

THE AUSTRALIAN HANDBOOK FOR THE IDENTIFICATION OF FRUIT FLIES

Version 3.1





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The Australian Handbook for the Identification of Fruit Flies (Version 3.1) is recognised by the Subcommittee on Plant Health Diagnostics as a compilation of current fruit fly identification practices and techniques that are recognised as best practice by relevant experts within Australia.

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Introduction

Fruit flies are one of the world's most destructive horticultural pests and pose risks to most commercial fruit and vegetable crops. This has major implications for the sustainable production and market access of Australia's multi-billion-dollar horticultural industry. Worldwide there are over 4,000 species of fruit flies in the family Tephritidae of which around 350 species are of economic importance.

More than 300 species of fruit fly occur in Australia although only a few of these have been found to have any degree of economic impact, with Queensland fruit fly (*Bactrocera tryoni*) and Mediterranean fruit fly (*Ceratitis capitata*) being the species of primary economic concern. It is therefore important to distinguish between the species that pose a threat to production and domestic market access and those that do not, including exotic species.

Australia is free from many species that impact horticultural production elsewhere. Neighbouring countries in south east Asia and the South Pacific are home to numerous species of fruit fly that pose an immediate incursion risk to Australia. Rapid diagnosis of these flies, should they arrive in Australia, is therefore a critical prerequisite to containing and eradicating the populations before they establish.

The accurate identification of fruit flies is a key component of Australia's biosecurity system. It underpins the domestic movement of fruit and vegetables, maintains international market access for Australian producers, and protects Australia's borders from exotic pest incursion.

This completely revised version of *The Australian Handbook for the Identification of Fruit Flies* (Version 3.1) (the handbook) has been compiled by diagnosticians for diagnosticians using some of the latest research outcomes and resources available.

The handbook is a compilation of diagnostic information for 65 fruit fly species, most of which are exotic to Australia, including the non-tephritid fruit infesting *Drosophila suzukii* (spotted-wing *Drosophila*). The handbook is intended to facilitate rapid diagnosis of fruit fly species and be a comprehensive guide for Australian diagnosticians and field officers involved in maintaining, supporting and enhancing Australia's biosecurity system.

ABOUT THIS HANDBOOK

This publication is the product of the Plant Biosecurity Cooperative Research Centre (PBCRC) project *Next Generation National Fruit Fly Diagnostics and Handbook* PBCRC2147.

The handbook draws together hundreds of new high definition fruit fly images as well as new molecular diagnostic tools generated from this research.

A companion website **Fruit Fly Identification Australia** (fruitflyidentification.org.au) has also been developed. The website contains an expanded selection of high definition images as well as an updated description of the latest molecular techniques and protocols used for the identification of fruit flies. The website also includes a new multi-entry Lucid key for identifying the Dacini species as well as comprehensive printable data sheets and an interactive glossary.

The handbook and website were developed to support Australia's fruit fly researchers, academics, surveillance officers, diagnosticians and laboratory scientists with the hope that the sharing of information and experience, as well as the constructive communication that brings this knowledge base together, will continue to grow.

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How to use this handbook

The handbook is designed as a diagnostic aid for entomologists and biosecurity and plant health professionals. Each fruit fly species described is illustrated with a dorsal photograph annotated with important diagnostic characteristics. Additional photographs provide information about variation within species as well as head, leg and lateral views. Maps indicate published distribution information and notes on easily confused or similar species are provided to aid correct identification.

Photographs were taken by project members at Queensland University of Technology. A classic representative specimen (matching the current written morphological description in the literature) from each species has been photographed from a variety of angles showing key diagnostic features. Images for each individual include a head view, full body dorsal view, full body lateral view, dorsal and ventral abdomen views and a dorsal scutum view. Slide mounted fore, mid and hind legs and left and right wings were also photographed. Intraspecific morphological variants were also photographed illustrating differences where they occur, principally associated with colour pattern variation.

As mentioned under 'things to be wary of', some of the fruit fly species included in this handbook are highly variable. Every effort has been made to include as many images of this variation as possible, however, due to limited space it was not always possible to include all images. Please note that the full image set can be found on the companion website **Fruit Fly Identification Australia** (fruitflyidentification.org.au).

The coloured banner down the side of the species pages refers to whether the species is present in Australia and whether it is a pest or non-pest species. The functional categories are:

Red (EXOTIC/PEST)

Orange (PRESENT/PEST)

Green (PRESENT/NON-PEST)

The word 'pest' in the above context refers to whether the species is listed on the High Priority Pest list of the National Fruit Fly Strategy (planthealthaustralia.com.au/national-programs/fruit-fly).

Annotations have been included on the species pages to assist users with the identification of these species.



THINGS TO BE WARY OF

Variation: Some fruit fly species are highly variable, either morphologically, molecularly, or both. This often blurs the distinction between intra- versus inter-specific variation, with variants of some species often looking like something entirely different to what they actually are. A classic example of this is the guava fruit fly, *Bactrocera correcta*, which displays a wide variation in colour pattern such that the extremes look like completely different flies. Problematically, species like *B. frauenfeldi* can often be confused with their close relatives, such as *B. albistrigata*; the former of which occurs in Australia, the latter not; or members of the Oriental fruit fly (*B. dorsalis*) species complex that contains almost 100 species, many of which are highly similar in appearance.

Host and geographic distribution: Knowing the locality, host or lure a fruit fly was collected from can provide invaluable information towards making a diagnosis, but must also be used with caution to avoid falsely identifying a specimen as pest or non-pest. Geographic information presented in this handbook has been drawn from published records or available public records, such as Centre for Agriculture and Bioscience International (CABI). Please note that:

- the markings on the maps are indicative for the sovereign states and may not present actual distribution ranges within each country as indicated
- some locations are listed under their geographic region which may differ from their political association (e.g., Réunion Island is a region of France but is geographically placed under 'Africa' in this Handbook due to its proximity to that continent).

Species complexes: Groups of species that share similar morphological characters are sometimes grouped together as species complexes. Typically, these groups are also very closely related and hence can be especially difficult to discern. This is particularly the case for cryptic species, which are species that, while biologically distinct, may not be distinguished morphologically. A number of species complexes exist within *Bactrocera* and *Zeugodacus*, such as the *dorsalis*, *tau*, and *frauenfeldi*-complexes. Further, species complexes are found in other genera, such as the *Anastrepha fraterculus* complex (also referred to as a 'species group'). Particular care must be taken when identifying species that belong to complexes, with integration of multiple datasets and additional expert opinions generally recommended before making a definitive diagnosis.



Limitations of this handbook: While pest species of high priority to Australia have been included in this handbook, along with species that may be readily confused with them, it is by no means an exhaustive treatment of all fruit fly species. With several thousand species known from the family (and over 900 species from *Bactrocera*, *Dacus* and *Zeugodacus*), it is impossible to include them all, especially those that are more widely represented in other parts of the world (e.g. *Anastrepha*, *Ceratitis*, *Rhagoletis*). Therefore, we direct users to other excellent resources that deal in greater details for these other groups. This includes but is not limited to websites, primary literature, and other diagnostic publications. These include:

- *Anastrepha* and *Toxotrypana*: descriptions, illustrations, and interactive keys: delta-intkey.com/anatox/intro.htm
- A set of multi-entry identification keys to African frugivorous flies (Diptera, Tephritidae): fruitflykeys.africamuseum.be/
- USDA Compendium of Fruit Fly Host Information: coffhi.cphst.org/

Images were taken with grey photographic card as background; hence grey colouration on wings where they are transparent/hyaline in life. For example, see *Toxotrypana curvicauda*.

OTHER RESOURCES

- Drew, R. A., & Romig, M. C. (2013). Tropical Fruit Flies (Tephritidae Dacinae) of South-East Asia: Indomalaya to North-West Australasia. CABI.
- Drew, R. A., & Romig, M. C. (2016). Keys to the tropical fruit flies (Tephritidae: Dacinae) of South-East Asia: Indomalaya to North-West Australasia. CABI.
- Drew, R. A. (1989). The tropical fruit flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian regions. *Memoirs of the Queensland Museum*, **26**.
- LUCID key for identification of fruit flies in Australia.



Morphological identification

Approximately 90% of dacine pest species can be identified accurately and quickly by microscopic examination of the adult. For these species there is no need for supporting evidence. The remaining 10% (mainly members of species complexes) can be identified with this same method but require expert examination and may require additional supporting evidence (e.g., molecular data or host association records). Methods here are updated according to Drew & Romig (2013).

Only morphological diagnostic procedures and information for adult fruit flies are contained in this document. Aside from molecular techniques, larval diagnosis has been excluded from this protocol.

For routine morphological identification:

- Collect flies in dry traps.
- When clearing traps collect samples into a tissue. Put tissue in a small box with collection details on the outside. Samples in tissue can also be collected into a vial though this is less preferred particularly in the tropics as samples can 'sweat' causing specimens to deteriorate. If collecting into vial, a label written in pencil or permanent pen (not biro as it runs) should be put inside as writing on the outside can rub off.
- Store samples in freezer until ready for identification.
- Sort dry specimens in a petri dish under a dissecting stereo microscope.
- If keeping specimens after identification store in freezer to prevent deterioration.
- Do not store specimens in ethanol, alcohol or propylene glycol unless being kept for DNA analysis. They leach colours and patterns necessary for morphological identification. An option is to remove three legs from one side for molecular analysis, and keep the rest of the specimen on pinned material.

For suspect specimens requiring further identification:

- Store the specimen in a small vial with tissue to protect it until ready to pin or ship. Add a pencil or permanent ink label (not biro as it runs) detailing collection location, collection date, collection method, collector, tentative identification and identifier.
- As manipulating loose specimens with forceps tends to damage them, suspect specimens should ideally be pinned to keep them as intact as possible. If the specimen is a suspect exotic and needs to be shipped to a specialist quickly, they can be sent unpinned in a tube as above.

For pinning:

- Put specimen in relaxing chamber with thymol (to prevent mould growth) for 6–12 hours.
- Using a micropin, pin through the right hand side of the scutum. Mount micropinned specimen on a pith stage on a pin.
- Add label to pin.
- Store pinned specimens in reference collection conditions (21°C and 50% relative humidity).

Key features (see glossary on following page) used for the morphological diagnosis of adult fruit flies include:

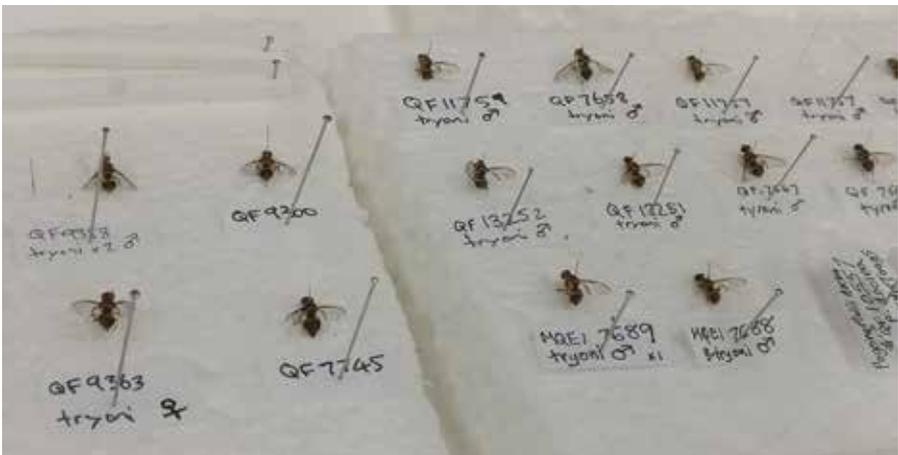
- Overall colour and colour patterning
- Wing patterns
- Presence and shape of thoracic vittae (yellow bands)
- Presence or absence of various setae.

Use the morphological diagnostic key and descriptions contained in the data sheets to identify the species of fruit fly under a microscope.

If identification cannot be made and/or the specimen is suspected to be of quarantine concern, it should be referred to either a state or federal biosecurity agency. If the specimen is identified as an exotic fruit fly, the appropriate national authority should be notified as required under the Emergency Plant Pest Response Deed.

PRESERVATION OF LARVAE FOR MORPHOLOGICAL IDENTIFICATION

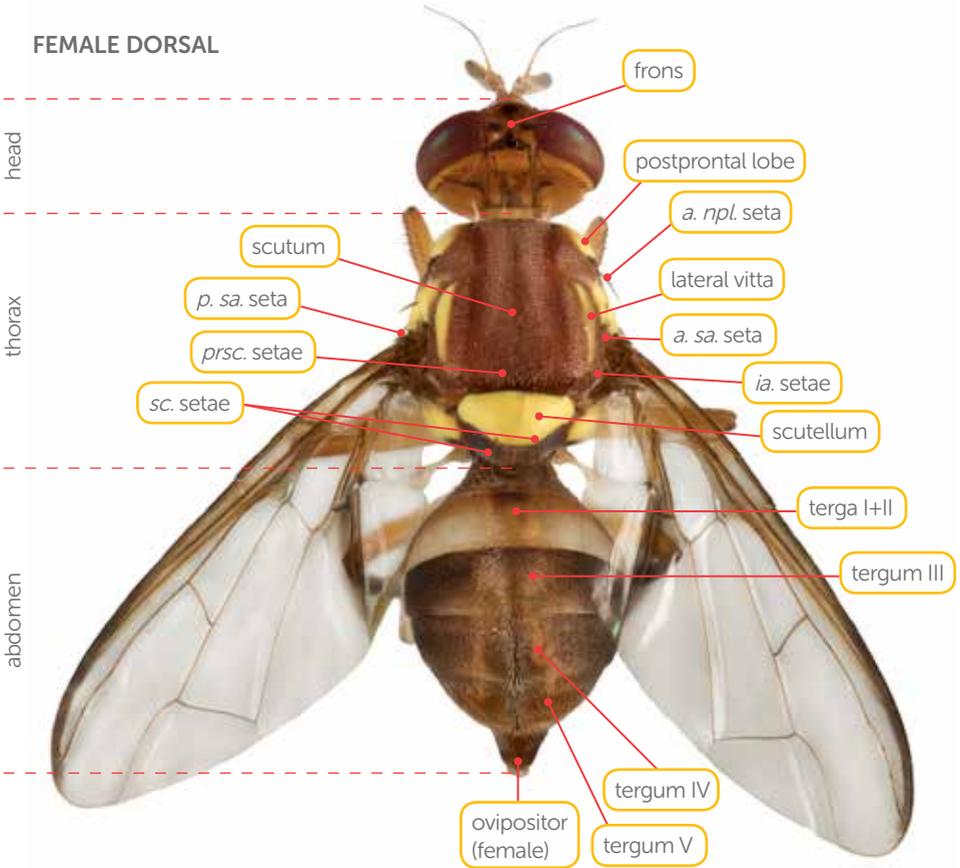
Adult flies are generally always needed to make an accurate species identification; however under some circumstances larvae will need to be preserved for morphological examination to at least identify them to family or genus level. Under these circumstances, larvae are preserved by first placing them in hot (approximately 65°C) water for 2–4 minutes, after which they are removed and allowed to cool to room temperature. Once at room temperature, immerse larvae in 50% ethanol for 15–30 minutes then transfer to 70% ethanol for storage ensuring all relevant collection information is included with the sample. Further details on subsequent procedures for slide mounting is provided in ISPM-27 DP9 (Diagnostic protocols for regulated pests: Genus *Anastrepha* Schiner).



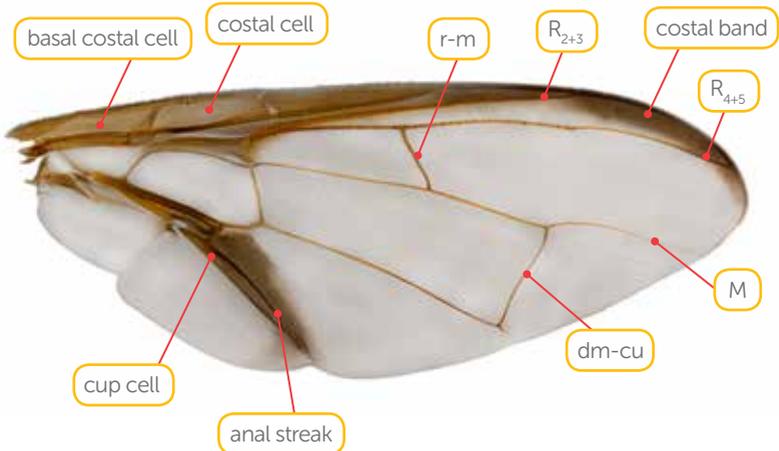
Fruit fly specimens being prepared for pinning

Glossary

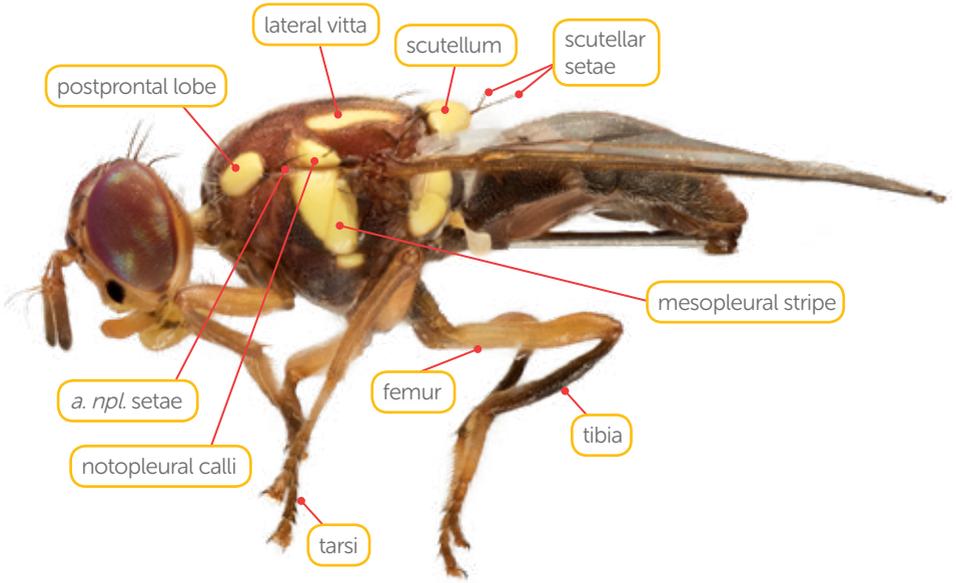
FEMALE DORSAL



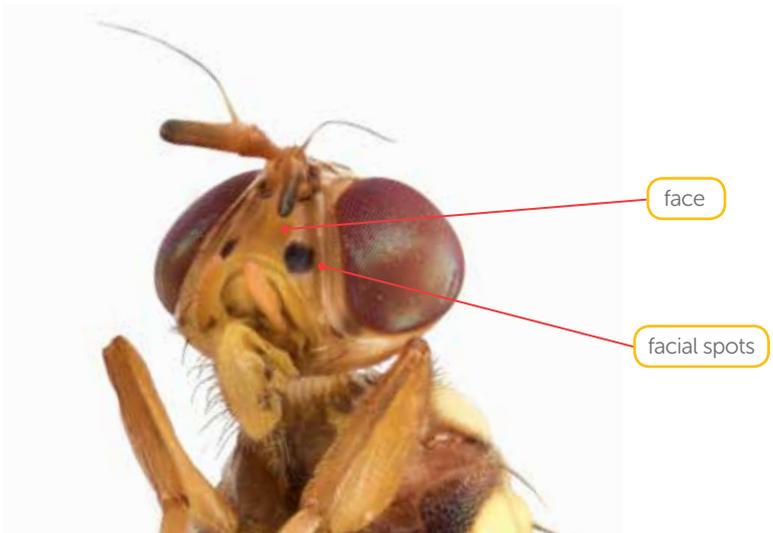
WING



MALE LATERAL



HEAD



Glossary

HEAD

face – an inverted smooth V-shaped area on the anterior surface between the antennae and ventral margin of the head (from which mouthparts protrude)

facial spots – dark spots on the face in the antennal furrows and above the mouthparts

facial mask – dark mask-like markings on face

frons – upper-frontal area of the head immediately above the antennae and between the eyes

antenna – located anteriorly on the head between the face and frons

THORAX

scutum – dorsal surface of thorax excluding the scutellum

mesonotum – dorsal surface of the thorax – in older texts used instead of scutum

postpronotal lobes = ppn. lobes – rectangular protuberances on the anterolateral corners of the scutum (= humeral calli)

ppn. lobes – postpronotal lobes

humeral calli – in older texts used instead of postpronotal lobes

notopleural calli – triangular protuberances on the notopleura, between the ppn. lobe and wing base

scutellum – truncated triangle on the posterior edge of the scutum

basal band – a band of dark colour on the base of the scutellum (where it joins the scutum)

mesopleural stripe – yellow band on lateral surface of the thorax

vitta – yellow stripe on the scutum (vittae plural)

lateral vittae = lateral post-sutural vittae – yellow bands on lateral margin of scutum

medial vitta – yellow, usually teardrop-shaped, band on the midline of the scutum

mesonotal suture – an impressed line on the mesonotum running from the notopleural callus towards the centre of the scutum

setae – longer bristle like hairs (= bristles) (seta singular)

bristle – older term for seta

halter – modified hind wings, used for maintaining equilibrium during flight

THORACIC SETAE

sc. = scutellar setae – 2 or 4 setae on the posterior dorsal edge of the scutellum

a. sa. = anterior supra-alar setae, or abbreviated to sa. (supra-alar setae) – setae on the mid-dorsal edge of the smooth semicircular flat cavity above the wing – presence or absence is a taxonomic character

ia. = intra-alar setae on the posterolateral corner of the mesonotum – used to measure length of the vittae

prsc. = prescutellar setae – setae on the posterior of the scutum anterior to the scutellum – presence or absence is a taxonomic character

a. npl. = anterior notopleural setae – setae between the notopleuron and ppn. lobes. – used to measure the width of the mesopleural stripe

p. sa. = posterior supra-alar setae – setae on the posterior-dorsal edge of the smooth semicircular flat cavity above the wing – in older texts used to measure length of the lateral vittae

WING

costal cells – cells on the basal anterior part of the wing – presence of microtrichia or tint are taxonomic characters

bc – basal costal cell closest to the thorax (= first costal cell)

c – costal cell, second costal cell from the thorax (= second costal cell)

microtrichia – minute short hairs in the costal cells – presence, absence or amount is a taxonomic character

R₂₊₃ – wing vein ending at the anterior apical third of the wing – often used to measure width of the costal band

R₄₊₅ – wing vein below R₂₊₃ ending at wing apex

M – wing vein below R₄₊₅ ending at wing apex

CuA – wing vein below M ending at posterior apical third of the wing

r-m – cross vein between R₄₊₅ and M – presence of infuscation is a taxonomic character

dm-cu – cross vein between M and CuA ending near posterior edge of wing – presence of infuscation is a taxonomic character

cup – cell with fingerlike extension running from near base of wing to posterior wing edge

costal band – tinted band on anterior edge of wing – width and sometimes darkness are taxonomic characters

Glossary

anal streak – band of colour outside cup cell – width is a taxonomic character

infuscation – tint, usually referring to r-m or dm-cu cross veins

ABDOMEN

terga – dorsal abdominal segments (there are five). Plural of tergum. Patterning on the posterior three (terga III-V) are often taxonomic characters

tergum I – basal abdominal segment closest to the thorax

tergum II – second from basal abdominal segment

tergum III – middle abdominal segment which has the pecten on the lateral posterior edge

tergum IV – second from posterior abdominal segment

tergum V – posterior abdominal segment

pecten – comb of hairs on posterolateral edge of tergum III, have the appearance of eyelashes

ceromata – oval shining spots on tergum V – dark ceromata can be a taxonomic character

LEGS

femur – basal leg segment basally joined to the coxa/e – colour patterns can be taxonomic (femora plural)

tibia – apical leg segment between the femur and tarsi – colour patterns can be taxonomic (tibiae plural)

OTHER

fuscous – dark red-brown

fulvous – yellow brown

Variation in appearance with preservation technique

How adult fruit flies are captured, preserved, and stored can drastically affect their colour. Colour is frequently used as a defining characteristic of species, therefore knowing the impact of preservation techniques on the colour of a specimen is critical.

The following methods of preservation are most frequently used:

- propylene glycol (a non-toxic/non-flammable liquid often used in field collecting where DNA preservation is needed)
- dry/pinned: how many adult flies are trapped and preserved, and considered the best method for retaining colour
- ethanol: flies may be collected into or stored in ethanol, especially when needed for DNA work; however, ethanol will leach colour over time.

As shown below for one species, the Queensland fruit fly *Bactrocera tryoni*, the way each of these methods has impacted the colour is evident. Note especially the loss of colour in the propylene glycol specimen, and that while colour is retained in the ethanol specimen it will fade over time. Visual loss of the thoracic vittae and other yellow/pale characters is particularly affected.



B. tryoni - propylene glycol

B. tryoni - dry pinned

B. tryoni - ethanol

Molecular identification

Molecular data, primarily generated via direct DNA sequencing of diagnostic markers, may be necessary to support inconclusive morphological identification. There are several circumstances for which this might be necessary. Firstly, for immature life stages, only third instar larvae (and sometimes pupae) of some species are identifiable via visual examination (e.g. White & Elson-Harris 1992). Secondly, there are numerous examples of 'problematic' species pairs and groups that are closely related and/or the adults are near morphologically identical. Thirdly, significant intraspecific variation in key morphological characters (e.g. scutum colour pattern), occurs in many widely distributed species. For all such situations, molecular data may improve species diagnosis.

Diagnosticians should ideally obtain DNA from specimens using relatively non-destructive techniques, to ensure that a voucher specimen is available for future morphological re-examination (Floyd et al. 2010). For fruit fly adults up to three legs from the same side of the body can be destructively used, thereby retaining other diagnostically informative features of the specimen (such as wings, thorax and abdomen). For larvae, anterior and posterior sections can be sectioned off and retained, preserving the morphologically valuable mouthparts and spiracles. Alternatively, even less destructive methods – including Proteinase K digestion of internal tissues that retains the entire cuticle – can also be very effective (e.g. Gilbert et al. 2007).

This handbook focuses only on DNA barcoding as the molecular tool of choice for diagnosing tephritid fruit flies. DNA barcoding of an unknown insect specimen involves obtaining a DNA sequence of a specific region of the genome (most commonly the mitochondrial cytochrome c oxidase subunit 1 gene [COI]), and then comparing it with a database of curated sequences from positively identified reference specimens. The molecular loci we refer to in this handbook include COI, and the nuclear genes EIF3L, RPA2, DDOSTs2, and POP4. In-depth protocols are not provided here, but are accessible on the companion website (fruitflyidentification.org.au). We do, however, provide a list of available diagnostic molecular markers and the species pairs/groups for which they are each most appropriately applied (Table 1).

Table 1. Genetic loci that best separate easily confused species

SPECIES PAIR	MOLECULAR DIAGNOSTIC LOCUS				
	COI	POP4	EIF3L	RPA2	DDOSTS2
<i>B. dorsalis</i> / <i>B. carambolae</i>	✓	✓	✓	✓	✓
<i>B. dorsalis</i> / <i>B. kandiensis</i>	✓	✓	✓	✓	✓
<i>B. dorsalis</i> / <i>B. musae</i>	✓	✓	✓	inconclusive	✓
<i>B. dorsalis</i> / <i>B. endiandrae</i>	✓	✓	✓	✓	✓
<i>B. dorsalis</i> / <i>B. cacuminata</i>	✓	✓	✓	inconclusive	✓
<i>B. dorsalis</i> / <i>B. occipitalis</i>	✓	N/A	✓	✓	inconclusive
<i>B. dorsalis</i> / <i>B. opiliae</i>	✓	N/A	✓	✓	✓
<i>B. dorsalis</i> / <i>B. latifrons</i>	✓	✓	✓	✓	✓
<i>B. carambolae</i> / <i>B. kandiensis</i>	✓	✓	✓	✓	✓
<i>B. carambolae</i> / <i>B. opiliae</i>	✓	N/A	✓	✓	✓
<i>B. carambolae</i> / <i>B. musae</i>	✓	✓	✓	✓	✓
<i>B. carambolae</i> / <i>B. occipitalis</i>	✓	inconclusive	✓	✓	✓
<i>B. musae</i> / <i>B. opiliae</i>	✓	N/A	✓	inconclusive	✓
<i>B. musae</i> / <i>B. latifrons</i>	✓	✓	✓	✓	✓
<i>B. musae</i> / <i>B. endiandrae</i>	✓	✓	✓	✓	✓
<i>B. opiliae</i> / <i>B. endiandrae</i>	✓	N/A	✓	✓	✓
<i>B. musae</i> / <i>B. bancroftii</i>	✓	inconclusive	✓	✓	✓
<i>B. zonata</i> / <i>B. correcta</i> / <i>B. pallida</i> / <i>B. jarvisi</i>	✓	✓	✓	✓	✓
<i>B. kraussi</i> / <i>B. tryoni</i>	✓	✓	✓	✓	✓
<i>B. tryoni</i> complex	✗	✗	✗	✗	✗
<i>B. trivialis</i> / <i>B. rufofuscula</i>	✓	N/A	N/A	N/A	N/A
<i>B. trivialis</i> / <i>B. breviaculeus</i>	✓	N/A	N/A	N/A	N/A
<i>B. rufofuscula</i> / <i>B. breviaculeus</i>	inconclusive	N/A	✗	N/A	inconclusive
<i>B. decurtans</i> / <i>B. pallida</i>	✓	N/A	N/A	✓	✓
<i>B. passiflorae</i> / <i>B. facialis</i>	✓	N/A	✓	N/A	N/A
<i>B. frauenfeldi</i> / <i>B. albistrigata</i>	✗	✗	✓	✗	✗
<i>Z. atrisetosus</i> / <i>Z. cucumis</i>	✓	N/A	N/A	N/A	N/A
<i>Z. choristus</i> / <i>Z. cucurbitae</i>	✓	✓	✓	✓	✓
<i>Z. tau</i> / <i>Z. cucurbitae</i>	✓	✓	✓	✓	✓
<i>Z. depressus</i> / <i>Z. tau</i>	✓	N/A	✓	✓	✓

Groupings of fruit fly by morphological similarity

DACINAE - DACINI - TWO VITTAE - DORSALIS COMPLEX



B. carambolae, page 38



B. caryeae, page 40



B. dorsalis, page 46



B. kandiensis, page 56



B. occipitalis, page 76



B. pyrifoliae, page 88



B. cacuminata, page 36



B. endiandrae, page 48



B. musae, page 70



B. opiliae, page 80

KEY:
Red (EXOTIC/PEST)
Orange (PRESENT/PEST)
Green (PRESENT/NON-PEST)

TWO VITTAE - OTHERS WITH BLACK SCUTUM



B. curvipennis, page 44



B. bryoniae, page 34



B. latifrons, page 64



B. bancroftii, page 30

TWO VITTAE - INCOMPLETE COSTAL BAND



B. correcta, page 42



B. zonata, page 106



B. tuberculata, page 100

TWO VITTAE - BROWN FLIES - TRYONI COMPLEX



B. tryoni, page 96



B. neohumeralis, page 72



B. aquilonis, page 28

TWO VITTAE - BROWN FLIES CONFUSED WITH TRIVIALIS OR TRYONI (+ TRIVIALIS)



B. kraussi, page 60



B. trivialis, page 94



B. rufofuscula, page 90



B. breviaculeus, page 32

TWO VITTAE - GOLDEN FLIES



B. jarvisi, page 54



B. pallida, page 82

THREE VITTAE



Z. atrisetosus, page 108



Z. cucumis, page 112



Z. cucurbitae, page 114



Z. choristus, page 110



Z. decipiens, page 116



Z. tau, page 120



Z. depressus, page 118



B. minax, page 68



B. tsuneonis, page 98



B. xanthodes, page 104

ZERO VITTAE, OR SMALL FLIES BLACK SCUTUM



B. melanotus, page 66
no wing pattern



B. passiflorae, page 84
no wing pattern



B. oleae, page 78
no wing pattern



B. facialis, page 50
Vittae: 2

WING BAND



B. albistrigata, page 26



B. frauenfeldi, page 52



B. trilineola, page 92

WING PATTERN



B. umbrosa, page 102

WING INFUSCATION



B. kirki, page 58



B. obliqua, page 74



B. psidii, page 86



B. laticaudus, page 62

ZERO VITTAE - DACUS



D. longicornis, page 126



D. solomonensis, page 128



D. axanus, page 124



D. aequalis, page 122

CERATITIDINI



C. capitata, page 130



C. quilicii, page 132



C. rosa, page 134

TRYPETINAE



A. fraterculus, page 138



A. serpentina, page 140



R. cerasi, page 142



R. cingulatus, page 144



R. completa, page 146



R. fausta, page 148



R. pomonella, page 150



T. curvicauda, page 152

PHYTALMIINAE



D. pornia, page 136

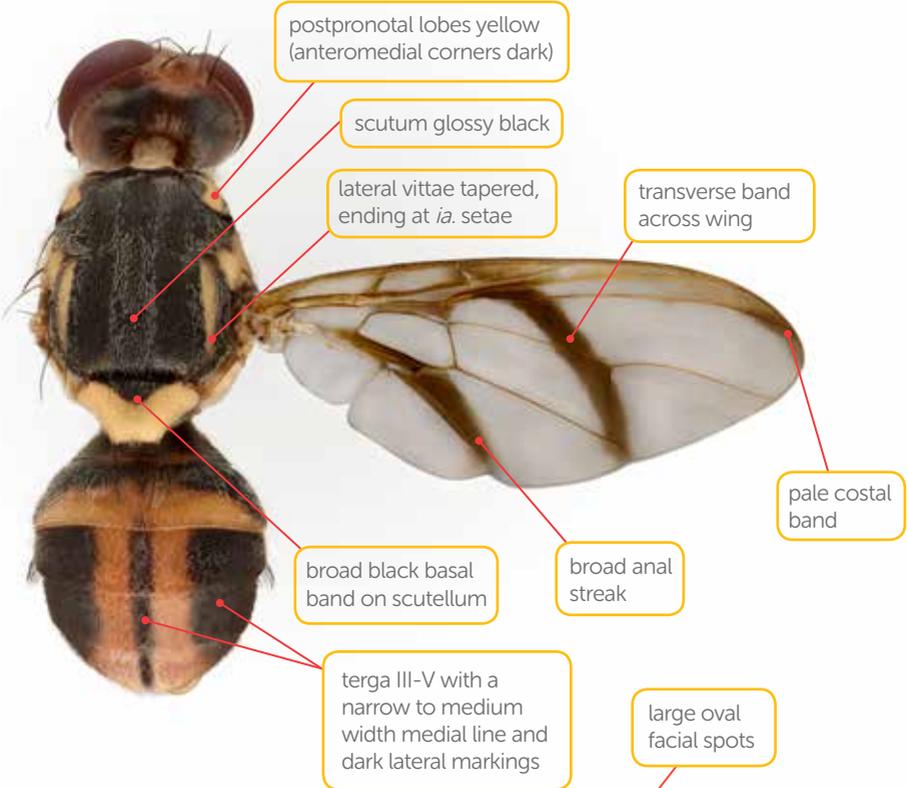
DROSOPHILIDAE



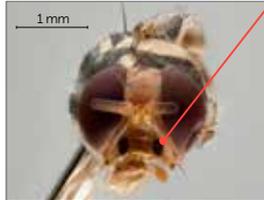
D. suzukii, page 154

Bactrocera albistrigata (de Meijere)

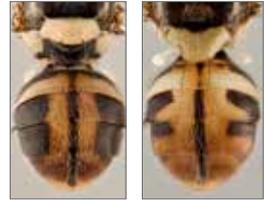
WHITE STRIPED FRUIT FLY



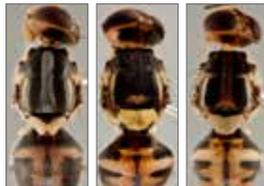
Lateral thorax



Head



Abdominal variation



Scutum variation



Fore, mid, hind legs

DISTRIBUTION

ASIA:

Andaman Islands, Thailand, Peninsular Malaysia, East Malaysia, Singapore and Indonesia

OCEANIA/PACIFIC ISLANDS:

Christmas Island



SIMILAR SPECIES, HOST & LURE

This species belongs to the *frauenfeldi* complex which includes *B. caledoniensis*, *B. frauenfeldi*, *B. parafrauenfeldi* and *B. trilineola*. It is most similar to *B. frauenfeldi*, which is present in north Queensland. It is separated from this species by its yellow postpronotal lobes, although *B. frauenfeldi* can occasionally have orange-brown postpronotal lobes.

