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## Breeding of the Scuttle Fly *Megaselia scalaris* in a fish Carcass and Implications for the use in Forensic Entomology (Diptera: Phoridae).

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MORETTI T C, THYSSSEN P J & SOLIS D R [UNESP, São Paulo, Brazil]: **Breeding of the Scuttle Fly *Megaselia scalaris* in a fish Carcass and Implications for the use in Forensic Entomology (Diptera: Phoridae).** – Entomol Gener 31(4): 349–353; Stuttgart 2009-01. – – – [Note]

The breeding of 138 specimens of the scuttle fly *Megaselia scalaris* (Loew 1866) in a piece of sardine, *Sardinella brasiliensis* (Steindachner 1879) (Teleostei: Clupeidae), exposed in a rural site in SE Brazil is reported. Some aspects regarding the exploitation of carcasses of such nature and size by phorids are discussed, aiming to comprehend their potential forensic utility.

**Keywords:** *Megaselia scalaris* (Loew 1866) – fish carrion – necrophagous flies – Neotropical region – forensic sciences.

MORETTI T C, THYSSSEN P J & SOLIS D R [UNESP, São Paulo, Brasil]: **Obtenção do Forídeo *Megaselia scalaris* em uma Carcaça de peixe e implicações para o uso em Entomologia Forense (Diptera: Phoridae).** – Entomol Gener 31(4): 349-353; Stuttgart 2009-01. – – – [Nota]

A obtenção de 138 espécimes do forídeo *Megaselia scalaris* (Loew 1866) (Diptera: Phoridae) de um fragmento de sardinha *Sardinella brasiliensis* (Steindachner 1879) (Teleostei: Clupeidae) exposto em região rural no Sudeste Brasileiro, é descrita. Aspectos relacionados à exploração por forídeos de carcaças desta natureza e tamanho são discutidos, objetivando compreender o potencial uso forense desta família de dípteros.

**Palavras-chave:** *Megaselia scalaris* (Loew 1866) – carcaça de peixe – moscas necrófagas – região Neotropical – ciências forenses.

## 1 Introduction

Even considering the difficulties with identification and their small size, phorids are worthy of study because of their biological diversity and possible usefulness in very diverse fields, from biological control to forensic entomology [DISNEY 1994].

Specifically in the forensic entomology field, most cases focusing on the analysis of insects found on a corpse are concerned with the dipteran families Calliphoridae, Sarcophagidae, Muscidae, Fanniidae and more rarely, other Calyptrata [GREENBERG & KUNICH 2002]. When these flies cannot reach the body, the smaller flies may represent the only entomological data that could provide important information for the forensic team. Among these, the scuttle flies (Diptera: Phoridae) have special skills at entering through the smallest openings, succeeding at gaining access to concealed corpses [DISNEY 1994]. However, sometimes it is not clear what the phorids use the carcass for: necrophagy or predation on other arthropods possibly encountered on/in such a resource.

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The phorid *Megaselia scalaris* (Loew 1866) (Diptera: Phoridae) is a saprophagic fly, which is distributed widely throughout the tropical and subtropical areas of the world [PRAWIRODISASTRO & BENJAMIN 1979]. Larvae of this species regularly develop in stored vegetables and fermenting fruits and may be found in excrement and decaying plant and animal matter [BOHART & GRESSITT 1951, EL-MINIAMI 1965]. They are known to be causative agents of urogenital, cutaneous, intestinal and ophthalmic myiasis [DISNEY & KURAHASHI 1978, BIERY et al 1979, SINGH et al 1988]. The adults of both sexes feed on sugars and the females on a rich protein meal, essential for maturation of the eggs [DISNEY 1994]. Animal carcasses and their fluids are one such source. Such habits mean they represent a considerable hygiene risk when they invade indoor areas where food is being prepared. This explains why *M. scalaris* was suspected to be a vector of *Vibrio comma* in the Philippine Islands [EL-MINIAMI 1965], and also indicates its forensic utility [DISNEY 1994, MORETTI et al 2008].

There are numerous records of Phoridae associated with vertebrate carrion, but the majority of these are simply related to the adult females' necessity for a meal with high protein content. Particularly in relation to *M. scalaris*, DISNEY [1994] pointed out this species breeding in exposed corpses which had started to mummify. BARNES [1990] reported this phorid colonizing a corpse in an advanced stage of decomposition, in Puerto Rico. GREENBERG & WELLS [1998] and SUKONTASON et al [2001] have also documented the breeding of *M. scalaris* on mummified corpses in the USA and Thailand, respectively.

