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Ophyra capensis (Wiedemann) (Diptera, Muscidae) found inside the esophagus of a mummy in Lisbon (Portugal)

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ABSTRACT

The present paper aims to describe the material (puparia and adult fragments) of Ophyra capensis *(Wiedemann, 1818) (Diptera, Muscidae) recently found inside the esophagus of a mummified body from the XIX century, in Lisbon (Portugal). Illustrations of the material and a brief discussion are presented. Third larvar stadium, pupa and adult of* O. capensis *and* O. ignava *are presented.*

Keywords: *Ophyra capensis;* Esophagous Infestation; Mummy; Morphology; Diptera.

INTRODUCTION

Couri *et al.* (2008) recently reported a case of *Ophyra capensis* (Wiedemann, 1818) (Diptera, Muscidae) found inside the esophagus of a mummified adult male from the early XIX century, buried inside the crypt of the Sacrament Church (Lisbon, Portugal). The colonization showed to be monospecific and the case was the first record of this species invading internal human organs of a mummified body. Considerations of the finding were presented by these authors.

The present paper aims to describe in detail the material (puparia and adult fragments) of *O. capensis* and register other invertebrate fragments also found within the material removed from the interior of the esophagous. Illustrations of the material and a brief discussion are presented.

MATERIAL AND METHODS

The corpse studied (Fig. 1) is, according to the anthropological exam, of a middle stature, robust, middle aged man about 45 years old, with no hair. The description and illustrations of the corpse are found in Couri *et al.* (2008).

The fragments of Diptera and other invertebrates were found with the aggregate of powder and

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spider web material removed from the upper part of the esophagus (Figs. 2 and 3).

The material is deposited at the collection of Museu Nacional, Universidade Federal do Rio de Janeiro.

RESULTS AND DISCUSSION

Within the material we can easily identify fragments of an unidentifiable insect leg and a Diplopoda (Figs. 4 and 5). Concerning to *O. capensis,* as related by Couri *et al.* (2008), 11 puparia (fragments of two of them shown in Figs. 6 and 7), one intact pupa (Figs. 8 and 9), one partially destroyed male head (Fig. 10), fragments of about six wings (Fig. 11) and two legs were found.

Ophyra is herein treated as a good genus, although some authors as Pont (1986) considered it to be a junior synonym of *Hydrotaea* Robineau-Desvoidy. Different opinions have been recently published (see Schuehli *et al.,* 2004, Savage & Wheeler, 2004, Carvalho *et al.,* 2005).

Ophyra species are highly eurytopic, and most often breed with other muscids as *Musca* Linnaeus, 1758 and *Stomoxys* Geoffroy, 1762 and also species of Calliphoridae and Sarcophagidae. In the case different flies are present, *Ophyra* larvae will feed on the other species, acting chiefly as regulators of fly populations (Skidmore, 1985).

Adults of *Ophyra* have a metallic black coloration, males are holoptic with bare eyes, the ocellar triangle is shiny, the arista is bare, the dorsocentral setae are 2:4, the katepisternals 1:1, the anepimeron is bare and the vein M is straight (Carvalho & Couri, 2002). The puparium of *Ophyra* measures about 4.8-7.3 mm long, has usually long and thick pupal horns; the posterior spiracles are large, with straight parallel posterior to very little sinuose spiracular slits, slightly convergent upon median scar.

The projected posterior spiracles (Figs. 9 and 12), the straight posterior spiracular slits (Fig. 14) and the shape of the anal plate with lateral wings much narrower than the median part (Fig. 13) are characteristic of this species. Also, the pupal respiratory horns that are massive and reddish (Fig. 6).

O. capensis is known to be the most widespread species of *Ophyra.* According to Skidmore (1985) it ranges from Capetown northwards to northern England, and the Oslo area eastwards through Tadzhikistan to China. In Europe, it is the commonest species of *Ophyra* and in the New World it ranges from New York to Chile, but its occurrence in these areas is more recent probably due to commerce, as it is originally an Old World species (Skidmore, 1985).

O. capensis has been recorded in breeding in numerous media as human faeces, carrion, nests of various mammals and birds and dead animals. Together with *O. ignava* (Harris, 1780), it is known to invade corpses after *Calliphora* Robineau-Desvoidy, 1830 and *Muscina* Robineau-Desvoidy, 1830 but before the phorids and sometimes is found on human bodies kept indoors for several months, where blowflies have not access (*eg.* Smith, 1986 and Bourel *et al.,* 2004).

