

# Description of the entomofauna associated with the remains of the Cistercian nun Angela Veronica Bava (1591-1637)

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**Abstract.** The study of insects and other arthropods from death bodies is commonly used in forensic contexts but, in the last years this approach is also applied to archaeological contexts where cadavers - human or other animals - are found. Insects provides a large spectrum of information that is used to reconstruct the peri and post mortem events. In this paper the evidence produced by insects collected from the remains of the nun Angela Veronica Bava is used to describe the taphonomic process of the body and to verify historical data. Diptera and Coleoptera fragments were collected from the body. Diptera belong to *Hydrotaea capensis* (Muscidae), whereas Coleoptera are included in 5 different families Zopheridae, Carabidae, Dermestidae, Staphylinidae and Endomychidae. Entomological evidence is in agreement with the historical data highlighting that the entomological approach can be properly carried out in archaeological studies related with religious contexts.

**Key words:** Taphonomy, human remains, insects, *Hydrotaea*, crypt, catholic church

## Introduction

“Funerary archaeoentomology” is the name suggested by the French researcher J.B Huchet in 1996 to define the study of insects and other arthropods associated with human remains of archaeological interest (1). Funerary archaeoentomology shares with forensic entomology the same fundamental knowledge and part of the investigative techniques and methods. Both disciplines, despite answering different questions, focus their analyses on the insects and other arthropods associated with a dead body at the different stages of decomposition or mummification. If on the one hand forensic entomology aims to reconstructs the perimortem event from a forensic perspective, on the other funerary archaeoentomology answer to archaeological and historical questions without any legal mandate (2).

In an archaeological context, the knowledge of the ecological and biological peculiarities of the arthropods species associated with the human remains - or in case of funerary offerings also with animal remains (3,4) - can be useful to reconstruct the funerary practices (5-10) and to understand the hygienic and social conditions of the investigated human populations (Huchet, 1996 (1,11-13).

In Italy the discipline has been already apply to the study of WWI soldier remains (8, 10) and to sepultures inside or under Christian churches of body belonging to members of royal families (14,15), members of the clergy (2,7), Saints (16).) and common people (17).

This research, based on the insect fragments collected from the bones of the Cistercian nun Angela Veronica Bava (1591-1637), stored in the Fossano Monastery (Northern Italy) (Fig. 1), aims to describe the entomological community associated with the



**Figure 1.** Map of the sampling site. The black dot indicates the location of the Monastery where the remains of Veronica Bava are preserved. Fossano is located in the region of Piedmont (Northern Italy), 375 m asl (maps used for the plate retrieved from: [https://d-maps.com/carte.php?num\\_car=3126&lang=en](https://d-maps.com/carte.php?num_car=3126&lang=en); [https://d-maps.com/carte.php?num\\_car=2334&lang=en](https://d-maps.com/carte.php?num_car=2334&lang=en) and [https://d-maps.com/carte.php?num\\_car=8252&lang=en](https://d-maps.com/carte.php?num_car=8252&lang=en)).

body in order to provide information about her funerary ceremony, the taphonomic process affecting her body and eventually her sanitary and hygienic status when alive and so doing verifying the historical data.

#### *Geographical context*

The small town of Fossano (Fig. 1) is located in the region of Piedmont (Northern Italy), on a hill close to the Stura river at 375 m asl.

The climate is typically temperate continental. There is significant rainfall throughout the year and the average annual rainfall is over 1300 mm. The driest month is January (about 70mm) in contrast May and November are the rainiest months (more than 150mm) (<https://it.climate-data.org/>). The average annual temperature is around 11 °C, with a maximum over 20° C and a minimum of about 0-1 °C respectively in summer and during the winter.

### *Historical and Archaeological context*

The Monastery of SS. Annunziata in Fossano has its origins since 1125, in the Fossano countryside. In 1592, under the direction of the Bishop, the old monastery was moved into the city walls. In homage to the Duchess Catherine of Austria, the Monastery was dedicated to S. Caterina, until 1825, when the Monastery was restored in the premises of the SS. Annunziata, being the S. Caterina's almost destroyed.

Angela Veronica Bava, was born in Fossano on May the 20th 1591, from a noble family. She lost her father as a child and with her mother she was used to attend the Cathedral of San Giovenale, patron of the city, to which she was devoted.

On August the 6<sup>th</sup> 1606, at the age of fifteen, Veronica Bava enters the Cistercian monastery of Santa Caterina where she worked as a pharmacist and nurse even during the 1630 black plague, dedicating her life to the care of sick people.