Current molecular markers do not adequately separate species in this complex. Some resolution between especially *B. albistrigata* and *B. frauenfeldi* can be observed at EIF3L.

SIMILAR SPECIES

HOST RANGE

Polyphagous, recorded from 12 hosts from seven families including Anacardiaceae, Clusiaceae, Moraceae, Myrtaceae and Sapotaceae. Commercial hosts include mango, guava, jackfruit and several cultivated *Syzygium*.

LURE

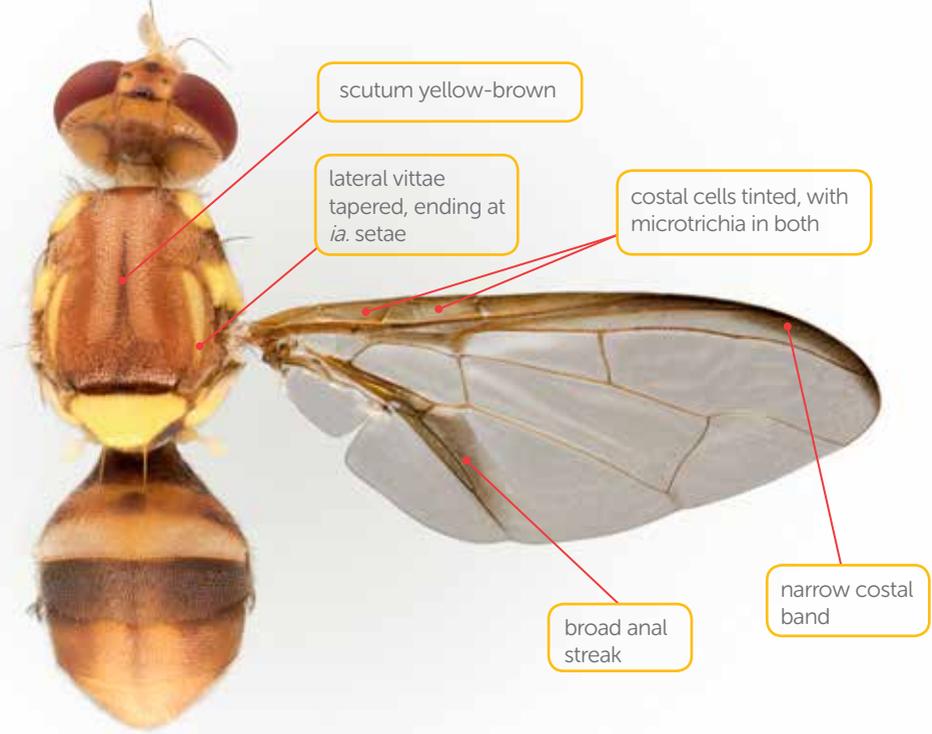
Cue lure.

OTHER COMMENTS

B. albistrigata has a lesser pest status than the introduced *B. frauenfeldi* having only been recorded from 12 hosts (compared to 109 for *B. frauenfeldi*).

Bactrocera aquilonis (May)

NORTHERN TERRITORY FRUIT FLY



terga III-V pale orange-brown, may have a pale medial line and lateral bands



Abdominal variation



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: northern areas of Western Australia and the Northern Territory



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera aquilonis belongs to the *B. tryoni* species complex, which includes *B. tryoni*, *B. neohumeralis* and *B. melas*. It is most similar to *B. tryoni* and is difficult to distinguish from paler *B. tryoni* forms. No existing molecular markers separate *B. aquilonis* from other species in this complex.

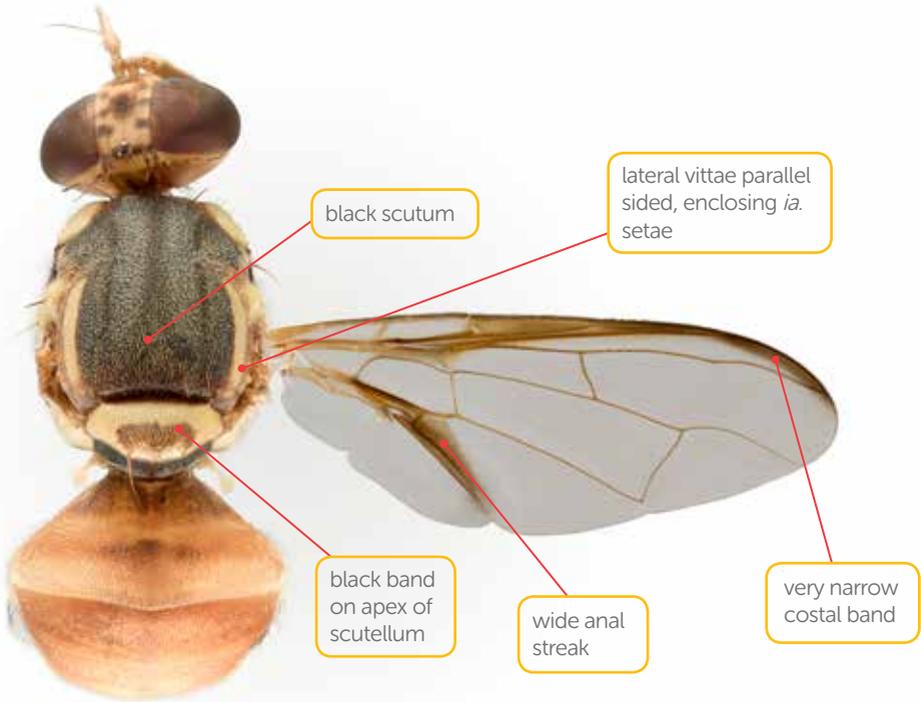
HOST RANGE

Polyphagous. Host records from the Northern Territory after 1984 are suspected to be of a *B. tryoni* hybrid. Before this period it was recorded from 17 hosts from seven families including including Curcurbitaceae, Myrtaceae, Rosaceae, Rutaceae and Sapotaceae. Its major host is billy-goat plum (*Terminalia ferdinandiana*).

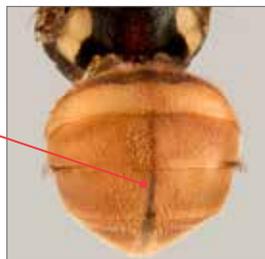
LURE

Cue lure.

Bactrocera bancroftii (Tryon)



abdomen orange-brown and usually broad, may have a faint medial line on terga IV and V

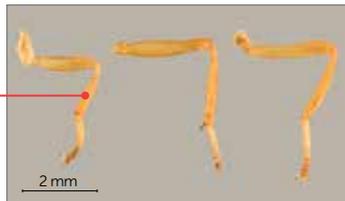


Abdominal variation



Lateral thorax

legs entirely pale



Fore, mid, hind legs



Head

DISTRIBUTION

OCEANIA:

Australia: Torres Strait Islands and coastal areas of Queensland; Papua New Guinea; Solomon Islands

ASIA:

Indonesia: West Timor



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

This species is similar to *Bactrocera musae*. It can be separated by having a very narrow costal band confluent with R_{2+3} , a wide anal streak and a band on the apex of the scutellum.

The abdomen is also usually quite broad.

Several molecular markers, including COI, EIF3L and POP4, adequately distinguish *B. bancroftii* and *B. musae*.

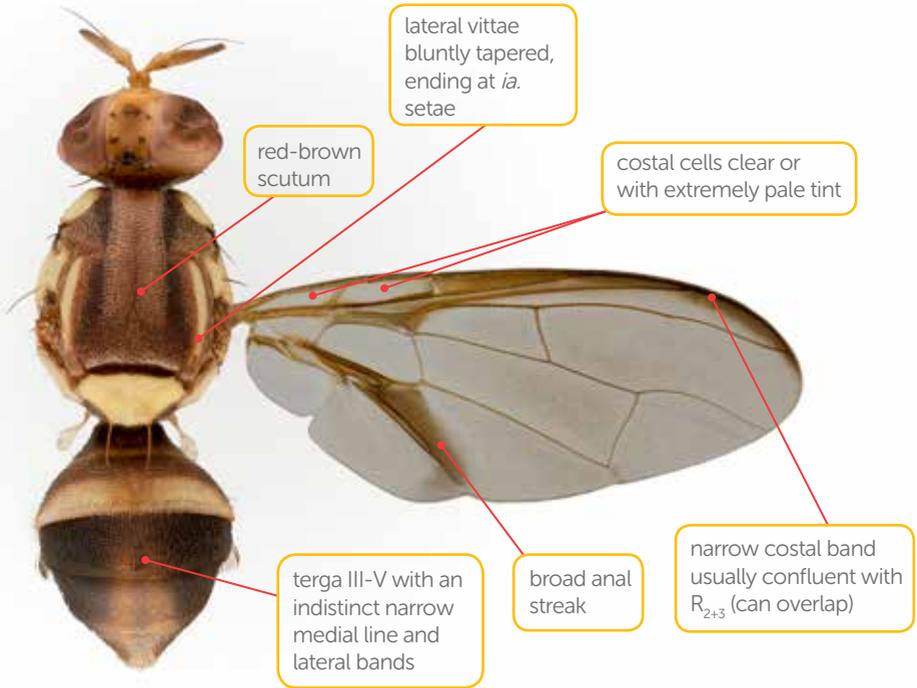
HOST RANGE

Oligophagous on Moraceae: Indian cockspur *Maclura cochinchinensis* (Moraceae) and mulberry.

LURE

Weakly attracted to methyl eugenol.

Bactrocera breviaculeus (Hardy)



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Torres Strait Islands and eastern Queensland south to Rockhampton; Papua New Guinea



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera breviaculeus is similar to the exotic *B. trivialis* but can be separated by having a brown scutum (instead of black), without the lateral bands on terga III broadly joining at the top, and without the costal band distinctly overlapping R_{2+3} .

It is similar to the native *B. rufofuscula* but can be separated by being a paler medium brown, without the lateral bands on terga III joining at the top, occasionally having a faint tint in the costal cells, and normally not having the costal band overlapping R_{2+3} .

It can be difficult to separate from this species.

All molecular markers suggest close similarity to *B. rufofuscula*.

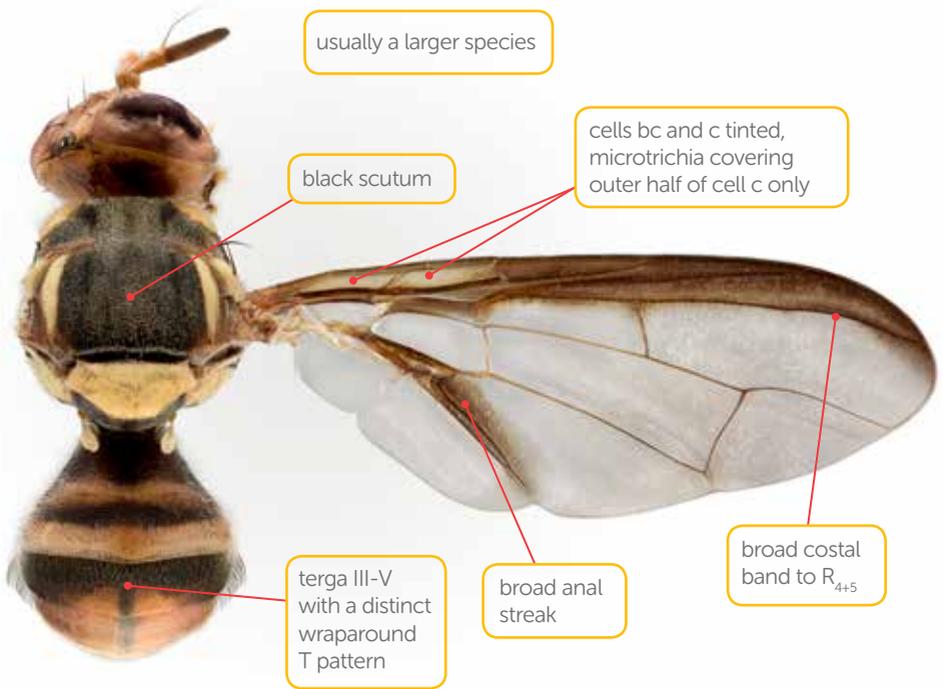
HOST RANGE

Oligophagous on Euphorbiaceae: *Glochidion ferdinandii* and *Glochidion harveyanum* (Harvey's buttonwood).

LURE

Cue lure.

Bactrocera bryoniae (Tryon)



Abdominal variation



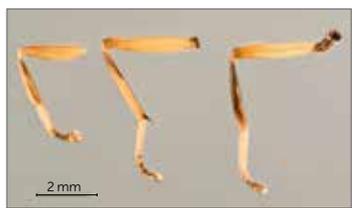
Lateral thorax



Scutum variation



Head



Fore, mid, hind legs

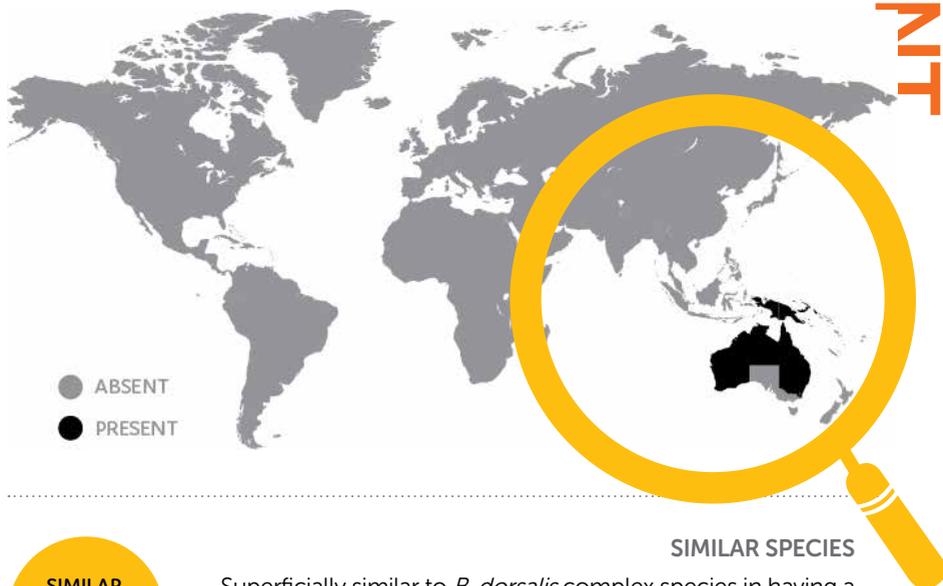
DISTRIBUTION

OCEANIA:

Australia: northern Western Australia, Northern Territory, eastern Australia as far south as Sydney; Papua New Guinea

ASIA:

Indonesia (Papua)



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Superficially similar to *B. dorsalis* complex species in having a black scutum and T on the abdomen, except it is cue-responsive and has a very broad costal band to R_{4+5} . In cue traps it is most similar to *B. trivialis* except it has a distinct wraparound T pattern on terga III-V and a very broad costal band.

All molecular markers consistently separate *B. bryoniae* from the abovementioned morphologically similar species.

HOST RANGE

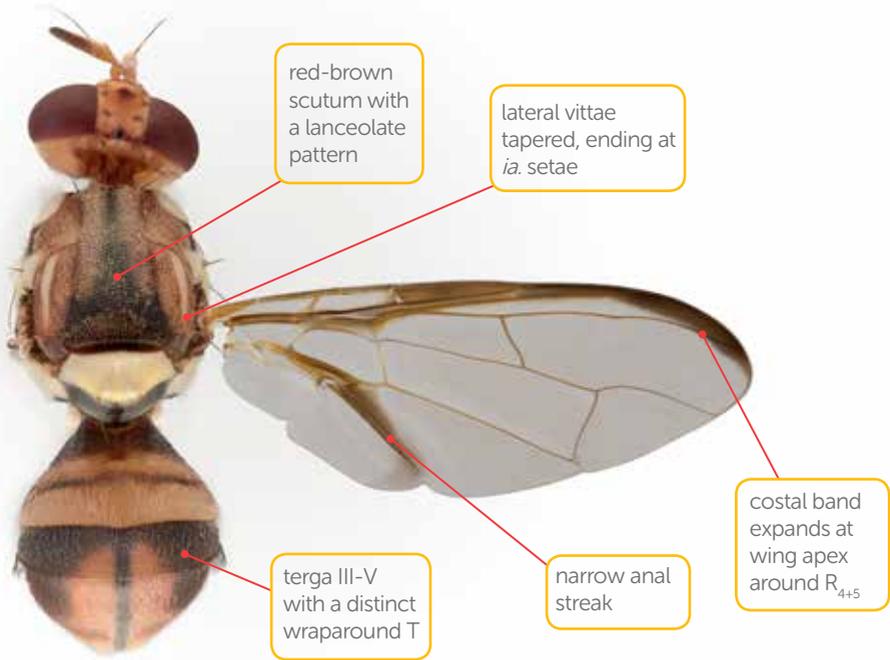
Polyphagous recorded from nine hosts from five families including Cucurbitaceae, Loganiaceae, Musaceae, Passifloraceae and Solanaceae. Main commercial host is chilli.

LURE

Cue lure group. In north Queensland this species was significantly more attracted to Melolure (raspberry ketone formate) than cue lure (Royer 2015).

Bactrocera cacuminata (Hering)

WILD TOBACCO FRUIT FLY, SOLANUM FRUIT FLY



Abdominal variation

Scutum variation



Lateral thorax



Head



Head variation



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: eastern Australia from Cape York, Queensland to the east Gippsland district, Victoria



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to the native non-pest *B. opiliae*, except it has an apically expanding costal band, a distinct wraparound T on the abdomen and tapering vittae ending at the *ia*. setae. It also invariably has a dark lanceolate pattern on the scutum, whereas *B. opiliae* can range from a mostly black scutum, to black centrally, to a lanceolate pattern to W shape. It can also appear superficially similar to some *B. dorsalis* or *B. carambolae*, but differs in having a wider anal streak, a distinct wraparound T on the abdomen and lanceolate pattern on the scutum.

All molecular markers consistently separate *B. cacuminata* from the abovementioned morphologically similar species.

HOST RANGE

Monophagous on *Solanum mauritianum* (tobacco tree) (Solanaceae).

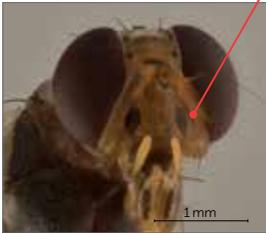
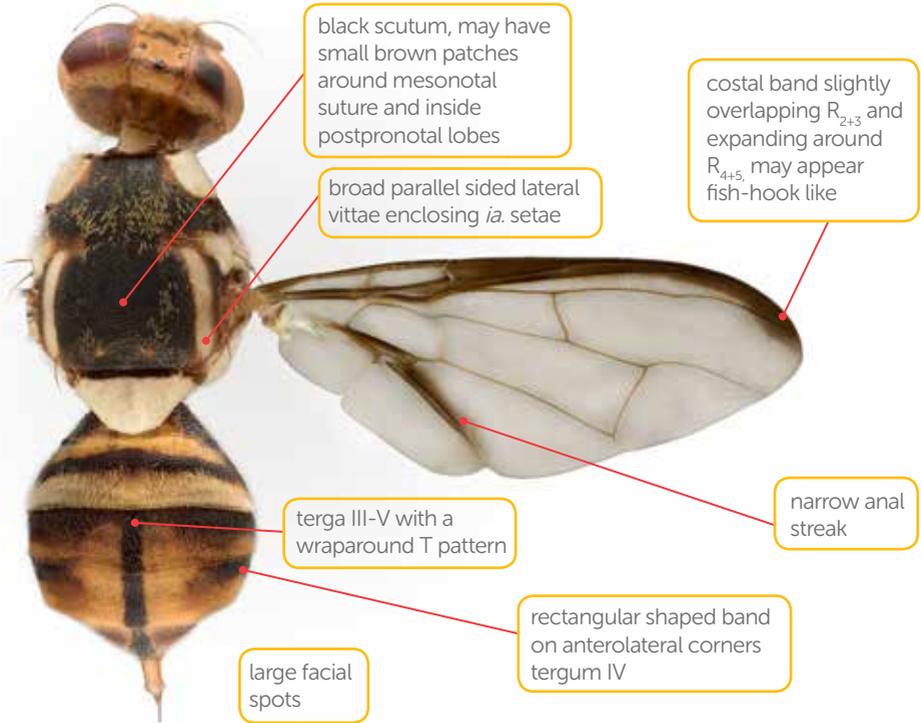
LURE

Methyl eugenol.

Bactrocera carambolae

Drew and Hancock

CARAMBOLA FRUIT FLY



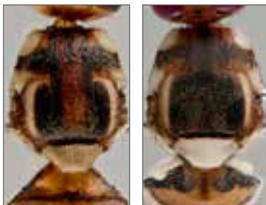
Head



Lateral thorax



Abdominal variation



Scutum variation



Fore, mid, hind legs

all tibia usually dark, sometimes oval preapical spot on outer surface of fore femora

DISTRIBUTION

ASIA:

Thailand, Vietnam, Peninsular Malaysia, East Malaysia, Singapore, Indonesia, Andaman Islands

SOUTH AMERICA:

Suriname, French Guiana, Guyana, Brazil



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera carambolae is similar to the Australian *B. opiliae* but differs in having an expanding costal band, rectangular bands on tergum IV and dark tibia. It is similar to the Australian *B. musae* but differs in having longer more parallel sided lateral vittae, an expanding costal band, a more defined T on the abdomen and rectangular bands on tergum IV. It is similar to the exotic *B. dorsalis* but differs in having a broader costal band overlapping R_{2+3} and expanding apically around R_{4+5} , sometimes having a subapical spot on the fore femora, and having rectangular bands present on tergum IV. All molecular markers separate *B. carambolae* from *B. musae*, *B. opiliae* and *B. dorsalis*.

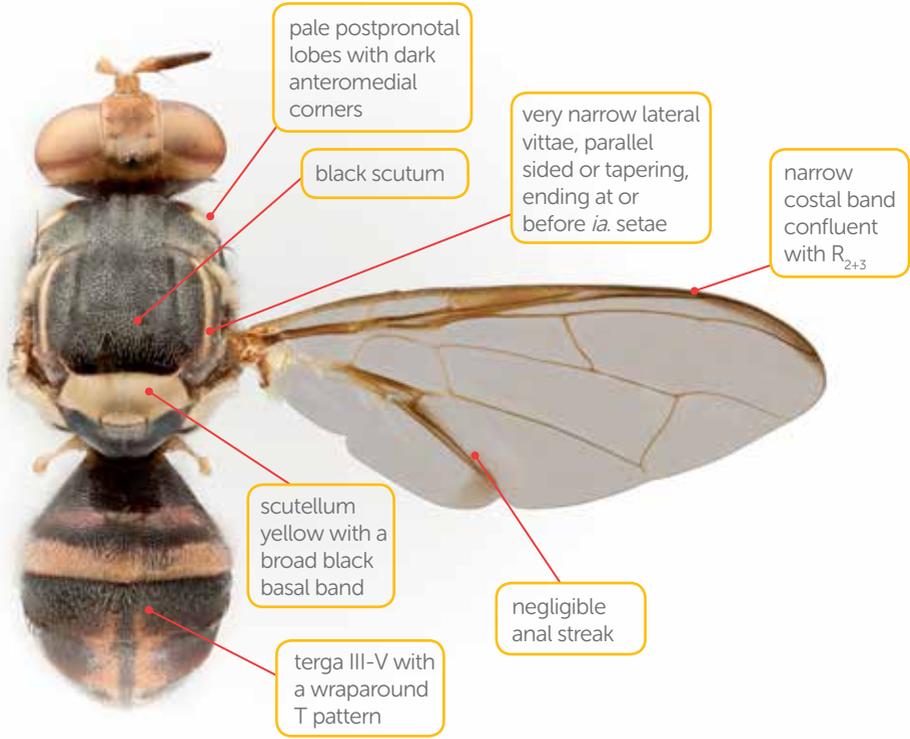
HOST RANGE

Polyphagous. Recorded from 75 hosts from 26 families including Anacardiaceae, Annonaceae, Clusiaceae, Lauraceae, Moraceae, Myrtaceae, Oxalidaceae, Rhamnaceae, Rutaceae, Sapotaceae, and Solanaceae. Major commercial hosts include carambola, mango, sapodilla, jackfruit and guava.

LURE

Methyl eugenol.

Bactrocera caryeae (Kapoor)

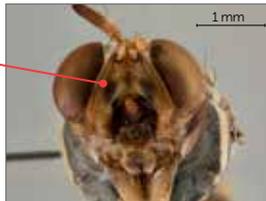


Lateral thorax

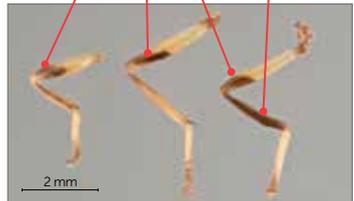
large dark preapical spots on all femora

fore and hind tibiae dark

large elongate facial spots



Head



Fore, mid, hind legs

DISTRIBUTION

ASIA:
Southern India



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera caryeae is similar to the Australian *B. endiandrae* but differs in having dark anteromedial corners on the postpronotal lobes, very narrow dark anteromedial vittae, very narrow anal streak, dark fore tibia and dark apical spots on all femora. It is similar to the exotic *B. kandiensis*, but differs in having a wraparound T (instead of a defined T) on the abdomen.

HOST RANGE

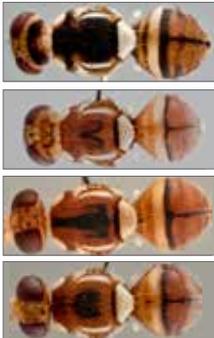
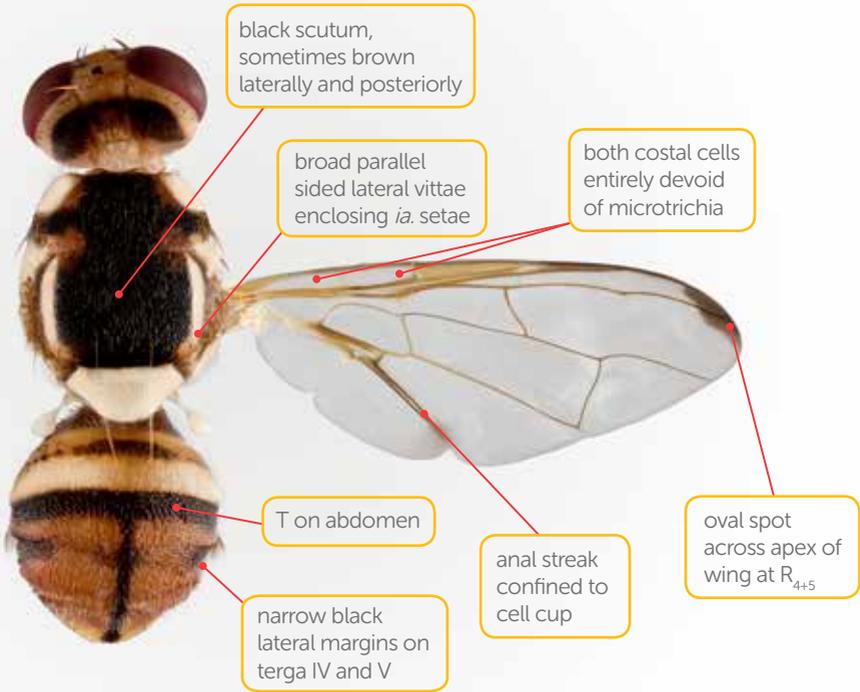
Polyphagous. Recorded from eight hosts from six families including Anacardiaceae, Myrtaceae, Rutaceae and Sapotaceae. Commercial hosts include citrus, mango and guava.

LURE

Methyl eugenol.

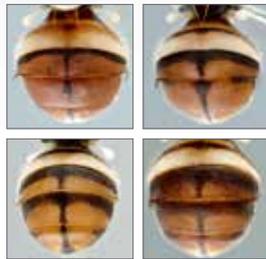
Bactrocera correcta (Bezzi)

GUAVA FRUIT FLY

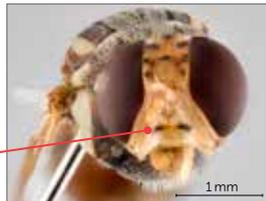


Scutum variation

transverse elongate facial spots sometimes meeting in centre



Abdominal variation



Head



Lateral thorax



Fore, mid, hind legs

DISTRIBUTION

ASIA:

Pakistan, Nepal, India, Bangladesh, Sri Lanka, Bhutan, Myanmar, Thailand, southern China, Peninsular Malaysia, Vietnam



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera correcta is similar to the exotic *B. dorsalis* but differs in having transverse facial spots, an elongate apical wing spot instead of a continuous costal band and costal cells devoid of microtrichia. It is similar to *B. zonata* but has a predominantly black scutum.

All molecular markers consistently separate *B. correcta* from the abovementioned morphologically similar species (but most similar to *B. zonata*).

