



# Identification of Peach Fruit Fly, *Bactrocera zonata* (Saunders), in The Eastern Mediterranean

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*Bactrocera Zonata* (female from Egypt) © [The Natural History Museum](#)

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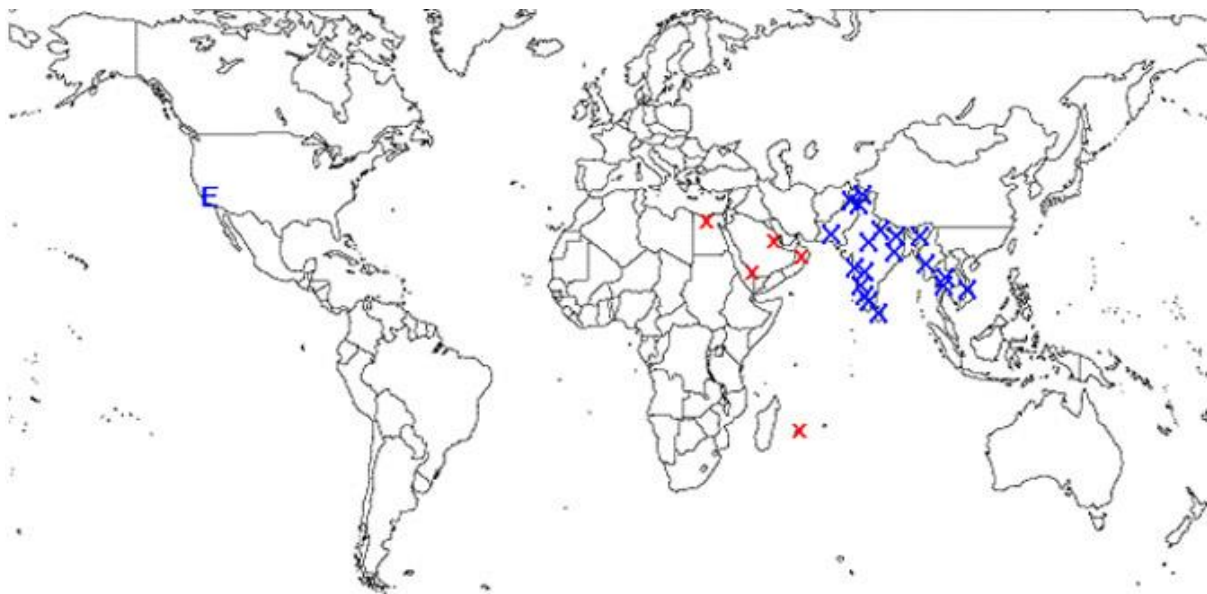
## Introduction

The peach fruit fly, *Bactrocera zonata*, is native to South and South-east Asia, where it attacks a wide variety of soft fruits, e.g. peach, guava and mango (see White & Elson-Harris, 1994; Allwood et al., 1999 for further details), and is commonly known as the Peach Fruit Fly. It is not known exactly when it spread to the Middle East, but there is a record from Saudi Arabia dated 1982, and more recently it has been found in Oman (CABI, 1996). By the late 1990s it was well established in Egypt. The following map is based on the distribution map produced by



CABI (1996), with the addition of Egypt (X = records from areas where fly is presumed native; x = records from areas where fly is known or presumed introduced; E = briefly introduced but eradicated). There is also an old record from Egypt (Efflatoun, 1924) but that appears to have been based on a quarantine interception.

Males of *Bactrocera zonata* are attracted to methyl eugenol.



*Bactrocera zonata* (distribution largely based on CABI, 1996)

The genus *Bactrocera* includes about 500 species, mostly in Asia, the Pacific and Australasian Regions. Only 10 species are native to Africa, the best known of which is the olive fly, *B. oleae* (Rossi). Older literature may refer to the peach fruit fly as *Dacus zonatus*. Modern authors now restrict the use of the name *Dacus* to those members of the tribe Dacini (*Dacus* and *Bactrocera*) that have their abdominal terga fused together into a single sclerotised plate, and most *Dacus* spp. are found in sub-saharan Africa (about 180 spp. in that region).

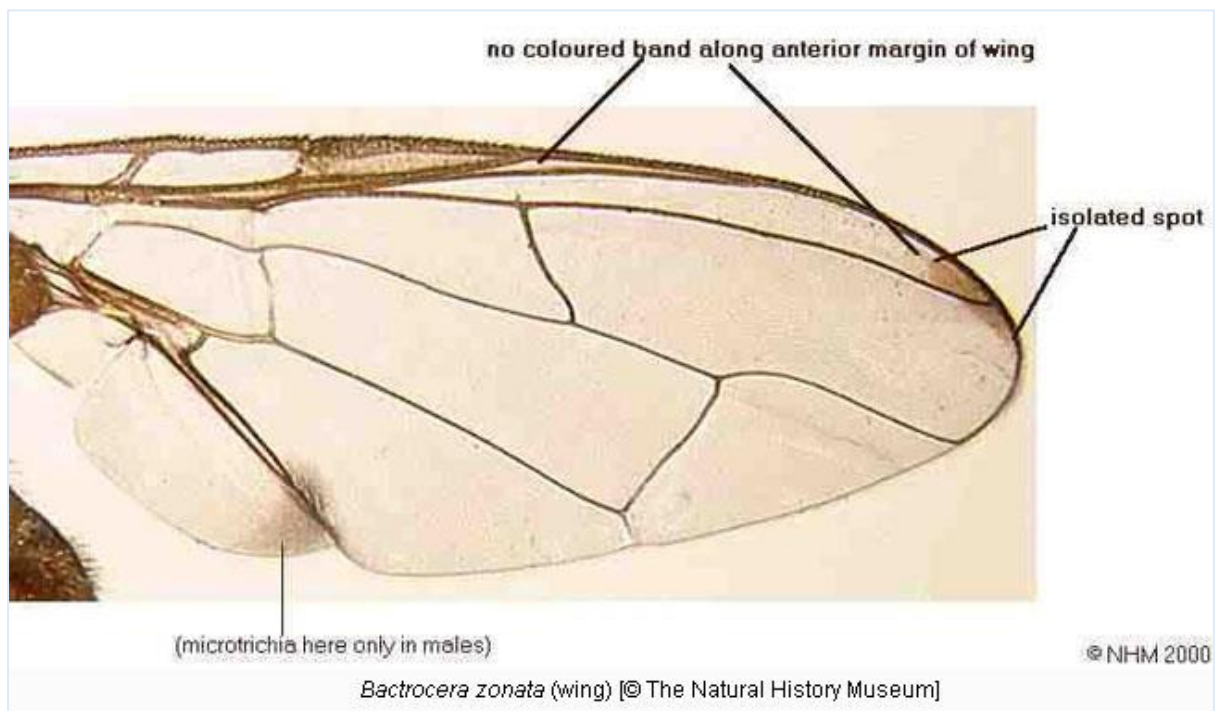
These genera belong to the family Tephritidae (Trypetidae or Trupaneidae in some older literature), a group of about 4000 known species, an estimated 80% of which have larvae that develop in the seed bearing organs (flowers or fruit) of higher plants, and are therefore known as fruit flies. Unfortunately, the term "fruit fly" is also sometimes used for the genus *Drosophila* (family Drosophilidae), which are microfungi feeders, that may sometimes be found with mouldy fruit. To avoid this confusion the Tephritidae, which attack the seed bearing organs of plants while they are intact and alive on the plant, are sometimes called true fruit flies. The fruit flies of Egypt are not well known and the only comprehensive treatments are now very old (Eflatoun, 1924; Hendel, 1927) but the fauna of nearby Palestine has been extensively studied (Freidberg & Kugler, 1989). In that area most species are flower feeders, which are of no significance as pests.