Both *O. capensis* and *O. ignava* are native from the Old World and have forensic importance.

Smith (1986) in his book mainly on the British and European fauna mentioned *O. leucostoma* (Wiedemann, 1817) (= *O. ignava* Harris, 1780) and *O. capensis,* both having forensic importance, the second one preferring a warmer environment and probably being a later arrival than *O. ignava.* Puparia of *O. ignava* have been found about 90 cm deep in the soil beneath the pabulum in March. Adults emerge when the mean temperature beneath the surface reaches about 10ºC and are abundant from June to October, being most plentiful in August (Graham-Smith, 1916 in Smith, 1986).

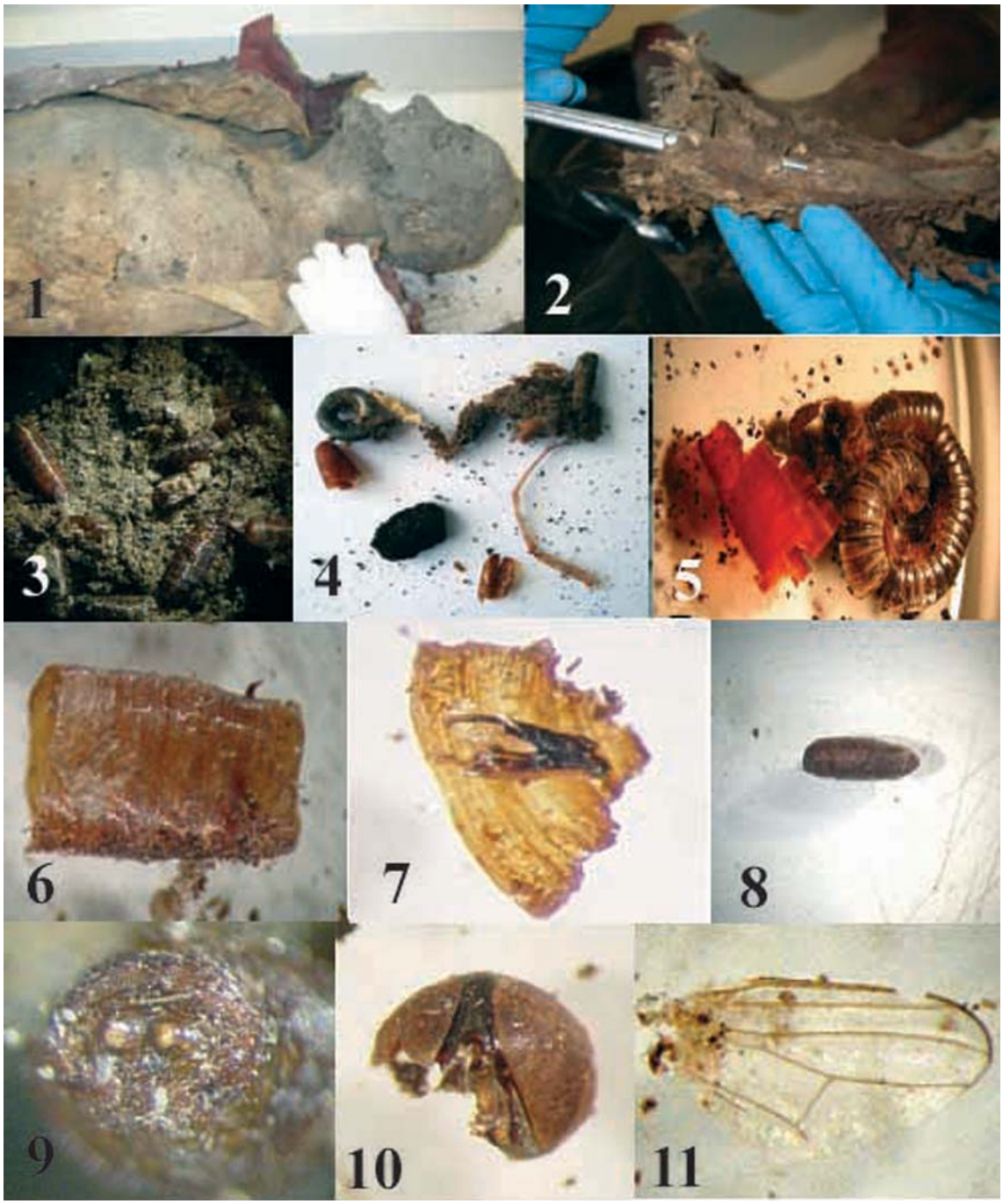
The following characters help to segregate the 3rd larvar stadium and pupa and adult of both species:

O. ignava: anal plate with lateral wings hardly narrower than the median area; para-anal papillae very large, larger than the extra-anal ones; posterior spiracular slits, especially the outer one more sinuate and distinctly convergent towards the median scar; males with hind tibia curved and with fine and long setae on basal third of anteroventral, ventral and posteroventral surfaces; (Fig. 15, modified from Carvalho & Couri, 2002); females with ocellar triangle not strongly sclerotized and blackish.

O. capensis: anal plate with lateral wings much narrower than the median area and reaching the base of para-anal papillae; para-anal papillae hardly projecting; anal spiracles strongly projected (Fig. 13); posterior spiracular slits almost straight and parallel (Fig. 14); males with hind tibia not curved and with series of long setae on apical two-thirds of anteroventral, ventral and posteroventral surfaces (Fig. 16, modified from Carvalho & Couri, 2002); females with ocellar triangle strongly sclerotized and reddish-brown.

Among the *Ophyra* species, the biology and behavior of *O. aenescens* is better documented mainly because it is often used as a biological control agent of the house fly *Musca domestica* Linneaus, 1758.

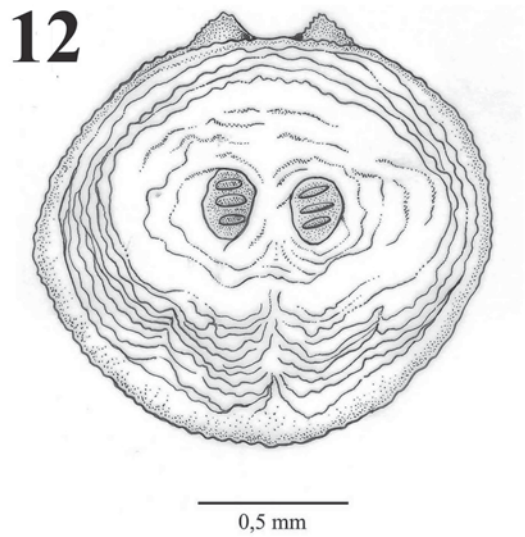
Ophyra species have been recorded from buried corpses, helping to solve forensic cases. Mégnin (1894 in Smith, 1986) found numerous *Ophyra* specimens in buried corpses about one year old. Smith *(op. cit.)* described a case history) in which the presence of numerous larvae and puparia of *Ophyra* and only a few

