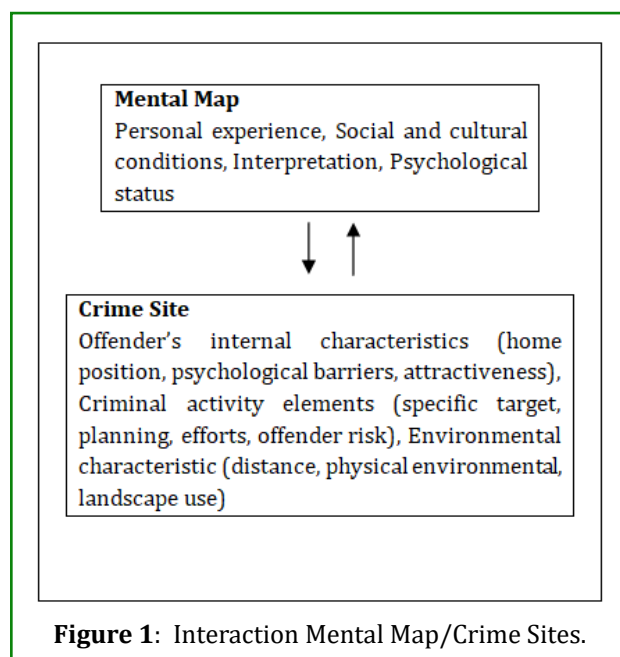
Awareness Space

According to Canter, "where we go depends on what we know to be available. What we know depends on where we go" [10]. In terms of behavioral geography, the areas in which an individual has geographic knowledge are called awareness space. This concept is a very important in spatial analysis of crime and about journey to crime; many research shows that offender's "work area" is correlated with his awareness space. The awareness space is defined as total area and all places where a person has knowledge with sufficient level, even without having visited some of them. It includes activity space, an area in which most individual daily activities take place, a space periodically traveled and fairly well known. In fact, the activity space contains the detailed areas helpful to habitual geography of individuals. The awareness space

and the activity space area can expand as new locations are discovered and/or new information's are collected, becoming a very important familiar area. Eck introduces the concept "familiarity decay": if a criminal cannot find or is not in the right conditions to hit targets close to known or favorite places, it is less likely a shift to other unknown areas because the distance from the original crime site increases the probability of "unfamiliarity" condition [11]. For example, if an attractiveness area located near a familiar place is under police surveillance, it is very plausible that the relocation will take place in the direction of other targets, but located within a familiar area or in other zone perceived as comfortable for offender's point of view.

The Circle Hypothesis

Canter developed a model to explain the spatial behavior of the offender called "Circle Hypothesis": a way to define the area delimited by crimes identifying the two furthest crimes from each other and using the line between them as diameter of circle [12]. This model takes in consideration the role of the home base as the starting point of inference about the geographical analysis of a criminal series. Canter and Larkin applied the model on serial sexual offenders's spatial activity based on 45 British rapist and they suggested the classification of offenders into two spatial categories: Commuter (or traveling offender) and Marauder. In first case, the offender travels from a home base into an separate area to offend and, in this situation, there is little or no overlap between the area around the home (home range) and the area in which the crimes are committed (criminal range): the offender comes outside his home range to commit crimes. In Marauder pattern, the offender's home base acts as a focus for his crime locations. The result of Canter's findings shows strong indications for the Marauder hypothesis in this set of sexual offenders and also in the other researches over time. From Canter's studies, supported by various analyzes in different countries around the world, it predominantly emerges a domocentric criminal spatial pattern, especially in expressive crimes.

The Home Base's Role

The home base, as a starting point for committing a crime, mainly identified in the residence but also in alternative or social sites, such as the workplace and recreational place, or in a significant anchor point (family member's residence), assumes within the geographical profiling techniques a strategic importance because it constitutes the natural place for all human activities, illegal and legal, into the environment. In criminal terms, it is not excluded that other known areas (the area of residence of friends and relatives) can also be considered tactical for criminal opportunity but the dimensional range of this condition appears smaller than the offender residence area. In South Africa, Wemmerpan

serial killer case, the spatial analysis showed that most of the crime sites were located around the suspect's two places of residence, with the others being where he worked, where his girlfriend lived and where his brother lived [13]. The travels and activity of criminals are characterized by the distance decay curve. It is not an exclusively mathematical concept because, from a criminological and investigative point of view, the function can be used to investigate the relationship between the serial offender's home base and the crime sites.

