



Fruit Flies in Tonga

In Tonga, fruit and fleshy (that is, non-leafy) vegetables such as sweet pepper, chilli, eggplant and tomato are attacked by fruit flies of the Family Tephritidae. These flies are different from the small vinegar flies (Family: Drosophilidae) that infest rotten or fallen fruit. The activities of adult fruit flies are centred around the host fruit tree, where adult feeding, mating, egg laying, larval development and pupal development (in the soil) take place. The adult female lays its eggs in clutches under the skin of the fruit using its egg laying organ, the ovipositor. As the eggs are inserted into the fruit, bacteria are also introduced, and these bacteria cause the fruit to rot. The rotting flesh of the fruit provides food for the larvae or maggot stage of the fruit fly.

Six fruit fly species have been recorded in the Kingdom of Tonga, of which three (*Bactrocera facialis*, *B. xanthodes* and *B. kirki*) are economically important. The remaining three (*B. obscura*, *B. distincta* and *B. new species near passiflorae*) are non-pest fruit fly species because they do not attack commercial or edible fruit or vegetable.

ECONOMICALLY IMPORTANT SPECIES

Bactrocera facialis (Coquillett)

Bactrocera facialis (Figure 1) occurs in Tonga only and is known as the native fruit fly species of this island nation. This species is widely distributed throughout the islands of Tonga, but is absent from the Niuaus Islands. It is known to attack 64 species of fruit and vegetables covering 48 plant genera and 29 plant families. Some of the major edible host fruits of this species are avocado, chillies (*Capsicum frutescens*), citrus fruit (orange – *C. sinensis*, sour orange – *C. aurantium*, pomelo – *C. maxima*, mandarin – *C. reticulata*, grapefruit – *C. x paradisi*), guava, mango, mountain apple (*Syzygium malaccense*), rose apple (*Syzygium jambos*), sweet pepper (*Capsicum annuum*), Tahitian chestnut (*Inocarpus fagifer*), tomato, and tropical almond (*Terminalia catappa*). It has also been bred from breadfruit, cashew, papaya, passionfruits (*Passiflora foetida*, *P. ligularis*, *P. quadrangularis*), sapodilla (*Manilkara zapota*), soursop, star apple (*Chrysophyllum cainito*), and Surinam cherry (*Eugenia uniflora*). Some of its wild hosts include ahi vao (*Vavaea amicorum*), fao (*Ochrosia oppositifolia*), feta'u (*Calophyllum inophyllum*), huni (*Phaleria disperma*), puopua (*Guettarda speciosa*), sandalwood

(*Santalum yasi*), takafalu (*Micromelum minutum*), telie'a manu (*Terminalia littoralis*), toto (*Cerbera manghas*), and wild *Syzygium* (*S. corynocarpum*, *S. neurocalyx*, *S. richii*).

Capsicum suffers from 97-100 % infestation, the level of damage to chilli is 89-97% and for guava, over 90% of fruit are infested. The male flies of this species are attracted to the bait Cue-lure.

This fruit fly species is slightly smaller than a house fly. It has an upper body that is black with yellow portions near the wings and on the triangular section at the end of the thorax. The wings are clear except for the dark veins on the front of the wings running along the rim of the wings and also a small part of the lower end of the wing. The lower body or abdomen is largely orange-brown in colour except for the black portions in the middle and lateral margins of the abdomen.



Figure 1: *Bactrocera facialis* (Coquillett)

Pacific fruit fly - *Bactrocera xanthodes* (Broun)

Pacific fruit fly (Figure 2) is a little larger than a housefly, slender and almost translucent in appearance. It is light brown-orange in colour with three yellow stripes on the upper surface of the thorax. The abdomen is orange-brown and has two dark spots at the rear of the abdomen.

The Pacific fruit fly attacks 18 host fruits and vegetable species in Tonga including avocado, breadfruit, giant granadilla (*Passiflora quadrangularis*), mango, papaya, passionfruit (*Passiflora edulis*, *P. ligularis*), tomato, mandarin, and several non-commercial or edible fruits, such as fao and toto. Male flies are attracted to methyl eugenol.