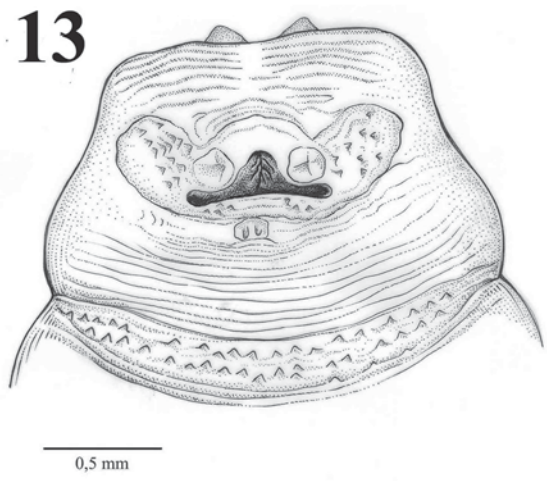


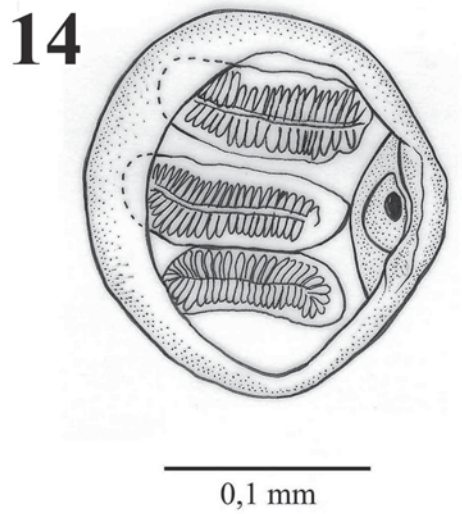
FIGURES 1-11: 1. Mummified body of a man of the XIX century found in the Church of Sacrament, Lisbon, lateral view; **2.** Dissected esophagus of the mummy; **3.** Material collected inside the esophagus of the mummy; **4.** A diplopod adult and invertebrate fragments found inside the esophagus of the mummy; **5.** Detail of the diplopod; **6.** *O. capensis,* fragment of one puparium showing the respiratory horn; **7.** *O. capensis,* fragment of anterior part of one puparium showing the cephalopharyngeal skeleton; **8.** *O. capensis,* intact pupa; **9.** *O. capensis,* detail of posterior end of the intact pupa showing the posterior spiracles; **10.** *O. capensis,* fragment of male head found inside the esophagus of the mummy; **11.** *O. capensis,* fragment of a wing found inside the esophagus of the mummy.

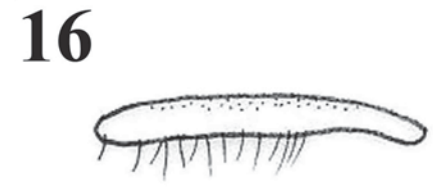
larvae and puparia of *Calliphora,* found in a headless body of a woman, helped to clarify the original deposit of the corpse. As species of Calliphora attack fresh corpses, they are part of the first wave of insects. The absence of a significant number of these flies on this corpse associated with the presence of numerous *Ophyra* suggested that the body had been kept indoors for several months in a warm and dry place. The head of the body, found later, showed different maggot populations, numerous *Calliphora* and only one *Ophyra* suggesting it was exposed for some time before the burial.

Grassberger & Scharrer-Liška (2006) have found puparia and adult fragments of *Ophyra* ("most likely *O. capensis*") in one of the examined graves in a burial site dating back to about 800 A.D. (late Avar period), 50 km south of Vienna (Frohsdorf). It was a monospecific colonization and the fact that species of *Ophyra* attack the corpses in a later succession wave (ammoniacal fermentation) and are only found in high numbers when colonization of the corpse by blowflies is not possible, they concluded that probably the corpse has not been exposed to open air for some time. According to the authors interpretation,









FIGURES 12-16: 12. *O. capensis,* posterior spiracles of the puparium; **13.** *O. capensis,* detail of anal plate of the puparium; **14.** *O. capensis,* detail of the posterior spiracular slits of the puparium; **15.** *O. ignava,* posterior tibia of male (modified from Carvalho & Couri 2002); **16.** *O. capensis,* posterior tibia of male (modified from Carvalho & Couri 2002).

the grave was reopened and closed again shortly afterwards but they did not conclude if the infestation occurred inside the coffin immediately after reburial or during a longer period of exposure to open air. The authors called attention to the good preservation of the chitinous fragments, which can be observed only when the bacterial activity is constrained by toxins such as copper salts from corroding artifacts or at waterlogged.

Bourel *et al.* (2004) studied the entomofauna of 22 exhumed cadavers in the Lille, France. *O. capensis* was one of the three most abundant, found both in putrefied as in two mummified corpses, the last ones exhumated about one year after inhumation. The authors postulated that the presence of this species is consequently an indication of internment in a confined space.

Together with the corpse herein studied, other 72 mummified bodies were found in the same crypt and the opportunity to study other bodies of the same collection will certainly add information to the dipteran colonization in corpses.

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RESUMO

O presente trabalho tem o objetivo de descrever fragmentos de pupário e adultos de Ophyra capensis *(Wiedemann, 1818) (Diptera, Muscidae) recentemente encontrados no interior do esôfago de um corpo mumificado do século XIX em Lisboa (Portugal). Ilustrações do material e uma breve discussão são apresentados.*

Palavras-chave: *Ophyra capensis;* Infestação no Esôfago; Múmia; Morfologia; Diptera.

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