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REVIEW ARTICLE

A checklist of the Dacinae (Diptera: Tephritidae) of South Africa

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South Africa has a diverse assemblage of true fruit flies in the subfamily Dacinae (Diptera: Tephritidae). Amongst its members are species with significant agricultural and ecological importance, yet this is the first comprehensive checklist available for this group in South Africa. This account was compiled using verified specimen lists, which are maintained by the Royal Museum for Central Africa (RMCA) database and includes material from 30 global museum collections. To supplement the database and obtain detailed information on pest status, distribution and known host plant records, additional literature records were sourced. In total, 105 species belonging to ten genera are documented. Of the species recorded, several include key pests of cultivated fruit and vegetables in South Africa, while most are non-pest species restricted to native host plants. In addition to known pest status and host range within South Africa, the observed distribution patterns on a continental and national scale, and the known attractants used for trapping fruit fly specimens are also briefly reported. This resource combines information into a single document and provides support to taxonomic, ecological and applied studies of dacine fruit flies in South Africa, as well as pest risk assessments of relevance to South Africa's fruit exports.

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INTRODUCTION

Fruit flies (Diptera: Tephritidae) are one of the more speciose families of Diptera, comprising over 5000 species worldwide (EFSA 2020). Of these, about 1000 species, grouped in 160 genera, are recorded from the Afrotropical region (Norrbom et al. 1999; Hancock et al. 2021), although it is suspected that several species remain hitherto undescribed (Hancock et al. 2021). The family is characterised by a diverse larval developmental biology, mainly infesting the seed-bearing organs of a wide variety of host plants. Two predominant larval feeding strategies are known, with the larval development taking place either in the flower heads or in the fruits (the fleshy part or the actual seeds) (Drew and Yuval 1999). While the first group demonstrates an exceptional diversity in the Afrotropics, their biology and distribution are poorly known (Hancock et al. 2021). Species belonging to the frugivorous group have received more attention because of the economic significance of several of them as pest species of cultivated crops (White and Elson-Harris 1994). They attack a wide range of fruits including major crops grown for local consumption and export, as well as several vegetables (mainly Cucurbitaceae and Solanaceae), such as cucumber, pumpkin, tomato, eggplant. Dacinae (Diptera: Tephritidae) is one of the six subfamilies recognised within the family, largely following the classification proposed by Korneyev (1999), although some classifications consider Dacinae as a tribe (Dacini) of the subfamily Trypetinae (Norrbom et al. 1999; White 2006). All representatives of the Dacinae belong to the frugivorous group, except for the tribe Gastrozonini, which are grass infesters. The group comprises approximately 400 species in the Afrotropical region.

Dacinae have received considerable attention in South Africa. The first description of a dacine fruit fly from South Africa dates back to Wiedemann (1819): *Dacus fuscatus* collected by B.W. Westermann at "Prom. bon. sp." [= "Cape of Good Hope", considered to cover the whole area around Cape Town (Pont 1995)] probably in January 1817. The same species was collected a few years before by William John Burchell, also in the Cape region, and later described by Walker (1849) as *Dasyneuba nebulosa* (currently considered a junior synonym of *D. fuscatus*). Throughout the 19th Century, material collected in South Africa was reported in several publications, including descriptions of new species, e.g. Wiedemann (1824, 1830), Walker (1849, 1861), Loew (1862). The South African fauna received more focused attention in the early 20th Century, first by M. Bezzi, who described several new species from the Afrotropical region, and in particular from South Africa between 1908 and 1924 (e.g. Bezzi 1908, 1915, 1917, 1922). The most extensive contribution, however, was by H.K. Munro, who worked for the South African government in different capacities almost uninterrupted from 1910 till 1985 and published on dacines from 1924 till his monograph on the group in 1984 (White 2006). The majority of the material he collected is housed in the collections of SANC (Kirk-Spriggs 2017). In addition to taxonomy, Munro also published a number of papers dealing with the biology of several groups (Munro 1925, 1926, 1929, 1935) and kept notebooks on host records. Reference to the notebooks is found on several of the specimens in the SANC collections, where codes along the standard of "Mxxx" (with the "xxx" being a number) refer to an entry in the notebooks.

In the late 20th and early 21st Centuries, different groups within the Dacinae were the topic of comprehensive taxonomic revisions (see Hancock et al. 2021, and references therein) and phylogenetic relationships (e.g. De Meyer and Freidberg 2005; Virgilio et al. 2009; Erbout et al. 2011). Also, more

attention was given to the distribution, biology and management of the economically important species in recent decades (e.g. Mwatawala et al. 2015; Vayssières et al. 2015). As a guideline and reference for future research, contemporary checklists of recorded Dacinae are being compiled for several Afrotropical countries, including Tanzania (De Meyer et al. 2023a), Mozambique (De Meyer et al. 2023b) and now this one for South Africa. In addition, several more comprehensive checklists for the family Tephritidae as a whole have also been published in recent decades for some countries in the Afrotropical region (excluding the Arabian Peninsula): Namibia (Hancock et al. 2001, 2003), Zimbabwe (Hancock 2003) and Madagascar (Rasolofoarivao et al. 2022a).

MATERIAL AND METHODS

The checklist is based upon a specimen database (in Microsoft Access©) for Afrotropical dacine (Tephritidae, Dacinae) fruit flies, maintained by the Royal Museum for Central Africa (Tervuren Belgium). This database includes information for all specimens housed in the main natural history collections worldwide and of which the identification could be confirmed by re-examination.

