Chapter 5
The Increasing Role of the Forensic Anthropologist in the Search for the Missing

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Abstract Forensic anthropology has played a major part in the investigation of human rights' cases and is increasingly playing an important role in searching for missing persons, and assisting in the identification of the deceased in mass fatality incidents. Since its early years, work which was primarily restricted to the laboratory and mortuary setting with the purpose of identification of the deceased, to the present day the role of the forensic anthropologist has expanded to crime scene attendance in order to understand the contextual information in which human remains, primarily skeletonised, have been found and to assist in their recovery. In particular since the 1990s, forensic anthropologists have been key team players in mass grave investigations. Moreover, in recent years, at least in the United Kingdom, there has been an increasing request for forensic anthropologists to assist in search operations for human remains.

This paper provides a brief overview of the role of the forensic anthropologist, focusing on search in particular, and it highlights its value in a number of scenarios relating to searchisng for the missing.

Keywords Forensic anthropology · Human remains · Search · Missing person · United Kingdom

5.1 Forensic Anthropology

Much has been written about forensic anthropology, its definition, its history, the work undertaken, and the methods employed (e.g. Komar and Buikstra 2008; Tersigni-Tarrant and Langley 2017; Dirkmaat and Cabo 2012; Klepinger 2006; İşcan and Steyn 2013). Indeed, forensic anthropology in its wider sense does not only deal with the dead but also with the living (e.g. see Thompson and Black 2006; Cattaneo 2007; Cunha and Cattaneo 2006; Black et al. 2010a; Meadows 2011;

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Wilkinson and Rynn 2012; Cummaudo et al. 2014); whether it is to assess the age of living individuals through radiographs and CT scans, or the age subjects from photographs in cases of child pornography, to undertaking gait analysis or analysing physical features from CCTV footage to identify the individual, and even interviewing families in a human rights context. It may also be considered that those anthropologists examining primarily human remains, the body or the skeleton, may be more specifically called forensic physical anthropologists, since other anthropologists – whether social or cultural – may be undertaking forensic work too (e.g. Rosen 1977; Berger et al. 2015; Sanders 2005; Gill et al. 2009). In addition, the relation between forensic anthropology and archaeology and forensic practice overall differs according to country (e.g. see Kranioti and Paine 2011; Márquez-Grant et al. 2012; Groen et al. 2015; Ubelaker 2015). This relationship between archaeology and (physical) anthropology is not a topic for discussion here; although for the purpose of this paper, archaeology is excluded and also covered elsewhere in this volume.

Stewart (1979: ix) defined forensic anthropology as *that branch of physical anthropology which, for forensic purposes, deals with the identification of more or less skeletonised remains known to be, or suspected of being, human.* He further adds (Stewart 1979: ix) that apart from establishing if the remains are human, *the identification process undertakes to provide opinions regarding sex, age, race, stature, and such other characteristics of each individual involved as many lead to his or her recognition.* Forensic anthropology, therefore, can be defined, simplistically and in other words, as the application of methods and principles of physical anthropology[1] to cases of medicolegal or forensic interest. However, humanitarian cases may also fall under the umbrella of forensic anthropology.

Today's definition has also expanded beyond assisting in the identification of the deceased. It involves assisting in the location and recovery of human remains, which are in a certain state of decomposition and cannot be rapidly identified and also addresses trauma, which may have been associated to the manner and cause of death. Komar and Buikstra (2008), following the American Board of Forensic Anthropology state, more specifically, that the discipline deals with the identification of skeletal or badly decomposed or unidentified human remains; assists in the location and recovery of human remains, mainly of unexplained or suspicious deaths; and seeks to provide an opinion on post-mortem interval and evidence regarding any foul play. It was Dirkmaat and colleagues (2008a, b) who highlighted new trends in the field: the increasing role of DNA analysis, forensic archaeology, forensic taphonomy and trauma. It has developed from a role in the laboratory to attending crime scenes and on occasions now certifying the cause of death alongside forensic pathology in some countries or states. Developments in the field (e.g. see Latham et al. 2018) are also shaping these trends. Analysis may be done directly

[1] The American Association of Physical Anthropology (http://physanth.org/, accessed January 2018) defines it as 'a biological science that deals with the adaptations, variability, and evolution of human beings and their living and fossil relatives. Because it studies human biology in the context of human culture and behaviour, physical anthropology is also a social science'.

on the bone or through imaging and remotely. Specialisation is also necessary with this developing trend and the new techniques, and whereas in the past one forensic anthropologist may have analysed a skeleton, it may be that now several specialist forensic anthropologists (e.g. histological analysis, trauma analysis, taphonomy, age at death, craniofacial reconstruction, etc.) work on the same case.

