A modified version of Schoenly trap for collecting sarcosaprophagous arthropods. Detailed plans and construction

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Resumen

Versión modificada de la trampa Schoenly para capturar artópodos sarcosaprófagos. Planos detallados y construcción.

Este trabajo intenta simplificar la construcción de una trampa tipo Schoenly (Schoenly 1981), en la que se han incorporado algunas modificaciones. Este tipo de trampa resulta muy útil para estudiar la sucesión faunística entomosarcosaprófaga, uno de los temas de interés de la Entomología Forense. Se aportan planos detallados y medidas exactas de los distintos componentes de la trampa.

Palabras clave: Entomología forense, Fauna sarcosaprófaga, Sucesión de insectos, Trampa Schoenly

Abstract

This paper attempts to simplify the task of building Schoenly's insect trap (Schoenly 1981), with some modifications to the original. The trap is very useful in Forensic Entomology works, in order to study sarcosaprophagous insect succession. Detailed plans of the trap with exact measures are supplied.

Key words: Forensic entomology, Sarcosaprophagous fauna, Insect succession, Schoenly trap

Introduction

In Forensic Entomology, when studying arthropod fauna that colonizes a cadaver, it is desirable that collection of samples is easy and efficient. Most of the works focusing on insect succession in cadavers and inventories of this type of fauna have been done using manual sampling as methodology (Reed 1958, Payne 1965, Early & Goff 1986, Anderson & VanLaerhoven 1996, Tantawi et al. 1996, Richards & Goff 1997, Grassberger & Frank 2004, Matuszewski et al. 2008). This traditional method of collection consists in laying the dead animal in the study site (eventually protected inside a vertebrate scavenger-exclusion cage) and periodically visiting it. In each visit, part of the organisms found on, in, under and around the carcass is sampled with commonly used entomological material, as aerial nets and tweezers. The problem with this methodology is that only the fauna present in the moment of the visit is collected, and so, a considerable part of it is ignored. Another disadvantage is related with the dependence in the collector's ability and experience. The data obtained may lead to incomplete and biased inventories (Ordóñez et al. 2008) and cannot be easily compared with other works.

An alternative to face this problem is the use of specific traps that allow the collection of all the arthropod fauna that enters the trap and that emerges from the decaying remains.

Schoenly (1981) described a trap invented to

collect arthropod fauna from baits (such as small-animal carrion, dung or rotting fruit). Schoenly et al. (1991) described another trap with the same mechanisms, but somewhat improved, and sized for human and pig cadavers. These traps are designed to collect adult arthropods that are attracted to a carcass. Some of them are immediately captured as they enter the trap and another part enters and reaches the carcass. These uncollected arthropods will eventually leave the corpse, being also captured; the same way, second generations emerging inside the trap are also collected, as well as migratory larvae that leave the carcass. With this method, all insects that are attracted to the carcass and enter the trap are captured, thus giving a total census, not only samples. Physical contact with the bait during sampling is not needed, arthropods are collected continuously and automatically, reducing the disturbance in the colonization and collector's bias is not introduced. Even thought, only a few works refer Schoenly traps as methodology for collecting arthropods

Figura 1: Fotografía del exterior de la trampa.
Figure 1: Photo of trap, exterior.

Figura 2: Fotografía del interior de la trampa.
Figure 2: Photo of trap, interior.

attracted to cadavers (Arnaldos et al. 2001, 2004, Prado e Castro 2005, Battán Horenstein et al. 2007). Recently, Ordóñez et al. (2008) proved the efficiency of Schoenly trap in the collection of adult sarcosaprophagous dipterans, where it is described as a superior methodology to perform inventories of Diptera associated with carcasses and recommended for the study of sarcosaprophagous succession.

Although Schoenly (1981) and Schoenly et al. (1991) have descriptions and careful details of trap construction, in fact it is not very simple to build it.

The objective of this work is to provide plans with the precise dimension of the trap designed by Schoenly (1981), but with some modifications to the original. Since we wanted to study insect succession in a piglet carcass, it was decided to use the smaller Schoenly trap. However, this one was prepared for animals such as mice and rats, so we had to design it much bigger. Another modification introduced to the trap was the use of underground conduits to collect beneath the ground bottles, so the trap didn't need to be raised, in the way described in Schoenly et al. (1991). The exact dimension of each piece that constitutes the trap is given, so that trap construction becomes much simpler.