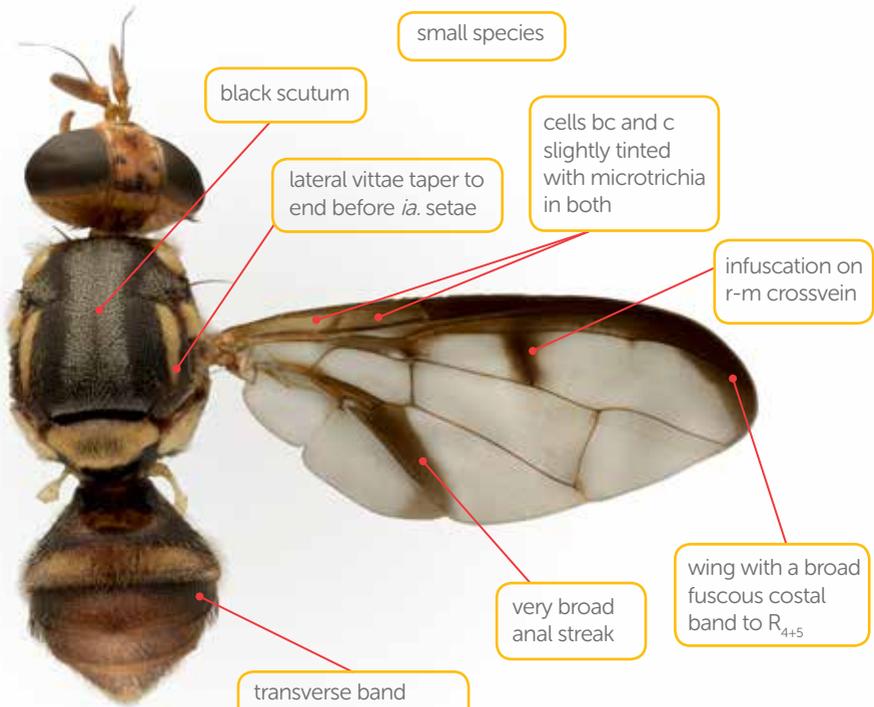
HOST RANGE

Polyphagous, including the families Anacardiaceae, Myrtaceae, Rhamnaceae, and Sapotaceae. Commercial hosts include mango, guava, carambola, mandarin, sapodilla and edible *Syzygium*.

LURE

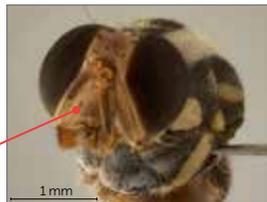
Beta-caryophyllene is a species-specific attractant for *B. correcta* that is more attractive than methyl eugenol (Wee et al. 2017).

Bactrocera curvipennis (Froggatt)



Lateral thorax

very small facial spots which may be present or absent



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

New Caledonia, Vanuatu (Aneityum Island only)



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

This species is similar to *B. bryoniae* but has infuscation on the r-m vein, doesn't have a medial line on the abdomen and is generally smaller.

HOST RANGE

Polyphagous. Recorded from 41 hosts from 20 families including Anacardiaceae, Annonaceae, Caricaceae, Moraceae, Myrtaceae, Oxalidaceae, Passifloraceae, Rhamnaceae, Rosaceae, Rubiaceae, Rutaceae and Solanaceae. Commercial hosts include mango, guava, custard apple, papaya, carambola, peach, coffee, white sapote, citrus, sweet pepper and tomato.

LURE

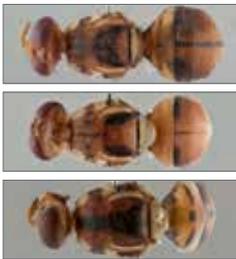
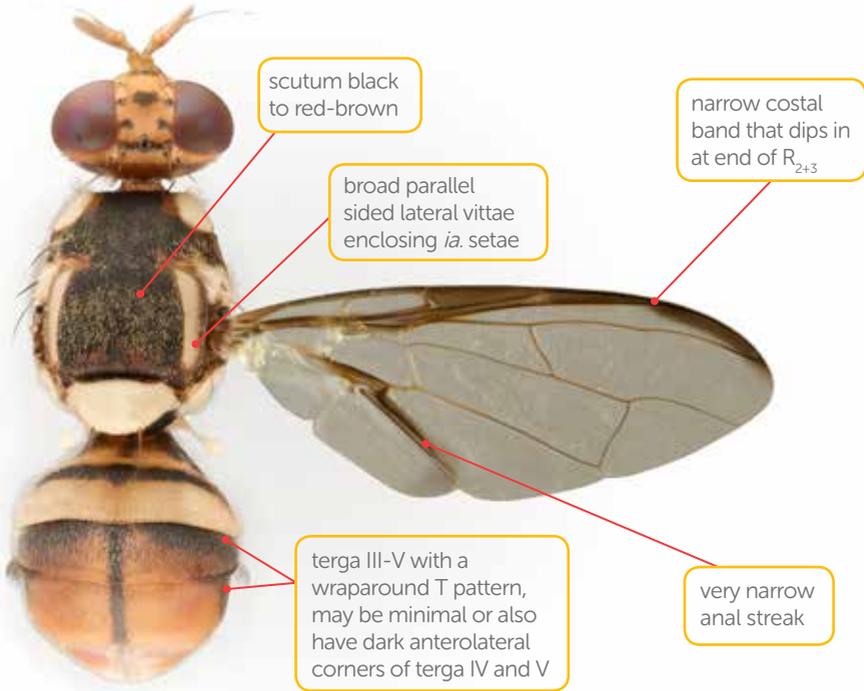
Isoeugenol (significantly more attractive than its previous known lure, cue lure) (Royer et al. 2018).

OTHER COMMENTS

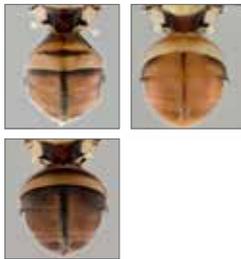
Bactrocera curvipennis was a dominant pest species in New Caledonia until the introduction of *B. tryoni* in the 1960s. Host fruit surveys show that where *B. tryoni* is represented by dense populations *B. curvipennis* is almost absent, but where *B. tryoni* has low populations *B. curvipennis* is still an important pest species.

Bactrocera dorsalis (Hendel)

ORIENTAL FRUIT FLY



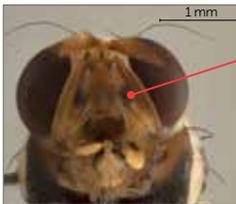
Scutum variation



Abdominal variation

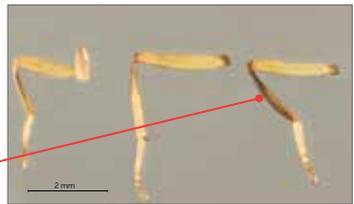


Lateral thorax



Head

large facial spots



Fore, mid, hind legs

fore and hind tibiae dark

DISTRIBUTION

AFRICA: Widespread, predominantly in sub-saharan African countries

ASIA: Pakistan, India, Sri Lanka, Bangladesh, Nepal, Bhutan, Myanmar, China, Taiwan, Hong Kong, Thailand, Vietnam, Cambodia, Laos, Malaysia, Singapore, Philippines, Indonesia

OCEANIA: Christmas Island, Papua New Guinea, Palau, Hawaii, Tahiti



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *B. carambolae* but differs in having a narrow costal band confluent with R_{2+3} and triangular shaped anterolateral dark corners on abdominal terga IV and V (if present) (rectangular in *B. carambolae*).

Similar to the Australian *B. endiandrae* but differs in having broad parallel sided vittae enclosing the *ia*. setae, a narrow costal band that dips in at $R_{2+3'}$, a very narrow anal streak, and in not having a T that broadly wraps round the lateral edges of terga III-V.

Similar to the Australian *B. musae* but differs in having a very narrow anal streak, narrow costal band that dips in at $R_{2+3'}$, having broad parallel sided lateral vittae enclosing the *ia*. setae, and in general having a more distinct T shape on the abdomen.

All markers separate *B. dorsalis* from *B. carambolae* and *B. endiandrae*. RPA2 does not separate *B. dorsalis* from *B. musae*.

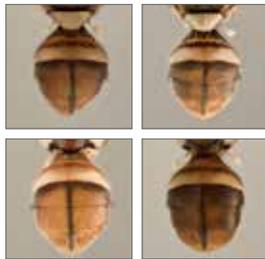
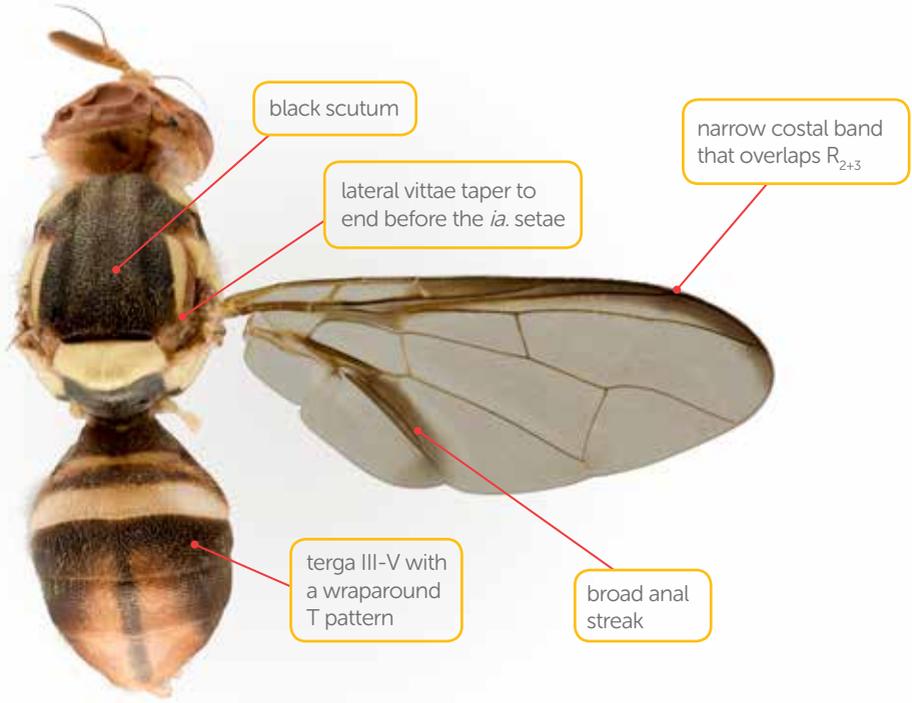
HOST RANGE

Polyphagous on over 300 hosts and can oviposit in some fruit in the hard green stage. The majority of edible fruit is susceptible.

LURE

Methyl eugenol.

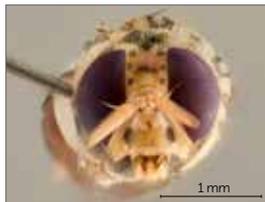
Bactrocera endiandrae (Perkins and May)



Abdominal variation



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

AUSTRALIA:

Torres Strait Islands and eastern Australia south to northeast NSW



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *B. dorsalis* and *B. carambolae* (see comments under those species for differentiating characters). Similar to *B. musae*, but differs in having a narrower costal band that just overlaps R_{2+3} , a wide anal streak, vittae tapering to a point and ending before the *ia*. setae, and a wraparound T pattern with broad lateral bands on terga III-V.

All molecular markers adequately separate *B. endiandrae* from *B. dorsalis* and *B. musae*.

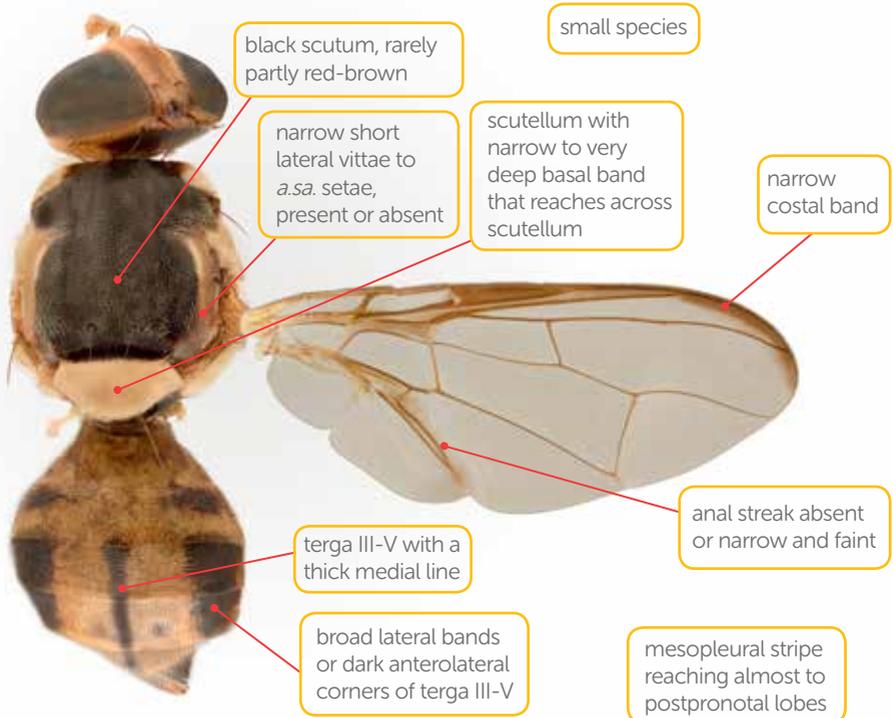
HOST RANGE

Primarily oligophagous on Lauraceae, particularly *Endiandra* spp.

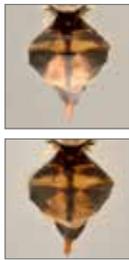
LURE

Methyl eugenol.

Bactrocera facialis (Coquillett)



Scutum variation

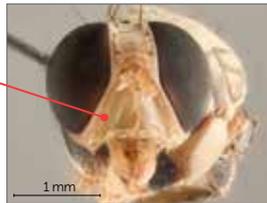


Abdominal variation



Lateral thorax

facial spots absent



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:
Tonga



SIMILAR SPECIES, HOST & LURE

Bactrocera facialis can appear superficially similar to *B. frauenfeldi* which is established in north Queensland, but differs in not having a band across the wing.

SIMILAR SPECIES

HOST RANGE

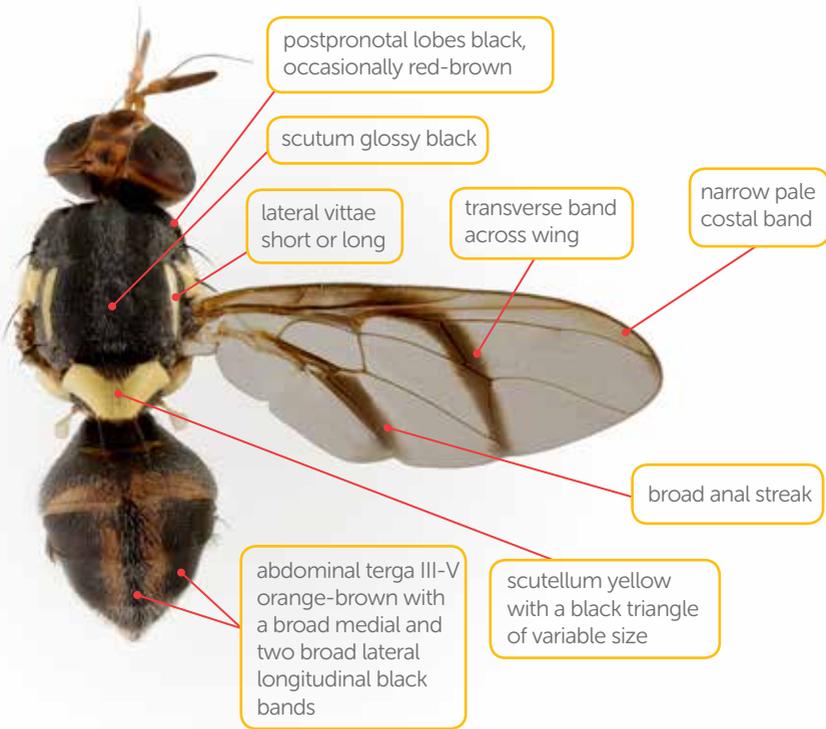
Polyphagous. Recorded on 64 hosts from 30 families including Anacardiaceae, Annonaceae, Caricaceae, Lauraceae, Leguminosae, Malvaceae, Meliaceae, Moraceae, Musaceae, Myrtaceae, Passifloraceae, Rosaceae, Rubiaceae, Rutaceae, Sapotaceae and Solanaceae. Main commercial hosts include mango, soursop, avocado, breadfruit, guava, Brazilian cherry, passionfruit, granadilla, citrus, sapodilla and star apple (Leblanc et al. 2012).

LURE

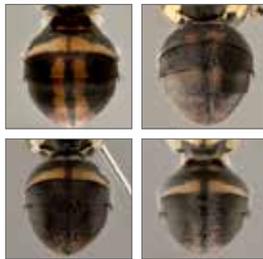
Cue lure.

Bactrocera frauenfeldi (Schiner)

MANGO FRUIT FLY



Humeral calli variation



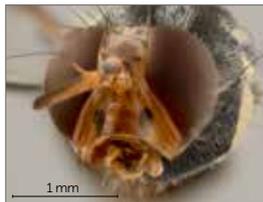
Abdominal variation



Lateral thorax



Scutum variation



Head

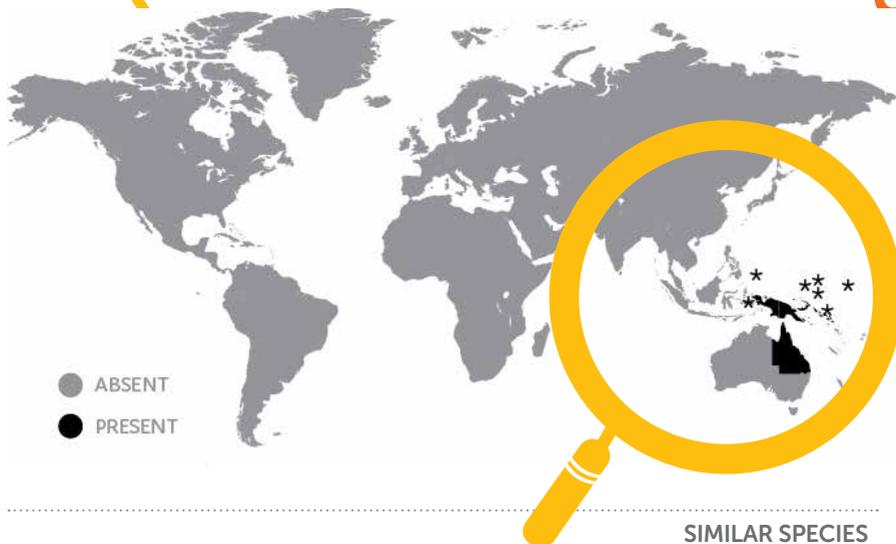


Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Torres Strait and north Queensland south to Townsville; Federated States of Micronesia, Kiribati, Marshall Islands, Palau, Nauru, Solomon Island, Moluccas, West Papua, Papua New Guinea



SIMILAR SPECIES, HOST & LURE

Similar to *B. albistrigata* but has dark ppn. lobes (sometimes red-brown ppn. lobes). Similar to *B. trilineola* but has lateral vittae present and facial spots instead of a facial mask. Similar to *B. kirki* but has dark ppn. lobes, lateral vittae present and a distinct band on the wing. Similar to *B. psidii* but has dark ppn. lobes, a medial line and lateral bands on terga III-V, legs with dark patterning and a distinct band on the wing. Current molecular markers do not adequately separate species in this complex. Some resolution between *B. albistrigata* and *B. frauenfeldi* can be observed at EIF3L.

SIMILAR SPECIES

HOST RANGE

Polyphagous. Recorded on 109 hosts from 37 families including Anacardiaceae, Caricaceae, Moraceae, Musaceae, Myrtaceae, Oxalidaceae, Passifloraceae, Rutaceae, Sapotaceae and Solanaceae. Commercial hosts include mango, banana, citrus, carambola, guava, papaya, edible *Syzygium*, star apple, sapodilla and abiu.

LURE

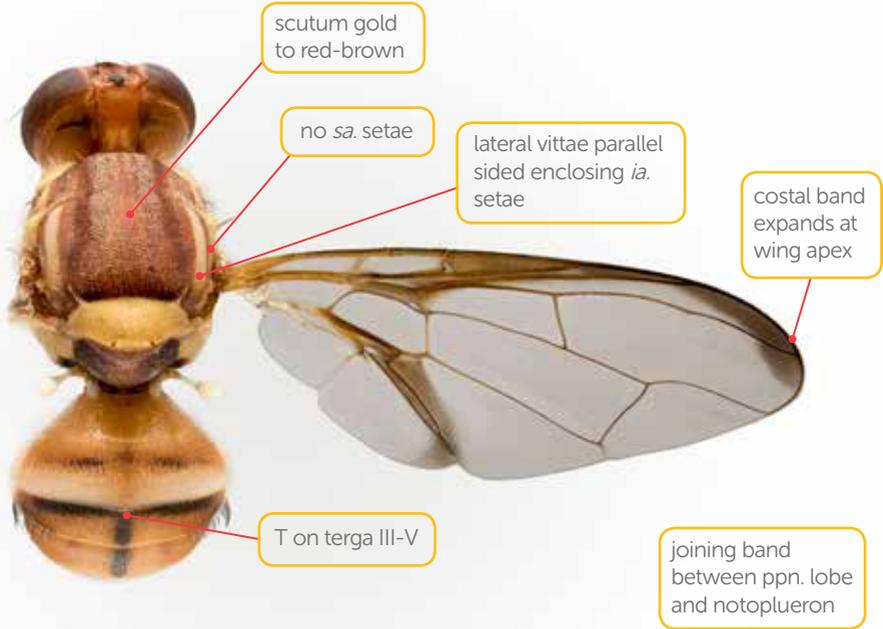
Cue group. Melolure (raspberry ketone formate) was found to be a stronger attractant for this species in north Queensland (Royer 2015).

OTHER COMMENTS

B. frauenfeldi was detected on the northernmost part of mainland Queensland in 1974 and had spread to Townsville by 1997. It has not spread further since despite there being no containment measures. While it occurs in high numbers in Cairns it is rarely found in Townsville, and this seems to be the natural southernmost limit for this species.

Bactrocera jarvisi (Tryon)

JARVIS' FRUIT FLY



Post notum variation



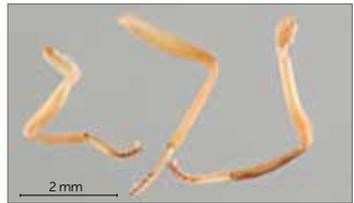
Abdominal variation



Lateral thorax



Head

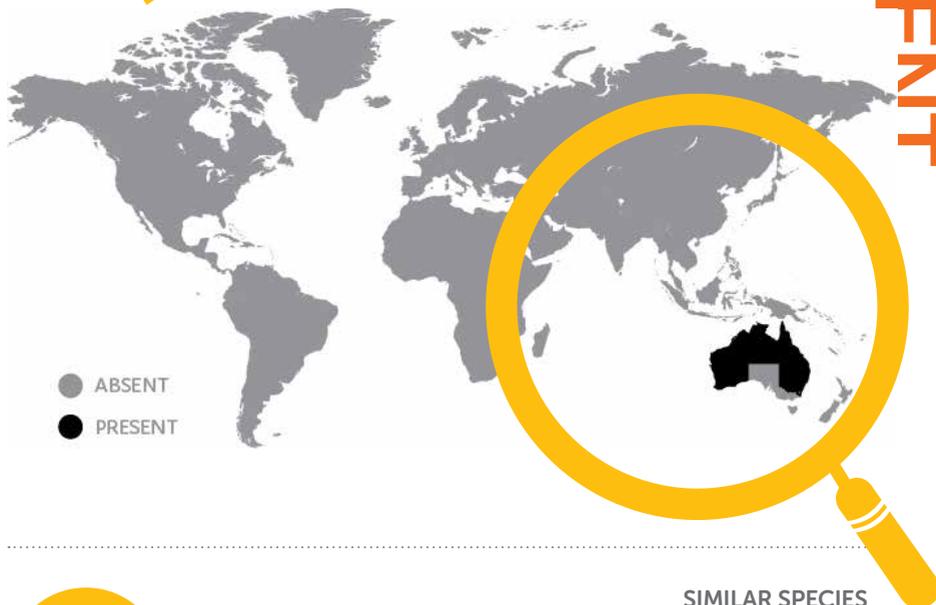


Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Broome in Western Australia, Northern Territory, Queensland, New South Wales south to Sydney



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera jarvisi is similar to *B. zonata* but differs in having a joining band between the ppn. lobe and notopleural calli, a continuous costal band (instead of an isolated apical oval spot), anal streak present and a more defined T on the abdomen. It is also zingerone and cue-responsive whereas *B. zonata* is methyl eugenol-responsive.

All tested molecular markers clearly separate *B. jarvisi* from all other species.

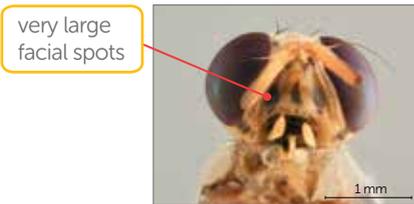
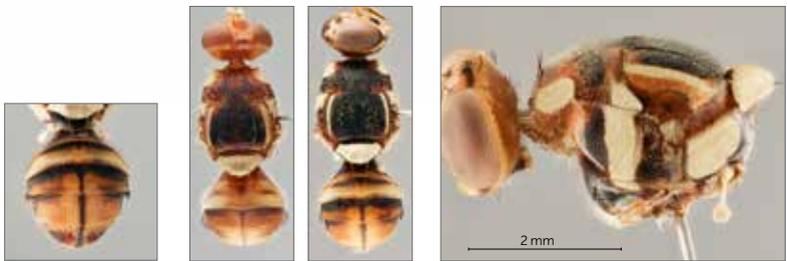
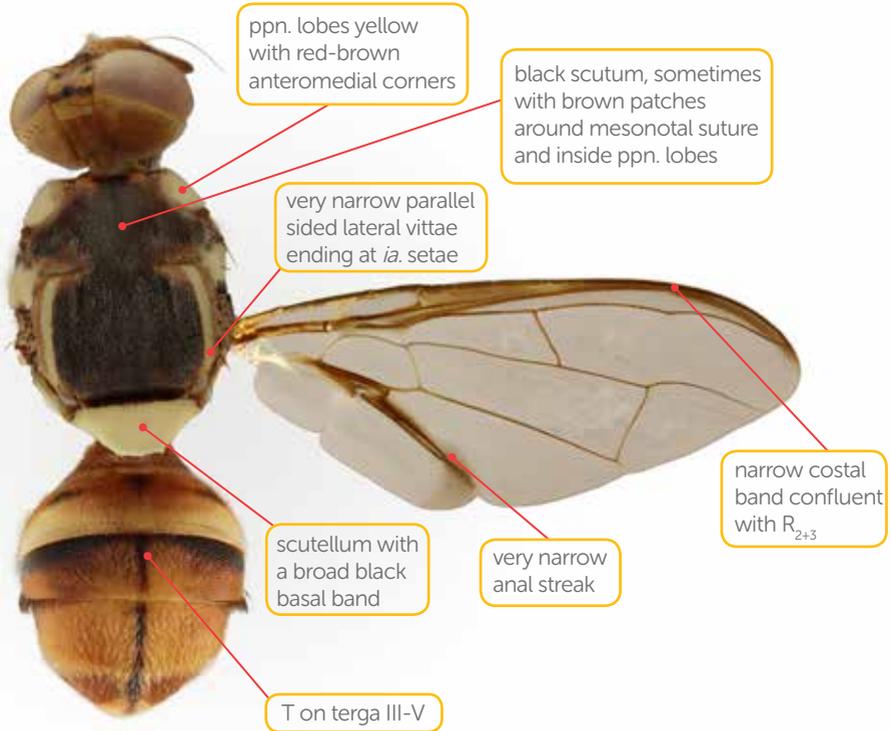
HOST RANGE

Polyphagous. Recorded from 84 hosts from 29 families including Anacardiaceae, Annonaceae, Arecaceae, Caricaceae, Clusiaceae, Curcubitaceae, Lauraceae, Malpighiaceae, Moraceae, Musaceae, Myrtaceae, Oxalidaceae, Passifloraceae, Punicaceae, Rosaceae, Rubiaceae, Rutaceae, Sapindaceae, Sapotaceae and Solanaceae. Commercial hosts include mango, guava, papaya, persimmon, soursop, avocado, banana, pomegranate, apple, peach, pear, coffee, citrus and edible *Syzygium*.

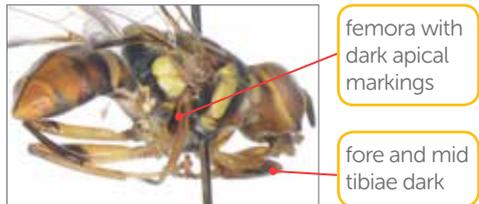
LURE

Strongly attracted to zingerone (Fay 2012) and weakly to cue lure.

Bactrocera kandiensis Drew and Hancock



Head



Fore, mid, hind legs. Image: Luc Leblanc

DISTRIBUTION

ASIA:
Sri Lanka



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *B. caryeae* but differs in having a defined T on the abdomen (instead of wraparound) and in having blunt ended vittae (sometimes taper in *B. caryeae*). Similar to *B. dorsalis* but has narrower vittae, dark markings on the apices of the femora and a broad basal band on the scutellum. Similar to some specimens of the Australian rainforest species *B. endiandrae* but has narrower vittae, a very narrow anal streak, dark markings on the apices of the femora and a broad basal band on the scutellum.

All tested molecular markers clearly separate *B. kandiensis* from *B. dorsalis*; data lacking for *B. caryeae*.

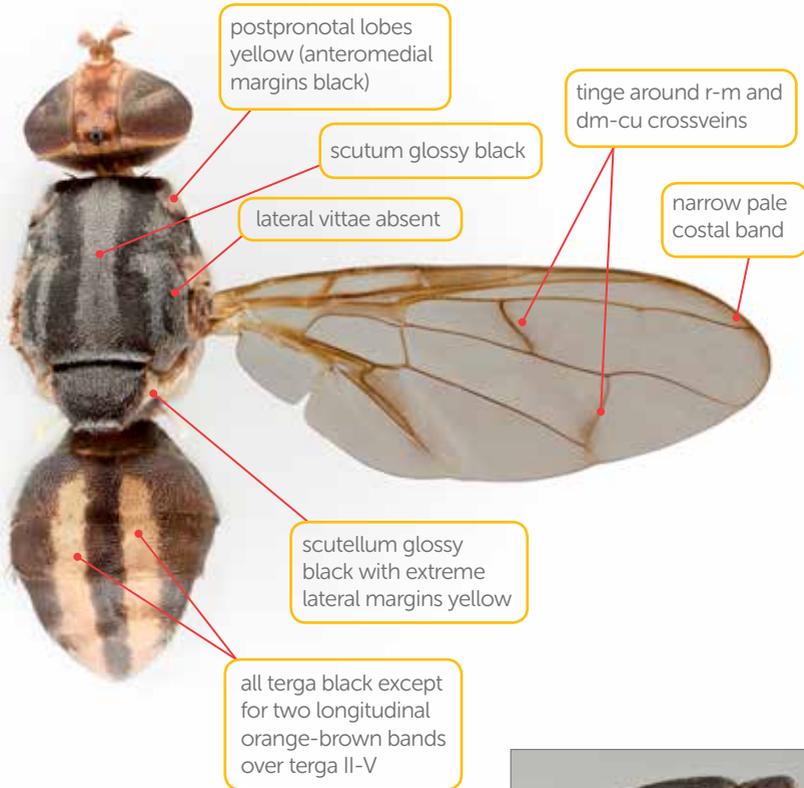
HOST RANGE

Polyphagous. The pest status of this species is unclear. Drew & Romig (2013) and Allwood et al. (1999) only record this species from mango and *Garcinia* spp. However, Tsuruta et al. (1997) record it from 21 hosts from 13 plant families including Anacardiaceae, Caricaceae, Clusiaceae, Lauraceae, Moraceae, Myrtaceae, Oxalidaceae and Rutaceae.

LURE

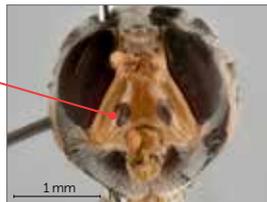
Methyl eugenol.

Bactrocera kirki (Froggatt)



Lateral thorax

large facial spots



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Western Samoa, American Samoa, Fiji Islands (Rotuma),
Tonga, Wallis and Futuna, Niue, Tahiti



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *B. psidii* but lacks vittae, has a wide black band on the scutellum and has two yellow longitudinal bands on the abdomen.

Similar to members of the *B. frauenfeldi* complex but differs in not having a distinct transverse band on the wing, (only infuscation on the r-m and dm-cu cross veins), and additionally: similar to *B. frauenfeldi* but lacks vittae, has yellow ppn. lobes, very wide band on the scutellum and very thick medial line on abdomen;

similar to *B. albistrigata* but lacks vittae, has a very wide band on the scutellum and very thick medial line on abdomen, similar to *B. trilineola* but has facial spots (instead of a mask), yellow ppn. lobes.

