

7 Diagnostic Information

The family Tephritidae can be separated from all other Diptera by the shape of the subcostal vein, which bends abruptly through a right-angle and fades to a fold before reaching the wing edge, combined with the presence of setulae (small setae) along the dorsal side of vein R₁.

7.1 Simplified key to major pest fruit fly genera (after White and Elson-Harris 1992)

- 1 Vein Sc abruptly bent forward at nearly 90°, weakened beyond the bend and ending at subcostal break; dorsal side of vein R₁, with setulae. Wing usually patterned by coloured bands. Wing cell cup with an acute extension..... **TEPHRITIDAE 2**
- Vein Sc not abruptly bent forward, except in the *Psilidae*, which lack both dorsal setulae on vein R₁, and frontal setae. Species associated with fruit very rarely have any wing patterning. Wing cell cup usually without an acute extension (exceptions include some *Otitidae* and *Pyrgotidae*)..... **Families other than Tephritidae**
- 2 Cell cup very narrow and extension of cell cup very long. 1st flagellomere (3rd segment of antenna) at least three times as long as broad. Wing pattern usually confined to a costal band and an anal streak. (Tropical and warm temperate Old World; adventive species in Hawaii and northern South America)..... **BACTROCERA and DACUS (p. 54)**
- Cell cup broader and the extension shorter. 1st flagellomere shorter. Wing pattern usually includes some coloured crossbands..... **3**
- 3 The wing vein that terminates just behind the wing apex (vein M) is curved forwards before merging into the wing edge. Wing pattern usually similar to Figure 85. (South America, West Indies and southern USA)..... **ANASTREPHA (p. 162)**
- The wing vein that terminates just behind the wing apex (vein M) meets the wing edge at approximately a right angle. Wing pattern usually similar to Figure 80..... **4**
- 4 Cell cup, including its extension, shaped as Figure 80. Basal cells of wing usually with spot- and fleck-shaped marks, giving a reticulate appearance. Scutellum convex and shiny. (*Ceratitis capitata* is found in most tropical and warm temperate areas; other spp. are African)..... **CERATITIS (p. 154)**
- Cell cup, including its extension, shaped as Figure 91-Figure 95 Basal area of wing not reticulate. Scutellum fairly flat and not shiny. (Larvae develop in the fruits of Berberidaceae, Caprifoliaceae, Cornaceae, Cupressaceae, Elaeagnaceae, North temperate regions and South America)..... **RHAGOLETIS (p. 185)**

7.2 Guide to PCR-RFLP molecular information

ITS1 Frag length - gel: size in base pairs (bp) (visual estimate) of amplified ITS fragment, on an agarose gel

Hinfl: approximate size of fragment(s) in bp for restriction enzyme *Hinfl*

Vspl: approximate size of fragment(s) in bp for restriction enzyme *Vspl*

Ssp1: approximate size of fragment(s) in bp for restriction enzyme *Sspl*

Bsr1: approximate size of fragment(s) in bp for restriction enzyme *BsrI*

Sau3a1: approximate size of fragment(s) in bp for restriction enzyme *Sau3aI*

SnaB1: approximate size of fragment(s) in bp for restriction enzyme *SnaBI*

Where a restriction enzyme does not cut the ITS1 sequence, or cuts only once and that is within about 90bp of the terminus, the enzyme is scored as 'DNC' (does not cut).

7.3 *Bactrocera*

7.3.1 *Bactrocera (Bactrocera) albistrigata* (de Meijere)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Dacus albistrigatus

Dacus (Bactrocera) albistrigata

DIAGNOSIS

7.3.1.1.1 *Morphological - Adult*

A medium sized species; face fulvous with a pair of circular to oval black spots; postpronotal lobes yellow (anteromedial corners black); notopleura yellow; scutum mostly black; lateral postsutural vittae present; medial postsutural vitta absent; mesopleural stripe reaching to anterior *npl.* seta dorsally; scutellum yellow with a broad black basal band; wing with a narrow fuscous costal band which is extremely pale beyond extremity of cell *sc* to apex of wing, a narrow dark fuscous transverse band across wing enclosing *r-m* and *dm-cu* crossveins, a broad fuscous to dark fuscous anal streak; cells *bc* and *c* pale fuscous; microtrichia in outer corner of cell *c* only; abdominal terga III-V orange-brown with a narrow to medium width medial longitudinal dark fuscous to black band over all three terga and lateral dark markings which vary from narrow anterolateral dark fuscous to black corners on all three terga to broad lateral longitudinal dark fuscous to black bands over all three terga; posterior lobe of male surstylus short; female with aculeus tip needle shaped (pers. comm. Drew 2010).

7.3.1.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.1.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 850 bp

*Bsr*1: DNC *Sna*B1: DNC

*Hha*1: 670, 180 *Ssp*1: 180, 620

*Hinf*1: DNC *Vsp*1: DNC

*Sau*3a1: 400, 450

See also **PCR-DNA barcoding** (Section 6.3.2.).

HOST RANGE

Bactrocera albistrigata has been recorded on hosts from a wide range of families. These include: Anacardiaceae, Apocynaceae, Combretaceae, Moraceae, Myrtaceae and Verbenaceae (for a full list of recorded hosts see Allwood *et al.* 1999).

Major commercial hosts (Allwood *et al.* 1999; pers. comm. Drew 2010):

Scientific name	Common name	Scientific name	Common name
<i>Mangifera indica</i>	mango	<i>Syzygium malaccense</i>	malay-apple
<i>Syzygium aqueum</i>	watery rose-apple	<i>Syzygium samarangense</i>	water apple

DISTRIBUTION

Andaman Islands, central to southern Thailand, Peninsular Malaysia, East Malaysia and Kalimantan (Borneo), Singapore, Indonesia east to Sulawesi, Christmas Island (pers. comm. Drew 2010).

REMARKS

Bactrocera albistrigata belongs to the *frauenfeldi* complex described by Drew (1989). The other species in the complex, *B. caledoniensis*, *B. frauenfeldi*, *B. parafrauenfeldi* and *B. trilineola* all possess the same basic body and wing colour patterns, however, *B. albistrigata* is the only species that occurs in South-East Asia and is distinguished by having a combination of moderately broad and elongate lateral postsutural vittae, face with a pair of black spots and abdominal terga III-V fulvous with dark colour patterns (not entirely black) (pers. comm. Drew 2010).

PEST STATUS

- Exotic
- Medium level pest species

ATTRACTANT

Cue lure.

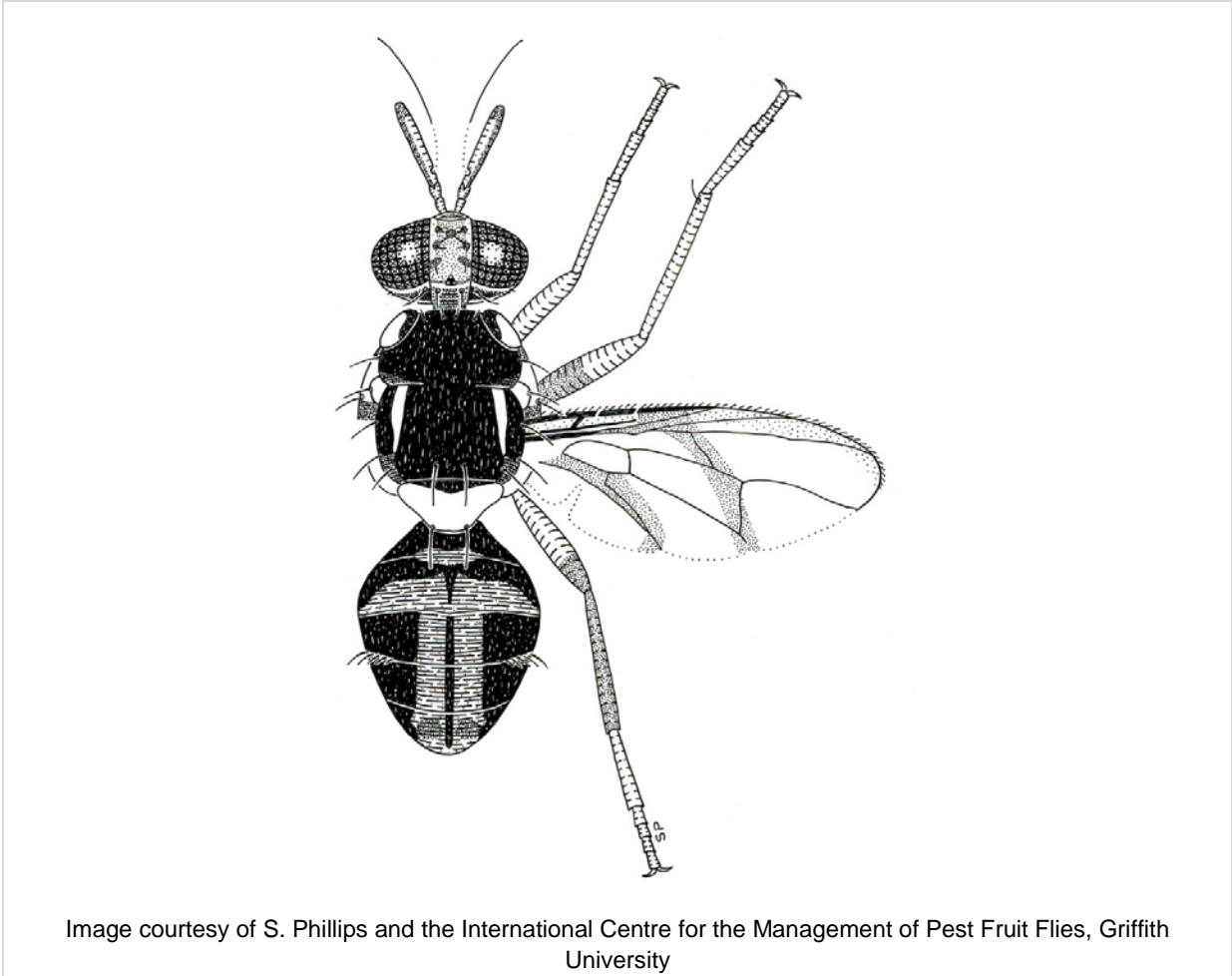
FIGURES

Figure 14. *Bactrocera albistrigata*



Images courtesy of Ken Walker, Museum Victoria, www.padil.gov.au (as of 22 August 2011))

Figure 15. *Bactrocera albistrigata*



7.3.2 *Bactrocera (Bactrocera) aquilonis* (May)

TAXONOMIC INFORMATION

Common name: Northern Territory fruit fly

Previous scientific names:

Strumeta aquilonis

Dacus (Bactrocera) aquilonis

DIAGNOSIS

7.3.2.1.1 *Morphological - Adult*

Medium sized species; large black facial spots present; postpronotal lobes and notopleura yellow; scutum pale red-brown with fuscous markings, mesopleural stripe reaching almost to anterior *npl.* seta, lateral postsutural vittae present, medial postsutural vitta absent, scutellum yellow; wing with a narrow fuscous costal band and broad fuscous anal streak, cells bc and c fuscous, microtrichia covering cell c and most of cell bc; abdominal terga III-V pale orange-brown with pale fuscous along anterior margin of tergum III and widening over lateral margins of that tergum, a medial longitudinal pale fuscous band on terga III to V; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.2.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.2.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 850 bp

*Bsr*1: 600, 200 *Sna*B1: DNC

*Hha*1: 650, 200 *Ssp*1: 570, 180

*Hin*f1: 770 *Vsp*1: DNC

*Sau*3a1: 420

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera aquilonis has been recorded on hosts from a wide range of families. These include: Annonaceae, Arecaceae, Chrysobalanaceae, Combretaceae, Curcubitaceae, Ebenaceae, Elaeocarpaceae, Euphorbiaceae, Lauraceae, Meliaceae, Myrtaceae, Rosaceae, Rubiaceae, Rutaceae, Santalaceae and Sapotaceae (for a full list of recorded hosts see Smith *et al.* 1988; Hancock *et al.* 2000).

Major commercial hosts (Hancock *et al.* 2000; pers. comm. Drew 2010):

Scientific name	Common name	Scientific name	Common name
<i>Anacardium occidentale</i>	cashew nut	<i>Flacourtia rukam</i>	rukam
<i>Annona muricata</i>	soursop	<i>Fortunella x crassifolia</i>	meiwa kumquat
<i>Annona reticulata</i>	bullock's heart	<i>Lycopersicon esculentum</i>	tomato
<i>Annona squamosa</i>	sugarapple	<i>Malpighia glabra</i>	acerola
<i>Averrhoa carambola</i>	carambola	<i>Malus domestica</i>	apple
<i>Blighia sapida</i>	akee apple	<i>Mangifera indica</i>	mango
<i>Capsicum annum</i>	bell pepper	<i>Manilkara zapota</i>	sapodilla
<i>Chrysophyllum cainito</i>	caimito	<i>Prunus persica</i>	peach
<i>Citrus limon</i>	lemon	<i>Psidium guajava</i>	guava
<i>Citrus maxima</i>	pummelo	<i>Psidium littorale</i> var. <i>longipes</i>	strawberry guava
<i>Citrus reticulata</i>	mandarin	<i>Spondias dulcis</i>	otaheite apple
<i>Citrus x paradisi</i>	grapefruit	<i>Syzygium aqueum</i>	watery rose-apple
<i>Eriobotrya japonica</i>	loquat	<i>Syzygium jambos</i>	rose apple
<i>Eugenia uniflora</i>	Surinam cherry	<i>Syzygium malaccense</i>	malay-apple
<i>Flacourtia jangomas</i>	Indian plum	<i>Ziziphus mauritiana</i>	jujube

DISTRIBUTION

Northern areas of Western Australia and the Northern Territory (Hancock *et al.* 2000).

REMARKS

In the Northern Territory this species dramatically increased its host range during 1985. Since *B. aquilonis* and *B. tryoni* will produce viable offspring when crossed in the laboratory (Drew and Lambert 1986), hybridisation with *B. tryoni* was strongly suspected and might explain this increase (Smith and Chin 1987; Smith *et al.* 1988). By 1997, most but not all commercial production areas and larger towns supported populations of this fly, which attacks a wide range of cultivated hosts. Therefore, many of the Northern Territory host records for *B. aquilonis* since March 1985 are attributed to the suspected hybrid *B. aquilonis* x *B. tryoni* and are recorded under *B. tryoni* and now under *B. aquilonis* in the above table (Hancock *et al.* 2000).

Bactrocera aquilonis and *B. tryoni* are very similar in general body and wing colour patterns. *Bactrocera aquilonis* differs in being an overall paler colour with the scutum pale red-brown and the abdominal terga generally fulvous without distinct fuscous markings. However, these differences are not easily observed. These species can also be separated on the differences on the ovipositors: apex of aculeus rounded and spicules with 7-10 uniform dentations in *B. tryoni* compared with the more pointed aculeus and uneven dentations in *B. aquilonis* (Drew 1989).

A recent molecular genetic study of northwestern Australian fruit fly populations (Cameron *et al.* 2010) concluded that there is no genetic evidence supporting *B. aquilonis* as a distinct species from *B. tryoni*. They conclude that the recent increase in host range of fruit flies in northwestern Australia is due to local populations of *B. tryoni* (= *B. aquilonis*) utilising additional food resources from increased agricultural production in this region.

PEST STATUS

- Endemic
- Minor pest species

ATTRACTANT

Cue lure.

FIGURES

Figure 16. *Bactrocera aquilonis*



Image courtesy of the International Centre for the Management of Pest Fruit Flies, Griffith University

Figure 17. *Bactrocera aquilonis*

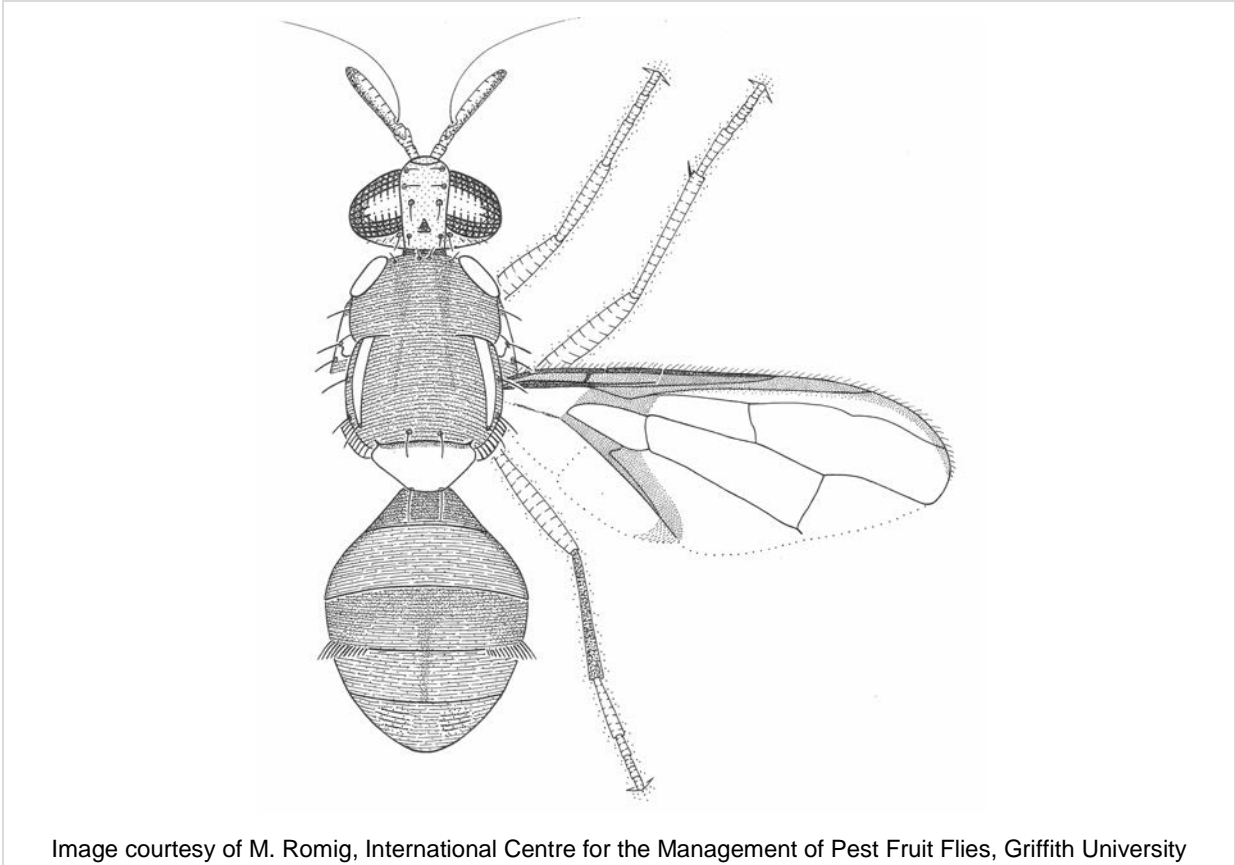


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.3 *Bactrocera (Paratridacus) atrisetosa* (Perkins)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Zeugodacus atrisetosus

Melanodacus atrisetosus

Bactrocera (Paratridacus) atrisetosa

DIAGNOSIS

7.3.3.1.1 *Morphological - Adult*

Medium sized species; small fuscous facial spots present; postpronotal lobes and notopleura yellow; scutum red-brown with irregularly shaped fuscous markings, mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta, lateral postsutural vittae beginning anterior to mesonotal suture, medial postsutural vitta present, scutellum yellow; wing with a narrow fuscous costal band and anal streak, cells bc and c pale fulvous with microtrichia in outer ½ of cell c only; abdominal terga III-V orange-brown occasionally with fuscous on lateral margins of tergum III and generally with narrow medial fuscous band on tergum V; posterior lobe of male surstylus long; female with aculeus tip blunt trilobed (Drew 1989; pers. comm. Drew 2010).

7.3.3.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.3.1.3 *Molecular*

See **PCR-DNA barcoding** (Section 6.3.2.).

HOST RANGE

This species has been reared from eight host species in seven genera and three families, and is mainly associated with cucurbits: watermelons, honeydew and rock melons, cucumbers, pumpkins, zucchini, luffa and tomatoes (PaDIL 2007).

Major commercial hosts (per. comm. Drew 1989):

Scientific name	Common name	Scientific name	Common name
<i>Citrullus lanatus</i>	watermelon	<i>Cucurbita pepo</i>	ornamental gourd
<i>Cucumis sativus</i>	cucumber	<i>Lycopersicon esculentum</i>	tomato

DISTRIBUTION

Known only from Papua New Guinea where it occurs at higher altitudes (Drew 1989).

REMARKS

Bactrocera atrisetosa is distinguished in having the costal band narrow (just overlapping R₂₊₃), scutum red-brown with fuscous patterns, wings colourless, cells bc and c pale fulvous, abdominal terga III-V orange-brown except for a narrow medial longitudinal fuscous band on tergum V and lateral margins of tergum III fuscous (Drew 1989).

Bactrocera atrisetosa is very similar in appearance to the endemic *B. cucumis*. However it differs in having prescutellar and supra-alar setae present. In common with *B. cucumis* it also lacks pecten.

PEST STATUS

- Exotic.
- Medium level pest species

ATTRACTANT

No known record.

FIGURES

Figure 18. *Bactrocera atrisetosa*



Image courtesy of Mr. S. Wilson and the International Centre for the Management of Pest Fruit Flies, Griffith University

Figure 19. *Bactrocera atrisetosa*

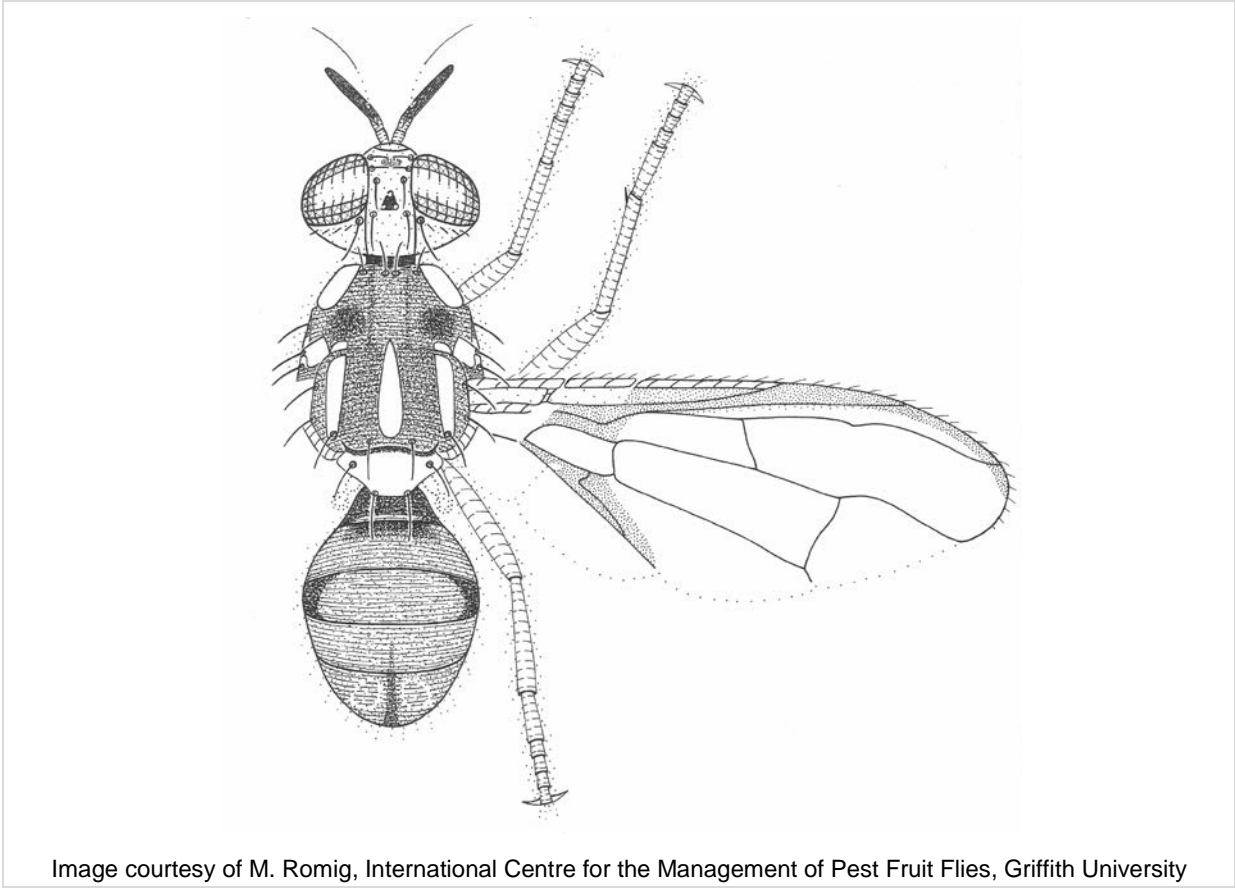


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.4 *Bactrocera (Bactrocera) bryoniae* (Tryon)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Chaetodacus bryoniae

Strumeta bryoniae

Dacus (Strumeta) bryoniae

DIAGNOSIS

7.3.4.1.1 *Morphological - Adult*

Large species; irregularly circular black facial spots present; postpronotal lobes and notopleura yellow; scutum dull black, mesopleural stripe slightly wider than notopleuron, lateral postsutural vittae present, medial postsutural vitta absent, scutellum yellow; wing with a broad fuscous costal band and anal streak, cells bc and c fulvous, microtrichia covering outer ½ of cell c only; abdominal terga III-V orange-brown with a medial and two lateral longitudinal dark bands joined along anterior margin of tergum III; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.4.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.4.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 820 bp

BsrI: 600, 230 *SnaBI*: DNC

HhaI: 620, 200 *SspI*: 560, 180

HinfI: 760 *VspI*: DNC

Sau3A1: 400

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera bryoniae has been recorded on hosts from five families. These include: Curcubitaceae, Loganiaceae, Musaceae, Passifloraceae and Solanaceae (for a full list of recorded hosts see Hancock *et al.* 2000).

Major commercial host (Drew 1989; Hancock et al. 2000):

Scientific name	Common name	Scientific name	Common name
<i>Capsicum annuum</i>	chilli		

Infests wild species of Cucurbitaceae and Passiflora (Hancock et al. 2000). Records from capsicum thought to be erroneous.

DISTRIBUTION

Widespread and common all over Papua New Guinea (every province except Bougainville and Manus), and Australia (Northern Western Australia, Northern Territory, east coast south to Sydney, New South Wales, and the Torres Strait Islands) (SPC 2006).

REMARKS

There are a number of species in Southeast Asia and the South Pacific with broad costal bands. However, *Bactrocera bryoniae* differs from these species in having costal band confluent with R₄₊₅, lateral postsutural vittae ending at upper *pa*. seta, abdominal terga III-V red-brown with a broad, dark fuscous band along anterior margin of tergum III and covering lateral margins, anterolateral corners of terga IV and V fuscous and a medial longitudinal dark fuscous band over all 3 terga (Drew 1989).

PEST STATUS

- Endemic
- Low level pest species in Queensland but not in Western Australia or the Northern Territory

ATTRACTANT

Cue lure, Willison's lure.