General trap characteristics

The trap consists of 12 lateral holes connected with funnels, 8 of them are 'entry holes' and 4 are 'exit holes' (Figs. 1 & 2). From the 8 entry openings, 4 of them give the arthropods direct access to the bait (a dead piglet or other animal). The other 4 are connected with collecting channels that lead to bottles that immediately collect the portion of the fauna attracted to the carcass. The 4 exit holes plus the one on the top of the trap, connect to bottles with preservative solution. All the fauna that leaves the body is captured.

Schoenly`s trap allows a total census of the arthropods that enter it and that develop on the cadaver, with a minimum interference in the natural decomposition process and its faunistic succession.

Construction details and functioning

The trap is dodecahedral, measuring 99 cm diameter at its base and stands 61 cm high. It is appropriate for animals until 10 kg weight.

The figure 3 shows trap structure, constructed in marine plywood, which is a light material, very resistant to water and humidity and so, convenient for outdoors studies. Exact dimensions are given for each piece of the trap, as well as indications of the holes that should be made in some pieces.

During the process of properly gluing and nailing all the pieces, a fine mesh plastic net was nailed in the superior part of the trap, coupled to pieces D, E and G (Figs. 1 & 3), and a large mesh plastic net was fastened with a screw between pieces A and B of trap base and pieces F (Figs. 2 & 3). The wood surfaces of the trap were coated with water resistant varnish.

To the 12 lateral holes in the trap, 12 funnels (7 cm diameter, with the end cut off) were glued. Eight of them serve as entry for the insects in the trap and 4 as exit, so, alternately, funnels are turned inside and outside (Figs. 1 & 2). In the top of the trap another funnel (with 8 cm diameter and end cut off) was glued to piece D, also serving as exit hole to arthropods. To this funnel a tube and a bottle were connected (Fig. 1). To the 4 lateral funnels turned outside (exit funnels), 4 bottles were connected. Four of the 8 funnels turned inside the trap give the arthropods direct access to the carcass. To the other 4, "tubes" of fine mesh plastic net were coupled, making the connection between the funnels and the 4 holes in the base of the trap (Fig. 2). Bottles were coupled to these holes in the base of the trap (pieces B). Since these 4 bottles will be positioned beneath the ground, a

