EPPO Datasheet: *Bactrocera tryoni*

Last updated: 2021-04-28

IDENTITY

Preferred name: *Bactrocera tryoni*
Authority: (Froggatt)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Diptera: Tephritidae
Other scientific names: *Chaetodacus tryoni* (Froggatt), *Dacus ferrugineus tryoni* (Froggatt), *Dacus tryoni* (Froggatt), *Strumeta tryoni* (Froggatt), *Tephritis tryoni* Froggatt
Common names: Queensland fruit fly
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EPPO Categorization: A1 list
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EU Categorization: Quarantine pest ((EU) 2019/2072 Annex II A)
EPPO Code: DACUTR

Notes on taxonomy and nomenclature

Bactrocera tryoni belongs to a species complex (see Drew, 1989) and differentiation between this species and closely related species is difficult and needs expert confirmation. Separation between *B. tryoni* and *B. neohumeralis* cannot be done reliably on morphological grounds. See Clarke *et al.* (2011) and Clarke (2019) for a discussion on the differentiation of species within the *tryoni* complex.

HOSTS

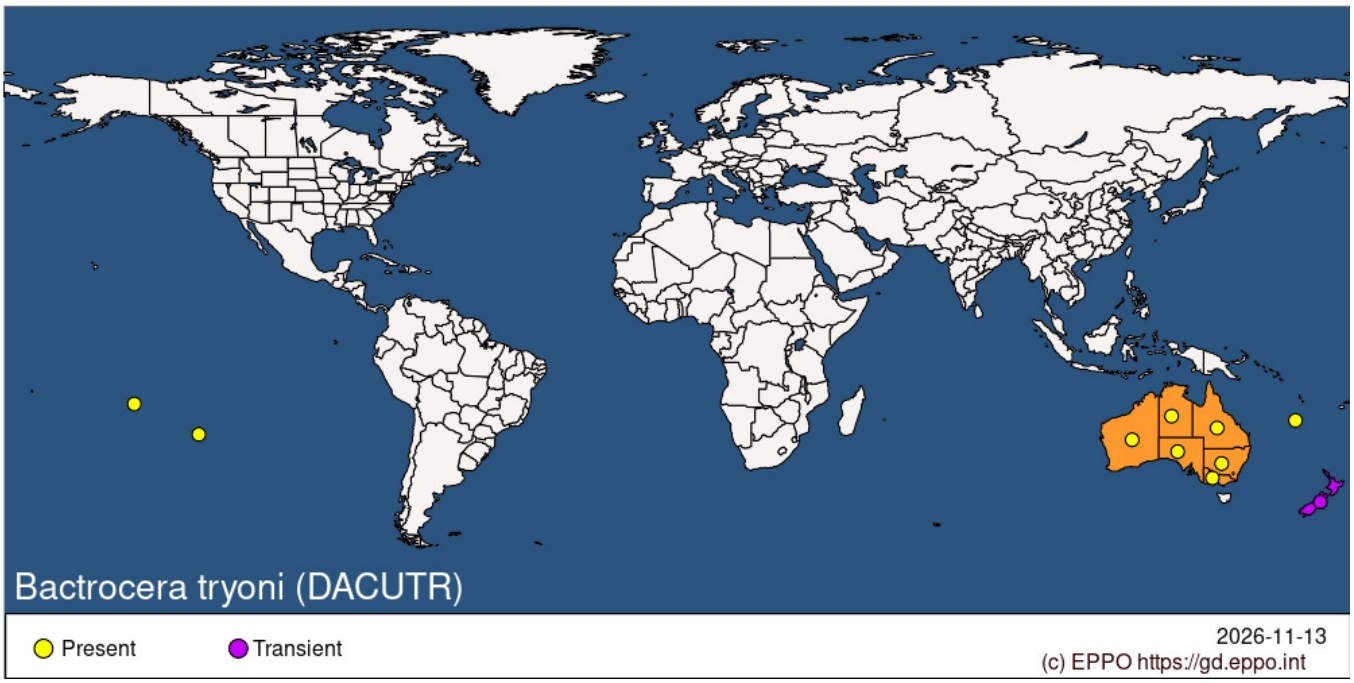
Bactrocera tryoni has a wide range of hosts. In Australia, it has been reported from 234 plant species, belonging to 49 different families, according to the catalogue compiled by Hancock *et al*. (2000). Leblanc *et al*. (2012) gives a list of host plant records for the adventive populations in Pacific Islands. In total, it is reported from more than 250 different hosts. Fitt (1986) states that adults of *B. tryoni* exhibit no particular preference in the species of fruits on which they will lay eggs, but Clarke *et al.* (2011) argue that data on relative susceptibility are largely missing. The main hosts of interest are fruit trees: *Annona*, *Averrhoa carambola*, avocados (*Persea americana*), *Citrus*, *Fortunella* , guavas (*Psidium guajava*), *Malus*, mangoes (*Mangifera indica*), passion fruits (*Passiflora edulis*), pawpaws (*Carica papaya*), peaches (*Prunus persica*), plums (*Prunus domestica*) and *Pyrus*. However, vegetables such as tomatoes (*Lycopersicon esculentum*) are also infested. Many tree fruit crops of the EPPO region are potential hosts.