For the purposes of this paper, the role of the forensic anthropologist relates to the dead or those presumed dead. It relates, in particular, to the contribution forensic anthropologists can provide as part of a wider team in the search for the missing. Their role is becoming vital (e.g. see Hackman 2016) in cases of missing person searches, searching for human remains in mass fatality incidents and searching for the right remains during an exhumation; case scenarios which are discussed below. The below-mentioned discussion does not imply that the forensic archaeologist has no role to play in forensic investigations involving search for and recovery of clandestinely hidden human remains. The focus is to inform about the possibilities a forensic anthropologist has to offer, especially during casework in which the forensic archaeologist and police officers have limited knowledge of human osteology and anatomy as well as on forensic taphonomy. Finally, it is recognised that some of the roles mentioned below will be fulfilled by a forensic archaeologist, depending on the country.

5.2 What Questions Can a Forensic Anthropologist Answer?

Although there are a number of forensic (physical) anthropologists working on identifying living subjects via CCTV images or photographs, for example, or on estimating the age of living individuals (Cattaneo 2007; Black et al. 2010a; Wilkinson and Rynn 2012); with specific regard to the dead and particularly skeletal remains, the role of the forensic anthropologist can be summarised as follows (after Komar and Buikstra 2008; Roberts and Márquez-Grant 2012; Márquez-Grant 2015; Márquez-Grant et al. 2016a, b):

- Assisting with search, location, documentation and recovery of either surface, buried or submerged human remains, working together with a forensic archaeologists or using forensic archaeological methods.
- Assessing whether the material is bone.
- If it is bone, whether it is human or non-human.
- Providing an inventory of skeletal elements present, indicating which ones are missing and providing an explanation as to why that may be.
- Commenting on the number of individuals present.
- Answering the question: What information can you obtain from these remains?
- Assisting in the identification of the deceased by reconstructing a biological profile (e.g. age at death, sex, stature, ancestry, unique identifying features).
- Indicating whether or not a skeleton or skeletal remains are consistent with a missing person's biological profile.

- Reconstructing fragmentary remains for a better assessment of trauma.
- Attributing bone fragments or complete skeletal elements to a particular individual or a primary identifier (e.g. dentition) in a commingled assemblage and/or minimising the number of DNA samples to be taken.
- Providing an opinion on the time-since-death or post-mortem interval.
- Interpreting taphonomic modifications to the bone; for example, have they been burnt, cut or bleached?
- Taking samples for DNA analysis, identifying and documenting the bone prior to sampling.
- Assessment of trauma, evidence of neglect or torture.
- Assessing whether the damage on the bone is post-mortem.
- Undertaking craniofacial reconstruction.
- Giving advice when required on other techniques of identification.
- Providing general advice, report writing and attending court as an expert witness when required.

The scenarios in which these questions relate are domestic homicide cases, natural and accidental deaths, mass fatality incidents, genocide cases, etc. The bulk of the work, once the remains have been confirmed as human, is assisting in the identification of the deceased. Whilst biological profile in a laboratory or mortuary setting will assist with the identification of the deceased, for example, by reducing the list of missing people to whom those remains could belong after obtaining information on age at death, sex, stature, etc., this paper focuses on the aspect of searching for the missing (presumed dead) in the field. Indeed, in recent years, at least in the United Kingdom, there has been an increase in forensic anthropology requests by the police for search operations,[2, 3] and an awareness of its importance is increasing through training and through the academic literature (e.g. see Hackman 2016; Márquez-Grant et al. 2016a, b). Therefore, from the above list of questions the forensic anthropologist can address, those in particular relating to search are emphasised below and addressed later in this paper:

- Search and recovery. For example, in areas where there are many bones and bone fragments but non-specialists are unsure if the bone is human or not. Prior to the search, the forensic anthropologist can provide a taphonomic report, contribute to the forensic strategy (e.g. recommended sieve size for human remains) and brief the search teams. The forensic anthropologist can also assist with identifying the right individual where many individuals may be buried in the area (e.g. cemetery, mausolea, etc.).
- Is it bone? Questions may be asked by non-specialists, especially when searching for small bones in cases of missing children, regarding whether material they

[2] http://www.mirror.co.uk/news/world-news/ben-needham-police-to-start-digging-1384886 (accessed January 2018).