Figure 2: Pacific fruit fly - *Bactrocera xanthodes* (Broun)

***Bactrocera kirki* (Froggatt)**

B. kirki (Figure 3) is present also in Rotuma (Fiji Islands), American Samoa, Samoa, Niue, French Polynesia and Futuna. *B. kirki* is a black fruit fly with yellow portions in the areas closest to the head and wings. The abdomen is glossy black with orange brown longitudinal bands in the middle of the abdomen. Male flies are attracted to Cue-lure.

Edible host fruits of *B. kirki* in Tonga are avocado, mango, Tahitian chestnut, tropical almond, Surinam cherry, guava, mandarin, orange, passionfruit (*Passiflora edulis*), sour-sop, starfruit (*Averrhoa carambola*), mountain apple and rose apple. Some of its wild hosts are *Terminalia litoralis*, *Calophyllum inophyllum*, *Syzygium corynocarpum*, *S. delectatum*, *S. neurocalyx*, *S. richii*. It has been bred from 22 host fruits in Tonga.



Figure 3: *Bactrocera kirki* (Froggatt)

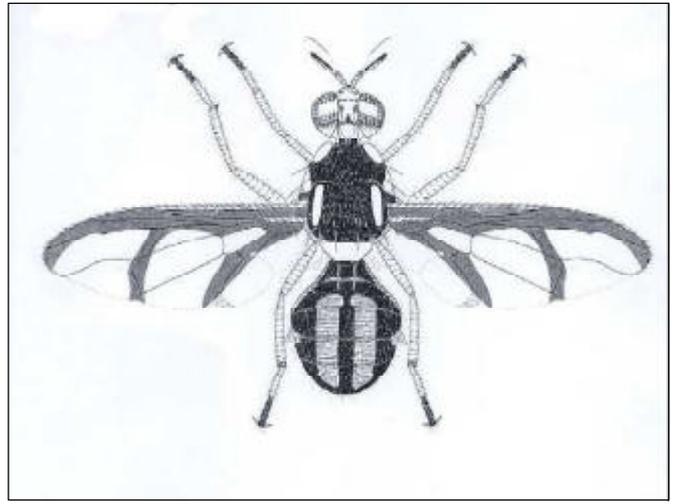


Figure 4: *Bactrocera distincta* (Malloch)

NON-PEST FRUIT FLY SPECIES

***Bactrocera distincta* (Malloch)**

Of the three non-pest fruit fly species, *B. distincta* (Figure 4) is a medium sized fly, partially black and has a distinct dark crossband pattern on the wings. In Tonga, it is known to attack five species of host fruit from the family Sapotaceae: star apple (*Chrysophyllum cainito*), sapodilla (*Manilkara zapota*), kau'uta (*Burckella richii*) and kau tahi (*Planchonella membranacea*), and kalaka (*Planchonella costata*). Male flies are attracted to Cue-lure.

Bactrocera* new species near *passiflorae

An undescribed new fruit fly species related to *B. passiflorae*, is present in Tonga (restricted to the Niua islands), Fiji Islands (excluding Rotuma), Tuvalu and Tokelau. This species has been bred in Tonga from a number of commercial/edible and wild host species, such as avocado, giant granadilla, guava, mandarin, papaya, sweet orange, Tahitian chestnut, tropical almond, *Calophyllum inophyllum*, *Hernandia nymphaefolia*, *Guettarda speciosa* and *Ochrosia oppositifolia*, but its economic impact has not been assessed. In Fiji Islands, it has been bred only from *Ochrosia oppositifolia*.

This new species is similar to *B. passiflorae*, except that the abdomen has extensive pale markings on the dorsal surface of terga III to V. A drawing of the species was published in Drew and Hancock (1995). Because it is not present in the other islands in Tonga, vigilant quarantine measures are required to prevent its introduction elsewhere in Tonga. Male flies are attracted to Cue-lure traps.

***Bactrocera obscura* (Malloch)**

B. obscura (Figure 5) occurs in Rotuma (Fiji Islands), Samoa, American Samoa, Niue and Wallis and Futuna. This species has yellow portions in the upper body, which is dull black in colour, giving a grayish appearance. The abdomen is orange-brown, a dark band extends in the middle of the abdomen with dark markings on the lateral sides of the abdomen. Host plants for this species are not known. Male flies are attracted to Cue-lure.