Material from the following collections is included:

1. AMGS: Albany Museum, Makhanda (formerly Grahamstown), South Africa
2. BMSA: National Museum Bloemfontein, South Africa
3. BPBM: Bernice P. Bishop Museum, Honolulu, USA
4. CAS: California Academy of Sciences, San Francisco, USA
5. CSCA: California State Collection of Arthropods, California Department of Food and Agriculture, Sacramento, USA
6. CNC: Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Canada
7. FSCA: Florida State Collection of Arthropods, Gainesville, USA
8. HNHM: Hungarian Natural History Museum, Budapest, Hungary
9. ICIPE: International Centre for Insect Physiology and Ecology, Nairobi, Kenya
10. IZUSN: Instituto di Zoologia, Universita degli Studi di Napoli, Portici, Italy
11. MNHN: Muséum National d'Histoire Naturelle, Paris, France
12. MSNM: Museo Civico di Storia Naturale, Milan, Italy
13. NHMB: Naturhistorisches Museum Basel, Switzerland
14. NHMUK: Natural History Museum, London, UK
15. NHRS: Naturhistoriska Riksmuseet, Stockholm, Sweden
16. NMBZ: Natural History Museum of Zimbabwe, Bulawayo, Zimbabwe
17. NMKE: National Museums of Kenya, Nairobi, Kenya
18. NMSA: KwaZulu-Natal Museum (formerly Natal Museum), Pietermaritzburg, South Africa
19. NMW: Naturhistorisches Museum Wien, Vienna, Austria
20. RBINS: Royal Belgian Institute of Natural Sciences, Brussels, Belgium
21. RMCA: Royal Museum for Central Africa, Tervuren, Belgium
22. SAMC: Iziko South African Museum, Cape Town, South Africa
23. SANC: South African National Collections of Insects, Pretoria, South Africa
24. SDEI: Senckenberg Deutsches entomologisches Institut, Eberswalde, Germany
25. SUEC: Stellenbosch University Entomology Collection, Stellenbosch, South Africa
26. TAMU: Texas A & M University, College Station, USA
27. TAU: Tel Aviv University, Tel Aviv, Israel
28. TMSA: Ditsong National Museum of Natural History (formerly Transvaal Museum), Pretoria, South Africa
29. UPSA: University of Pretoria, Pretoria, South Africa
30. ZMUC Zoological Museum, University of Copenhagen, Copenhagen, Denmark

In addition, it includes literature records that are deemed reliable with regard to identification of reported taxa and their distribution. In total, the database comprises more than 3000 block records (one block record represents all specimens with identical collection information, i.e. collected at the same locality, on the same date by the same collector, using the same collecting means, and deposited in the same collection) for South Africa, representing close to 14000 specimens. All available records are included (from the earliest (1814) to the most recent (2024) ones) and considered the same way. Only when older literature records could not be unambiguously linked to the currently accepted taxonomy, were they excluded. The database is downloadable at https://fruitflies.africamuseum.be/outputs/database.

The listing is ordered by genus and each genus is preceded by a short description on the general biology and the availability of taxonomic revision and/or identification key. For each species, information is provided in the following format:

1. Distribution in South Africa: indication of provinces from which the species is recorded. For species that are widespread, the general region is given: 'northern': largely corresponding with Limpopo, Mpumalanga and northern part of KwaZulu-Natal provinces; 'eastern': KwaZulu-Natal and eastern and central parts of Eastern Cape provinces; 'southern': Western Cape and western part of Eastern Cape provinces; 'central': Free State and eastern part of Northern Cape. We use the term 'dispersed' for cases where a species is known from a few scattered records throughout the country. For species known from single records, the province and locality are specified. If more than one locality is listed under 'single records' it means that we have unique block records from each locality listed.
2. Distribution elsewhere in Africa: general distribution is indicated (Eastern Africa, Southern Africa, etc) or the specific countries.
3. Status: indication whether the species is considered a horticultural pest or not, as documented in Prinsloo and Uys (2015). The status of the species as a pest refers only to the situation in South Africa. This may differ from the status in other (African) countries where the species occurs.
4. This is followed by known hosts: only hosts recorded from material collected in South Africa are given. If none are known, it is indicated as such. No known host records from other (African) countries are provided, as this can vary between countries due to various factors that may affect host utilisation (Aluja and Mangan 2008). This information is available via the above-mentioned database, specified literature (e.g. the revisions mentioned under the generic introductions), factsheets, and dedicated platforms like those by EPPO (EPPO Global Database: https://gd.eppo.int/), in particular for pest species. Whenever available, additional information is provided on the status of specific plants under commercial cultivation for the species. If there are no host records from anywhere for a particular species, this is indicated as "(host unknown)".
5. Attractant: fruit flies are often collected by using specific traps and a lure. Several commercial lures exist. They are divided into two categories (Shelly et al. 2015):
   a. Food bait attractants. These are not species specific and attract a wide range of species, predominantly females, although also males. In Africa, proteinaceous commercial bait products are used either as a natural or synthetic chemical blend. They are classified in the list under the general name of 'proteinaceous bait'.

b. Male attractants. These attract a much more specific range of species or species groups and are usually sold as commercial products of chemical compounds. These are listed with their specific names.

However, sometimes specimens of a particular species are found in a trap loaded with a lure that is not considered specific for this species. This can be due to attraction by other stimuli (like visual attraction to the trap), or cross-contamination of the actual trap but sometimes there could be a genuine attraction involved. Such aberrant records are also listed but with the indication that there is a need of confirmation for their attraction power.

SPECIES LIST

Ceratitidini

Genus: Capparimyia Bezzi, 1920

A predominantly Afrotropical genus comprising eight species. Host range is mainly restricted to several genera of the family Capparaceae, with a few additional records from representatives of the genus *Carissa* (Apocynaceae). A taxonomic revision, discussion on host range, and identification key are presented by De Meyer and Freidberg (2005).