[3] http://www.mirror.co.uk/news/world-news/madeleine-mccann-search-april-jones-3642420 (accessed January 2018).

have found is bone or not. These questions may be asked during the walking search phase or during the sieving process for example.
- Is the bone human or non-human? When search officers find a bone, the forensic anthropologist can assess whether it is human or not by direct visual observation or, if remotely, through photographs or other imaging means. If the forensic anthropologist is on site, then a quick assessment can be invaluable.
- What skeletal elements are present? Which ones are missing and why? This is information that is given to the police and can inform search teams regarding what skeletal elements need to be found. An assessment of modifications to bone, such as those as a result of scavenging activity, may explain the missing elements, likelihood of retrieval and with the right specialist, define the wider search boundaries.
- How many individuals? Sometimes the search, which is intelligence led, may recognise that the individual to be searched is to be found alongside a certain number of individuals. This may be asked in mass grave scenarios, exhumations from cemetery niches or vaults, mass fatalities, fire scenes, etc.
- Does this skeleton match the missing person's profile? When searching for the remains of a particular individual in a cemetery (e.g. an exhumation to obtain a DNA sample), the forensic anthropologist will need to take into account as much ante-mortem information as possible about the individual. Although ultimately there will be a primary identifier (e.g. odontology, DNA), in a cemetery with many buried, the assessment of the biological profile in situ is necessary in order to exhume the right individual.
- Any trauma? This may be applicable, for example, in a scenario where the deceased may have been executed in a human rights' case, buried in a normal cemetery, and then a few years later, a request is made to search for the remains for later repatriation and reburial. Apart from the biological profile, the ante-mortem information regarding gunshot trauma, for example, is important in terms of finding the right person (in cases where other people buried in the cemetery were not executed).

Thus, this paper aims to describe and provide an awareness of the valuable role of the forensic anthropologist in the search for the missing (presumed dead) and to introduce the ways in which forensic anthropology can be practised in search operations. This knowledge derives primarily from a personal reflection through experience with forensic casework, supported by the academic literature. It is, mainly, providing a perspective from a forensic practitioner's point of view and as a direct witness in recent years of the increasing role of forensic anthropology in search operations. Although forensic archaeology may come under forensic anthropology in a number of countries, forensic archaeology (see Hunter et al. 2013; Groen et al. 2015; Márquez-Grant et al. 2012) is treated separately here and excluded from this paper, so that focus can be given to forensic anthropology with regard to expertise in the human skeleton, in this case concerning the dead, rather than an assessment of the skeleton in the living. As the objective is forensic anthropology, this paper

focuses on searching for human remains where the remains may be skeletonised, bones disarticulated and/or fragmented.

This paper is structured according to a number of hypothetical scenarios yet deriving from the author's experience in forensic and humanitarian casework. Thus it is divided into (a) search of missing persons, presumed dead, for example, in the case of a missing individual and as part of a police investigation; this is the longest section; (b) mass fatality incidents; (c) exhumations; and (d) other scenarios.

5.3 Forensic Anthropology in the Search for the Missing

During a search, the forensic anthropologist will work integrated within a team. His or her tasks can include briefing the search team regarding, for example, the shape and size of human bones and walking alongside or behind the team as they are actively searching the area flagging material of interest and asking for an immediate expert opinion on the following questions: Is it bone? Is it human? This search may be undertaken in a variety of settings, with juvenile remains as a result of homicide found in attics, basements, fields, gardens and quarries amongst other contexts (e.g. see Gill-King 2009).