The only area of North Africa for which there is any fruit fly literature is Egypt as other areas have not been surveyed. There are only 11 frugivorous species recorded from Egypt and a key is presented here for their separation.

#### Identification of *Bactrocera zonata*

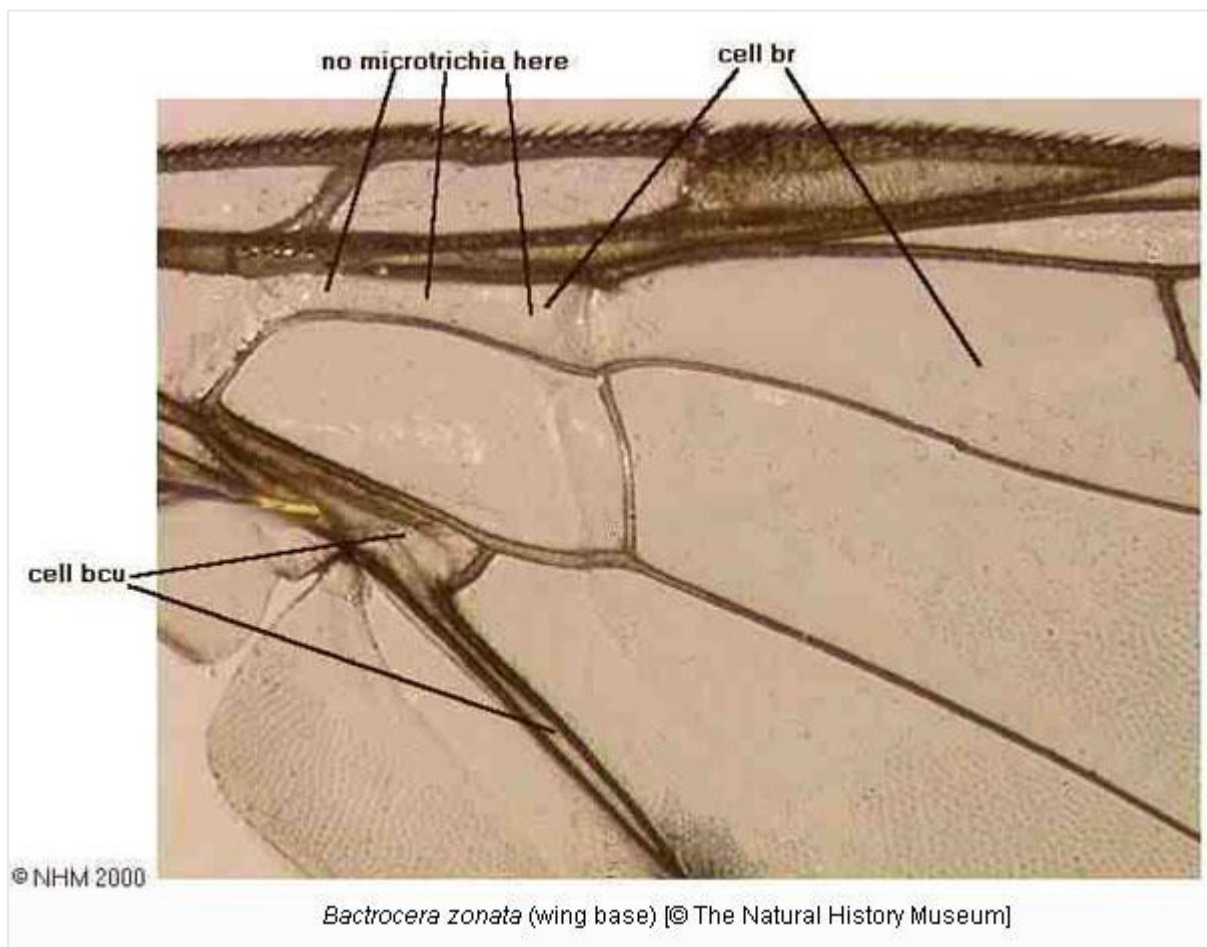
*Bactrocera zonata* is about the size of a house fly and predominantly red-brown in colour. The characters noted here are sufficient to separate *B. zonata* from all other known species of Dacini. [See also](#) fig. 7 in the Eflatoun (1924) plate.