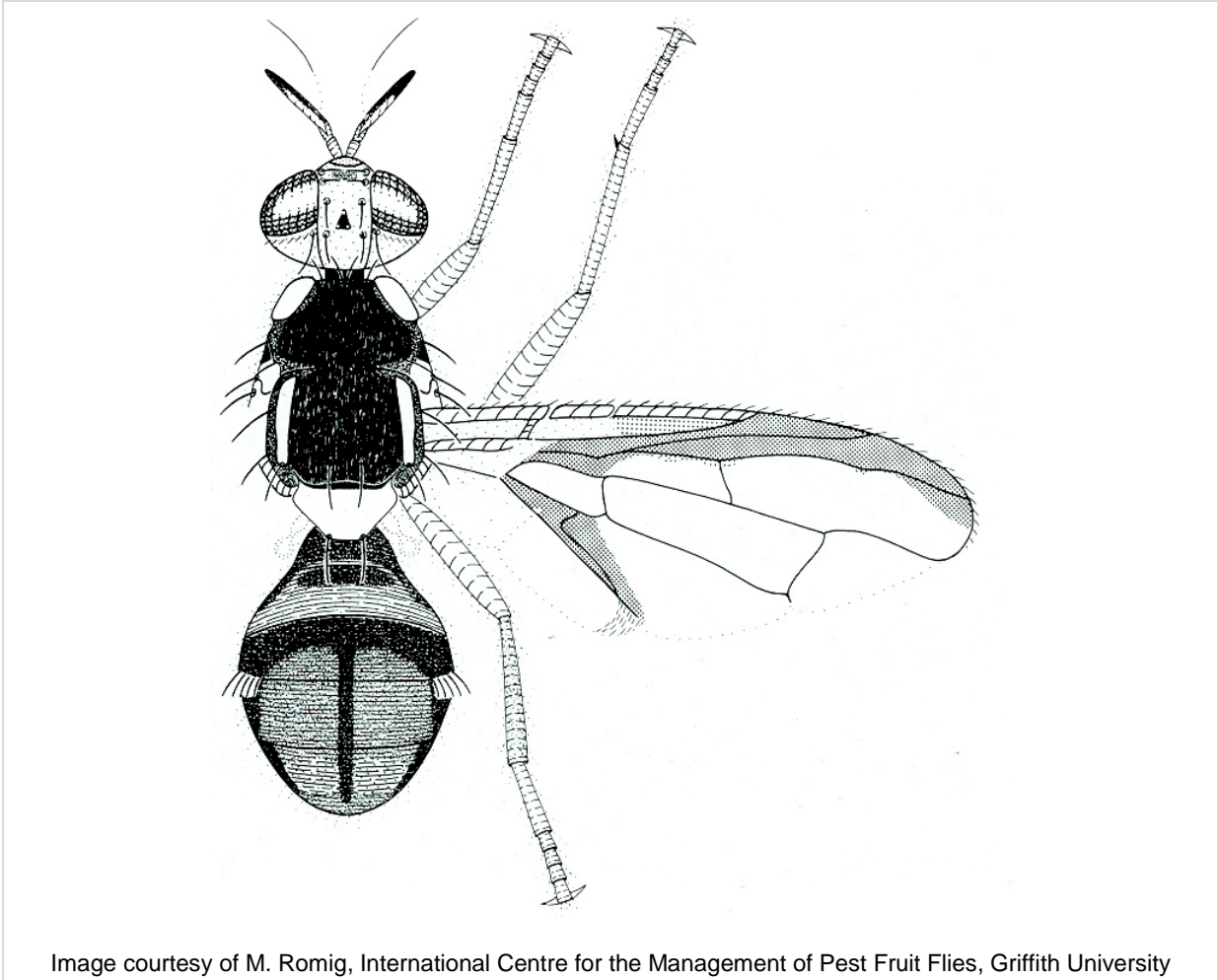
FIGURES

Figure 20. *Bactrocera bryoniae*



Image courtesy of S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and the Queensland Museum

Figure 21. *Bactrocera bryoniae*



7.3.5 *Bactrocera (Bactrocera) carambolae* Drew and Hancock

TAXONOMIC INFORMATION

Common name: Carambola fly

Previous scientific names:

Bactrocera sp. near *dorsalis*

DIAGNOSIS

7.3.5.1.1 *Morphological - Adult*

Face fulvous with a pair of medium sized oval black spots; scutum dull black with brown behind lateral postsutural vittae, around mesonotal suture and inside postpronotal lobes; postpronotal lobes and notopleura yellow; mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta dorsally; two broad parallel sided lateral postsutural vittae ending at or behind *ia.* seta; medial postsutural vitta absent; scutellum yellow; legs with femora fulvous with a large elongate oval dark fuscous to black preapical spot on outer surfaces of fore femora in some specimens, tibiae dark fuscous (except mid tibiae paler apically); wings with cells bc and c colourless, microtrichia in outer corner of cell c only, a narrow fuscous costal band slightly overlapping R_{2+3} and expanding slightly beyond apex of R_{2+3} across apex of R_{4+5} , a narrow fuscous anal streak; supernumerary lobe of medium development; abdominal terga III-V orange-brown with a 'T' pattern consisting of a narrow transverse black band across anterior margin of tergum III and widening to cover lateral margins, a medium width medial longitudinal black band over all three terga, anterolateral corners of terga IV dark fuscous to black and rectangular in shape and anterolateral corners of tergum V dark fuscous, a pair of oval orange-brown shining spots on tergum V; abdominal sterna dark coloured; posterial lobe of male surstylus short; female with aculeus tip needle shaped (pers. comm. Drew 2010).

7.3.5.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.5.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 850 bp

*Bsr*I: 650, 250 *Sna*BI: 350, 530

*Hha*I: 680, 200 *Sspl*: DNC

*Hinf*I: DNC *Vspl*: 355, 485

*Sau*3A1: 400, 450

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera carambolae has been recorded on hosts from a wide range of families. These include: Alangiaceae, Anacardiaceae, Annonaceae, Apocynaceae, Arecaceae, Clusiaceae, Combretaceae, Euphorbiaceae, Lauraceae, Loganiaceae, Meliaceae, Moraceae, Myristicaceae, Myrtaceae, Oleaceae, Oxalidaceae, Polygalaceae, Punicaceae, Rhamnaceae, Rhizophoraceae, Rutaceae, Sapindaceae, Sapotaceae, Simaroubaceae, Solanaceae and Symplocaceae (for a full list of recorded species see Allwood *et al.* 1999).

Major commercial hosts (Allwood *et al.* 1999):

Scientific name	Common name	Scientific name	Common name
<i>Averrhoa carambola</i>	carambola	<i>Syzygium jambos</i>	rose apple
<i>Manilkara zapota</i>	sapodilla	<i>Syzygium malaccense</i>	malacca apple
<i>Psidium guajava</i>	guava	<i>Syzygium samarangense</i>	wax apple
<i>Syzygium aqueum</i>	watery rose-apple		

DISTRIBUTION

Southern Thailand, Peninsular Malaysia, East Malaysia, Kalimantan (Borneo), Singapore, Indonesian islands east to Sumbawa, Andaman Islands, Surinam, French Guiana, Brazil (pers. comm. Drew 2010).

REMARKS

Bactrocera carambolae is similar to *B. propinqua* and some specimens of *B. papayae* in possessing broad parallel sided or subparallel lateral postsutural vittae, costal band slightly overlapping R_{2+3} , abdominal terga III-V with narrow to medium width dark lateral margins, shining spots on abdominal tergum V pale (orange-brown to fuscous), femora entirely fulvous or with, at most, subapical dark spots on fore femora only, in addition to the general characteristics of the *dorsalis* complex.

It differs from *B. papayae* in having a broad medial longitudinal black band on abdominal terga III-V, a broader costal band apically, and shorter male aculeus and female ovipositor and from *B. propinqua* in having a narrower medial longitudinal black band on abdominal terga III-V (in *B. propinqua* this band is very broad) and apex of the aculeus needle shaped (in *B. propinqua* the apex of the aculeus is trilobed) (pers. comm. Drew 2010).

PEST STATUS

- Exotic
- High priority pest identified in the Tropical Fruit Industry Biosecurity Plan (IBP; Plant Health Australia)
- This species is a major economic pest throughout the region where it occurs

ATTRACTANT

Methyl eugenol.

FIGURES

Figure 22. *Bactrocera carambolae*



Image courtesy of the International Centre for the Management of Pest Fruit Flies, Griffith University

Figure 23. *Bactrocera carambolae*

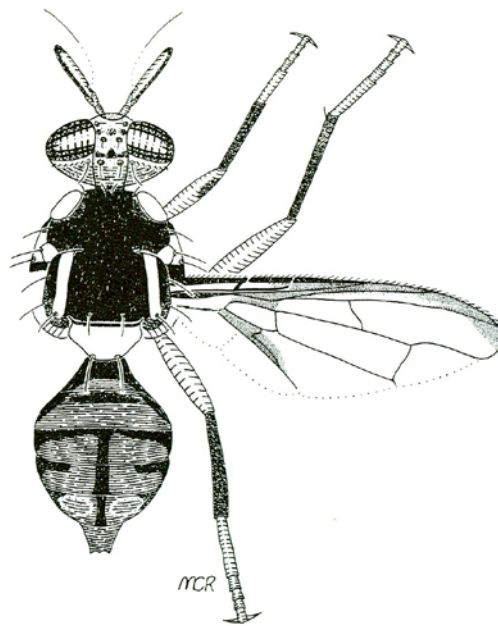


Image courtesy of M. Romig, the International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.6 *Bactrocera (Bactrocera) caryeae* (Kapoor)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Dacus (Strumeta) caryeae

Dacus (Bactrocera) caryeae

Bactrocera (Bactrocera) caryeae

DIAGNOSIS

7.3.6.1.1 *Morphological - Adult*

Face fulvous with a pair of large elongate oval black spots; scutum black with a small area of dark brown posterolateral to lateral postsutural vittae; postpronotal lobes yellow (except anterodorsal corners fuscous); notopleura yellow; mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta dorsally; two narrow lateral postsutural vittae which are either parallel sided or narrowing slightly posteriorly to end at or just before *ia.* seta; medial postsutural vitta absent; scutellum yellow with a broad black basal band; legs with femora fulvous with large dark fuscous to black preapical spots on outer surfaces of fore femora and inner surfaces of mid and hind femora, fore tibiae fuscous, mid tibiae fulvous, hind tibiae dark fuscous; wings with cells bc and c colourless, sparse microtrichia in outer corner of cell c only, a very narrow fuscous costal band confluent with R_{2+3} and remaining very narrow around apex of wing, a narrow fuscous anal streak contained within cell cup; supernumerary lobe of medium development; abdominal terga III-V orange-brown with dark fuscous to black across anterior 1/3 to 1/2 of tergum III, two broad lateral longitudinal dark fuscous to black bands and a narrow medial longitudinal black band over all three terga, a pair of oval orange-brown shining spots on tergum V; abdominal sterna dark coloured; posterior lobe of male surstylus short; female with aculeus tip needle shaped (pers. comm. Drew 2010).

7.3.6.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.6.1.3 *Molecular*

See **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera caryeae has been recorded on hosts from six families. These include: Anacardiaceae, Lecythidaceae, Malpighiaceae, Myrtaceae, Rutaceae and Sapotaceae (for a full list of recorded species see Allwood *et al.* 1999).

Major commercial hosts (Allwood *et al.* 1999):

Scientific name	Common name	Scientific name	Common name
<i>Citrus maxima</i>	pummelo	<i>Mangifera indica</i>	mango
<i>Citrus reticulata</i>	mandarin	<i>Psidium guajava</i>	guava

DISTRIBUTION

Southern India and Sri Lanka (pers. comm. Drew 2010).

REMARKS

Bactrocera caryeae is similar to *B. kandiensis* and *B. arecae* in possessing narrow parallel sided lateral postsutural vittae, preapical dark markings on at least one pair of femora in addition to the general characteristics of the *dorsalis* complex. It differs from *B. arecae* in possessing preapical dark markings on all femora (in *B. arecae* the preapical dark markings are on fore femora only) and from *B. kandiensis* in possessing a broad medial longitudinal dark band and broad lateral longitudinal dark bands over abdominal terga III-V (pers. comm. Drew 2010).

PEST STATUS

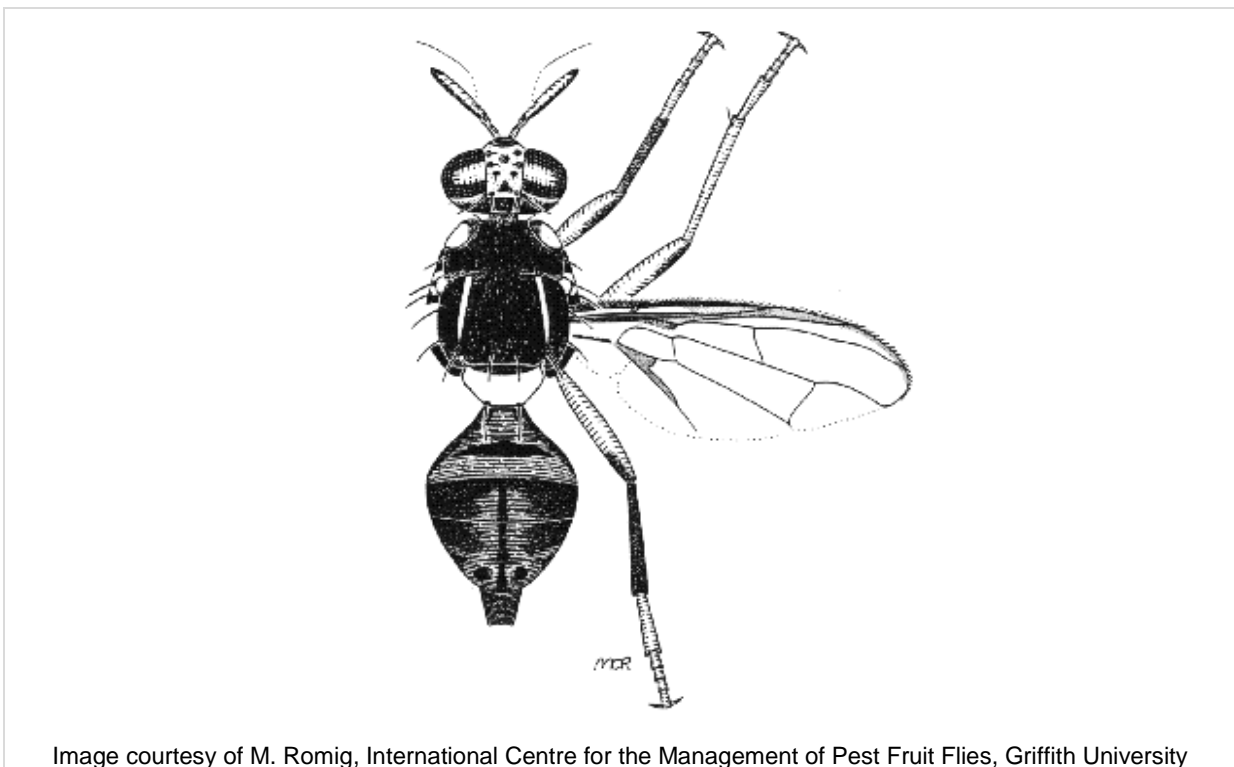
- Exotic
- *Bactrocera caryeae* occurs in very large populations in many fruit growing areas of southern India and is probably responsible for much of the damage generally attributed to *Bactrocera dorsalis*

ATTRACTANT

Methyl eugenol.

FIGURES

Figure 24. *Bactrocera caryeae*



7.3.7 *Bactrocera (Bactrocera) correcta* (Bezzi)

TAXONOMIC INFORMATION

Common name: Guava fruit fly

Previous scientific names:

Chaetodacus correctus

Dacus (Strumeta) correctus

Bactrocera (Bactrocera) correcta

DIAGNOSIS

7.3.7.1.1 *Morphological - Adult*

Face fulvous with a pair of transverse elongate black spots almost meeting in centre; scutum black with dark red-brown along lateral and posterior margins; postpronotal lobes and notopleura yellow; mesopleural stripe reaching almost to anterior *npl.* seta dorsally; broad parallel sided lateral postsutural vittae ending behind *ia.* seta; medial postsutural vitta absent; scutellum yellow with narrow black basal band; legs with all segments entirely fulvous except hind tibiae pale fuscous; wings with cells *bc* and *c* colourless, both cells entirely devoid of microtrichia, a narrow pale fuscous costal band confluent with R_{2+3} and ending at apex of this vein, a small oval fuscous spot across apex of R_{4+5} , anal streak absent but with a pale fuscous tint within cell cup; supernumerary lobe of medium development; abdominal terga III-V red-brown with a 'T' pattern consisting of a narrow transverse black band across anterior margin of tergum III and a narrow medial longitudinal black band over all three terga, narrow black anterolateral corners on terga IV and V, a pair of oval red-brown shining spots on tergum V; posterior lobe of male surstylus short; female with aculeus tip needle shaped (pers. comm. Drew 2010).

7.3.7.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.7.1.3 *Molecular*

See **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera correcta has been recorded on hosts from a wide range of families. These include: Anacardiaceae, Annonaceae, Apocynaceae, Arecaceae, Cactaceae, Capparaceae, Caricaceae, Combretaceae, Curcubitaceae, Dipterocarpaceae, Elaeocarpaceae, Euphorbiaceae, Flacourtiaceae, Lecythidaceae, Malpighiaceae, Meliaceae, Moraceae, Musaceae, Myristicaceae, Myrtaceae, Olacaceae, Oxalidaceae, Rhamnaceae, Rosaceae, Rutaceae, Sapindaceae, Sapotaceae and Simaroubaceae (for a full list of recorded hosts see Allwood *et al.* 1999).

Major commercial hosts (Allwood et al. 1999):

Scientific name	Common name	Scientific name	Common name
<i>Anacardium occidentale</i>	cashew nut	<i>Psidium guajava</i>	guava
<i>Mangifera indica</i>	mango	<i>Syzygium samarangense</i>	water apple
<i>Manilkara zapota</i>	sapodilla	<i>Terminalia catappa</i>	Singapore almond
<i>Mimusops elengi</i>	Spanish cherry	<i>Ziziphus jujuba</i>	common jujube
<i>Muntingia calabura</i>	Jamaican cherry		

DISTRIBUTION

Sri Lanka, India, Nepal, Pakistan, Myanmar, northern Thailand, southern China, Bhutan, Vietnam (pers. comm. Drew 2010).

REMARKS

Bactrocera correcta is similar to *B. dorsalis* in the general colour patterns of the body, wings and legs but differs from *B. dorsalis* in possessing transverse facial spots and an incomplete costal band. It is also similar to *B. penecorrecta* in the general colour patterns of the body and wings but differs from this species in having abdominal terga III-V mostly pale coloured (not mostly black as in *B. penecorrecta*) and the scutellum with a narrow black basal band (pers. comm. Drew 2010).

PEST STATUS

- Exotic
- Major pest species, particularly in Vietnam

ATTRACTANT

Methyl eugenol.

FIGURES

Figure 25. *Bactrocera correcta*

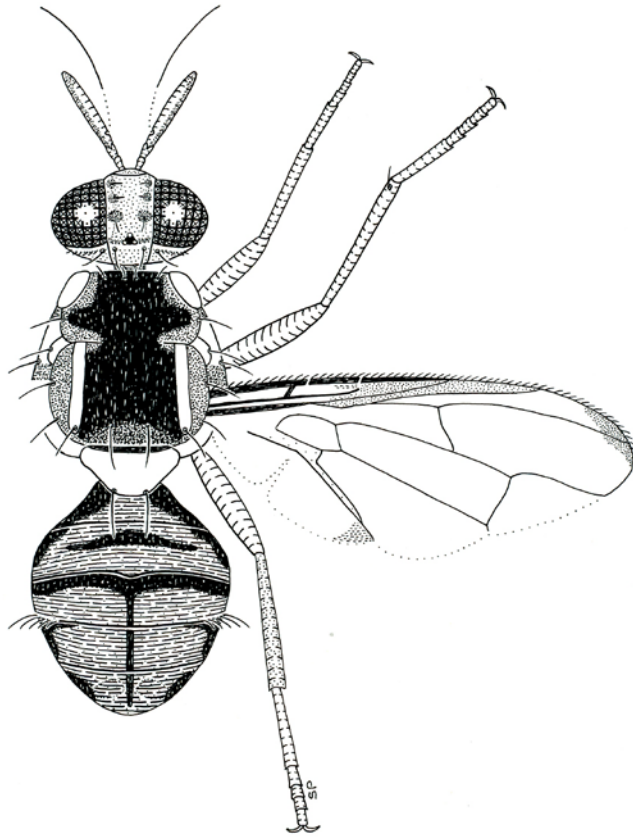


Image courtesy of S. Phillips and the International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.8 *Bactrocera (Austrodacus) cucumis* (French)

TAXONOMIC INFORMATION

Common name: Cucumber fruit fly

Previous scientific names:

Dacus tryoni var. *cucumis*

Dacus cucumis

Austrodacus cucumis

Dacus (Austrodacus) cucumis

DIAGNOSIS

7.3.8.1.1 Morphological - Adult

Medium sized species; small fuscous to black facial spots present; postpronotal lobes and notopleura yellow; scutum orange-brown without dark markings, mesopleural stripe reaching almost to anterior *npl.* seta, lateral postsutural vittae beginning anterior to mesonotal suture, broad medial postsutural vitta present, scutellum yellow; wing with a narrow fuscous costal band and anal streak, cells bc and c pale fulvous (cell c slightly paler than cell bc), microtrichia in outer corner of cell c only; abdominal terga I and II orange-brown, terga III-V fulvous except for two broad lateral longitudinal orange-brown bands over all three terga and a narrow medial longitudinal band which is orange-brown on tergum III and orange-brown to dark fuscous on tergum IV and V (this band is broader on tergum V); posterior lobe of male surstylus long; female with aculeus tip blunt trilobed (Drew 1989; pers. comm. Drew 2010).

7.3.8.1.2 Morphological - Larvae

- Not available/included in this edition -

7.3.8.1.3 Molecular

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 750 bp

BsrI: DNC *SnaBI*: DNC

HhaI: 550, 180 *SspI*: DNC

HinfI: DNC *VspI*: DNC

Sau3AI DNC

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

While cucurbits are the major hosts of this species, it has been reared at moderate to high levels from several other species in different plant families, including pawpaw and tomato (PaDIL 2007).

The rare or incidental hosts (usually a single rearing) include mango, avocado, guava, carambola, apricot, some species of citrus, and capsicum. It is likely that most of these records could be attributed to fruit damage prior to oviposition. *B. cucumis* attacks wild cucurbits such as *Diplocyclos palmatus* and these may be reservoir hosts (CABI 2007).

Bactrocera cucumis has been recorded on hosts from a wide range of families. These include: Anacardiaceae, Caricaceae, Combretaceae, Curcubitaceae, Ebenaceae, Euphorbiaceae, Lauraceae, Myrtaceae, Oxalidaceae, Passifloraceae, Rosaceae, Rubiaceae, Rutaceae, Solanaceae and Vitaceae (for a full list of recorded hosts see Hancock *et al.* 2000).

It is worth noting, however, that many of the host associations for this species in Hancock *et al.* (2000) are single records and are considered unusual. Hancock *et al.* (2000) concede that the publication may contain a variety of errors as only the records that could be confidently attributed to errors were removed. This does not rule out the possibility that many of the host association records contained within are still erroneous.

Further, the revision by Hancock *et al.* (2000) cites a large body of work conducted as early as 1951. Much of the work in those earlier publications may also contain a number of errors.

As such, the Hancock *et al.* (2000) publication should not be used as the sole basis for providing evidence of host association.

Major commercial hosts (Drew, 1989; Hancock *et al.* 2000):

Scientific name	Common name	Scientific name	Common name
<i>Carica papaya</i>	papaw	<i>Passiflora edulis</i>	passionfruit
<i>Cucumis sativus</i>	cucumber	<i>Solanum lycopersicum</i>	tomato
<i>Cucurbita moschata</i>	pumpkin	<i>Trichosanthes anguinea</i>	guada bean
<i>Cucurbita pepo</i>	squash and zucchini		

DISTRIBUTION

Eastern Queensland and northeast New South Wales although it has not been trapped as far south as Sydney. Hancock *et al.* (2000) list it as present in the Northern Territory and Torres Strait Islands but its presence there cannot be proven (pers. comm. Drew 2011). Although morphologically indistinguishable from Queensland specimens (Drew pers. comm. 2011), the Northern Territory strain does not infest commercial crops and in laboratory culture, failed to develop on undamaged cucurbit, solonaceous or other commercial hosts, but could be reared on sliced cucumber (Smith and Chin 1987).

REMARKS

Bactrocera cucumis is a pale orange-brown species with medial and lateral postsutural vittae present, a yellow scutellum, *prsc.* and *sa.* setae absent, 4 *sc.* seta present and a small elongate-oval black spot centrally on tergum V (Drew 1989).

Other remarks:

In common with most species in, or close to, subgenus *Zeugodacus*, the scutum has three yellow vittae (lateral and medial stripes), four setae on the margin of the scutellum, and the males lack a deep V-shaped notch in posterior margin of 5th sternite. This species is unusual in that it also lacks both anterior supra-alar setae and prescutellar acrostichal setae, and the males lack a pecten (comb of setae on each postero-lateral corner of tergite 3) (CABI 2007).

PEST STATUS

- Endemic
- Major pest species in Queensland. Regarded as a potential pest of fruit in the National Tropical Fruit IBP (page 26)

ATTRACTANT

None known, but can be captured in traps emitting ammonia.

FIGURES

Figure 26. *Bactrocera cucumis*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 27. *Bactrocera cucumis*

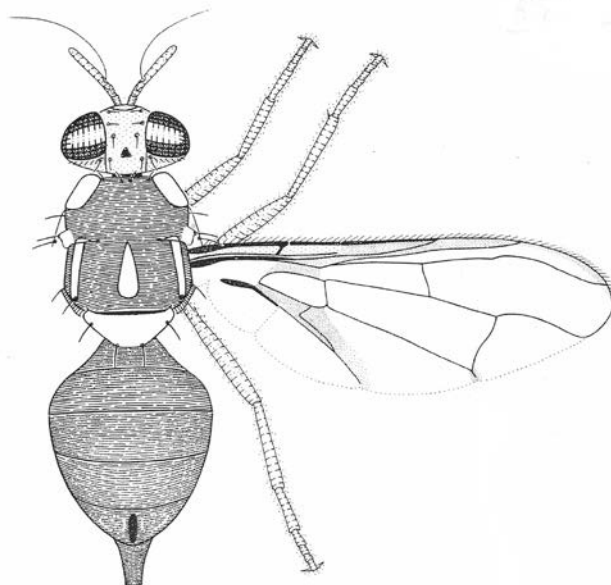


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.9 *Bactrocera (Zeugodacus) cucurbitae* (Coquillett)

TAXONOMIC INFORMATION

Common name: Melon fly

Previous scientific names:

Dacus cucurbitae

Chaetodacus cucurbitae

Strumeta cucurbitae

Dacus (Strumeta) cucurbitae

Dacus (Zeugodacus) cucurbitae

Bactrocera cucurbitae

DIAGNOSIS

7.3.9.1.1 *Morphological - Adult*

Medium sized species; large black facial spots present; postpronotal lobes and notopleura yellow; scutum red-brown with or without fuscous markings, mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *np1*. seta, lateral postsutural vittae beginning anterior to mesonotal suture, narrow medial postsutural vitta present, scutellum yellow; wing with a broad fuscous costal band expanding into a fuscous spot at wing apex, a broad fuscous anal streak, dark fuscous along dm-cu crossvein, pale infuscation along r-m crossvein, cells bc and c colourless, microtrichia in outer corner of cell c only; abdominal terga III-V orange-brown except for a narrow transverse black band across anterior margin of tergum III which expands over anterolateral corners, a narrow medial longitudinal dark fuscous to black band over all three terga and anterolateral corners of terga IV and V fuscous; posterior lobe of male surstylus long; female with aculeus needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.9.1.2 *Morphological - Larvae*

- Not available / included in this edition -

7.3.9.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 600 bp

*Bsr*I: DNC *Sna*BI: DNC

*Hha*I: 400, 180 *Ssp*I: DNC

*Hinf*I: DNC *Vsp*I: DNC

*Sau*3AI: DNC

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera cucurbitae is primarily a pest of Cucurbitaceae, however it has also been recorded from eleven other families. These include: Agavaceae, Capparaceae, Fabaceae, Malvaceae, Moraceae,

Myrtaceae, Rhamnaceae, Rutaceae, Sapotaceae, Solanaceae and Vitaceae (for a full list of recorded hosts see Allwood *et al.* 1999).