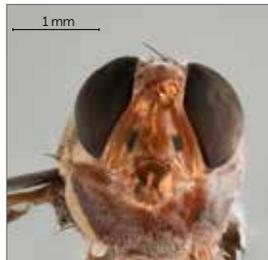
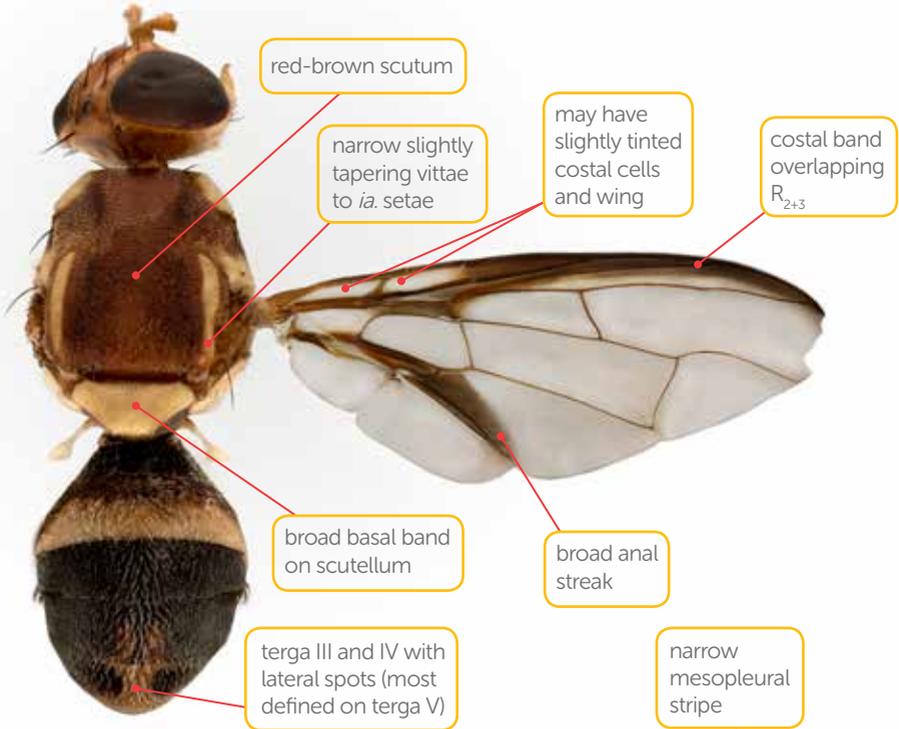
HOST RANGE

Polyphagous. Recorded on 42 hosts from 19 families including Anacardiaceae, Annonaceae, Caricaceae, Lauraceae, Myrtaceae, Oxalidaceae, Passifloraceae, Rosaceae, Rutaceae and Solanaceae. Commercial hosts include cashew, mango, custard apple, soursop, papaya, avocado, guava, edible *Syzygium*, carambola, passionfruit, noni, citrus, abiu, sweet pepper, tomato and eggplant.

LURE

Cue lure.

Bactrocera kraussi (Hardy)



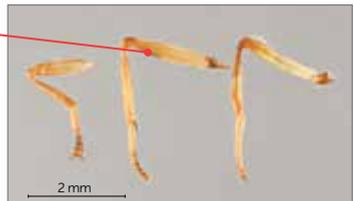
Head



Lateral thorax



Abdominal variation



Fore, mid, hind legs

dark apices of femora

DISTRIBUTION

OCEANIA:

Australia: Torres Strait Islands and northeast Queensland south to Townsville



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera kraussi is similar to *B. tryoni* but differs in having tint only in both costal cells (instead of tint and microtrichia in both), longer less tapered vittae, lateral spots on the abdomen (instead of a wraparound T), narrow mesopleural stripe, broad basal band on the scutellum and dark apices of the femora.

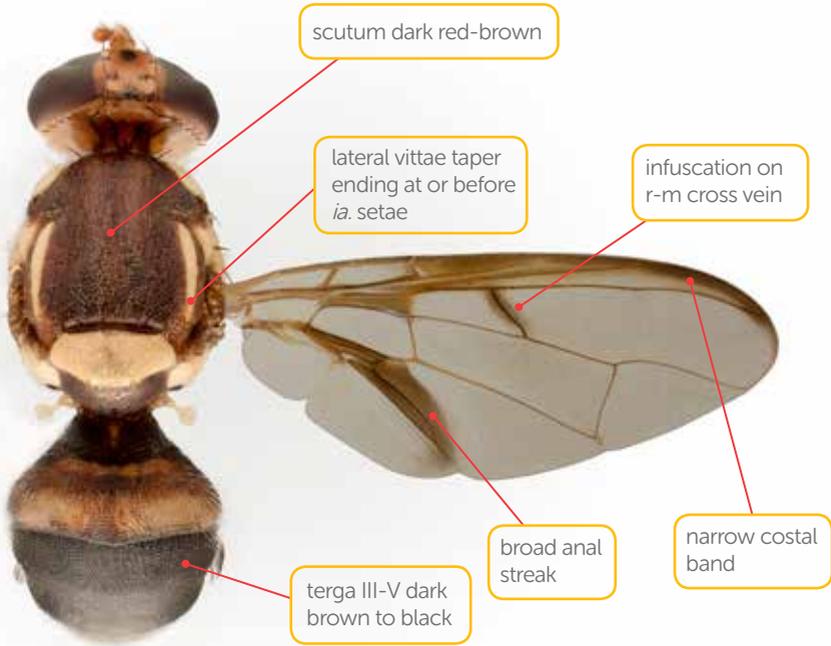
HOST RANGE

Polyphagous. Recorded on 106 hosts from 31 families including Anacardiaceae, Musaceae, Myrtaceae, Oxalidaceae, Passifloraceae, Rosaceae, Rubiaceae, Rutaceae, Sapindaceae, Sapotaceae and Solanaceae. Commercial hosts include mango, banana, grumichama, guava, feijoa, carambola, peach, citrus and tamarind.

LURE

Isoeugenol (significantly more attractive than its previous known lure, cue lure) (Royler 2015).

Bactrocera laticaudus (Hardy)



Scutum variation



Lateral thorax



Abdominal variation



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Torres Strait Islands and northeast Queensland south to Townsville



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

B. laticaudus is similar to *B. psidii* in having infuscation on the r-m vein, a dark abdomen and lateral vittae tapering to end at *ia*. setae.

It differs in having a brown scutum, a yellow scutellum and no infuscation on the dm-cu cross vein and being methyl eugenol-responsive (instead of cue lure).

HOST RANGE

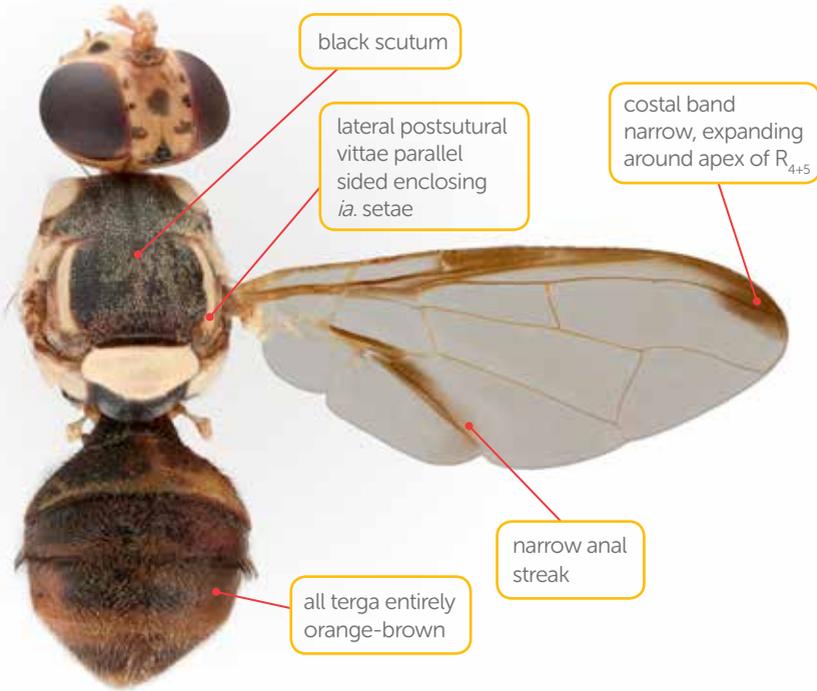
Oligophagous on Sapotaceae. Major host is black ash (*Planchonella obovoidea*).

LURE

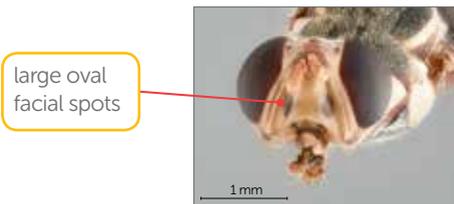
Methyl eugenol.

Bactrocera latifrons (Hendel)

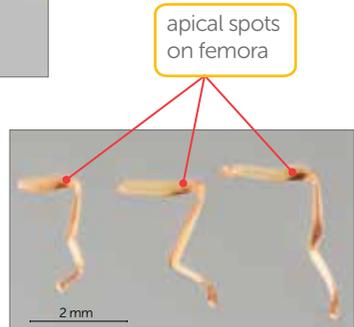
SOLANUM FRUIT FLY



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

ASIA:

Pakistan, India, Sri Lanka, Bangladesh, Myanmar, Southern China, Japan (Okinawa), Taiwan, Thailand, Laos, Vietnam, Peninsular Malaysia, Singapore, Brunei

OCEANIA:

Hawaii

AFRICA:

Tanzania, Kenya, Burundi



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera latifrons is similar to *B. musae* but differs in having an expanding costal band, longer parallel sided vittae and apical spots on the femora. It is similar to *B. dorsalis* but differs in having an expanding costal band, no markings on the abdomen, and apical spots on the femora. It is similar to *B. carambolae* but differs in having no markings on the abdomen.

All molecular markers clearly distinguish *B. latifrons* from *B. musae* and *B. dorsalis* complex species.

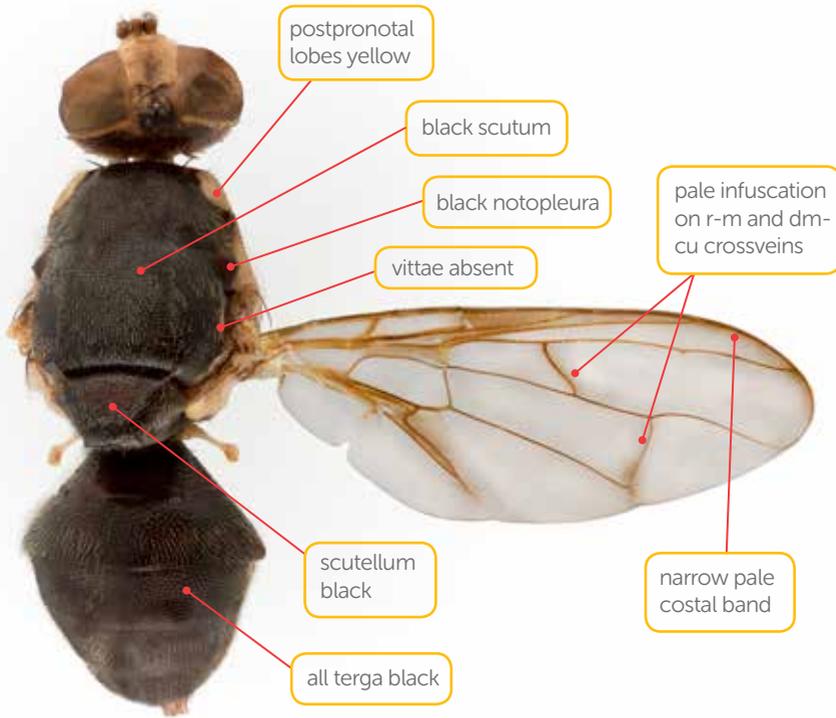
HOST RANGE

Polyphagous. Primarily a pest of Solanaceae and Cucurbitaceae. Recorded on 59 hosts from 14 families including Myrtaceae, Oxalidaceae, Passifloraceae, Rhamnaceae and Rutaceae. Main commercial hosts include capsicum, chilli, eggplant, winter melon and ivy gourd.

LURE

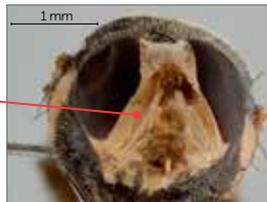
Alpha-ionol and cade oil is the best attractant for this species (McQuate and Peck 2001). While it's not as attractive as cue lure and methyl eugenol are to other species, it is more attractive than protein bait; however some records contradict this (Mziray et al. (2010)).

Bactrocera melanotus (Coquillett)



Lateral thorax

facial spots absent or small and pale



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:
Cook Island



SIMILAR SPECIES, HOST & LURE

Bactrocera melanotus is similar to *B. passiflorae* in having a black scutum without vittae and black abdomen, but differs in having pale postpronotal lobes, a black scutellum and dark legs.

SIMILAR SPECIES

HOST RANGE

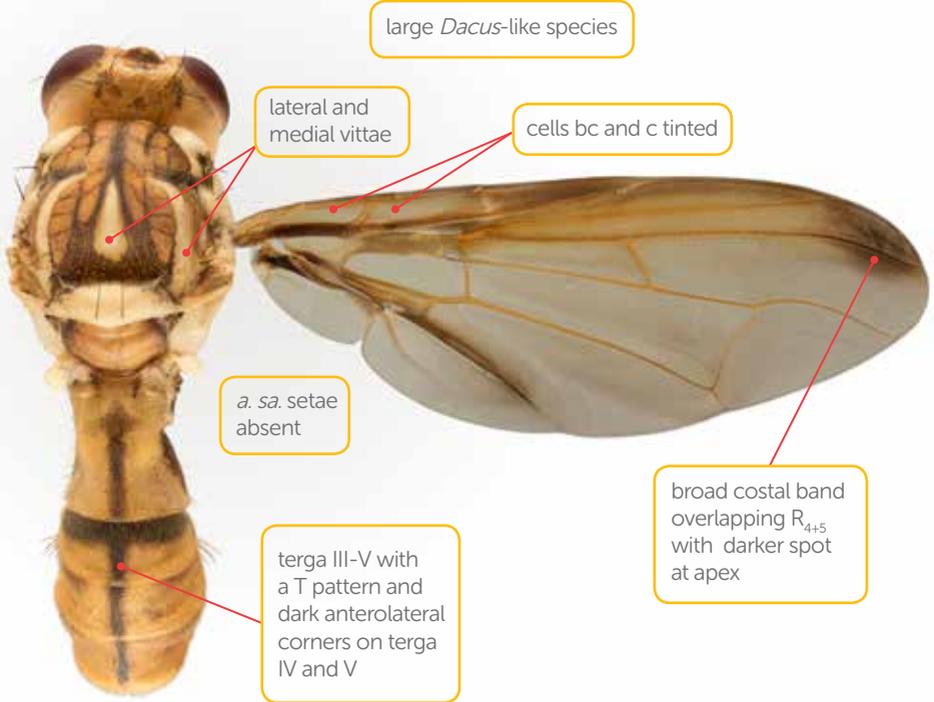
Polyphagous. Recorded on 31 hosts from 18 families including Anacardiaceae, Annonaceae, Caricaceae, Lauraceae, Moraceae, Myrtaceae, Oxalidaceae, Rubiaceae, Rutaceae, Sapotaceae and Solanaceae. Commercial hosts include mango, papaya, avocado, breadfruit, jackfruit, Brazilian cherry, guava, rose apple, carambola, citrus, sapodilla and tomato.

LURE

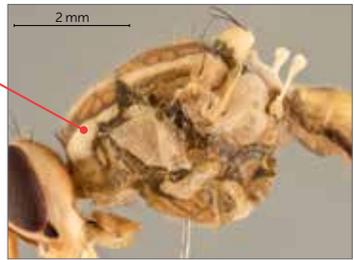
Cue lure.

Bactrocera minax (Enderlein)

CHINESE CITRUS FRUIT FLY

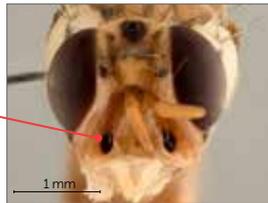


yellow band from postpronotal lobe to near notopleuron



Lateral thorax

very elongated facial spots



Head



Fore, mid, hind legs

DISTRIBUTION

ASIA:
Bhutan, Nepal, northern India, southern China



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera minax is similar to *B. tsuneonis* in being a larger *Dacus* like fly with lateral and medial vittae, a band between the postpronotal lobe and notopleuron, a wide costal band, and a T on the abdomen. It differs in lacking the *a. sa.* setae, having the costal band well overlapping R_{4+5} with a dark spot at the apex, and having lateral bands on terga IV and V.

HOST RANGE

Oligophagous. Recorded on eight hosts in Rutaceae. Commercial hosts include orange, lemon, pomelo, mandarin, tangerine and cumquat.

LURE

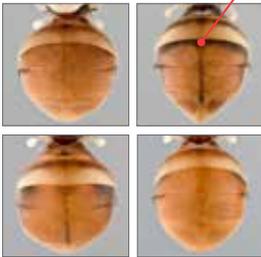
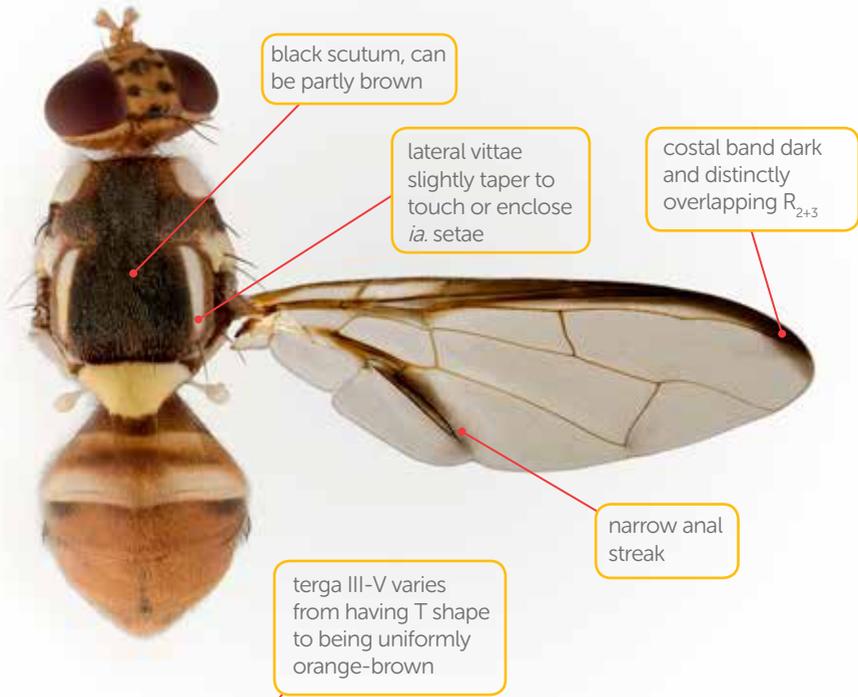
Weak response to methyl eugenol.

OTHER COMMENTS

Bactrocera minax is univoltine, having only one generation per year.

Bactrocera musae (Tryon)

BANANA FRUIT FLY



Abdominal variation



Scutum variation



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Torres Strait Islands and northeast Queensland south to Townsville, Papua New Guinea and associated islands, Bismarck Archipelago and the Solomon Islands, West Papua



SIMILAR SPECIES, HOST & LURE

Similar to several other methyl eugenol-responsive species. Similar to *B. bancroftii*, but differs in not having an apical band on the scutellum and having a wider costal band and narrower anal streak.

Similar to *B. endiandrae* but differs in having a wider costal band, narrower anal streak, longer less tapered vittae and less of a distinct T or wraparound T on the abdomen. Very similar to *B. opiliae* but

differs in having a wider costal band that overlaps $R_{2+3'}$, a slightly wider anal streak, and usually less patterning on the abdomen (*B. opiliae* has a distinct T). Similar to the exotic *B. dorsalis* but differs in having a wider costal band that overlaps at $R_{2+3'}$, a slightly wider anal streak, slightly tapering and shorter vittae that usually end at the *ia*.

setae, and usually less patterning on the abdomen.

All molecular markers separate *B. musae* from *B. endiandrae* and *B. bancroftii*; however RPA2 does not separate *B. musae* from *B. opiliae* and *B. dorsalis*.

SIMILAR SPECIES

HOST RANGE

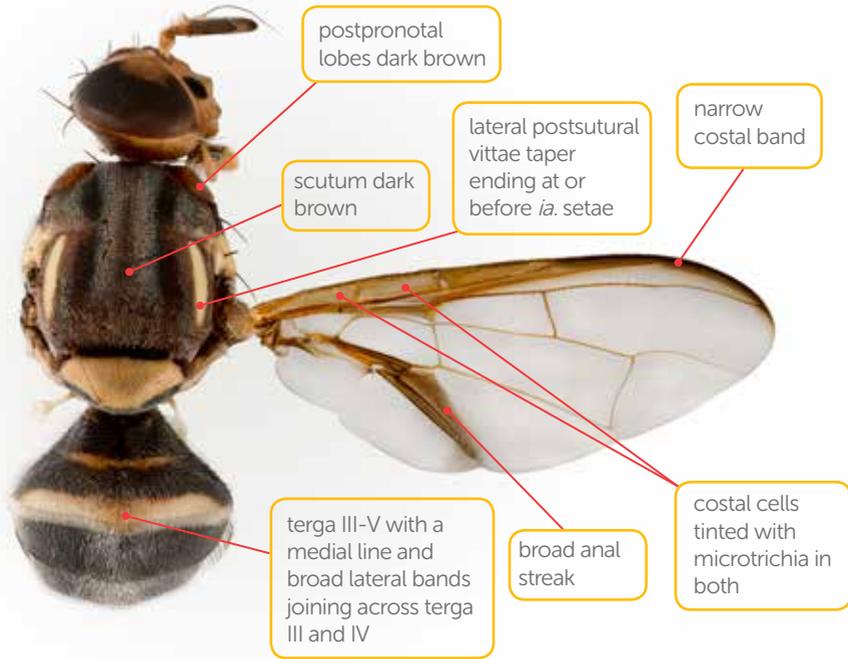
Polyphagous. Recorded on 16 hosts from nine families, although these are mostly single records or specimens that may be dubious. Confirmed families are Musaceae, Caricaceae and Myrtaceae. Primary economic host is banana, but papaya and guava are occasional hosts.

LURE

Methyl eugenol.

Bactrocera neohumeralis (Hardy)

LESSER QUEENSLAND FRUIT FLY



Scutum variation



Lateral thorax



Abdominal variation



Head

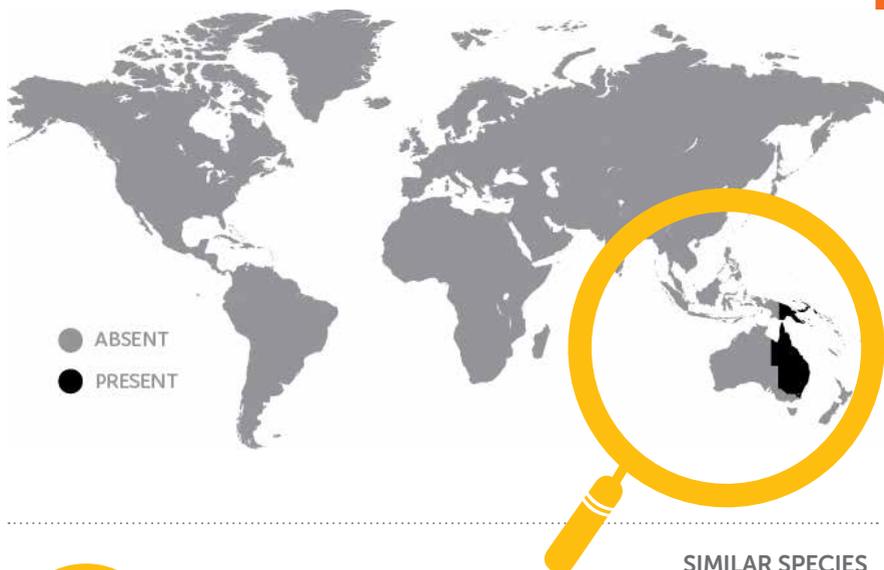


Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Torres Strait Islands, eastern Australia south to Coffs Harbour, Papua New Guinea



SIMILAR SPECIES, HOST & LURE

Similar to *B. tryoni*, but differs in having dark postpronotal lobes and being generally darker, with more dark marking on the legs. No current molecular markers separate *B. tryoni* from *B. neohumeralis*.

SIMILAR SPECIES

HOST RANGE

Polyphagous. Recorded on over 160 hosts from 44 families including Anacardiaceae, Annonaceae, Caricaceae, Clusiaceae, Ebenaceae, Lauraceae, Moraceae, Musaceae, Myrtaceae, Oxalidaceae, Passifloraceae, Rosaceae, Rubiaceae, Rutaceae, Sapotaceae, Solanaceae, and Vitaceae. Commercial hosts include mango, custard apple, rollinia, date palm, persimmon, mulberry, banana, carambola, passionfruit, loquat, apple, plum, peach, pear, citrus, coffee, star apple, sapodilla, abiu, capsicum and tomato.

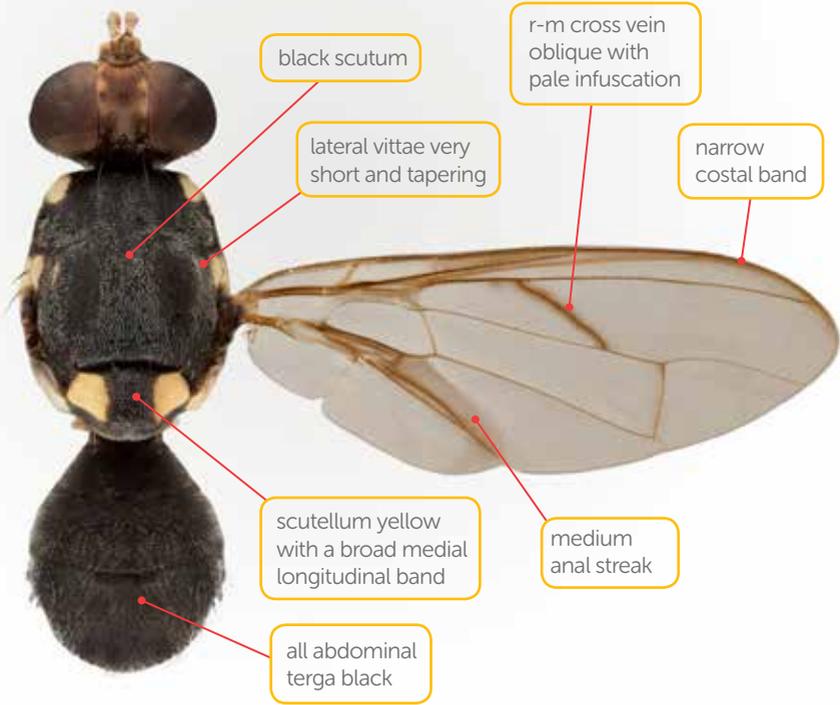
LURE

Cue lure.

OTHER COMMENTS

Bactrocera neohumeralis is unusual in mating in the middle of the day. Most species, including the similar *B. tryoni*, mate at dusk.

Bactrocera obliqua (Malloch)

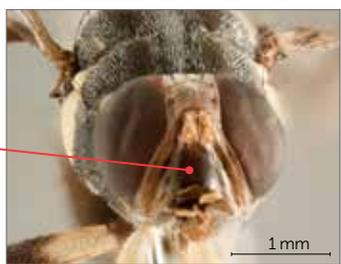


femora with dark apical markings



Fore, mid, hind legs

black face



Head



Lateral thorax

DISTRIBUTION

OCEANIA:

Papua New Guinea: Bismarck Archipelago and Bougainville Island



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *B. psidii*, but differs in having a band across the scutellum (instead of a triangle), shorter vittae that end level to the *a. sa.* setae, dark apices of the femora, and a more oblique and longer r-m cross-vein.

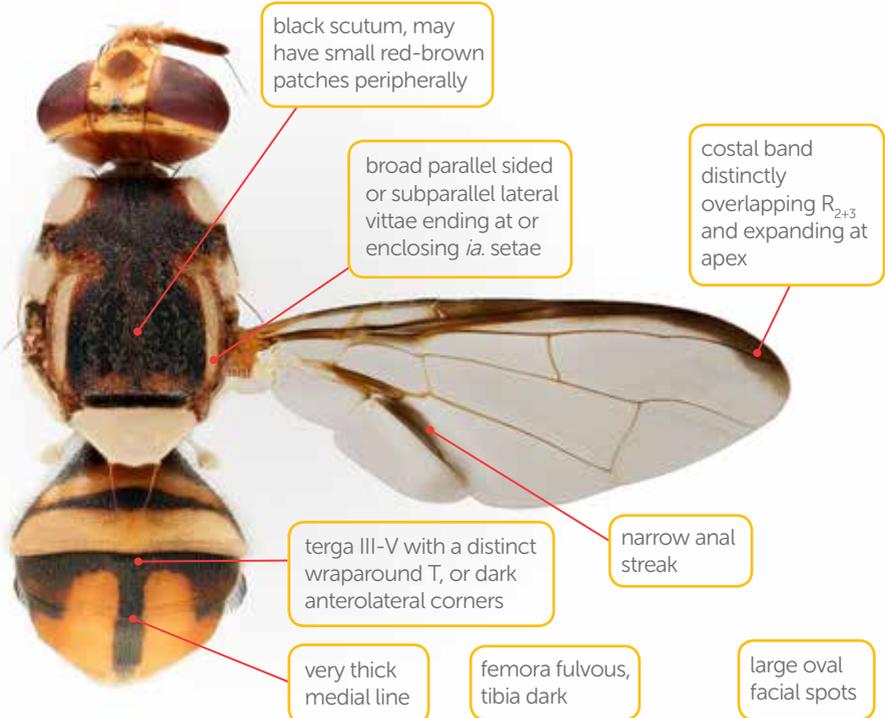
HOST RANGE

Polyphagous. Recorded on six hosts from three families including Myrtaceae. Edible hosts include guava and edible *Syzygium* (water apple, Malay apple).

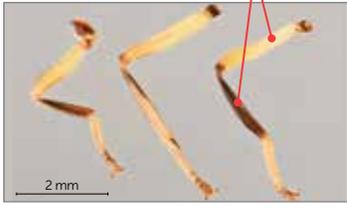
LURE

Weakly attracted to isoeugenol (Royer et al. 2018).

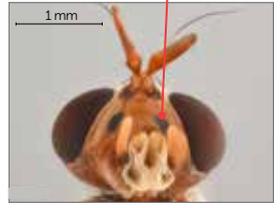
Bactrocera occipitalis (Bezzi)



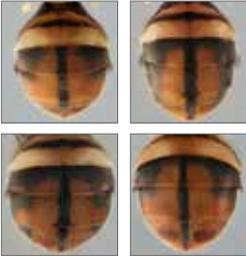
Leg variation



Fore, mid, hind legs



Head



Abdominal variation



Scutum variation



Lateral thorax

DISTRIBUTION

ASIA:

Philippines, Borneo (Malaysian Sabah, Brunei, Indonesian Kalimantan)



SIMILAR SPECIES, HOST & LURE

Similar to *B. carambolae* but differs in usually having subparallel vittae, no spot on the fore femora, a broader costal band distinctly overlapping R_{2+3+4} , a very thick medial line and defined wraparound T or dark anterolateral corners on terga III-V (instead of rectangles on terga IV and sometimes V).

SIMILAR SPECIES

HOST RANGE

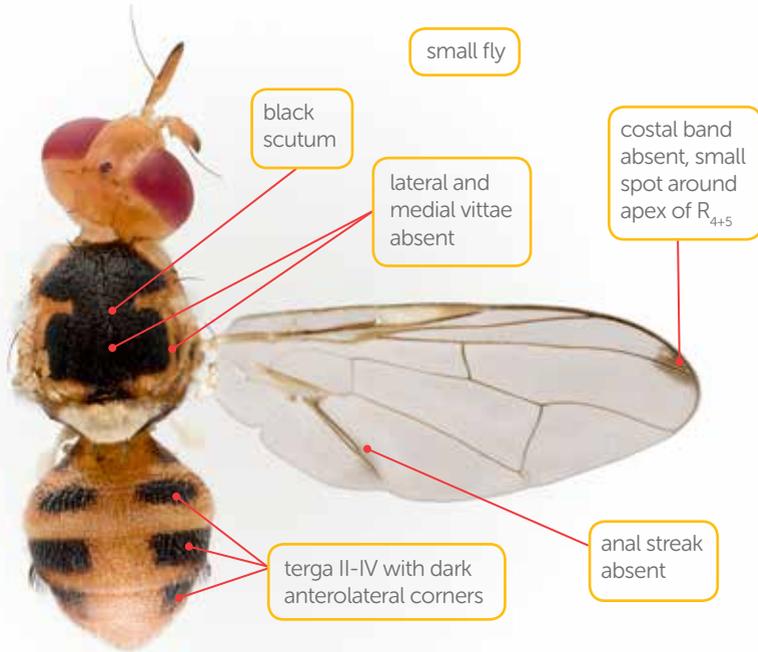
Polyphagous. Recorded from four hosts from four families including Anacardiaceae, Cucurbitaceae, Myrtaceae and Rutaceae. Commercial hosts include mango, calabash, guava and calamondin (a cumquat mandarin hybrid).

LURE

Methyl eugenol.