The first feature to look for is the lack of a complete costal band (it is reduced to an isolated apical spot):





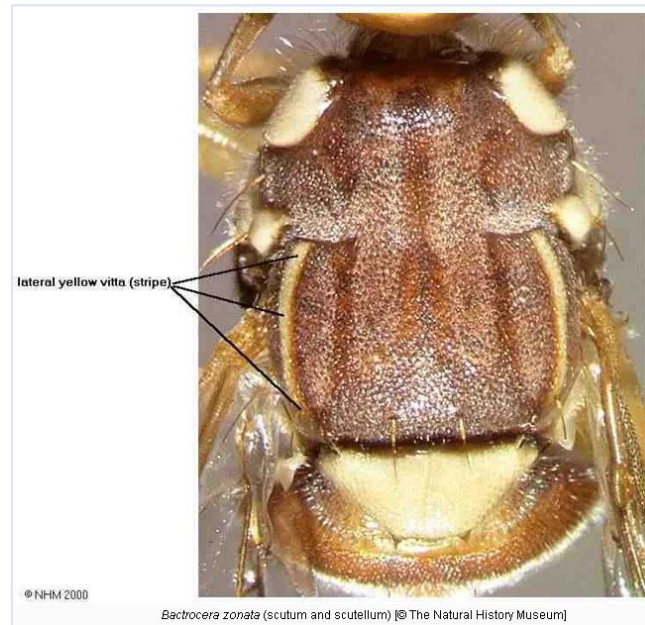
Now look at the base of the wing. There is a raised area, in the narrow basal part of wing cell br. Check that it lacks microtrichia (i.e. tiny spicules). Additionally, there should be no "anal streak", i.e. no diagonal coloured band across the base of the wing, aligned with cell bcu:



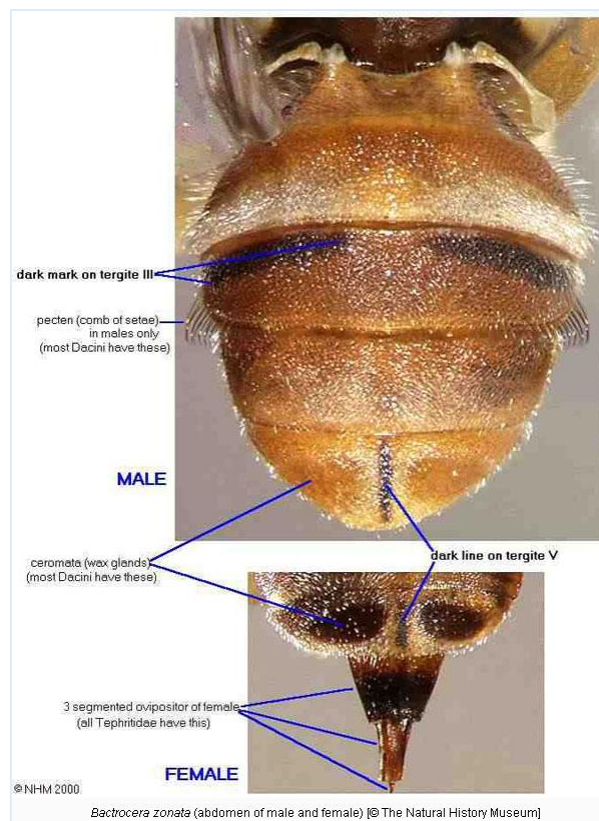
Now check the face. There should be two spots, one in each antennal furrow, just above the "mouth":



Now examine the thorax in dorsal view. There should be a lateral yellow vitta (stripe) down each side (in posterior two-thirds only) and the vittae should be narrow. There should not be a third (medial) vitta down the centre:



Finally, look at the abdomen. Abdominal markings tend to vary more than face, wing and thorax markings. There is usually a pair of dark marks on tergite III and no medial dark line except on tergite V:



## Identification Table for Fruit Associated Species Recorded from North-Eastern Africa

The following table is designed to use simple characters (where possible) to separate the 12 species of fruit associated Tephritidae that have been found in Egypt. Begin with question 1a. If your specimen does not match 1a, then it should match 1b. Which ever answer it matches, follow the link in the last column to go to another question or to the notes on a species. It is very important to read both halves of a question before choosing which matches (if neither match refer your specimen to a suitable specialist) and to compare it to any images that have been linked to the question. When you have worked through the table to a species, it is very important to read the notes about that species which may mention additional characters with which to verify the identification. If you appear to have a species that is does not match any in the table then it should be passed to a specialist for study. Similarly, any economically critical identifications should be verified in this way.

Question Number	Question	Image Links	Go To
1a	Scutellum with a dark marking covering apical half or largely black		2
1b	Scutellum without a dark apical mark		4
2a	Scutellum largely black, except for 4 pale spots; scutum (main dorsal area of thorax) entirely dark		<a href="#"><i>Neoceratitis efflatouni</i></a>
2b	Scutellum with a continuous pale area across its basal half; scutum with distinct dark and pale areas	<a href="#"><i>Capparimyia savastani</i></a> <a href="#"><i>Ceratitis capitata</i></a>	3
3a	Scutellum with one dark mark part divided into two	<a href="#"><i>Capparimyia savastani</i></a>	<a href="#"><i>Capparimyia savastani</i></a>
3b	Scutellum with one dark mark part divided into three	<a href="#"><i>Ceratitis capitata</i></a>	<a href="#"><i>Ceratitis capitata</i></a>
4a	Wing with narrow crossbands across whole width of wing (see image)	<a href="#"><i>Carpomya incompleta</i></a>	<a href="#"><i>Carpomya incompleta</i></a>
4b	Wing without complete crossbands; at most with short marking along one or more crossveins	<a href="#">no bands</a> <a href="#">short bands</a>	5
5a	Separate short marking on 2 crossveins (see image)	<a href="#">short bands</a>	<a href="#"><i>Bactrocera cucurbitae</i></a>
5b	Wing with at most one marking along a crossvein (usually none)		6
6a	Abdominal terga fused into a single sclerite. Costal band (coloured band along anterior edge	<a href="#">narrow band</a>	7

	of wing) narrow and usually expanded into a spot at the apex.		
6b	Abdominal terga all separate (except basal 2 segments which are fused in all higher Diptera). Costal band reduced, leaving spot at wing apex isolated	<a href="#">apical spot</a>	11
7a	Scutum (dorsal area of thorax) with lateral (and a medial) yellow vittae (stripes). Female with a very long ovipositor	<a href="#">vittae</a> <a href="#">ovipositor</a>	<a href="#">Dacus longistylus</a>
7b	Scutum without yellow vittae. Ovipositor shorter		8
8a	Face without spots in each antennal furrow		<a href="#">Dacus annulatus</a>
8b	Abdominal terga all separate (except basal 2 segments which are fused in all higher Diptera). Costal band reduced, leaving spot at wing apex isolated	<a href="#">spots</a>	9
9a	Wing with a slight infuscation along the R-M crossvein. Male without a pecten		<a href="#">Dacus semisphaerus</a>
9b	Wing without any infuscation along any crossvein. Male with a pecten.	<a href="#">pecten</a>	10
10a	Midfemur distinctly darker in apical half (orange in apical half; yellow basally). Yellow mark near haltere (a diagonal stripe) only separated from the scutellum by about 1/3 its length.	<a href="#">marks</a>	<a href="#">Dacus frontalis</a>
10b	Midfemur entirely yellow. Yellow mark near haltere (a spot) separated from scutellum by at least its own diameter	<a href="#">marks</a>	<a href="#">Dacus ciliatus</a>
11a	Scutum (dorsal area of thorax) with lateral yellow vittae (stripes)	<a href="#">vittae</a>	<a href="#">Bactrocera zonata</a>
11b	Scutum (dorsal area of thorax) without lateral yellow vittae.		<a href="#">Bactrocera oleae</a>

