

Megaselia scalaris (Diptera: Phoridae) can live on ripe bananas – a potential health hazard?

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(Index words: Myiasis, identification of *M. scalaris*, rearing in laboratory)

Abstract

Objective Identification of larvae that infest bananas and investigating its habits.

Design Laboratory based study.

Setting Department of Parasitology, Faculty of Medicine, University of Colombo.

Methods Bananas brought to the department with a query of maggot infestation were examined and the presence of maggots was confirmed. Maggots were allowed to develop into adults. The larvae and the flies were identified using standard keys.

Results *Megaselia scalaris* was identified, the larvae of which infest ripe bananas. Three generations of *M. scalaris* were reared using ripe bananas as the only source of food. Two other banana specimens yielded larvae that eventually grew into adult flies of *Bactrocera* species.

Conclusions In addition to *Bactrocera* spp. larvae of which are known pests in bananas, *M. scalaris* larvae were detected as pests for the first time. We demonstrated that *M. scalaris* can complete its life-cycle depending on ripe bananas as the only source of food. The vast consumption of bananas and the potential of *M. scalaris* to cause intestinal and wound myiasis in humans make these findings medically important.

Introduction

Megaselia scalaris is a small fly (length 2 to 3 mm) with known scavenging properties (1). Larvae of the fly have been implicated in intestinal, urogenital, corneal and wound myiasis (2 to 10). Infestation of fruits, including bananas, with fly larvae is a known occurrence (11). In Sri Lanka the common fruit fly belongs to *Bactrocera* species (12). This is the first report of *M. scalaris* infesting bananas and surviving solely on this fruit for several generations under laboratory conditions. Infestation of ripe bananas by larvae of *M. scalaris* has the potential to cause human myiasis.

Methods

A banana (*Musa accuminata*) of the "Anamalu" variety was brought to the Department of Parasitology, Faculty of Medicine, University of Colombo, with small light brown patches in the flesh of the fruit when the skin was peeled off. Observation under a magnifying lens revealed the presence of tiny white maggots. The peel on the outer

surface appeared to be intact but the inner side was slightly discoloured. Examination of a slice of the banana with the skin under the dissecting microscope showed a number of maggots crawling about. Thick slices of the banana were placed inside a 500 ml beaker which was kept upright in large petri dish protected from ants, covered with a large bell jar to prevent contamination by other insects. The beaker was examined daily. After 6 days puparia were seen attached to the inner side and the outer surface of the beaker. After 8 more days the adults appeared. The identification was based on morphological features of larvae, pupae and adults (13,14). The adults were fed on fresh ripe bananas of the 'Ambul' and the 'Kolikuttu' varieties and the cycle was repeated to get two more generations of adults. Control experiments were set up to exclude contamination of fresh bananas with fly larvae before the experiment. The identification of the insect was confirmed at the Ashworth Laboratories of University of Edinburgh (courtesy of Dr. Derek Cosens). Two other specimens of bananas brought to the department were observed separately and the insects was identified (Figure).

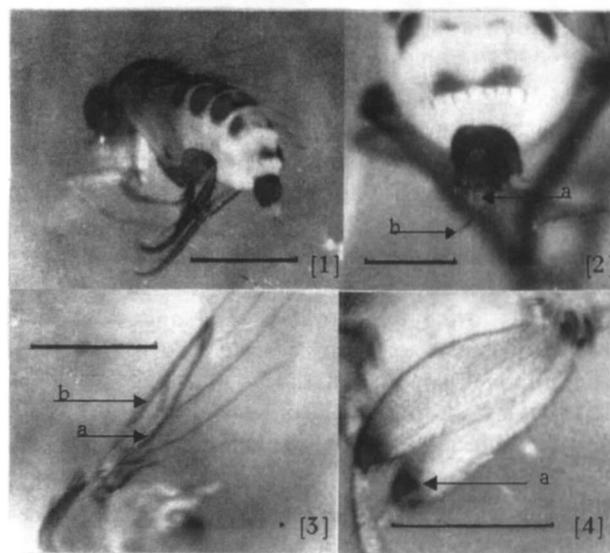


Figure. (1) *Megaselia scalaris* adult fly, bar = 1 mm; (2) Dorsal view of posterior end of male, bar = 0.25 mm, a. anal tube, b. a bristle at the tip of the tube; (3) Characteristic wing venation; bar = 1 mm, a the thick longitudinal vein, b. costa; (4) Femora of hind legs, bar = 0.5 mm, a. dark spot at the apical end

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Results

Identification of the insect as *M scalaris* was based on morphological characteristics of larvae, pupae and adult flies as described by earlier workers (1,13,14). The mature larva is about 4 mm long and dirty white. Body segments bear short fleshy processes. The posterior spiracles are situated dorsally on a pair of sclerotised humps and consist of a narrow slit at the apical end. A marked feature of the puparium is a pair of strongly projecting horn-like anterior spiracles dorsally. It is brown and somewhat conical in shape.