In investigative context, the distance decay function Figure 2, represents the empirical confirmation that the crimes committed by a serial offender decrease as the distance between the crime scene and his home increases. There is a body of studies termed "journey-to-crime research" that shows that criminals will tend to commit their crimes fairly close to home base. We can find the offenders' criminal "proximity" activity in different crimes. For example, among the serial arsonists, a travelling pattern of two miles from the offender residence was detected in 70 percent of cases; it been similarly observed in the research of Fritzon where the distance was 2.06 km; in Edwards and Grace's data, in 68.5 percent of cases the base was located within 5 km. In analysis conducted in Washington, DC, Rhodes and Conly found an average distance of 2.6, 1.9, and 1.2 km respectively in robbers, burglaries and rapists [14-17]. In some studies about serial rapes, the researchers showed that the distance generally traveled by an offender from the residence site to commit a crime is very small. Canter and Larkin found a distance from the home base about 2.46 km, LeBeau about 2.85 km, while non-serial offenders moved from the residence on average about 5.63 km; in Topalin 4.52 km and in Rossmo-Baeza about 4.03 km. In addition, it was found that in 108 rapist cases studied, 83 offenders traveled on average 3.14 miles to commit their crimes [12,18-22].

Figure 2: Distance Decay function.
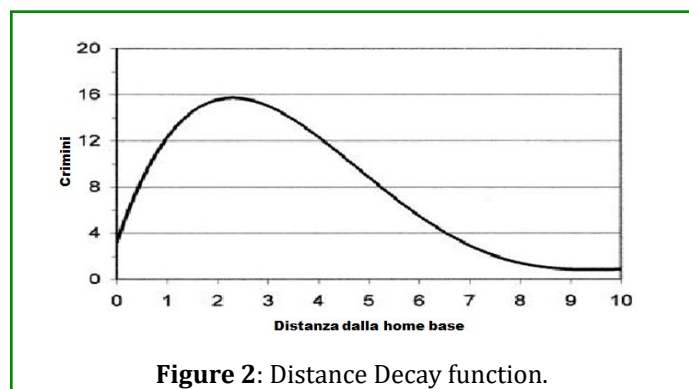
The distance decay function does not always have the same consistency and adherence in all crimes, because it is known that the offender's characteristics (race, age, gender) and the perpetrated crime (against person or against property) influence the relationship between the distance from the base and the crime site selection. In a study on a sample of 79 stranger rapists, Davies and Dale's results, supported [23] that younger offender tend to attack nearer to home: offender of 26 years or less travelled within 1.8 miles of home base. Always Davies and Dale showed that most rapes (75%) were initiated within five miles of rapist's base, and some of rapists tended to travel longer distances (also 100 miles). For the researchers this spatial pattern is likely to be related to offense characteristics than to offender personal characteristics, like searching victims from a specific area (red light district), spending large amounts time wandering and using public transportation. In violent interpersonal criminal acts (assaults) committed by young people, a short distance was recorded from the offender residence to crime location, in vandalism the distance was short-medium, in burglar the spatial pattern was longer, in drug related crimes there was a major spread: the highest frequency of crimes occurred within a distance of two miles and very few crimes were committed more than six miles from the offender home base [24]. Turner was the first to suggest the presence of security area around the home base, also called buffer zone (Figure 3), a transition area where the targets are considered by the offender less desirable than other due to the proximity to home base and the risk of identification. For Turner, "very close to his residence, say a block or two, he is less likely to commit as many offence as we would expect"[25].