Bactrocera oleae (Rossi)

OLIVE FRUIT FLY



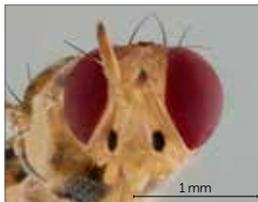
Scutum variation



Lateral thorax



Abdominal variation



Head



Fore, mid, hind legs

DISTRIBUTION

EUROPE:

Albania, Croatia, Cyprus, France, Italy, Malta, Montenegro, Portugal, Serbia, Slovenia, Spain, Switzerland

AFRICA:

Algeria, Angola, Egypt, Eritrea, Ethiopia, Kenya, Libya, Mauritius, Morocco, Réunion Island, Seychelles, South Africa, Sudan, Tunisia

ASIA:

Georgia, India, Iran, Israel, Jordan, Lebanon, Pakistan, Saudi Arabia, Syria, Turkey

THE AMERICAS:

USA (California), Mexico



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera oleae is quite distinct in lacking vittae and having a spot at the apex of the wing. It is superficially similar to *B. tuberculata* and *B. correcta* in having a black scutum and spot at the wing apex instead of a costal band, but lacks lateral vittae. It is superficially similar to *B. melanotus* and *B. passiflorae* in having a black scutum and lacking lateral vittae, but has an orange brown abdomen with lateral colouring on terga II-IV and a spot at the apex of the wing.

HOST RANGE

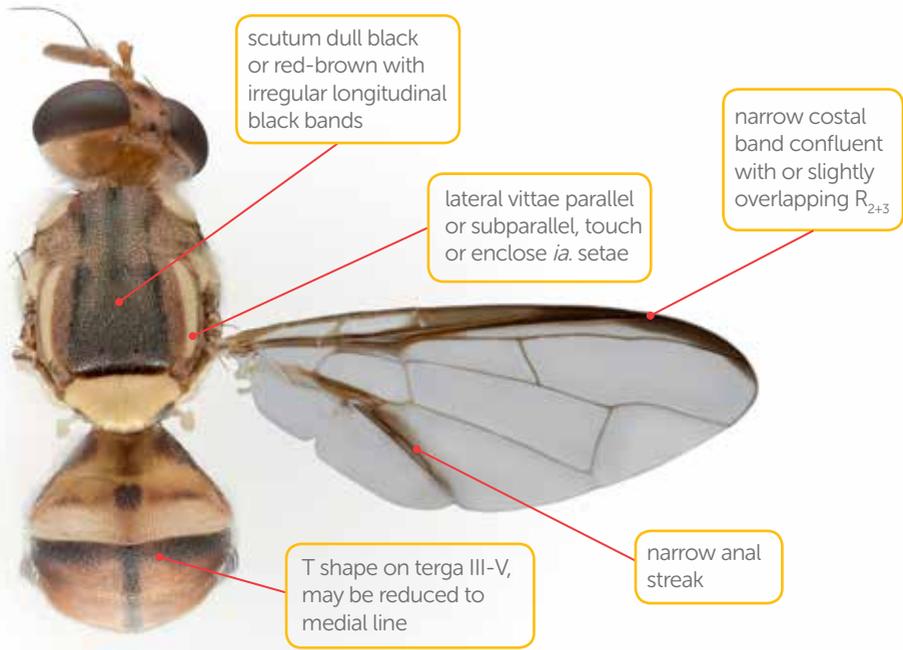
Monophagous on olives (*Olea europaea*: Oleaceae).

LURE

Olive fruit fly lure or protein bait in McPhail traps attracts both sexes. In the USA the latter has been found to be more attractive.

Bactrocera opiliae (Drew and Hardy)

FALSE ORIENTAL FRUIT FLY



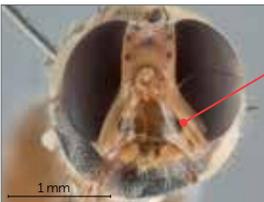
Abdominal variation



Scutum variation



Lateral thorax



medium sized facial spots

fore tibiae slightly tinted, hind tibiae dark

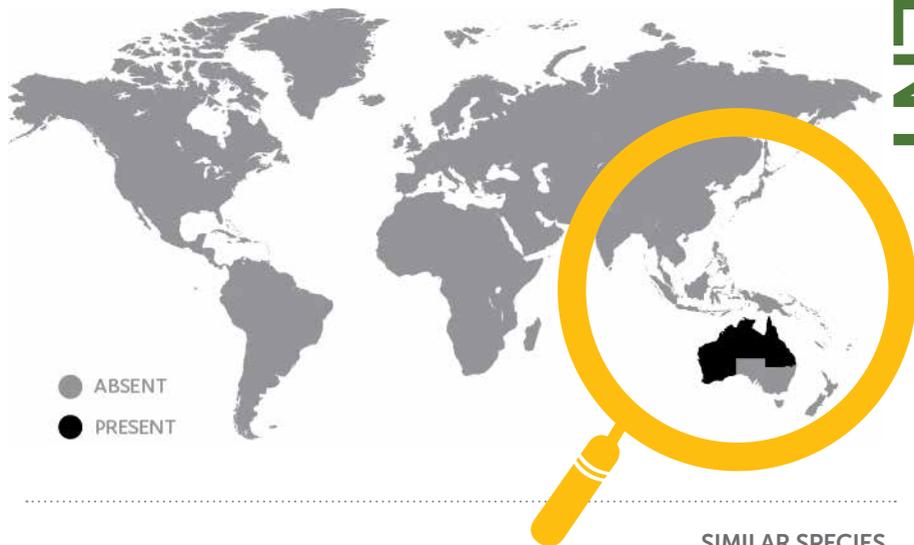


Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: northern Western Australia, Northern Territory and north-west and north central Queensland



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera opiliae is most similar to *B. musae* but differs in usually having a more defined T on the abdomen and the costal band only slightly overlapping R_{2+3} (if at all). These two species can be very difficult to distinguish. Some *B. opiliae* specimens can be similar to *B. cacuminata* in having a red-brown scutum with a lanceolate pattern but differs in not having an expanding costal band and having a straight T on the abdomen (instead of wraparound T). It is similar to *B. dorsalis* but has a slightly wider anal streak, and a slightly wider costal band that doesn't dip in at the end of R_{2+3} . All tested molecular markers clearly distinguish *B. opiliae* from *B. cacuminata*.

HOST RANGE

Monophagous on *Opilia amentacea* (Opiliaceae), although there are two records from *Mukia maderaspatana* (Cucurbitaceae).

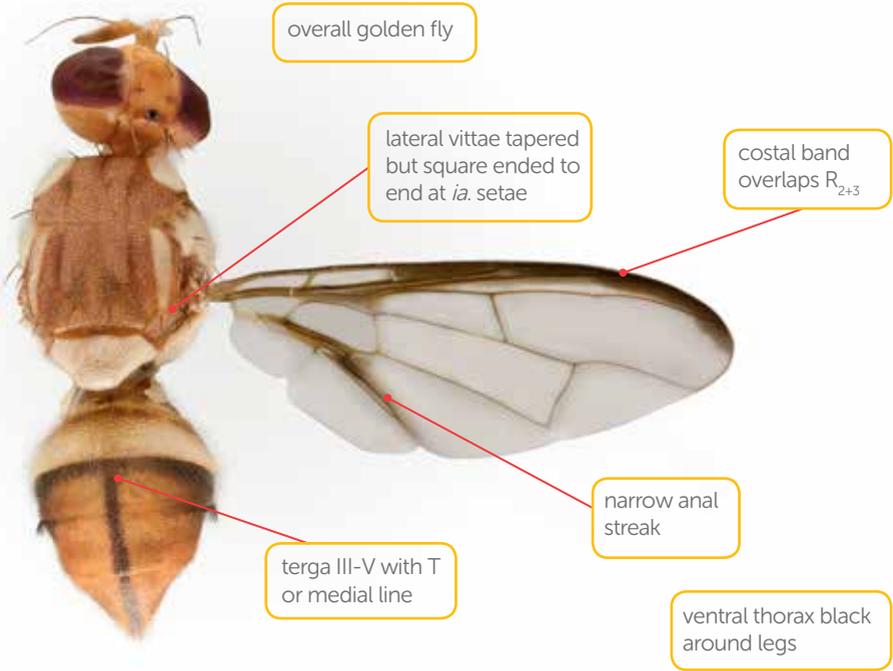
LURE

Methyl eugenol.

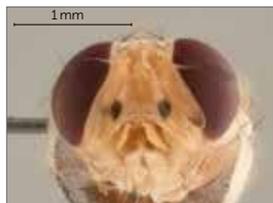
OTHER COMMENTS

B. opiliae was collected in methyl eugenol traps in Melville Island in the Northern Territory in 1975 and was thought to be *B. dorsalis*. This caused alarm and intensive field surveys showed the fly was distributed over 358 000km² of the Northern Territory and Western Australia. Ecological, physiological and genetic studies showed it to be a distinct species with *Opilia acmentata* (Opiliaceae) as its host.

Bactrocera pallida (Perkins and May)



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Northern Territory, Torres Strait Islands and Queensland south to Brisbane, Papua New Guinea



- ABSENT
- PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *B. zonata* but differs in having a complete costal band (instead of an oval spot on the apex of the wing), a narrow anal streak (instead of no anal streak), and microtrichia in cell c (absent in *B. zonata*).

The COI barcode separates *B. pallida* from all similar species.

HOST RANGE

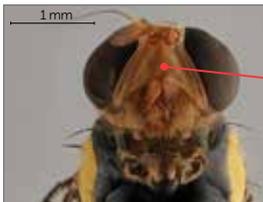
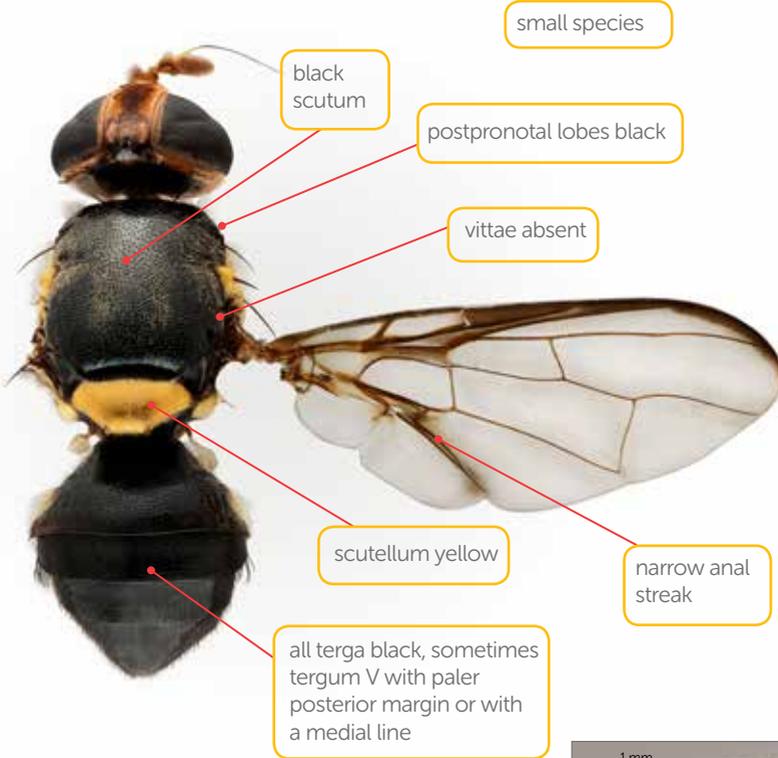
Monophagous on Leichhardt tree (*Nauclea orientalis*: Rubiaceae).

LURE

Methyl eugenol.

Bactrocera passiflorae (Froggatt)

FIJIAN FRUIT FLY



facial spots absent

pale legs



DISTRIBUTION

OCEANIA:
Fiji Islands, Niue, Wallis and Futuna



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera passiflorae is similar to *B. melanotus* from the Cook Islands in being all black but differs in having pale legs and scutellum and black postpronotal lobes.

HOST RANGE

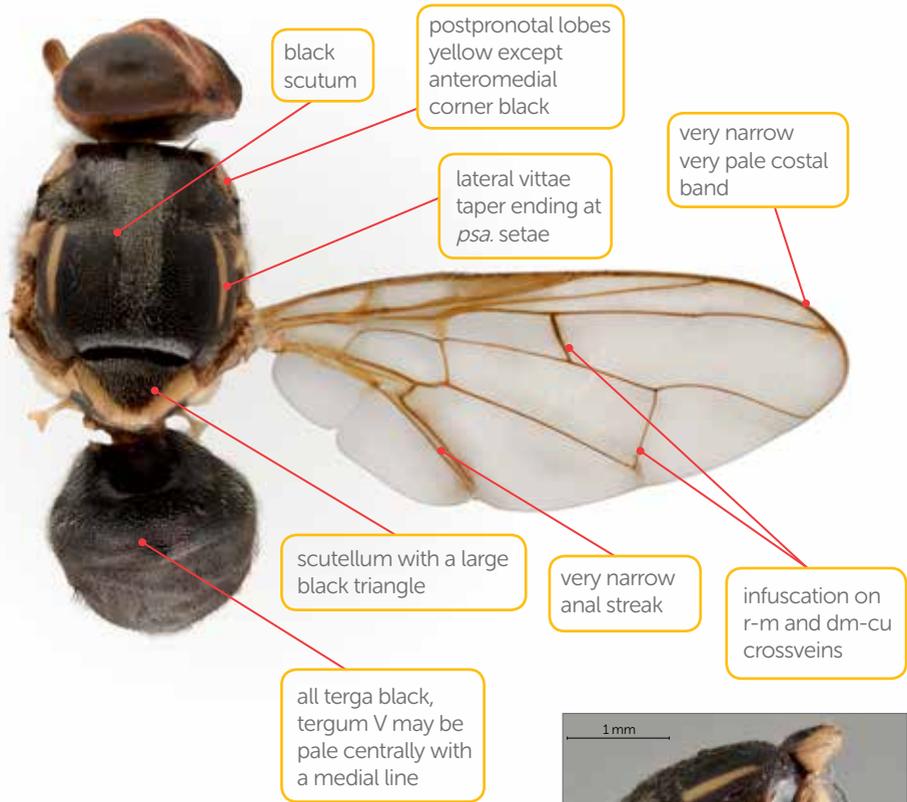
Polyphagous. Recorded from 49 hosts in 28 families including Anacardiaceae, Caricaceae, Rutaceae, Passifloraceae, Lauraceae, Leguminosae, Malvaceae, Moraceae, Myrtaceae and Solanaceae. Commercial hosts include mango, papaya, avocado, passionfruit, Tahitian chestnut, breadfruit, jackfruit, guava, rose apple, Malay apple, cocoa, coffee, citrus, star apple and chilli.

LURE

Cue lure.

Bactrocera psidii (Froggatt)

SOUTH SEA GUAVA FRUIT FLY



Lateral thorax

small facial spots present or absent



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:
New Caledonia



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera psidii is similar to *B. obliqua* in possessing a black abdomen and thorax, infuscation on the r-m and dm-cu crossveins and a dark pattern on the scutellum. It differs in having a black triangle on the scutellum (instead of a band across it), longer vittae that end at the *a. sa.* setae, face fulvous with or without small facial spots, legs entirely pale, r-m cross vein shorter than dm-cu crossvein, and being cue lure responsive.

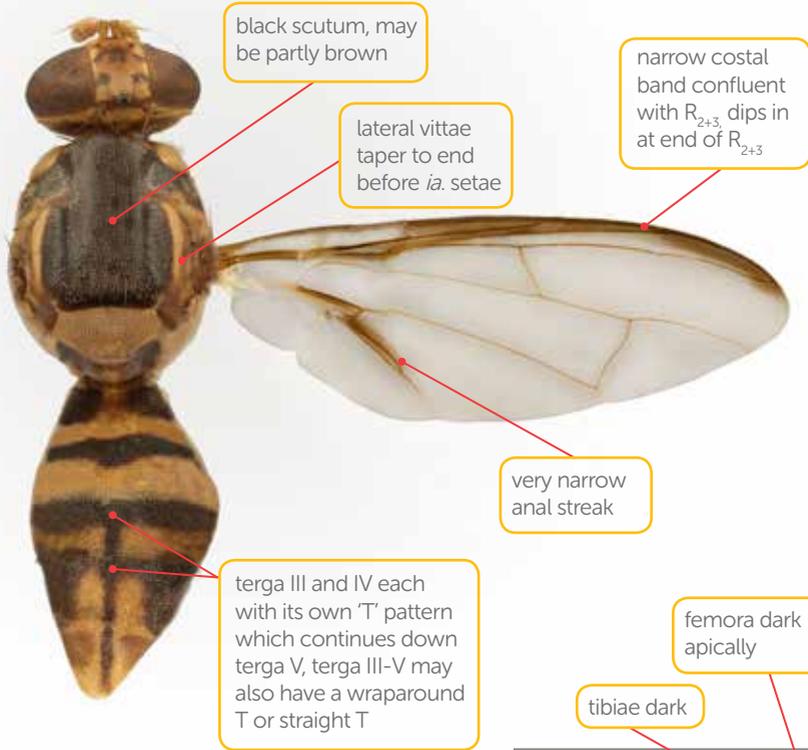
HOST RANGE

Polyphagous. Recorded on 31 hosts from 16 families including Anacardiaceae, Annonaceae, Caricaceae, Ebenaceae, Euphorbiaceae, Malpighiaceae, Moraceae, Myrtaceae, Oxalidaceae, Passifloraceae, Punicaceae, Rosaceae, Rutaceae and Vitaceae. Commercial hosts include mango, soursop, custard apple, papaya, persimmon, acerola, mulberry, guava, rose apple, Malay apple, carambola, granadilla and plum.

LURE

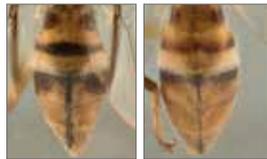
Cue lure.

Bactrocera pyrifoliae Drew and Hancock



femora dark apically

tibiae dark

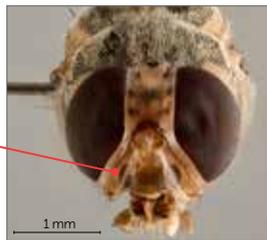


Abdominal variation



Fore, mid, hind legs

large facial spots



Head



Lateral thorax

DISTRIBUTION

ASIA:
Northern Thailand, northern Vietnam



SIMILAR SPECIES, HOST & LURE

Bactrocera pyrifoliae is similar to the Australian *B. endiandrae* in having a black scutum, tapered vittae and wraparound T on the abdomen. It differs in having large facial spots, a very narrow anal streak, a costal band that dips in at the end of $R_{2+3'}$, all tibiae dark, dark apices of the femora and sometimes having a double T on the abdomen.

SIMILAR SPECIES

HOST RANGE

Polyphagous. Recorded from seven hosts from five families including Myrtaceae and Rosaceae. Commercial hosts include guava, sour cherry, plum, peach and nashi pear.

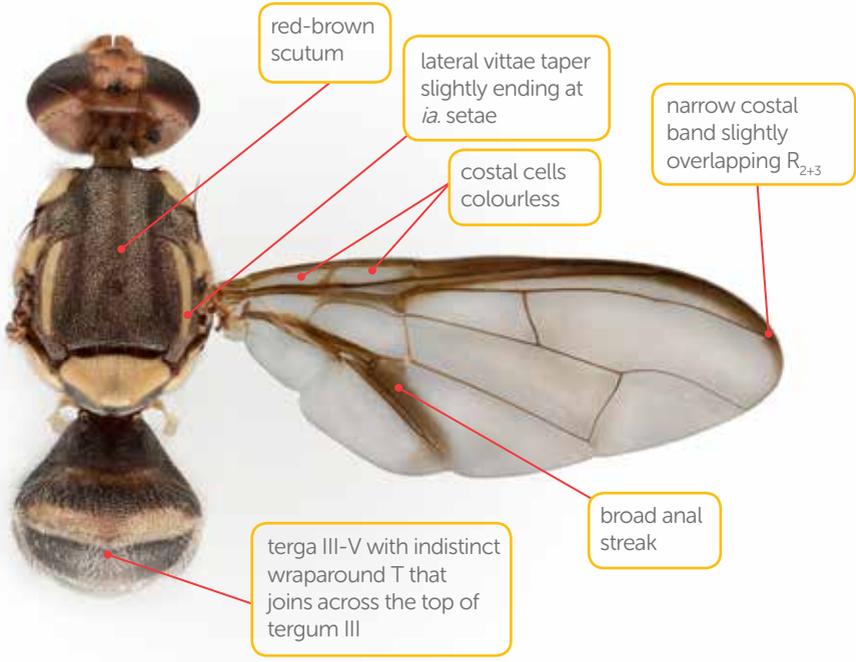
LURE

Possible weak response to cue lure (Drew and Romig 2013).

OTHER COMMENTS

Found only at elevations of 1,000–1,500m.

Bactrocera rufofuscula (Drew and Hancock)



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Torres Strait Islands, Cape York Peninsula, north Queensland south to Mackay



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to the exotic *B. trivialis* except it has a dark brown scutum (instead of black), and the lateral bands on the abdomen join narrowly across the top of tergum III (instead of broadly covering all of tergum III in *B. trivialis*).

Similar to the native *B. breviaculeus* except it is dark red-brown (instead of red-brown), the costal band overlaps R_{2+3} and the lateral bands join across the top of tergum III.

All molecular markers suggest close similarity to *B. breviaculeus*.

HOST RANGE

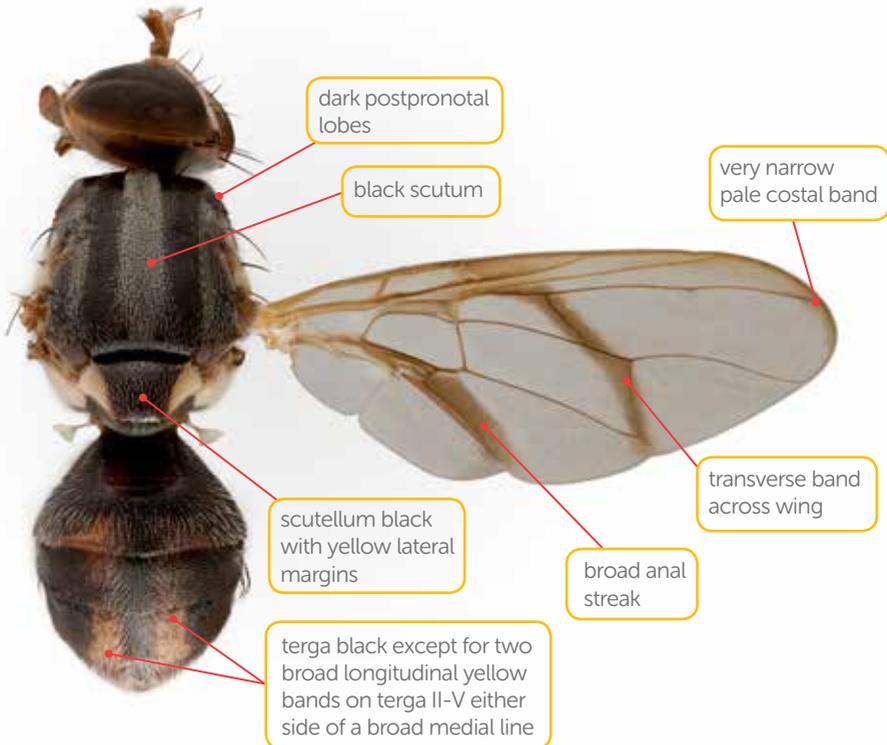
Polyphagous on native rainforest fruits (no economic hosts).
Recorded from seven hosts in four families.

LURE

Cue lure.

Bactrocera trilineola (Drew)

VANUATU FRUIT FLY

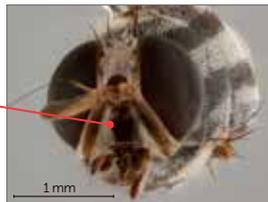


Scutum variation



Lateral thorax

face entirely black



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:
Vanuatu



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to other species in the *frauenfeldi* complex. It is similar to *B. frauenfeldi* and *B. albistrigata*, but differs in lacking vittae, having a black face, having a broad black band on the scutellum, it also differs from *B. albistrigata* in having dark postpronotal lobes.

It is similar to *B. kirki* but differs in having a distinct band on the wing, dark postpronotal lobes and a black face.

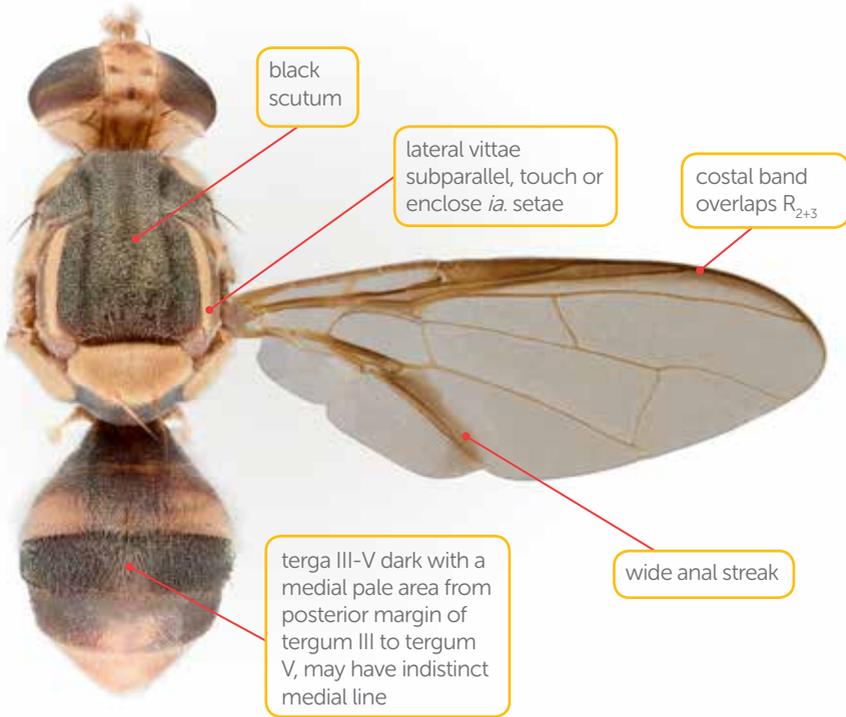
HOST RANGE

Polyphagous. Recorded on 31 hosts from 17 families including Anacardiaceae, Annonaceae, Caricaceae, Lauraceae, Moraceae, Musaceae, Myrtaceae, Oxalidaceae, Rutaceae and Sapindaceae. Commercial hosts include mango, soursop, avocado, breadfruit, guava, rose apple, Malay apple, carambola and citrus.

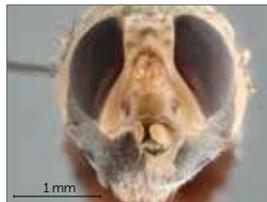
LURE

Cue lure.

Bactrocera trivialis (Drew)



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:
Papua New Guinea and West Papua



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *B. rufofuscula* and *B. breviaculeus* but differs in having a black scutum (instead of dark brown or red-brown) and the lateral bands broadly joining on tergum III.

HOST RANGE

Polyphagous. Recorded on 17 hosts from 10 families including Anacardiaceae, Myrtaceae, Oxalidaceae, Rosaceae, Rutaceae, and Solanaceae. Commercial hosts include mango, guava, carambola, peach, citrus and chilli.

LURE

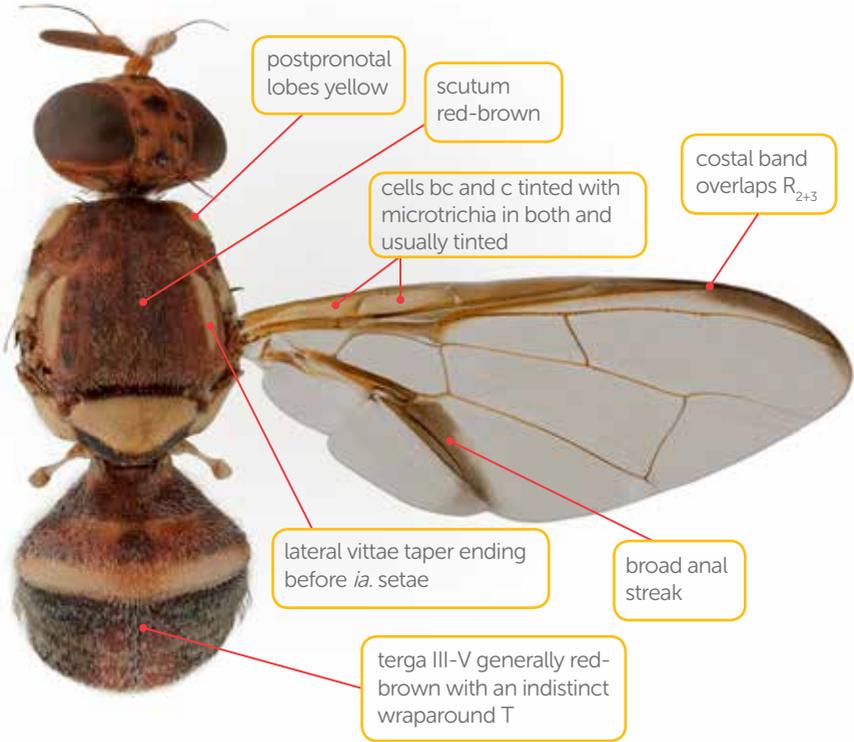
Cue lure.

OTHER COMMENTS

Seasonal incursions into the Torres Strait Islands from Papua New Guinea occur most years. These are promptly detected and eradicated under the Exotic Fruit Fly in Torres Strait Response Plan, jointly run by the federal and state agriculture departments. This response program has been successfully eradicating exotic pest fruit fly incursions for 20 years.

Bactrocera tryoni (Froggatt)

QUEENSLAND FRUIT FLY



Abdominal variation



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Northern Territory, Queensland, New South Wales and Victoria; New Caledonia, French Polynesia, Pitcairn Island



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

Similar to *B. aquilonis* but is overall red-brown instead of golden and has more of a wraparound T on the abdomen (instead of minimal markings). Similar to *B. neohumeralis* but has pale postpronotal lobes and is overall red-brown (instead of dark brown). Similar to *B. breviaculeus* but differs in having tinted costal cells with microtrichia in both and sharply tapering vittae that end before the *ia*. setae. Similar to *B. kraussi* but differs in having microtrichia in both costal cells, sharply tapered vittae, lacking a broad basal band on the scutellum, lacking lateral spots on tergum V and lacking dark apices of the femora.

All molecular markers distinguish *B. tryoni* from *B. breviaculeus* and *B. kraussi*; however, no markers separate *B. tryoni* complex species. COI barcodes suggest the Australian native *B. erubescens* to be very close to *B. tryoni*.

SIMILAR SPECIES

HOST RANGE

Polyphagous. Recorded from over 200 hosts in 49 families including Anacardiaceae, Annonaceae, Caricaceae, Curcubitaceae, Lauraceae, Moraceae, Musaceae, Myrtaceae, Oleaceae, Oxalidaceae, Passifloraceae, Rosaceae, Rubiaceae, Rutaceae, Sapotaceae, Solanaceae, and Vitaceae. Major commercial hosts include mango, custard apple, papaya, carambola, passionfruit, loquat, apple, peach, coffee, star apple, sapodilla, capsicum, chilli and tomato.

LURE

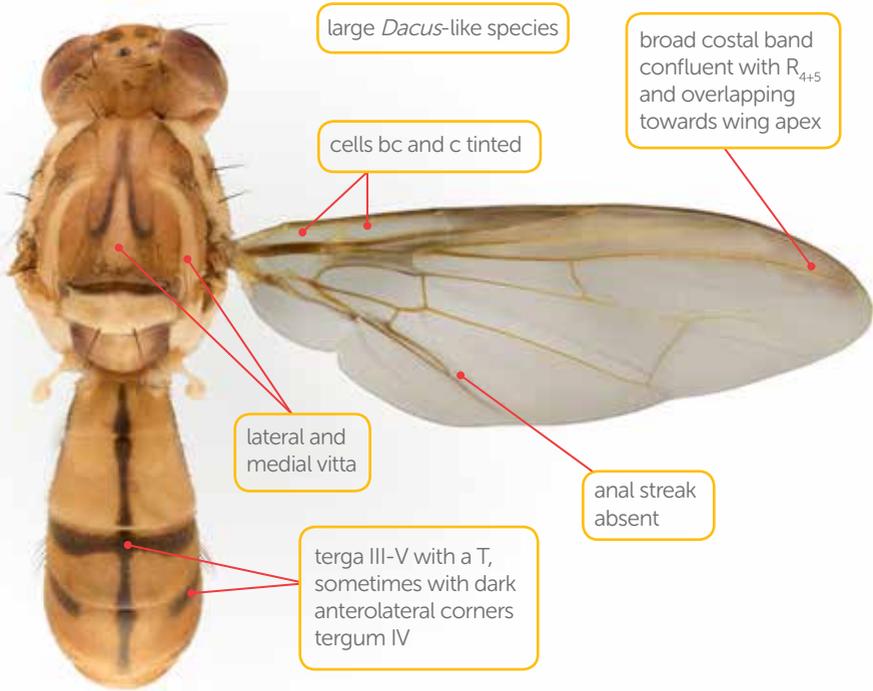
Cue lure. Melolure (raspberry ketone formate) was 1.5 times more attractive in north Queensland (Royer 2015) but was slightly less attractive in Sydney (Dominiak et al. 2015).