The adult is a small 2 to 3 mm long fly, with a hump-backed appearance and a characteristic quick running motion when moving on a surface (hence the name 'scuttle flies'). In the male, the two bristles at the tip of the anal tube are long and feathery, and the longest hair of the side of the epandrium is bristle-like and distinct from the rest of the hair (14). On the head the antennae are placed low with a sub-dorsal 3-jointed crista. The legs are long and stoutly built with the hind femora having a characteristic dark spot at the apical ends which further helps in the identification of *M scalaris* (13). The thorax and abdomen are yellow to light brown with a variable dark brown to black pattern on the abdomen. In the female the ovipositor is prominent at the hind end of the abdomen. The opportunistic behavioural characteristics and the ability of *M scalaris* to breed and live successfully on bananas were identified and confirmed. Two other banana specimens similarly investigated yielded larvae which grew into adult flies of the fruit fly of *Bactrocera* species (12).

Discussion

M scalaris, like the house fly, is a scavenger fly found on decaying vegetable and animal matter, excretions of animals and humans, faeces and secretions such as discharges of wounds (1). The present study describes for the first time its ability to successfully complete its life-cycle in bananas. It is likely that the female lays eggs on the banana having pierced the skin with its ovipositor. The observation of flies squatting on bananas pressing their hind ends to the skin supports this suggestion. This behavioural characteristic of *M scalaris* is of agricultural and economic importance, and its potential as a health hazard is also significant. The difficulty of identification of an affected banana from its external appearance increases the risk of human consumption.

The medical significance of *M scalaris* has been described previously in reports of larvae of this fly causing myiasis of wounds (2), eye (5), intestine (3,6,8) and urogenital system (9). Up to now there are no records of cutaneous (15) or intestinal myiasis due to *M scalaris* in Sri Lanka. Although typically *M scalaris* breeds on excretions of animals and humans, decaying vegetables, and ulcers on animals and humans, this report shows its affinity for fresh ripe bananas.

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References

1. Zumpt F. Myiasis in man and animals in the Old World. London: Butterworths, 1965; 20-1.
2. Patton WS. Notes on some Indian Aphiochaetae. *Aphiochaeta xanthina*, Speiser (repicta, Schmitz; circumsetosa, de Meijere; ferruginea, Brunetti), whose larvae cause cutaneous and intestinal myiasis in man and animals, and *Aphiochaeta rufipes*, Meigen, whose larvae occasionally cause cutaneous myiasis in animals. *Indian Journal of Medical Research* 1922; 9: 683.
3. Ingram A. *Aphiochaeta xanthina*, Speiser (*A. ferruginea*, Brun.) as an intestinal parasite in the Gold Coast. *Journal of Tropical Medicine and Hygiene* 1922; 25: 113.
4. Patton WS, Evans AM. Insects, ticks, mites and venomous animals of medical and veterinary importance. Part 1. Medical. Croyden: Grubb, 1929; 786.
5. James MT. *United States Department of Agriculture, Miscellaneous Publication No. 631*. Washington: United States Department printing office, 1947; 162.
6. Rhodes-Jones R. Intestinal myiasis in Tanganyika. *Journal of Tropical Medicine and Hygiene* 1957; 60: 169.
7. Biery TL, Clegern RW, Hart WW. Two cases of phorid (Diptera:Phoridae) myiasis in Texas. *Journal of Medical Entomology* 1979; 15: 122-3.
8. Singh NB, Singh TK, Singh YI, Razaque MA. Intestinal myiasis caused by *Megaselia scalaris* (Diptera:Phoridae): A case report. *Journal of Communicable Diseases* 1988; 20: 163.
9. Singh TS, Rana D. Urogenital myiasis caused by *Megaselia scalaris* (Diptera:Phoridae): A case report. *Journal of Medical Entomology* 1989; 26: 228-9.
10. da Silva RJ, do Prado AP, Rodrigues RR, Lopes C A de M, Godoy WAC. *Megaselia scalaris* (Diptera: Phoridae) causing myiasis in *Crotalus durissus terrificus* (Serpentes: Viperidae) in Brazil. *Journal of Medical Entomology* 1999; 36: 630.
11. Armstrong JW. Infestation biology of three fly (Diptera; Tephritidae) species on 'Brazilian', Valery and 'William's' cultivars of banana in Hawaii. *Journal of Economic Entomology* 1983; 76: 539-43.
12. Tsuruta K, Bandara HMJ, Sundaraperuma SAH, Kahawatta SBMUC, Rajapakse GBJP. Pictorial key to dactine fruit flies associated with economic plants in Sri Lanka. *Research Bulletin of Plant Protection Japan* 1998; 34: 23-35.
13. Brues CT, Melander AL. Classification of insects. *Bulletin of the Museum of Comparative Zoology: Massachusetts; Harvard College*, 1932; 304-5.
14. Disney RHL. Handbook for the identification of British insects; Scuttle flies, Diptera, Phoridae. London: Royal Entomological Society, 1989; 10.
15. Kumarasinghe SPW, Karunaweera ND, Ithalamulla RL. A study of cutaneous myiasis in Sri Lanka. *International Journal of Dermatology* 2000; 39: 689-94.