### Notes on Other Species Recorded from North-Eastern Africa

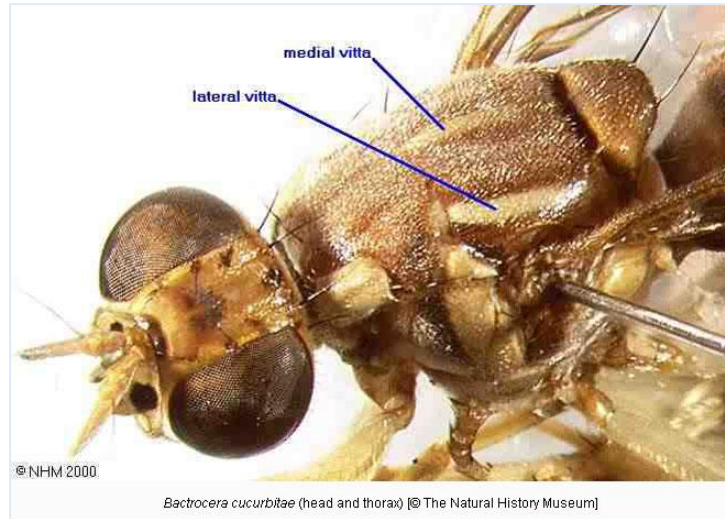
The following notes are intended to supplement the above key. Like the key, simple terminology is used whenever possible. Those with a more technical knowledge, e.g. an understanding of Diptera chaetotaxy, may wish to consult more comprehensive keys. [Efllatoun](#) (1924) provided a key to all species of Tephritidae known in Egypt at that time (and included *Bactrocera zonata*). Munro (1984) should be consulted for African *Dacus* and *Bactrocera* species (but did not include *B. zonata*). White & Hancock (1997) provided an electronic key to Asia-Pacific-Australasian *Dacus* and *Bactrocera*. White & Elson-Harris (1994) keys all pest



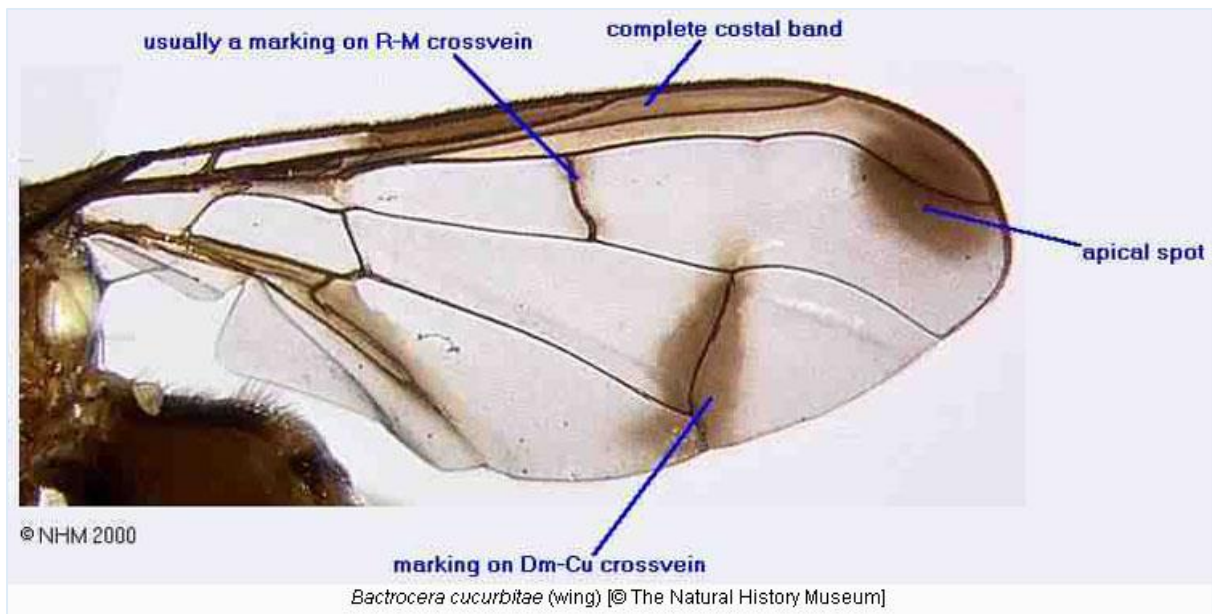
species of Tephritidae worldwide and may be used for specimens reared from cultivated fruits but is not suitable for the identification of trapped individuals.

### *Bactrocera cucurbitae* (Coquillett)

The melon fly, *Bactrocera cucurbitae*, is principally an Asian species and its main hosts are species of Cucurbitaceae. It is also known from a few areas of East Africa, the lower Nile Valley area of Egypt and from the Hawaiian Islands. In Africa it is almost certainly a very long established introduction (it has no immediate relatives outside of Asia); it was introduced to Hawaii in the 1890s, and to Mauritius and Reunion in the early 1900s. A distribution map was provided by IIE (1995).



It can be separated from all other African species (of *Dacus* and *Bactrocera* combined) by its characteristic wing pattern. A few other Asian species have a similar wing pattern but these either have a darker scutum, or lack the medial vitta on the scutum. It is usually larger than a housefly.



