



Review

Forensic anthropology in the global investigation of humanitarian and human rights abuse: Perspective from the published record

Douglas H. Ubelaker^{a,*}, Austin Shamlou^b, Amanda E. Kunkle^b^a Department of Anthropology, Smithsonian Institution, National Museum of Natural History Room 350, Washington, D.C. 20560, USA^b Department of Anthropology, Smithsonian Institution, National Museum of Natural History Room 348, Washington, D.C. 20560, USA

ARTICLE INFO

Keywords:

Forensic anthropology
Humanitarian action
Human rights
Forensic science

ABSTRACT

Forensic anthropologists have played key roles in the historical development of forensic science applications to global humanitarian and human rights issues. These anthropological initiatives can be traced back to the Smithsonian seminar organized by T. D. Stewart in 1968 and published in 1970. Key developments include the 1984 delegation sent by the American Association for the Advancement of Science to Argentina and the formation of the Argentine Forensic Anthropology Team. Subsequent highlights include major anthropological involvement in support of investigations by international criminal tribunals, formation of forensic anthropology teams in different countries and activities of the International Commission of Missing Persons and the forensic unit of the International Committee of the Red Cross. Recent developments feature the formation of the Humanitarian and Human Rights Resource Center of the American Academy of Forensic Sciences and its support of worthwhile projects in many countries. The published record provides historical perspective on these developments.

1. Introduction

Currently many forensic anthropologists are deeply involved in various global efforts to address issues relating to humanitarian and human rights abuse. This type of endeavor has emerged as a recognized subfield of forensic anthropology and offered employment to scores of professionals. For those willing to commit the time to become involved, these global initiatives offer enriching experiences and a genuine opportunity for positive contributions to many world problems that affect peoples' lives. This work is complex and difficult, requiring training, extensive travel, a cultural understanding, and the ability to work with many others, often in uncomfortable, unfamiliar environments. Involvement offers an opportunity to contribute as well as a tremendous educational experience.

As anthropological involvement in these types of global investigations has surged in recent years, so has development. From its modest beginnings in the 1970's, growth in this field has been fueled by research developments, recognition of the value of anthropological involvement, organizational expansion and structural changes, and the availability of highly-trained and motivated anthropologists. This article examines the historical context of that growth, primarily from the perspective of key publications in the anthropological literature. The contributions that have been selected for this article document the

general development of these endeavors but the literature is too vast to allow complete coverage. The intent is neither to provide a history of forensic anthropology nor a listing of all relevant publications. This article reports on historical progress in the global investigation of humanitarian and human rights abuse primarily as revealed by select publications within the anthropological literature.

2. Roots: 1970 to 1999

While recent publications focusing on forensic anthropology (e.g. [1]) include topical coverage of global humanitarian and human rights issues, such discussion was largely absent in Wilton Krogman's classic text "The Human Skeleton in Forensic Medicine" [2]. The purpose of Krogman's publication was only to provide information primarily to investigators about the important role human skeletal remains can play in a forensic investigation. Within the preface of his book, Krogman admits that there is a definite American bias in the information presented, as most of the skeletal material used in the research originated from white and African American individuals [2]. Thus, the book lacks the global perspective exemplified in current publications.

T.D. Stewart's edited volume "Personal Identification in Mass Disasters" marks the professional interest shift in forensic anthropology toward these issues (Table 1) [3]. The volume resulted from a

* Corresponding author.

E-mail addresses: ubelaked@si.edu (D.H. Ubelaker), alana_shamlou@gwmail.gwu.edu (A. Shamlou), kunklea@si.edu (A.E. Kunkle).

Table 1

Key developments in anthropological involvement in humanitarian and human rights initiatives.

1970	Publication of “Personal Identification in Mass Disasters”
1984	AAAS delegation travel to Argentina Formation of the Argentine Forensic Anthropology Team (EAAF)
1986	Formation of Physicians for Human Rights (PHR)
1989	Minnesota Protocol incorporated by the United Nations
1992	Formation of the Guatemalan Forensic Anthropology Team (EAFG)
1993–1994	Establishment of international criminal tribunals for prosecution of international crimes related to the former Yugoslavia and Rwanda
1996	Formation of the International Commission of missing persons (ICMP)
2001	Formation of the Inforce Foundation in the U.K.
2002	Rome Statute of the International Criminal Court established
2003	Formation of the forensic unit of the International Committee of the Red Cross (ICRC)
2015	Formation of the Humanitarian and Human Rights Resource Center (HHRRC) of the American Academy of Forensic Sciences

symposium held at the Smithsonian Institution in December 1968. Although stimulated by past efforts to identify United States military war dead, the symposium and the publication broadened the topic to include identification issues in general mass disasters. Contributions by Mant [4] and Neep [5] recognized the importance of training (later emphasized by Clark et al. [6]), as well as the value of comprehensive, multidisciplinary approaches to identification.

In 1984, Clyde Snow and colleagues published an account of their investigation into the “disappeared” in Argentina [7]. In June 1984, the American Association for the Advancement of Science (AAAS) sent a seven member team of forensic scientists to Argentina to assist local authorities with human identification efforts. From 1975 until 1983 an estimated 8800 persons were reported missing during the military dictatorship in that country. The team effort followed the formation of an Argentine commission in December 1983. The publication called for action aimed at identification efforts and related investigations [7]. Snow's effort also resulted in the formation of the Argentine Forensic Anthropology Team (EAAF) that subsequently pioneered positive activity in many global situations [8–11].

During this formative period, utilization of methodology developed in bioarchaeology was especially important. Some perspective on excavation of mass graves was available from the early work of Ubelaker [12] featuring a prehistoric ossuary from Maryland, USA. Then, in 1986, Verano published his analysis of a mass burial of mutilated individuals from the ancient Peruvian site of Pacatnamu describing techniques for the excavation and analysis (especially trauma assessment), which provided a methodological roadmap for the forensic investigation of more recent, but similar, sites [13].