Capparimyia bipustulata (Bezzi, 1923)

South Africa: dispersed records from the provinces of Limpopo, Mpumalanga and KwaZulu-Natal.
Widespread mainly in Eastern and Southern Africa, also recorded from Chad and Senegal.
Status: non-pest. Recorded from *Capparis* sp., and *Capparis tomentosa* (Capparaceae). A record from *Carrisa bispinosa* (Apocynaceae) needs confirmation (see De Meyer and Freidberg 2005).
Attractant: attracted to proteinaceous bait.

Capparimyia maeruae De Meyer & Freidberg, 2005

South Africa: single record from Limpopo province (Kruger National Park).
Also recorded from Kenya.
Status: non-pest. No host records known from South Africa.
Attractant: no attractant known.

Capparimyia melanaspis (Bezzi, 1920)

South Africa: dispersed records from northern and eastern provinces.
Widespread mainly in eastern and southern Africa, also recorded from Benin.
Status: non-pest. Recorded from *Maerua juncea* subsp. *crustata*, *M. racemulosa* and *M. triphylla* (Capparaceae).
Attractant: no attractant known.

Genus: Carpophthoromyia Austen, 1910

An Afrotropical genus comprising 17 species. Although several species are recorded from different host plant families, the only recently confirmed records are from the genus *Drypetes* (Putranjivaceae, previously grouped under Euphorbiaceae). An identification key, discussion on host range, and taxonomic revision are presented by De Meyer (2006).

Carpophthoromyia dimidiata Bezzi, 1924

South Africa: dispersed records from the provinces of Mpumalanga, KwaZulu-Natal and Eastern Cape.
Widespread in southern and eastern Africa.
Status: non-pest. Recorded from *Drypetes arguta* (Putranjivaceae).
Attractant: attracted to proteinaceous bait.

Carpophthoromyia litterata (Munro, 1933)

South Africa: coastal records from KwaZulu-Natal province.
Also recorded from Kenya.
Status: non-pest. Recorded from *Drypetes natalensis* (Putranjivaceae).
Attractant: no attractant known.

Genus: Ceratitis MacLeay, 1829

An Afrotropical genus comprising about 100 described species, of which one (*Ceratitis capitata*) has been introduced into other parts of the world and is considered one of the most economically important pest species (Giunti et al. 2023a,b). While some representatives are polyphagous, infesting a wide range of host plants, others have a much more restricted range. See Erbout et al. (2011) for a discussion on host range within the genus and De Meyer *et al.* (2002) for a checklist of host records from the Afrotropical region. A comprehensive multi-entry key for the genus was presented by Virgilio et al. (2014).

Ceratitis aliena (Bezzi, 1920)

South Africa: dispersed records mainly throughout eastern and southern provinces.
Widespread in eastern to southern Africa, also recorded from Cameroon.
Status: non-pest. Recorded from *Solanum nigrum* (Solanaceae).
Attractant: attracted to proteinaceous bait.

Ceratitis argenteobrunnea Munro, 1935

South Africa: single records from the provinces of Limpopo (Agatha) and Eastern Cape (near Alexandria).
Also recorded from D.R. Congo, Kenya, Tanzania and Uganda.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to proteinaceous bait.

Ceratitis capitata (Wiedemann, 1824)

South Africa: widely distributed throughout the country.
Widespread in Africa; introduced in other parts of the world.
Status: major economic pest. Polyphagous, recorded from a wide range of different plant families (De Meyer *et al.* 2002). *Persea americana* cv. Hass was found to be a conditional non-host for *C. capitata* in South Africa (De Graaf et al. 2009). Commercially produced and export-grade *Citrus limon* cv Eureka was found to be non-host for *C. capitata* in South Africa (Manrakhan et al. 2018). Grové et al. (2017; 2019) reported on native hosts in South Africa and provided the infestation index of the fruit.
Attractant: attracted to EGOlure, trimedlure and proteinaceous bait (records of attraction to other male attractants need confirmation).

Ceratitis connexa (Bezzi, 1926)

South Africa: provinces of Limpopo and Mpumalanga, isolated record in Rustenburg from the eastern part of North West province.
Widespread in Africa.
Status: non-pest. Recorded from *Englerophytum magalismontanum* (Sapotaceae).
Attractant: attracted to proteinaceous bait (single record of attraction to terpinyl acetate needs confirmation).

Ceratitis contramedia (Munro, 1937)

South Africa: single record from KwaZulu-Natal province (Eshowe).
Also recorded from Kenya.
Status: non-pest. Recorded from *Carissa macrocarpa* (Apocynaceae).
Attractant: no attractant known.

Ceratitis cornuta (Bezzi, 1924)

South Africa: single records from the provinces of Limpopo (Mariepskop) and KwaZulu-Natal (Durban).
Also recorded from Kenya and Zimbabwe.
Status: non-pest. Recorded from *Oxyanthus pyriformis* (Rubiaceae).
Attractant: no attractant known.

Ceratitis cosyra (Walker, 1849)

South Africa: abundant but restricted distribution in northern part of the country, few isolated records from KwaZulu-Natal province.
Widespread in Africa.
Status: major economic pest. Polyphagous, recorded from a wide range of different plant families (De Meyer et al. 2002). In South Africa, the records are from the following plants: *Mangifera indica* and *Sclerocarya birrea* (Anacardiaceae), *Annona senegalensis* (Annonaceae), *Landolphia* sp. (Apocynaceae), *Parinari curatellifolia* (Chrysobalanaceae), *Cordyla africana* (Fabaceae), *Dovyalis afra* (Salicaceae), *Feijoa sellowiana*, *Psidium cattleianum*, *Psidium friedrichsthalianum*, *Psidium guajava* and *Syzygium jambos* (Myrtaceae) (Supplementary records, in addition to those contained in the database, were obtained from Grové et al. 2017, 2019). *Warburgia salutaris* (Canellaceae) is also an important native host in South Africa (Muatinte et al. 2014; Grové et al. 2020). Commercially produced and export grade *Citrus limon* cv Eureka was found to be non-host for *C. cosyra* in South Africa (Manrakhan et al. 2018).
Attractant: attracted to EGOlure, terpinyl acetate and proteinaceous bait (records of attraction to other male attractants need confirmation).