Major commercial hosts (Drew 1989, Allwood *et al.* 1999):

Scientific name	Common name	Scientific name	Common name
<i>Coccinia grandis</i>	ivy gourd	<i>Cucurbita pepo</i>	ornamental gourd
<i>Cucumis melo</i>	melon	<i>Momordica charantia</i>	
<i>Cucumis sativus</i>		<i>Trichosanthes cucumerina</i> var. <i>anguinea</i>	snakegourd
<i>Cucurbita maxima</i>	giant pumpkin		

DISTRIBUTION

Widely distributed over Southeast Asia, the Indian subcontinent, southern China, northern Africa and Papua New Guinea. Introduced into the Mariana Islands, the Hawaiian Islands and from Papua New Guinea to the Solomon Islands. Present in Indonesia and East Timor.

REMARKS

Bactrocera cucurbitae is similar to *B. emittens* in possessing only a slight widening of the costal band in wing apex, a narrow infuscation along dm-cu crossvein and abdominal terga with ground colour fulvous but differs in having the spot on apex of costal band not reaching M, cells bc and c colourless, abdominal tergum III with a narrow transverse black band across base and tip of piercer of ovipositor needle shaped. The most distinctive characteristic of the adult is the wing pattern (Drew 1989).

B. cucurbitae can appear similar to the endemic *B. chorista* and both are attracted to cue lure. *B. cucurbitae* has a narrower medial vitta and a larger marking at the distal end of the wing.

PEST STATUS

- Exotic
- High priority pest identified in the Tropical fruit and Vegetables IBPs
- *Bactrocera cucurbitae* is a very serious pest of cucurbit crops

ATTRACTANT

Cue lure or a mixture of methyl eugenol and cue lure (Dominiak *et al.* 2011).

FIGURES

Figure 28. *Bactrocera cucurbitae*



Image courtesy of Ken Walker, Museum Victoria, www.padil.gov.au (as of 22 August 2011)

Figure 29. *Bactrocera cucurbitae*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 30. *Bactrocera cucurbitae*

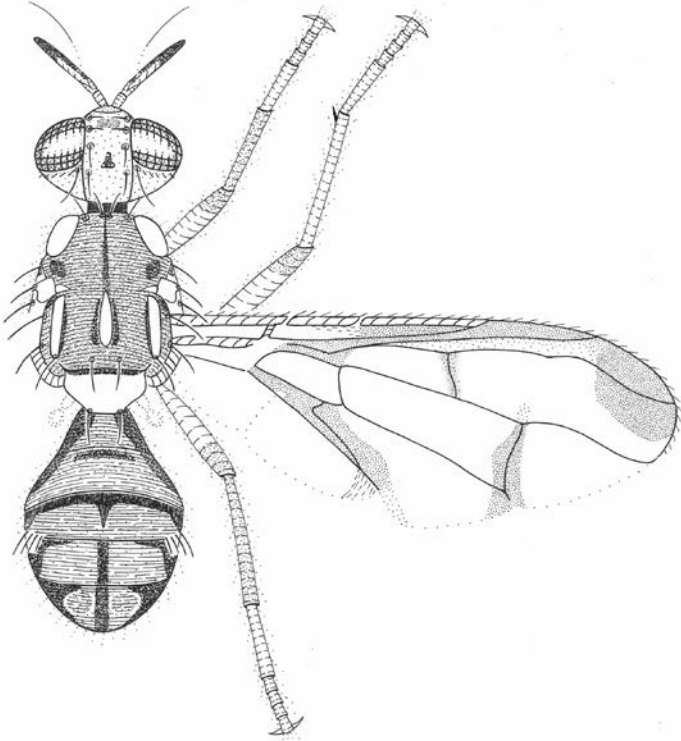


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.10 *Bactrocera (Bactrocera) curvipennis* (Froggatt)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Dacus curvipennis

Strumeta curvipennis

Dacus (Strumeta) curvipennis

DIAGNOSIS

7.3.10.1.1 Morphological - Adult

Small species; very small pale fuscous facial spots present; postpronotal lobes and notolueria yellow; scutum black, mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta, lateral postsutural vittae present, medial postsutural vitta absent, scutellum yellow; wing with a broad fuscous costal band and anal streak, a broad fuscous band along r-m crossvein, cells bc and c pale fuscous, microtichia covering cell c and outer corner of cell bc; abdominal terga III-V orange-brown with a narrow transverse fuscous band along anterior margin of tergum III merging into broad lateral black margins and with anterolateral corners of terga IV and V fuscous; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.10.1.2 Morphological - Larvae

- Not available/included in this edition -

7.3.10.1.3 Molecular

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 850 bp

*Bsr*I: 570, 250 *Sna*BI: DNC

*Hha*I: 620, 170 *Ssp*I: 550, 200

*Hinf*I: DNC *Vsp*I: DNC

*Sau*3AI: 420

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera curvipennis has been recorded on hosts from two families, Rutaceae and Anacardiaceae (for a full list of recorded hosts see CABI 2007).

Major commercial hosts (Drew 1989):

Scientific name	Common name	Scientific name	Common name
<i>Citrus reticulata</i>	mandarin		

DISTRIBUTION

New Caledonia and one remote island in Vanuatu (Drew 1989).

REMARKS

Bactrocera curvipennis is distinct in having the mesopleural stripe not extending to the postpronotal lobes, microtrichia covering cell c and outer corner of cell bc, and abdominal terga III-V orange-brown with a very narrow transverse fuscous band across anterior margin of tergum III which merges into broad lateral black margins and the anterolateral corners of terga IV and V fuscous (Drew 1989).

PEST STATUS

- Exotic

ATTRACTANT

Cue lure, Willison's lure.

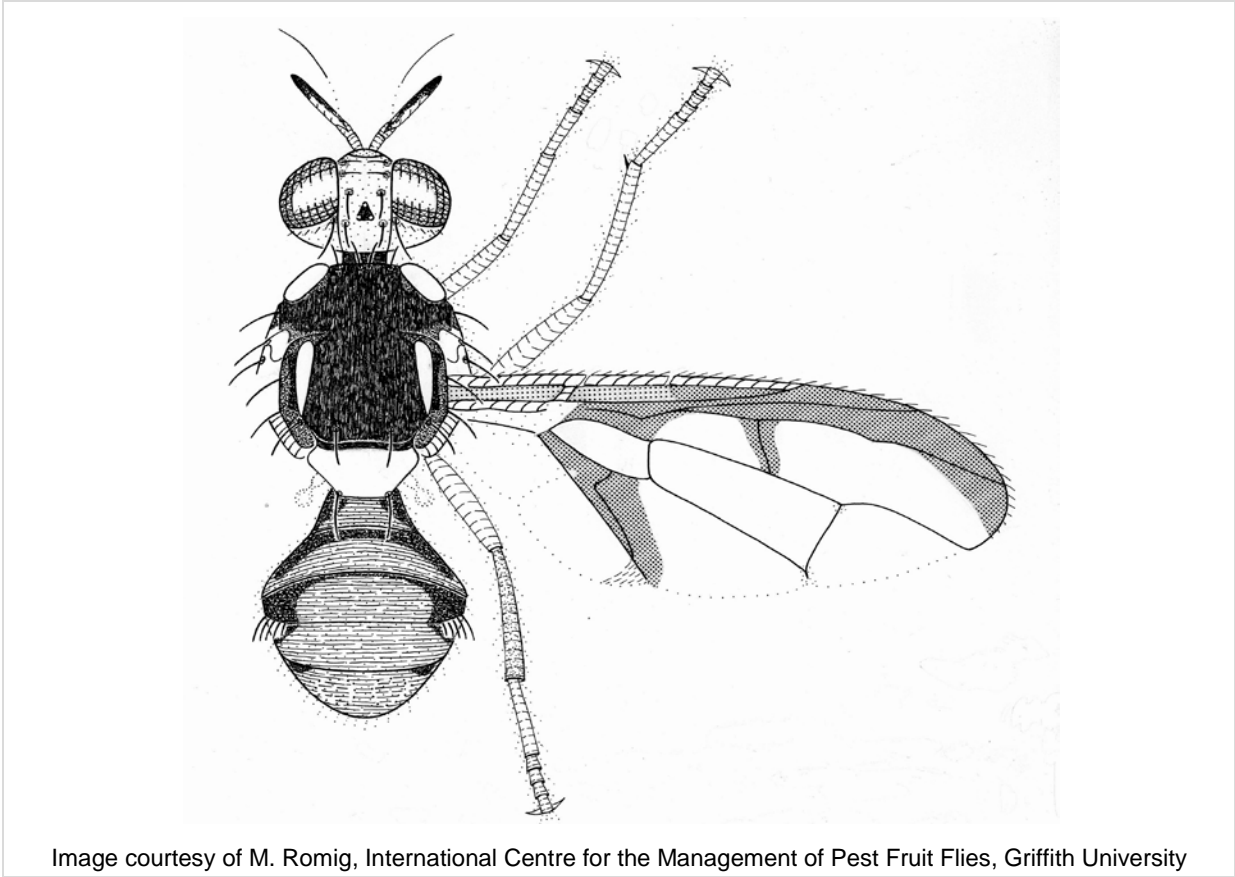
FIGURES

Figure 31. *Bactrocera curvipennis*



Image courtesy of Mr. S. Wilson and the International Centre for the Management of Pest Fruit Flies, Griffith University

Figure 32. *Bactrocera curvipennis*



7.3.11 *Bactrocera (Paradacus) decipiens* (Drew)

TAXONOMIC INFORMATION

Common name: Pumpkin fruit fly

Previous scientific names:

Dacus (Paradacus) decipiens

DIAGNOSIS

7.3.11.1.1 *Morphological - Adult*

Large species; medium sized fuscous to black facial spots present; postpronotal lobes and notopluera yellow; scutum red-brown with two broad lateral longitudinal fuscous bands, mesoplural stripe reaching almost to anterior *np1*. seta, lateral postsutural vittae beginning anterior to mesonotal suture, broad medial postsutural vitta present, scutellum yellow: wing with a broad fuscous costal band and anal streak, an irregular recurved pale fuscous marking across wing, cells bc and c extremely pale fuscous (cell c paler in centre), microtrichia in outer 1/3 of cell c only; abdominal terga I-V fulvous except for broad lateral fuscous margins on tergum I and a narrow medial longitudinal fuscous band on tergum V; posterior lobe of male surstylus long; female with aculeus tip trilobed (Drew 1989; pers. comm. Drew 2010).

7.3.11.1.2 *Morphological - Larvae*

- Not available / included in this edition -

7.3.11.1.3 *Molecular*

See **PCR-DNA barcoding** (Section 3.3.2.).

HOST RANGE

Pumpkin (*Cucurbita pepo*) is the only recorded host.

Major commercial hosts (Drew 1989):

Scientific name	Common name
<i>Cucurbita pepo</i>	pumpkin

DISTRIBUTION

Papua New Guinea (New Britain) (Drew 1989).

REMARKS

Bactrocera decipiens is similar to *B. perplexa* in possessing infuscation on wings in addition to costal band and anal streak but differs in having an irregular S-shaped pale fuscous marking across wing, microtrichia in outer 1/3 of cell c only, mesoplural stripe not extending to postpronotal lobes, abdominal terga mostly fulvous with broad lateral fuscous margins on tergum I, a narrow medial longitudinal fuscous band on tergum V and apex of piercer of ovipositor with one pair of subapical lobes (Drew 1989).

PEST STATUS

- Exotic
- A major pest of pumpkins in New Britain

ATTRACTANT

No known record.

FIGURES

Figure 33. *Bactrocera decipiens*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 34. *Bactrocera decipiens*

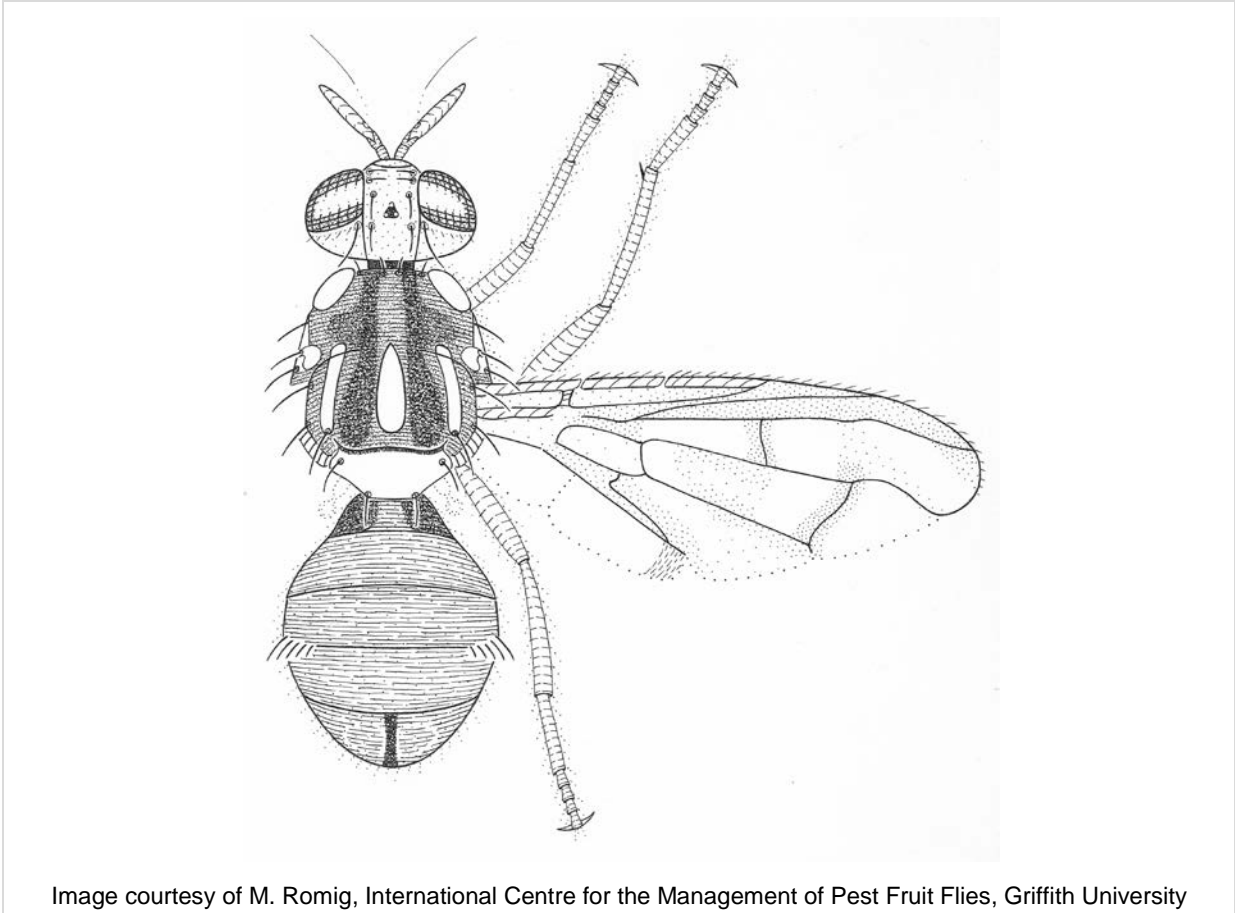


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.12 *Bactrocera (Bactrocera) dorsalis* (Hendel)

TAXONOMIC INFORMATION

Common name: Oriental fruit fly

Previous scientific names:

Dacus dorsalis

Dacus (Strumeta) dorsalis

Strumeta dorsalis

Dacus (Bactrocera) dorsalis

Bactrocera (Bactrocera) dorsalis

DIAGNOSIS

7.3.12.1.1 *Morphological - Adult*

Face fulvous with a pair of medium sized circular black spots; scutum black with extensive areas of red-brown to brown below and behind lateral postsutural vittae, around mesonotal suture, between postpronotal lobes and notopleura, inside postpronotal lobes; postpronotal lobes and notopleura yellow; mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta dorsally; broad parallel sided lateral postsutural vittae ending behind *ia.* seta; medial postsutural vitta absent; scutellum yellow; legs with femora entirely fulvous, fore tibiae pale fuscous and hind tibiae fuscous; wings with cells bc and c colourless, microtrichia in outer corner of cell c only, a narrow fuscous costal band confluent with R_{2+3} and remaining very narrow around apex of wing (occasionally there can be a very slight swelling around apex of R_{4+5}), a narrow pale fuscous anal streak; supernumerary lobe of medium development; abdominal terga III-V exhibits a range of colour patterns (see Drew and Hancock 1994) but possesses the basic pattern of a black 'T' consisting of a narrow transverse black band across anterior margin of tergum III, a narrow medial longitudinal black band over all three terga, narrow anterolateral fuscous to dark fuscous corners on terga IV and V; a pair of oval orange-brown to pale fuscous shining spots on tergum V; abdominal sterna dark coloured; posterior lobe of male surstylus short; female with aculeus tip needle shaped (pers. comm. Drew 2010).

7.3.12.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.12.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 820 bp

*Bsr*I: 650, 260 *Sna*BI: 326, 540

*Hha*I: 656, 192 *Ssp*I: DNC

*Hin*II: 770 *Vsp*I: DNC

*Sau*3AI: DNC

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera dorsalis has been recorded on hosts from a wide range of families. These include: Alangiaceae, Anacardiaceae, Annonaceae, Apocynaceae, Arecaceae, Burseraceae, Capparaceae, Caprifoliaceae, Caricaceae, Celastraceae, Chrysobalanaceae, Clusiaceae, Combretaceae, Convolvulaceae, Curcubitaceae, Ebenaceae, Elaeocarpaceae, Euphorbiaceae, Fabaceae, Flacourtiaceae, Lauraceae, Lecythidaceae, Malpighiaceae, Meliaceae, Moraceae, Musaceae, Myrtaceae, Olacaceae, Oleaceae, Oxalidaceae, Polygalaceae, Rhamnaceae, Rosaceae, Rubiaceae, Rutaceae, Sapindaceae, Sapotaceae, Simaroubaceae and Solanaceae (for a full list of recorded hosts see Allwood *et al.* 1999).

Major commercial hosts (Allwood *et al.* 1999):

Scientific name	Common name	Scientific name	Common name
<i>Anacardium occidentale</i>	cashew nut	<i>Mimusops elengi</i>	spanish cherry
<i>Annona reticulata</i>	bullock's heart	<i>Muntingia calabura</i>	Jamaican cherry
<i>Annona squamosa</i>	sugarapple	<i>Musa</i>	banana
<i>Averrhoa carambola</i>	carambola	<i>Prunus armeniaca</i>	apricot
<i>Capsicum annuum</i>	bell pepper	<i>Prunus avium</i>	sweet cherry
<i>Carica papaya</i>	papaw	<i>Prunus cerasus</i>	sour cherry
<i>Chrysophyllum cainito</i>	caimito	<i>Prunus domestica</i>	plum
<i>Citrus reticulata</i>	mandarin	<i>Prunus persica</i>	peach
<i>Coffea arabica</i>	arabica coffee	<i>Psidium guajava</i>	guava
<i>Dimocarpus longan</i>	longan tree	<i>Pyrus communis</i>	European pear
<i>Diospyros kaki</i>	persimmon	<i>Syzygium aqueum</i>	watery rose-apple
<i>Malpighia glabra</i>	acerola	<i>Syzygium cumini</i>	black plum
<i>Malus domestica</i>	apple	<i>Syzygium jambos</i>	rose apple
<i>Mangifera foetida</i>	bachang	<i>Syzygium malaccense</i>	malay-apple
<i>Mangifera indica</i>	mango	<i>Syzygium samarangense</i>	water apple
<i>Manilkara zapota</i>	sapodilla		

DISTRIBUTION

India, Sri Lanka, Nepal, Bhutan, Myanmar, southern China, Taiwan, Hong Kong, northern Thailand, Vietnam, Cambodia, Laos, Hawaii, Mariana Islands, Tahiti (pers. comm. Drew 2010).

REMARKS

Bactrocera dorsalis is similar to *B. carambolae*, *B. papayae* and *B. verbascifoliae* in possessing broad parallel sided lateral postsutural vittae, costal band confluent with or very slightly overlapping R₂₊₃ and to *B. papayae* and *B. verbascifoliae* in having the costal band remaining very narrow beyond apex of R₂₊₃, femora entirely fulvous and abdominal terga III-V with a narrow medial longitudinal dark band.

It differs from *B. carambolae* in possessing a very narrow apical section of the costal band, narrow medial longitudinal dark band on abdominal terga III-V and triangular shaped anterolateral dark corners on abdominal terga IV and V (these markings are rectangular in *B. carambolae*).

It differs from *B. verbascifoliae* in possessing narrow lateral dark margins on abdominal terga IV and V and from *B. papayae* in having a short male aedeagus and female ovipositor.

Other *dorsalis* complex species that are similar to *B. dorsalis* are *B. hantanae*, *B. irvingiae*, *B. raiensis* and *B. syzygii* however, all of these species possess a broad medial longitudinal dark band on abdominal terga III-V and have not been recorded as having males responding to methyl eugenol. See Drew and Hancock (1994) for a full discussion of type specimens, relationships and synonymies.

Following the publication on the *dorsalis* complex by Drew and Hancock (1994), there has been considerable research to investigate the integrity of many of the morphologically close species in the *dorsalis* complex. The review of Clarke *et al.* (2005) summarised the bulk of this research and has demonstrated that most taxa within the complex can be satisfactorily resolved and that the complex is undergoing rapid morphological change.

PEST STATUS

- Exotic
- High priority pest identified in the Apple and Pear, Avocado, Banana, Citrus, Summerfruit, Tropical fruit and Vegetable IBPs
- *Bactrocera dorsalis* is a major economic pest and utilises a wide range of commercial, edible and rainforest fruits

ATTRACTANT

Methyl eugenol.

FIGURES

Figure 35. *Bactrocera dorsalis*

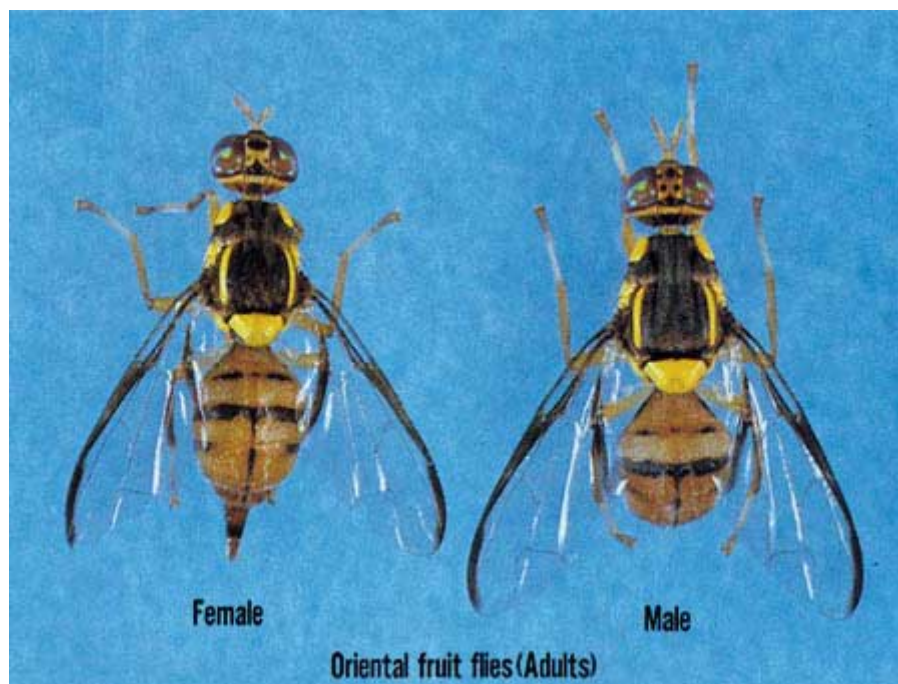
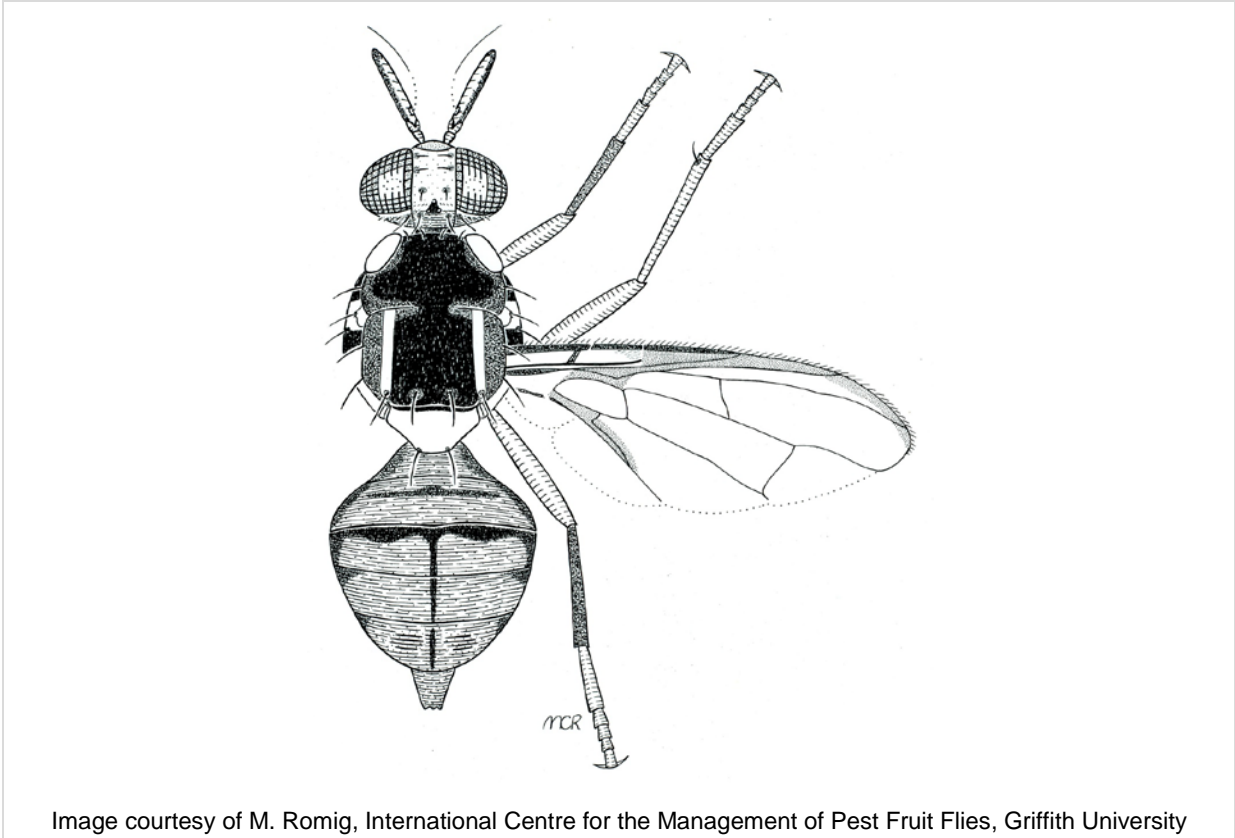


Image courtesy of the University of Florida and the Florida Department of Agriculture and Consumer Services
<http://entomology.ifas.ufl.edu/creatures/index.htm> (as of 22 August 2011)

Figure 36. *Bactrocera dorsalis*



7.3.13 *Bactrocera (Bactrocera) facialis* (Coquillett)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Dacus facialis

Chaetodacus facialis

Strumeta facialis

Dacus (Strumeta) facialis

DIAGNOSIS

7.3.13.1.1 Morphological - Adult

Small species; facial spots absent; postpronotal lobes and notopleura yellow; scutum dark fuscous to black, mesopleural stripe reaching almost to postpronotal lobes, narrow short lateral postsutural vittae present, medial postsutural vitta absent, scutellum yellow; wing with a narrow fuscous costal band and narrow pale fuscous anal streak, cells bc and c colourless with microtrichia in outer corner of cell c only; abdominal terga III-V orange-brown with a moderately broad medial longitudinal fuscous to black band over all three terga, broad lateral fuscous to black margins on tergum III and anterolateral corners of terga IV and V; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.13.1.2 Morphological - Larvae

- Not available/included in this edition -

7.3.13.1.3 Molecular

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 750 bp

*Bsr*I: 580, 250 *Sna*BI: DNC

*Hha*I: 600, 180 *Ssp*I: DNC

*Hinf*I: DNC *Vsp*I: DNC

*Sau*3AI: 400

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera facialis has been recorded on hosts from a wide range of families. These include: Anacardiaceae, Combretaceae, Fabaceae, Lauraceae, Moraceae, Myrtaceae, Passifloraceae, Rosaceae, Rutaceae, Sapindaceae and Solanaceae (for a full list of recorded hosts see CABI 2007).