Whilst search strategies and processes in forensic archaeology may be classified into a number of phases (Hunter et al. 2013), so too can this occur in forensic anthropology. For instance, the equivalent of the archaeological (desk-based/initial) assessment may be in the form, from the forensic anthropological perspective, of taphonomy reports on the human remains; this could be followed by anthropological input in a team briefing or training, after which the presence of the forensic anthropologist is recommended during the active search to assess whether what has been found is a human bone. Finally, a final debrief may be put in place to advice on further work stemming from the search, for example, the need to search for missing skeletal elements, the need to consider sieving the material which has been excavated and retained, etc. Thus, Márquez-Grant and colleagues suggest a number of possible steps or phases from the point of view of forensic anthropology (modified from Márquez-Grant et al. 2016a):

1. Taphonomy report and assist in designing the search strategy (desk-based assessment): Do children remains survive in this type of environment? Will the remains be skeletonised after such a time period? Has there been any ploughing or any human activity on the land since the person went missing? Are there any scavengers, and how may these affect the skeleton?
2. Team briefing on site: What to look out for? What do bones look like in this environment? Will they be fragmented? What size are the remains?
3. During the active search: Is it bone? Is it human? Opinions can be provided remotely or on site; as Komar and Buikstra (2008: 95) point out, the forensic anthropologist can be part of the visual or pedestrian searches. It may be that

endoscopes have to be placed in certain areas and the forensic anthropologist can advise, highlighting the limitations, whether or not human bones can be observed.
4. Assess what is being excavated: Advise whether the remains are from the right person or constitute similar or consistent biological profile from the ante-mortem or historical information available on a particular individual, be involved in the sieving process, and advise on what skeletal elements or parts are missing.

The above first three points are discussed in more detail below.

5.4 Taphonomy Report

Taphonomy reports in forensic anthropology have been recommended elsewhere (e.g. Márquez-Grant et al. 2016a, b). Taphonomy, as we know, relates traditionally to the laws of burial, or the transition from the biosphere to the lithosphere, the conversion from bone to fossil following Efremov (1940b). Haglund and Sorg (1997) define 'forensic taphonomy' as the study of the processes affecting the body after death or post-mortem, whilst Dirkmaat (2012) indicates these processes go beyond the discovery and recovery of the human remains but much further into transportation, laboratory analysis and curation (see also Schotsmans et al. 2017a, b).

Whilst forensic archaeologists will have undertaken a desk-based assessment on the area to be searched (e.g. see Hunter et al. 2013), this information may serve for the report on the human remains written by the forensic anthropologist. As such, it is believed that a report on what is expected to be found and how (e.g. state of preservation) may assist in designing a forensic strategy as well as the anthropological briefing to the search team(s). As is known, many factors can influence the decomposition process, including temperature; humidity; deposition surrounding; soil; presence of scavengers; biological profile (including body mass); disease; manner and cause of death; plants; grave attributes including depth, clothing and other wrappings; geological features; etc. (e.g. see Haglund and Sorg 1997, 2001; Pokines and Symes 2014; Schotsmans et al. 2017a, b; Junkins and Carter 2017; Barker et al. 2017). It may be that a combined report by archaeologists and anthropologists would be the most appropriate.

Often, apart from any archaeological desk-based assessment that may be available (e.g. see Hunter et al. 2013), forensic taphonomy reports can be of use as it answers questions specific to human remains that the police want to know prior to searching or planning a search.[4] For example:

– Do the remains survive in this environment?
– Will the remains be fleshed or skeletonised?

[4] I undertake an exercise when training police forces and forensic scientists generally, which is to think of a hypothetical scenario and do a little research to explain to the rest of the class how the body would be preserved in such an environment after a certain period of time, what search strategies are planned for this type of scenario, etc., an exercise which seems to be of value.

– What size will they be?
– What colour will the bones be?
– Will they be fragmented?
– Will the remains be buried or scattered?

To cover what is expected and to relay this information to the police and other specialists, the taphonomy report or initial assessment report may be written with the following structure (see also Márquez-Grant 2015):

- *Introduction*: Hypothesis of what may be expected, deposition of remains and intelligence information.
- *Background*: When did the person disappear? What clothing was he or she wearing? What was the sex and age of the person? Are there any unique identifying features? Did he or she suffer from any disease?
- *Sequence and timing of decomposition of a human cadaver*: What is the sequence of decomposition? Is mummification typical in this environment? What if the body has been buried? What is the geology of the area to be searched?
- *The human skeleton*: If juvenile, then provide information on the size of the bones for a particular age, whether epiphyses are unfused, different types of bones, etc.
- *The search area*: Environmental assessment of possible deposition site – climate, topography, vegetation, landscape use, fauna, depth of certain strata, etc.
- *Assessment*: If the remains would survive, whether they would be scattered in the surface, whether they bones would be stained a particular colour, etc.