Ceratitis discussa Munro, 1935

South Africa: dispersed records from the provinces of Limpopo and Mpumalanga.
Widespread in mainly eastern to southern Africa, also recorded from Benin.
Status: non-pest. Recorded from *Annona senegalensis* (Annonaceae).
Attractant: attracted to EGOlure, terpinyl acetate and proteinaceous bait.

Ceratitis ditissima (Munro, 1938)

South Africa: single records from the provinces of Mpumalanga (Vergenoeg) and KwaZulu-Natal (Durban).
Widespread in Africa.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to methyl eugenol and proteinaceous bait (records of attraction to other male attractants need confirmation).

Ceratitis divaricata (Munro, 1933)

South Africa: dispersed records from the provinces of Limpopo, Mpumalanga and KwaZulu-Natal, isolated record from the eastern part of North West province (Rustenburg).
Also recorded from Kenya.
Status: non-pest. Recorded from *Ekebergia capensis* (Meliaceae).
Attractant: attracted to EGOlure.

Ceratitis dumeti Munro, 1933

South Africa: dispersed records from the provinces of Mpumalanga, KwaZulu-Natal and Eastern Cape.
Widespread in Africa.
Status: non-pest (host unknown).
Attractant: attracted to proteinaceous bait.

Ceratitis edwardsi (Munro, 1957)

Single record from KwaZulu-Natal province (Eshowe).
Widespread in Africa.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to methyl eugenol.

Ceratitis lobata Munro, 1933

South Africa: records from Durban and environs (KwaZulu-Natal province), isolated record from Gauteng province (Rosslyn).
Also recorded from Kenya, Rwanda and Tanzania.
Status: non-pest. Recorded from *Strychnos decussata* and *S. usambarensis* (Loganiaceae).
Attractant: attracted to EGOlure.

Ceratitis marriotti Munro, 1933

Single records from the provinces of KwaZulu-Natal (Durban) and Mpumalanga (Bushbuckridge/Mapulaneng).
Also recorded from the Democratic Republic of Congo (Kivu region), Kenya, Mozambique and Uganda.
Status: non-pest. Recorded from *Solanum giganteum* (Solanaceae).
Attractant: no attractant known.

Ceratitis millicentae De Meyer & Copeland 2005

South Africa: isolated records from Mpumalanga province near the borders with Eswatini and Mozambique.
Also recorded from Eswatini, Kenya, and Mozambique.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to methyl eugenol.

Ceratitis munroanum (Bezzi, 1926)

South Africa: dispersed records from the provinces of KwaZulu-Natal, Eastern Cape and Western Cape.
Also recorded from Kenya and Zimbabwe.
Status: non-pest. Recorded from *Ekebergia capensis* (Meliaceae).
Attractant: attracted to proteinaceous bait.

Ceratitis munroi De Meyer, 1996

South Africa: single record from KwaZulu-Natal province (Durban), and perhaps Mpumalanga (specimen labelled 'Valencia' but uncertain whether it refers to a locality).
Only known from South Africa.
Status: non-pest (host unknown).
Attractant: no attractant known.

Ceratitis pedestris (Bezzi, 1924)

South Africa: dispersed records from the provinces of Gauteng, Limpopo, Mpumalanga and KwaZulu-Natal.
Widespread in Africa.
Status: non-pest. Recorded from *Strychnos* sp., *S. gerrardi*, *S. pungens*, and *S. spinosa* (Loganiaceae).
Attractant: attracted to EGOlure, trimedlure and proteinaceous bait (records of attraction to other male attractants need confirmation).

Ceratitis pinax Munro, 1933

South Africa: single record from KwaZulu-Natal province (Durban).
Also recorded from Kenya and Tanzania.
Status: non-pest (host unknown).
Attractant: attracted to trimedlure.

Ceratitis podocarpi (Bezzi, 1924)

South Africa: dispersed records from northeastern, eastern and southern part of the country.
Also recorded from Ethiopia and Kenya.
Status: non-pest. Recorded from *Podocarpus* sp., *P. elongatus* and *P. latifolius* (Podocarpaceae).
Attractant: attracted to proteinaceous bait (single record of attraction to EGOlure needs confirmation).

Ceratitis punctata (Wiedemann, 1824)

South Africa: single records from KwaZulu-Natal province (Durban, Eshowe).
Widespread in Africa.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to methyl eugenol and proteinaceous bait (records of attraction to other male attractants need confirmation).

Ceratitis quilicii De Meyer, Mwatawala & Virgilio, 2016

South Africa: widely distributed throughout the country.
Widespread in Eastern and Southern Africa.
Status: major economic pest. Polyphagous, recorded from a wide range of different plant families although exact host range unknown because of earlier confusion with *C. rosa*. See Tsatsu et al. (2024) for list of confirmed South African hosts. Commercially produced and export grade *Citrus limon* cv Eureka was found to be non-host for *C. quilicii* in South Africa (Manrakhan et al. 2018).
Attractant: attracted to EGOlure, trimedlure and proteinaceous bait (records of attraction to other male attractants need confirmation).