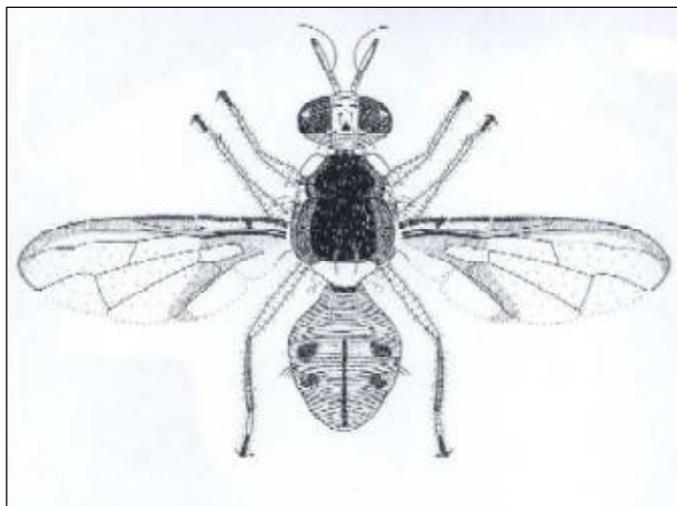


Figure 5: *Bactrocera obscura* (Malloch)

QUARANTINE SURVEILLANCE

The fruit fly surveillance programme in Tonga involves maintaining a network of pairs of modified Steiner traps baited with either Cue-lure or methyl eugenol mixed with an insecticide (generally malathion). A third trap, baited with Trimedlure to attract Mediterranean fruit fly, may also be present at some locations. These locations include backyards in residential areas of towns and cities, rubbish dumps, villages, hotels and resorts, research stations and ports of entry. Flies collected in traps are removed on a weekly basis (ports of entry) or monthly at other locations.

As part of the surveillance programme, host fruit collections are also carried out. This activity confirms the host range of the fruit fly species in Tonga, their geographic distribution, their seasonal abundance, and the presence and impact of parasitoids. It also helps to confirm the presence of fruit fly species not attracted to male lures, such as solanum fruit fly (*B. latifrons*), a destructive pest of eggplant, tomato, capsicum and chilli native to Asia and present in Hawaii.

The fruit fly trapping and host fruit survey programme in Tonga have confirmed that the major pest fruit fly species, such as melon fly (*B. cucurbitae*), Asian papaya fruit fly (*B. papayae*), oriental fruit fly (*B. dorsalis*), Queensland fruit fly (*B. tryoni*) and Mediterranean fruit fly (*Ceratitis capitata*), are not present in Tonga.

Tonga has a lucrative export market for squash to Japan worth over US\$ 7 million. The introduction of an exotic fruit fly species such as melon fly will result in the closure of exports of squash and other fresh fruit and vegetable. A vigilant quarantine surveillance and public awareness programme therefore needs to be maintained and strengthened to keep Tonga free from these exotic species.

FURTHER READING

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This leaflet was compiled under the Fruit Fly Projects in the Pacific. The FAO/AusAID/UNDP/SPC Project on Regional Management of Fruit Flies in the Pacific (RMFFP) commenced in 1990 and Phase 1 initially operated in Fiji Islands, Cook Islands, Tonga and Samoa. Phase 2 (1994-1997) included, besides the four original countries, Federated States of Micronesia (FSM), Solomon Islands and Vanuatu. The third phase (1997-2000) included all 22 Pacific Island countries and territories (PICTs). The RMFFP was funded by AusAID, UNDP and New Zealand Government (NZODA), implemented by FAO and executed by the Secretariat of the Pacific Community (SPC). The Australian Centre for International Agricultural Research (ACIAR) has also run a parallel fruit fly project in the seven countries during Phases 1 and 2, and in Papua New Guinea since 1998. Since January 2001, fruit fly activities have become Component 2, "Fruit Fly Management", of the Project on "Pest Management in the Pacific", executed by SPC and funded by the Australian (AusAID) and New Zealand (NZODA) governments. For more information on the Fruit Fly Project, consult the Web site: <http://www.pacifly.org>.



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