

# A new modified night trap: more selective and less harmful to Heterocera (Insecta: Lepidoptera)

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## Abstract

We present one modified collection container to the “Luiz de Queiroz” light trap. This night tent-trap (or NTT) is characterized by being simple, inexpensive, and efficient in several aspects related to the capture of Heterocera: 1) even the fragile insects had few morphological damages; 2) favors selective collection of specimens, avoiding the predatory capture which contributes to the maintenance of local diversity, and 3) does not select any taxonomic groups or body sizes.

KEY WORDS: Insecta, Lepidoptera, Heterocera, collection, light trap, techniques, entomology.

**Una nueva trampa de noche modificada: mayor cantidad selectiva y poco perjudicial para los Heterocera  
(Insecta: Lepidoptera)**

## Resumen

Presentamos un recipiente colector modificado para la trampa de luz “Luiz de Queiroz”. Esta tienda-trampa nocturna (o NTT) se caracteriza por ser simple, económica y eficiente en varios aspectos relacionados con la captura de Heterocera: 1) incluso los insectos frágiles tenían pocos daños morfológicos; 2) favorece la recolección selectiva de especímenes, evitando la captura depredadora que contribuye al mantenimiento de la diversidad local y 3) no selecciona ningún grupo taxonómico o tamaño corporal.

PALABRAS CLAVE: Insecta, Lepidoptera, Heterocera, colección, trampa de luz, técnicas, entomología.

## Introduction

Traps are important tools for insect studies, and are defined as mechanical, physical or chemical methods that capture them, whether or not they are attractive (NAKANO *et al.*, 2000). Light traps are efficient devices for the attraction and capture of winged adult insects of different taxonomic orders, which have positive phototropism. The use of these traps allows passive collection of insects during longer night periods, and for several days, avoiding collectors to exposition to the dangers inherent to night work. In addition, it enables the standardization of the sampling effort, allowing spatial and temporal comparisons, thus avoiding the sample bias caused by collectors with different levels of knowledge and experience (DINIZ *et al.*, 2005). These characteristics favour their use in richness and diversity studies (SILVEIRA-NETO *et al.*, 1995; GUSMÃO *et al.*, 2004; TESTON *et al.*, 2004), seasonality (COELHO *et al.*, 2003; OLIVEIRA *et al.*, 2008; SILVA *et al.*, 2011), spatial heterogeneity (CHOI, 2008), and habitat fragmentation (TESTON *et al.*, 2009), among so many others. However, despite so many benefits they are avoided by taxonomists who need to obtain

specimens with morphological structures in perfect condition for correct identification and preservation in entomological collections.

The light trap model called “Luiz de Queiroz” (SILVEIRA-NETO *et al.*, 1969) is widely used in Brazil, mainly in entomological population and pest control studies. (SILVEIRA-NETO *et al.*, 1995). This trap model consists of either a 15 W or 20 W specific-wavelength, usually fluorescent, or mixed-light mercury lamp (GALLO *et al.*, 2002), attached to a metal structure that intercepts the flight of nocturnal adult insects. The radius of attractiveness of the weak light source usually used in “Luiz de Queiroz” is probably less than 30 meters (BECK *et al.*, 2006), restricting it to studies of communities residing in particular vegetation types or forest fragments (BRAGA *et al.*, 2015, 2018). Although this trap model has a satisfactory performance in insect capture (SILVEIRA-NETO *et al.*, 1984; NAKAYAMA *et al.*, 1979), its collection containers have been adapted according to the researcher’s interest or need (OLIVEIRA *et al.*, 2008; SILVA *et al.*, 2011; TESTON *et al.*, 2009).

For fragile insects, especially lepidopterans, which have easily detachable scales, several attempts have already been made to improve the preservation of specimens captured by the “Luiz de Queiroz” light trap. Some adaptations to the trap collector (catcher) had already been made, such as the use of a plastic bag containing a glass container with Ethyl Acetate and 5 x 50 cm strips of paper to prevent captured insects from breaking (PINTO *et al.*, 2004; FERREIRA *et al.*, 1982), and the use of cardboard trays to hold eggs inside the plastic bag, thus preventing resistant insects such as beetles from moving around and damaging the most fragile insects. (Ferro, personal com.). However, even with these adaptations, in the case of Lepidoptera, the risk of damage to delicate wings, antennae and legs remains due to the mechanical impacts of other insects within the container.

Thus, we present here another modification for the “Luiz de Queiroz” light trap collection container. This new model, the night tent-trap (NTT), consists of a three-dimensional rectangular structure (tent type) made of thin, transparent and resistant fabric (e. g. cotton tulle or Voal), 60 cm wide by 100 cm high, and 60 cm deep (Figs 1-2), connected to the funnel of the metal structure of the trap by a cylinder of 15 cm in length by 10 in diameter. The fabric is permeable and thus there is no limitation of collection and loss of quality of material collected during rainy periods, as there is no water retention inside the tent. The ends of the tent are attached by nylon strings or ropes to the vegetation or stakes to keep it always taut. One may also choose to use the rope-suspended trap in vertical stratification studies. The tent has a side opening for handling and collecting material (Figs 1-2), which remains closed by spring-hook or velcro when not in use, thus preventing the escape of insects. The size of the lateral opening allows manual collection using a deadly bottle, and sorting can be done in the field for taxonomically aware collectors.