The 1978 Jonestown Guyana tragedy represents a landmark in forensic investigation of sites involving many decedents. According to Thompson et al. [14], identifications of the over 900 persons primarily involved fingerprints, but also included dental records, known pathology, and a footprint. Autopsy and related toxicological studies revealed that both gunshot injury and drugs were involved. While this report did not directly reference anthropology, it called attention to forensic analysis of multiple deaths under difficult circumstances (advanced decomposition). Later investigations of similar situations (such as the Branch Davidian deaths in Waco, Texas) have involved anthropologists to assist in recovery, identification and assessment of trauma [15,16]. While trauma assessment of soft tissue usually requires expertise of a forensic pathologist, anthropologists can provide useful perspectives when the skeleton is involved [17].

Considerable progress during this period was fueled by the formation of global organizations whose activities focused on the location, exhumation and analysis of human remains. In addition to the Argentine team discussed above, the Tribunal for the Former Yugoslavia (ICTY), Physicians for Human Rights (PHR) and the

International Commission on Missing Persons (ICMP) formed during this period and sponsored extensive forensic work in the Balkans involving many forensic anthropologists [18,19]. This exciting chapter in the evolution of anthropological involvement in humanitarian and human rights issues opened new opportunities for those colleagues involved. Experiences were shared both in the published literature [20–24] and in scientific meetings catalyzing further growth and development of the field.

3. Formative period: 2000–2009

Investigation of war crimes in the former Yugoslavia region has led to many developments involving anthropologists. Teams working in this region have represented many countries and forensic specialties. Sprogøe-Jakobsen et al. [25] presented an eye-opening account of experiences of Danish-Swedish teams working at the request of the International Criminal Tribunal for the former Yugoslavia (ICTY). They indicated that teams from 12 countries were involved in 1999 investigative efforts and noted that forensic contributions focused on determining cause and manner of death with less emphasis placed on identification. Gunshot wounds represented the most common cause of death with both firearms and explosives involved. This publication documented that, despite the limited facilities available for their mobile autopsy teams, the work still produced meaningful results.

In the early 2000's, it became more common for forensic specialists to work on international cases, which was possible via the formation of different organizations in many countries. The Inforce Foundation was founded in 2001 and is the only registered non-profit organization within the forensic sciences in the U.K. [26]. This foundation provides staff, including anthropologists, archaeologists, radiographers, and advisors, who can assist in education, training, and casework internationally [26].

The location, excavation and analysis of mass graves have become regular features of modern forensic investigation of genocide and war crimes. In 2002, Schmitt published guidelines for mass grave investigation with examples from Honduras, Croatia, Iraq, Guatemala and Rwanda [27]. The publication was significant not only from its thoughtful content but also its appearance in an edited book [28] largely focusing on taphonomic issues in forensic anthropology. This indicates increased interest in the application of forensic anthropology in a more global context and its expansion into human rights issues.

Also in 2002, Corder and McKelvie called attention to efforts to develop standards globally in trying to identify missing persons [29]. They discussed the diverse disciplines employed in forensic science methodology related to identification. Corder and McKelvie [29] summarized key historical developments such as the formation of Physicians for Human Rights (PHR) in 1986 and the incorporation of the Minnesota Protocol by the United Nations Economic and Social Council and the General Assembly in 1989. The Minnesota Protocol had been developed earlier in the United States with a focus on prevention of arbitrary killings through appropriate death investigation and autopsy. They also discussed the 1991 publication by the United Nations of a manual providing guidance for investigation, including excavation, analysis and identification of human remains. Other highlights include the 1993/1994 establishment by the United Nations of international criminal tribunals for the prosecution of certain crimes in the former Yugoslavia and Rwanda. Investigations related to these efforts involved anthropologists, especially in detection and exhumation of buried individuals. The Rome Statute of the International Criminal Court came on-line in 2002 offering a permanent mechanism to address international criminal behavior related to genocide, war crimes, and similar crimes against humanity. Noting these positive developments, Corder and McKelvie [29], and also Coupland and Corder [30], called for the development of improved standards, guidelines, and training to strengthen identification efforts.

Komar [24] provided a detailed account of lessons learned from

anthropological participation in war crime victim identification in the Srebrenica area of the former Yugoslavia. Komar's work initiated awareness of the importance of local research and methodological standards. As anthropologists began putting more of an emphasis on population-specific methodology instead of taking particular techniques for granted, researchers in the Balkans began re-evaluating techniques used to estimate sex and age in the context of their distinct populations. Djurić and her colleagues noted the importance of such re-evaluations through their 2005 study in which an experienced and less experienced anthropologist estimated sex for over 260 individuals using markers on the skull and pelvis. This research demonstrated that techniques developed specifically for the population improved the results [31]. In 2006, she published, with other colleagues, a study in the Balkans testing the accuracy of the Suchey-Brooks method, the most popular method of estimating age by forensic anthropologists working on identifying war victims in former Yugoslavia at the time [32]. They were able to add more population-specific information to the method, which in turn increased the accuracy of identifications and added weight to the already established call for improving methodological standards.

In 2003, Ferlini examined human rights investigations since 1945. Ferlini called attention to deaths resulting from the Spanish Civil War, the German Holocaust and the Polish population killed during the Stalin era [33]. In particular, Ferlini discussed the Katyn tragedy involving 15,000 killed in the Katyn Forest area of Poland in 1939. Eight mass graves were located yielding 4153 individuals. Of these, 2850 were identified using personal documents. These investigations and others led to the formation of the International Criminal Court and the need for forensic anthropologists to support the process of investigation.

