Why FORENSIC ANTHROPOLOGISTS need ENTOMOLOGY?

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This presentation aims to address some of the main difficulties encountered by forensic anthropologists in estimating the post mortem interval (PMI) and how forensic Entomology can help to achieve this goal.

Estimation of PMI is among the most important and complex tasks performed by forensic anthropologists, being crucial in forensic sciences for both positive identification and reconstruction of perimortem events. An accurate PMI can help in the determination of a timeline for events surrounding death and, therefore, contribute to the outcome of forensic investigation.

However, reliable dating of skeletonized remains poses a scientific challenge since human remains decomposition involves a set of complex and highly variable processes [***fig.1***], and the time required for a body to become a skeleton is very variable because skeletonization is a complex phenomenon involving the intervention of multiple factors [***Pinheiro, 2006***].

Actually, PMI estimation is complicated by numerous factors, some endogenous such as cause of death, body build or drug use, and some exogenous, which vary geographically, including temperature, precipitation, pH, oxygen concentration and other soil characteristics [***fig.2***]. Besides, the combination of all these factors contributes to the ecology of plant, insect and other animal communities that have a strong impact in the condition of a corpse. I.e., PMI is dependent upon local climate conditions and scavengers.

In the current state of the art PMI estimation based solely on the state of decomposition and/or bone degradation of a cadaver in advanced decay is indeed not accurate [***fig.3***] as has been demonstrated by several investigations [***Ferreira, 2012***].

In many forensic investigations, PMI estimation provided by anthropologist is more likely based on experience in particular regional/environmental contexts than on a standard technique. In fact, the principal difficulty in PMI estimation is the lack of methods who actually work in everyday practice of forensic Anthropology [***Ferreira and Cunha, 2012; 2013***].

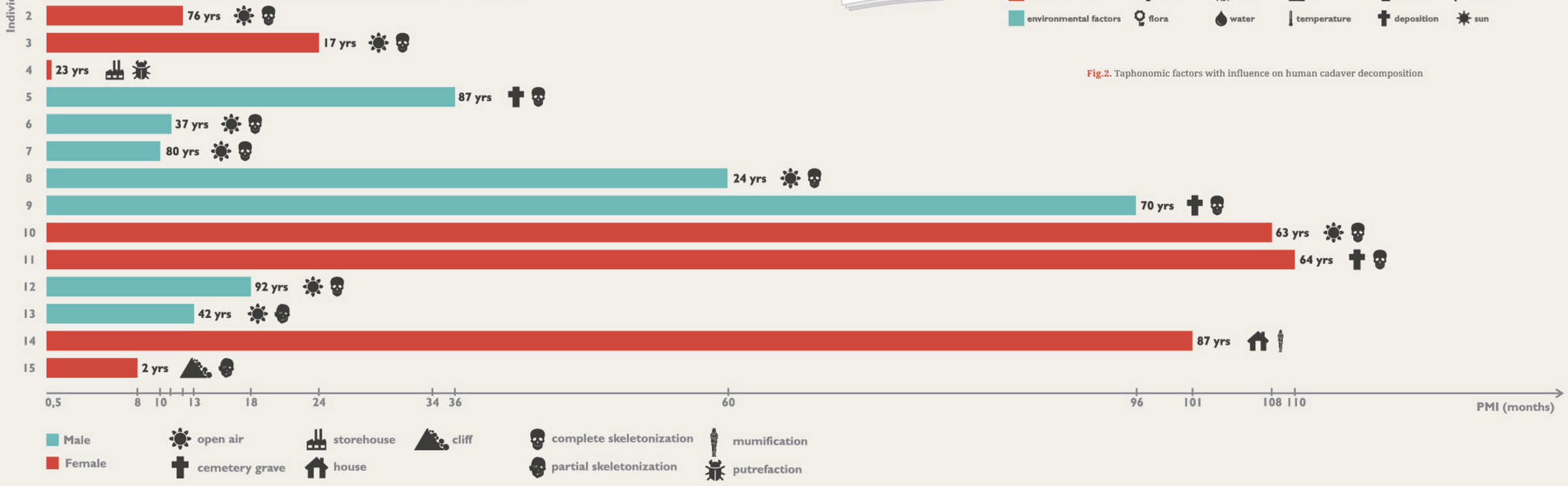

Fig.3. A sample of cases from Forensic Anthropology unit of Southern Delegation of the INMLCF.IP. with known ID and PMI. Through the analysis of skeletal remains, trying to apply the methods described in the literature or by comparison with cases from similar conditions would not have been able to get PMI if this was unknown (adapted from Ferreira e Cunha, 2012)

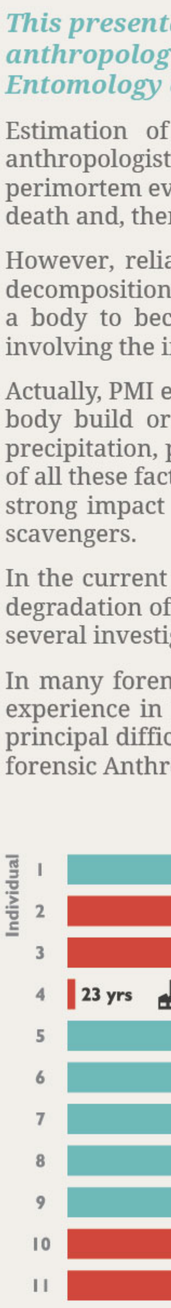

Fig.1. Decomposition process (adapted from Pinheiro, 2006)

Besides state of cadaveric decomposition and bone degradation, forensic anthropologist can be assisted by different methods such as forensic Entomology. Since insects are a very noticeable part of the decomposition process and colonize remains in a predictable sequence, species composition of insects present on the body at the time of discovery can be used to estimate PMI of advanced decay cadavers [***fig.4***].