Host list: *Acronychia acidula, Acronychia laevis, Acronychia vestita, Actinidia deliciosa, Aegle marmelos, Aglaia sapindina, Alyxia ruscifolia, Amorphospermum antilogum, Anacardium occidentale, Annona glabra, Annona muricata, Annona reticulata, Annona squamosa, Annona x atemoya, Artocarpus altilis, Artocarpus heterophyllus, Artocarpus odoratissimus, Averrhoa bilimbi, Averrhoa carambola, Barringtonia asiatica, Barringtonia calyptrata, Barringtonia edulis, Beilschmiedia obtusifolia, Blighia sapida, Bouea macrophylla, Calophyllum inophyllum, Cananga odorata, Canarium indicum, Capparis lucida, Capparis mitchellii, Capparis nobilis, Capsicum annuum, Capsicum frutescens, Carallia brachiata, Carica papaya, Carissa ovata, Cascabela thevetia, Casimiroa edulis, Casimiroa tetrameria, Castanospermum australe, Castanospora alphandii, Chrysophyllum cainito, Cissus antarctica , Cissus sp., Citrus glauca, Citrus maxima, Citrus medica, Citrus reticulata, Citrus x aurantiifolia, Citrus x aurantium var. paradisi, Citrus x aurantium var. sinensis, Citrus x aurantium, Citrus x latifolia, Citrus x limon var. limetta, Citrus x limon, Citrus x limonia var. jambhiri, Clausena lansium, Coffea arabica, Coffea sp., Cryptocarya erythroxylon, Cucurbita moschata, Cucurbita pepo, Cydonia oblonga, Davidsonia pruriens, Dimocarpus longan, Diospyros australis, Diospyros discolor, Diospyros ebenum, Diospyros kaki, Diospyros mespiliformis, Diospyros nigra, Diplocyclos palmatus, Dovyalis afra, Drypetes deplanchei, Elaeocarpus angustifolius, Elaeocarpus bancroftii , Elaeodendron australe, Endiandra compressa, Endiandra cowleyana, Endiandra discolor, Endiandra longipedicellata, Endiandra microneura, Endiandra sankeyana, Endiandra wolfei, Eriobotrya japonica, Eugenia dombeyi*