Ceratitis quinaria (Bezzi, 1918)

South Africa: dispersed records, restricted to northern part of the country.
Widespread in Africa.
Status: minor economic pest. Polyphagous species, recorded from a range of different plant families including several of economic significance (De Meyer et al. 2002). In South Africa, the records are from the following plants: *Psidium guajava* (Myrtaceae), and *Prunus persica* (Rosaceae). See Manrakhan et al. (2020) for discussion on non-host status of *Citrus* for this species.
Attractant: attracted to EGOlure, terpinyl acetate and proteinaceous bait (records of attraction to other male attractants need confirmation).

Ceratitis rosa Karsch, 1887

South Africa: dispersed records restricted to northern part of the country; isolated records from eastern part of North West province (Rustenburg) and from KwaZulu-Natal province (Pongola).
Widespread in eastern and southern Africa.
Status: major economic pest. Polyphagous, recorded from a wide range of different plant families, although the exact host range unknown because of earlier confusion with *C. quilicii*. See Tsatsu et al. (2024) for list of confirmed South African hosts. Commercially produced and export-grade *Citrus limon* cv Eureka was found to be non-host for *C. rosa* in South Africa (Manrakhan et al. 2018).
Attractant: attracted to EGOlure, trimedlure and proteinaceous bait (records of attraction to other male attractants need confirmation).

Ceratitis rubivora Coquillett, 1901

South Africa: records from northern, eastern and southern part of the country.
Widespread mainly in Eastern and Southern Africa, also recorded from Cameroon.
Status: minor economic pest. Recorded from several representatives of the genus *Rubus* (Rosaceae).
Attractant: attracted to EGOlure, trimedlure and proteinaceous bait (records of attraction to other male attractants need confirmation).

Ceratitis scaevolae (Munro, 1929)

South Africa: predominantly coastal records from the provinces of KwaZulu-Natal and Eastern Cape.
Only known from South Africa.
Status: non-pest. Recorded from *Scaevola* sp., *S. plumieri* (Goodeniacae).
Attractant: no attractant known.

Ceratitis simi Munro, 1933

South Africa: single records from the provinces of Gauteng (Rosslyn) and KwaZulu-Natal (Cedara, Kokstad).
Also recorded from Cameroon and Kenya.
Status: non-pest. No host records known from South Africa.
Attractant: no attractant known (a single record of attraction to cuelure needs confirmation).

Ceratitis venusta Munro, 1956

South Africa: single records from the provinces of Mpumalanga (Burgershall Experimental Farm) and Western Cape (Jonkershoek).
Widespread in eastern and southern Africa.
Status: non-pest. No host records known from South Africa.
Attractant: no attractant known.

***Genus: Neoceratitis* Hendel, 1927**

The genus *Neoceratitis* comprises six species, all restricted to the Afrotropical and Palaearctic regions. Most confirmed host records are from the genus *Lycium* (Solanaceae), although one species from Madagascar (*N. cyanescens*) is recorded from a wide range of different Solanaceae. A taxonomic revision, discussion on host records and an identification key are provided by De Meyer and Freidberg (2012).

Neoceratitis lycii (Coquillett, 1901)

South Africa: dispersed records from throughout the county.
Also recorded from Namibia and Tanzania.
Status: non-pest. Recorded from *Lycium* sp., *L. acutifolium, L. amoenumis, L. cinereum* and *L. horridum* (Solanaceae).
Attractant: a single record of attraction to proteinaceous bait needs confirmation.

***Genus: Nippia* Munro, 1929**

A genus endemic to the Afrotropical Region with two described species and probably several undescribed ones (Hancock et al. 2021). Their biology is unknown and there is no identification key available.

Nippia alboscutellata Munro, 1929

South Africa: a single record from the province of Mpumalanga (Stentor, Barberton district).
Status: non-pest (host unknown).
Attractant: no attractant known.

Genus: Perilampsis Bezzi, 1920

Perilampsis comprises 17 species occurring solely in different parts of the Afrotropical region. They are unique among the Afrotropical fruit flies in that they solely infest representatives of the family Loranthaceae and thus are possibly oligophagous. A taxonomic revision, discussion on host plant use, and identification key are provided by De Meyer (2009).

Perilampsis amazuluana Munro, 1929

South Africa: dispersed records from northern and northeastern parts of the country.
Only known from South Africa.
Status: non-pest. Recorded from *Loranthus* sp. and *Tapinanthus rubro-marginatus* (Loranthaceae).
Attractant: a single record of attraction to proteinaceous bait needs confirmation.

Perilampsis curta Munro,1938

South Africa: dispersed records from the provinces of Limpopo and Mpumalanga.
Widespread in Eastern and Southern Africa.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to methyl eugenol and proteinaceous bait.

Perilampsis diademata Bezzi, 1924

South Africa: dispersed records from northeastern part of the country and in Northern Cape province.
Also recorded from Southern Africa and Democratic Republic of Congo.
Status: non-pest. Recorded from *Loranthus* sp., *Tapinanthus oleifolius* and *T. rubromarginatus* (Loranthaceae).
Attractant: attracted to methyl eugenol and proteinaceous bait.

Perilampsis dryades Munro, 1939

South Africa: dispersed records from the provinces of Mpumalanga and KwaZulu-Natal.
Only known from South Africa.
Status: non-pest. Recorded from *Agelanthus kraussianus*, *Loranthus* sp. and *Oncocalyx quinquenervius* (Loranthaceae).
Attractant: a single record of attraction to cuelure needs confirmation.

Perilampsis tetradactyla Munro, 1933

South Africa: restricted to Durban and environs (KwaZulu-Natal province).
Also recorded from Kenya.
Status: non-pest. Recorded from *Agelanthus kraussianus* and *Loranthus* sp. (Loranthaceae).
Attractant: no attractant known.