OTHER COMMENTS

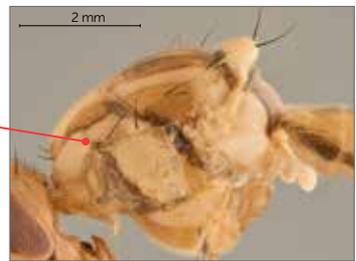
B. tryoni was accidentally introduced into New Caledonia around 1969 and detected in French Polynesia in 1970. It has become a dominant pest in both places.

Bactrocera tsuneonis (Miyake)

CITRUS FRUIT FLY

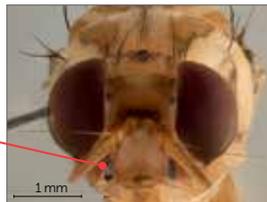


yellow band connecting postpronotal lobe and notopleuron



Lateral thorax

oval facial spots



Head



Fore, mid, hind legs

DISTRIBUTION

ASIA:
Japan, southern China, Taiwan



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES
Bactrocera tsuneonis is similar to *B. minax* in general body shape and colour patterns but differs in having a complete joining band between the postpronotal lobes and notopleuron, possessing *a.sa.* setae, having a narrower costal band that is mostly confluent with R_{4+5} and lacking a dark apical spot on the costal band.

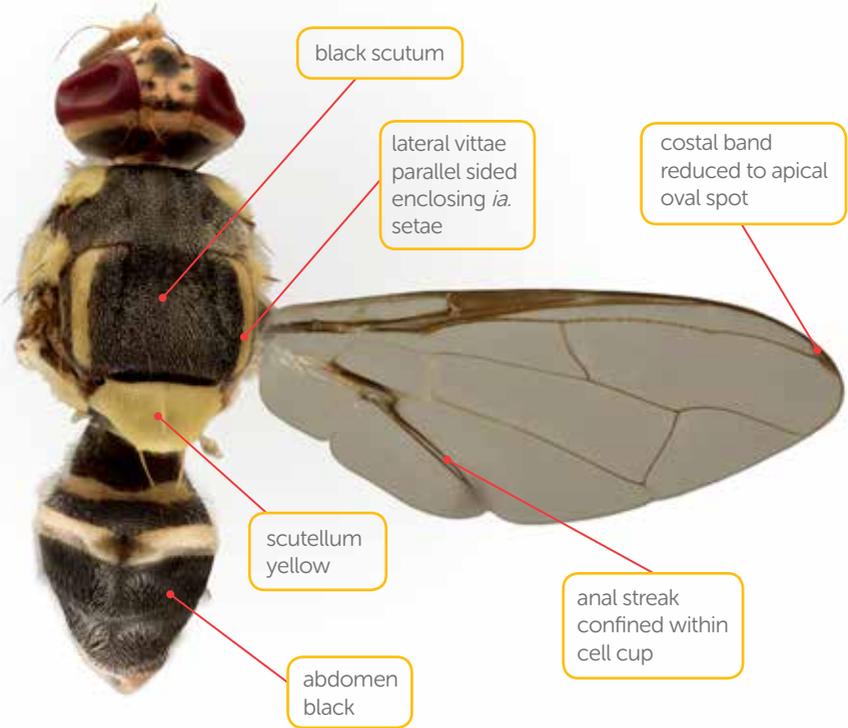
HOST RANGE

Oligophagous. Recorded on nine hosts in Rutaceae, all *Citrus* and *Fortunella* species. Commercial hosts include orange, mandarin, tangerine and cumquat.

LURE

No known record.

Bactrocera tuberculata (Bezzi)



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

ASIA:

Bhutan, Myanmar, southern China, Thailand, Vietnam, Bangladesh



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera tuberculata is similar to *B. correcta* and *B. oleae* in possessing an incomplete costal band that is reduced to an apical elongate spot and black scutum. It differs from *B. correcta* in having a black abdomen, and from *B. oleae* in having lateral vittae and a black abdomen.

HOST RANGE

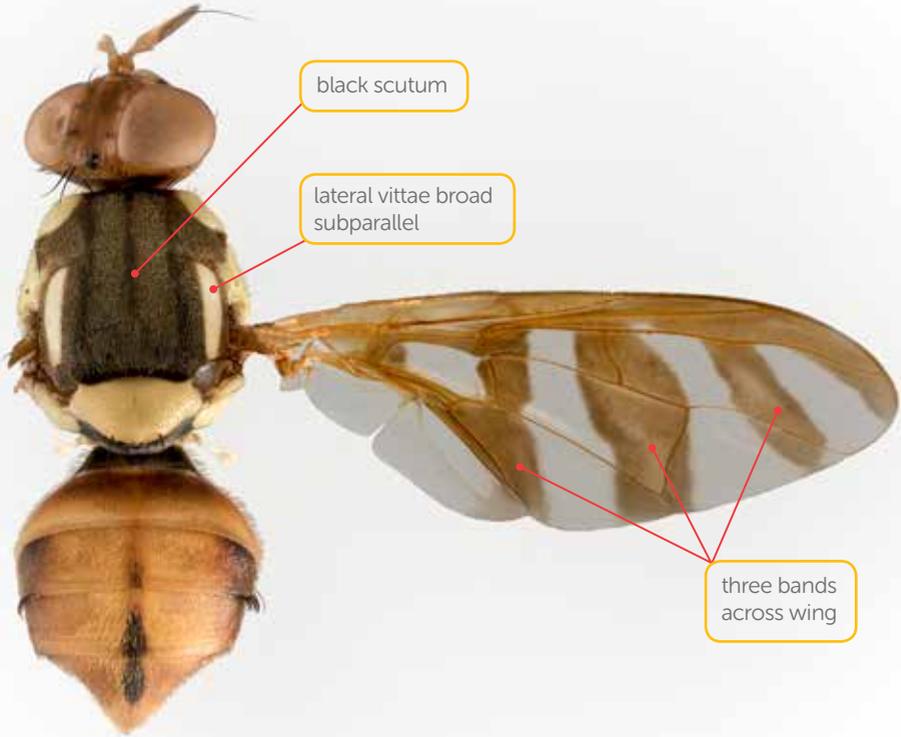
Polyphagous. Recorded on 11 hosts from eight families, including Anacardiaceae, Caricaceae, Myrtaceae and Sapotaceae. Commercial hosts include mango, papaya, wax jambu, peach and sapodilla.

LURE

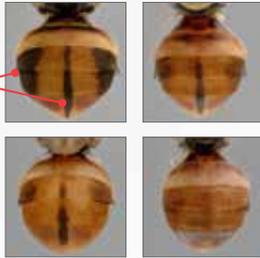
Methyl eugenol.

Bactrocera umbrosa (Fabricius)

BREADFRUIT FRUIT FLY



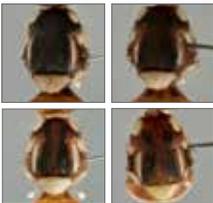
terga III-V vary from having no markings to having a short medial line to having a medial line and two broad lateral bands



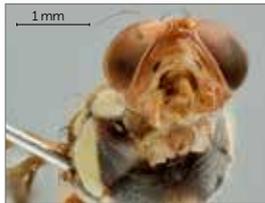
Abdominal variation



Lateral thorax



Scutum variation



Head



Fore, mid, hind legs

DISTRIBUTION

ASIA:

Malaysia, southern Thailand, Philippines, Indonesia

OCEANIA/PACIFIC ISLANDS:

Palau, Papua New Guinea, Solomon Islands, Vanuatu, New Caledonia

SIMILAR SPECIES,
HOST & LURE

SIMILAR SPECIES

Bactrocera umbrosa bears no close resemblance to other species. It is easily recognised by the three broad transverse bands across the wings. However, there are other PNG non-pest methyl eugenol-responsive species that have bands on the wings and similar pattern on the abdomen that may superficially appear similar e.g. *B. seguyi* and *B. confluens*.

HOST RANGE

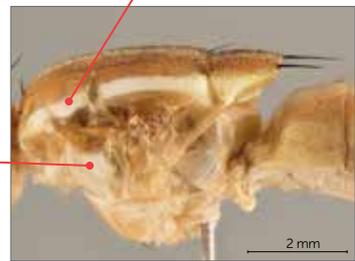
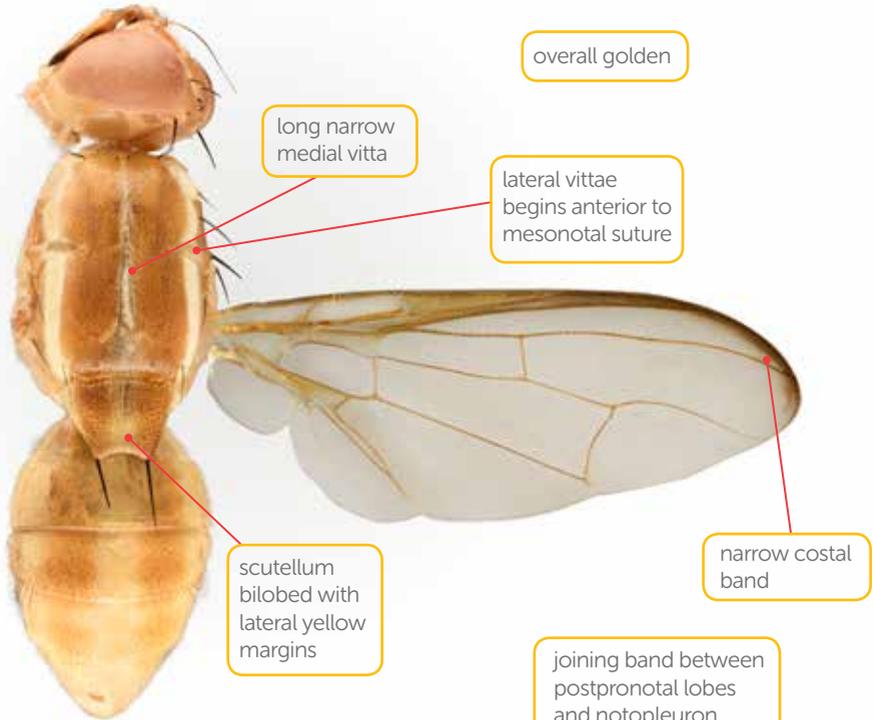
Oligophagous. Recorded on four hosts in Moraceae including breadfruit, jackfruit and chempadək.

LURE

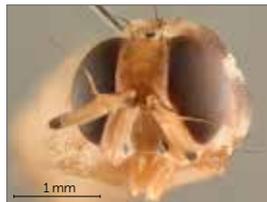
Methyl eugenol.

Bactrocera xanthodes (Broun)

PACIFIC FRUIT FLY



Lateral thorax



Head

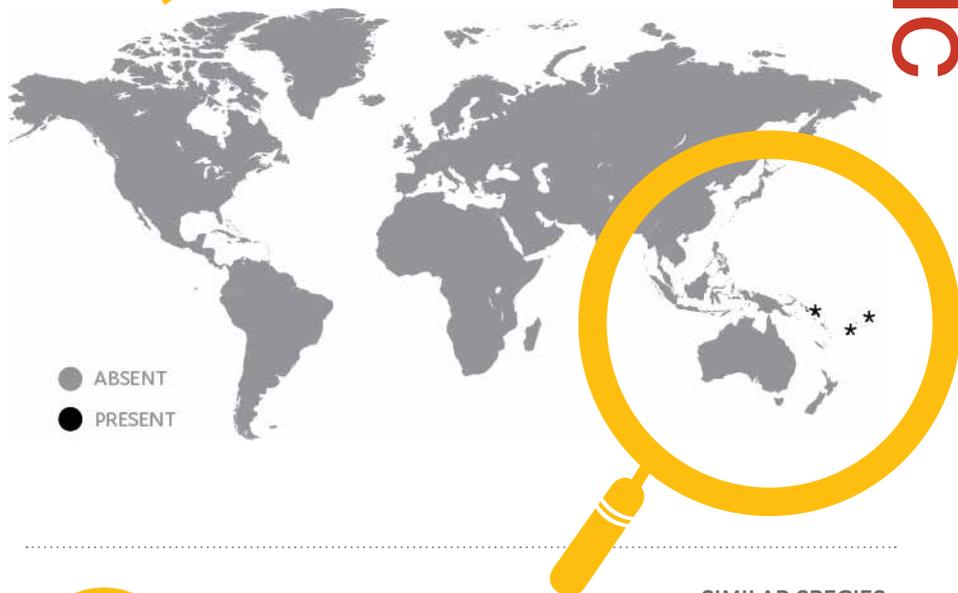


Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Fiji, Tonga, Niue, Samoa, American Samoa, southern group of Cook Islands, Wallis and Futuna, French Polynesia



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Bactrocera xanthodes is unique in having a medial vitta, joining band between the postpronotal lobe and notopleuron and a large bilobed scutellum. It is similar to the other species in the *Notodacus* subgenus (*B. neoxanthodes*, *B. paraxanthodes* and *B. (N.)* undescribed species) which are not pests and have limited distributions (Vanuatu, New Caledonia and Samoa respectively).

HOST RANGE

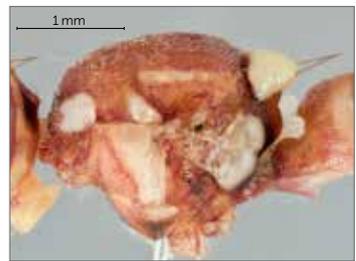
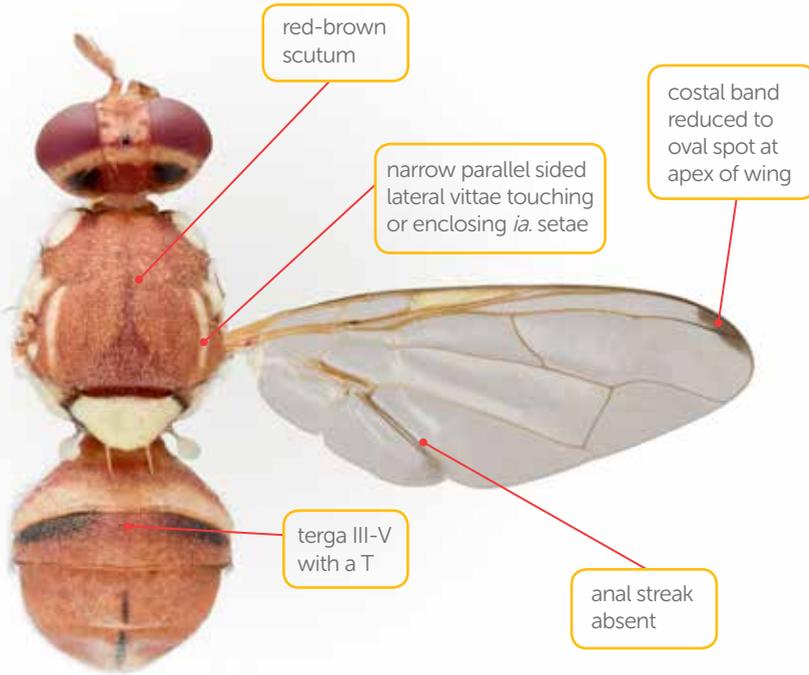
Polyphagous. Recorded on 34 hosts in 20 families including Anacardiaceae, Annonaceae, Caricaceae, Euphorbiaceae, Lauraceae, Moraceae, Passifloraceae, Rutaceae, Sapotaceae and Solanaceae. Commercial hosts include mango, custard apple, papaya, breadfruit, jackfruit, citrus, star apple and abiu.

LURE

Methyl-isoeugenol (significantly more attractive than its previous known lure, methyl eugenol) (Royer et al. 2018).

Bactrocera zonata (Saunders)

PEACH FRUIT FLY



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

ASIA:

Pakistan, Bhutan, Nepal, Sri Lanka, India, Bangladesh, Thailand, Vietnam, Laos, Myanmar

AFRICA:

Mauritius, Egypt, Sudan, Libya, Réunion Island

MIDDLE EAST:

UAE, Iran, Iraq, Israel, Oman, Yemen



SIMILAR SPECIES, HOST & LURE

Similar to *B. correcta* but has a red-brown scutum (instead of black or partly black). Similar to *B. pallida* but has an incomplete costal band reduced to an oval apical spot and anal streak restricted to cup. Similar to *B. jarvisi* but has an incomplete costal band and no joining band between the postpronotal lobe and notopleuron.

All tested molecular markers clearly separate *B. zonata* from *B. tryoni* and *B. correcta*.

SIMILAR SPECIES

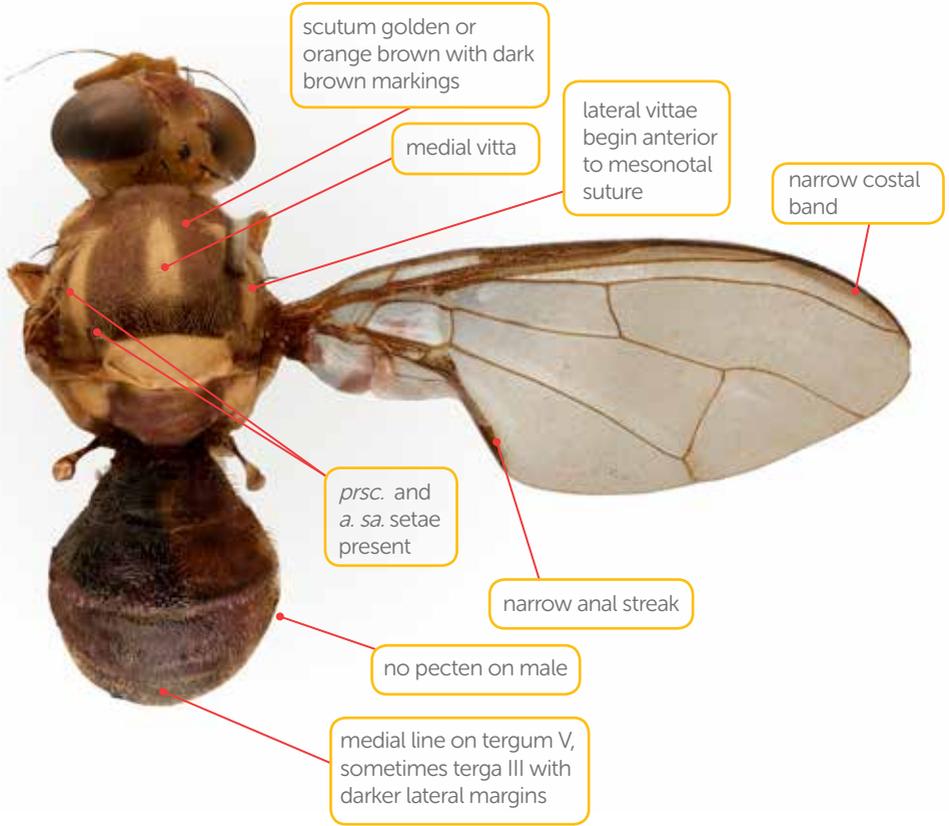
HOST RANGE

Polyphagous. Recorded on 20 hosts from 15 families including Anacardiaceae, Annonaceae, Caricaceae, Malpighiaceae, Malvaceae, Myrtaceae, Rosaceae and Rutaceae. Commercial hosts include mango, custard apple, papaya, acerola, okra, guava, rose apple, apple and peach.

LURE

Methyl eugenol.

Zeugodacus atrisetosus Perkins



Head



Lateral thorax

DISTRIBUTION

OCEANIA:

Papua New Guinea mainland, particularly higher altitudes



- ABSENT
- PRESENT

SIMILAR SPECIES, HOST & LURE

Very similar to the Australian *Z. cucumis*, but differs in having *prsc.* and *a. sa. setae*.

SIMILAR SPECIES

HOST RANGE

Polyphagous. Recorded on eight hosts from three families including Cucurbitaceae and Solanaceae. Commercial hosts include watermelon, cucumber, pumpkin, bitter melon and edible *Luffa*.

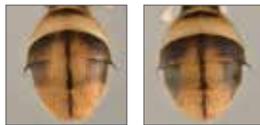
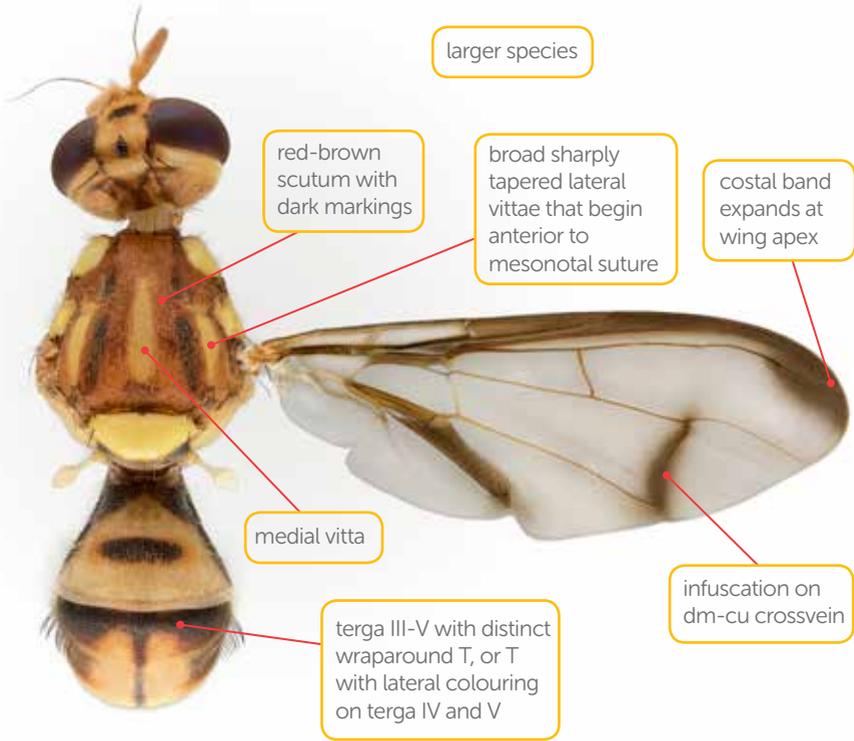
LURE

No known record. Protein or orange ammonia traps are the only alternative to fruit rearing.

OTHER COMMENTS

Previously known as *Bactrocera (Austrodacus) atrisetosa* in the *Zeugodacus* group of subgenera (Hancock and Drew 2015) until Virgilio et al. (2015) elevated *Zeugodacus* to generic level. Now known as *Zeugodacus (Austrodacus) atrisetosa*. For a full list of *Zeugodacus* species see Doorenweerd et al. (2018).

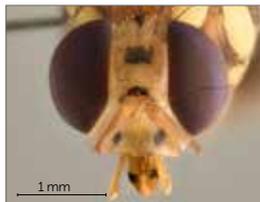
Zeugodacus choristus May



Abdominal variation



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: eastern Queensland and Papua New Guinea



- ABSENT
- PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to the exotic *Z. cucurbitae* but differs in being more red-brown (rather than golden), having wider medial and lateral vittae, having the costal band expanding less apically (not into a semicircle) and not having a faint infuscation on the r-m vein.

HOST RANGE

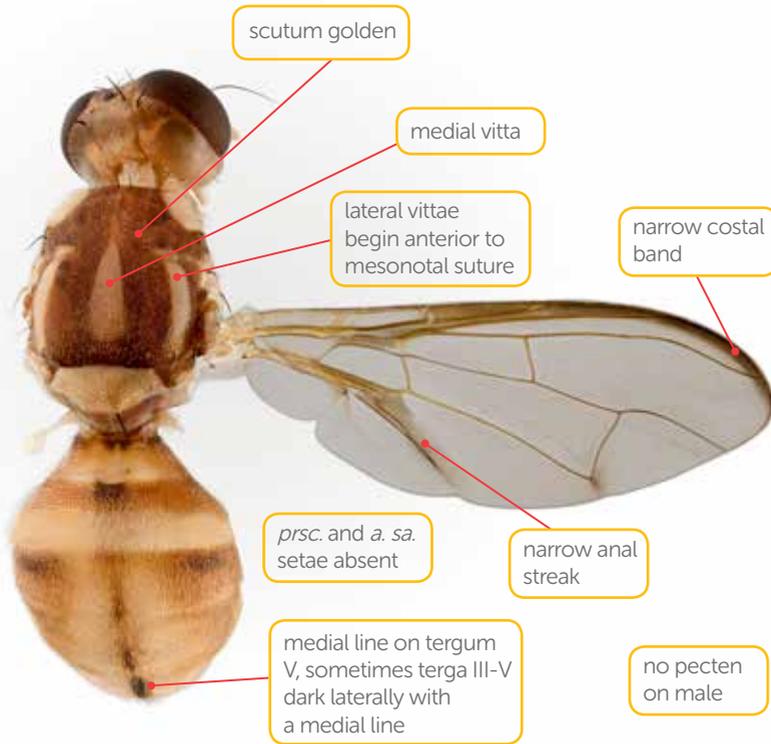
Monophagous on *Diplocyclos palmatus* (striped cucumber) in Cucurbitaceae.

LURE

Cue lure.

Zeugodacus cucumis (French)

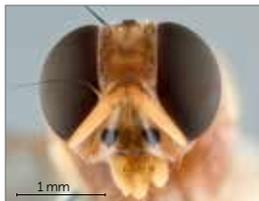
CUCUMBER FRUIT FLY



Abdominal variation



Lateral thorax



Head

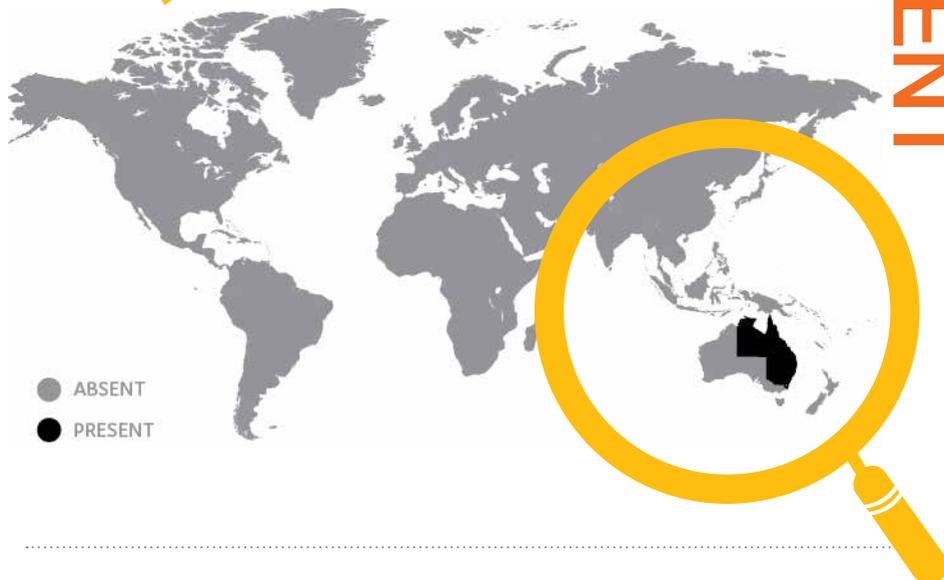


Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Northern Territory, Queensland including Torres Strait Islands, northeast New South Wales



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to the exotic *Z. atrisetosus* but differs in lacking *prsc.* and *a. sa.* setae.

HOST RANGE

Polyphagous. Recorded from 40 hosts in 15 families including the families Caricaceae, Curcubitaceae, Myrtaceae, Passifloraceae, and Solanaceae, although many recorded hosts are single records and may require confirmation. Major commercial hosts include papaya, cucumber, pumpkin, squash, zucchini, guada bean, passionfruit and tomato.

LURE

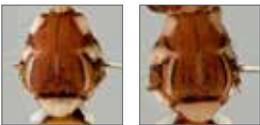
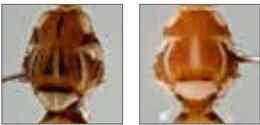
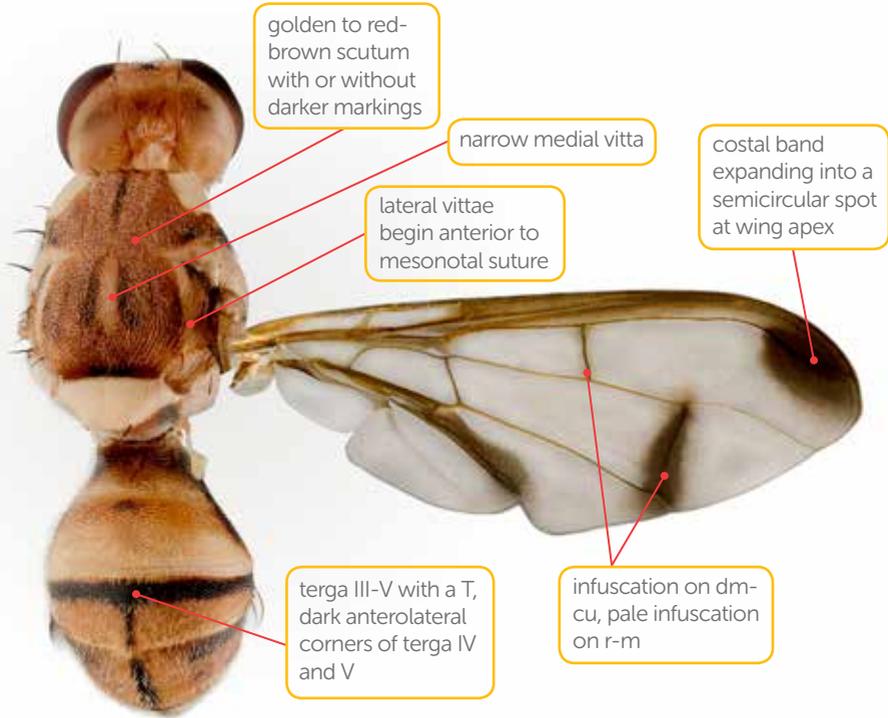
No known attraction to male lures, although sporadically trapped at cue lure. Cucumber volatile blend was found to generally be more attractive to both sexes than orange-ammonia or protein traps (Ceratrap) (Royer et al. 2014).

OTHER COMMENTS

Previously known as *Bactrocera (Austrodacus) cucumis* in the *Zeugodacus* group of subgenera (Drew 1989) until Virgilio et al. (2015) elevated *Zeugodacus* to generic level. For a full list of *Zeugodacus* species see Doorenweerd et al. (2018).

Zeugodacus cucurbitae (Coquillett)

MELON FLY



Scutum variation



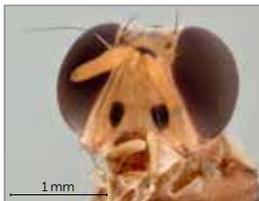
Abdominal variation



Lateral thorax



Wing variation



Head



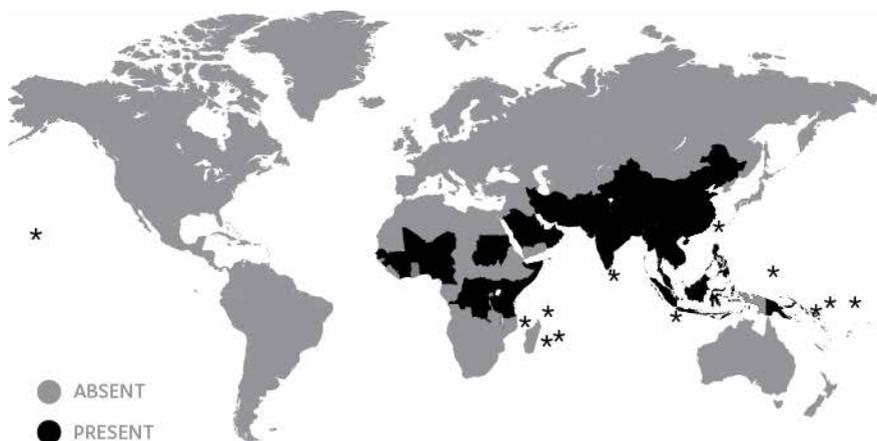
Fore, mid, hind legs

DISTRIBUTION

ASIA: Widely distributed over Asia through the Indian subcontinent, Southeast Asia and southern China

AFRICA: Occurs in a number of sub-Saharan countries

OCEANIA: Papua New Guinea, Mariana Islands, Solomon Islands, Nauru, Kiribati, Guam, Hawaii



SIMILAR SPECIES, HOST & LURE

Similar to *Z. choristus* but differs in being more golden, having narrower medial and lateral vittae, having a more semicircular spot at the wing apex, sometimes having a faint infuscation on the r-m cross vein and having a less defined narrower T on the abdomen.

All tested molecular markers clearly separate *Z. cucurbitae* and *Z. choristus*.

SIMILAR SPECIES

HOST RANGE

Polyphagous. Primarily a pest of cucurbits but recorded on 44 hosts from 12 families including Cucurbitaceae, Fabaceae, Malvaceae, Myrtaceae and Solanaceae. Main commercial hosts include watermelon, rockmelon, cucumber, pumpkin, bitter melon, edible *Luffa*, ivy gourd, wax gourd, bean and tomato.