Major commercial hosts (Drew 1989):

Scientific name	Common name	Scientific name	Common name
<i>Capsicum annuum</i>	bell pepper	<i>Psidium guajava</i>	guava
<i>Mangifera indica</i>	mango		

DISTRIBUTION

Known from the Tongatapu I. and the Ha'apai Group, Tonga (Drew 1989).

REMARKS

Bactrocera facialis is distinct in having broad black lateral margins on abdominal tergum III and anterolaterally on terga IV and V, a moderately broad medial longitudinal black band on terga III-V and lateral postsutural vittae very short and narrow ending at level of sa. setae (Drew 1989).

PEST STATUS

- Exotic
- *Bactrocera facialis* is a major pest, which causes up to 100% fruit loss in *Capsicum* species in Tonga

ATTRACTANT

Cue lure.

FIGURES

Figure 37. *Bactrocera facialis*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 38. *Bactrocera facialis*

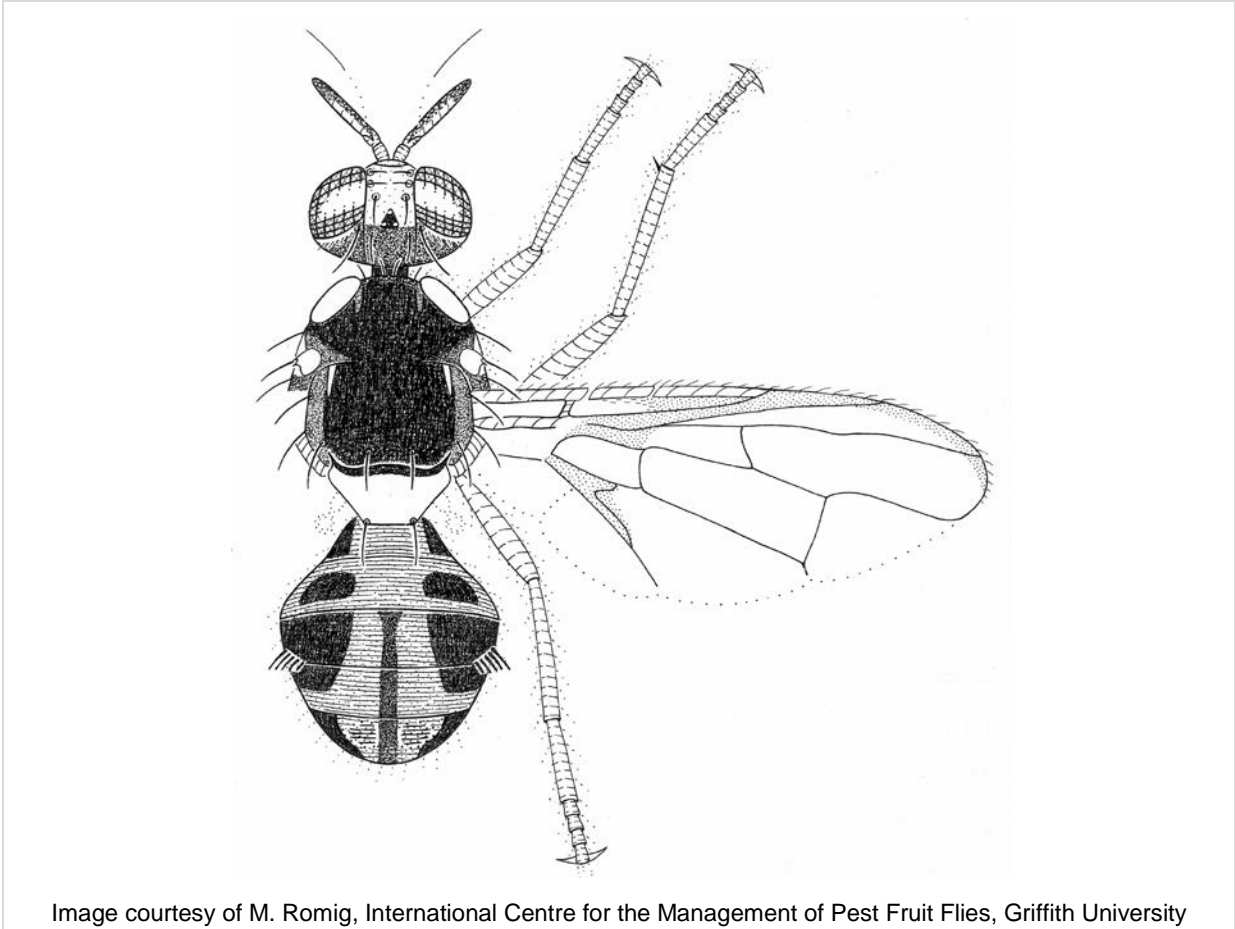


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.14 *Bactrocera (Bactrocera) frauenfeldi* (Schiner)

TAXONOMIC INFORMATION

Common name: Mango fruit fly

Previous scientific names:

Dacus frauenfeldi

Strumeta frauenfeldi

Dacus (Strumeta) frauenfeldi

DIAGNOSIS

7.3.14.1.1 Morphological - Adult

Medium sized species; large black facial spots present; postpronotal lobes black; notopleura yellow; scutum glossy black, mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta, lateral postsutural vittae present, medial postsutural vitta absent, scutellum yellow with a black triangle on dorsal surface; wing with a narrow extremely pale fuscous costal band and broad fuscous anal streak, a narrow fuscous transverse band across wing, cells bc and c pale fuscous, microtrichia covering most of cell c; abdominal terga III-V orange-brown with a broad medial and 2 broad lateral longitudinal black bands; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.14.1.2 Morphological - Larvae

- Not available/included in this edition -

7.3.14.1.3 Molecular

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 840 bp

*Bsr*I: DNC *Sna*BI: DNC

*Hha*I: 600, 200 *Ssp*I: 180, 620

*Hin*II: DNC *Vsp*I: DNC

*Sau*3AI: 400, 450

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera frauenfeldi has been recorded on hosts from a wide range of families. These include: Anacardiaceae, Annonaceae, Caricaceae, Clusiaceae, Combretaceae, Ebenaceae, Euphorbiaceae, Lecythidaceae, Loganiaceae, Malpighiaceae, Meliaceae, Moraceae, Musaceae, Myrtaceae, Olacaceae, Oxalidaceae, Passifloraceae, Rubiaceae, Rutaceae, Sapotaceae and Solanaceae (for a full list of recorded hosts see Hancock *et al.* 2000).

Major commercial hosts (Drew 1989):

Scientific name	Common name	Scientific name	Common name
<i>Mangifera indica</i>	mango	<i>Psidium guajava</i>	guava
<i>Manilkara kauki</i>		<i>Syzygium malaccense</i>	malay-apple

DISTRIBUTION

Widely distributed in Papua New Guinea and across the Bismark Archipelago to the Solomon Islands, and established in the Torres Strait and northern Queensland as far south as Townsville (CABI 2007; Hancock *et al.* 2000).

REMARKS

Bactrocera frauenfeldi is similar to *B. parafrasfrauenfeldi* and *B. trilineola* in having black postpronotal lobes and a black triangular marking on dorsal surface of scutellum extending to the apex but differs in possessing lateral postsutural vittae and with the black markings on the scutellum reaching the apex as a point. *Bactrocera albistrigata*, regarded as a synonym of *B. frauenfeldi* by Hardy and Adachi (1954), is a distinct species. It possesses yellow postpronotal lobes and is confined to South-east Asia (Drew 1989).

Other remarks:

This species can be separated from other members of the subgenus by the presence of a dark crossband from the pterostigma (cell sc), which also includes both the r-m and dm-cu crossvein. This runs roughly parallel to the anal stripe (diagonal mark across wing base). However, the costal band is very pale and often not visible at all beyond apex of R_{2+3} .

Bactrocera frauenfeldi can be identified by its entirely dark postpronotal lobes; the dark triangle shaped mark on the scutellum; and the short tapered lateral vittae on the scutum (CABI 2007).

PEST STATUS

- Established
- A major pest fruit fly species in Papua New Guinea, attacking most locally grown tropical fruits and nuts (with the exception of banana which is a rare host)

ATTRACTANT

Cue lure, Willison's lure.

FIGURES

Figure 39. *Bactrocera frauenfeldi*



Image courtesy of the International Centre for the Management of Pest Fruit Flies, Griffith University

Figure 40. *Bactrocera frauenfeldi*

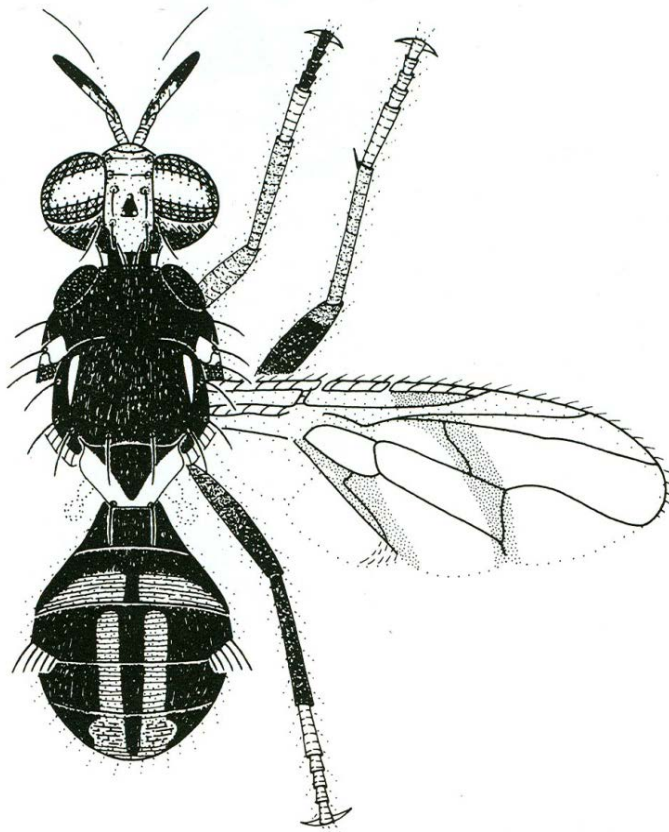


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.15 *Bactrocera (Afrodacus) jarvisi* (Tryon)

TAXONOMIC INFORMATION

Common name: Jarvis' fruit fly

Previous scientific names:

Chaetodacus jarvisi

Chaetodacus jarvisi var. *careya*

Dacus (Afrodacus) jarvisi

Afrodacus jarvisi

DIAGNOSIS

7.3.15.1.1 *Morphological - Adult*

Medium sized species; medium sized irregularly oval black facial spots present; postpronotal and notopleura yellow and connected by a broad yellow band; scutum red-brown, mesopleural stripe reaching almost to anterior *npl.* seta, lateral postsutural vittae present, medial postsutural vittae absent, wing with a narrow fuscous costal band and broad fuscous anal streak, cells bc and c colourless with microtrichia in outer corner of cell c only; abdominal terga III-V orange-brown except for a fuscous to black transverse band across anterior margin of tergum III and fuscous to black medial longitudinal band generally over all three terga but often variable; posterior lobe of male surstylus long; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.15.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.15.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 820 bp

*Bsr*I: 600, 250 *Sna*BI: DNC

*Hha*I: 650, 180 *Ssp*I: 700

*Hin*fI: 770 *Vsp*I: DNC

*Sau*3AI: 420

See also **PCR-DNA barcoding** (Section 6.3.2) and **Allozyme Electrophoresis** (Section 6.4.).

HOST RANGE

Bactrocera jarvisi has been recorded on hosts from a wide range of families. These include: Anacardiaceae, Annonaceae, Arecaceae, Cactaceae, Caricaceae, Celastraceae, Chrysobalanaceae, Clusiaceae, Combretaceae, Curcubitaceae, Ebenaceae, Elaeocarpaceae, Lauraceae, Lecythidaceae, Malpighiaceae, Meliaceae, Moraceae, Musaceae, Myrtaceae, Oleaceae, Oxalidaceae, Passifloraceae, Punicaceae, Rosaceae, Rubiaceae, Rutaceae, Sapindaceae, Sapotaceae and Solanaceae (for a full list of recorded hosts see Hancock *et al.* 2000).

Major commercial hosts (Drew 1989):

Scientific name	Common name	Scientific name	Common name
<i>Mangifera indica</i>	mango	<i>Prunus persica</i>	peach
<i>Psidium guajava</i>	guava	<i>Musa sp.</i>	banana

DISTRIBUTION

Northern Australia from Broome, Western Australia to eastern Arnhem Land, Northern Territory and northwest Queensland, Torres Strait islands and eastern Australia from Cape York to the Sydney district, New South Wales (Hancock *et al.* 2000). Has been recorded from Indonesia (Irian Jaya) by White and Elson-Harris on one occasion but is not established there and should not be regarded as a permanent record (pers. comm. Drew 2010).

REMARKS

Bactrocera jarvisi is similar to *B. ochracea* in having a pale coloured scutum, yellow notopleura and abdominal terga III-V without dark lateral margins. It is distinct from this species in having a broad yellow band connecting postpronotal lobes and notopleura, colourless cells bc and c with microtrichia in outer corner of cell c only, costal band expanded slightly at apex of wing and abdominal terga III-V with a fuscous to black narrow band across base of tergum III and a medial longitudinal fuscous to black band over all three terga (Drew 1989).

PEST STATUS

- Endemic
- A major pest in Queensland and the Northern Territory where it attacks a large number of fruit and vegetable crops

ATTRACTANT

Weakly attracted to cue lure in northwest Western Australia and Queensland (Drew 1989). Zingerone is a powerful selective male lure. A paper outlining research to this effect is currently in press (Fay 2011).

FIGURES

Figure 41. *Bactrocera jarvisi*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 42. *Bactrocera jarvisi*

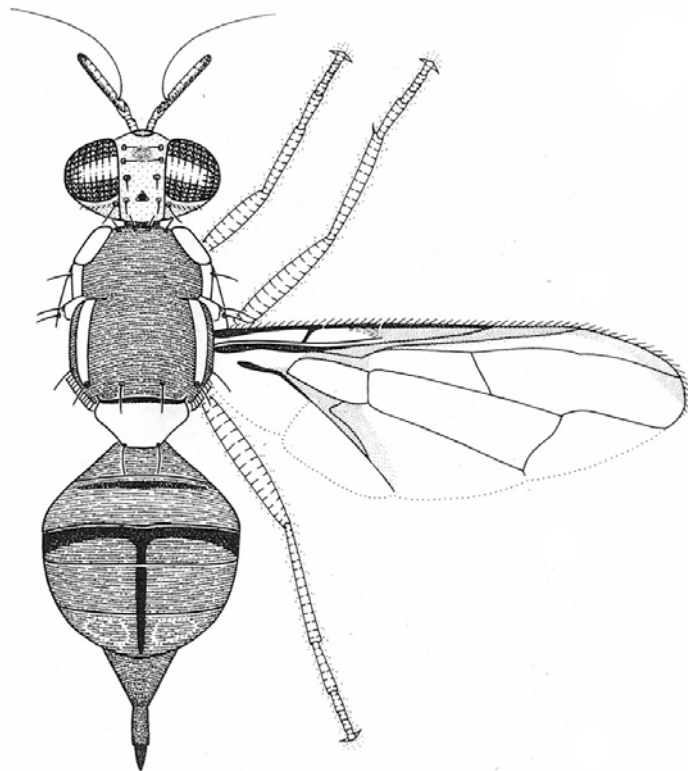


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.16 *Bactrocera (Bactrocera) kandiensis* Drew and Hancock

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

DIAGNOSIS

7.3.16.1.1 *Morphological - Adult*

Face fulvous with a pair of large oval black spots; scutum black except brown below and behind lateral postsutural vittae, around mesonotal suture, inside postpronotal lobes, around *prsc.* setae and on anterocentral margin; postpronotal lobes yellow (anteromedial corners red-brown); notopleura yellow; mesopleural stripe slightly wider than notopleuron dorsally; narrow parallel sided lateral postsutural vittae ending at *ia.* seta; medial postsutural vitta absent; scutellum yellow with a moderately broad black basal band; legs with femora fulvous with dark fuscous on outer apical 2/3 of fore femora, inner apical 1/2 of mid and inner apical 1/3 of hind femora, fore tibiae fuscous, mid tibiae fulvous and hind tibiae dark fuscous; wings with cells bc and c colourless, microtrichia in outer corner of cell c only, a narrow fuscous costal band confluent with R₂₊₃ and remaining narrow around margin of wing to end between extremities of R₄₊₅ and M, a narrow fuscous cubital streak; supernumerary lobe of medium development; abdominal terga III-V orange-brown with a narrow transverse black band across anterior margin of tergum III but not covering lateral margins, a very narrow medial longitudinal fuscous to dark fuscous band over all three terga (occasionally interrupted at intersegmental lines) and very narrow fuscous to dark fuscous anterolateral corners on terga IV and V, a pair of oval orange-brown shining spots on tergum V; abdominal sterna dark coloured; posterior lobe of male surstylus short; female with aculeus tip needle shaped (pers. comm. Drew 2010).

7.3.16.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.16.1.3 *Molecular*

See **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera kandiensis has been recorded on hosts from six families, Anacardiaceae and Clusiaceae (for a full list of recorded hosts see Allwood *et al.* 1999).

Major commercial hosts (Allwood *et al.* 1999; Tsuruta *et al.* 1997):

Scientific name	Common name	Scientific name	Common name
<i>Anacardium occidentale</i>	cashew nut	<i>Psidium guajava</i>	guava
<i>Annona glabra</i>	pond apple	<i>Spondias cytherea</i>	jew plum
<i>Citrus maxima</i>	pummelo	<i>Syzygium aromaticum</i>	clove
<i>Mangifera indica</i>	mango	<i>Syzygium jambos</i>	rose apple
<i>Averrhoa carambola</i>	carambola	<i>Carica papaya</i>	papaya

DISTRIBUTION

Bactrocera kandiensis is confined to Sri Lanka (Drew and Hancock 1994).

REMARKS

Bactrocera kandiensis is similar to *B. caryeae* and *B. neoarecae* in possessing narrow parallel sided lateral postsutural vittae and dark patterns on the apices of all femora or, at least, on fore and mid femora.

It differs from *B. neoarecae* in possessing a single 'T' pattern over abdominal terga III-V (not on each of the three separate terga), a narrow black basal band on the scutellum and dark markings on the apices of all

femora and from *B. caryeae* in possessing a very narrow medial longitudinal dark band on abdominal terga III-V and narrow dark anterolateral corners on terga IV and V (pers. comm. Drew 2010).

PEST STATUS

- Exotic
- *Bactrocera kandiensis* is a major pest of mangoes and is probably responsible for much of the damage generally attributed to *B. dorsalis* in Sri Lanka

ATTRACTANT

Methyl eugenol.

FIGURES

Figure 43. *Bactrocera kandiensis*

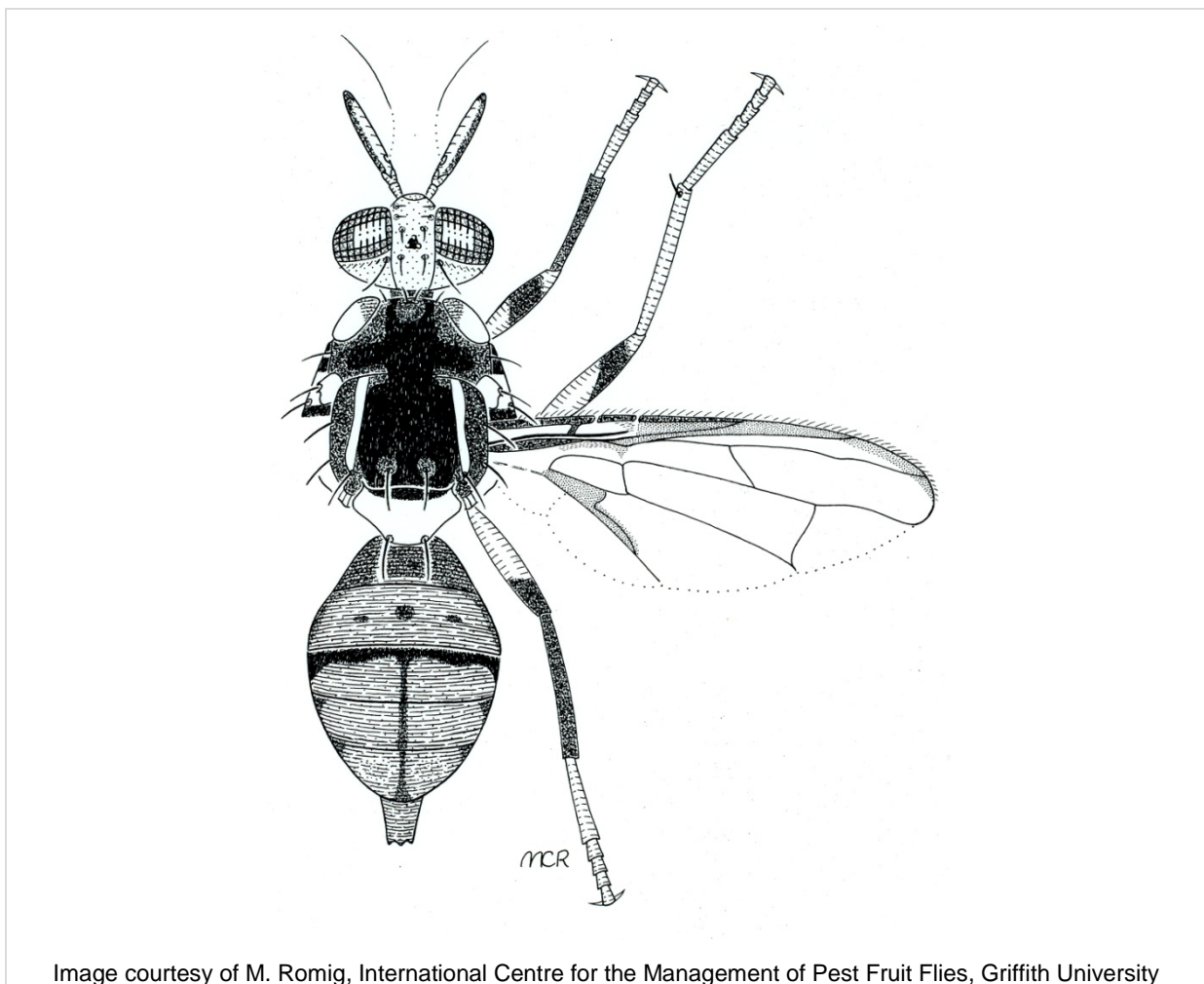


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.17 *Bactrocera (Bactrocera) kirki* (Froggatt)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Dacus kirki

Strumeta kirki

Dacus (Strumeta) kirki

DIAGNOSIS

7.3.17.1.1 Morphological - Adult

Medium sized species; large black facial spots present; postpronotal lobes yellow (anterodorsal margins black); notopleura yellow; scutum glossy black, mesopleural stripe slightly wider than notopleuron, lateral and medial postsutural vittae absent, scutellum glossy black with extreme lateral margins yellow; wing with a narrow pale fuscous costal band and narrow fuscous anal streak, a narrow pale fuscous tinge around r-m and dm-cu crossveins, cells bc and c with extremely pale fuscous tinge and microtrichia in outer ½ of cell c only; abdominal terga glossy black except for two longitudinal orange-brown bands over terga II-V either side of a broad medial longitudinal glossy black band; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.17.1.2 Morphological - Larvae

- Not available/included in this edition -

7.3.17.1.3 Molecular

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 850 bp

*Bsr*I: DNC *Sna*BI: DNC

*Hha*I: 680, 190 *Ssp*I: 180, 620

*Hin*fI: DNC *Vsp*I: DNC

*Sau*3AI: 400, 450

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera kirki has been recorded on hosts from a range of families. These include: Anacardiaceae, Bromeliaceae, Combretaceae, Fabaceae, Myrtaceae, Oxalidaceae, Passifloraceae, Rosaceae, Rutaceae, Solanaceae (for a full list of recorded hosts see CABI 2007).

Major commercial hosts (Drew 1989):

Scientific name	Common name
<i>Mangifera indica</i>	mango
<i>Psidium guajava</i>	guava

DISTRIBUTION

Widespread in the South Pacific islands: Western Samoa, American Samoa, Tonga, Niue and Tahiti (Drew 1989).

REMARKS

Bactrocera kirki is similar to *B. setinervis* in having lateral and medial postsutural vittae absent, scutellum yellow with a black triangle on dorsal surface and postpronotal lobes yellow but differs in possessing facial spots and yellow notopleura. *Bactrocera kirki* is unusual in that it lacks yellow vittae on the scutum and the scutellum is largely black except for the pale margins (Drew 1989; pers. comm. Drew 2010).

PEST STATUS

- Exotic
- High priority pest identified in the Avocado IBP
- *Bactrocera kirki* is considered a major pest, and perhaps the most significant in the South Pacific region

ATTRACTANT

Cue lure, Willison's lure.