In spring of 1637 she fell ill, probably due to the penances she inflicted on herself and frequent fasting. Veronica Bava died on April the 14th 1637 at the age of 46. Historical notes report that, after the death, her body was exposed in the cloister and then, the body, preserved in a wooden coffin, was initially placed in a common grave. On May the 22<sup>nd</sup> 1637 the body was transferred and buried under the floor of the monastery church choir. Notes about the preservation state of the body written on that day reported that the common grave was filled of water and that the body was in a perfect conservation state without any smell. On 1676, because some church floor restoration works the body was transferred in another place and it was observed that it was still in a perfect conservation state, as well as the clothes. On July the 17<sup>th</sup> 1811, because of the

suppression/abolition of the monastery of Saint Caterina the remains, were placed in two different jars: one for the bones, the seconds for the clothes and buried in the San Michele Chapel inside the Cathedral. Then, again in 1977 where moved again because other restoration works. The state of conservation of the jars, without opening them, was carried out in 1978, without any further observation, while in 2017 a new survey and the transfer of the remains in a new container was done.

### **Material and Methods**

During a preservative survey of the Veronica Bava body performed by Prof. Fulcheri and his team in 2019 some insect fragments were identified on the bones and in the coffin (Fig. 2). Entomological samples were manually collected with sterile tweezers and paintbrushes and stored in sterile plastic vials.

Entomological samples were observed and photographed using an IJM29 Leica stereomicroscope.

Specimens' identifications were performed using specific keys (18-22) and by comparison with already identified specimens stored in one of the authors (SV) entomological collection.

Specimens are stored in the FLEA (Forensic Laboratory for Entomology and Archaeology, University of Genoa) collection.

### **Results**

The arthropod fragments collected from the Veronica Bava remains belong mainly to the insects



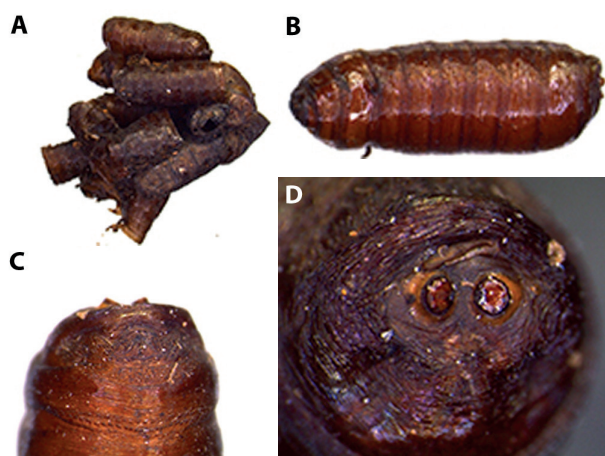
**Figure 2.** Skull with puparia of *Hydrataea capensis* (Diptera, Muscidae).

(Insecta) while only two fragments belong to a spider (Arachnida, Aranea). The total minimum number counts 139 specimens: 81 collected from the skull, 57 from the rest of the body.

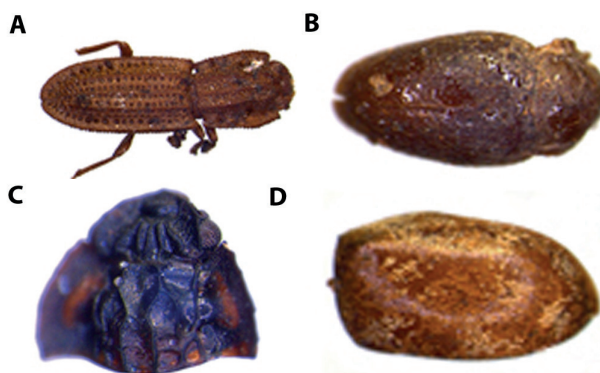
Among the insects, puparia of *Hydrotaea capensis* (Wiedemann, 1818) (Diptera: Muscidae) count more than the 84% of the analysed specimens (Fig. 3). Fragments of five families of Coleoptera (Dermestidae, Zosteridae, Staphylinidae, Endomychidae, Carabidae) (Fig. 4) and one family of Hymenoptera were also associated with the bones (Tab. 1).

No arthropod ectoparasites as lice or fleas were found among the analysed material.

The entomofauna associated with the body of Angela Veronica Bava is quite simple and mainly composed by remains of adult beetles and puparia of *H. capensis* a species well known as colonizer of buried body that has been reported from several sepulchres in churches and other archaeological sites (2,7,15,17,23,24). This taxon often represents the majority of the entomological findings, especially if the body was suddenly buried after the death or anyway treated with chemical or physical procedures to preserve it preventing the arrival of flies in the family Calliphoridae, the first colonizer of an exposed body. Being the nun dead in April, in case of body exposure the presence of specimens in the genus *Calliphora*



**Figure 3.** *Hydrotaea capensis* (Diptera: Muscidae): A) cluster of puparia collected from the bones; B) single puparium with respiratory horn and a cuticle hole potentially due to a predatory attack, scale bar: 1mm C) detail of the anal region of the puparium; D) puparium posterior spiracles. C and D show the diagnostic features typical of the species.