Figure 3: Buffer Zone.
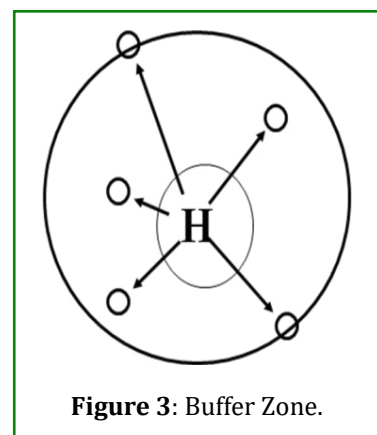
In conclusion, most offenders have the propensity to gravitate around their homes for even non-criminal reasons. The home base, as Canter and Godwin says, "acts as a structuring device for the development of the criminal activity" [26]. In fact, it is likely that there is a high probability level of overlapping between the home base locations and the crimes location and/or the main sites related to criminal activity.

Serial Murder Case: Sebai Ben Mohamed Ezzedine

According to FBI definition, the Serial Murder is "The unlawful killing of two or more victims by the same offender(s), in

separate events, at different times" [27]. Ben Mohamed Ezzedine Sebai is known in Italy as "Elderly female serial killer". Between 1996 and 1997, there were 12 homicides of elderly women over the age of 70, in South of Italy - Puglia region, killed in their own apartments with stabs wounds to the neck; DNA evidence was found in only one of the cases. Ben Mohamed Ezzedine Sebai was born in 1964, in Tunisia, North Africa. He immigrated illegally to northern Italy. In Italy he lived in different places, with no stable jobs. In 1991,

he was charged with attempted murder and rape by the State Police of Bolzano in northern Italy. From Bolzano, Sebai relocated in South of Italy, in province of Foggia; here he worked occasionally and as a farm laborer. The chronological distribution of the victims were three crimes in 1996 and nine in 1997. The crime sites are distributed in two areas: Province of Foggia and Province of Taranto, located about 250 km between them (Table 1, Figure 4).

Case	Date (dd/mm/yy)	Age	Site
1	24/04/1996	81	Lucera
2	29/05/1996	72	S. Ferdinando
3	10/08/1996	85	Ginosa
4	15/01/1997	75	Cerignola
5	04/04/1997	75	Massafra
6	01/05/1997	70	Trinitapoli
7	09/05/1997	82	Canosa
8	14/05/1997	86	Castellaneta
9	29/07/1997	83	Palagiano
10	21/08/1997	90	Laterza
11	27/08/1997	84	Spinazzola
12	16/09/1997	75	Palagianello
1995 Homicide Case			
1	06/1995	72	Foggia
2	08/07/1995	83	Melfi
3	13/08/1995	76	Palagiano

Table 1: Chronological distribution of events.

Figure 4: The geographical extent of the serial killer's activity space.

The murder investigations were conducted separately by three different Judicial Authorities based upon the locations where the victims lived. In 1997, because of the similarities in the cases, the hypothesis of single, serial killer of elderly victims came out. So, the investigation team, with also a forensic pathologist and a forensic psychiatrist, starts to work and review each of the crimes. The team determined that all murders appeared to be sexually motivated and had common similarities: victims were women over the age of 70, who lived alone in their own ground floor apartments; there were no signs of forced entry; all of the victims' apartments were ransacked; in some of the cases money, jewelry was taken. All of the victims were stabbed in the neck, and none of the victims had defensive injuries.

The killer appears organized; in fact the he apparently brought the knife to the crime scene and took it with him afterward. In several cases, diluted blood evidence indicated that the killer washed his hands in the victims' residences.

The investigators believed that the modus operandi was unusual for the local italian offenders and suggested that the he could be an immigrant. Another important element that they said was the offender might have a prior arrest for sex-related crimes or attempted murder because the murders appeared to be sexually motivated. On 1997, September 16, after last murder, Sebai was arrested near Palagianello's train station. In his home, Carabinieri found the knife utilized in last homicide and newspaper articles about elderly homicides in Puglia. In 2000, Sebai had been convicted for 4 of the 12 murders. In his confession, he admitted also to masturbating at every homicide, even though his DNA was recovered at only one scene. After several years of incarceration, Sebai confessed a total of 15 murders, including three cases committed on 1995 in Foggia, Melfi (Potenza province) and Palagiano, crimes not previously linked to the 12 homicides.