Perilampsis umbrina Munro, 1939

South Africa: restricted to Durban and environs (KwaZulu-Natal province).
Only known from South Africa.
Status: non-pest (host unknown).
Attractant: no attractant known.

Perilampsis unita Munro, 1939

South Africa: restricted to Durban and environs (KwaZulu-Natal province).
Also recorded from Zimbabwe.
Status: non-pest. Recorded from *Oncocalyx quinquenervius* (Loranthaceae).
Attractant: no attractant known.

Genus: Trirhithrum Bezzi, 1918

The genus *Trirhithrum* is endemic to the Afrotropical region and includes about 40 described species. Some representatives are known as pests of Rubiaceae (in particular *Coffea* spp.), although others have a restricted host range in other host plant families such as Araceae, Erythroxylaceae, Flacourtiaceae, Solanaceae or Vitaceae. An identification key is provided by White et al. (2003).

Trirhithrum albomaculatum (Röder, 1885)

South Africa: dispersed records from the northern and eastern parts of the country.
Also recorded from Eastern and Southern Africa.
Status: non-pest. Recorded from *Dovyalis afra*, *D. hebecarpa, D. longispina* and *D. rotundifolia* (Salicaceae)
Attractant: no attractant known.

Trirhithrum divisum Munro, 1934

South Africa: single record from KwaZulu-Natal (Durban).
Also recorded from Kenya and Tanzania.
Status: non-pest. No host records known from South Africa.
Attractant: no attractant known.

Trirhithrum homogeneum Bezzi, 1924

South Africa: dispersed records from the provinces of Limpopo, Mpumalanga and KwaZulu-Natal.
Widespread in Africa.
Status: non-pest (host unknown).
Attractant: no attractant known.

Trirhithrum nigerrimum (Bezzi, 1913)

South Africa: dispersed records from the provinces of Limpopo, Mpumalanga and KwaZulu-Natal.
Widespread in Africa.
Status: minor economic pest. Recorded hosts in South Africa *Coffea* sp. (Rubiaceae) and *Cyphostemma cirrhosum* (Vitaceae).
Attractant: attracted to proteinaceous bait (records of attraction to methyl eugenol need confirmation).

Trirhithrum nitidum (von Röder, 1885)

South Africa: dispersed records from KwaZulu-Natal province.
Also recorded from Mozambique.
Status: non-pest. Recorded from *Rawsonia lucida* and *Xylotheca kraussiana* (Achariaceae).
Attractant: attracted to proteinaceous bait.

Trirhithrum occipitale Bezzi, 1918

South Africa: dispersed records from northern and eastern part of the country.
Widespread in Africa.
Status: non-pest. Recorded from *Cyphostemma cirrhosum* and *C. hypoleuca* (Vitaceae).
Attractant: attracted to proteinaceous bait.

Trirhithrum viride Munro, 1934

South Africa: single record from KwaZulu-Natal (Durban).
Only known from South Africa.
Status: non-pest (host unknown).
Attractant: no attractant known.

Dacini

***Genus: Bactrocera* Macquart, 1835**

A very speciose genus (>500 species) mainly found in the Oriental and Oceanian regions (Doorenweerd et al. 2018) and among which several are of major economic significance (White and Elson-Harris 1994). Only 13 species are known from the Afrotropical region including three invasive species introduced from Asia. While the introduced species are considered oligophagous to polyphagous, the native ones have a much more restricted host range. A key for the Afrotropical species, and list of host records are provided by White (2006).

Bactrocera amplexa (Munro, 1984)

South Africa: dispersed records from the provinces of Limpopo and Mpumalanga.
Also recorded from Kenya, Malawi and Tanzania.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to proteinaceous bait.

Bactrocera biguttula (Bezzi, 1922)

South Africa: dispersed records from central, northeastern and southern part of the country.
Also recorded from Kenya and Mozambique.
Status: non-pest. Recorded from *Olea europaea* ssp *cuspidata* (Oleaceae) (Mkize et al. 2008). Also recorded from *Noronhia foveolata*, *Olea woodiana* and *Chionanthus capensis* (Oleaceae).
Attractant: attracted to proteinaceous bait.

Bactrocera dorsalis (Hendel, 1912)

South Africa: widely distributed throughout northern part of the country, dispersed records in KwaZulu-Natal province.
Widespread in Africa.
Status: major economic pest. Polyphagous species, recorded from a range of different plant families including several of economic significance. See Theron et al. (2017) and Grové et al. (2017, 2019) for list of confirmed South African hosts. Commercially produced and export grade *Citrus limon* cv Eureka was found to be non-host for *B. dorsalis* in South Africa (Manrakhan et al. 2018).
Attractant: attracted to methyl eugenol and proteinaceous bait (records of attraction to other male attractants need confirmation).
Comment: reference in the literature to this species is sometimes under the name *Bactrocera invadens* Drew, Tsuruta & White. This is now considered a junior synonym of *Bactrocera dorsalis*. Discussion on the synonymy is provided in Schutze et al. (2014).

Bactrocera lucida (Munro, 1939)

South Africa: isolated coastal records in Western Cape province (Hout Bay, Mossel Bay)
Only known from South Africa.
Status: non-pest (host unknown).
Attractant: no attractant known.

Bactrocera oleae (Rossi, 1790)

South Africa: dispersed records from throughout the country.
Widespread in Africa; introduced in other parts of the world.
Status: minor economic pest (major pest in areas with high humidity, see Prinsloo and Uys 2015). Monophagous, recorded from wild and cultivated olive.
Attractant: attracted to proteinaceous bait.