The above assessment may lead to a number of bullet points that may be helpful for the police prior and during a search. Below are some summary bullet points from a hypothetical case, and it highlights its implications for search:

– Burial may have occurred by understanding the depth of the soil in the area.
– The corpse with this x amount of time would be expected to be skeletonised in this environment.
– Bones may be fragmented, weathered and incomplete due to the action of the soil and the scavengers in the area.
– Bone fragments on the surface is possible, for example, if there has been ploughing in the land to be searched, which may have disturbed any shallow graves.
– Bones may be stained a specific colour due to this geology, or bleached if exposed to the sun.
– Bones will survive in this environment for hundreds of years.

The above relates to the body, although of course other evidence types can be taken into consideration, such as the survivability of clothing the missing person was last seen wearing (see Janaway 2008; Stuart and Ueland 2017a, b).

5.5 Team Briefing

As the search will be undertaken by a number of individuals, not always trained in human osteology, a briefing by the anthropologist is recommended (Márquez-Grant 2015: 311; Márquez-Grant et al. 2016a, b). Photographs of adult/juvenile bones, bone casts and other materials may be brought to the briefing. The briefing should cover some of the following points (after Márquez-Grant et al. 2016b):

1. Depending on information regarding the biological profile of the missing persons (e.g. infant), provide brief training regarding the appearance and dimensions of the bones and the different types of bone shapes in the skeleton (e.g. long bones, flat bones, irregular bones). This awareness can be provided through photographs, casts, etc. Be aware to mention teeth and dental fragments if a forensic odontologist is not present at the briefing and what developing teeth look like, etc.
2. Based on the information contained in the taphonomic report, inform the team about what is expected regarding degree of decomposition or skeletonisation and the different possibilities that the remains may be disarticulated, weathered, burnt, bleached, fragmented, etc. Even photographs of archaeological bone may show how modified bone can be with the passing of time.
3. Based on the taphonomy report, also indicate the likelihood that the remains may be scattered, brought to the surface and fragmented following ploughing of the land, any scavengers that may have modified and transported the remains to a certain distance, etc.
4. Perhaps it may be necessary to show examples of bone staining, colour of bones, etc. in the area. This may be done if there are a number of non-human bones in the area that can be observed and showing colour changes through sunlight, etc.
5. Provide information about the sieving process, when this will be required and whether manual sieving, automated saving or raking (in some circumstances when there are large quantities of soil to deal with) may be required.
6. Reiterate that the search teams should always consult with the forensic anthropologist and always check if in doubt about something being bone or human. The forensic anthropologist will preferably be present at the scene or during the search operation.
7. Finally, it may be worth discussing during this briefing, the protocol for any documentation, even of non-human bones, with the scientific police or CSI team, the collection of non-human bone during the line search, whether bones that are not easily diagnosed are exhibited, etc.

5.6 During the Physical Search for Human Remains

It is not the aim here to provide an analysis or recommend different search strategies and techniques (e.g. see Hunter et al. 2013); however if excavation with a mechanical digger is required to strip the area in search for a clandestine grave, for example, depending on the intelligence information and taphonomy report, the forensic anthropologist, in conjunction with the forensic archaeologist, may suggest searching the ground for any bones that may have come to the surface (e.g. through plant activity, agricultural use, ground alterations due to severe weather) prior to excavating an area.

From personal casework experience, a line search where the forensic anthropologist is behind that line providing support (Is it bone? Is it human?) is effective. It avoids forensically documenting a bone, which may be non-human, with a rapid assessment and provides time-saving efforts. It allows the search to continue until human remains are found.

If the forensic anthropologist is not present during the search operation, photographs of bones (including a scale) taken from different angles may also be sufficient; however in areas where the grounds have large quantities of animal bones, it may be more cost-effective and necessary to have a forensic anthropologist on site. The forensic anthropologist should and will also be familiar with other tissues, such as calcified tissue or ossified cartilage and any bone anomalies or variations (e.g. bone ossicles), in order to fully assess whether or not a bone or material is human.