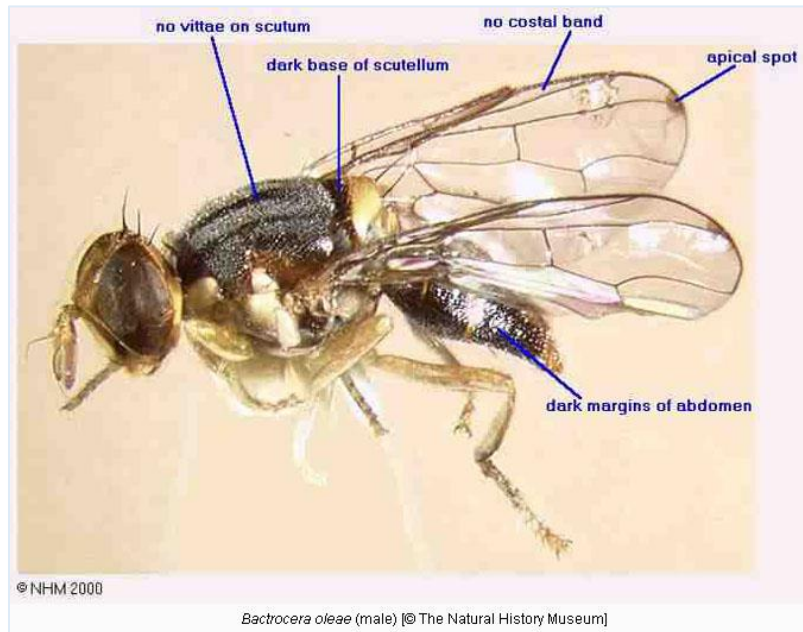
Males of *Bactrocera cucurbitae* are attracted to cue lure.

Some earlier works will have called this species *Dacus cucurbitae*, *Chaetodacus cucurbitae*, *Strumeta cucurbitae* or *Zeugodacus cucurbitae*.

### *Bactrocera oleae* (Rossi)

The olive fly, *Bactrocera oleae*, is a very unusual species. Generally, the serious pests species of *Bactrocera* are the species with a capability of attacking a wide range of hosts. *Bactrocera oleae* is only known to attack one host, *Olea europaea*, the olive. Taxonomically it has an unusual combination of features, which makes it difficult to relate it to other species, although its closest relatives are probably the few other *Bactrocera* species native to Africa. Its natural host is *Olea europaea* ssp.

*africana*, the wild olive of Africa. Botanists now believe the cultivated olive is derived from that African subspecies, and archaeologists believe olive culture was first developed in Syria almost 6000 years ago, and reached Egypt around 3500 years ago. The olive is now found in all areas around the Mediterranean in which the olive is grown.



The wing of *Bactrocera oleae* is superficially similar to that of *Bactrocera zonata*, in that the costal band is reduced to an apical spot and there is no area of microtrichia in the narrowed basal area of cell br (see [wing](#) and [wing base](#) of *B. zonata*). However, it is a much darker coloured fly, usually rather smaller than a housefly, and lacks any [vittae](#) (stripes) on the scutum. It is about housefly size. [See also](#) fig. 4 in the Efflatoun (1924) plate.

Males of *Bactrocera oleae* are not attracted to any known lure.

Some earlier works have called this species *Dacus oleae* or *Daculus oleae*.

### *Capparimyia savastani* (Martelli)

The caper fly, *Capparimyia savastani*, belongs to the same group of genera as the Mediterranean fruit fly, *Ceratitis capitata*. Its yellow wing pattern and yellow body with black patches makes it look superficially similar to *Ceratitis capitata* but its characteristic scutum and scutellum patterning are quite different. Its larvae only develop in the buds of caper, *Capparis spinosa*, and it is found in many areas around the Mediterranean and Middle East. It is about the same size as a housefly.





*Capparimyia savastani* (scutum and scutellum) [© The Natural History Museum]

It was originally called *Ceratitis savastani* and it is often misspelt as *Capparimyia savastanii* or *Capparimyia savastanoi*.

#### *Carpomya incomplete* (Becker)

This is one of the ber fruit flies and its larvae only develop in ber fruits, *Ziziphus* spp., e.g. jujube, *Ziziphus jujube*. It is found in the Middle East and Italy, and its uniformly pale body and narrow wing crossbands make it easily recognisable. It is about half the size of a housefly. [See also](#) fig. 6 in the Efflatoun (1924) plate.

*Carpomya* is often misspelt as *Carpomyia*.



*Carpomya incomplete* (male) [© The Natural History Museum]

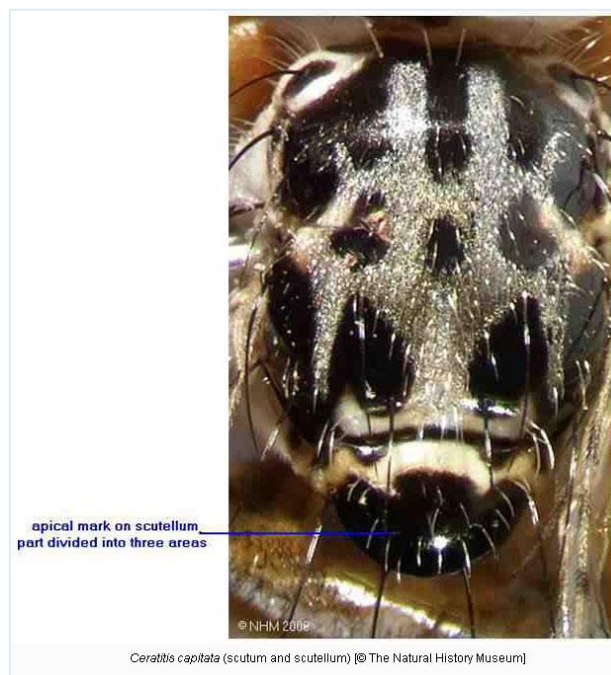


*Ceratitis capitata* (Wiedemann)

The Mediterranean fruit fly, *Ceratitis capitata*, was originally confined to sub-saharan Africa, where several related species are found. In the early 1800s it was spread to the western Mediterranean and the islands off the north-west coast of Africa, and from there it has since spread to the rest of the Mediterranean area, the Americas, Hawaii and western Australia.