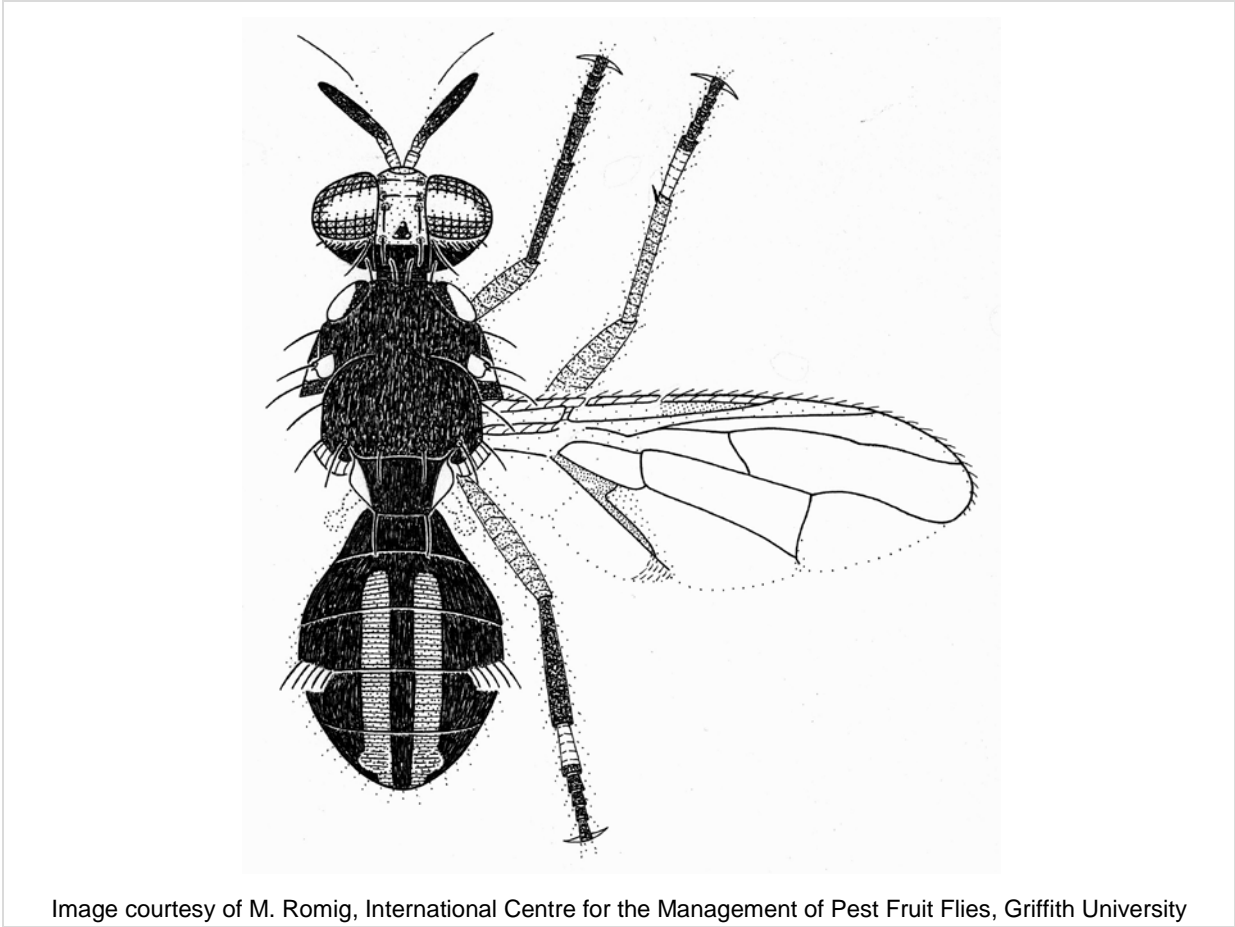
FIGURES

Figure 44. *Bactrocera kirki*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 45. *Bactrocera kirki*



7.3.18 *Bactrocera (Bactrocera) kraussi* (Hardy)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Dacus (Strumeta) kraussi

Strumeta kraussi

DIAGNOSIS

7.3.18.1.1 Morphological - Adult

Medium sized species; medium sized oval facial spots present; postpronotal lobes and notopleura yellow; scutum red-brown with irregularly shaped lateral longitudinal pale fuscous to fuscous bands, mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta, lateral postsutural vittae present, medial postsutural vitta absent, scutellum yellow with a broad red-brown to fuscous basal band; wing colourless or with a pale fulvous tint and a narrow fuscous costal band and broad fuscous anal streak, cells bc and c pale fulvous to fulvous with microtrichia in outer corner of cell c only, abdominal terga III and IV fuscous and tergum V fulvous except for broad lateral dark fuscous margins on terga III and IV and broad fuscous lateral margins on tergum V; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.18.1.2 Morphological - Larvae

- Not available/included in this edition -

7.3.18.1.3 Molecular

See **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera kraussi has been recorded on hosts from a wide range of families. These include: Agavaceae, Anacardiaceae, Annonaceae, Apocynaceae, Clusiaceae, Combretaceae, Cunoniaceae, Davidsoniaceae, Elaeocarpaceae, Euphorbiaceae, Flacourtiaceae, Icacinaceae, Lauraceae, Lecythidaceae, Loganiaceae, Malpighiaceae, Meliaceae, Menispermaceae, Moraceae, Musaceae, Myrtaceae, Oleaceae, Oxalidaceae, Passifloraceae, Rosaceae, Rubiaceae, Rutaceae, Sapindaceae, Sapotaceae, Solanaceae and Thymeliaceae (for a full list of recorded hosts see Hancock *et al.*, 2000).

Major commercial hosts (Drew 1989, Hancock *et al.* 2000):

Scientific name	Common name	Scientific name	Common name
<i>Citrus</i> sp.	Grapefruit, mandarin, orange	<i>Musa</i> sp.	banana
<i>Mangifera indica</i>	mango	<i>Psidium guajava</i>	guava

It should be noted that fruit flies are not known to attack hard green bananas (Hancock *et al.*, 2000).

DISTRIBUTION

Torres Strait Islands and northeast Queensland, as far south as Townsville (Hancock *et al.* 2000).

REMARKS

Bactrocera kraussi is similar to all other species in the *agraea* complex being a general red-brown fly, scutellum with a broad dark basal band and cells bc and c not covered in dense microtichia. It differs from *B. rufescens* in lacking a medial dark band on abdomen, from *B. fagraea* and *B. russeola* in having lateral fuscous markings on abdominal terga III and IV and from *B. halfordiae* in having a red-brown scutum with or without fuscous markings, abdomen usually fuscous over terga III and IV and laterally on tergum V, mesopleural stripe 1 ½ times the width of notopleuron and lateral postsutural vittae parallel sided (Drew 1989).

PEST STATUS

- Endemic
- A moderate pest species in North Queensland

ATTRACTANT

Cue lure.

FIGURES

Figure 46. *Bactrocera kraussi*

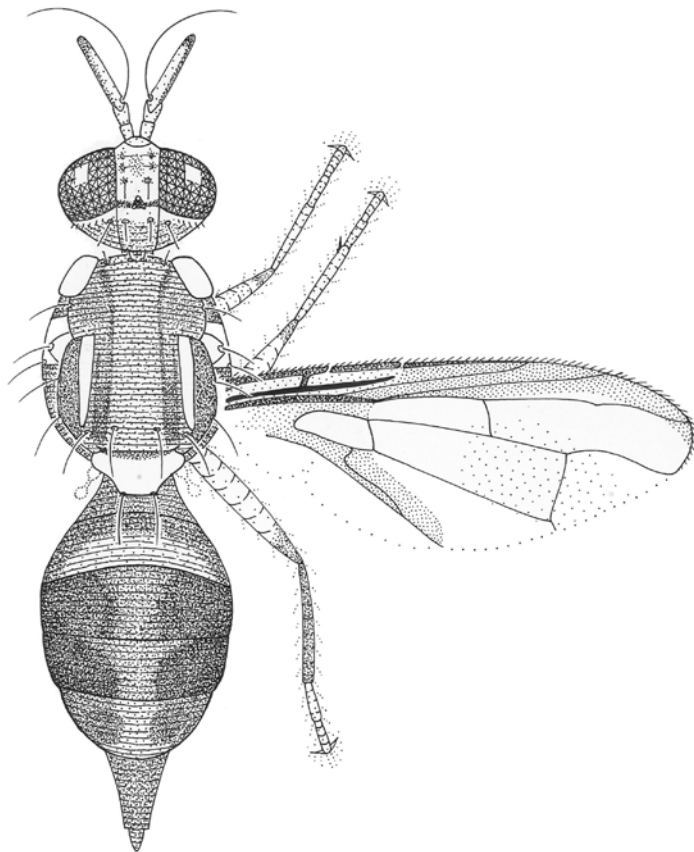


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.19 *Bactrocera (Bactrocera) latifrons* (Hendel)

TAXONOMIC INFORMATION

Common name: Solanum fruit fly

Previous scientific names:

Chaetodacus latifrons

Bactrocera (Bactrocera) latifrons

DIAGNOSIS

7.3.19.1.1 Morphological - Adult

A medium sized species; face fulvous with a pair of large oval black spots; postpronotal lobes and notopleura yellow; scutum dull black; lateral postsutural vittae present; medial postsutural vitta absent; mesopleural stripe extending to anterior *npl.* seta dorsally; scutellum yellow; wing with a narrow fuscous costal band overlapping R_{2+3} and expanding into a small spot around apex of R_{4+5} , a medium width fuscous anal streak; cells bc and c colourless; microtrichia in outer corner of cell c only; all abdominal terga entirely dark orange-brown, posterior lobe of male surstylus short; female with apex of aculeus trilobed (pers. comm. Drew 2010).

7.3.19.1.2 Morphological - Larvae

- Not available / included in this edition -

7.3.19.1.3 Molecular

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 770 bp

Bsr1: 600, 200 SnaB1: DNC

HhaI: 600, 190 Ssp1: DNC

Hinfl: DNC Vspl: DNC

Sau3a1: DNC

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera latifrons has been recorded on hosts from a wide range of families. These include: Lythraceae, Myrtaceae, Oleaceae, Passifloraceae, Punicaceae, Rhamnaceae, Rutaceae, Sapindaceae, Solanaceae and Verbenaceae (for a full list of recorded hosts see Allwood *et al.* 1999).

Major commercial hosts (Allwood *et al.* 1999):

Scientific name	Common name	Scientific name	Common name
<i>Capsicum</i> sp.	peppers	<i>Solanum lycopersicum</i>	tomato
<i>Capsicum annuum</i>	bell pepper	<i>Solanum melongena</i>	eggplant

DISTRIBUTION

Sri Lanka, India, Pakistan through to Southern China, Japan, Taiwan, Thailand, Laos, Vietnam, Peninsular Malaysia, Indonesia, Hawaii, Tanzania (pers. comm. Drew 2010).

REMARKS

Bactrocera latifrons can be confused with species in the *B. musae* complex and the *B. dorsalis* complex in possessing similar body colour patterns. However it is distinct in having a trilobed apex on the aculeus and uniformly dark orange-brown abdominal terga. It is similar to *B. citima* in possessing a generally black scutum, costal band overlapping R_{2+3} , cells bc and c colourless and parallel sided lateral postsutural vittae but differs from this species in having red-brown around the lateral and posterior margins of the scutum, femora entirely fulvous and abdominal terga III-V entirely red-brown (pers. comm. Drew 2010).

PEST STATUS

- Exotic
- This is a pest of solanaceous crops throughout its range

ATTRACTANT

No known record. Alpha-ionol, known as latilure is not a strong attractant but has been patented since 1989 (Flath *et al.* 1994). Latilure and cade oil were used in Jackson traps for surveys of *B. latifrons* in Tanzania (Flath *et al.* 1994).

FIGURES

Figure 47. *Bactrocera latifrons*

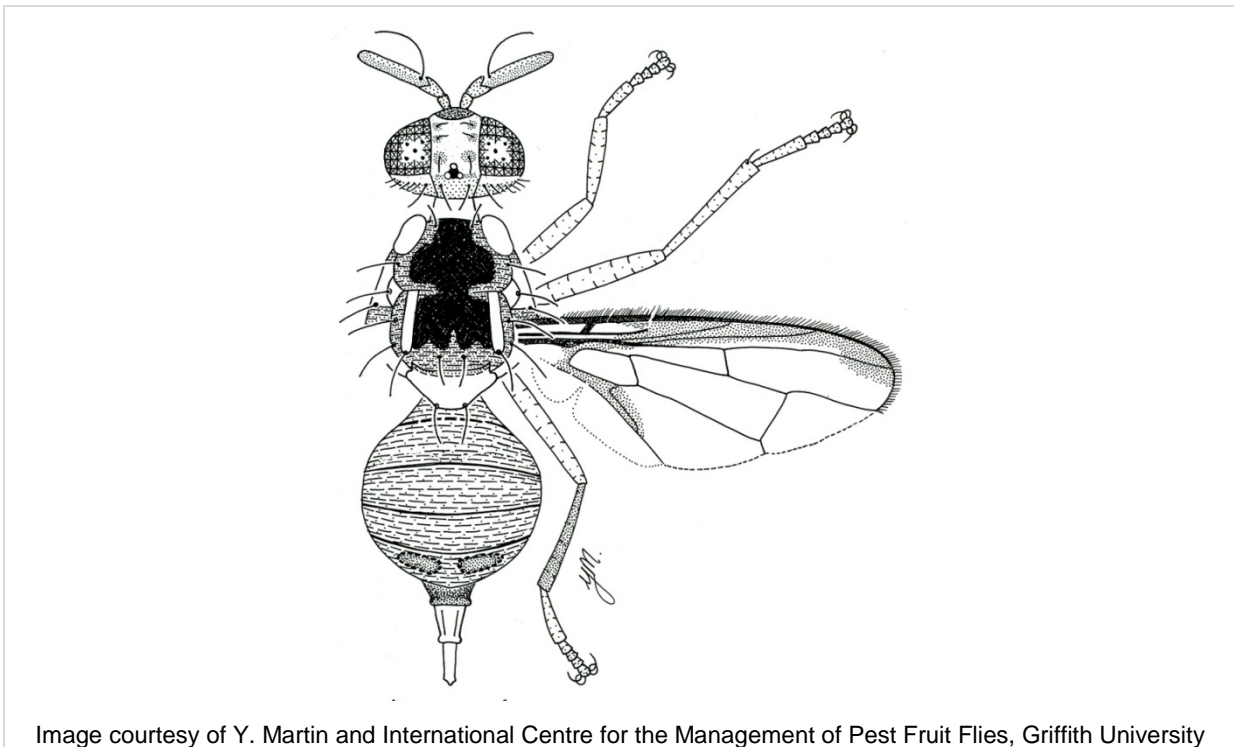


Image courtesy of Y. Martin and International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.20 *Bactrocera (Bactrocera) melanotus* (Coquillett)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Dacus melanotus

Chaetodacus melanotus

Strumeta melanotus

Dacus (Strumeta) melanotus

DIAGNOSIS

7.3.20.1.1 Morphological - Adult

Medium sized species; facial spots absent or small and pale; postpronotal lobes yellow (anterolateral corners black); notopleura glossy black; scutum glossy black, mesopleural stripe reaching to postpronotal lobe, lateral and medial postsutural vittae absent, scutellum glossy black; wing with a narrow pale fuscous costal band and narrow fuscous tint in anal cell, narrow pale fuscous markings along r-m and dm-cu crossveins, cells bc and c colourless or with a very pale fuscous tint, microtrichia in outer corner of cell c only; all abdominal terga entirely glossy black; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.20.1.2 Morphological - Larvae

- Not available / included in this edition -

7.3.20.1.3 Molecular

See **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera melanotus has been recorded on hosts from seven families. These include: Anacardiaceae, Caricaceae, Combretaceae, Fabaceae, Myrtaceae, Rutaceae and Sapindaceae (for a full list of recorded hosts see CABI 2007).

Major commercial hosts (Drew 1989):

Scientific name	Common name	Scientific name	Common name
<i>Citrus</i> sp.		<i>Psidium guajava</i>	guava
<i>Mangifera indica</i>	mango		

DISTRIBUTION

Restricted to Cook Is (Drew 1989).

REMARKS

Bactrocera melanotus is similar to *B. atra* and *B. perpuscain* possessing an entirely black scutellum, scutum black with medial and lateral postsutural vittae absent, abdominal terga black but differs from these species in having infuscation around r-m and dm-cu crossveins. In addition, it can be separated from *B. atra* in having postpronotal lobes mostly yellow, yellow mesopleural stripe and black femora (Drew 1989). *Bactrocera melanotus* is unusual in that its scutum, scutellum and abdomen are entirely dark coloured (black or very dark brown) (CABI 2007).

PEST STATUS

- Exotic
- High priority pest identified in the Avocado IBP
- *Bactrocera melanotus* is considered a major pest of papaw and citrus crops

ATTRACTANT

Cue lure.

FIGURES

Figure 48. *Bactrocera melanotus*

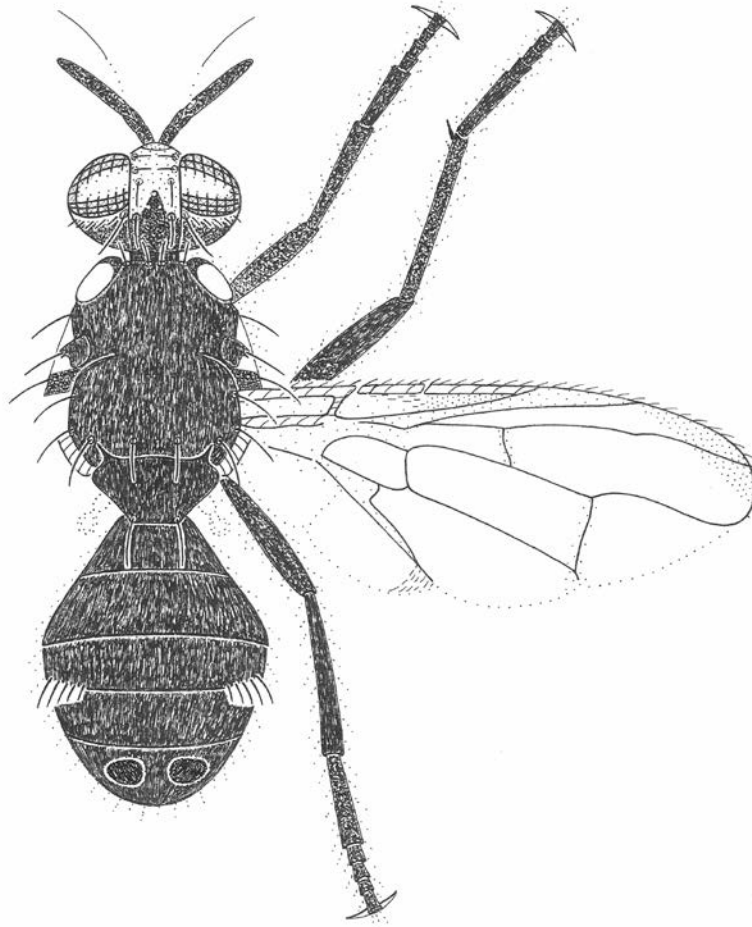


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.21 *Bactrocera (Bactrocera) musae* (Tryon)

TAXONOMIC INFORMATION

Common name: Banana fruit fly

Previous scientific names:

Chaetodacus musae

Chaetodacus tryoni var. *musa*

Chaetodacus musae var. *dorsopicta*

Dacus (Strumeta) musae

Strumeta musae

Bactrocera (Bactrocera) musae

DIAGNOSIS

7.3.21.1.1 *Morphological - Adult*

Medium sized species; medium sized black facial spots present; postpronotal lobes and notopleura yellow; scutum dull black, mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *np1* seta, lateral postsutural vittae present; medial postsutural vitta absent, scutellum yellow; wing with a narrow fuscous costal band and anal streak, cells bc and c colourless with microtrichia in outer corner of cell c only; abdominal terga III-V may vary from uniformly orange-brown to orange-brown with a fuscous to black medial longitudinal band and fuscous to black anterolateral corners on tergum III; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.21.1.2 *Morphological - Larvae*

- Not available / included in this edition -

7.3.21.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 820 bp

BsrI: 600, 250 *SnaBI*: 320, 520

HhaI: 630, 220 *SspI*: DNC

HinfI: DNC *VspI*: DNC

Sau3AI: DNC

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera musae has been recorded on hosts from nine families. These include: Capparaceae, Caricaceae, Musaceae, Myrtaceae, Olacaceae, Passifloraceae, Rubiaceae, Rutaceae and Solanaceae (for a full list of recorded hosts see Hancock *et al.* 2000).

Major commercial hosts (Drew, 1989; Hancock *et al.*, 2000):

Scientific name	Common name	Scientific name	Common name
<i>Musa</i> sp.	banana		

DISTRIBUTION

Torres Strait Islands and northeast Queensland, as far south as Townsville (Hancock *et al.* 2000), Papua New Guinea and associated islands, Bismark Archipelago and the Solomon Islands (Drew 1989).

REMARKS

There are a large number of species similar to *Bactrocera musae*, all placed in the *musae* complex. It is similar to *B. finitima* and *B. tinomiscii* in possessing a black scutum with lateral postsutural vittae present and ending at *ia*. setae and medial postsutural vittae absent, postpronotal lobes and notopleura yellow, scutellum yellow with a narrow dark basal band and cells bc and c colourless. It differs from *B. tinomiscii* in having the costal band dark and extending well below R_{2+3} , apex of piercer of ovipositor not curved upwards and subapical sensory setae on piercer of ovipositor consisting of two large and two small each side and from *B. finitima* in having the costal band not extending almost to R_{4+5} ; posterior lobe of male surstylus short; female with apex of aculeus needle shaped (pers. comm. Drew 2010).

B. musae has a considerable intraspecific variation and can appear similar to *B. endiandrae* (endemic rainforest species from Queensland) and *B. papayae* which are also methyl eugenol attracted.

PEST STATUS

- Endemic
- Minor pest of commercial bananas.

ATTRACTANT

Methyl eugenol.

FIGURES

Figure 49. *Bactrocera musae*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 50. *Bactrocera musae*



Image courtesy of Ken Walker, Museum Victoria, www.padil.gov.au (as of 22 August 2011))

Figure 51. *Bactrocera musae*

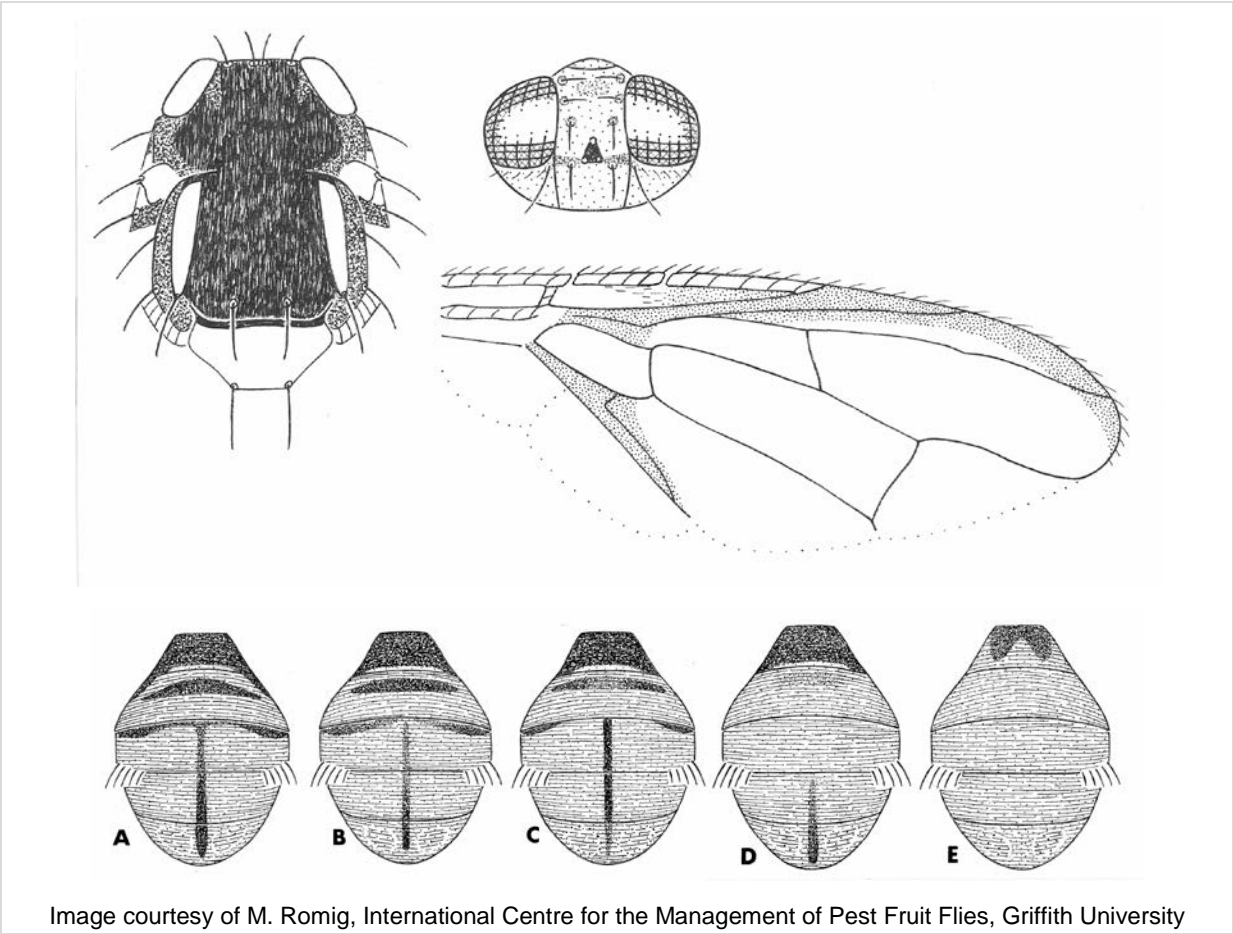


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.22 *Bactrocera (Bactrocera) neohumeralis* (Hardy)

TAXONOMIC INFORMATION

Common name: Lesser Queensland fruit fly

Previous scientific names:

Chaetodacus humeralis

Strumeta humeralis

Dacus (Strumeta) tryoni var. *neohumeralis*

Dacus (Strumeta) neohumeralis

Dacus (Bactrocera) neohumeralis

DIAGNOSIS

7.3.22.1.1 Morphological - Adult

Medium sized species; medium sized black facial spots present; postpronotal lobes dark brown to fuscous; notopleura yellow; scutum dark red-brown with dark fuscous to black markings, mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta, lateral postsutural vittae present, medial postsutural vitta absent, scutellum yellow; wing with a narrow fuscous costal band and broad fuscous anal streak, cells bc and c fuscous, microtrichia covering cell c and outer ½ of cell bc; abdominal terga III-V generally dark fuscous to dull black and tending red-brown medially; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.22.1.2 Morphological - Larvae

- Not available/included in this edition -

7.3.22.1.3 Molecular

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 820 bp

*Bsr*I: 200, 600 *Sna*BI: DNC

*Hha*I: 640, 190 *Ssp*I: 180, 570

*Hinf*I: 770 *Vsp*I: DNC

*Sau*3AI: 420

PCR - Restriction Fragment Length Polymorphism (Test 2, Section 6.3.1):

(This species cannot be differentiated from *Bactrocera tryoni*)

<i>Alu</i> I	780-770, 240-230*, 170, 130 120 110
<i>Dde</i> I	1000-980*, 270, 220, 170-160
<i>Rsa</i> I	530-500*, 460-440*, 410, 290
<i>Ssp</i> I	1000, 550, 100

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera neohumeralis has been recorded on hosts from a wide range of families. These include: Anacardiaceae, Annonaceae, Apocynaceae, Arecaceae, Basellaceae, Cactaceae, Capparaceae, Caricaceae, Celastraceae, Chrysobalanaceae, Clusiaceae, Combretaceae, Davidsoniaceae, Ebenaceae, Elaeocarpaceae, Euphorbiaceae, Flacourtiaceae, Hippocraterceae, Lauraceae, Leeaceae, Lecythidaceae, Malpighiaceae, Melastomataceae, Meliaceae, Moraceae, Musaceae, Myrtaceae, Olacaceae, Oleaceae, Oxalidaceae, Passifloraceae, Piperaceae, Rhamnaceae, Rhizophoraceae, Rosaceae, Rubiaceae, Rutaceae, Santalaceae, Sapindaceae, Sapotaceae, Smilacaceae, Solanaceae, Verbenaceae and Vitaceae (for a full list of recorded hosts see Hancock *et al.* 2000).