Since the formation of the EAAF in 1984, that team and others have provided anthropological involvement in recovery and identification efforts in many Latin American countries, especially Argentina, Chile, Peru, Guatemala and Colombia. While political developments in each of these countries resulted in large numbers of civilian deaths, the factors involved in each country varied considerably. Recognizing these differences, Casallas and Piedrahita [34] conducted a comparative analysis of the forensic anthropology involved in the investigations of deaths resulting from armed conflict in Argentina, Guatemala, Peru and Colombia.

In 2005, Blau and Skinner summarized their use of forensic archaeology in the investigation of human rights abuse in East Timor [35]. This publication placed on record the history of human rights abuse in East Timor and documented the important role of recovery of human remains. Detailed information was provided on the site excavation of a 1991 massacre at Santa Cruz and additional information was later published in 2011 [36].

Also in 2005, Steadman and Haglund surveyed the scope of anthropological involvement in human rights investigations at that time [37]. Their survey focused primarily on anthropologists who had worked with the Argentine Forensic Anthropology Team, the Guatemalan Forensic Anthropology Foundation (FAFG), the International Criminal Tribunal for the former Yugoslavia and Physicians for Human Rights. Steadman and Haglund [37] documented that many anthropologists have worked with these organizations and have originated from many countries, but most came from North, South and Central America, the UK, the Philippines, Europe, Australia, Israel and Iceland. As expected, they were mostly involved in exhumation and skeletal analysis, and education levels varied considerably.

Baraybar and Gasior [38] discussed how forensic anthropology analysis can provide key information relating to the cause of death. Using examples from work in Bosnia and Herzegovina, they emphasized the multidisciplinary nature of trauma analysis and the demographics of injury. Baraybar and Gasior [38] concluded that gunshot injury was presented as well as a case of shrapnel trauma.

This heightened emphasis on multidisciplinary analysis was noted

by *Lessons Learned from 9/11* [39] as DNA analysis was shown to play an increasingly important role in mass fatality incidents, especially related to individual identification [40]. Anthropologists in this era learned to recognize the value of DNA analysis in order to strengthen their own contributions [41]. Even prior to publication of the much-discussed NAS report [42], forensic anthropologists identified the need for evidence security and general quality-control in the forensic anthropology laboratory [43]. Such recognition extended to laboratories focusing on disaster victim identification [44] and the Defense POW/MIA accounting agency's (formerly known as the Joint POW/MIA accounting command) central identification laboratory in Hawaii [45].

By 2008, enough forensic anthropological analysis had been conducted in the context of human rights abuse and armed conflict to enable an edited volume offering comparative data on the skeletal trauma encountered [46]. Examples were presented from anthropological studies in Peru [47,48], Panama [49] and Guatemala [50]. This volume revealed that patterns of skeletal trauma could be recognized. Baraybar [51] later argued that these patterns were distinct between victims of human rights abuse and armed conflict.

Steele [52] offered a summary of institutional developments by that time as well as a detailed report on work in Iraq. Steele recognized that forensic archaeology was emerging as a recognized area of specialization within the general field of archaeology but issued a call for developments of standards relating to ethics and report writing.

Publication of the second edition of Steadman's "Hard Evidence" in 2009 included numerous contributions relating to anthropological involvement in the investigation of multiple death sites [53]. Sledzik et al. [54] discussed anthropological contributions to victim recovery and identification in the aftermath of the September 11, 2001 attacks in the United States. Olmo et al. [55] reported on excavation and analysis of a mass grave at the San Vicente cemetery site in Cordoba, Argentina. Doretti and Snow [56] provided an overview of the Argentine experience in general related to human rights issues. Sledzik and Wilcox [57] related attempts to recover and identify remains dislocated in the Hardin Cemetery flood of 1993. Generally, these accounts present the diversity of contributions and the interdisciplinary nature of the efforts.

In a Korean example, Park et al. [58] discussed the role of forensic anthropology in analysis of mass casualties produced by the Daegu subway disaster. The recovery team consisted of two medical examiners and one forensic anthropologist. Of the 142 victims in this disaster, 136 were positively identified. The successful identification of the majority of the victims in this disaster shows the importance of anthropology during the recovery operation.

Throughout the history of anthropological investigation, technology has played an important role in progress. Blau et al. [59] note that CT imagery provides an important tool in the disaster victim identification process. In the example provided, they describe how use of CT technology allows rapid identification of body parts that positively contributes to the effort to identify victims. Similarly, Ruffell et al. [60] describe how site survey and ground penetrating radar can be used effectively to locate a 150 to 160-year-old mass grave.

Organizational advances also mark this formative period. The Forensic Anthropology Society of Europe (FASE) formed in 2003 offering training and enhanced scientific communication to its members. Also in 2003, the Latin American Association of Forensic Anthropology (ALAF) was founded, bringing together the large number of anthropologists from that global region who were involved in humanitarian and human rights work. Both FASE and ALAF now offer certification programs for qualified individuals. Anthropological certification is also now available in the United Kingdom sponsored by the Royal Anthropological Institute, the British Association of Forensic Anthropology and the Office of the Forensic Science Regulator [19,61]. These certifying organizations complement the long-standing American Board of Forensic Anthropology (ABFA). With growing numbers of anthropologists becoming involved in humanitarian and human rights issues and projects, the need emerged to recognize individuals who

were qualified to do this work. Certification offers some assurance of individual qualification and provides a useful credential for those who are certified.

4. Maturity: 2010–2018

By 2010, forensic anthropology had become well-established as a critical component in Disaster Victim Identification (DVI). Blau and Briggs [62] provided a useful history of the development of forensic anthropology as a component in DVI. In addition, they present a very detailed example of such involvement in the investigation and analysis of victims from the Australian Bushfire of 2009. Key roles included recovery, fragment recognition, differentiation of human from non-human remains, creation of the biological profile to assist identification, and recognition and association of body parts.