Hunter et al. (2013: 200) indicate that sieving provides a second opportunity to recover materials and achieve as much as possible a full skeletal recovery. During the search operations therefore (following Márquez-Grant et al. 2016b), the forensic anthropologist should also be sieving or checking material that has been sieved and retained at sieving stations; likewise if large quantities of soil have been raked. He or she should also provide information on the most appropriate sieve sizes (e.g. 10 mm, 5 mm, 2 mm mesh sizes or variations from that). This advice can be assessed on a case-by-case basis and depends on a number of factors including soil type, material to be sieved, size of missing elements, quantities to be sifted, time constraints, resources and health and safety. Although usually a quick visual assessment on site is sufficient (e.g. see Mulhern 2016), it may be that with such small fragment sizes, a second opinion or further analysis in a laboratory such as histology and DNA is required (see Ubelaker et al. 2004; Ubelaker 2018; Cattaneo et al. 2009; Crowder et al. 2018).

Even if the bones found are not human, it is advisable that the remains are retained and disposed of elsewhere. If human remains are found, the forensic anthropologist, other specialists (e.g. forensic archaeologist), the forensic pathologist (if required and depending on country legislation and type of case) and police teams can proceed with their appropriate forensic protocols. An inventory can be provided by the forensic anthropologist of the bones present/recovered and a list of missing elements can be forwarded onto the police officer in charge of the investigation and/or search teams.

To summarise, in these scenarios the forensic anthropologist should:

1. Brief the team about 'what to look for' – size of bones, types of bones, completeness and potential condition of the remains. Part of this will be based on the taphonomy assessment relating to the human remains, which has taken into consideration time since disappearance, circumstances of disappearance, topography of the area to be searched, etc.
2. Be able to quickly assess whether or not a bone or bone fragment is human, unless it is too fragmented and compromised that laboratory analyses are required. The presence of a forensic anthropologist in these search operations will save time and money by immediately excluding the bones as human (in the case animal remains are found) without the need for further forensic procedures, exhibiting, etc. to take place. This assessment may on occasions be undertaken remotely through photographs for a small quantity of well-preserved bones.
3. Be able to assist and provide advice on sieving procedures and check material which has been sieved.
4. Recommend that non-human bones be retained and documented quickly, after which these will be disposed in alternative location.
5. If the remains are of human origin, assist with documentation, recovery, etc.
6. Have in place a contingency plan; for example, another forensic anthropologist on standby to provide a second opinion – even if remotely via photographs – in cases where identification may be challenging. Also consider other techniques and have a list of who may be able to undertake these analyses.

The high responsibility of identifying bone as human or not human cannot be emphasised enough.

5.7 Mass Fatality Incidents

In a mass fatality incident, forensic anthropologists can be part of a team working to identify the remains, provide answers and bring closure to relatives. Increasingly, forensic anthropologists play an important role in mass fatality deployments and on many occasions lead a number of tasks. Many countries will have a list of forensic anthropologists as part of their Disaster Victim Identification (DVI) teams.

Focusing on the search aspect for this paper, depending on the nature of the incident, fragmentation of skeletal remains may be present, the remains may be compromised (e.g. by fire), and there may be commingling between remains of various deceased and mixing of human remains with animal remains. In these circumstances, the forensic anthropologist's question as to whether a bone or fragment of bone is human or not is crucial in saving time and reducing costs, minimising any DNA analysis. This triage needs to occur at the very beginning (Sledzik et al. 2009: 291; Black et al. 2010b: 345), and it is often led by forensic anthropologists, for example, in the case of the World Trade Center (Mundorff 2014: 375).

Moreover, Sledzik and Mundorff (2016: 478–479) also highlight the value of forensic anthropology, in particular during a mass fatality investigation, to (a) devise an appropriate system for search and recovery of remains; (b) assist with locating, recognising or identifying and recovering human remains; and (c) train or brief search personnel to recognise human remains. This is often done alongside a forensic archaeologist. The benefit of a forensic anthropologist at the site/scene, they argue, is that they can provide an identification of remains even if they have been affected considerably by taphonomic factors, remains that may be overlooked by non-specialists, apart from providing an opinion as to whether the material is human, non-human or non-biological (Sledzik and Mundorff 2016: 479).