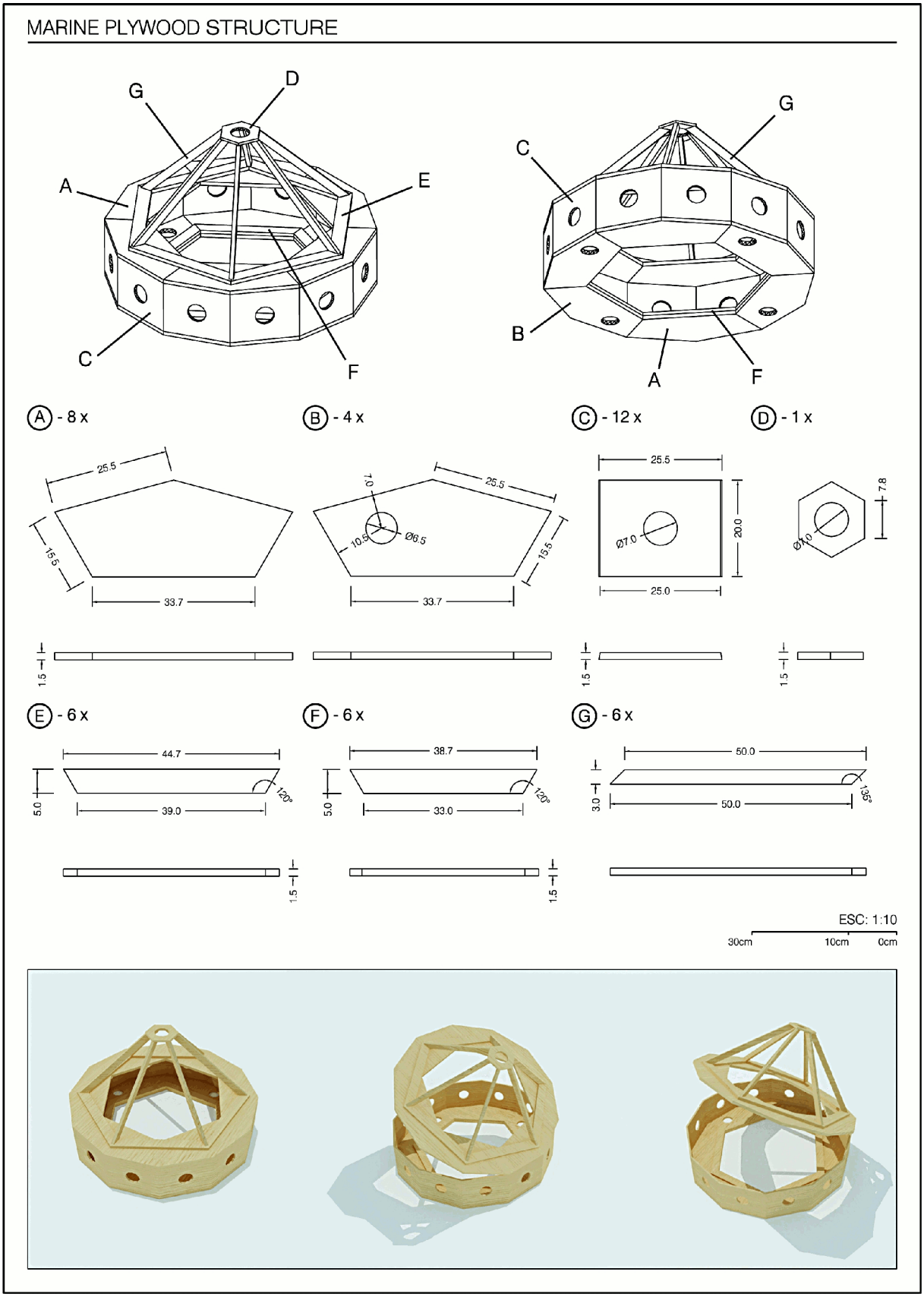

Figura 3: Estructura de la trampa con los detalles de sus piezas constituyentes.
Figure 3: Trap structure with details of each piece that constitutes it.

tube in which an arm can enter should be used, in order to be possible the access to these bottles. The trap is installed in the field by digging holes to accommodate those 4 tubes and then, using soil to fill spaces around them. The trap should settle for 1 or 2 weeks before experiments begin (Schoenly et al. 1991).

To sum up, the trap has 4 unobstructed openings for the arthropods to enter and access the carcass and a total of 9 bottles with a solution that kills and preserves the arthropods (4 bottles underneath the ground connected to collector channels for incoming organisms, 4 bottles and 1 top bottle for outgoing organisms).

The bottles should be filled approximately ¼ of its capacity with Leech's solution (Leech 1966), which is usually used in pitfall traps (Morril 1975). This solution serves as general arthropod killing agent and temporary preservative and is a mixture containing 600 ml water, 400 ml ethylene glycol (anti-freeze coolant), 5 ml formalin and 1 ml detergent. This solution preserves specimens for up to a week (Morril 1975), is odorless, rate of evaporation is low (Schoenly 1981, Schoenly et al. 1991) and the specimens stay in good conditions.

At last, the carcass can be placed inside the trap that is ready to work. The regularity of collections is up to the investigator, however, due to the large amount of insects (mainly Diptera) that are attracted to the cadaver, especially in the first days we recommend it to be done, at least, in a daily basis.

The trap can easily be opened (Fig. 3, bottom) to perform temperature measurements in the carcass, to observe or make manual collections, e.g. immature stages, if desired.

Final considerations

As it was demonstrated by Ordóñez et al. (2008), Schoenly trap is very effective in the collection of entomosarcosaprophagous fauna and suggested as the best methodology for making inventories of this type of fauna associated with a decaying carcasss. The trap we describe is suited for animal carcasses up to 10 kg. It was modified in order to be bigger than the one in which is based (Schoenly 1981), for the purpose of using larger animals and because a bigger size increases the possibility that pupation occurs in trap area, leading to 2nd generation collections. It is smaller than the one described in 1991 (Schoenly et al. 1991) and has different shape, but includes some of its improvements. Above all, the plans supplied with exact measures of trap pieces will strongly facilitate the task of planning and constructing the trap.

Insect succession on cadavers can be better studied using this trap and with this contribution we believe that building one will be simpler.

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