Geographic Profiling Analysis

The minimal number of offences to qualify a crime as "serial" is two linked offensive events, according to the reviewed serial killer definition proposed by Federal Bureau of Investigation. On geographic prospective, to obtain a stable but probabilistic algorithmic detection, Rossmo recommends that the geographic profile analysis should be carried out in the presence of a structured serial action with at least five connected, independent crimes linked to the same offender [28]. Generally, the more locations in a crime series, the more accurate is a geographic profile analysis. To optimize the processing phase of the Geographic Profiling, some software tools have been developed. The systems analyze the fundamental points of the crime scenes in order to predict the probable position of the offender's residence, a "risk surface" is produced where the red color indicates an area most likely that will contain the home base, followed by pink, second most likely area, light green, third most likely area. After the probability surface has been created, it can be superimposed on a map, providing the areas for offender's search. The geographic profiling software utilized in this essential analysis is Dragnet created by David Canter and his team at International Academy of Investigative Psychology. A "search cost" is calculated. The "search cost" reflects the percentage of the rectangle area before finding the offender's home base [8]. For example, a search cost of 0.5 would mean that 50% of defined search area had to be searched. Lower search cost means that geographic profile is accurate and products a small proportion of the area that needs to be searched in order to locate the offender after the prioritization. It is fundamental emphasize that a relevant geographic profiling analysis contains more other details of crimes and geographic elements as road network, train station, target backcloth, socio-demographic aspects of area, method of transport. Here the intent is introduce the use of geographic profiling in criminal investigation as decision making support tool and how it can reduce the area of investigation.

Crime Locations

This crime series involves 12 homicide crime scenes. The homicide cases occurred in 1995 are excluded from this analysis for methodological considerations. About the case on June 1995 in Foggia, there are some doubts about the nature of this murder because the event was originally classified by investigation as natural death case [29]. The homicide committed in Melfi was located in another region (Basilicata) and it is appears as an outliner so it can increase more the search area for investigation; the Palagiano's case on 1995 was excluded from the analysis because it already shows the same spatial pattern of the offender linked to case #9. In Sebai's case there are very distinct clusters in two different areas of Puglia region. For analytical reasons, we have chosen to separate the clusters due to the great extension of crimes area. So, the series and therefore the size of the hunting area is also divided into two subareas of interest prioritized. Due to spread between the crimes located in different activity spaces, and because of the results of the criminal profiling analysis about the offender (he could be an immigrant), it is possible to establish that train or other public transport was the most likely method of travel. So, a particular attention with police surveillance should be paid to train stations located in the peak profile area and near crime sites, the closed circuits television (CCTV) and commercial video cameras can similarly be checked to gain insights for offender search.
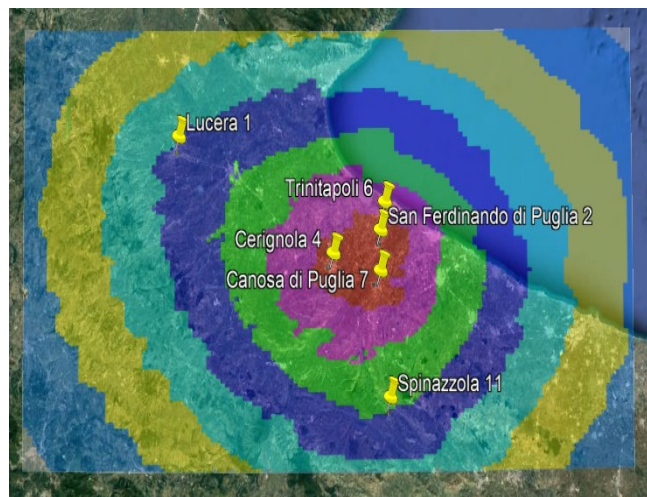
North Cluster

The analysis of the north cluster involves 6 crime sites (Table 2).