In summary, with regard to searching for human remains following a mass disaster, the forensic anthropologist can be part of an initial triage at a sieving station to assess whether bone or bone fragments are human or not. Alternatively, the forensic anthropologist can examine in the laboratory or morgue the material classified as bone or possible human bone by the recovery teams. This system provides a more cost-effective way rather than sending samples directly to a laboratory for DNA analysis. The forensic anthropologist may also be able to comment on minimum number of individuals, which should eventually feed into the search teams. For example, police information may relate to a family in a house that has exploded, but the remains of a certain person do not appear to have been recovered from the biological assessment of the remains by the forensic anthropologist and forensic pathologist at the mortuary. Finally, to minimise DNA sampling and providing as many remains as possible to the families of the deceased, the forensic anthropologist in a commingled assemblage can attempt to attribute as many bones or bone fragments as possibly to a particular individual, via systems of pair matching, biological profiling, reconstruction, etc. (see Adams and Byrd 2014).

5.8 Exhumations

There are a number of reasons for exhuming or disinterring human remains. On some occasions, there is a need to exhume an unknown individual in order to obtain a sample for DNA analysis when after further investigations an identity is presumed or in cases of mistaken identification in the past. On other occasions, exhumation of a known individual is required to review the initial autopsy or because a criminal investigation has been opened. There are many examples of exhumations worldwide due to some of the reasons just mentioned.[5] Other reasons include family

[5] E.g. the exhumation of President Salvador Allende from Chile (http://www.nytimes.com/2011/05/24/world/americas/24chile.html – accessed January 2018); Poet Pablo Neruda (https://www.theguardian.com/books/2015/jun/05/pablo-neruda-poisoning-doubts-fuelled-by-new-forensic-tests – accessed January 2018); the identification of Argentinian soldiers buried in the Falkland Islands/Malvinas (https://uk.reuters.com/article/uk-argentina-britain-falklands/scientists-aim-to-identify-remains-of-argentine-soldiers-on-falklands-idUKKBN18S61Y – accessed January 2018).

requests or public health reasons. Thus, exhumations are also necessary for repatriation or because there is a need for reburial (Ferllini 2002: 63; see also, for example, Brooks and Brooks 1984). Recommendations have included the participation of forensic anthropologists and archaeologists. For instance, with regard to search and exhumation of neonatal and infant remains or 'bebés robados' ('stolen babies') from the second half of the twentieth century in Spain, the documentation recommends the presence of archaeologists and anthropologists during the exhumations[6] (see Cubero 2013). Whilst Hunter and colleagues (2013: 136) indicate that in exhumation activities the forensic archaeologist is attempting to reconstruct the events which occurred and the various life actions, the forensic anthropologist can ensure that the individual exhumed has a biological profile consistent with the person to be exhumed or missing. Indeed, a number of exhumations have been carried out with the presence of forensic anthropologists in cemeteries or areas with clandestine graves in order to find the right body.[7] It is this search aspect that is the focus here.

Search operations within a burial ground or cemetery may involve exhuming an unidentified individual buried in the past in a coffin but within a communal grave with many others; it may also involve searching for the right individual from a number of unmarked graves or identifying the right niche or vault containing the remains that need to be investigated. The forensic anthropologist will rely on ante-mortem information obtained by an investigation team from a number of sources or by the forensic anthropologist himself/herself on interviewing witnesses (in order to ask the right questions). This information about the deceased will target age, sex, stature, ancestry, past medical history and any skeletal abnormalities, any other unique features and cause of death and circumstances around death if known. Thus with this information, it is possible to discriminate some individuals over others (adult vs juvenile; young adult vs old adult).

To summarise, exhuming the right individual in a cemetery by assessing biological profile and other information, such as peri-mortem trauma, is another benefit provided by employing a forensic anthropologist in the search, whether it relates to searching for a particular individual in a cemetery or ensuring the right person is exhumed from a communal grave.

5.9 Other Scenarios

There are a number of scenarios, where there has been a discovery of a surface deposition of human remains or a clandestine grave that can be considered a little further. Thus, even when the remains have been found or have been discovered

[6] https://politica.elpais.com/politica/2017/10/20/actualidad/1508500176_449374.html (accessed January 2018).

[7] For example, searching for the remains of a British hostage found in Lebanon (https://www.telegraph.co.uk/news/worldnews/middleeast/lebanon/6592000/Body-found-in-Lebanon-thought-to-be-missing-Alec-Collett.html – accessed January 2018).