Major commercial hosts:

A large number of important commercial/edible host fruits and vegetables (see Drew 1989; Hancock *et al.* 2000).

DISTRIBUTION

Common pest in Eastern Australia, south to Coffs Harbour, Torres Strait Islands and mainland Papua New Guinea (Drew 1989). It is not found in central and southern NSW (Osborne *et al.* 1997).

REMARKS

B. neohumeralis differs from *B. tryoni* in having dark postprotonotal lobes (this is a distinct character) in addition to being generally darker. Although these two species are very similar morphologically, their different daily mating periods (*B. tryoni* at dusk and *B. neohumeralis* during the middle of the day) are good reason to keep them separate (Drew 1989).

PEST STATUS

- Endemic
- *Bactrocera neohumeralis* is a major pest of commercial fruit crops in Queensland, Australia, and in some crops it occurs in equal abundance to *B. tryoni*

ATTRACTANT

Cue lure.

FIGURES

Figure 52. *Bactrocera neohumeralis*



Image courtesy of the International Centre for the Management of Pest Fruit Flies, Griffith University

Figure 53. *Bactrocera neohumeralis*

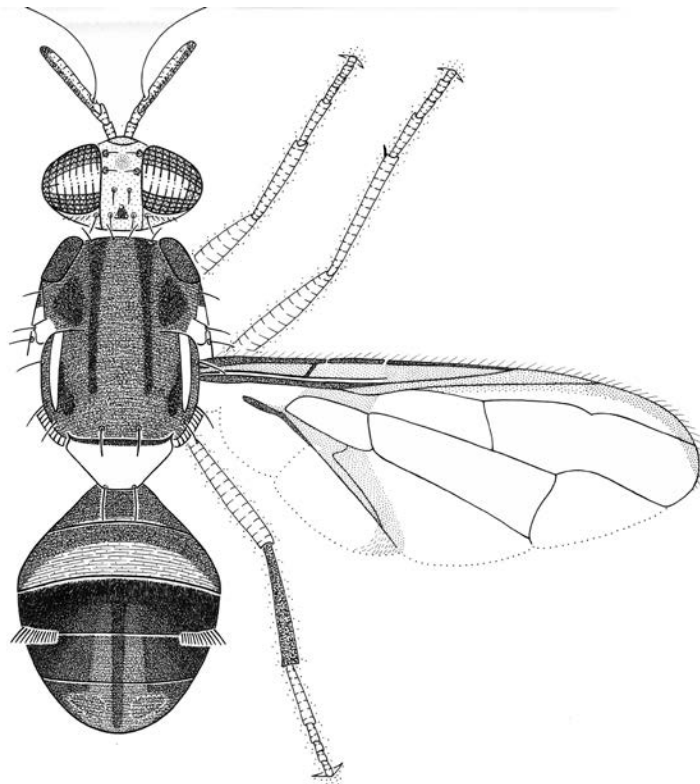


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.23 *Bactrocera (Bactrocera) occipitalis* (Bezzi)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Chaetodacus ferrugineus var. *occipitalis*

Dacus (Strumeta) dorsalis var. *occipitalis*

Dacus (Strumeta) occipitalis

Dacus (Bactrocera) occipitalis

Bactrocera (Bactrocera) occipitalis

DIAGNOSIS

7.3.23.1.1 *Morphological - Adult*

Face fulvous with a pair of large oval black spots; scutum black except dark red-brown along posterior margin and enclosing *prsc.* setae, below and behind lateral postsutural vittae, around mesonotal suture, around anterior margin of notopleura and inside postpronotal lobes; postpronotal lobes and notopleura yellow; mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta dorsally; broad parallel sided or subparallel lateral postsutural vittae ending at *ia.* seta (in some specimens the vittae end behind the *ia.* seta); medial postsutural vitta absent; scutellum yellow; legs with femora entirely fulvous, fore tibiae pale fuscous to fuscous, mid tibiae pale fuscous to fuscous basally tending paler apically, hind tibiae fuscous; wings with cells bc and c colourless, microtrichia in outer corner of cell c only, a narrow fuscous costal band distinctly overlapping R₂₊₃ and widening markedly across apex of wing, a narrow fuscous anal streak; supernumerary lobe of medium development; abdominal terga III-V with a narrow transverse black band across anterior margin of tergum III and expanding to cover lateral margins, dark fuscous to black rectangular markings anterolaterally on tergum IV which sometimes continue to cover posterolateral margins of this tergum, dark fuscous to black anterolateral corners on tergum V, a very broad medial longitudinal black band over all three terga, a pair of oval orange-brown shining spots on tergum V; abdominal sterna dark coloured; posterior lobe of male surstylus short; female with apex of aculeus needle shaped (pers. comm. Drew 2010).

7.3.23.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.23.1.3 *Molecular*

See **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Allwood *et al.* (1999) host records are incomplete due to a lack of field host survey work through the area of distribution of the species (pers. comm. Drew 2010a). *Bactrocera occipitalis* has been recorded on hosts from three families, Anacardiaceae, Myrtaceae and Rutaceae (Allwood *et al.* 1999).

Major commercial hosts (Allwood et al. 1999):

Scientific name	Common name	Scientific name	Common name
<i>Citrus microcarpa</i>	musk lime	<i>Psidium guajava</i>	guava
<i>Mangifera indica</i>	mango		

DISTRIBUTION

Philippines, East Malaysia (Sabah), Brunei, Indonesia (Kalimantan) (pers. comm. Drew 2010).

REMARKS

Bactrocera occipitalis is similar to some specimens of *B. fuscitibia* in possessing broad parallel sided lateral postsutural vittae, costal band overlapping R_{2+3} , narrow to medium width dark patterns on lateral margins of abdominal terga III-V, shining spots on abdominal tergum V pale coloured, femora entirely fulvous or with a dark spot on outer apical surfaces of fore femora only and a broad medial longitudinal dark band on abdominal terga III-V.

It differs from *B. fuscitibia* in having the anterolateral bare area on the scutum broad and lateral dark markings on abdominal terga IV and V of medium width (not narrow). Some populations of fruit flies throughout South-East Asia have been misidentified as *B. occipitalis* in previous literature. See Drew & Hancock (1994) for a complete discussion on this species and previous misidentifications (pers. comm. Drew 2010).

PEST STATUS

- Exotic
- High priority pest identified in the Tropical fruit IBP
- *Bactrocera occipitalis* is a major pest species within the *dorsalis* complex of South-east Asia

ATTRACTANT

Methyl eugenol.

FIGURES

Figure 54. *Bactrocera occipitalis*



Image courtesy of the International Centre for the Management of Pest Fruit Flies, Griffith University

Figure 55. *Bactrocera occipitalis*

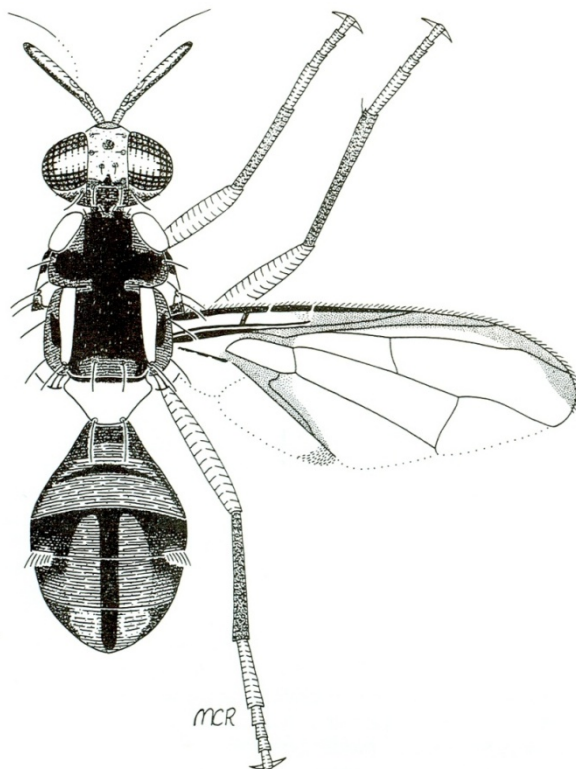


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.24 *Bactrocera (Bactrocera) papayae* Drew and Hancock

TAXONOMIC INFORMATION

Common name: Papaya fruit fly

Previous scientific names:

DIAGNOSIS

7.3.24.1.1 *Morphological - Adult*

Face fulvous with a pair of large oval black spots; scutum black with dark brown below and behind lateral postsutural vittae, around mesonotal suture and inside postpronotal lobes; postpronotal lobes and notopleura yellow; mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta dorsally; broad parallel sided lateral postsutural vittae ending at or behind *ia.* seta; medial postsutural vitta absent; scutellum yellow; legs with femora entirely fulvous, fore and hind tibiae dark fuscous, mid tibiae fuscous basally and fulvous apically; wings with cells bc and c colourless, microtrichia in outer corner of cell c only, a narrow fuscous costal band confluent with R_{2+3} or just overlapping this vein where it becomes paler and remaining narrow around wing apex (in some specimens there is a slight expansion or a small fish-hook shape around apex of R_{4+5}), a narrow fuscous anal streak; supernumerary lobe of medium development in males and weak in females; abdominal terga III-V orange-brown with a 'T' pattern consisting of a narrow transverse black band across anterior margin of tergum III which expands laterally into narrow margins and a medium width medial longitudinal black band over all three terga, anterolateral corners of terga IV and V dark fuscous to black (in occasional specimens the transverse black band across anterior margin of tergum III is broken in the midline), a pair of oval orange-brown shining spots on tergum V; abdominal sterna dark coloured; posterior lobe of male surstylus short; female with apex of aculeus needle shaped (pers. comm. Drew 2010).

7.3.24.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.24.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 820 bp

*Bsr*I: 650, 260 *Sna*BI: 320, 530

*Hha*I: 650, 190 *Ssp*I: 750

*Hinf*I: 770 *Vsp*I: DNC

*Sau*3AI: DNC

See also **PCR-DNA barcoding** (Section 6.3.2) and **Allozyme Electrophoresis** (Section 6.4).

HOST RANGE

Bactrocera papayae has been recorded on hosts from a wide range of families. These include: Amaryllidaceae, Anacardiaceae, Annonaceae, Apocynaceae, Arecaceae, Boraginaceae, Burseraceae, Cactaceae, Caricaceae, Clusiaceae, Combretaceae, Curcubitaceae, Dilleniaceae, Ebenaceae, Elaeocarpaceae, Euphorbiaceae, Fagaceae, Flacourtiaceae, Flagellariaceae, Lauraceae, Lecythidaceae, Leguminosae, Loganiaceae, Malpighiaceae, Meliaceae, Menispermaceae, Moraceae, Musaceae, Myrusticaceae, Myrsinaceae, Myrtaceae, Oleaceae, Oxalidaceae, Passifloraceae, Punicaceae, Rhamnaceae, Rhizophoraceae, Rosaceae, Rubiaceae, Rutaceae, Sapindaceae, Sapotaceae, Simaroubaceae, Solanaceae, Sterculiaceae, Tiliaceae, Ulmaceae, Verbenaceae, Vitaceae and Zingiberaceae (for a full list of recorded hosts see Allwood *et al.* 1999).

Major commercial hosts:

A large number of important commercial/edible host fruits and vegetables (see Allwood *et al.* 1999; Hancock *et al.* 2000).

DISTRIBUTION

Irian Jaya, Papua New Guinea, Southern Thailand, Peninsular Malaysia, East Malaysia, Brunei, Singapore, Indonesia provinces, Christmas Island (pers. comm. Drew 2010).

Although *Bactrocera papaya* is not established in the Torres Strait Islands, occasional incursions do occur in the northern Torres Strait Islands. They are promptly eradicated.

REMARKS

Bactrocera papayae is similar to *B. carambolae*, *B. dorsalis*, *B. occipitalis* and *B. philippinensis* in possessing a black scutum with broad lateral postsutural vittae that are generally parallel sided and reaching to or behind *ia*. setae, a narrow costal band on the wing, abdominal terga III to V with a black 'T' pattern and dark lateral margins. It differs from *B. carambolae*, *B. dorsalis* and *B. occipitalis* in having a longer aculeus in the female ovipositor (1.77 to 2.12 mm) and the costal band mostly confluent with R_{2+3} and from *B. philippinensis* in having a shorter male aedeagus (mean 3.0 mm).

B. papayae and other *dorsalis* complex flies can appear similar to endemic fruit flies caught in methyl eugenol traps – namely *B. endiandrae* and *B. musae*, both of which can exhibit intraspecific variation that makes them appear more similar to *dorsalis* complex flies. The diagnostician should be familiar with this range of variation in the native species.

PEST STATUS

- Exotic
- High priority pest identified in the Apple and Pear, Avocado, Banana, Citrus, Mango, Summerfruit, Tropical fruit and Vegetable IBPs
- *Bactrocera papayae* is a major pest species within the *dorsalis* complex of South-east Asia

ATTRACTANT

Methyl eugenol.

FIGURES

Figure 56. *Bactrocera papayae*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 57. *Bactrocera papayae*

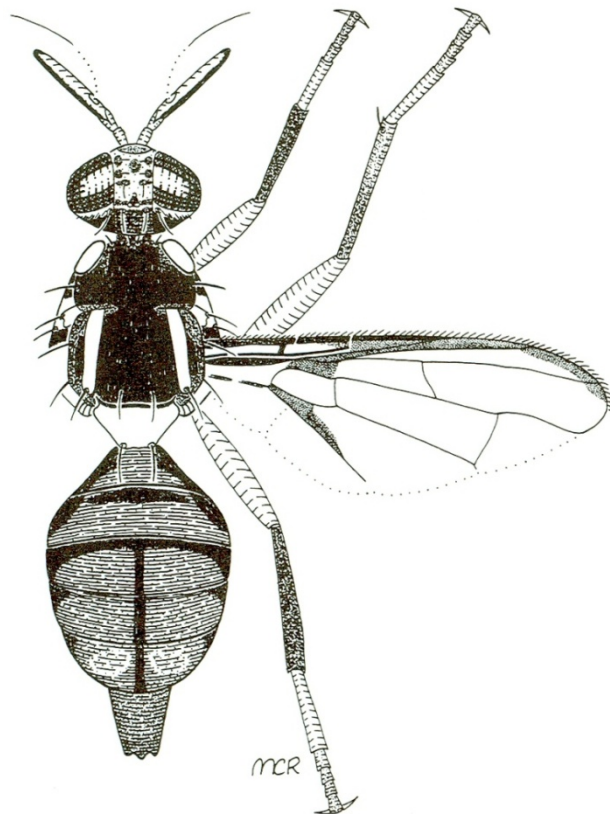


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.25 *Bactrocera (Bactrocera) passiflorae* (Froggatt)

TAXONOMIC INFORMATION

Common name: Fijian fruit fly

Previous scientific names:

Dacus passiflorae

Chaetodacus passiflorae

Strumeta passiflorae

Dacus (Strumeta) passiflorae

DIAGNOSIS

7.3.25.1.1 Morphological - Adult

Small species; facial spots absent; postpronotal lobes glossy black; notopleura yellow; scutum glossy black, mesopleural stripe reaching to or beyond anterior *npl.* seta, lateral and medial postsutural vittae absent, scutellum yellow; wing with a narrow fuscous costal band and narrow pale fuscous anal streak, cells bc and c colourless with microtrichia in outer corner of cell c only; abdominal terga I-IV glossy black and tergum V either glossy black with posterior margin dark fuscous or fuscous with a medial longitudinal black band; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.25.1.2 Morphological - Larvae

- Not available / included in this edition -

7.3.25.1.3 Molecular

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 830 bp

*Bsr*I: 650, 270 *Sna*BI: DNC

*Hha*I: 650, 190 *Sspl*: 750

*Hinf*I: 770 *Vspl*: DNC

*Sau*3AI: DNC

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

The host list for *Bactrocera passiflorae* is large but unpublished. It is a major pest species and capable of attacking a wide range of commercial host plants.

Major commercial hosts (White and Elson-Harris 1992):

Scientific name	Common name	Scientific name	Common name
<i>Anacardium occidentale</i>	cashew nut	<i>Passiflora quadrangularis</i>	giant granadilla
<i>Carica papaya</i>	papaw	<i>Persea americana</i>	avocado
<i>Citrus aurantiifolia</i>	lime	<i>Psidium guajava</i>	guava
<i>Citrus reticulata</i>	mandarin	<i>Solanum melongena</i>	eggplant
<i>Mangifera indica</i>	mango	<i>Theobroma cacao</i>	cocoa
<i>Passiflora edulis</i>	passionfruit		

DISTRIBUTION

Fiji Islands, Niue, Wallis and Futuna. There is also a separate form of *B. passiflorae* with paler abdomen. This is probably an undescribed new species which occurs in Fiji, Tuvalu, Tokelau and possibly the Niuas group in Tonga. Its host range and potential pest status have not yet been well studied (SPC 2006).

REMARKS

Bactrocera passiflorae is similar to *B. thistleoni* in possessing black postpronotal lobes, scutellum entirely yellow, scutum black with lateral and medial postsutural vittae absent but differs in having facial spots absent and legs entirely fulvous (Drew 1989).

PEST STATUS

- Exotic
- High priority pest identified in the Avocado and Tropical Fruit IBPs

ATTRACTANT

Cue lure.

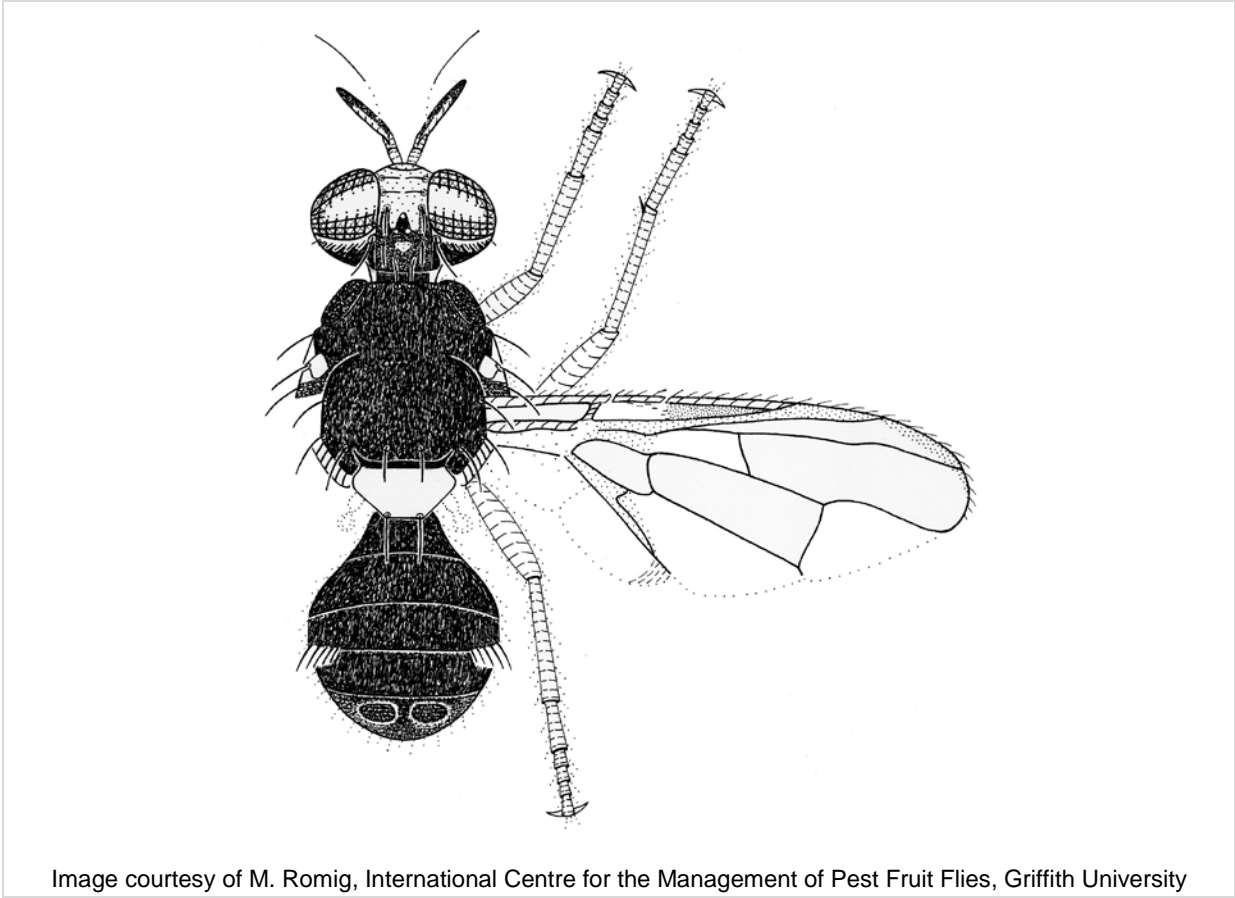
FIGURES

Figure 58. *Bactrocera passiflorae*



Image courtesy of the Secretariat of the Pacific Community Pacific Fruit Fly Web, www.spc.int/pacifly (as of 22 August 2011)

Figure 59. *Bactrocera passiflorae*



7.3.26 *Bactrocera (Bactrocera) philippinensis* Drew and Hancock

TAXONOMIC INFORMATION

Common name: Philippine fruit fly

Previous scientific names:

DIAGNOSIS

7.3.26.1.1 *Morphological - Adult*

Face with a pair of large oval black spots; postpronotal lobes and notopleura yellow; scutum black; mesopleural stripes reaching midway between anterior margin of notopleura and anterior notopleural setae dorsally; two broad parallel sided lateral postsutural vittae ending at or behind *ia.* seate; scutellum yellow; legs with femora generally fulvous except for a small elongate dark fuscous spot on outer apical surfaces of fore femora in occasional specimens, all tibiae dark fuscous (mid tibiae paler apically); wings with cells bc and c colourless and microtrichia in outer corner of c only; costal band slightly overlapping R_{2+3} and usually expanding in a fish hook pattern on apex of R_{4+5} ; cubital streak narrow; abdominal terga III-V with a black 'T' and small dark fuscous to black anterolateral corners on terga IV and V; the medial longitudinal black band is narrow to medium width; posterior lobe of male surstylus short; ovipositor with aculeus long (1.6 – 2.1mm) and needle shaped (pers. comm. Drew 2010).

7.3.26.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.26.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 820 bp

*Bsr*I: 630, 250 *Sna*BI: 530, 320

*Hha*I: 650, 190 *Ssp*I: 750

*Hin*II: 770 *Vsp*I: DNC

*Sau*3AI: DNC

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

The Philippines have not been the focus of a major fruit fly survey in the same manner as Malaysia and Thailand, and so the extent to which other fruit crops are attacked is uncertain (CABI 2007). *Bactrocera philippinensis* has been recorded on hosts from five families, Anacardiaceae, Caricaceae, Moraceae, Myrtaceae and Sapotaceae (for a full list of recorded hosts see Allwood *et al.* 1999).

Major commercial hosts (Allwood et al. 1999):

Scientific name	Common name	Scientific name	Common name
<i>Carica papaya</i>	papaw	<i>Mangifera indica</i>	mango
<i>Citrus reticulata</i>	mandarin	<i>Syzygium malaccense</i>	malay-apple

DISTRIBUTION

Bactrocera philippinensis has been recorded from the Philippines and Palau (pers. comm. Drew 2010).

REMARKS

Bactrocera philippinensis is similar to *B. carambolae* and *B. papayae* in possessing broad parallel sided lateral postsutural vittae, the costal band just overlapping R_{2+3} , some small areas of dark colour on lateral margins of abdominal terga III-V, femora mostly fulvous and tip of aculeus needle shaped.

It differs from *B. carambolae* in having a narrower medial longitudinal band on abdominal terga III-V and a longer male aedeagus and female aculeus. It differs from *B. papayae* in having a fish-hook barb pattern at the apex of the costal band and a longer male aedeagus and female aculeus (pers. comm. Drew 2010).

PEST STATUS

- Exotic
- High priority pest identified in the Apple and Pear, Avocado, Banana, Citrus, Mango, Summerfruit, Tropical fruit and Vegetable IBPs
- *Bactrocera philippinensis* is a very important pest of mango in the Philippines

ATTRACTANT

Methyl eugenol.