Citing general ethical and philosophical concerns, Rosenblatt [63] discussed the terminology involved in human rights abuse cases. In his argument, Rosenblatt did not suggest that the dead have human rights but did recognize that the exhumation process can help restore identity and care for remains. Discussion focused on definitions of agency and dignity that relate to human rights investigations involving the dead.

Through the many applications of forensic anthropology in different regions of the world, issues emerged relating to how recovery efforts related to local laws and policy. In 2011, an important edited volume was published entitled “The Routledge Handbook of Archaeological Human Remains and Legislation: An International Guide to Laws and Practice in the Excavation and Treatment of Archeological Human Remains” [64]. The volume presents chapters representing 60 countries and a wealth of information on the global variation in law, policy, and traditions relating to human remains. While the focus of the book centers on archaeological human remains, the information is relevant to those found in forensic contexts.

In 2012, Garrido Varas and Intriago Leiva discussed the management of commingled remains from mass graves with an example of a human rights case from Chile [65]. The case presented illustrates the complexity frequently encountered in human rights cases. Remains of multiple individuals were commingled in the same grave with remains of other individuals who died at different times and were not of medico-legal interest. The case argues for interdisciplinary analysis and effective communication with prosecutors.

In 2013, the American Academy of Forensic Sciences (AAFS) teamed up with the publisher Wiley-Blackwell to publish a new edited book “Forensic Science: Current Issues, Future Directions” [66]. The volume presented perspectives on forensic science from all 11 sections of the AAFS. It also included a chapter authored by Morris Tidball-Binz who, at that time, directed the forensic unit of the International Committee of the Red Cross. In his chapter, Tidball-Binz [67] describes the formation of the forensic unit in 2003. Its role has been focused on capacity building, promoting international cooperation, and assisting in preventing and resolving humanitarian issues related to armed conflict and catastrophes. Staff of the forensic unit has grown dramatically since its inception and provide assistance in many troubled world countries.

Congram et al. [68] provide intersite analysis of victims of both extrajudicial and judicial execution during the civil war period in Spain (1936–1939). This anthropological study examines patterns of perimortem gunshot trauma in victims recovered from three extrajudicial execution sites and compares them with those presented by decedents from a postwar prison site. Significant differences were detected in the patterns of trauma. In a separate article, Congram et al. [69] present analysis of eight mass graves in Spain also connected to the Spanish civil war and representing remains of extrajudicial killings.

Human migration represents a global phenomenon that frequently involves deaths during border crossings. This problem is especially acute along the Mexican/United States border resulting in recovery of many unidentified dead in the border areas of the United States. Identification of these individuals is particularly challenging due to

their migrant status and unavailability of missing persons information from the unknown countries represented. Anderson and Spradley [70] provided a useful review of this issue from their work in the American Southwest. They relate the importance of the anthropologist in the migrant identification process and present detail on a recent successful identification. Schwartz-Marin and Cruz-Santiago [71] describe the complexities of family involvement in search and recovery processes in Mexico.

The second edition of Blau and Ubelaker's “Handbook of Forensic Anthropology and Archaeology” presents multiple updated examples of anthropological involvement in human rights investigations [1]. These include discussions related to the 2004 Asian tsunami [72], developments with the International Commission on Missing Persons [73], investigations in the former Yugoslavia [22], the 2004 terrorist attacks in Bali, Indonesia [74], the “Ethnic Tension” murders in the Solomon Islands [75], disaster response [76] and deaths relating to political violence in South America [10]. The Hanson et al. [73] chapter highlights the accomplishments of the ICMP in the former Yugoslavia region and more recently in Iraq and Libya. The work of the ICMP features DNA-based positive identifications but also includes anthropologists in recovery and skeletal analysis efforts.

Salado Puerto and Tuller [77] outlined approaches that need to be considered in forensic anthropological involvement in large-scale investigations into the missing. Previous experience argues for establishing accounts of those reported missing, creation of protocols clarifying procedures, defining the stakeholders and establishing agreement on approaches to be taken, recognizing local cultural factors, and identifying constraints on the investigation. Additional concerns and issues were outlined by Ferlini [78].

Also in 2017, Mohd Noor et al. documented the investigation of multiple clandestine graves in Malaysia [79]. They utilized a multidisciplinary team coupled with international observers and report that 165 individuals were recovered from 28 human trafficking transit camps within the country.

Mikellide [80] offered a comparative study of the humanitarian forensic programs in Cyprus and Kosovo, both featuring extensive involvement by anthropologists. The study reveals the importance of capacity building in sustaining progress and productivity.

Cordner and Tidball-Binz [81] presented a synthetic treatment of humanitarian forensic action in their introduction to a special edition of *Forensic Science International* devoted to that topic. Terminology, history and goals of humanitarian forensic action are discussed with a special emphasis on the role of the International Committee of the Red Cross (ICRC). Recognition of the ICRC is appropriate given their seminal role in humanitarian forensic action since their formation in 2003. Cordner and Tidball-Binz [81] recognize the growing demands for action, and increasing complexity of the issues addressed. They note that involvement is usually a co-development process and an enriching experience for all involved.

New organizational support for humanitarian and human rights forensic involvement marks an additional sign of maturity in this area of forensic anthropology. Organizations such as the AAAS, AAFS and the American Association of Physical Anthropologists (AAPA) have maintained interest in such initiatives and provided opportunities for scholarly presentations and interaction through their annual meetings. In 2015, AAFS expanded that interest in creating a formal program “The Humanitarian and Human Rights Resource Center” (HHRRC) [82]. This new program seeks to utilize assets of AAFS to promote quality applications of forensic science to global problems and issues in need of assistance. The HHRRC provides resources and support to AAFS members and others and encourages professional involvement in relevant international issues. Subcommittees develop resources relating to publications, documents, laboratory protocols, educational materials and equipment. The program also features monetary support for needy projects judged by an international advisory group and committee chairs. The AAFS and the Forensic Technology Center of Excellence

(FTCOE) program of the National Institute of Justice (USA) provide funding for this initiative [82].