LURE

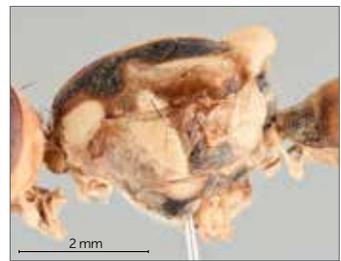
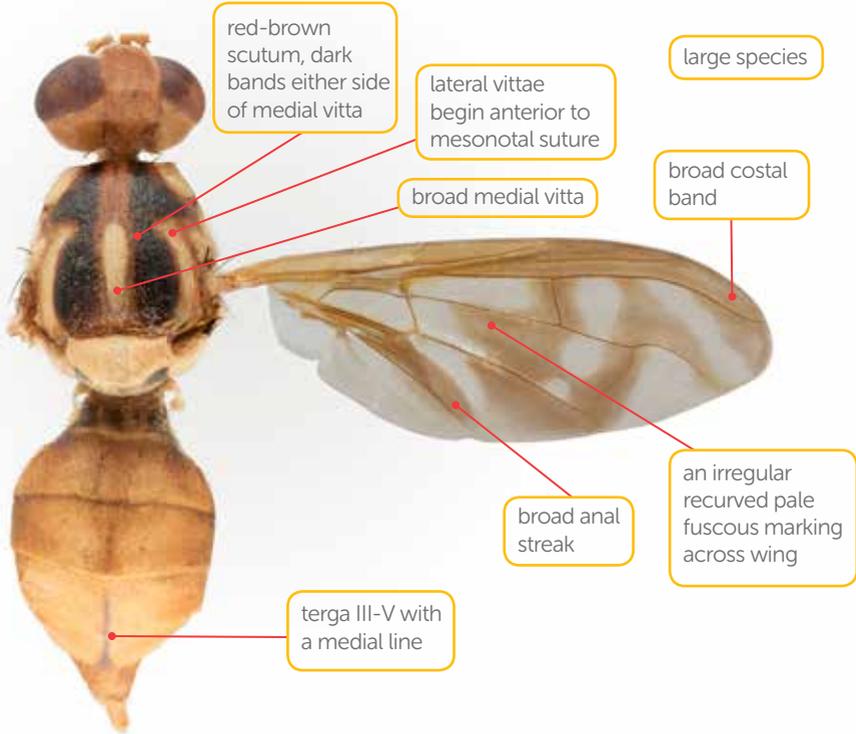
Cue group. Melolure (raspberry ketone formate) was found to be a stronger attractant than cue lure in Hawaii (Casana-Giner et al. 2003).

OTHER COMMENTS

Previously known as *Bactrocera* (*Zeugodacus*) *cucurbitae* until Virgilio et al. (2015) elevated *Zeugodacus* to generic level. Now known as *Zeugodacus* (*Zeugodacus*) *cucurbitae*. For a full list of *Zeugodacus* species see Doorenweerd et al. (2018).

Zeugodacus decipiens (Drew)

PUMPKIN FRUIT FLY



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

ASIA:

Papua New Guinea (New Britain)



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Distinctive in having a medial vitta and recurved pattern on the wings.

HOST RANGE

Monophagous on pumpkin *Cucurbita pepo* (Cucurbitaceae).

LURE

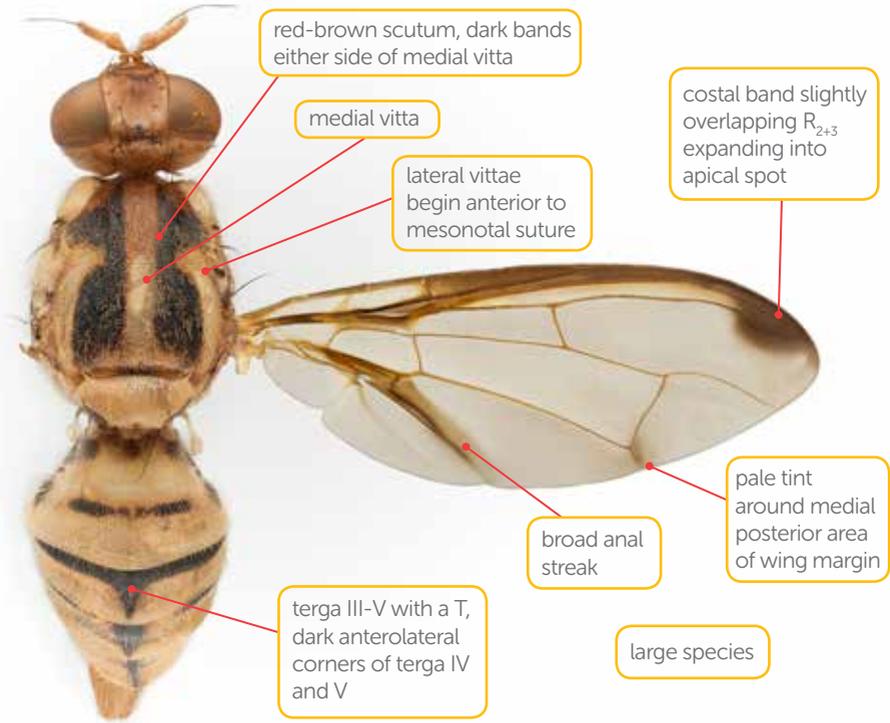
No known male attractant. Responds to Ceratrap protein traps placed within pumpkin crops (Royer et al. 2017).

OTHER COMMENTS

Zeugodacus decipiens larvae can co-exist in pumpkin with melon fly larvae (*Zeugodacus cucurbitae*) but its rate of development is much slower.

Previously known as *Bactrocera (Paradacus) decipiens* in the *Zeugodacus* subgenus group until *Zeugodacus* was elevated to genus level by Virgilio et al. (2015). Now known as *Zeugodacus (Paradacus) decipiens*. For a full list of *Zeugodacus* species see Doorenweerd et al. (2018).

Zeugodacus depressus (Shiraki)



Wing variation



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

ASIA:
Taiwan, Japan, Korea, China



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *Zeugodacus tau* except has pale tint around medial posterior area of wing margin, and all leg segments pale.

HOST RANGE

Oligophagous. Recorded from nine hosts in two families including Cucurbitaceae and Solanaceae. Commercial hosts include watermelon, cucumber, pumpkin and tomato.

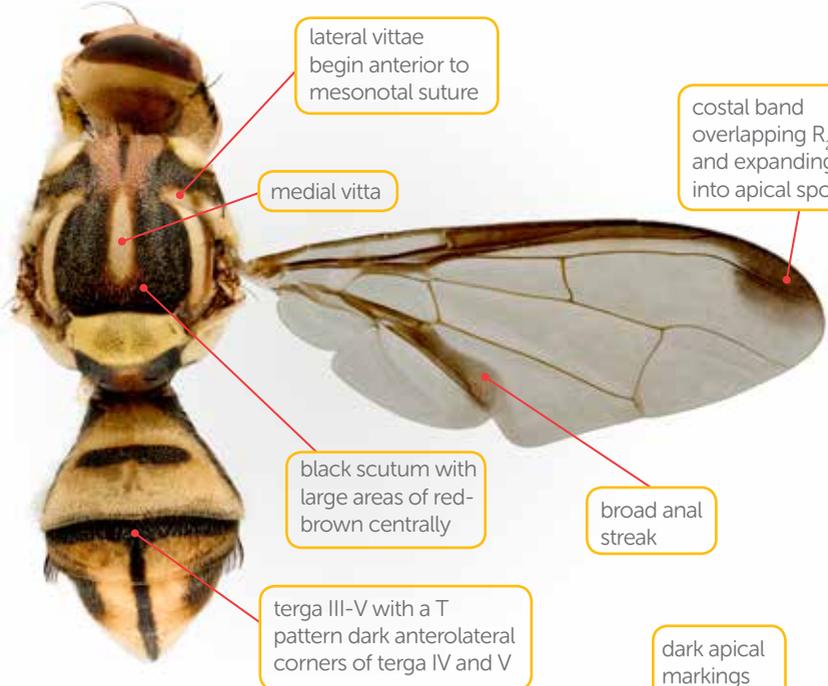
LURE

No known male attractant.

OTHER COMMENTS

Previously known as *Bactrocera (Zeugodacus) depressa* until *Zeugodacus* was elevated to genus level by Virgilio et al. (2015). Now known as *Zeugodacus (Zeugodacus) depressus*. For a full list of *Zeugodacus* species see Dooreenweerd et al. (2018).

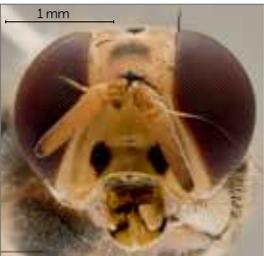
Zeugodacus tau (Walker)



Leg variation



Fore, mid, hind legs



Head



Scutum variation

Abdominal variation



Lateral thorax

DISTRIBUTION

ASIA:

India, Sri Lanka, Bangladesh, Bhutan, Vietnam, southern China, Taiwan, Thailand, Cambodia, Philippines, Laos, Peninsular Malaysia, Singapore, East Malaysia, Brunei, Indonesia



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *Z. depressus* except is smaller, has dark tibia and femora with dark markings apically. The *Z. tau* complex contains several other similar species.

HOST RANGE

Polyphagous, but primarily a pest of cucurbits. Recorded on 34 hosts from nine families including Curcubitaceae and Myrtaceae. Commercial hosts include wax gourd, watermelon, rockmelon, cucumber, pumpkin, edible *Luffa*, bitter melon and guava.

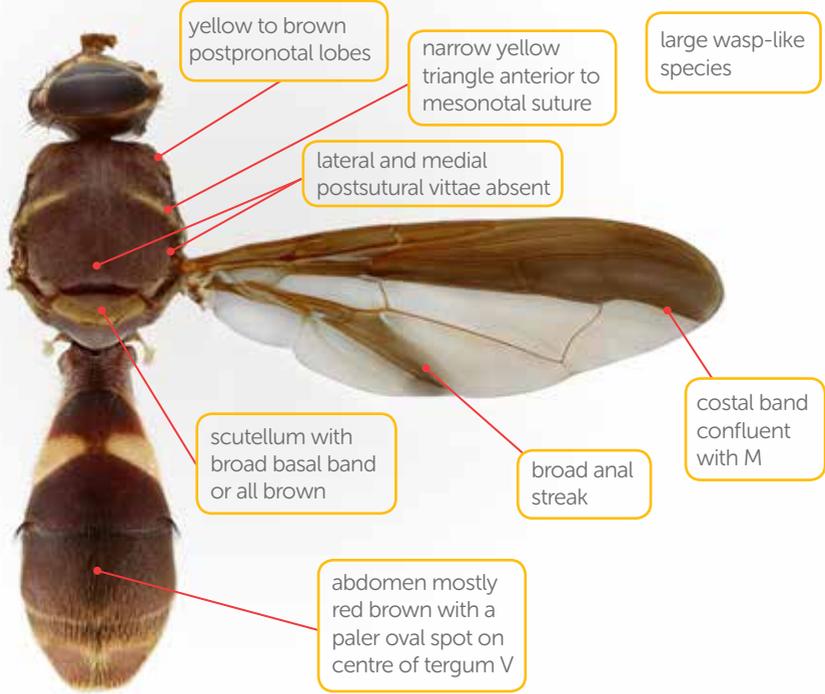
LURE

Cue lure.

OTHER COMMENTS

Previously known as *Bactrocera (Zeugodacus) tau* until *Zeugodacus* was elevated to genus level by Virgilio et al. (2015). Now known as *Zeugodacus (Zeugodacus) tau*. For a full list of *Zeugodacus* species see Dooreenweerd et al. (2018).

Dacus aequalis (Coquillet)



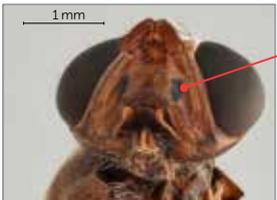
Abdominal variations



Scutum variation



Lateral thorax



Head

large elongate facial spots

all femora and tibiae dark



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Queensland, New South Wales, Australian Capital Territory



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *D. longicornis* and *D. solomenensis* but differs in having the costal band equal to the M vein (instead of midway between R_{4+5} and M). Similar to *D. absonifacies* but differs in having the hind femora all red-brown (instead of pale basally).

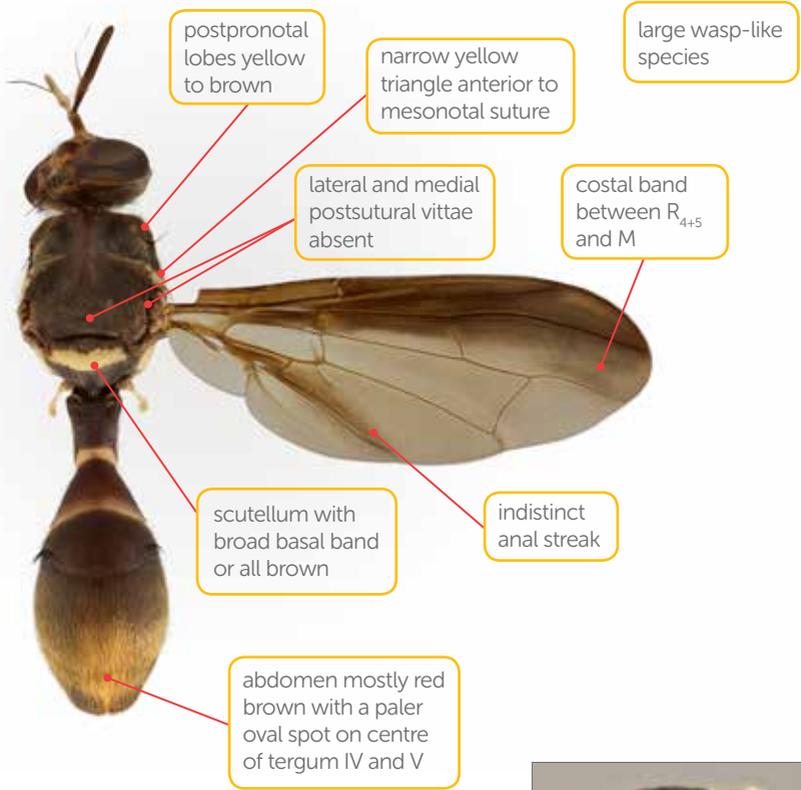
HOST RANGE

Monophagous on *Marsdenia rostrata* (Asclepiadaceae).

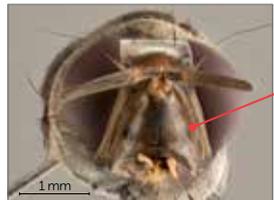
LURE

Cue lure.

Dacus axanus (Hering)



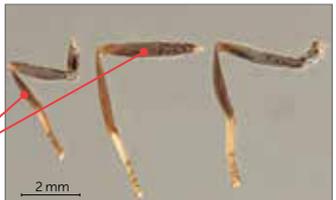
Lateral thorax



Head

irregularly round facial spots

all femora and tibiae dark



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Torres Strait Islands and Queensland south to Gladstone; Papua New Guinea; Indonesia (Moluccas and Timor)



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to the exotic *D. longicornis*, but differs in having an anal streak, not having mid femora pale basally.

Similar to the exotic *D. solomonensis* but differs in having dark postpronotal lobes, not having a protrusion on tergum V, and having a less elongated abdomen.

Morphologically similar to *D. longicornis*, but clearly differentiated using COI barcodes.

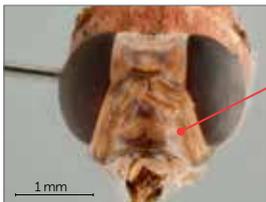
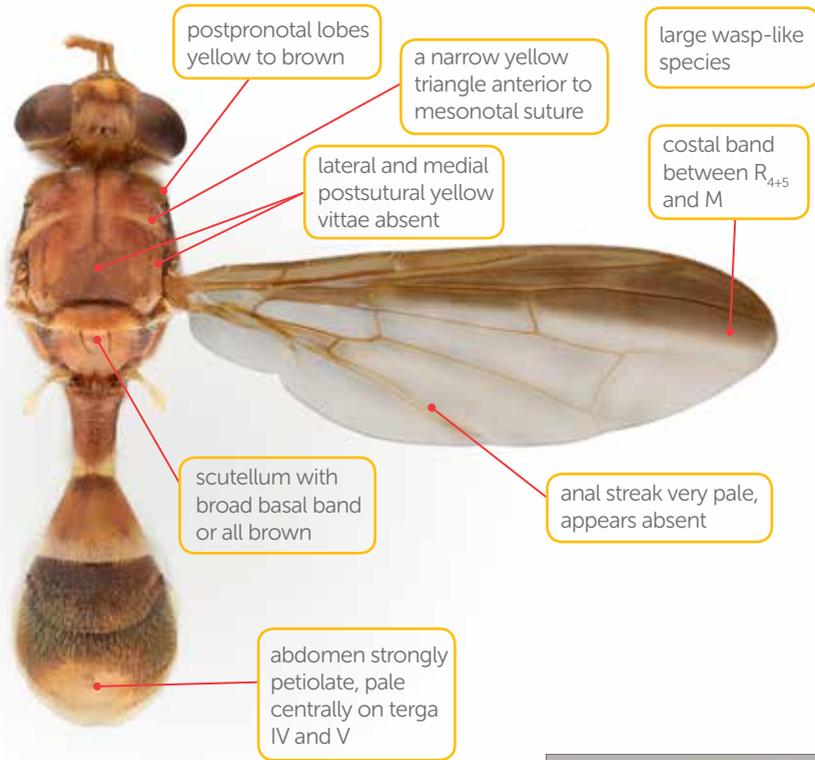
HOST RANGE

Oligophagous. Recorded on three hosts from Cucurbitaceae (*Luffa acutangulata*, *L. cylindrica* and *Trichosanthes anguina* [guada bean]).

LURE

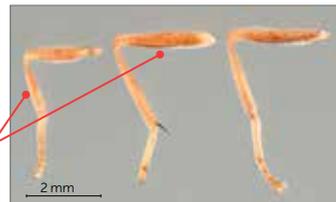
Cue lure.

Dacus longicornis (Wiedemann)



very small irregularly round facial spots

all femora and tibiae dark, except mid femora pale on basal 1/4



Head

Fore, mid, hind legs

DISTRIBUTION

ASIA:

Indonesia, Malaysia, Brunei, Laos, Myanmar, Thailand, China, Philippines, India, Bhutan, Vietnam, Bangladesh



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to the Australian *D. axanus*, but differs in having no discernible anal streak, usually smaller facial spots and having the mid femora pale basally. Similar to the exotic *D. solomonensis* but differs in not having a protrusion on tergum V and having a less elongate abdomen, and narrower triangles anterior to the mesonotal suture.

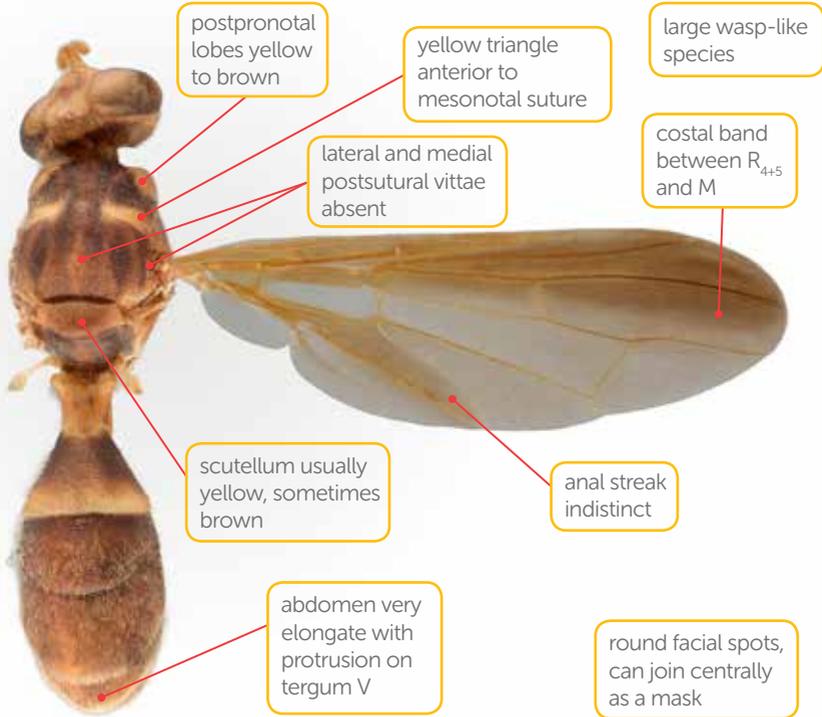
HOST RANGE

Oligophagous. Recorded on four hosts in Cucurbitaceae, including the Asian vegetables *Luffa acutangula*, *L. aegyptica* and *Trichosanthes cucumerina*.

LURE

Cue lure.

Dacus solomonensis (Malloch)



Abdominal variation



Lateral thorax



Head



Scutum variation



Fore, mid, hind legs



Abdomen lateral

DISTRIBUTION

OCEANIA:

Papua New Guinea (Bougainville) and Solomon Islands



- ABSENT
- PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *D. longicornis* and *D. axanus* except has a protrusion on tergum V, a longer oval abdomen, and broader triangles anterior to the mesonotal suture.

HOST RANGE

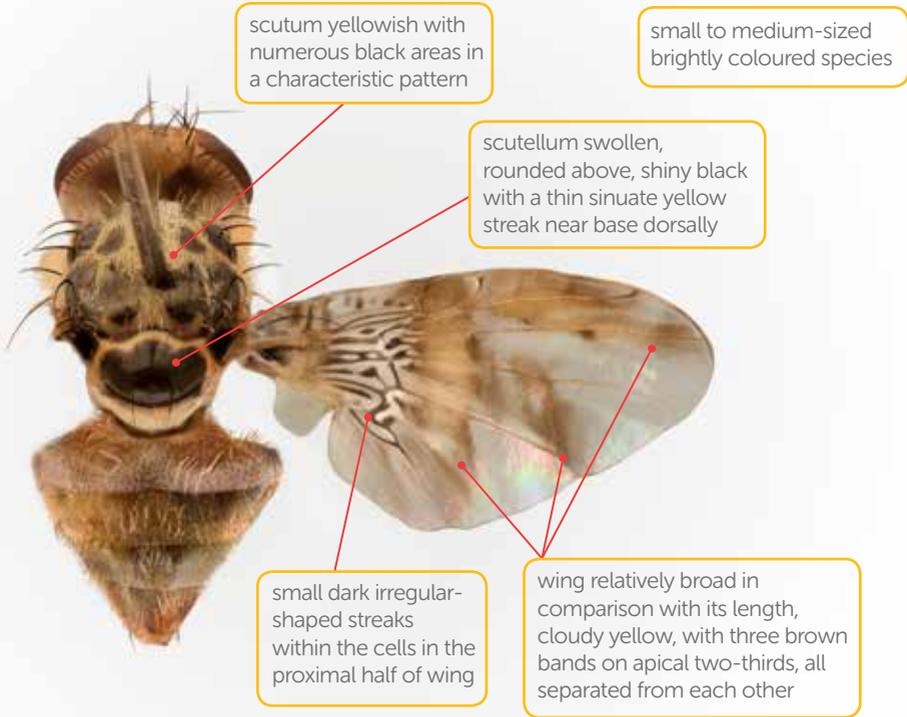
Oligophagous. Recorded from five hosts in Cucurbitaceae, including pumpkin, cucumber and edible *Luffa*.

LURE

Cue lure.

Ceratitis capitata (Wiedemann)

MEDITERRANEAN FRUIT FLY



Head



Lateral thorax



Wing



Abdomen



Fore, mid, hind legs

DISTRIBUTION

AFRICA: Widespread

EUROPE: Southern Europe

MIDDLE EAST: Iran, Iraq, Israel, Jordan, Lebanon, Saudi Arabia, Syria, Turkey, Yemen

OCEANIA: Hawaii and Western Australia

THE AMERICAS: Variably widespread or restricted in Central America (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama) and South America (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela)



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Easily separated from other members of the family.

HOST RANGE

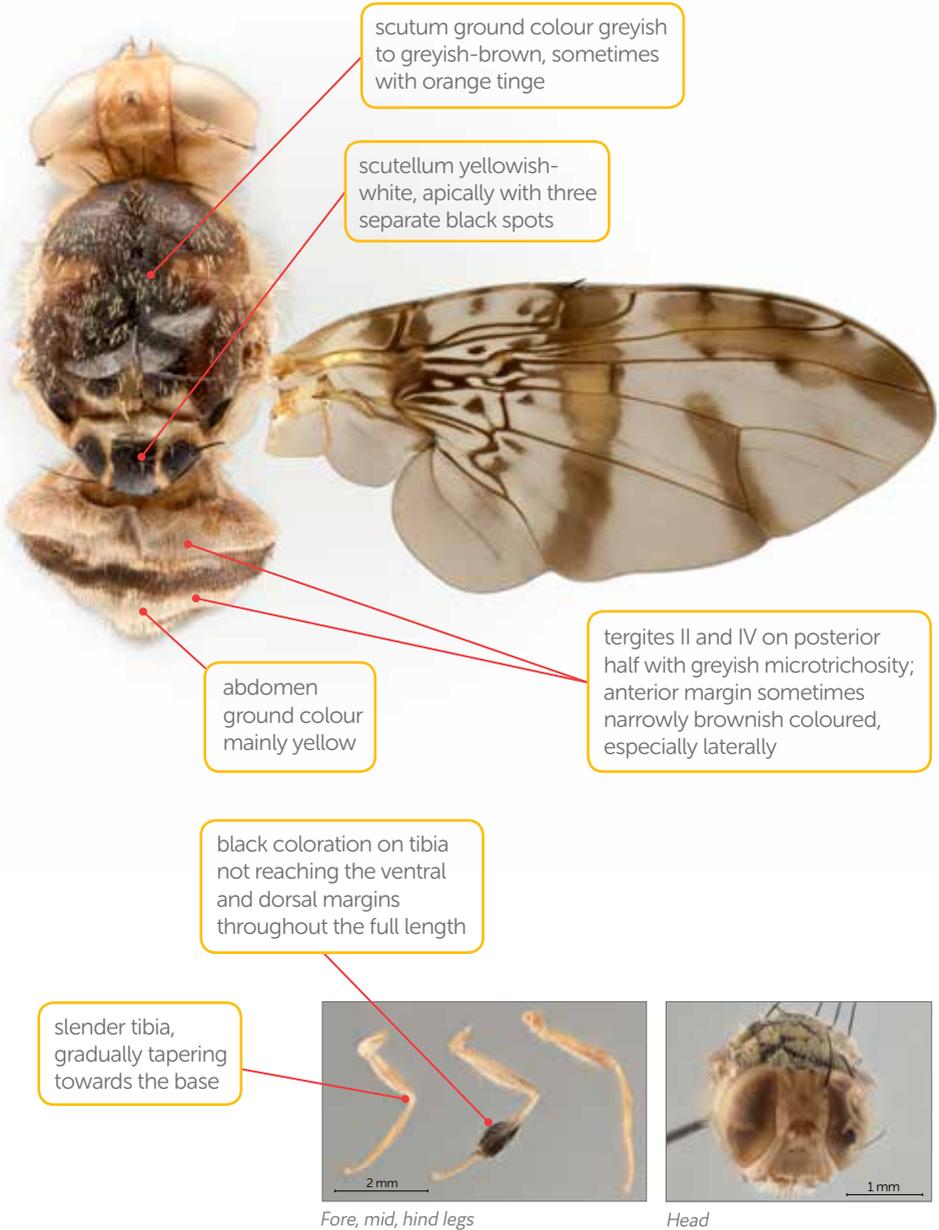
Polyphagous including the families Anacardiaceae, Annonaceae, Apocynaceae, Arecaceae, Cactaceae, Caricaceae, Clusiaceae, Combretaceae, Ebenaceae, Juglandaceae, Lauraceae, Lythraceae, Malpighiaceae, Malvaceae, Muntingiaceae, Myrtaceae, Passifloraceae, Rosaceae, Rubiaceae, Rutaceae, Santalaceae, Sapindaceae, Sapotaceae, Solanaceae and Vitaceae.

LURE

Trimedlure/capilure and terpinyl acetate. Also attracted to EGO lure which appears to be more powerful than trimedlure.

Ceratitis quilicii (De Meyer, Mwatawala & Virgilio)

CAPE FRUIT FLY



DISTRIBUTION

AFRICA:

Botswana, Kenya, Malawi, South Africa, Swaziland, Tanzania, Zimbabwe, Réunion Island

Due to the recent distinction of *C. quilicii* as a separate species from *C. rosa*, these distributions may require further resolution as more knowledge is gained of each species' true geographic range



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Morphologically similar to *C. rosa*: these are inseparable using COI barcodes. Differs from *C. rosa* in arrangement of setae on the male mid-tibial comb.

HOST RANGE

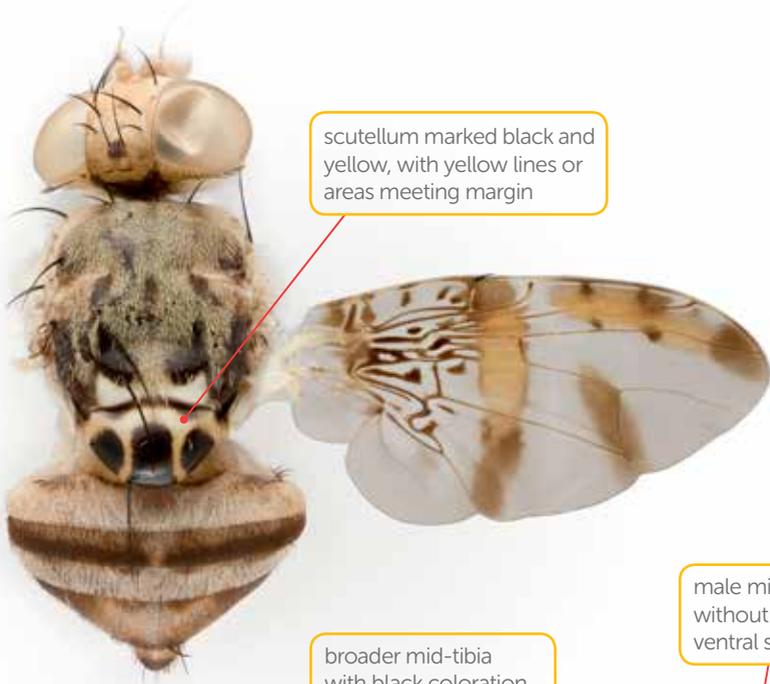
Polyphagous including Myrtaceae, Rosaceae, Rubiaceae and Sapotaceae.

LURE

Capilure. Also attracted to EGO lure which appears to be more powerful than trimmed lure.

Ceratitis rosa (Karsch)

NATAL FRUIT FLY



scutellum marked black and yellow, with yellow lines or areas meeting margin

broader mid-tibia with black coloration reaching the ventral and dorsal margins of the tibia throughout

male mid-femora without stout ventral setae



Fore, mid, hind legs



Head



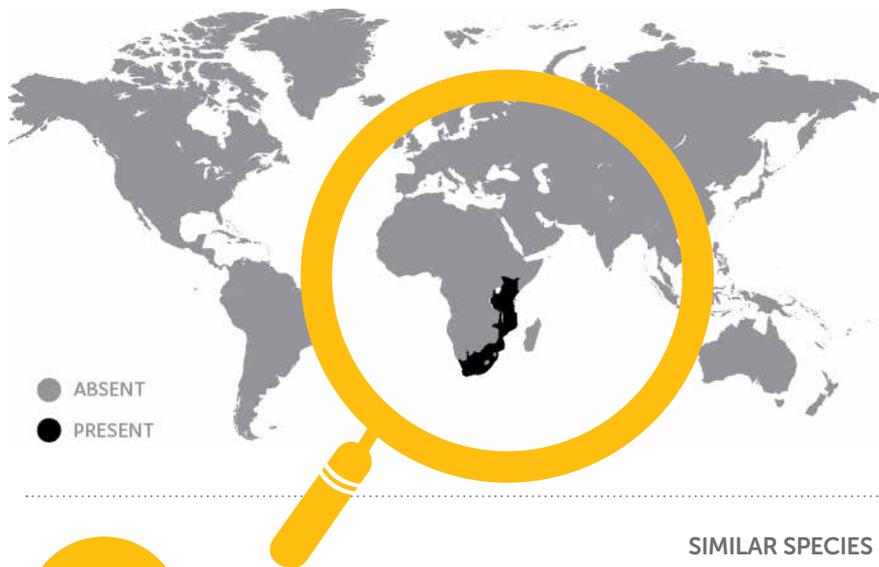
Lateral thorax

DISTRIBUTION

AFRICA:

Kenya, Malawi, Mozambique, South Africa, Tanzania

Due to the recent distinction of *C. quilicii* as a separate species from *C. rosa*, these distributions may require further resolution as more knowledge is gained of each species' true geographic range



- ABSENT
- PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *C. capitata* and *C. quilicii*.

COI barcodes do not separate *C. rosa* and *C. quilicii*, but this marker does distinguish *C. rosa* from *C. capitata*.