FIGURES

Figure 60. *Bactrocera philippinensis*



Image courtesy of the International Centre for the Management of Pest Fruit Flies, Griffith University

Figure 61. *Bactrocera philippinensis*

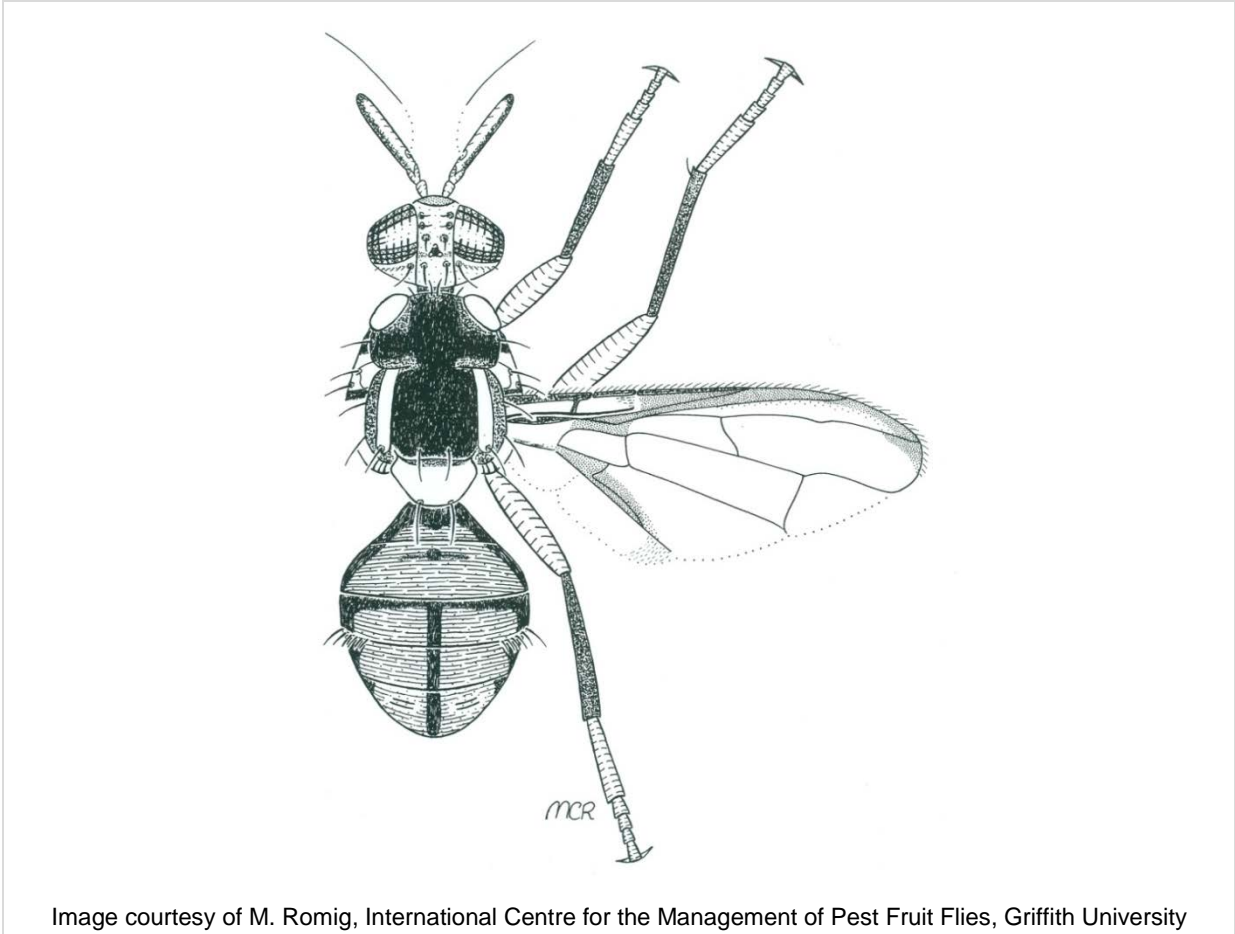


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.27 *Bactrocera (Bactrocera) psidii* (Froggatt)

TAXONOMIC INFORMATION

Common name: South sea guava fruit fly

Previous scientific names:

Tephritis psidii

Dacus psidii

Strumeta psidii

Dacus (Strumeta) psidii

DIAGNOSIS

7.3.27.1.1 *Morphological - Adult*

Medium sized species; generally small fuscous to dark fuscous facial spots present; postpronotal lobes yellow except anterodorsal corner black; notopleura yellow; scutum glossy black, mesopleural stripe equal in width to notopleuron, short lateral postsutural vittae present, medial postsutural vitta absent, scutellum yellow with a broad triangular black marking on dorsal surface; wing with a narrow tint of extremely pale fuscous colouration around costal margin and a narrow fulvous anal streak, a narrow tint of fuscous colouration around r-m and dm-cu crossveins, cells bc and c colourless to extremely pale fulvous with microtrichia in outer corner of cell c only; abdominal terga entirely glossy black; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.27.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.27.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 780 bp

*Bsr*I: DNC *Sna*BI: DNC

*Hha*I: 640, 190 *Ssp*I: 200, 550

*Hinf*I: DNC *Vsp*I: DNC

*Sau*3AI: DNC

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera psidii has been recorded on hosts from a wide range of families. These include: Anacardiaceae, Annonaceae, Apocynaceae, Caricaceae, Combretaceae, Ebenaceae, Euphorbiaceae, Malpighiaceae, Moraceae, Musaceae, Myrtaceae, Oxalidaceae, Passifloraceae, Punicaceae, Rosaceae, Rutaceae and Vitaceae (for a full list of recorded hosts see SPC 2006).

Major commercial hosts (Drew 1989):

Scientific name	Common name	Scientific name	Common name
<i>Citrus</i> sp.		<i>Psidium guajava</i>	guava
<i>Mangifera indica</i>	mango		

DISTRIBUTION

Restricted to New Caledonia (Drew 1989).

REMARKS

Bactrocera psidii is similar to *B. obliqua* in possessing infuscation on crossveins and the scutellum yellow with a broad black triangular marking on dorsal surface. It differs from this species in having the face fulvous with small pale spots in 75% of specimens, costal band narrow and not overlapping R_{2+3} , r-m crossvein shorter than dm-cu crossvein, infuscation around crossveins very narrow and pale, legs entirely fulvous, lateral postsutural vittae elongated and ending before *ia*. setae; posterior lobe of male surstylus short; female with apex of aculeus needle shaped. This species is unusual in having wing patterning very pale (including a mark along the r-m crossvein), scutellum marked with a large black triangle and the abdomen entirely dark (black or dark orange-brown) (Drew 1989; pers. comm. Drew 2010).

PEST STATUS

- Exotic
- *Bactrocera psidii* is a major pest

ATTRACTANT

Cue lure, Willison's lure.

FIGURES

Figure 62. *Bactrocera psidii*



Image courtesy of the International Centre for the Management of Pest Fruit Flies, Griffith University

Figure 63. *Bactrocera psidii*

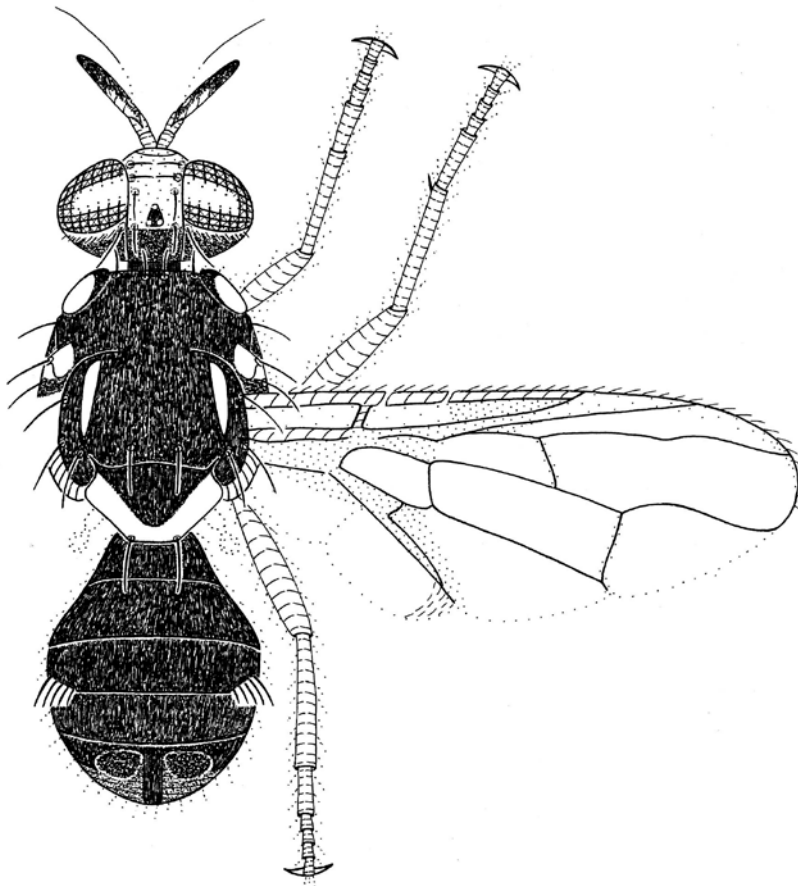


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.28 *Bactrocera (Zeugodacus) tau* (Walker)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Dasyneura tau

Dacus (Zeugodacus) tau

Bactrocera (Zeugodacus) tau

DIAGNOSIS

7.3.28.1.1 Morphological - Adult

A medium sized species; face fulvous with a pair of medium sized circular to oval black spots; postpronotal lobes and notopleura yellow; scutum black with large areas of red-brown centrally and anterocentrally; lateral and medial postsutural vittae present; yellow spot anterior to mesonotal suture in front of lateral postsutural vittae; mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta; scutellum entirely yellow; wing with a narrow dark fuscous costal band overlapping R₂₊₃ and expanding into a distinct apical spot and broad dark fuscous anal streak; cells bc and c colourless; microtrichia in outer corner of cell c only; abdominal terga III-V fulvous with a black 'T' pattern and anterolateral corners of terga IV and V with broad black markings; posterior lobe of male surstylus short; female with apex of aculeus trilobed (pers. comm. Drew 2010).

7.3.28.1.2 Morphological - Larvae

- Not available/included in this edition -

7.3.28.1.3 Molecular

See **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera tau has been recorded on hosts from nine families. These include: Arecaceae, Curcubitaceae, Fabaceae, Loganiaceae, Moraceae, Myrtaceae, Oleaceae, Sapotaceae and Vitaceae (for a full list of recorded hosts see Allwood *et al.* 1999).

Major commercial hosts (Allwood *et al.* 1999):

Scientific name	Common name	Scientific name	Common name
<i>Cucumis melo</i>	melon	<i>Manilkara zapota</i>	sapodilla
<i>Cucumis sativus</i>	cucumber	<i>Momordica charantia</i>	bitter gourd
<i>Cucurbita maxima</i>	giant pumpkin	<i>Psidium guajava</i>	guava
<i>Luffa acutangula</i>	angled luffa		

DISTRIBUTION

India, Sri Lanka, Bhutan, Vietnam, Southern China, Taiwan, Thailand, Peninsular Malaysia, Singapore, East Malaysia and Indonesian provinces (pers. comm. Drew 2010).

REMARKS

Bactrocera tau is a very common species throughout southeast Asia. It is an economic pest species, mainly in cucurbit crops, but can be misidentified as it belongs to a complex of closely related species. The *tau*-complex includes *Zeugodacus* species with a black scutum, wings colourless except for a costal band and cubital streak, cells bc and c colourless or with an extremely pale tint, costal band overlapping R_{2+3} and expanding into a distinct spot at apex. *Bactrocera tau* is distinct in having an entirely yellow scutellum, abdominal terga III-V with a distinct dark 'T' pattern and all femora with dark preapical spots (pers. comm. Drew 2010).

PEST STATUS

- Exotic
- A major pest of cucurbit crops

ATTRACTANT

Cue lure.

FIGURES

Figure 64. *Bactrocera tau*



Image courtesy of Ken Walker, Museum Victoria, www.padil.gov.au (as of 22 August 2011)

Figure 65. *Bactrocera tau*

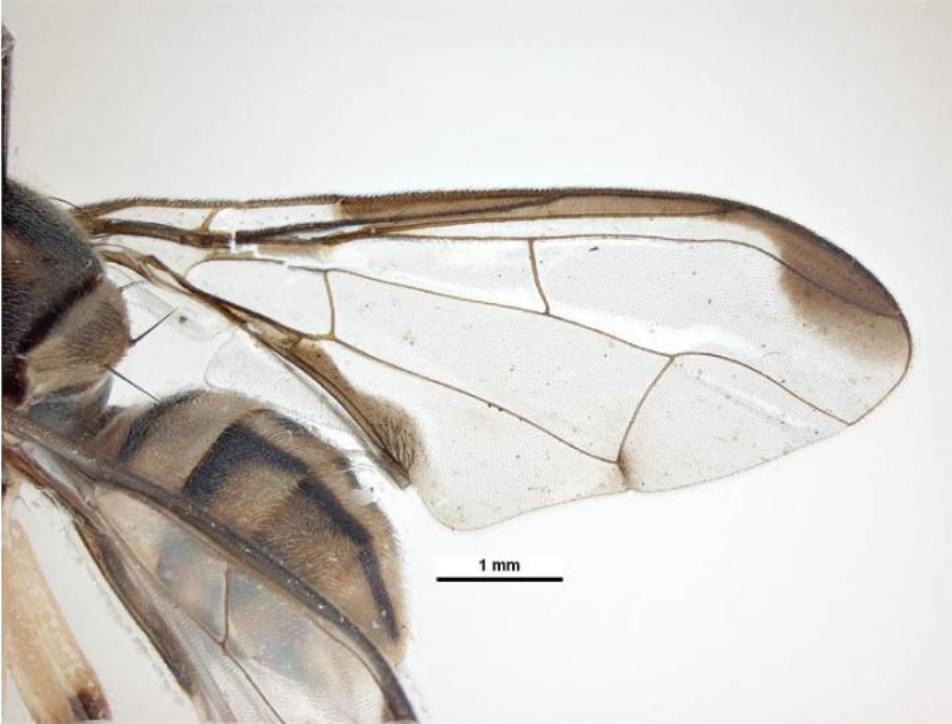


Figure 66. *Bactrocera tau*

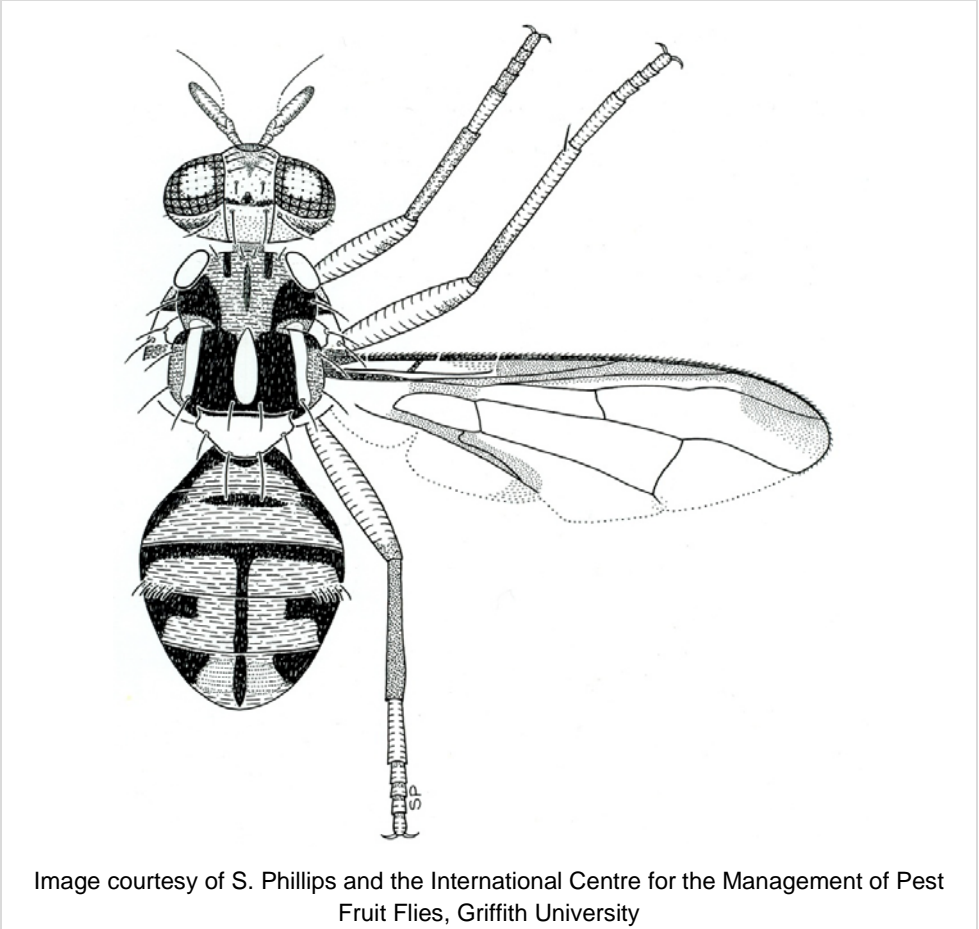


Image courtesy of S. Phillips and the International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.29 *Bactrocera (Bactrocera) trilineola* Drew

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Dacus (Strumeta) triseriatus

DIAGNOSIS

7.3.29.1.1 *Morphological - Adult*

Medium sized species; face entirely glossy black; postpronotal lobes fuscous to black; notopleura yellow; scutum glossy black; mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta, lateral and medial postsutural vittae absent, scutellum glossy black with lateral margins yellow; wing with a narrow extremely pale fuscous costal vein and broad fuscous anal streak, a narrow fuscous transverse band across wing, cells bc and c extremely pale fuscous, microtrichia covering outer ½ of cell c only; abdominal terga mostly glossy black except for two broad longitudinal fulvous bands on terga II-V either side of a broad medial longitudinal glossy black band; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.29.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.29.1.3 *Molecular*

See **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera trilineola has been recorded on hosts from a range of families. These include: Anacardiaceae, Annonaceae, Caricaceae, Caesalpinaceae, Combretaceae, Lauraceae, Moraceae, Musaceae, Myrtaceae, Oxalidaceae, Rutaceae and Sapindaceae (for a full list of recorded hosts see SPC 2006).

Major commercial hosts:

Scientific name	Common name
<i>Mangifera indica</i>	mango

DISTRIBUTION

Restricted to Vanuatu where it is common over nearly every island (Drew 1989).

REMARKS

Bactrocera trilineola belongs to the *frauenfeldi* complex. It differs from *B. caledonensis* and *B. frauenfeldi* in possessing a glossy black face and in lacking lateral postsutural vittae and from *B. parafrasfrauenfeldi* in having a glossy black face, cells bc and c extremely pale fuscous, microtrichia in outer ½ of cell c only, costal band present but very pale beyond subcostal cell and legs fulvous except apical 1/3 of hind femora and hind tibiae fuscous. The apex of piercer and the spicules on the middle segment of the ovipositor are similar in *B. frauenfeldi* and *B. trilineola*, however the apex of the aculeus is slightly more pointed in *B. trilineola*.

PEST STATUS

- Exotic

ATTRACTANT

Cue lure, Willison's lure.

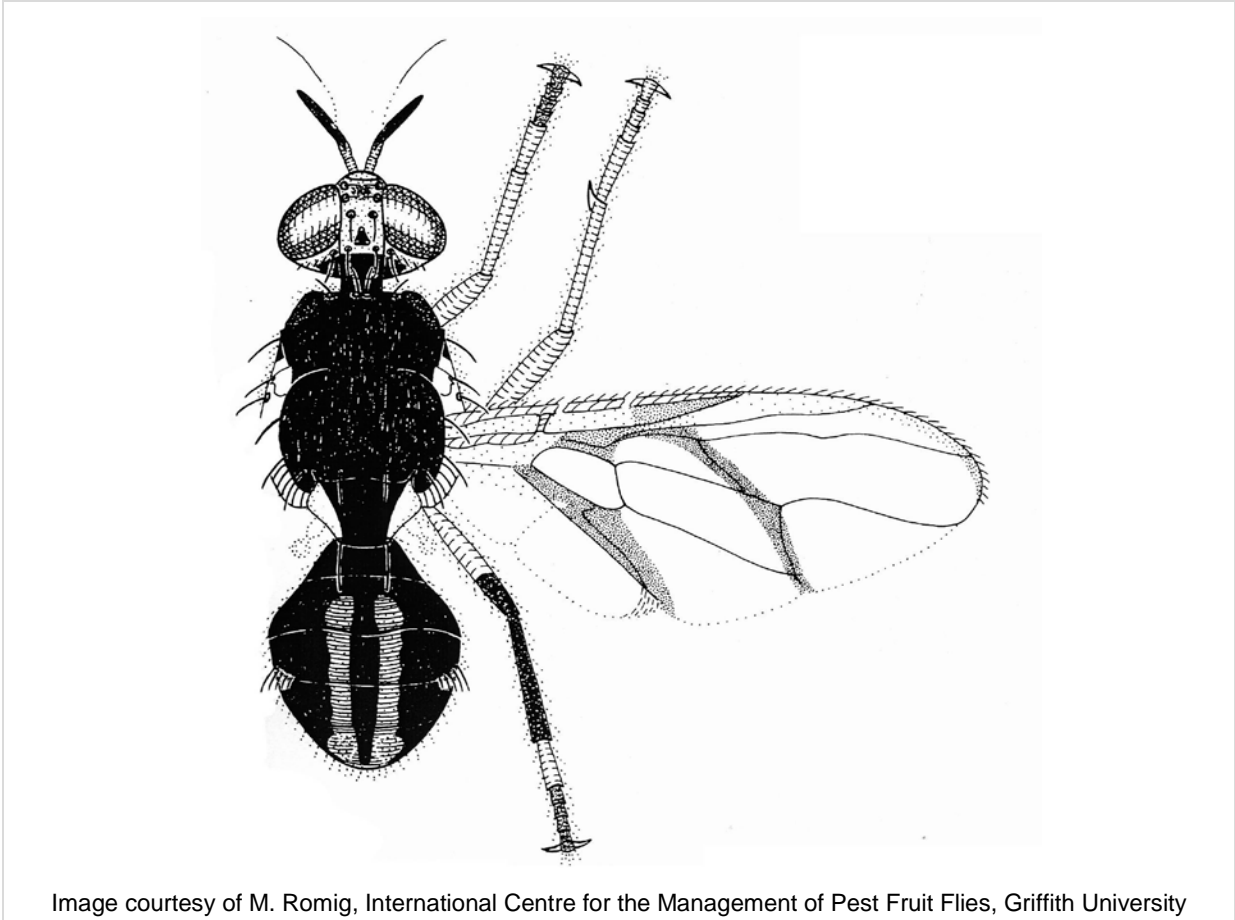
FIGURES

Figure 67. *Bactrocera trilineola*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 68. *Bactrocera trilineola*



7.3.30 *Bactrocera (Bactrocera) trivialis* (Drew)

TAXONOMIC INFORMATION

Common name:

Previous scientific names:

Dacus (Strumeta) trivialis

DIAGNOSIS

7.3.30.1.1 Morphological - Adult

Medium sized species; medium sized pear shaped facial spots present; postpronotal lobes and notopleura yellow; scutum black, mesopleural stripe ending midway between anterior margin of notopleuron and anterior *npl.* seta, lateral postsutural vittae present, medial postsutural vitta absent, scutellum yellow; wing with a narrow fuscous costal band and anal streak, cells bc and c colourless, microtrichia in outer corner of cell c only; males with all leg segments fulvous except hind tibiae fuscous, females with dark colour patterns on femora and tibiae; abdominal terga III-V generally black with a medial longitudinal fulvous area from posterior margin of tergum III to tergum V; posterior lobe of male surstylus short; female with apex of aculeus needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.30.1.2 Morphological - Larvae

- Not available/included in this edition -

7.3.30.1.3 Molecular

See **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera trivialis has been recorded on hosts from seven families. These include: Anacardiaceae, Combretaceae, Euphorbiaceae, Myrtaceae, Rosaceae, Rutaceae, Santalaceae and Solanaceae (for a full list of recorded hosts see SPC 2006).

Major commercial hosts (Drew 1989):

Scientific name	Common name	Scientific name	Common name
<i>Capsicum frutescens</i>	chilli	<i>Prunus persica</i>	peach
<i>Citrus x paradisi</i>	grapefruit	<i>Psidium guajava</i>	guava

DISTRIBUTION

Mainland Papua New Guinea (less common in the Highlands than at low elevations), Indonesia (Irian Jaya) (Drew 1989).

Although *Bactrocera trivialis* is not established in the Torres Strait Islands, occasional incursions do occur. They are promptly eradicated.

REMARKS

A large collection of specimens reared from grapefruit at Mt. Hagen, 1980, 1981, show sexual dimorphism in leg colour patterns: females possess fore, mid and apical 1/3 of hind femora dark

fuscous, fore tibiae and apical four segments of fore tarsi fuscous, hind tibiae dark fuscous; males have all segments fulvous except hind tibiae fuscous.

It is similar to *B. cacuminata*, *B. nigrescens* and *B. opiliae* (*dorsalis* complex) in having colourless cells bc and c and the mesopleural stripe reaching midway between the anterior margin of notopleuron and anterior *npl.* seta. It differs from *B. cacuminata* and *B. opiliae* in having an entirely black scutum and from *B. nigrescens* in having abdominal terga III-V mostly dark fuscous to black except orange-brown postercentrally on tergum III and centrally on terga IV and V; posterior lobe of male surstylus short; female with aculeus tip needle shaped (Drew 1989).

B. trivialis can appear similar to *B. rufofuscula*, an endemic north Queensland rainforest species, which is also trapped in cue traps. However *B. trivialis* has a black scutum.

Other remarks:

Bactrocera trivialis is similar to *B. laticosta* in having medium to broad lateral postsutural vittae, abdominal tergum III either entirely dark across tergum or with broad lateral bands, and terga IV and V with broad lateral longitudinal dark bands. It differs from this species in having a narrow medial longitudinal dark band (sometimes absent) and costal band confluent with R₂₊₃ (Lawson *et al.* 2003).

PEST STATUS

- High priority pest identified in the Tropical fruit IBP

ATTRACTANT

Cue lure.

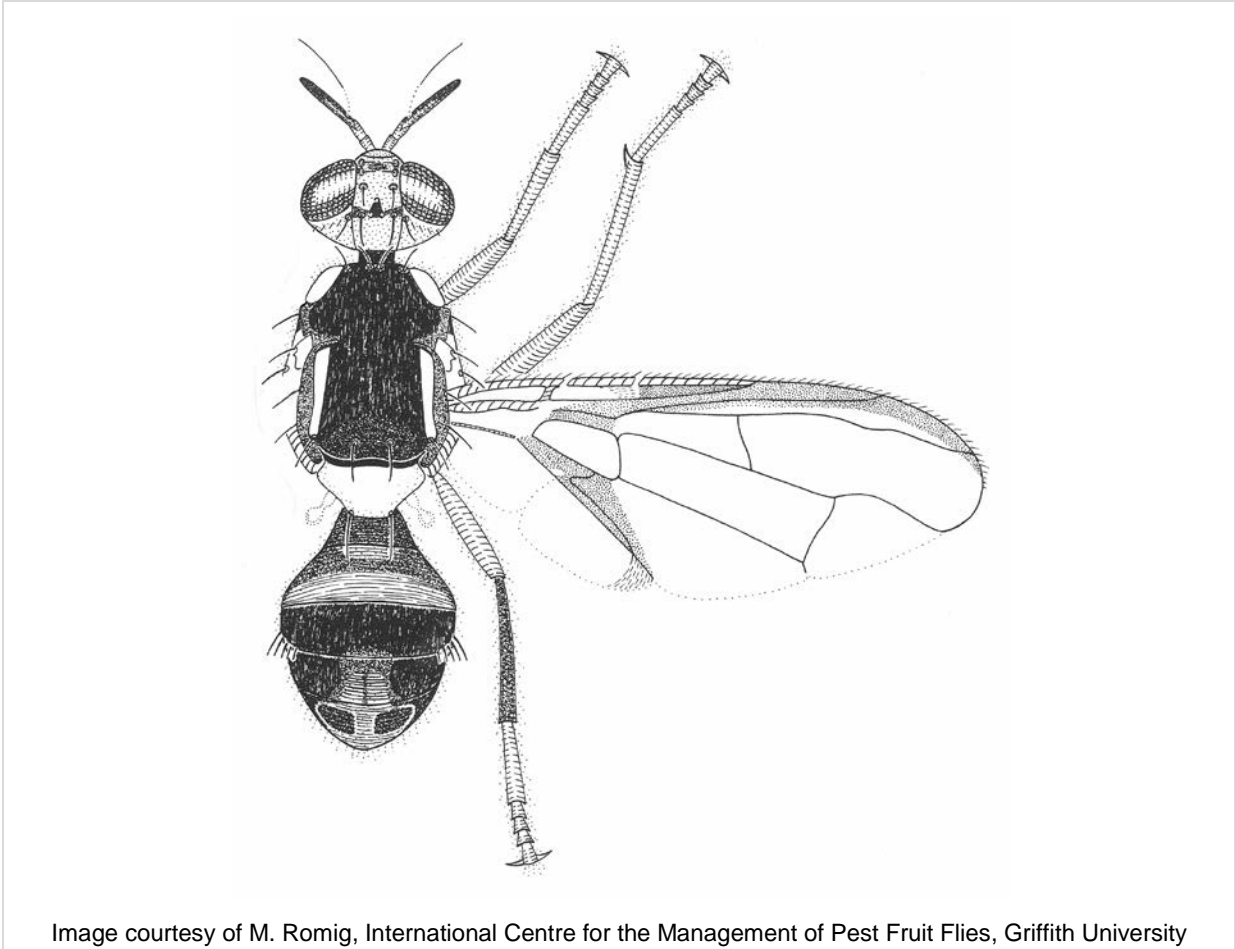
FIGURES

Figure 69. *Bactrocera trivialis*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 70. *Bactrocera trivialis*



7.3.31 *Bactrocera (Bactrocera) tryoni* (Froggatt)

TAXONOMIC INFORMATION

Common name: Queensland fruit fly

Previous scientific names:

Tephritis tryoni

Dacus tryoni

Chaetodacus tryoni

Chaetodacus tryoni var. *juglandis*

Chaetodacus tryoni var. *sarcocephali*

Dacus (Strumeta) tryoni

Strumeta tryoni

Dacus (Bactrocera) tryoni

DIAGNOSIS

7.3.31.1.1 Morphological - Adult

Medium sized species; medium sized black facial spots present; postpronotal lobes and notopleura yellow; scutum red-brown with fuscous markings, mesopleural stripe reaching midway between anterior margin of notopleuron and anterior *npl.* seta, lateral postsutural vittae present, medial postsutural vitta absent, scutellum yellow; wing with a narrow fuscous costal band and broad fuscous anal streak, cells bc and c fuscous, microtrichia covering cell c and outer ½ of cell bc; abdominal terga III-V generally red-brown with a medial and two broad lateral longitudinal fuscous bands over all three terga and joined along anterior margin of tergum III; paler forms of the abdomen are often present; posterior lobe of male surstylus short; female with apex of aculeus needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.31.1.2 Morphological - Larvae

- Not available/included in this edition -

7.3.31.1.3 Molecular

PCR - Restriction Fragment Length Polymorphism (Test 1, Section 6.3.1):

Approximate ITS1 Frag length - gel: 820 bp

*Bsr*I: 200, 600 *Sna*BI: DNC

*Hha*I: 640, 190 *Sspl*: 180, 570

*Hinf*I: 770 *Vspl*: DNC

*Sau*3AI: 420

PCR - Restriction Fragment Length Polymorphism (Test 2, 6.3.1):

<i>AluI</i>	780-770, 240-230*, 170, 130 120 110
<i>DdeI</i>	1000-980*, 270, 220, 170-160
<i>RsaI</i>	530-500*, 460-440*, 410, 290
<i>SspI</i>	1000, 550, 100

See also **PCR-DNA barcoding** (Section 6.3.2) and **Allozyme Electrophoresis** (Section 6.4).

