

On the use of U.V. traps to monitor infestation risk

Author of this guide:
Fabien Fohrer (entomologist/microbiologist)

Captions will be soon available in english.

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Light as an attraction factor for insects

Insects are strongly attracted to certain light sources (phototropism).

Different species of insects exhibit varying degrees of attraction to different parts of the ultraviolet spectrum, but a large majority of insects are sensitive to the U.V.A. band (between 380 nm and 315 nm). The greatest effectiveness is achieved at about 365 nm, especially for the insect order Diptera (flies), while also attracting several species that are harmful to heritage works (for example, *Stegobium paniceum*).

Insects are less sensitive to the other parts of the U.V. spectrum (U.V.B., between 315 nm and 280 nm, and U.V.C., between 100 nm and 280 nm) but these may also be useful.

This attraction is therefore used to trap and eradicate a large number of pest species in many sectors and especially in the food processing industry where hygiene standards are increasingly exacting (for instance, risk of appearance of blowflies or house flies).

The effectiveness of these traps was also demonstrated in studies performed by the CICRP in grain mills in Marseille, which sought to confirm the presence of *Stegobium paniceum* in these locations.

In addition, these studies revealed the presence of many types of insects that tend to infest stored and processed grains (beetles of the families Tenebrionidae, Cucujidae, Bostrichidae, Silvanidae, Mycetophagidae, Rhizophagidae Anthicidae, Latridiidae and Histeridae, among others).

Characteristics of U.V. traps

These traps are equipped with ultraviolet tubes with glue boards mounted behind them (there are also systems that electrify the insects), thus permitting the determination of the pest species trapped as well as the monitoring of the insect population at any given time. These elements serve as indicators of potential risk for the works and permit the estimation of the extent of risk (Photo 1).



Photo 1: Insects trapped on the glue board, here mainly beetles (photo Fabien Fohrer, CICRP).

There are several types of traps: wall-mounted or hanging. The power output of these devices depends on the space to be covered (Photo 2).

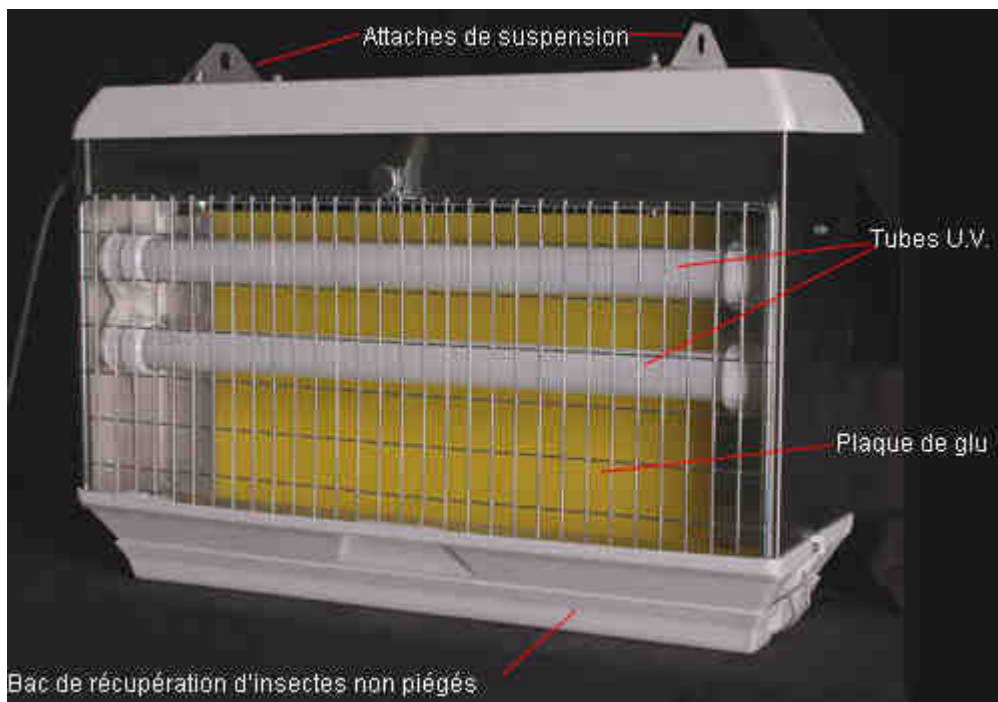


Photo 2: Hanging U.V. trap (Photo: Odile Guillon, CICRP).

These traps may be mounted in trafficked areas or in storerooms. It is important to ensure that they are kept far away from the works themselves due to the risk of photochemical damage: deterioration and discolouration of some materials contained in objects (coloured feathers, fur, pigments, etc.).

However, these traps do not present any real danger to persons in proximity since the wavelength of 365 nm is very close to the wavelengths of visible light detectable by the human eye (about 380 nm).

These devices require very little maintenance. It is important to change:

- the UV tubes once each year
- the glue boards:
 - every month between March and September (period conducive to the development of infestations)
 - every three months during the rest of the year

A few explanations

These traps serve as indicators. Following an eradication treatment and the elimination of an infestation at a given site, they are used to ascertain whether reinfestation has occurred and to ensure the identification by an entomologist of the species captured in order to determine which may pose a danger to heritage works. Service agreements may be concluded with specialised firms for the identification of insects and trap maintenance.

Compared to other trapping systems (pheromone traps and food traps, for example), U.V. traps are less selective and may be used to capture a large number of flying insects, whether they are dangerous for heritage works or merely passing through the premises. They may be used in an initial phase in order to better identify the insects present on the site and to determine which of them are dangerous for the cultural objects, followed by the use of the other two types of traps just mentioned in a more selective fashion based on the results obtained with the U.V. traps.

Due to their attraction capability, these U.V. traps are excellent indicators of malfunctions or potential risks, since an abundance of insects in these traps may point to a deficiency in the watertightness of buildings.

A study of these traps and their contents has allowed us to draw up a list of several insect species that are hazardous for heritage works (see table below). As other insect species are collected using these traps, they will be added to the list, by means of correlations with bibliographic data.

List of hazardous insect species for heritage works collected in U.V.A. traps		
Orders	Families	Genus and species
Coleoptera	Anobiidae	Stegobium paniceum
		Oligomerus ptilinoides
		Lasioderma serricorne
		Priobium carpini
		Anobium punctatum
Dermestidae	Anthrenus verbasci	
	Anthrenus pimpinellae	
	Attagenus unicolor	
	Dermestes species	
	Sefrania bleusei	
Trogoderma versicolor		
Lyctidae	Lyctus species	
Ptinidae	Ptinus species	
Isoptera (termites)	Kalotermitidae	Kalotermes flavicollis (yellownecked dry-wood termite)
Lepidoptera	Pyralidae	Plodia interpunctella

Bibliography:

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Florian, M., *Heritage Eaters: Insects and Fungi in Heritage Collections* (London: James and James, 1997), 62–68.