Yet, one has to bear in mind that whenever bones are dry, forensic Entomology is usually not helpful. In other words, Entomology can help forensic Anthropology when the body is not yet fully skeletonized. Only a combination of different methods including the analysis of environmental conditions can allow an acceptable estimation of PMI from skeletonized remains.

In forensic Anthropology cases, the contribution of Entomology extends beyond estimating PMI [Haskell et al., 1997]. In fact, in these cases, since cadavers soft tissues are severe decomposed or no longer present, entomological evidence can be used to identify antemortem toxicology and also postmortem manipulation of remains (evidence of transportation or burial previous to the time of discovery).

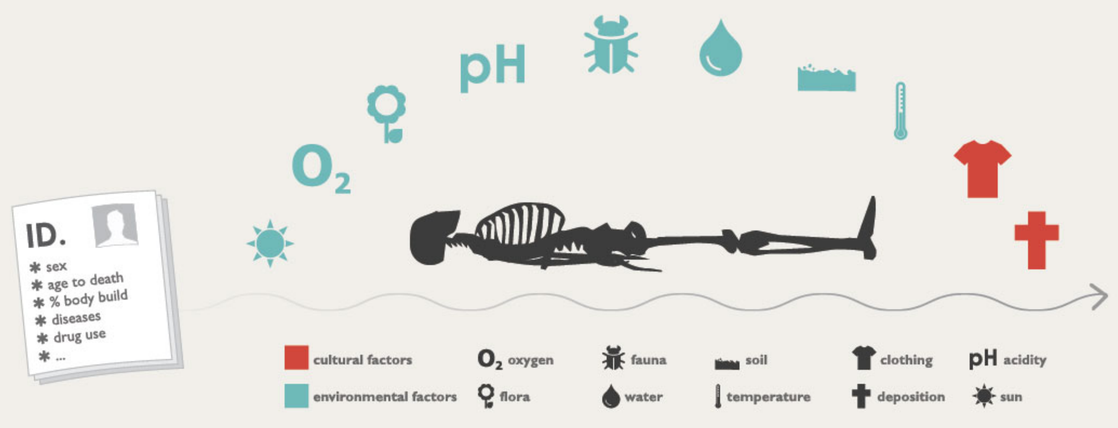

Fig.2. Taphonomic factors with influence on human cadaver decomposition

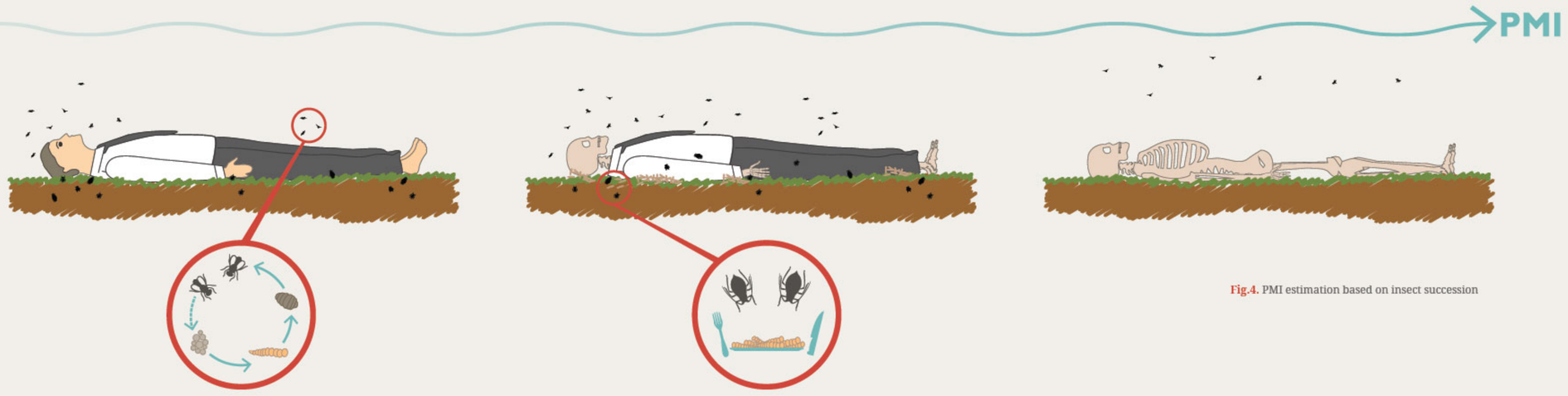

Fig.4. PMI estimation based on insect succession

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