The HHRRC considers funding support for all proposed projects that relate to its mission. These proposals reflect all areas of forensic science but many include or specifically focus on anthropological issues and involve forensic anthropologists and archaeologists [82]. Following three years of project consideration, the following initiatives have been supported, most of which contain at least one anthropological component.

1. Preserving Evidence of the Khmer Rouge Genocide: Analysis and Conservation of the Human Skeletal Remains in Cambodia and Training of Staff.
2. Building Forensic Capacity in Forensic Archaeology and Anthropology to Help in the Identification of Human Remains, with the Participation of the Families of the Disappeared Persons in Coahuila, Mexico.
3. Application of Stable Isotope Forensics to the Identification of Unidentified Border Crossers from the Texas-Mexico Border.
4. Strengthening (Training) in the Human Identification Department of the PGJE (Procuraduria General de Justicia del Estado) in Tlaxcala, Mexico.
5. A fully Computerized Method of Osteometric Sorting for Pairwise Comparisons in Large Assemblages (Human Remains).
6. Detection of Nerve Agent Exposure from Human Bone Tissue.
7. Technical Assistance in Establishing a Forensic Laboratory within the Commission on Human Rights of the Philippines Dedicated to the Investigation of Human Rights Violations.
8. Strategies for the Identification of the 800 Victims of the Migrant Shipwreck of April 18th, 2015 (Italy).
9. Operation Identification: Exhuming the Unidentified (Migrant Deaths in Texas).
10. Detecting Mass Graves: Broadening the Knowledge Base (Australia).
11. Scene Documentation for Human Rights Investigators (Training).
12. Decomposition and Taphonomy in the interior of South Africa
13. Humanitarian Identification of the Victims of the Lurigancho Prison Massacre, Peru
14. Reuniting the Remains of Undocumented Border Crossers with their Families through Isotope Analysis (U/S/Mexico border)
15. Establishing the First Stable Isotope Ratio Baseline in Crete (Greece) for Forensic Identification
16. Human Identification, Forensic Anthropology and Archaeology Training Workshop in Kampala, Uganda
17. Aging Unaccompanied minors: Teeth Estimation through the “Cut-Off” Approach in Four Samples of Populations from Romania and the Republic of Moldova.

The AAFS HHRRC also created an annual “Clyde Snow Award” to recognize outstanding achievement in human rights/humanitarian forensic applications [82]. In 2017, the first award was presented to the Argentine Forensic Anthropology Team. Founding member Luis Fondevbrider received this award on behalf of EAAF, 34 years after Clyde Snow worked with him and others in forming the EAAF.

5. Discussion

As noted by Blau [83], forensic anthropology has changed dramatically throughout its history. Part of that changing role involves the current, almost routine inclusion of anthropologists in the detection, recovery and analysis of human remains associated with mass disasters and political violence. While advances have been fueled by new technology, especially DNA analysis and remote sensing, the major driving forces have been the availability of well-trained and motivated anthropologists, coupled with the awareness of the importance of their incorporation into teams. Organizations have formed and matured that

target humanitarian/human rights problems using forensic anthropologists. While much of this activity is centered within such organizations, involvement has expanded to include many professionals in academic institutions or others with broad responsibilities. This expansion reflects the historical success registered by previous anthropological efforts and is documented in the published record.

The maturation of anthropological humanitarian and human rights science is also reflected in the strong academic interest registered in many universities and other educational institutions around the world. Academic administrators, faculty and students all recognize the compelling nature of anthropological involvement in humanitarian and human rights issues. Although these situations are sad and regrettable, they offer opportunities to use anthropological science to make a difference. Growing numbers of anthropologists meet this challenge and, through that involvement, enrich themselves.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