The NTT is very simple, of low cost, easy to transport and to install. Its attractiveness remains the same, but is very efficient in capturing phototropic insects, especially several small-sized Lepidoptera families such as Gelechiidae and Elachistidae, as well as the large ones such as Saturniidae and Sphingidae (BRAGA *et al.*, 2015; LEPESQUEUR *et al.*, 2021 [unpubl. Data]). The morphological integrity of the specimens is maintained (see Fig. 3), as the internal volume of the container (360,000 cm<sup>3</sup>) is sufficient to minimize physical contact with other insects, and also allows the scape from potential predators in the interior of the tent. In this way, the NTT contributes to the quality of material deposited in museums and entomological collections of research institutions.

The great methodological advantage of the NTT for ecological and conservation studies is the selectivity in sampling, which allows field specimen sorting and selective collection of insect taxa of interest to the researcher, making the method less predatory. In addition, this adaptation makes possible to use the capture-marking-recapture method, is suitable for nocturnal moth population and community monitoring, as well as for metapopulational studies, especially in protected areas. The National Action Plan for Lepidopteran Conservation - PAN (FREITAS *et al.*, 2011) is one of the official management tools of the Brazilian government (BRASIL, 2018), used for ordering and prioritizing actions for the conservation of species and natural environments, it aims to expand the conservation mechanisms of lepidopterans in Brazil, with emphasis on endangered species. One of the actions of that PAN was: “Define standardized protocols for monitoring light trapped

Heterocera”, and the product of this action resulted in a document entitled “General Protocol for Nocturnal Moth Sampling” in which the NTT was one of the models indicated for sampling of nocturnal Macrolepidoptera, being recommended for inventory, monitoring, rapid ecological assessments (AER) and, primarily, for conducting medium and long-term ecological studies (FREITAS *et al.*, 2011), because its selectivity minimizes the effects of specimen removal over time.

Thus, the present suggestion to the “Luiz de Queiroz” light trap with insertion of the collecting tent (NTT) makes it more efficient in several aspects: 1) maintain the morphological integrity of the insects including the most fragile ones; 2) avoids the indiscriminate collection of non-research specimens, which contributes to the conservation of biodiversity; 3) does not show selective attractiveness to Heterocera, attracting various taxonomic groups of different body shapes and sizes; and 4) enables comparative studies and monitoring regardless of collector ability, comprising an excellent capture method for ecological and conservation studies.

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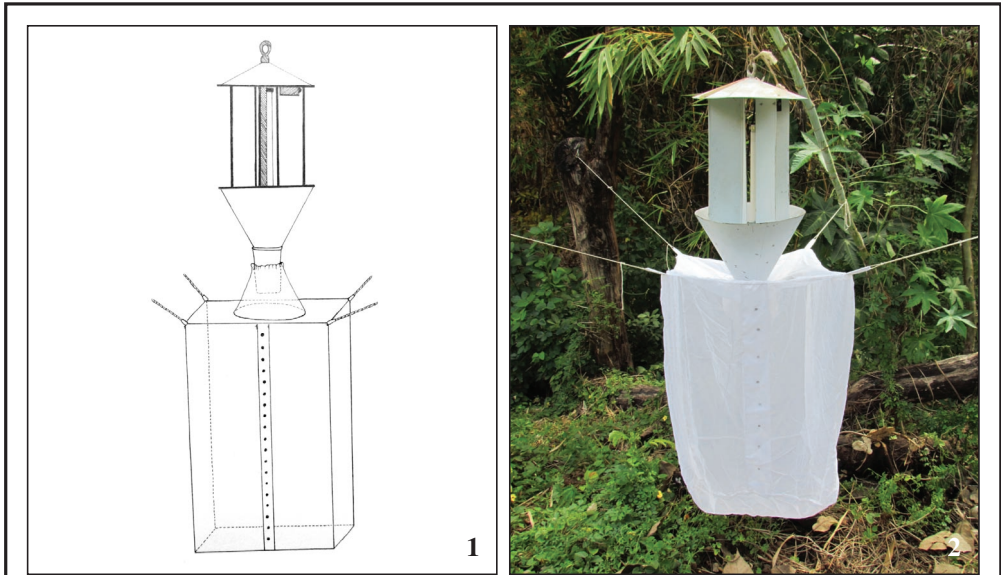
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**Figures 1-3.**– 1. Illustrative diagram of the tent to be attached to the “Luiz de Queiroz” light trap. Illustration: Willer Bontempo. 2. The night tent-trap (NTT) used in the cerrado sensu stricto of Brasília, DF, for nocturnal Lepidoptera. 3. Some specimens of Lepidoptera collected with night tent-trap (NTT) in areas of Brazilian Cerrado.