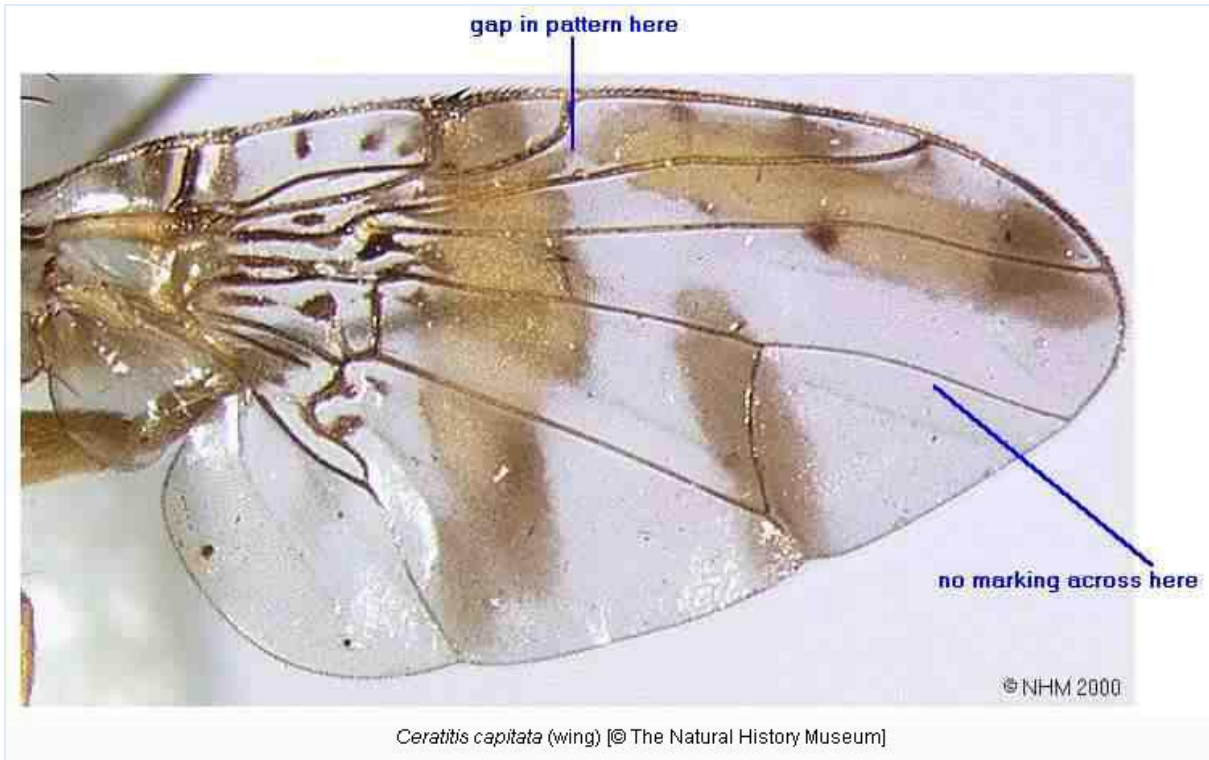


The initial spread coincides with the period when sailing ships first began to carry fresh fruit for the prevention of scurvy, and only the later introductions can be blamed on international trade. Its hosts are almost any soft fruit.



The males of Medfly have an unusual development of two of the setae on the forehead, which are modified into spade-shaped (capitate) appendages. Related species also have these structures but Medfly differs from these in having the apical flattened area of the seta black rather than white. Females are more difficult to identify; check the pattern on the scutellum, scutum and wings against the above pictures. It is less than housefly size. [See also](#) fig. 9 in the Efflatoun (1924) plate.





Males of *Ceratitits capitata* are attracted to trimedlure and its analogues.

*Dacus annulatus* Becker

*Dacus annulatus* is part of a large group of *Dacus* spp., which only attack the poisonous, and latex filled fruits of Asclepiadaceae and Apocynaceae (see also *D. longistylus*). It is known from many areas of East Africa and the Middle East. It is slightly smaller than a housefly. [See also](#) fig. 5 in the Efflatoun (1924) plate.

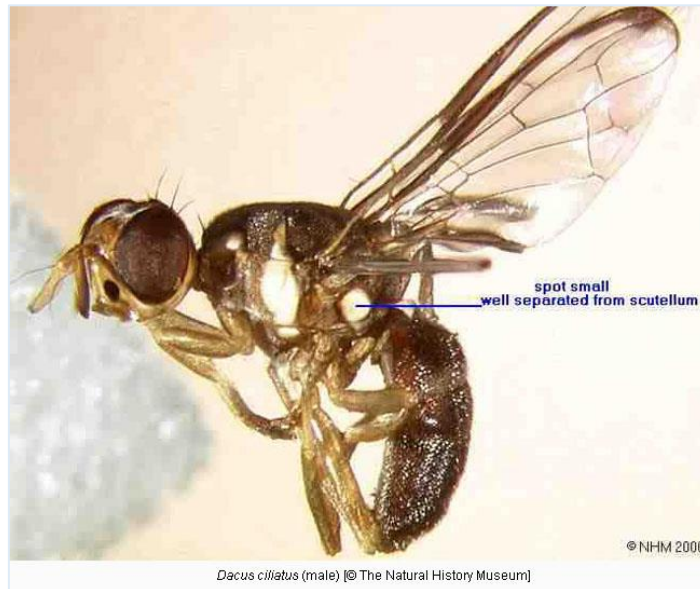


The male lure response of *Dacus annulatus* is not recorded.

Munro (1984) called it *Psilodacus annulatus*.

### *Dacus ciliatus* Loew

The Ethiopian fruit fly or lesser pumpkin fly, *Dacus ciliatus*, probably originated as an African species but it has long been established in the Middle East and south Asia, and more recently introduced to Mauritius and Reunion. Its larvae develop in the fruits of Cucurbitaceae.



Males of *Dacus ciliates* are not attracted to either methyl eugenol or to cue lure

It is very similar to *Dacus frontalis* and these two species can be difficult to differentiate. Diagnostic characters are given on the pictures and in the above key. They are at most housefly size.

Munro (1984) called it *Didacus ciliatus*.

### *Dacus frontalis* Becker

*Dacus frontalis* is also found in Africa and the Middle East, and its larvae also develop in the fruits of Cucurbitaceae. It may be widespread in North Africa as it is recorded from Algeria and Egypt.



It is very similar to *Dacus ciliates* and these two species can be difficult to differentiate. Diagnostic characters are given on the pictures and in the above key.

Males of *Dacus frontalis* are attracted to cue lure.

Munro (1984) called it *Didacus frontalis* and some earlier authors regarded it as a subspecies of *Dacus ciliatus*.