HOST RANGE

Bactrocera tryoni has been recorded on hosts from a wide range of families. These include: Anacardiaceae, Annonaceae, Apocynaceae, Arecaceae, Cactaceae, Capparaceae, Caricaceae, Celastraceae, Clusiaceae, Combretaceae, Curcubitaceae, Cunoniaceae, Davidsoniaceae, Ebenaceae, Elaeocarpaceae, Ericaceae, Euphorbiaceae, Fabaceae, Flacourtiaceae, Goodeniaceae, Hippocrateraceae, Juglandaceae, Lauraceae, Lecythidaceae, Loganiaceae, Malpighiaceae, Melastomataceae, Meliaceae, Moraceae, Musaceae, Myrtaceae, Oleaceae, Oxalidaceae, Passifloraceae, Punicaceae, Rhamnaceae, Rosaceae, Rubiaceae, Rutaceae, Santalaceae, Sapindaceae, Sapotaceae, Smilacaceae, Solanaceae, Thymeliaceae, Tiliaceae, Verbenaceae, Vitaceae (for a full list of recorded hosts see Hancock *et al.* 2000).

Major hosts (Hancock *et al.* 2000):

Scientific name	Common name	Scientific name	Common name
<i>Anacardium occidentale</i>	cashew	<i>Mangifera indica</i>	mango
<i>Annona atemoya</i>	atemoya	<i>Manikara zapota</i>	sapodilla
<i>Annona glabra</i>	pond apple	<i>Morus nigra</i>	mulberry
<i>Annona muricata</i>	soursop	<i>Passiflora edulis</i>	passionfruit
<i>Annona reticula</i>	bullock's heart	<i>Passiflora suberosa</i>	corky passionfruit
<i>Averrhoa carambola</i>	carambola	<i>Prunus persica</i>	peach
<i>Capsicum annum</i>	capsicum	<i>Prunus persica</i> var. <i>nucipersia</i>	nectarine
<i>Capsicum annum</i>	chilli	<i>Psidium cattleianum</i> (=littorale)	cherry guava
<i>Carica papaya</i>	papaya	<i>Psidium guajava</i>	guava
<i>Casimiroa edulis</i>	white sapote	<i>Solanum lycopersicum</i>	tomato
<i>Chrysophyllum cainito</i>	star apple	<i>Syzygium aqueum</i>	water apple
<i>Coffea arabica</i>	coffee	<i>Syzygium forte</i> ssp. <i>forte</i>	white apple
<i>Eugenia uniflora</i>	Brazilian cherry	<i>Syzygium jambos</i>	wax jambu
<i>Eriobotrya japonica</i>	loquat	<i>Syzygium malacense</i>	Malay apple
<i>Fortunella japonica</i>	kumquat	<i>Syzygium suborbiculare</i>	red bush apple
<i>Malus sylvestris</i>	apple	<i>Syzygium tierneyanum</i>	river cherry

DISTRIBUTION

Occurs in large populations throughout eastern Australia from Cape York (Queensland) to East Gippsland (Victoria). It is also established in New Caledonia, Austral Islands, many islands of the

society group, and has been eradicated from Easter Island (Drew *et al.* 1982). Despite three specimens being recorded from Papua New Guinea, it is most doubtful that this species is established there (Drew 1989). A review of the past and present distribution of *Bactrocera tryoni* in Australia is currently in press (Dominiak and Daniels 2011).

REMARKS

Bactrocera tryoni is similar to *B. aquilonis* (*tryoni* complex) in the general patterns of the wing, thorax and abdomen but *Bactrocera tryoni* differs in having dark fuscous patterns on the scutum and the abdomen. In *B. aquilonis* the scutum and abdomen are generally pale red-brown (pers. comm. Drew 2010). These species can also be separated on the differences on the ovipositors: apex of aculeus rounded and spicules with 7-10 uniform dentations in *B. tryoni* compared with the more pointed aculeus and uneven dentations in *B. aquilonis* (Drew 1989). However, these differences are not easily observed (Cameron *et al.* 2010).

PEST STATUS

- Endemic
- *Bactrocera tryoni* is the major fruit fly pest species in eastern Australia and is the target of major control and quarantine programmes

ATTRACTANT

Cue lure or a mixture of methyl eugenol and cue lure are effective at attracting *Bactrocera tryoni* (Dominiak *et al.* 2011). *Bactrocera tryoni* is also attracted to wet food lures such as protein and citrus juice although these lures are less effective (Dominiak *et al.* 2003; Dominiak and Nicol 2010).

FIGURES

Figure 71. *Bactrocera tryoni*



Image courtesy of the International Centre for the Management of Pest Fruit Flies, Griffith University

Figure 72. *Bactrocera tryoni*



Image courtesy of the International Centre for the Management of Pest Fruit Flies, Griffith University

Figure 73. *Bactrocera tryoni*

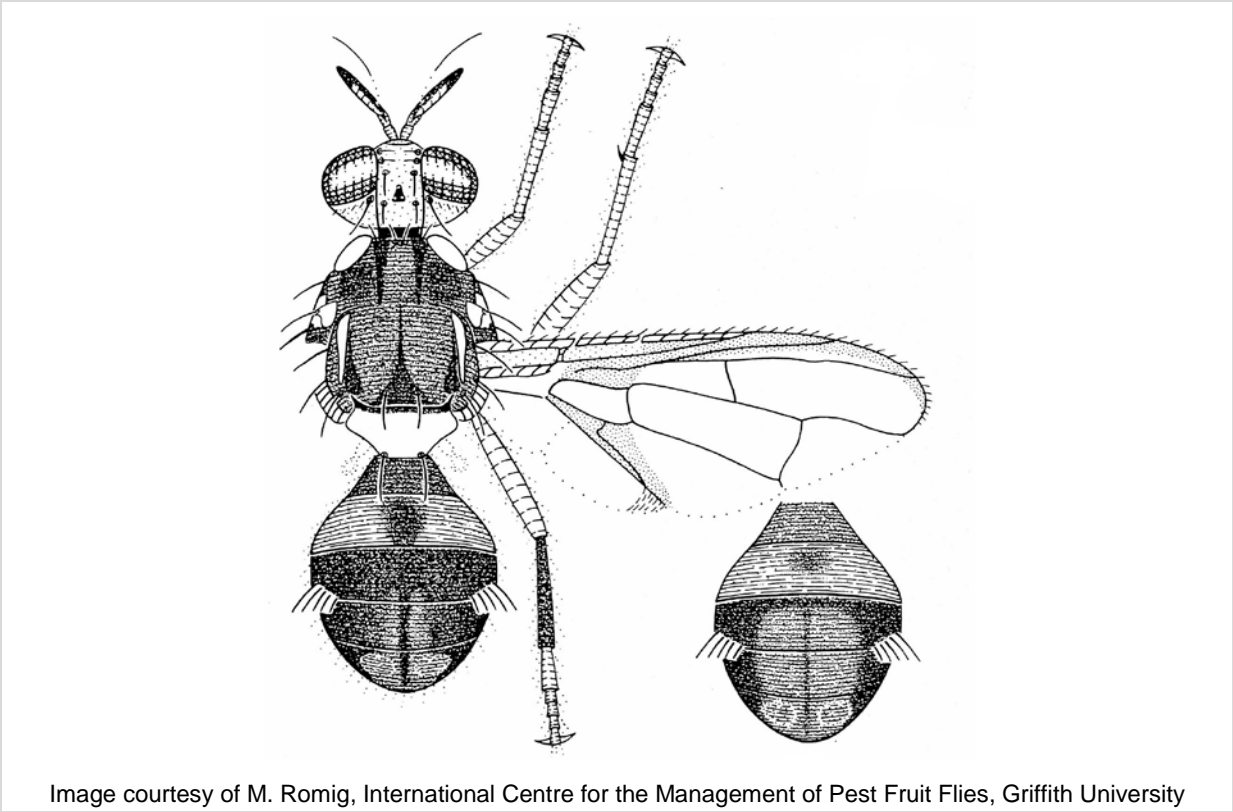


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.32 *Bactrocera (Bactrocera) umbrosa* (Fabricius)

TAXONOMIC INFORMATION

Common name: Breadfruit fruit fly

Previous scientific names:

Dacus umbrosus

Strumeta umbrosa

Dacus (Strumeta) umbrosus

Dacus (Bactrocera) umbrosus

DIAGNOSIS

7.3.32.1.1 Morphological - Adult

Medium sized species; medium sized black facial spots present; postpronotal lobes and notopleura yellow; scutum black, mesopleural stripe reaching to postpronotal lobe, lateral postsutural vittae present, medial postsutural vitta absent, scutellum yellow; wing with a broad fuscous costal band and anal streak, three transverse reddish-fuscous bands across wing with the basal one joining with the anal streak, cells bc and c fulvous with microtrichia in outer ½ of cell c only; abdominal terga varying from orange-brown with a medial longitudinal black stripe on terga IV and V to orange-brown with a broad medial and two broad longitudinal black bands over terga III-V; posterior lobe of male surstylus short; female with apex of aculeus needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.32.1.2 Morphological - Larvae

- Not available/included in this edition -

7.3.32.1.3 Molecular

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 780 bp

*Bsr*I: DNC *Sna*BI: DNC

*Hha*I: 600, 190 *Ssp*I: 680

*Hinf*I: 730 *Vsp*I: DNC

*Sau*3AI: 380

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera umbrosa has been recorded on hosts from only the family Moraceae (for a full list of recorded hosts see Allwood *et al.* 1999).

Major commercial hosts (Allwood *et al.* 1999):

Scientific name	Common name	Scientific name	Common name
<i>Artocarpus altilis</i>	breadfruit	<i>Artocarpus heterophyllus</i>	jackfruit

DISTRIBUTION

Widespread and very common in Malaysia, southern Thailand, Philippines, Indonesia, Palau, Papua New Guinea (much less common in the Highlands), Solomon Islands, Vanuatu and New Caledonia (pers. comm. Drew 2010).

REMARKS

Bactrocera umbrosa bears no close resemblance to other species. It is easily recognised by the three broad transverse bands across the wings which are red-brown, not the usual fuscous colour (Drew 1989).

PEST STATUS

- Exotic
- Major pest of *Artocarpus* species

ATTRACTANT

Methyl eugenol.

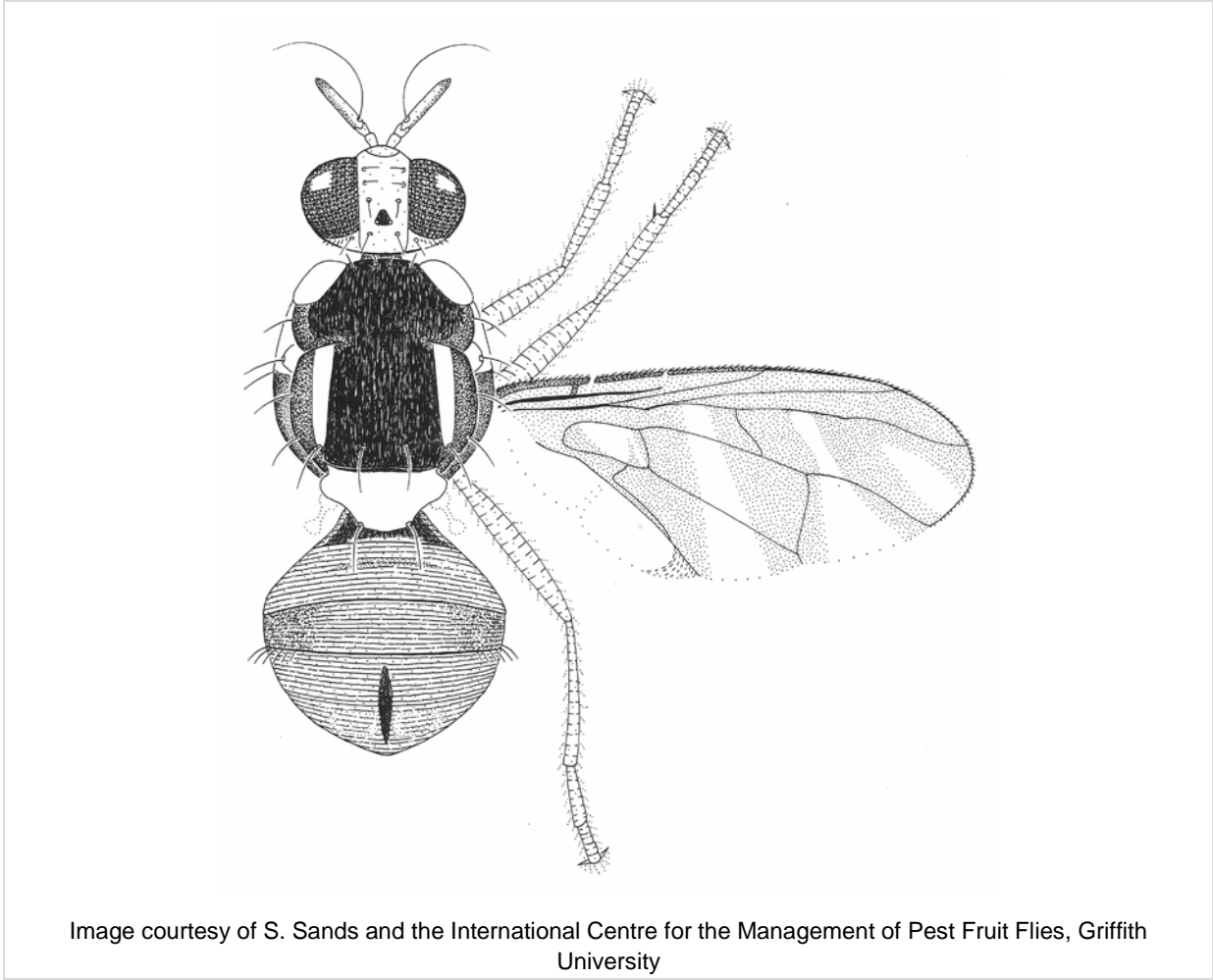
FIGURES

Figure 74. *Bactrocera umbrosa*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 75. *Bactrocera umbrosa*



7.3.33 *Bactrocera (Notodacus) xanthodes* (Broun)

TAXONOMIC INFORMATION

Common name: Pacific fruit fly

Previous scientific names:

Tephrites (Dacus) xanthodes

Dacus (Tephrites) xanthodes

Chaetodacus xanthodes

Dacus xanthodes

Notodacus xanthodes

Dacus (Notodacus) xanthodes

DIAGNOSIS

7.3.33.1.1 *Morphological - Adult*

Medium sized species; small black facial spots present; postpronotal lobes fulvous except for a broad yellow band on posterior 2/3; notopleura orange-brown; scutum transparent with a shining orange-brown colouration and with irregular dark markings, broad lateral yellow band running from postpronotal lobe to end just before anterior end of lateral postsutural vitta, large yellow spot on pleural region in place of the normal mesopleural stripe, lateral postsutural vittae present and beginning anterior to mesonotal suture, medial postsutural vitta present, scutellum orange-brown with lateral yellow margins, wing with a narrow fuscous costal band and a broad fulvous anal streak, cells bc and c extremely pale fulvous with microtrichia in outer corner of cell c only, abdominal terga transparent and shining orange-brown with no dark markings; posterior lobe of male surstylus short; female with apex of aculeus needle shaped (Drew 1989; pers. comm. Drew 2010).

7.3.33.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.33.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 860 bp

*Bsr*I: DNC *Sna*BI: DNC

*Hha*I: 670, 200 *Ssp*I: 380, 250

*Hin*fI: 680 *Vsp*I: DNC

*Sau*3AI: DNC

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera xanthodes has been recorded on hosts from a range of families. These include: Anacardiaceae, Annonaceae, Apocynaceae, Caricaceae, Combretaceae, Euphorbiaceae, Lauraceae, Lecythidaceae, Moraceae, Passifloraceae, Rutaceae and Sapotaceae (for a full list of recorded hosts see SPC 2006).

Major commercial hosts (Drew 1989):

Scientific name	Common name	Scientific name	Common name
<i>Artocarpus altilis</i>	breadfruit	<i>Carica papaya</i>	pawpaw

DISTRIBUTION

Fiji Islands, Tonga, Niue, Samoa, American Samoa, Southern group of Cook Islands, Wallis and Futuna. Introduced on Nauru (first detected in 1992) but subsequently eradicated by male annihilation. Detected in April 1998 on Raivavae (French Polynesia) but subsequently eradicated by male annihilation (Drew 1989).

REMARKS

Bactrocera xanthodes is a unique species having a pair of well-developed postpronotal lobe setae, the transparent integument on the head, thorax and abdomen, a soft integument particularly noticeable on the abdomen where the terga fold ventrally in dead specimens (Drew 1989).

Other remarks:

Bactrocera xanthodes belongs to subgenus *Notodacus*, an unusual feature of which is the presence of a seta on each postpronotal lobe (i.e. shoulder). It has a very distinct V-shaped notch in the apex of its scutellum. *Bactrocera paraxanthodes* has this to a lesser extent. Another unusual feature of *B. xanthodes* is that the lateral stripes (vittae) on the scutum extend forward to the postpronotal lobes and back down the sides of the scutellum. There is also a medial yellow stripe that extends to the posterior edge of the scutum (immediately before the scutellum); this stripe is shorter in *B. paraxanthodes*. The most obvious difference between the closely related *B. paraxanthodes* and *B. xanthodes* is that *B. xanthodes* has yellow lateral margins to the scutellum while *B. paraxanthodes* has dark margins (CABI 2007).

PEST STATUS

- Exotic
- High priority pest identified in the Avocado and Tropical fruit IBPs

ATTRACTANT

Methyl eugenol.

FIGURES

Figure 76. *Bactrocera xanthodes*



Image courtesy of Mr. S. Wilson, the International Centre for the Management of Pest Fruit Flies, Griffith University and Queensland Museum

Figure 77. *Bactrocera xanthodes*

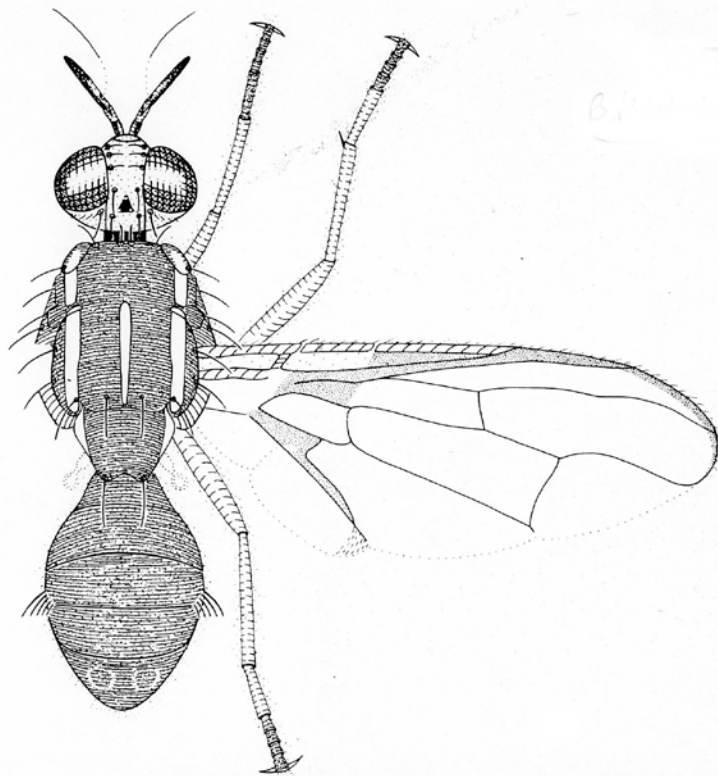


Image courtesy of M. Romig, International Centre for the Management of Pest Fruit Flies, Griffith University

7.3.34 *Bactrocera (Bactrocera) zonata* (Saunders)

TAXONOMIC INFORMATION

Common name: Peach fruit fly

Previous scientific names:

Dasyneura zonatus

Dacus (Strumeta) zonatus

Bactrocera (Bactrocera) zonata

DIAGNOSIS

7.3.34.1.1 *Morphological - Adult*

Face fulvous with a pair of medium sized oval black spots; scutum red-brown with pale fuscous patterning posteriorly; postpronotal lobes and notopleura yellow; mesopleural stripe reaching to or almost to anterior *npl.* seta dorsally; medium width parallel sided lateral postsutural vittae ending at or just behind *ia.* seta; medial postsutural vitta absent; scutellum yellow; legs with all segments entirely fulvous except apices of femora red-brown and hind tibiae pale fuscous to fuscous; wings with cells bc and c colourless and entirely devoid of microtrichia, a narrow fuscous costal band confluent with R₂₊₃ and ending at apex of this vein, a small oval fuscous spot across apex of R₄₊₅, anal streak reduced to a pale tint within cell cup; supernumerary lobe of medium development; abdominal terga III-V red-brown with a 'T' pattern consisting of a narrow transverse black band across anterior margin of tergum III (this band is often broken in the central region) and a narrow medial longitudinal black band over all three terga (this band is often reduced to a stripe over parts of terga IV and V), narrow anterolateral fuscous corners on terga IV and V, a pair of oval red-brown shining spots on tergum V; posterior lobe of male surstylus short; female with apex of aculeus needle shaped (pers. comm. Drew 2010).

7.3.34.1.2 *Morphological - Larvae*

- Not available/included in this edition -

7.3.34.1.3 *Molecular*

PCR - Restriction Fragment Length Polymorphism (Section 6.3.1):

Approximate ITS1 Frag length - gel: 850 bp

*Bsr*I: 600, 200 *Sna*BI: 535, 330

*Hha*I: 680, 190 *Ssp*I: 750, 120

*Hinf*I: DNC *Vsp*I: DNC

*Sau*3AI: DNC

See also **PCR-DNA barcoding** (Section 6.3.2).

HOST RANGE

Bactrocera zonata has been recorded on hosts from a wide range of families. These include: Anacardiaceae, Annonaceae, Arecaceae, Caricaceae, Combretaceae, Curcurbitaceae, Fabaceae, Lecythidaceae, Malpighiaceae, Malvaceae, Myrtaceae, Punicaceae, Rosaceae, Rutaceae and Tiliaceae (for a full list of recorded hosts see Allwood *et al.* 1999).

Major commercial hosts (Allwood *et al.* 1999):

Scientific name	Common name	Scientific name	Common name
<i>Mangifera indica</i>	mango	<i>Psidium guajava</i>	guava
<i>Prunus persica</i>	peach		

DISTRIBUTION

Sri Lanka, India, Pakistan, Thailand, Vietnam, Mauritius and Egypt (pers. comm. Drew 2010).

REMARKS

Bactrocera zonata is a red brown species that is similar in general appearance to *B. tryoni*. It is easily distinguished from *B. tryoni* in having the costal band interrupted beyond apex of R_{2+3} . *Bactrocera correcta* possess a similar costal band but has a black scutum and a black 'T' pattern on abdominal terga III-V (pers. comm. Drew 2010).

PEST STATUS

- Exotic
- High priority pest identified in the Tropical fruit IBP
- In India, Pakistan and now Egypt, it is an important fruit fly pest and causes severe damage to peach, guava and mango

ATTRACTANT

Methyl eugenol.

FIGURES

Figure 78. *Bactrocera zonata*

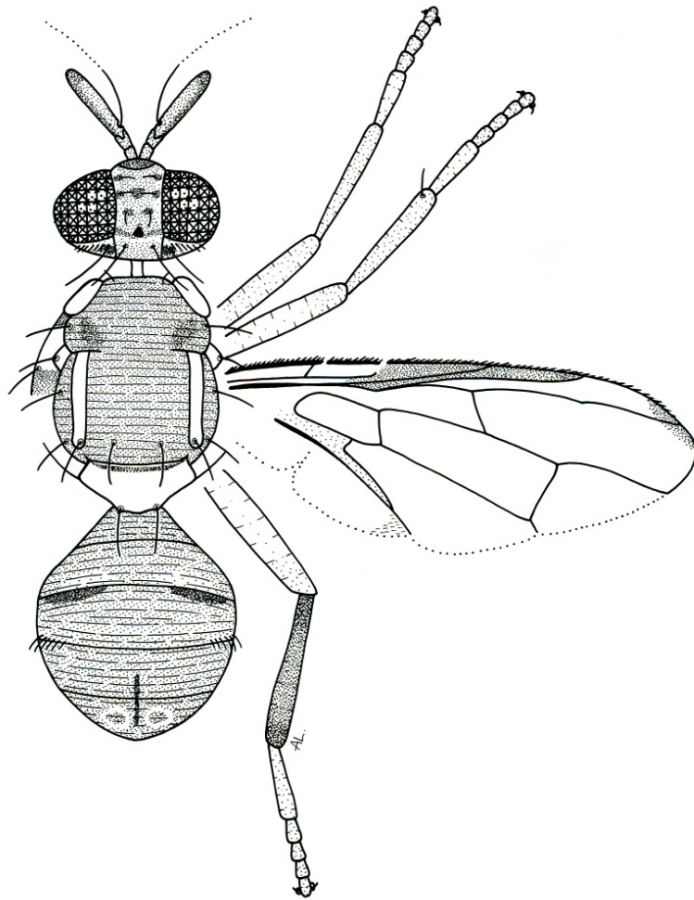


Image courtesy of A. Carmichael and the International Centre for the Management of Pest Fruit Flies, Griffith University