- [1] S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archeology*, second ed., Routledge, New York, 2016.
- [2] W.M. Krogman, *The Human Skeleton in Forensic Medicine*, Charles C Thomas, Illinois, 1962.
- [3] T.D. Stewart (Ed.), *Personal Identification in Mass Disasters*, National Museum of Natural History Smithsonian Institution, City of Washington, 1970.
- [4] A.K. Mant, Identification involving atrocities, in: T.D. Stewart (Ed.), *Personal Identification in Mass Disasters*, National Museum of Natural History Smithsonian Institution, City of Washington, 1970, pp. 11–18.
- [5] W.A. Neep, Procedures used by the U.S. army to ensure proper identification of the Vietnam war dead and their acceptance by the next-of-kin, in: T.D. Stewart (Ed.), *Personal Identification in Mass Disasters*, National Museum of Natural History Smithsonian Institution, City of Washington, 1970, pp. 5–10.
- [6] S.C. Clark, M.F. Ernst, W.D. Haglund, J.M. Jentzen, *Medicolegal Death Investigator: A Systematic Training Program for the Professional Death Investigator*, Occupational Research and Assessment Inc., Michigan, 1996.
- [7] C.C. Snow, L.G. Tedeschi, L. Levine, C. Orrego, L. Lukash, E. Stover, The investigation of the human remains of the “disappeared” in Argentina, *Am. J. Forensic Med. Pathol.* 5 (1984) 297–299.
- [8] Argentine Forensic Anthropology Team, Annual report 2003, Buenos Aires, (2003).
- [9] Argentine Forensic Anthropology Team, 2007 mini annual report: covering the period between January to December 2006, Buenos Aires, 2007.
- [10] L. Fondevbrider, The application of forensic anthropology to the investigation of cases of political violence: perspectives from South America, in: S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archaeology*, second ed., Routledge, New York, 2016, pp. 65–74.
- [11] A.A. Skolnick, Game's afoot in many lands for forensic scientists investigating most-extreme human rights abuses, *JAMA* 268 (1992) 579–583.
- [12] D.H. Ubelaker, Demographic reconstruction from osseous skeletal samples—case study from southern Maryland, *Am. J. Phys. Anthropol.* 40 (1974) 154.
- [13] J.W. Verano, A mass burial of mutilated individuals at Pacatnamu, in: C.B. Donnan, G.A. Cock (Eds.), *The Pacatnamu Papers*, Museum of Cultural History, University of California, Los Angeles, 1986, pp. 117–138.
- [14] R.L. Thompson, W.W. Manders, W.R. Cowan, Postmortem findings of the victims of the Jonestown tragedy, *J. Forensic Sci.* 32 (1987) 433–443.
- [15] D.H. Ubelaker, D.W. Owsley, M.M. Houck, E. Craig, W. Grant, T. Woltanski, R. Fram, K. Sandness, N. Peerwani, The role of forensic anthropology in the recovery and analysis of Branch Davidian compound victims: recovery procedures and characteristics of the victims, *J. Forensic Sci.* 40 (1995) 335–340.
- [16] M.M. Houck, D.H. Ubelaker, D. Owsley, E. Craig, W. Grant, R. Fram, T. Woltanski, K. Sandness, The role of forensic anthropology in the recovery and analysis of Branch Davidian compound victims: assessing the accuracy of age estimations, *J. Forensic Sci.* 41 (1996) 796–801.
- [17] L. Loe, Perimortem trauma, in: S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archaeology*, second ed., 2016, pp. 322–345 (New York).
- [18] L. Fondevbrider, The application of forensic anthropology to the investigation of cases of political violence, perspectives from South America, in: S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archaeology*, second ed., Routledge, New York, 2016, pp. 65–74.
- [19] D.H. Ubelaker, A history of forensic anthropology, *Am. J. Phys. Anthropol.* 165 (2018) 915–923.
- [20] J.P. Baraybar, G. Marek, Forensic anthropology and the most probable cause of death in cases of violations against international humanitarian law: an example from Bosnia and Herzegovina, *J. Forensic Sci.* 51 (2006) 103–108.
- [21] M. Djurić, Anthropological data in individualization of skeletal remains from a forensic context in Kosovo: a case history, *J. Forensic Sci.* 49 (2004) 464–468.