### *Dacus longistylus* Wiedemann

*Dacus longistylus* is part of a large group of *Dacus* spp., which only attack the poisonous, and latex filled fruits of Asclepiadaceae and Apocynaceae (see also *D. annulatus*). It is known from many areas of Africa and the Middle East and is larger than a housefly. A smaller species (or perhaps geographic form of the same species) is found in South Asia. This species has one of the longest ovipositors known in the genus. [See also](#) figs 2 and 3 in the Eflatoun (1924) plate.

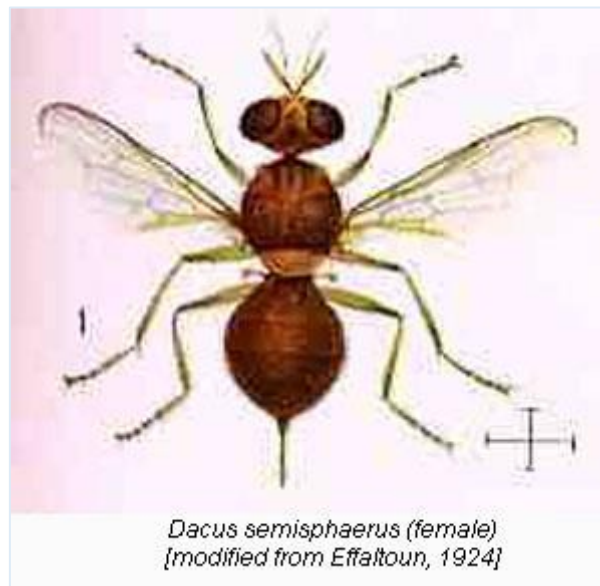


The male lure response of *Dacus longistylus* is not recorded.

Munro (1984) called it *Leptoxyda longistylus* and Eflatoun (1924) gave the name "variety *clarus*" to a pale form of this species.

*Dacus semisphaerus* Becker

*Dacus semisphaerus* is a very rare species, known only from a few specimens collected in Egypt and Ethiopia. Its biology and male lure response are unknown.



Munro (1984) called it *Aoptodacus semisphaerus*.

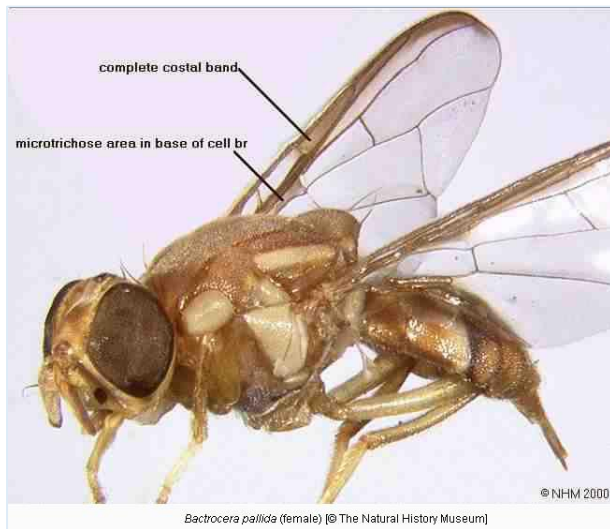
*Neoceratitis efflatouni* Becker

This Middle Eastern species belongs to the same group of genera as *Ceratitis* and *Capparimyia*. However, *Neoceratitis* spp. have dark bodies and wing markings so are very unlikely to be confused with such important pests as *Ceratitis capitata*, the Medfly. Furthermore, *Neoceratitis efflatouni* is very small, about half housefly size. All *Neoceratitis* spp. of known biology have larvae that develop in the fruits of *Solanaceae*.





Previous misidentification of *B. zonata* as *B. pallida* (Perkins & May)