, Eugenia reinwardtiana, Eugenia uniflora, Fagraea gracilipes, Feijoa sellowiana, Ficus carica, Ficus leptoclada, Ficus macrophylla, Ficus pancheriana, Ficus racemosa, Ficus sp., Flacourtia inermis, Flacourtia jangomas, Flacourtia rukam, Fortunella crassifolia, Fortunella japonica, Fragaria sp., Fragaria vesca, Ganophyllum falcatum , Garcinia dulcis, Garcinia warrenii, Glochidion harveyanum, Glycosmis trifoliata, Grewia asiatica, Hernandia cordigera, Huberantha nitidissima, Inocarpus fagifer, Juglans regia, Litchi chinensis, Maclura cochinchinensis, Malpighia emarginata, Malpighia glabra, Malus sylvestris, Mangifera indica, Manilkara zapota, Melastoma malabathricum, Melodorum leichhardtii, Mimusops elengi, Momordica charantia, Morinda citrifolia, Morus alba, Morus nigra, Murraya paniculata, Musa troglodytarum, Musa x paradisiaca, Nauclea orientalis, Nephelium lappaceum, Nerium oleander, Niemeyera chartacea, Niemeyera prunifera, Normanbya normanbyi, Notelaea longifolia, Ochrosia elliptica, Ochrosia moorei, Olea europaea, Opuntia ficus-indica, Opuntia sp., Owenia venosa, Passiflora aurantia, Passiflora edulis f. flavicarpa, Passiflora edulis, Passiflora foetida, Passiflora laurifolia, Passiflora quadrangularis, Passiflora suberosa, Passiflora subpeltata, Persea americana, Phaleria clerodendron, Phoenix dactylifera, Phyllanthus acidus, Phyllanthus ferdinandi, Physalis peruviana, Planchonella australis, Planchonella myrsinodendron, Planchonella pohlmaniana, Planchonella sp., Planchonella sphaerocarpa, Planchonia careya, Pleiogynium cerasiferum, Pleioluma macrocarpa, Plinia cauliflora, Polyalthia sp., Pometia pinnata, Pourouma cecropiifolia, Pouteria caimito, Pouteria campechiana, Pouteria sapota, Premna serratifolia, Prunus armeniaca, Prunus avium, Prunus cerasifera, Prunus domestica, Prunus persica var. nucipersica, Prunus persica, Prunus simonii, Psidium acutangulum, Psidium cattleyanum, Psidium guajava, Psidium guineense, Punica granatum, Pyrus communis, Pyrus pyrifolia, Rhamnella vitiensis, Rhodamnia sessiliflora, Ripogonum album, Rollinia mucosa, Rubus fruticosus, Rubus x loganobaccus, Salacia chinensis, Sandoricum koetjape, Santalum lanceolatum, Scaevola taccada, Schizomeria ovata, Semecarpus australiensis, Siphonodon australis, Solanum betaceum, Solanum laciniatum, Solanum lycopersicum, Solanum mauritianum, Solanum melongena, Solanum muricatum, Solanum seaforthianum, Solanum torvum, Spondias dulcis, Spondias mombin, Synsepalum dulcificum, Syzygium alliiligneum, Syzygium angophoroides, Syzygium aqueum, Syzygium australe, Syzygium canicortex, Syzygium claviflorum, Syzygium coarctatum, Syzygium cormiflorum, Syzygium corynanthum, Syzygium cumini, Syzygium erythrocalyx, Syzygium fibrosum, Syzygium forte, Syzygium graveolens, Syzygium hemilamprum, Syzygium jambos, Syzygium kuranda, Syzygium luehmannii, Syzygium malaccense, Syzygium paniculatum, Syzygium puberulum, Syzygium resa, Syzygium rubrimolle, Syzygium samarangense, Syzygium smithii, Syzygium suborbiculare , Syzygium tierneyanum, Syzygium xerampelinum, Terminalia arenicola, Terminalia aridicola, Terminalia catappa, Terminalia ferdinandiana, Terminalia melanocarpa, Terminalia muelleri, Terminalia platyphylla, Terminalia sericocarpa, Terminalia subacroptera, Trichosanthes cucumerina var. anguina, Vaccinium sp., Vitis labrusca, Vitis sp., Vitis vinifera, Ximenia americana, Ziziphus mauritiana

GEOGRAPHICAL DISTRIBUTION

This species is found in Eastern Australia, from the Northern Territory, and Queensland southwards to New South Wales and the eastern part of Victoria. It is also reported from the Torres Strait Islands. See Dominiak & Mapson (2017) for a review of the distribution in Eastern Australia. It was introduced and became established in French Polynesia, New Caledonia, and Pitcairn Island (Leblanc *et al*., 2012). It has been introduced in other areas but eradicated.