HOST RANGE

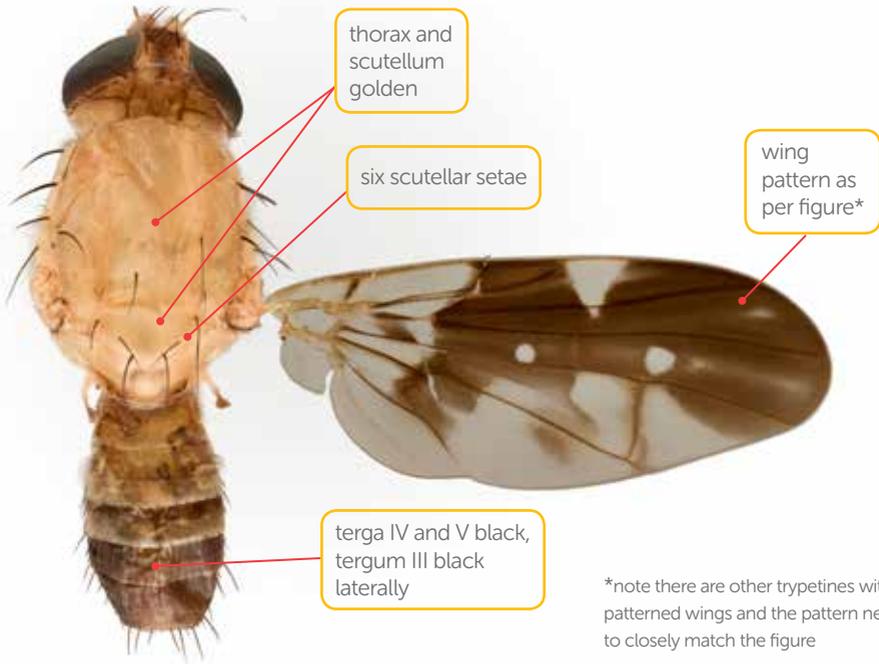
Polyphagous including the families Anacardiaceae, Annonaceae, Apocynaceae, Caricaceae, Clusiaceae, Combretaceae, Lauraceae, Malvaceae, Moraceae, Myrtaceae, Oxalidaceae, Rhamnaceae, Rosaceae, Rubiaceae, Rutaceae, Sapindaceae, Sapotaceae, Solanaceae, and Vitaceae.

LURE

Trimedlure. Also attracted to EGO lure which appears to be more powerful than trimedlure.

Dirioxa pornia (walker)

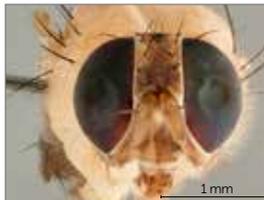
ISLAND FLY



Abdominal variation



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

OCEANIA:

Australia: Eastern Australia from Iron Range, Cape York Peninsula, to southern New South Wales. Introduced to Perth, Western Australia



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to some other Australian Trypetinae in having patterned wings, but has a distinct wing pattern and is the only one associated with edible fruit. Exotic Trypetinae (*Anastrepha* and *Rhagoletis*) and *Ceratitis* (Dacinae: Ceratitidini) have very different wing patterns.

HOST RANGE

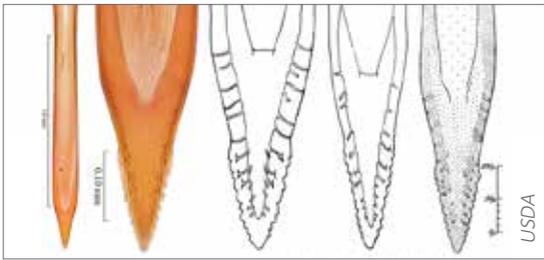
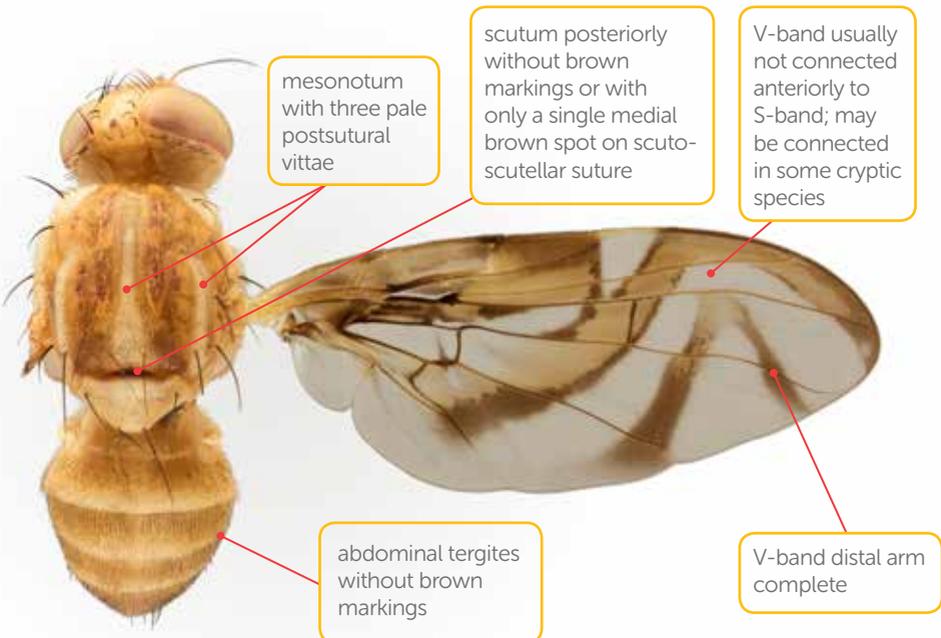
Polyphagous, but on overripe, damaged or fallen fruit. Recorded on 83 hosts in 27 families including Anacardiaceae, Annonaceae, Caricaceae, Curcurbitaceae, Lauraceae, Lecythidaceae, Moraceae, Musaceae, Myrtaceae, Oxalidaceae, Passifloraceae, Rosaceae, Rubiaceae, Rutaceae, Sapotaceae and Solanaceae. Commercial hosts include mango, papaya, carambola, peach, pear, citrus, capsicum and eggplant.

LURE

Attracted to protein lures and orange ammonia. Occasionally detected at cue lure.

Anastrepha fraterculus (Wiedemann)

SOUTH AMERICAN FRUIT FLY

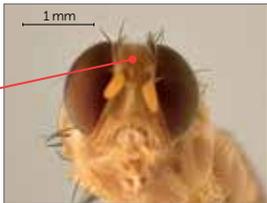


Aculeus and aculeus tip, ventral. Image: USDA



Lateral thorax

frons without brown markings



Head



Fore, mid, hind legs

DISTRIBUTION

THE AMERICAS:

Northern Mexico to northern Argentina, Trinidad and Tobago, Galapagos Island



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

A. fraterculus is difficult to diagnose and is very similar to *A. obliqua*, *A. suspensa*, and *A. distincta*. Further, it is now recognised through using integrative taxonomic approaches as composing multiple cryptic species that await full taxonomic revision.

HOST RANGE

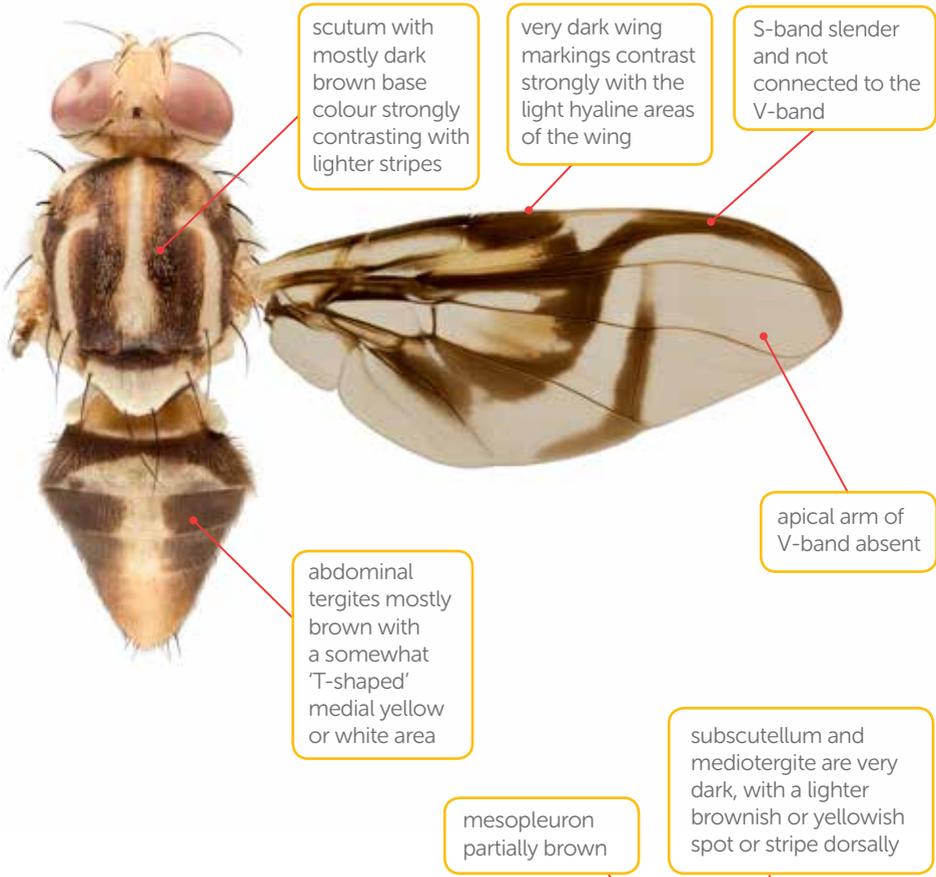
Polyphagous including the families Actinidiaceae, Anacardiaceae, Annonaceae, Combretaceae, Ebenaceae, Fabaceae, Juglandaceae, Lauraceae, Lythraceae, Malvaceae, Moraceae, Myrtaceae, Oleaceae, Oxalidaceae, Rosaceae, Rubiaceae, Rutaceae, Sapotaceae and Vitaceae.

LURE

No known record, but can be captured using McPhail traps with decaying protein (or similar), or with multilure traps with ammonium acetate + putrescine.

Anastrepha serpentina (Wiedemann)

SAPOTE FRUIT FLY; BLACK FRUIT FLY



frons without brown markings except ocellar tubercle



Head



Lateral thorax

DISTRIBUTION

THE AMERICAS:

Mexico, Belize, Costa Rica, Guatemala, Honduras, Netherlands Antilles, Panama, Trinidad and Tobago, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, Venezuela, northern Argentina, Bolivia, Paraguay, Nicaragua



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

This species is very distinctive and unlikely to be confused with any other major pest species.

HOST RANGE

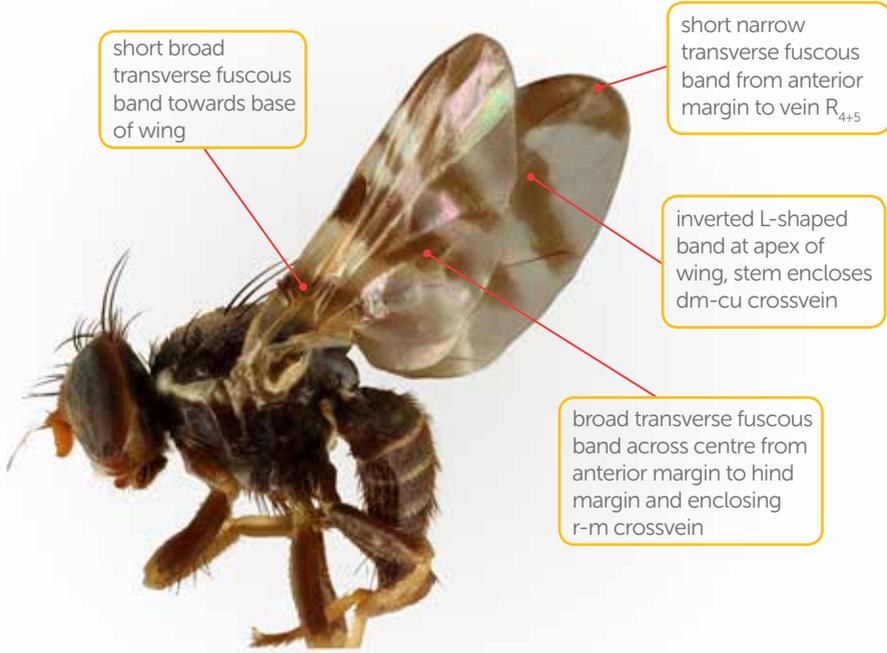
Polyphagous, predominantly on Sapotaceae, but also recorded from Anacardiaceae, Annonaceae, Clusiaceae, Lauraceae, Myrtaceae, Rosaceae and Rutaceae.

LURE

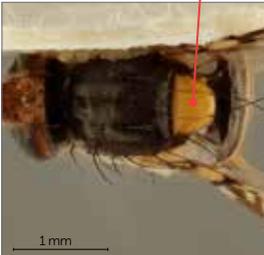
No known record, but can be captured using ammonia traps.

Rhagoletis cerasi (Linnaeus)

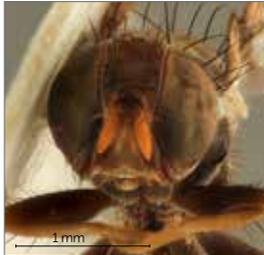
EUROPEAN CHERRY FRUIT FLY



yellow scutellum



Scutum



Head



Lateral thorax

DISTRIBUTION

Native to Europe/Asia; introduced to North America

ASIA:

Georgia, Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, Turkmenistan, Uzbekistan

EUROPE:

Austria, Belgium, Britain, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, Ukraine

THE AMERICAS:

Rhagoletis cerasi is a recent invasive (2015) to North America (southern Ontario, Canada and New York State, USA)



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to other species of *Rhagoletis*, some of which are of unknown status.

HOST RANGE

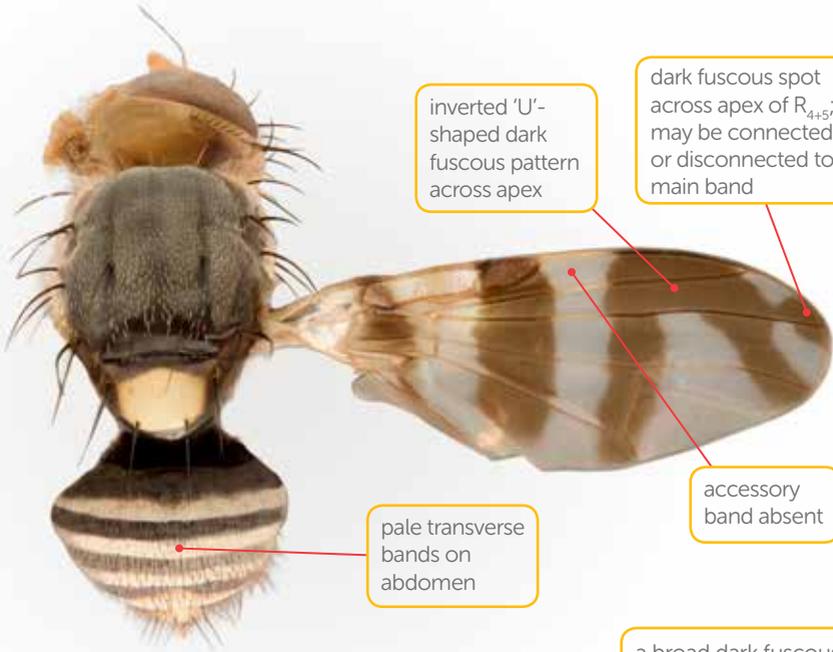
Polyphagous including the families Caprifoliaceae and Rosaceae.

LURE

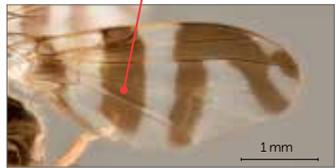
No known record.

Rhagoletis cingulata (Loew)

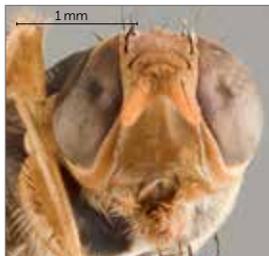
CHERRY FRUIT FLY



a broad dark fuscous band from anterior margin to hind margin in centre of wing



Wing



Head



Lateral thorax

DISTRIBUTION

THE AMERICAS:

Native to North America. Distribution in the USA is widespread, but this species is absent from several states; the map as presented does not represent true geographic distributions within the USA.

North America: Canada (Ontario, Quebec), northern and central Mexico, eastern USA

EUROPE:

Austria, Belgium, Britain, Croatia, Czech Republic, France, Germany, Hungary, Italy, Netherlands, Poland, Slovenia, Switzerland



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *Rhagoletis indifferens*. COI does not effectively distinguish these taxa, but a microsatellite panel is available that does (Johannesen et al. 2013).

HOST RANGE

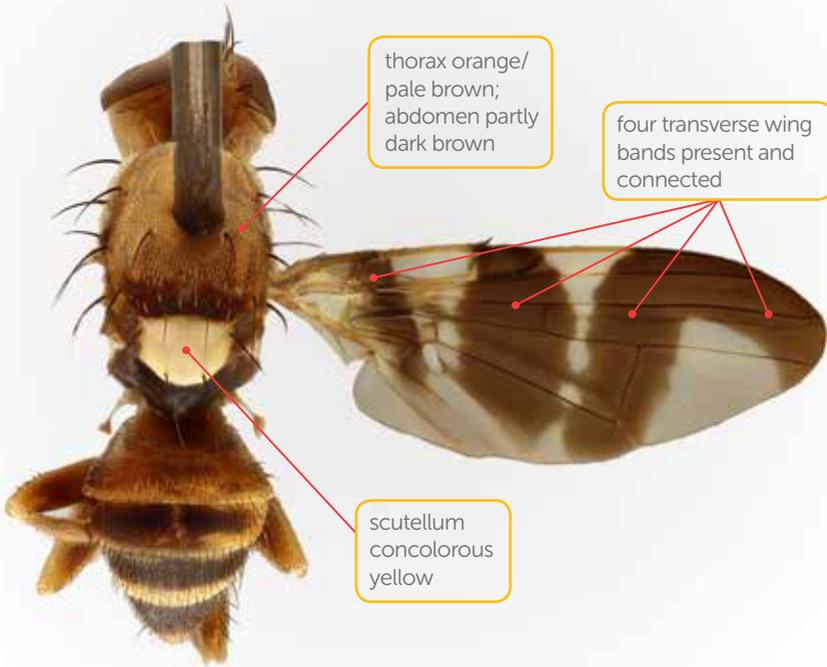
Oligophagous, attacking a small number of host species in genus *Prunus*, including sour cherries (*P. cerasus*).

LURE

No known species.

Rhagoletis completa Cresson

WALNUT HUSK FLY



Lateral variation



Dorsal variation



Head



Lateral thorax

DISTRIBUTION

THE AMERICAS:

Southern and Central USA including northern Mexico. Distribution in the USA is widespread, but this species is absent from several states; the map as presented does not represent true geographic distributions within the USA

EUROPE:

Established in southern Europe



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *R. berberis* and *R. suavis*. COI separates *R. completa* and *R. suavis*, but not *R. completa*, *R. ramosae*, and *R. zoqui* (Frey et al. 2013). Morphological characters can reliably distinguish *R. completa* from other species.

HOST RANGE

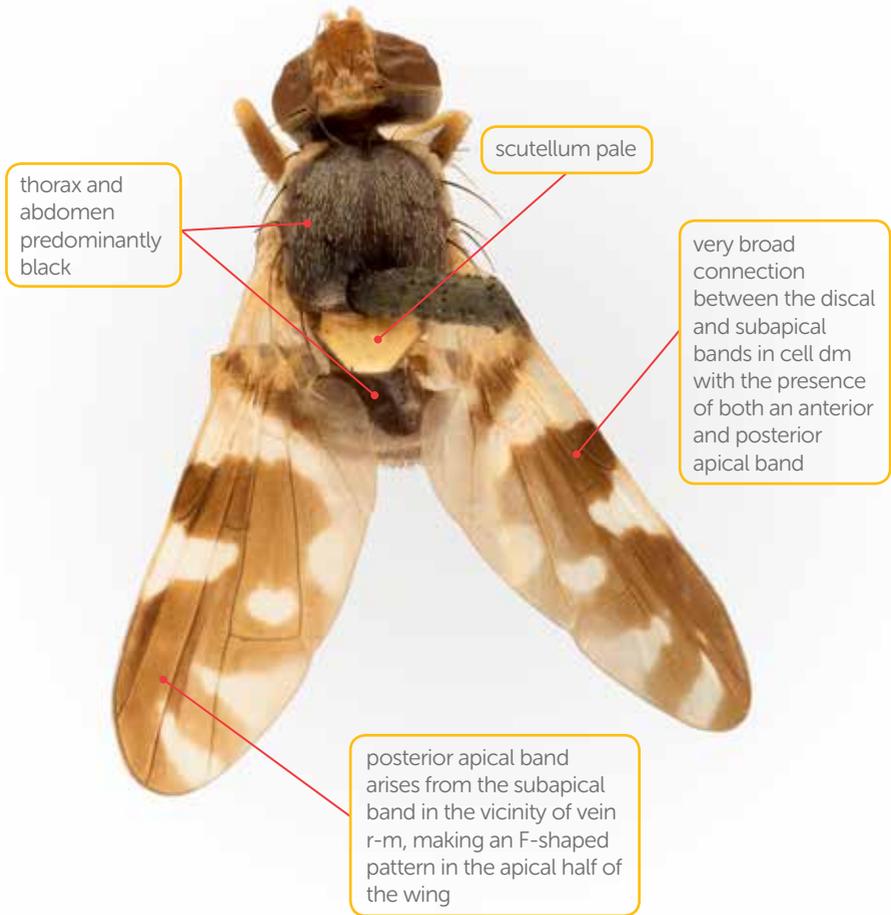
Polyphagous, including the families of Juglandaceae (*Juglans* spp. are predominant hosts) and Rosaceae (sub-optimal hosts, e.g., peaches).

LURE

No known record, but can be captured in traps emitting ammonia.

Rhagoletis fausta (Osten-Sacken)

BLACK CHERRY FRUIT FLY



Head



Lateral thorax

DISTRIBUTION

THE AMERICAS:

North America – western and eastern North America. Distribution in the USA and Canada is widespread, but either has restricted distributions, or is absent from, several states and provinces. The map below does not represent true geographic distributions within the USA and Canada



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Morphologically similar to *Rhagoletis suavis* and *R. striatella*, but molecular markers (eg., 16S) can separate these taxa. Morphological characters can be used to reliably identify this species.

HOST RANGE

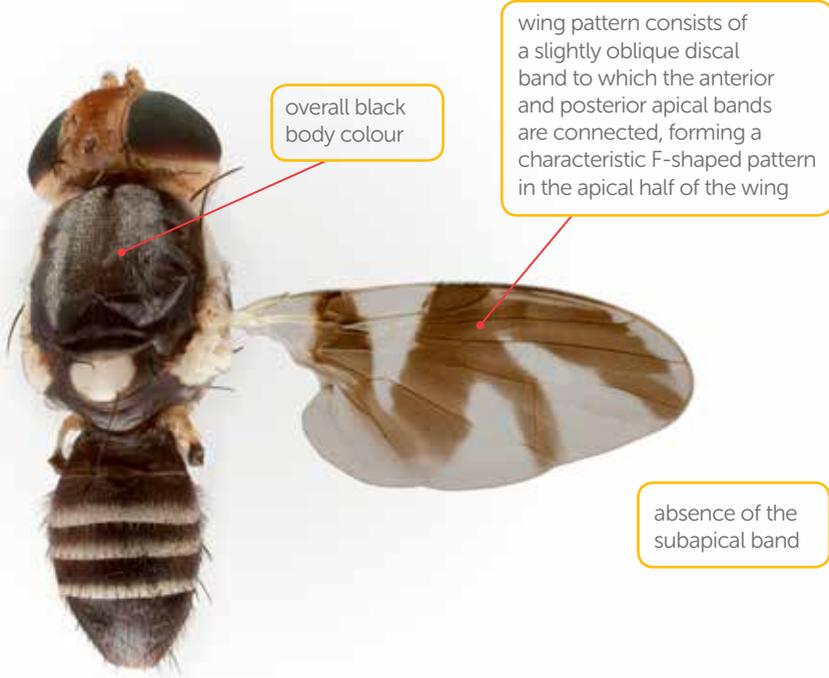
Oligophagous - affecting the Rosaceae family (major commercial hosts are sweet cherry and sour cherry).

LURE

No known record, but can be captured in traps emitting ammonia.

Rhagoletis pomonella (Walsh)

APPLE MAGGOT FLY



presence, in most specimens, of heavy black shading on the posterior surface of the fore femur



Lateral thorax



Fore, mid, hind legs



Head

DISTRIBUTION

THE AMERICAS:

Canada, USA and Mexico. Distribution in the USA is wide-spread, but this species is absent from several states; the map as presented does not represent true geographic distributions within the USA



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *R. mendax*. COI does not separate these species. Difficult to distinguish from several other non-pest cryptic species of the *R. pomonella* complex.

HOST RANGE

Oligophagous – affects numerous species of the Rosaceae family: apple and *Crataegus* spp. are the main hosts.

LURE

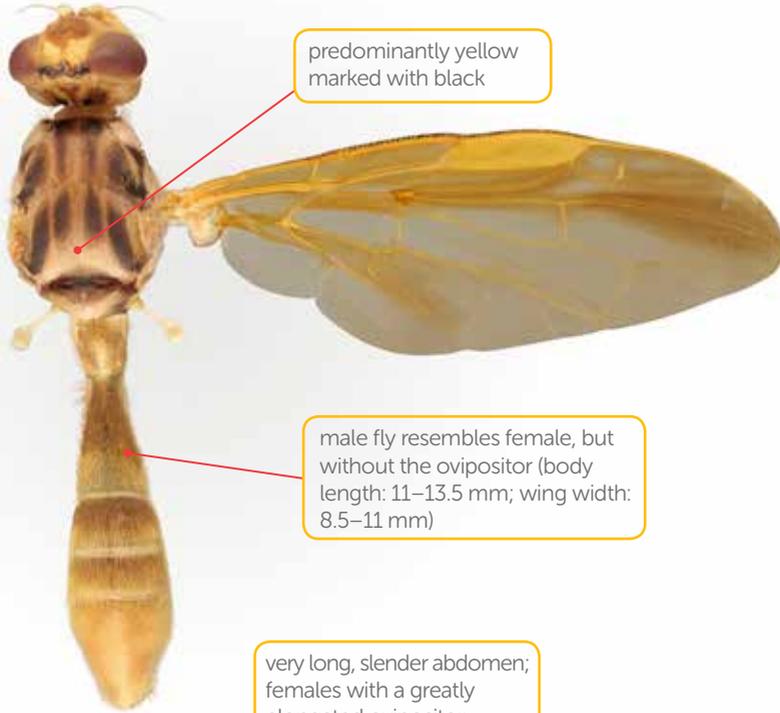
No known record, but can be captured in traps emitting ammonia.

OTHER COMMENTS

It has been the subject of extensive taxonomic, ecological and pest management research in the USA and is considered the major economic pest species within the genus *Rhagoletis*. It is a major pest of cultivated apples. It is distributed over the central and north-eastern regions of mainland USA and extreme southern Canada. In 1979 it was introduced into the western coastline of the USA and is now widespread in that region (pers. comm. Drew 2010).

Toxotrypana curvicauda Gerstaecker

PAPAYA FRUIT FLY



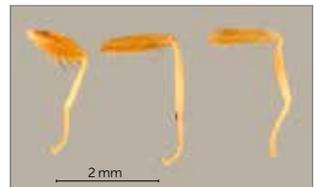
Female dorsal view



Lateral thorax



Head



Fore, mid, hind legs

DISTRIBUTION

THE AMERICAS:

Restricted to Florida and Texas in North America. Distributed throughout the Caribbean, particularly in Puerto Rico, the Dominican Republic, Trinidad, Cuba and the Bahamas. It is also found in Mexico, Central America (Belize, Costa Rica, Guatemala, Honduras, Nicaragua, Panama) and northern South America (Columbia, Venezuela)



● ABSENT
● PRESENT

SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Toxotrypana curvicauda may initially be confused with other members of genus *Toxotrypana*; online keys are available. All members of this genus are exotic to Australia, however, and are readily distinguished from other fruit fly genera (e.g. *Bactrocera*, *Zeugodacus*, *Dacus*).

HOST RANGE

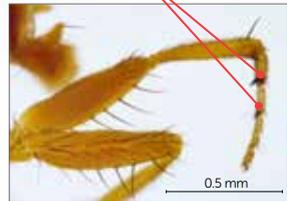
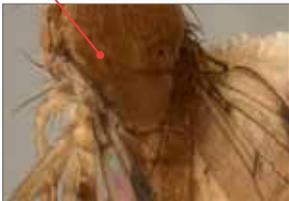
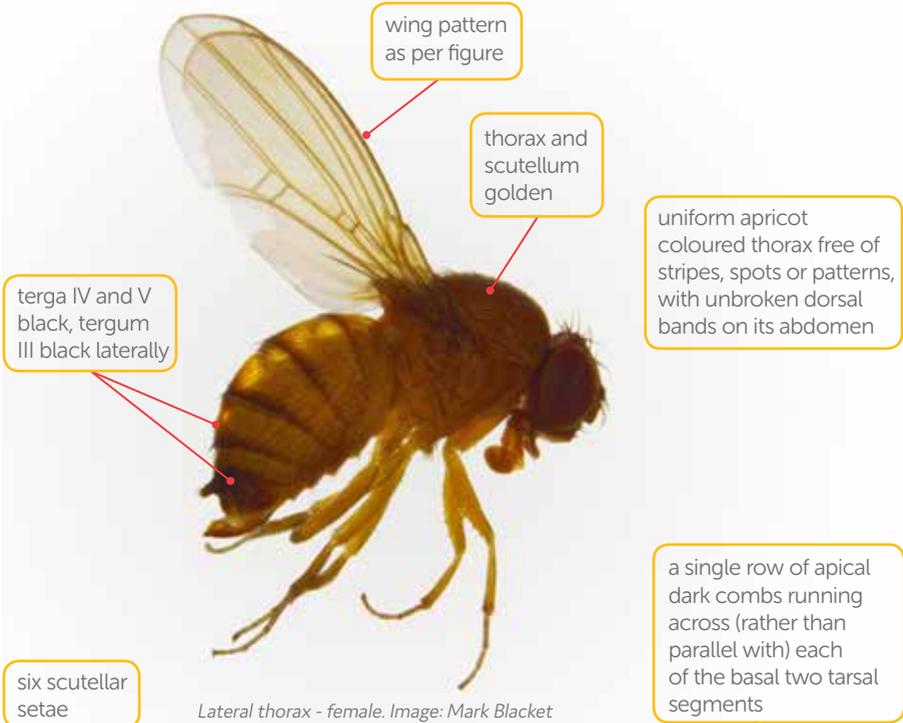
Polyphagous including the families Caricaceae (papaya: primary host), Anacardiaceae (mango), and Apocynaceae (milkweed).

LURE

No known record.

Drosophila suzukii (Matsumura)

SPOTTED-WING DROSOPHILA (SWD)



males have a single apical wing spot

strongly sclerotized ovipositor with 30–36 robust teeth; six–seven times longer than the diameter of the spermatheca



DISTRIBUTION

ASIA:

Bangladesh, China, India, Iran, Japan, Korea, Myanmar, Pakistan, Taiwan, Thailand

THE AMERICAS:

Canada, Mexico, USA, Argentina, Brazil

EUROPE:

Belgium, Bosnia-Herzegovina, Croatia, Czech Republic, France, Germany, Italy, Netherlands, Poland, Portugal, Russian Federation, Serbia, Slovenia, Spain, Switzerland, UK



SIMILAR SPECIES, HOST & LURE

SIMILAR SPECIES

Similar to *D. melanogaster* and *D. simulans*. Several molecular diagnostic tools are available that can distinguish this species (see Murphy et al. 2015).

HOST RANGE

Polyphagous including the families Actinidiaceae, Adoxaceae, Caprifoliaceae, Cornaceae, Ebenaceae, Elaeagnaceae, Ericaceae, Grossulariaceae, Moraceae, Myricaceae, Myrtaceae, Rhamnaceae, Rosaceae, Rutaceae and Vitaceae.

LURE

Adults are known to be attracted to traps baited with a combination of wine, vinegar and soap (Landolt et al. 2012).

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<p>Species: <i>Bactrocera facialis</i></p> 	<p>Species: <i>Bactrocera aquilonis</i></p> 	<p>Species: <i>Bactrocera cacuminata</i></p> 	<p>Species: <i>Bactrocera frauenfeldi</i></p> 
<p>Species: <i>Bactrocera musae</i></p> 	<p>Species: <i>Bactrocera tryoni</i></p> 	<p>Species: <i>Ceratitis capitata</i></p> 	<p>Species: <i>Dacus aequalis</i></p> 
<p>Species: <i>Zeugodacus choristus</i></p> 	<p>Species: <i>Bactrocera opiliae</i></p> 	<p>Species: <i>Bactrocera rufofuscula</i></p> 	<p>Species: <i>Bactrocera pallida</i></p> 

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