(outside of a search operation for a particular missing person), the forensic anthropologist that attends the scene is also able to offer, after documenting and recovering the remains, an assessment of missing bones or parts of bones. Indeed, the missing elements in a scattered surface scene may be assessed through any scavenging marks present on the bones. It is recommended that the forensic anthropologist undertakes, where possible, an inventory of the remains prior to the transportation of the body to the morgue. Nevertheless, after the forensic anthropological examination in the mortuary, a briefing will tend to be held and this, as well as the expert witness report, should include a list of missing bones. That way, the police can feed this back to the search teams to be deployed if necessary. It may be that the scene is still cordoned and guarded or that a wider search is undertaken depending on the results of the post-mortem forensic pathology and forensic anthropological examination and any recommendations thereafter. By contrast, it may be that it is unlikely that any further investment of time may yield any missing elements. That is, what bones are missing? Why are they missing? What is the likelihood of finding the missing bones? These first two questions should be answered in the expert statement. In addition, sieving may be recommended for any small bones and teeth that may be missing. Evidence of disarticulation, scavenging or dismemberment will also provide further information that will eventually be fed into the search team.

Finally, of course, in cases where identification needs to be carried out, the biological profile obtained from the analysis of the human skeletal remains will result in a search for who that person may be. When searching for potential missing persons to whom the remains may belong, the biological profile will narrow down the list of missing persons. As Rogers (2009) exemplifies for British Columbia, in October 1999, there were 1755 reported missing people; 444 (25%) were female, of those 143 were in the range of 20–40 years and, of those, 38 were non-white/Caucasoid. Therefore, the biological profile alongside other information the police may have can narrow the list of potential missing persons. This biological profile can be publicised, alongside craniofacial reconstruction when undertaken, in a number of missing person websites (such as that of the UK Missing Persons Bureau).[8]

5.10 Concluding Remarks

This paper has attempted to demonstrate the value of forensic anthropology in search, without addressing the area of forensic archaeology, which is covered elsewhere (e.g. see Hunter et al. 2013). Deriving from a number of scenarios, the role of the forensic anthropologist can be of utmost importance in the search for human remains or missing persons presumed or hypothetically deceased. Work on those cases can be for judicial or medicolegal purpose or purely humanitarian in nature. Mass disaster scenarios have also seen an increasing involvement of forensic anthropology, particularly in the triage stages. As Hackman (2016) indicates, the ability to

[8] http://missingpersons.police.uk/en-gb/home (accessed January 2018).

identify potential bone material, recognise and identify human bone at the scene, especially if there is fragmentation, colour changes and other taphonomic modifications, is of vital importance, and the forensic anthropologists can be invaluable here.

Overall, this paper focused on search outlines below, indicating the tasks the forensic anthropologists can contribute to:

- Assist in the search for human remains (mainly if skeletonised remains are expected).
- Write a taphonomy report.
- Contribute to the search strategy (e.g. retain animal bone, where to get a second opinion, etc.).
- Brief the teams as to what to potentially expect and what to look for regarding remains of an adult/child.
- Assist the search teams in confirming if what they have found is bone (or tooth) or not (either on site, at sieving station or via photographs if possible).
- Identify quickly and by visual means whether any bones found are human or not.
- Provide assistance or lead the triage regarding human vs non-human bone in a mass disaster incident.
- Assist with the recovery of fragmented human remains.
- Answer the following if the bones are human: How many bones are present? Have some been scavenged? What bones are missing? How is the body positioned?
- To answer the question of how many individuals are present.
- Assist archaeologists in the excavation/recovery of human remains.
- Advice on packaging and transportation of human remains.
- Supervise sieving.
- Exclude individuals by assessing the biological profile.
- Recover the right individual in an exhumation.
- Provide a list of missing elements after human remains have been discovered, to feed into the search teams.
- Obtain or guide questions when obtaining ante-mortem data.

Amongst the benefits, these can be summarised below:

- Cost-effective and more economical: having a forensic anthropologist at the scene/site can save further unnecessary work in the laboratory.
- Time: by having a forensic anthropologist at the scene/site, it is easy to exclude bones as being animal without having to photograph bones, send them for further consultancy, package them and provide an evidence number.
- Eliminate certain areas, and provide degree of confidence of an area that has been searched for human remains.
- Reduce DNA sampling.