Case	Date	Crime Site
1	24/04/1996	Lucera
2	29/05/1996	S. Ferdinando
4	15/01/1997	Cerignola
6	01/05/1997	Trinitapoli
7	09/05/1997	Canosa
11	27/08/1997	Spinazzola

**Table 2**: Chronological distribution of North cluster events.

According to CGT (Criminal Geographic Targeting) Rossmo's model, with six crime locations the offender's anchor point, usually a residence, should be found on average about 10% of the total hunting area (the area containing the crimes) [28]. This is typically an area that is familiar to the offender. With support of Dragnet the Geographic Profile and the map below are created (Figure 5).

Figure 5: Dragnet's Geographic Profile of North cluster.

In second map produced (Figure 6) Dragnet identifies the suspect's residence zone located in relation to the geoprofile, the area in map colored by red. It is an area that encapsulates four crime scenes (#2, #4, # 6, #7) at straight line distance of about 15 km between them. This is the high probability area or "hot spot" and it represents the starting point for any search or pro-active strategies for this offender than by searching in an arbitrary zone and manner. In this way, the use of geographic profiling with Dragnet software have restricted the search area.
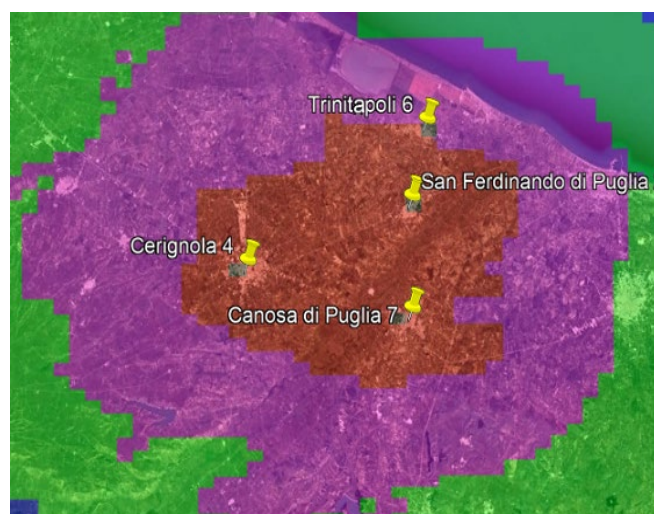
**Figure 6**: Peak profile area of North cluster.

South Cluster

The south cluster contains 6 offences below indicated (Table 3).

Case	Date	Crime Site
3	10/08/1996	Ginosa
5	04/04/1997	Massafra
8	14/05/1997	Castellaneta
9	29/07/1997	Palagiano
10	21/08/1997	Laterza
12	16/09/1997	Palagianello

Table 3: Chronological distribution of South cluster events.

The size of the hunting area for the south cluster calculated to be 1390 square kilometers, more restricted than the north area. This inset map Figure 7 shows the geoprofile based on analysis of offences in the south cluster. The site of Sebai's arrest is located in Palagianello (TA), inside the peak profile area.
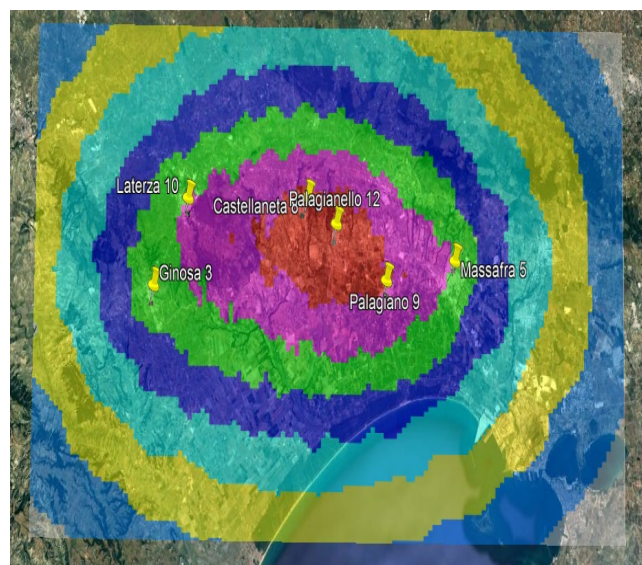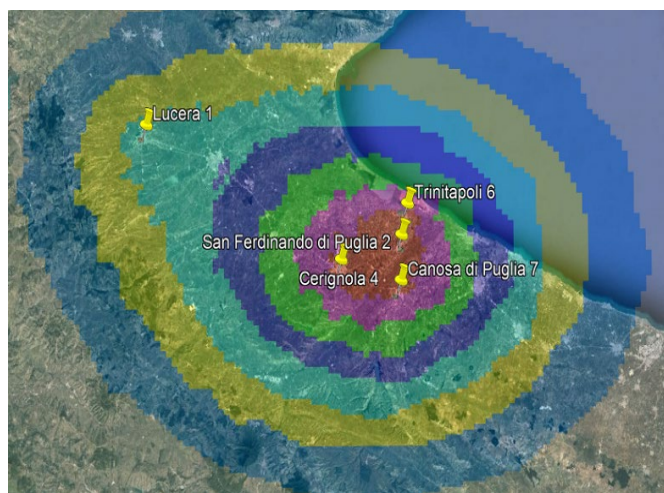