This note is to report in detail on the oviposition and development of the phorid species *M. scalaris* on a piece of sardine, *Sardinella brasiliensis* (Steindachner 1879) (Teleostei: Clupeidae), in the city of Paulínia/Brazil, in an attempt to fill in some of the gaps regarding the general biology of this phorid, with special remarks on its diet spectrum.

## 2 Material and methods

The present data were obtained using a carrion trap, similar to the kind used for muscoid flies collection by several authors [FERREIRA 1978, LINHARES 1981, ERZINÇLIOĞLU 1996], during the collection of necrophagous arthropods in the rural area of the municipality of Paulínia (22°45'40"S, 47°09'15"W) (São Paulo state, Brazil) in November 2006. The trap was made of 2 soft-drink plastic bottles – each one approximately 35 cm long and 8 cm in diameter (**Fig 1**). The bottom ends of both bottles were removed to allow them to fit and to permit the entrance of insects through the bottom opening of the lower bottle, which was painted black. The cap of the lower bottle was also removed, so its top end was open. The bait inside this trap was a 12 g piece of sardine left to rot for 48 h at room temperature before being placed into the trap, at the top end of the lower bottle with a small iron hook. The trap was suspended with a cord from a tree branch, approximately 180 cm above the ground. The trap remained exposed in the study site for a period of 72 h, after which any trapped arthropod in the top bottle would be collected and taken to the laboratory for identification.

## 3 Results

After 72 h of exposure in the study site, when the trap was removed to collect the adult baited arthropods, very small first-instar fly larvae were discovered on the fish piece. *The larvae were kept in the bait and deposited in a plastic vial containing vermiculite covered with organza, and kept in a climatic chamber under controlled temperature of 25±1°C and relative humidity of 75% until the emergence of the adults.* After 17 days, 138 adult specimens were identified as *M. scalaris*. Neither other fly species was found breeding in this bait, nor were any adult flies caught in the trap.

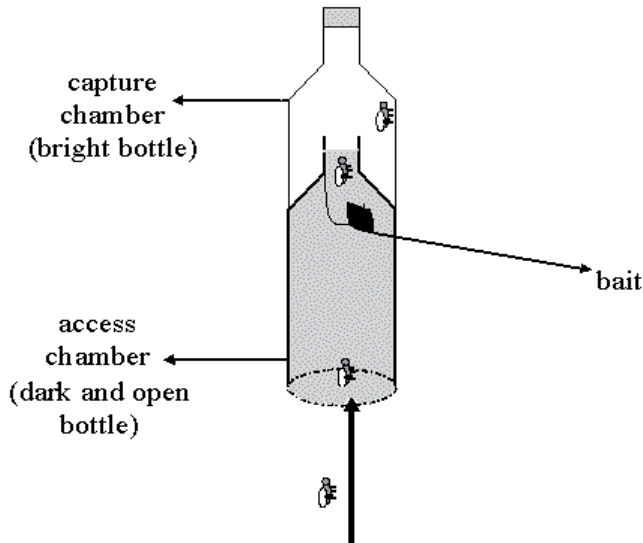


Fig 1: Drawing of the suspended carrion trap used to capture necrophagous arthropods in SE' Brazil

## 4 Discussion

Adult Phoridae visit carcasses to feed, and more rarely, to oviposit. The utilization of a piece of fish as the rearing media in the present report was not intentional, since one must be aware of the difficulty of directly using data obtained from a non-mammalian remain in a forensic context. However, contributing to the understanding of the diet spectrum, and therefore of the natural history of *M. scalaris* was the intention in this study, since these are prime steps to enable the utilization of any insects in the forensic field.

Any attempt to try to understand aspects of the natural history of phorids, mainly regarding their very diverse larval lifestyles should be encouraged, since the available information on this family is very scattered and even poor in some aspects [DISNEY 1994].

Hence, the prime goal in the present study was to catch adult arthropods attracted to the fish bait. When encountering such a considerable number of larvae, it was decided to keep them alive and rear them through to the adult stage, as this is one of the safest and easiest ways of identifying small flies [DISNEY & MUNK 2004].