**Figure 4.** Coleoptera collected from the remains of Angela Veronica Bava: A) *Langelandia anophthalma* (Zopheridae); B) cfr *Mycetaea subterranea* (Endomychidae); C) *Micropeplus* sp. (Staphylinidae) head and pronotum with the characteristic sculptures D) *Anthrenus verbascii* (Dermestidae) elytron. Scales bar: 1mm.

Robineau-Desvoidy, 1830 rather than *Lucilia* Robineau-Desvoidy, 1830 would be expected (17, 25, 26) despite it has to be considered the habit of wandering of the larvae in these taxa after the feeding period in order to find a sheltered and protected place where pupariate. This behavior could be one of the causes of the absence of finding of these species. However, stronger seems to be the hypothesis based on the habit of burning Frankincense typical of the Catholic funerary rites. In fact, the smoke produced by the Frankincense has an insect repellent action, stopping or retarding the insect arrivals on the body.

Historical chronicles reported that during the body inspections organized by the clergy the body of Veronica Bava, appeared intact and not decomposed, that based on the catholic rules is a characteristic of a Saint. However, something has changed during the time in the conservation conditions of the body (temperature, humidity, etc.) and it is well documented by the presence of two taxa, a species in the genus *Micropeplus* Latreille, 1809 and *Langelandia anophthalma* Aubé, 1842 that are associated with wet environment and that, despite the poor information about their biology, seem to be saprophagous or mold feeders. This conclusion is confirmed by the historical reports indicating that the body 39 days after the first burial in a common grave was transferred under the church floor. When the transfer of the body took place on May the 23<sup>rd</sup> 1637 it was found floating in water that accumulated on the first grave.

**Table 1.** List of the species and minimum number of specimens of the arthropods associated with the remains of Veronica Bava (A= adult; E= exuvia; P= Puparium.)

Taxon	Developmental stage	Skull	Other bones
<b>Arachnida</b>			
<b>Aranea</b>			
Gen. sp.	E		1
<b>Insecta</b>			
<b>Diptera</b>			
Muscidae (Azeliinae)			
<i>Hydrotaea capensis</i> (Wiedemann, 1818)	P	73	44
	A	7	4
<b>Coleoptera</b>			
Zopheridae (Colydiinae)			
<i>Langelandia anophtalma</i> Aubé, 1842	A	1	4
Staphylindae (Microplepinae)			
<i>Microplepus</i> sp.	A		1
Dermestidae (Megatominae)			
<i>Anthrenus verbascii</i> Linnaeus, 1767	A		1
Carabidae			
Gen. Sp.	A		1
Endomychidae (Mycetaeinae)			
<i>Mycetaea subterranea</i> (Fabricius, 1801)	A		1
<b>Hymenoptera</b>			
Formicidae (Myrmicinae)			
Cfr <i>Messor</i> sp.	A		1

In contrast, the fact that the body spent some time in a dry condition is documented by the presence of an elytron of *Anthrenus verbascii*, Linnaeus, 1767, a beetle in the Dermestidae family well-known as pest causing damages on dry skin, clothes and zoological museum collections. The finding of two fragments of a spider exuvia is in agreement with the *A. verbascii* environment preference: mainly dry. In 1676 the body was again moved to another location because some floor restoration works and it appeared mummified indicating a drying process that well justifies the presence of spider exuviae and *A. verbascii* elytron. However, the later taxon can be associated also with a subsequent contamination. *Anthrenus* species are well known as

collection pests and they can be found also on osteological collections centuries old (27).

It is worth mentioning the finding of a specimen of *Mycetaea subterranea* (Fabricius, 1801), a species primarily mycophagous that was already collected in association with stored bones (28). Following the observation of Shockley et al. (29) our record supports the hypothesis that this species may also facultatively feed on bodies during the later dry stages of decomposition.

The lack of ectoparasites reveals a good hygiene condition of the person however the cleaning of the body after the death and the change of its clothes, before the funerary practice would remove any ectoparasite.

## Conclusion

In conclusion entomological evidence highlighted that:

- The body of Veronica Bava, when exposed to the devotees was in an environment limiting (Frankincense smoke, cloister, chapel, etc) the arrival of Calliphoridae, not found during the remain inspection;
- The body was preserved in a sheltered, underground environment where decomposition took place as documented by the presence of *H. capensis* puparia;
- The conservation condition of the bodies changed during the time with periods of high humidity with the formation of mold as indicated by the presence of Zopheridae and Staphylinidae species and periods of low humidity (dry) as documented by the presence of Dermestidae beetles and spiders. This reconstruction is in agreement with the historical records about the body transfer at different times after death;
- The lack of ectoparasite reveals a good hygienic condition of the body but it cannot be excluded the usage of funerary practices composed by the cleaning of the body after the death typical of the catholic tradition.

This paper shows how the analysis of the traces of the insects associated with a body can provide evidence to confirm or to amend historical information also in a religious context.

**Declarations of interest:** none

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