- [22] M. Djurić, Dealing with human remains from recent conflict: mass grave excavation and human identification in a sensitive political context, in: S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archaeology*, second ed., Routledge, New York, 2016, pp. 532–544.
- [23] M. Djurić, D. Dunjic, D. Djonic, M. Skinner, Identification of victims from two mass graves in Serbia: a critical evaluation of classical markers of identity, *Forensic Sci. Int.* 172 (2007) 125–129.
- [24] D. Komar, Lessons from Srebrenica: the contributions and limitations of physical anthropology in identifying victims of war crimes, *J. For. Sci.* 48 (2003) 713–716.
- [25] S. Sprogø-Jakobsen, A. Eriksson, H.P. Hougen, P.J.T. Knudsen, P. Leth, N. Lynnerup, Mobile autopsy teams in the investigation of war crimes in Kosovo 1999, *J. Forensic Sci.* 46 (2001) 1392–1396.
- [26] M. Cox, Forensic anthropology and archeology: past and present – a United Kingdom perspective, in: S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archeology*, first ed., 2009, pp. 29–41 (California).
- [27] S. Schmitt, Mass graves and the collection of forensic evidence: genocide, war crimes and crimes against humanity, in: W.D. Haglund, M.H. Sorg (Eds.), *Advances in Forensic Taphonomy; Method, Theory and Archaeological Perspectives*, CRC Press, Boca Raton, 2002, pp. 277–292.
- [28] W.D. Haglund, M.H. Sorg (Eds.), *Advances in Forensic Taphonomy; Method, Theory and Archaeological Perspectives*, CRC Press, Boca Raton, 2002.
- [29] S. Cordner, H. McKelvie, Developing standards in international forensic work to identify missing persons, *IRRC* 84 (2002) 867–884.
- [30] R. Coupland, S. Cordner, People missing as a result of armed conflict: standards and guidelines are needed for all, including health professionals, *Br. Med. J.* 326 (2003) 943–944.
- [31] M. Durić, Z. Rakočević, D. Donić, The reliability of sex determination of skeletons from forensic context in the Balkans, *Forensic Sci. Int.* 147 (2005) 159–164.
- [32] M. Djurić, D. Djonić, S. Nikolić, D. Popović, J. Marinković, Evaluation of the Suchey-Brooks method for aging skeletons in the Balkans, *J. Forensic Sci.* 52 (2007) 21–23.
- [33] R. Ferlini, The development of human rights investigations since 1945, *Sci. Justice* 43 (2003) 219–224.
- [34] D.A. Casallas, J.P. Piedrahita, *Antropología forense en el conflicto armado en el contexto latinoamericano. Estudio comparativo Argentina, Guatemala, Perú y Colombia*, Maguaré 18 (2004) 293–310.
- [35] S. Blau, M. Skinner, The use of forensic archaeology in the investigation of human rights abuse: Unearthing the past in East Timor, *Int'l. J. Hum. Rights* 9 (2005) 449–463.
- [36] S. Blau, L. Fondebrider, Dying for independence: proactive investigations into the 12 November 1991 Santa Cruz massacre, Timor Leste, *Int'l. J. Hum. Rights* 15 (2011) 1249–1274.
- [37] D.W. Steadman, W.D. Haglund, The scope of anthropological contributions to human rights investigations, *J. Forensic Sci.* 50 (2005) 23–30.
- [38] J.P. Baraybar, M. Gasior, Forensic anthropology and the most probable cause of death in cases of violations against international humanitarian law: an example from Bosnia and Herzegovina, *J. Forensic Sci.* 51 (2006) 103–108.
- [39] A.R. Gonzales, R.B. Schofield, G.R. Schmitt, Lessons Learned from 9/11: DNA Identification in Mass Fatality Incidents, National Institute of Justice, Washington, D.C., 2006.
- [40] Z. Jakovski, K. Nikolova, B. Janeska, Z. Cakar, A. Stankov, V. Poposka, G. Palvovski, A. Duma, Forensic DNA analysis in the identification of human remains in mass graves, *J. Clin. Pathol. Forensic Med.* 1 (2010) 1–4.
- [41] D.C. Dirkmaat, L.L. Cabo, S.D. Ousley, S.A. Symes, New perspectives in forensic anthropology, *Yearb. Phys. Anthropol.* 51 (2008) 33–52.
- [42] National Research Council, *Strengthening Forensic Science in the United States: A Path Forward*, National Academies Press, Washington, D.C., 2009.
- [43] M.W. Warren, H.A. Walsh-Haney, L.E. Freas (Eds.), *The Forensic Anthropology Laboratory*, CRC Press, Boca Raton, 2008.
- [44] P.S. Sledzik, P.J. Kauffman, The mass fatality incident morgue: a laboratory for disaster victim identification, in: M.W. Warren, H.A. Walsh-Haney, L.E. Freas (Eds.), *The Forensic Anthropology Laboratory*, CRC Press, Boca Raton, 2008, pp. 97–116.
- [45] T. Holland, J. Byrd, V. Sava, P.O.W. Joint, MIA accounting command's central identification laboratory, in: M.W. Warren, H.A. Walsh-Haney, L.E. Freas (Eds.), *The Forensic Anthropology Laboratory*, CRC Press, Boca Raton, 2008, pp. 47–63.
- [46] E.H. Kimmerle, J.P. Baraybar, *Skeletal Trauma: Identification of Injuries Resulting from Human Rights Abuse and Armed Conflict*, CRC Press, Boca Raton, 2008.
- [47] E.T. Cagigao, M. Lund, Case Study 8.2: The Pacific war: a Chilean soldier found in Cerro Zig Zag, in: E.H. Kimmerle, J.P. Baraybar (Eds.), *Skeletal Trauma: Identification of Injuries Resulting from Human Rights Abuse and Armed Conflict*, CRC Press, Boca Raton, 2008, pp. 441–448.
- [48] J.P. Baraybar, C.R. Cardoza, V. Parodi, Case Study 5.4: Torture and extra-judicial execution in the Peruvian highlands: forensic investigation in a military base, in: E.H. Kimmerle, J.P. Baraybar (Eds.), *Skeletal Trauma: Identification of Injuries Resulting from Human Rights Abuse and Armed Conflict*, CRC Press, Boca Raton, 2008, pp. 255–263.
- [49] A.H. Ross, L. Suarez, Case study: 8.1: tyranny and torture in the Republic of Panama, in: E.H. Kimmerle, J.P. Baraybar (Eds.), *Skeletal Trauma: Identification of Injuries Resulting from Human Rights Abuse and Armed Conflict*, CRC Press, Boca Raton, 2008, pp. 438–440.
- [50] S.C. Chacón, F.A. Peccerelli, L.P. Diez, C.R. Fernández, Case study 6.1: disappearance, torture, and murder of nine individuals in a community of Nebaj, Guatemala, in: E.H. Kimmerle, J.P. Baraybar (Eds.), *Skeletal Trauma: Identification of Injuries Resulting from Human Rights Abuse and Armed Conflict*, CRC Press, Boca Raton, 2008, pp. 300–313.
- [51] J.P. Baraybar, Variation of gunshot injury patterns in mortality associated with human rights abuses and armed conflict: an exploratory study, *Sci. Justice* 55 (2015) 355–362.
- [52] C. Steele, Archaeology and the forensic investigation of recent mass graves: ethical issues for a new practice of archaeology, *Archaeologies* 4 (2008) 414–428.
- [53] D.W. Steadman (Ed.), *Hard Evidence: Case Studies in Forensic Anthropology*, second ed., Pearson Education Inc., New Jersey, 2009.