Oceania: Australia (New South Wales, Northern Territory, Queensland, South Australia, Victoria, Western Australia), French Polynesia, New Caledonia, New Zealand, Pitcairn

BIOLOGY

The general life cycle is similar to those of other *Bactrocera* species infesting fruits: eggs are deposited inside fruits by the female puncturing the fruit skin. Three larval stages develop inside the fruit, feeding on the plant tissue. Once mature the third instar larva will leave the fruit, dig down into the soil and turn into a pupa enclosed in a puparium. The adult fly will emerge from the puparium. During summer larvae mature in 7-10 days, while the pupal stage lasts about 10 days. The full life cycle can be completed in 2.5 weeks during summer but will take considerably longer in cooler conditions. A detailed overview of developmental rates and population dynamic models in relation to different weather conditions in Australia, is given in Yonow *et al.* (2004). Models predict 12-15 generations in the tropical parts of Australia, to 3-4 generations in Southern New South Wales (Clarke, 2019). Adults usually live around 80 days but can survive 7 to 8 months when overwintering (Clarke, 2019). The ability of *B. tryoni* to survive repeated frosts has been studied by Meats & Fitt (1987). In their review of overwintering of *B. tryoni*, Clarke *et al.* (2019) state that available data show the fly to overwinter almost exclusively as an adult.

DETECTION AND IDENTIFICATION

Symptoms

Attacked fruit will usually show signs of oviposition punctures. Fruit with a high sugar content, such as peaches, will exude a sugary liquid, which usually solidifies adjacent to the oviposition site.

Morphology

Larva

Fruit fly larvae in general have a typical shape, i.e., cylindrical maggot-shape, elongate, anterior end narrowed and somewhat recurved ventrally, with anterior mouth hooks, and flattened caudal end. Their length varies from 5 to 15 mm. Identification to species level is not possible based on larvae. The 3rd-instar larvae have been described by White & Elson-Harris (1992) and Carroll *et al.* (2004). The former work provides a key to 3rd-instar larvae which is useful for an identification to genus level.

Adult (after diagnostic description of Drew, 1989)

Male

Medium sized (5-8 mm) species; medium sized black facial spots present; humeral calli and notopleural calli yellow; mesonotum red-brown with fuscous markings, mesopleural stripe reaching midway between anterior margin of notopleural callus and anterior npl. bristle, lateral postsutural vittae present, media postsutural vitta absent, scutellum yellow; wing with a narrow fuscous costal band and broad fuscous anal streak, costal cells fuscous, microtrichia covering second costal cell and outer half of first costal cell; abdominal terga III-V generally red-brown with a medial and 2 broad lateral longitudinal fuscous bands over all 3 terga and joined along anterior margin of tergum III; paler forms of the abdomen are often present.

Female

As for male except no dense aggregation of microtrichia around A1+CuA2; supernumerary lobe weak; pecten of cilia on abdominal tergum III absent; ovipositor basal segment red-brown in, dorsoventrally compressed and tapering in dorsal view; ratio of length of oviscape to length of tergum V, 0.53:1; apex of piercer rounded.

Remark: *B. tryoni* belongs to a species complex (see Drew, 1989) and differentiation between this species and closely related species is difficult and needs expert confirmation. Separation between *B. tryoni* and *B. neohumeralis* cannot be done reliably on morphological grounds. See Clarke *et al*. (2011) and Clarke (2019) for a discussion on the differentiation of species within the *tryoni* complex.

DNA barcoding

The molecular identification of *B. tryoni* through DNA barcoding proves to be problematic as this species cannot be properly distinguished from a number of closely related species, including *B. aquilonis* and *B. neohumeralis*. Additionally, the presence of unidentified / possibly misidentified reference sequence in Barcoding Index Number Systems (BINs) in which this species is represented, might also bias its molecular identification. Sequences are available in the **Barcode of Life Data Systems (BOLD)** and **EPPO-Q-Bank**.

Detection and inspection methods

Males are attracted to cue lure (Drew, 1989) and melolure (Royer, 2015). Schutze *et al*. (2016) discuss the efficiency of a visual trap ('Ladd trap') for monitoring both sexes of *B. tryoni*. Both sexes can be monitored by traps baited with protein-based attractants. The trapping system used to monitor for possible introductions of *B. tryoni* into New Zealand has been described by Cowley (1990). Detection is also possible by examination of fruit for oviposition punctures and then rearing the larvae through to the adult stage.