Figure 7: Geographic Profile of South cluster.

Result

The software Dragnet showed itself as a reliable investigative tool, able to reduce the search area of criminal investigations on serial killer case. In fact, the system confirms its applicability to the sample, identifying the Sebai's residence zone. Also, in this peculiar environmental situation of north and south cluster, the search area would be than smaller the area reported by Dragnet which analyzed the location of crime scenes. Therefore, the probability to find the offenders' base in some place indicated in maps, as lake, mountain and sea or other parts not populated, are minimal. The offender's home base was located in North cluster, in city of Cerignola (FG), at Vico Matera [30], where the investigators found some traces of crimes. In this case the killer shows a

constant spatial pattern and about circle hypothesis he acts as marauder offender, at least on north cluster where he has ringed the his home base with geographic pattern of crimes. Using Dragnet p value function (a probability values assigned to points about the possibility to contain the offender's home base) the home base location has a good probability value about 0.340. The researches reveal 70% of serial offenders are within about 15 to 20% of area defined by spatial analysis [31].

In this case, the proportion of the area that needs to be searched in order to find the offender home base is about 174 square kilometers equivalent to 0.0178 of search cost value in Dragnet, and to 1,7% of area inside the North cluster defined by hunting space. We can further reduce this area giving priority to red zone or in ranked-order locations. About the south cluster of crimes, in absence of reliable data, this area appears to be for Sebai a preferential environment with more specific anchor points than other places, as example Bari o Lecce province. On geospatial view, it is evident the Sebai's need to move into a "geographical pole of attraction and safety" characterized by familiar areas and main anchor points in order to achieve his criminal purposes. From the spatial analysis on this sample, a curious but important detail for the investigation is noted; it concerns the high probability to apprehend the offender or to identify an investigation's appreciable area with a strong surveillance and investigative strategies in North cluster peak profile/red zone already after the seventh murder (Canosa) on may 1997 (Figure 8) using only five north crime scenes. The above condition demonstrates that geographic profiling can be done early in the series enabling the investigative agencies to search and stop the offender.

Figure 8: Geographic Profile of North cluster with five crime scenes.

Conclusion

The limited and partial findings in Sebai's sample support the hypothesis that serial offenders, although they exhibit a certain and in some cases a greater degree of planning like serial killers, stay in a predictable area, within their home or comfort zone when they commit crimes as others prefer to remain within their comfort zone or home area to shop, eat, to make sport. It is important remember that humans follow an environmental dependence, tend to have habits and to develop a personal, exclusive and constant travel and spatial pattern remaining close to home or near to places they consider "home" or at the least a familiar zone. Without creating generalizations and justifying a direct causality, it seems that the target selection by a serial offender slowly collapses in exchange for certainty of a safe area in which he can offend and because of the inconvenience of travelling within a unknown environment which requires more time, costs of movement and efforts of adaptability in that area [32-51].

Acknowledgment

Forewords

The paper is for research purposes without any operational use.

References

1. Brantingham PL, Brantingham PJ (1995) Criminality of Place: Crime Generators and Crime Attractors. Euro J Criminal Policy and Res 3(3): 1-26.