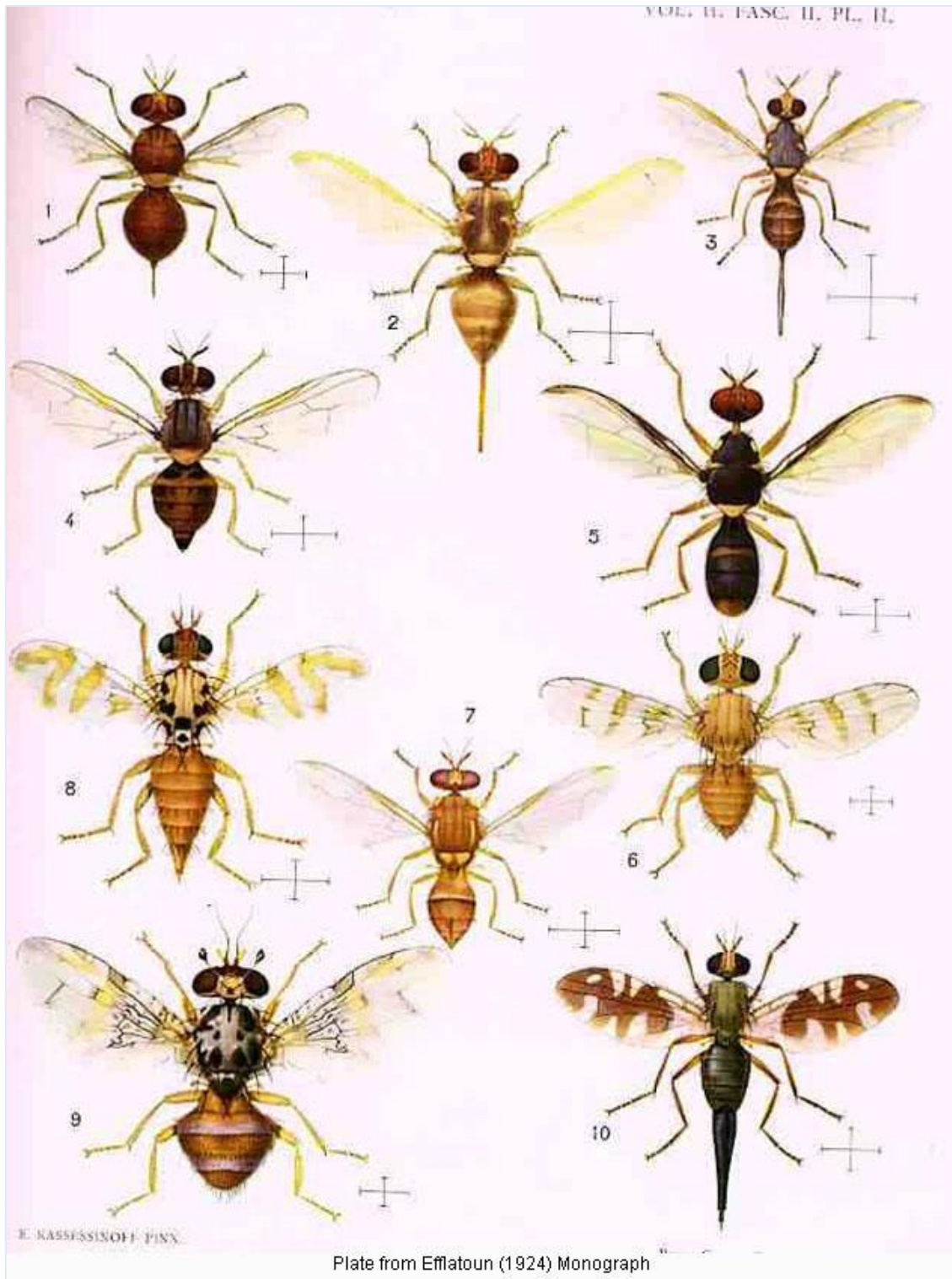


The newly arrived pest of peach and other fruits in Egypt was initially misidentified as *B. pallida*, a species only known from the Atherton Tableland of north-east Queensland, Australia. Its only known host are some wild species of Rubiaceae, and as it does not attack any commercial fruit crops it would seem an unlikely candidate for being accidentally exported outside of Australia. Abuel-Ela et al. (19??) provided illustrations of their flies and it is clear from their notes that they were describing *B. zonata*.

There are a great many differences between *B. zonata* and *B. pallida*. The most obvious are that *B. pallida* has a complete costal band (reduced to an apical spot in *B. zonata*) and *B. pallida* also has a raised microtrichose patch in the narrowed basal part of wing cell br (*B. zonata* lacks this).

## Notes on Eflatoun's Monograph

A plate from Eflatoun (1924) illustrating the following species: 1, *Dacus semisphaerus* (female); 2, *Dacus longistylus* var. *clarus* (female); 3, *Dacus longistylus* (female); 4, *Bactrocera oleae* (female); 5, *Dacus annulatus* (male); 6, *Carpomya incomplete* (female); 7, *Bactrocera zonata* (male); 8, *Carpomya pardalina* (female); 9, *Ceratitis capitata* (male); 10, *Metasphenica gracilipes* (female).



Efflatoun's (1924) monograph covered all of the species detailed here, with the exception of *Neoceratitis efflatouni*, which was discovered a few years later and named in his honour. Of the species depicted above, the following require some explanation:

*Bactrocera zonata* - This was included by Efflatoun (1924) because some specimens had been found at Port Said in 1912 but they were believed to have come from India, i.e. this was a quarantine interception.

*Carpomya pardalina* Bigot - The Baluchistan melon fly is a Middle Eastern and temperate Asian species whose larvae develop in the fruits of Cucurbitaceae. There are no confirmed records from Egypt but Efflatoun (1924) included it, as it was likely that it may occur. Older literature called this species *Myiopardalis pardalina*.

*Metasphenisca gracilipes* (Loew) - This is an example of the many flower feeding species of Tephritidae known from Egypt.

#### Other Tephritidae in North-Eastern Africa

The recent world catalogue of Tephritidae (Norrbom et al., 1999) recorded the following additional species from Egypt (taking that as an example of the region): *Chaetorellia conjuncta* (Becker), *Chaetorellia succinea* (Costa), *Dacus sexmaculatus* Walker, *Desmella conyzae* (Frauenfeld), *Euarestella iphionae* (Efflatoun), *Euarestella kugleri* Freidberg, *Euarestella pinnae* Freidberg, *Goniurellia lacerate* (Becker), *Goniurellia longicauda* Freidberg, *Goniurellia persignata* Freidberg, *Goniurellia spinifera* Freidberg, *Hyalotephritis planiscutellata* (Becker), *Katonaia aida* Hering, *Metasphenisca gracilipes* (Loew), *Metasphenisca haematopoda* (Bezzi), *Metasphenisca negeviana* (Freidberg), *Myopites variofasciatus* Becker, *Oedaspis trotteriana* Bezzi, *Oedaspis villeneuvei* Bezzi, *Oxyna superflava* Freidberg, *Paradesis augur* (Frauenfeld), *Paraspheniscus debskii* (Efflatoun), *Schistopterum moebiusi* Becker, *Spathulina acroleuca* (Schiner), *Sphaeniscus filiulus* (Loew), *Sphenella marginate* (Fallen), *Tephritis bimaculate* Freidberg, *Tephritis jabeliae* Freidberg, *Tephritis matricariae* (Loew), *Tephritis spreta* (Loew), *Tephritomyia lauta* (Loew), *Terellia luteola* (Wiedemann), *Trupanea pseudoamoena* Freidberg, *Trupanea replete* (Bezzi), *Urelliosoma desertorum* (Efflatoun), *Urelliosoma pulcherrimum* (Efflatoun) and *Urophora affinis calcitrapae* White & Korneyev.

With the exception of *Dacus sexmaculatus*, all the above species belong to the subfamily Tephritinae and none of that group are known to have fruit feeding larvae. The larvae of most species develop in Asteraceae, usually in the flowers, but a few genera such as *Metasphenisca* are associated with Acanthaceae, Lamiaceae and Verbenaceae. Many of these species were described in Efflatoun's (1924) monograph but the most practical modern guide covering a substantial proportion of these species was Freidberg & Kugler's (1989) work on the Tephritidae of Palestine.

*Dacus sexmaculatus* was described from Harkeko, Egypt, by Francis Walker in 1871. Unfortunately the specimens were destroyed and it is not possible to tell from the description if Walker really had an additional species or if he was simply re-describing one of the other known *Dacus* spp.

## Acknowledgements

Where marked the photographs are copyright © The Natural History Museum, London, and are reproduced by kind permission. They were taken with the new Synoptics imaging system which creates a montage from a sequence of frames taken at different focal depths. Details of the system are available from the Automontage web site:

<http://www.syncroscopy.com/syncroscopy/am.asp>

The photographs were taken for use on a planned web site for the ICIPE African Fruit Fly Initiative which provided funding for the author. (<http://www.icipe.org>)

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