PATHWAYS FOR MOVEMENT

Transport of infested fruits is the main mean of movement and dispersal to previously uninfested areas. Adult flight can also result in dispersal but previous citations of long (50-100 km) dispersal movements for *Bactrocera* spp. are unsubstantiated according to a recent review by Hicks *et al.* (2019). Meats *et al*. (2003) established that the dispersal rate was almost always less than 1 km.

PEST SIGNIFICANCE

Economic impact

In Australia, *B. tryoni* is a serious pest of a wide variety of unrelated fruit and vegetable crops (Dominiak, 2012). Sutherst *et al*. (2000) estimated the annual cost in Australia to be between 25.7 and 49.9 million AUD.

Control

Management for this species includes the general control measures for *Bactrocera* spp. (see Vargas *et al.* 2015 for an overview of management options). These include sanitation (to gather all fallen and infested host fruits and destroy them). Insecticidal protection is possible by using a cover spray or a bait spray. Bait sprays work on the principle that both male and female tephritids are strongly attracted to a protein source from which ammonia emanates. Bait sprays have the advantage over cover sprays in that they can be applied as a spot treatment so that the flies are attracted to the insecticide and there is minimal impact on natural enemies and other beneficials. A specific area-wide management approach for this species in Queensland, using bait spraying and Male Annihilation Technique (MAT), and its effects on trap catches and overall fruit fly infestation is given in Lloyd *et al*. (2010). Clarke *et al.* (2011) gives an overview of ecological factors relevant to control techniques, while Clarke (2019) discusses different aspects of management practices used against *B. tryoni* and other *Bactrocera* species.

Sterile Insect Technique (SIT) application specifically for this species has been deployed at quarantined areas for localized outbreaks (Jessup *et al*., 2007).

Phytosanitary risk

Bactrocera tryoni is a known pest of several fruit and vegetable crops in the area where it is present. It can be moved in trade with infested fruit. Although several studies were conducted on the present and potential distribution range of this species within Australia including the impact of climate change (e.g. Sutherst *et al*., 2000), no detailed study has been made on climatic suitability of the EPPO region, and it is unclear whether it could become established in the EPPO region. However, taken into consideration that the species co-occurred with *Ceratitis capitata* and displaced the latter in eastern Australia (Dominiak & Mapson, 2017), it is considered likely that *B. tryoni* could survive in parts of the EPPO region where *C. capitata* currently occurs. Transient populations could have impacts on the export of host fruit from the EPPO region. The EFSA Panel on Plant Health, in their Pest Categorization of non-EU Tephritidae (EFSA, 2020) placed *B. tryoni* on the list of fruit flies that satisfy the criteria to be regarded as a potential Union quarantine pest for the EU.

PHYTOSANITARY MEASURES

Consignments of fruits from countries or regions where *B. tryoni* occurs should be inspected for symptoms of infestation and those suspected should be cut open in order to look for larvae. Possible measures include that such fruits should come from an area where *B. tryoni* does not occur, or from a place of production found free from the pest by regular inspection for 3 months before harvest. Cold treatment and irradiation are described in the USDA treatment manual (USDA, 2021). Annex 16 to 18 of ISPM 28 Phytosanitary treatments for regulated pests (FAO, 2015) describe a cold treatment for *B. tryoni* on *Citrus sinensis*, *Citrus reticulata* x *C. sinensis* and *Citrus limon*, respectively. Annex 5 of ISPM 28 Phytosanitary treatments for regulated pests (FAO, 2009) describes an irradiation treatment for *Bactrocera tryoni.*

Plants of host species transported with roots from countries where *B. tryoni* occurs should be free from soil, or the soil should be treated against puparia. The plants should not carry fruits.

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CABI resources used when preparing this datasheet

CABI Datasheet on Pest https://www.cabi.org/isc/datasheet/17693

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Datasheet history

This datasheet was first published in the EPPO Bulletin in 1983 and revised in the two editions of 'Quarantine Pests for Europe' in 1992 and 1997, as well as in 2021. It is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', ‘Hosts’, and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

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