2. Sherman LW (1995) Hot spots of crime and criminal careers of places Crime and Places. Crime Prevention Studie pp: 36-37.

3. Zipf G (1965) Human behavior and the principle of least effort: an introduction of human ecology. Hafner, New York pp: 573.

4. Magliocca D (2020) Il sopralluogo criminologico sulla «scena geografica del crimine», in publication on Rivista Sicurezza e Giustizia, Roma.

5. Rossmo K, Harries K (2009) The Geospatial Structure of Terrorist Cells. Justice Quarterly pp: 1-18.

6. Rossmo K (1997) Geographic Profiling. JL Jackson and DA Bekerian (Eds.), In: Offender Profiling: Theory, Research and Practice, Wiley, West Sussex.

7. Lundrigan S, Czarnomski S, Wilson M (2010) Spatial and Environmental consistency in serial sexual assault. J Investigative Psychol and Offender Profiling 7(1): 15-30.

8. Canter D, Coffey T, Huntley M, Missen C (2000) Predicting Serial Killers Home Base Using a Decision-Support System. J Quantitative Criminol 16(4): 457-478.

9. Canter D, Hodge S (2000) Criminals' Mental Maps (From Atlas of Crime: Mapping the Criminal Landscape, P 186-191, 2000, Linda S. Turnbull, Elaine Hallisey Hendrix, eds, et al., -- See NCJ-193465). Oryx Press, United States of America pp: 6.

10. Canter D (1994) Criminal Shadows. Inside the Mind of Serial Killer. Harper Collins, London pp: 412.

11. Eck E J (1993) The threat of crime displacement. PSQ 6(3): 1-7.

12. Canter D, Larkin P (1993) The Environmental Range of Serial Rapists. J Environ Psychol 13(1): 63-69.

13. Cooper AK, Byleveld R, Rossmo K, Schmitz P (2000) Using GIS and digital aerial photography to assist in the conviction of a serial killer. The Fourth Annual International Crime Mapping Research Conference, USA.

14. Sapp AD, Huff TG, Gary GP, Icove DJ, Hobert P (1994) A report of essential finding from a study of Serial Arsonist, National Center for the Analysis of Violent Crime.

15. Fritzon K (2001) An examination of the relationship between distance travelled and motivated aspects of firesetting behavior. J Environ Psychol 21(1): 45-60.

16. Edwards MJ, Grace RC (2007) Analyzing the offender location and residential base of serial arsonist in New Zeland. Australian Psychol 42(3): 219-226.

17. Rhodes WM, Conley C (1981) Crime and mobility: an empirical study.

18. Canter D, Youngs D (2008) Principles of Geographical Offender Profiling, Ashgate, Hampshire, pp: 274.

19. LeBeau J (2008) The Journey to rape: geographic distance and the rapist's method of approaching the victim. In: Youngs D (Ed.), Applications of Geographical Offender Profiling. 1st (Edn.), Ashgate, London pp: 14.

20. LeBeau J (1987) The Methods and Measures of Centrography and the Spatial Dynamics of Rape. J Quantitative Criminol 3: 125-141.

21. Picozzi M, Zappalà A, Santilla P, Laukkanen M (2003) Testing the utility of geographic profiling approach in three rapes series of single offender: a case study. Forensic Sci Int 131(1): 42-52.

22. Warren J, Reboussin R, Hazelwood R, Cummings A, Gibbs N, Trumbetta S (1998) Crime Scene and Distance correlates of serial Rape, in Journal of Quantitative Criminology 14(1): 35-59.

23. Davies A, Dale A (1996) Locating the stranger rapist. Med Sci and Law 36(2): 91-103.

24. Phillips PD, Georges-Abeyie ED, Harries KD (1980) Characteristics and Typology of the Journey to Crime in Crime - A Spatial Perspective, pp: 167-180.

25. Turner S. (1969) Delinquency and Distance in Canter D., Youngs D., Principles of Geographical Offender Profiling, Ashgate, Hampshire, pp: 274.