***Genus: Dacus* Fabricius, 1805**

The genus *Dacus* comprises about 270 species worldwide with a predominance in the Afrotropical region (Doorenweerd et al. 2018). The host range is confined to three families: Apocynaceae, Cucurbitaceae and Passifloraceae. The vast majority appears to be oligophagous attacking plants of one particular host family and the host range does provide some phylogenetic coherence (Virgilio et al. 2009; Starkie et al. 2022). An identification key for the majority of the Afrotropical species (including all species recorded from South Africa) and a list of recorded host plants are provided by White (2006).

Dacus adustus Munro, 1948

South Africa: dispersed records from the provinces of Limpopo and Mpumalanga.
Also recorded from Malawi and Tanzania
Status: non-pest (host unknown).
Attractant: attracted to proteinaceous bait.

Dacus africanus Adams, 1905

South Africa: single record from Mpumalanga province (Botshabelo, near Middelburg)
Widespread in Southern Africa.
Status: non-pest (host unknown).
Attractant: attracted to cuelure, zingerone and proteinaceous bait.

Dacus annulatus Becker, 1903

South Africa: dispersed records from the provinces of Mpumalanga and KwaZulu-Natal.
Widespread in Africa.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to proteinaceous bait (a single record of attraction to cuelure needs confirmation).

Dacus apoxanthus Bezzi, 1924

South Africa: dispersed records from throughout the country.
Widespread mainly in Eastern and Southern Africa, also recorded from Cameroon.
Status: non-pest. Recorded from *Ceropegia africana* and *C. ampliata* (Apocynaceae).
Attractant: attracted to proteinaceous bait.

Dacus arcuatus Munro, 1939

South Africa: isolated records from the provinces of Limpopo, Mpumalanga and KwaZulu-Natal.
Also recorded from Kenya.
Status: non-pest. Recorded from *Pergularia daemia* (Apocynaceae).
Attractant: attracted to proteinaceous bait.

Dacus armatus Fabricius, 1805

South Africa: single record from Free State province (Katambwe).
Widespread in Africa.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to cuelure and proteinaceous bait (records of attraction to other male attractants need confirmation).

Dacus binotatus Loew, 1862

South Africa: widely distributed throughout the country.
Widespread in Africa.
Status: non-pest. Recorded from *Asclepias stellifera* and *Pachycarpus scaber* (Apocynaceae).
Attractant: attracted to cuelure (a single record of attraction to methyl eugenol needs confirmation).

Dacus bistrigulatus Bezzi, 1908

South Africa: dispersed records from the Cape provinces, also records from Gauteng province.
Also recorded from Botswana, Namibia and Lesotho
Status: non-pest. Recorded from different genera of Apocynaceae.
Attractant: no attractant known.

Dacus bivittatus (Bigot, 1858)

South Africa: widely distributed throughout the country, except Northern Cape province.
Widespread in Africa.
Status: major economic pest. Oligophagous, mainly recorded from different species of Cucurbitaceae; occasionally also recorded from other plant families. South African non-cucurbit records of *Carica papaya* (Caricaceae), *Solanum lycopersicum* and *S. melongena* (Solanaceae) and *Cola natalensis* (Malvaceae).
Attractant: attracted to cuelure and proteinaceous bait (records of attraction to other male attractants need confirmation).

Dacus botianus (Munro, 1984)

South Africa: dispersed records from the provinces of Free State, Gauteng, KwaZulu-Natal, Western and Eastern Cape.
Also recorded from Benin, Nigeria, and Zimbabwe.
Status: non-pest. Recorded from *Orbea variegata* (Apocynaceae).
Attractant: a single record of attraction to methyl eugenol needs confirmation.

Dacus brevis Coquillett, 1901

South Africa: dispersed records from throughout the country.
Widespread in Eastern and Southern Africa.
Status: non-pest. Recorded from different genera of Apocynaceae.
Attractant: attracted to cuelure and proteinaceous bait.

Dacus brevistriga Walker, 1861

South Africa: dispersed records from the provinces of Gauteng, KwaZulu-Natal and Eastern Cape.
Also recorded from Mozambique and Tanzania.
Status: non-pest. Recorded from *Gomphocarpus physocarpus* (Apocynaceae).
Attractant: attracted to zingerone (a single record of attraction to cuelure needs confirmation).

Dacus chrysomphalus (Bezzi, 1924)

South Africa: dispersed records from the provinces of Limpopo, KwaZulu-Natal and Eastern Cape.
Also recorded from Eastern Africa.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to proteinaceous bait.

Dacus ciliatus Loew, 1862

South Africa: widely distributed throughout the country.
Widespread in Africa, range extending into the Mediterranean Region, Central Asia and the Indian Subcontinent.
Status: major economic pest. Oligophagous species, mainly recorded from different species of Cucurbitaceae; occasionally also recorded from other plant families. South African non-cucurbit records on *Gossypium* sp. (Malvacaeae), *Passiflora caerulea* (Passifloraceae), *Phaseolus* sp. (Fabaceae) and *Solanum lycopersicum* (Solanaceae) need confirmation (see White 2006).
Attractant: attracted to proteinaceous bait (records of attraction to male attractants need confirmation).

Dacus delicatus Munro, 1939

South Africa: dispersed records from the provinces of KwaZulu-Natal and Eastern Cape.
Only known from South Africa.
Status: non-pest (host unknown).
Attractant: no attractant known.

Dacus durbanensis Munro, 1935

South Africa: dispersed records from the provinces of Limpopo, Mpumalanga and KwaZulu-Natal.
Widespread in Africa.
Status: non-pest. Recorded from *Adenia gummifera* (Passifloraceae).
Attractant: attracted to cuelure, zingerone and proteinaceous bait (records of attraction to other male attractants need confirmation).