*Megaselia scalaris* was the only fly reared in the bait used in the present study. This scenario also occurred in human remains investigated by CAMPOBASSO et al [2004] in Southern Italy. Phorids sometimes are the only insect evidence in bodies when larger flies are prevented from gaining access to the body, through burial, for instance. Apart from these cases, it is unusual to find only one species of Diptera breeding in a piece of carrion.

Could the early arrival of *M. scalaris* prevent the concomitant exploitation of the carcass by other fly families, also known to be included in the initial waves of colonization? The trap used in the present investigation did not shelter the fish remains from being colonized by other fly families (e.g. Calliphoridae, Sarcophagidae). This situation would be more likely to happen in buried carcasses, since Calliphoridae or Sarcophagidae are unable to reach buried corpses, while Phoridae in general show such a skill.

This behavior can suggest a specialization of this family in colonizing buried remains, possibly an attempt to avoid competition from larger larvae of other Diptera species. Furthermore, according to DISNEY [1994], the extremely rapid larval development and the very small size of the adults may represent important adaptations permitting the phorids to exploit small, patchily distributed and ephemeral resources, such as the piece of fish carrion colonized in the present observation.

*M. scalaris* is known to arrive on corpses in the early stages of decay, being able to reach the carrion very rapidly and lay eggs straight away [CAMPOBASSO et al 2004]. This is in agreement with the present report, since the fish carrion remained exposed for a very short period, but enough to be colonized by this phorid.

As the date of oviposition was not recorded, the developmental time was anything between 17 and 20 days, which is consistent with previously published data for the temperature regime reported [PRAWIRODISASTRO & BENJAMIN 1979]. Here, just the time from first-instar larva to adult at 25°C could be measured, which was 17 days.

Another question that could be raised is the possible influence of carcass taxon, since most of documented cases of carrion colonization by Phoridae species involve mammal carrion. WALL et al [2001] reported the occurrence of Sarcophagidae and Calliphoridae infesting fish baits on the coast of South West India, showing that these families do colonize fish carcasses. However, it is certain that Phoridae can also infest non-mammal carrion. This aspect also has human health implications, given that sun-drying fish is an important dietary component for people in developing countries of Africa, Asia and the Pacific [FAO 1981]. This practice is very susceptible to fly infestation, especially under warm and humid weather conditions [WALL et al 2001]. To the best of our knowledge, this is the first description of *M. scalaris* colonization on fish remains.

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WALL R & SHEARER D: **Veterinary Entomology**. Ectoparasites of Veterinary Importance. – [XV + 439 pag, var draw + fot, 155 x 235 mm, softcov]. – **Publ:** Chapman & Hall, London–Weinheim–New York–Tokyo–Melbourne–Madras; **ISBN:** 412-61510-X; **Pr:** Brit £ 29,99. – – – [EGR-Nr 2.529]

This is the first textbook to deal specifically with the insect and other arthropod ectoparasites of veterinary importance. It concentrates on the species of most significance in temperate N° Europe and N America (many of which are common to both regions). It is in a modern layout and clearly illustrated. It opens with a chapter on the general biology of arthropod ectoparasites. This includes host-parasite relationships, evolution, structure and function, development, lifecycles, classification and origins. A series of following chapters deal with each of the main arthropod groups encountered by practising veterinarians. These contain sections on morphology, life histories, pathology and classification. It closes with an extensive section concentrating on diagnosis, control and treatment of ectoparasite infestations, followed by a glossary and an index of terms. This book will serve medical students and practising veterinarians as well, but will also be of interest to medical entomologists, parasitologists and those working in livestock disciplines.

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SABROSKY C W: **Family-Group Names in Diptera**. An annotated catalog. – THOMPSON F C, EVENHUIS N L & SABROSKY C W: **Bibliography**. – THOMPSON F C: **Postscript**. – In THOMPSON F C (Editor): **Myia**. The Journal of the North American Dipterists’ Society: **10**. – [576 pag, 190 x 260 mm, balacr-hardcov]. – **Publ:** Backhuys Publishers, Leiden; **ISBN:** 90-5782-026-9; **Pr:** € 96,-. – – – [EGR-Nr 2.882]

This work on Diptera systematics is aimed at being historical as well as nomenclatural and bibliographical. It consists of four alphabetical lists: **a** *Conspectus*, listing under the currently recognized families the type genera concerned within the family limits; **b** *Annotated Catalog of Family-Group*