26. Canter D, Godwin M (1997) Encounter and death: The spatial behaviour of US Serial Killers. Policing: An Inter J Police Strategies & Management 20(1): 24-38.

27. National Center for the Analysis of Violent Crime Critical (2005) Serial Murder: Multi-Disciplinary Perspectives for Investigators. Federal Bureau of Investigation.

28. Rossmo K (2000) Geographic Profiling. Boca Raton pp: 378.

29. Campobasso CP, Colonna MF, Carabellese F, Grattagliano I, Candelli C, et al. (2009) A Serial Killer of Elderly Women: Analysis of a Multi-victim Homicide Investigation. Forensic Science International 185(3): e7-e11.

30. Castellaneta D (1997) Puglia, Manette a un Tunisino un Killer Per Cinque Delitti, quotidiano La Repubblica 19: 09.

31. Canter D, Youngs D (2008) Principles of Geographical Offender Profiling. Routledge pp: 274.

32. Accorsi A, Centini M (2006) The serial killers. Newton Compton Editorie, Roma.

33. Bernasco W (2010) A sentimental journey to crime: effects of residential history on crime location choice. Criminology 48(2): 389-416.

34. Bernasco W, Menting B, Lammers M, Ruiter S (2016) Family Matters: Effects of Family Members' Residential Areas on Crime Location Choice. Criminology 54(3): 413-433.

35. Brantingham PL, Brantingham PJ (1981), Note on Geometry of Crime. Canter D, Youngs D (Eds.), Principles of Geographical Offender Profiling. Taylor & Franics

Group pp: 28.

36. Brantingham PL, Brantingham PJ (2008) Crime Pattern Theory. Wortley R, Mazerolle L (Eds.), In: Enviromental Criminology and Crime Analysis William Publishing, Cullompton, UK.

37. Canter D, Youngs D (2013) Geographic Offender Profiling: making more effective use of G.O.P. to support intelligence and investigation, Workshop, Roma.

38. Canter D, Youngs D (2009) Investigative Psychology. Offender profiling and the analysis of criminal action, Wiley, West Sussex.

39. Canter D, Youngs D (2008) Applications of Geographical Offender Profiling. Ashgate, London.

40. Canter D, Hammond L (2006) A Comparison of the Efficacy of Different Decay Functions in Geographical Profiling for a Sample of US Serial Killers. J Investigative Psychol and Offender Profiling 3: 91-103.

41. Canter D, Lundrigan S (2001) Spatial Patterns of serial Murder: an analysis of disposal site location choice, in Behavioral Science and the Law. 1(9): 595-610.

42. Douglas J, Munn C (1992) Violent crime scene analysis: modus operandi, signature and staging. Law Enforcement Bulletin 61(2): 1-10.

43. Gabor T, Gottheil E (1984) Offender characteristic and spatial mobility: an empirical study and some policy implication, Canadian Journal of Criminology 26(3): 267-281.

44. Holmes RM, Holmes ST (2002) Profiling violent crime: an investigative tool, Sage Publications, Thousand Oaks.

45. Magliocca D (2020) Tracce geografiche criminali. Teoria e tecnica del Profilo Geografico, Primiceri Editore, Padova pp: 238.

46. Magliocca D (2020) Introduzione al crimine violento. Criminal Profiling e classificazioni pratiche, Primiceri Editore, Padova.

47. Magliocca D (2019) Profilo criminale. Analisi integrata del luogo del delitto, Primiceri Editore, Padova.

48. Mazerolle L, Wortley R (2008) Enviromental Criminology and Crime Analysis, William Publishing, Cullompton, UK.

49. Morton RJ, Campobasso CP, McNamara JJ, Colonna M, Carabellese F, et al. (2010) Cross-Cultural Comparison of Two Serial Sexual Murder Series in Italy and the United States, J Forensic Sci 55(4): 1111-1115.

50. Rossmo K (2011) Evaluation Geographic Profiling, in Crime Mapping 3: 42-65.

51. Rossmo K (2008) Geographic Profiling in serial rape investigations, in Hazelwood R., Burgess A.W., Practical aspects of rape investigation.