- [54] P.S. Sledzik, D. Dirkmaat, R.W. Mann, T.D. Holland, A.Z. Mundorff, B.J. Adams, C.M. Crowder, F. DePaolo, Disaster victim recovery and identification: forensic anthropology in the aftermath of September 11, in: D.W. Steadman (Ed.), *Hard Evidence: Case Studies in Forensic Anthropology*, second ed., Pearson Education Inc., New Jersey, 2009, pp. 289–302.
- [55] D. Olmo, A. Ginarte, C. Bisso, M. Salado Puerto, L. Fondebrider, A mass grave in Argentina: the San Vicente cemetery in Córdoba, in: D.W. Steadman (Ed.), *Hard Evidence: Case Studies in Forensic Anthropology*, second ed., Pearson Education Inc., New Jersey, 2009, pp. 321–331.
- [56] M. Doretti, C.C. Snow, Forensic anthropology and human rights: the Argentine experience, in: D.W. Steadman (Ed.), *Hard Evidence: Case Studies in Forensic Anthropology*, second ed., Pearson Education Inc., New Jersey, 2009, pp. 303–320.
- [57] P.S. Sledzik, A.W. Willcox, Corpi aquaticus: The Hardin Cemetery Flood of 1993, in: D.W. Steadman (Ed.), *Hard Evidence: Case Studies in Forensic Anthropology*, second ed., Pearson Education Inc., New Jersey, 2009, pp. 280–288.
- [58] D. Park, K. Park, J. Ko, Y. Kim, N. Chung, Y. Ahn, S. Han, The role of forensic anthropology in the examination of the Daegu subway disaster, *J. Forensic Sci.* 54 (2009) 513–518.
- [59] S. Blau, S. Robertson, M. Johnstone, Disaster victim identification: new applications for postmortem computed tomography, *J. Forensic Sci.* 53 (4) (2008) 956–961.
- [60] A. Ruffell, A. McCabe, C. Donnelly, B. Sloan, Location and assessment of an historic (150–160 years old) mass grave using geographic and ground penetrating radar investigation, NW Ireland, *J. Forensic Sci.* 54 (2009) 382–394.
- [61] G. MacKinnon, K. Harrison, Forensic anthropology and archaeology in the United Kingdom: are we nearly there yet? in: S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archaeology*, second ed., Routledge, New York, 2016, pp. 13–26.
- [62] S. Blau, C.A. Briggs, The role of forensic anthropology in Disaster Victim Identification (DVI), *Forensic Sci. Int.* 205 (2011) 29–35.
- [63] A. Rosenblatt, International forensic investigations and the human rights of the dead, *Hum. Rights Q.* 32 (2010) 921–950.
- [64] N. Márquez-Grant, L. Fibiger (Eds.), *The Routledge Handbook of Archaeological Remains and Legislation: An International Guide to Laws and Practice in the Excavation and Treatment of Archaeological Human Remains*, Taylor & Francis, 2011.
- [65] C.G. Varas, M.I. Leiva, Managing comingled remains from mass graves: considerations, implications and recommendations from a human rights case in Chile, *Forensic Sci. Int.* 219 (2012) e19–e24.
- [66] D.H. Ubelaker (Ed.), *Forensic Science: Current Issues, Future Directions*, John Wiley & Sons, West Sussex, UK, 2012.
- [67] M. Tidball-Binz, Global forensic science and the search for the dead and missing from armed conflict: the perspective of the International Committee of the Red Cross, in: D.H. Ubelaker (Ed.), *Forensic Science: Current Issues, Future Directions*, John Wiley & Sons, West Sussex, UK, 2012, pp. 337–365.
- [68] D. Congram, A. Flavel, K. Maeyama, Ignorance is not bliss: evidence of human rights violations from Civil War Spain, *Ann. Anthropol. Pract.* 38 (2014) 43–64.
- [69] D. Congram, N. Passalacqua, L. Rios, Inter-site analysis of victims of extra- and judicial execution in civil war Spain: location and direction of perimortem gunshot trauma, *Ann. Anthropol. Pract.* 38 (2014) 81–88.
- [70] B.E. Anderson, M.K. Spradley, The role of the anthropologist in the identification of migrant remains in the American southwest, *Acad. Forensic Path.* 6 (2016) 432–438.
- [71] E. Schwartz-Marin, A. Cruz-Santiago, Pure corpses, dangerous citizens: transgressing the boundaries between experts and mourners in the search for the disappeared in Mexico, *Soc. Res.* 83 (2016) 483–510.
- [72] S. Black, Disaster anthropology: the 2004 Asian tsunami, in: S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archaeology*, second ed., Routledge, New York, 2016, pp. 507–519.
- [73] I. Hanson, M. Holliday, K. Sullivan, K. Bomberger, T. Parsons, The International Commission on Missing Persons (ICMP) and the application of forensic archaeology and anthropology to identifying the missing, in: S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archaeology*, second ed., Routledge, New York, 2016, pp. 660–671.
- [74] A.M. Buck, C.A. Briggs, The role of the anthropologist in disaster victim identification: case studies from the 2002 and 2004 terrorist attacks in Bali, Indonesia, in: S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archeology*, second ed., Routledge, New York, 2016, pp. 520–531.
- [75] M. Archer, M.J. Dodd, Medico-legal investigation of atrocities committed during the Solomon Islands “ethnic tensions”, in: S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archaeology*, second ed., Routledge, New York, 2016, pp. 496–506.
- [76] P. Sledzik, A.Z. Mundorff, Forensic anthropology in disaster response, in: S. Blau, D.H. Ubelaker (Eds.), *Handbook of Forensic Anthropology and Archaeology*, second ed., Routledge, New York, 2016, pp. 477–495.
- [77] M. Salado Puerto, H. Tuller, Large-scale forensic investigations into the missing: challenges and considerations, *Forensic Sci. Int.* 279 (2017) 219–228.
- [78] R. Ferlini, Forensic anthropology in crisis settings: a required component of investigation in the world's trouble spots, *Hum. Remains Violence Interdiscip. J.* 3 (2017) 98–116.
- [79] M.S. Mohd Noor, L.S. Khoo, W.Z.Z. Alias, A.H. Hasmi, M.A. Ibrahim,

- M.S. Mahmood, The clandestine multiple graves in Malaysia: the first mass identification operation of human skeletal remains, *Forensic Sci. Int.* 278 (2017) (e1–e9).
- [80] M. Mikellide, Recovery and identification of human remains in post-conflict environments: a comparative study of the humanitarian forensic programs in Cyprus and Kosovo, *Forensic Sci. Int.* 279 (2017) 33–40.
- [81] S. Cordner, M. Tidball-Binz, Humanitarian forensic action — its origins and future, *Forensic Sci. Int.* 279 (2017) 65–71.
- [82] D.H. Ubelaker, The Humanitarian and Human Rights Resource Center: support to address global forensic issues, *Forensic Sci. Res.* 2 (2017) 210–212.
- [83] S. Blau, It's all about the context: reflections on the changing role of forensic anthropology in medico-legal death investigations, *Aust. J. Forensic Sci.* (2018) 1–11.