Dacus eclipsis (Bezzi, 1924)

South Africa: dispersed records from the provinces of Limpopo, Mpumalanga and KwaZulu-Natal, single record from Gauteng province (Roodeplaat).
Also recorded from Mozambique and Zimbabwe.
Status: non-pest. Recorded from *A. gummifera* (Passifloraceae).
Attractant: attracted to cuelure, zingerone and proteinaceous bait.

Dacus eminus Munro, 1939

South Africa: dispersed records from the provinces of Gauteng, Limpopo, Mpumalanga, single record from KwaZulu-Natal province (Durban).
Widespread in Southern Africa.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to cuelure.

Dacus famona Hancock, 1985

South Africa: dispersed records from the provinces of Limpopo, and Mpumalanga.
Widespread in Africa.
Status: non-pest (host unknown).
Attractant: attracted to cuelure, zingerone and proteinaceous bait (records of attraction to other male attractants need confirmation).

Dacus ficicola Bezzi, 1915

South Africa: dispersed records from throughout the country, except Northern Cape province.
Widespread in Eastern and Southern Africa.
Status: non-pest. Recorded from *Xysmalobium undulatum* (Apocynaceae).
Attractant: attracted to proteinaceous bait.

Dacus frontalis Becker, 1922

South Africa: dispersed records from throughout the country.
Widespread in Africa.
Status: major economic pest in South Africa. Of economic importance on cultivated cucurbits (Cucurbitaceae; see Daiber, 1992). Recorded from *Cucumis myriocarpus* (Cucurbitaceae).
Attractant: attracted to zingerone and proteinaceous bait (records of attraction to other male attractants need confirmation).

Dacus fuscatus Wiedemann, 1819

South Africa: widely distributed throughout the country.
Widespread in Southern Africa, also recorded from Tanzania.
Status: non-pest. Recorded from several genera of Apocynaceae.
Attractant: attracted to proteinaceous bait (single record of attraction to cuelure needs confirmation).

Dacus fuscinervis (Malloch, 1932)

South Africa: dispersed records from the provinces of Limpopo, Mpumalanga and KwaZulu-Natal, single record from Western Cape province (Mossel Bay).
Also recorded from Kenya, Mozambique and Tanzania.
Status: non-pest (host unknown).
Attractant: attracted to proteinaceous bait.

Dacus hamatus Bezzi, 1917

South Africa: dispersed records from the provinces of Mpumalanga, and KwaZulu-Natal.
Widespread in Africa.
Status: non-pest. Recorded from *Lagenaria sphaerica* (Cucurbitaceae).
Attractant: attracted to cuelure (records of attraction to other attractants need confirmation).

Dacus iaspideus Munro, 1948

South Africa: single records from the provinces of Gauteng (Pretoria, Roodeplaat), KwaZulu-Natal (Ndumu Reserve) and Eastern Cape (Willowmore).
Also recorded from Tanzania.
Status: non-pest (host unknown).
Attractant: no attractant known.

Dacus inornatus Bezzi, 1908

South Africa: dispersed coastal records from the provinces of KwaZulu-Natal and Eastern Cape.
Widespread in Africa.
Status: non-pest. Recorded from *Lagenaria sphaerica* and *Peponium mackenii* (Cucurbitaceae).
Attractant: no attractant known.

Dacus kariba Hancock, 1985

South Africa: single records from Mpumalanga province (Crocodile Valley, Radley Estate).
Recorded from Southern Africa.
Status: non-pest (host unknown).
Attractant: attracted to cuelure.

Dacus lotus (Bezzi, 1924)

South Africa: dispersed records from the northern and eastern parts of the country.
Only known from South Africa.
Status: non-pest (host unknown).
Attractant: no attractant known.

Dacus lounsburyii Coquillett,1901

South Africa: dispersed records from throughout the country, except Northern Cape province.
Widespread in Africa.
Status: minor economic pest. Recorded from several commercially grown Cucurbitaceae.
Attractant: attracted to cuelure (records of attraction to other attractants need confirmation).

Dacus mulgens Munro, 1932

South Africa: widespread throughout the country.
Also recorded from Lesotho and Mozambique.
Status: non-pest. Recorded from different genera of Apocynaceae.
Attractant: attracted to proteinaceous bait (a single record of attraction to zingerone needs confirmation).

Dacus namibiensis Hancock & Drew, 2001

South Africa: single record from Northern Cape province (Tswalu Kalahari Reserve).
Also recorded from Namibia.
Status: non-pest (host unknown).
Attractant: no attractant known.

Dacus ostiofaciens Munro, 1932

South Africa: dispersed records from the northern and southern parts of the country.
Also recorded from Kenya and Mozambique.
Status: non-pest. Recorded from *Adenium multiflorum*, *Raphionacme galpinii* and *R. velutina* (Apocynaceae).
Attractant: no attractant known.

Dacus pergulariae Munro, 1938

South Africa: dispersed records from Mpumalanga province.
Also recorded from Ethiopia, Kenya, Mozambique and Tanzania.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to proteinaceous bait.

Dacus plagiatus Collart, 1935

South Africa: dispersed records from the northeastern, central and eastern parts of the country.
Widespread in Africa.
Status: non-pest (host unknown).
Attractant: no attractant known.

Dacus pullescens Munro, 1948

South Africa: dispersed records from the northeastern part of the country, and of Eastern and Western Cape provinces.
Also recorded from Democratic Republic of Congo and Kenya.
Status: non-pest. Recorded from *Gomphocarpus fruticosus* and *Cynanchum viminale* (Apocynaceae).
Attractant: attracted to proteinaceous bait.

Dacus punctatifrons Karsch, 1887

South Africa: dispersed records from the northeastern and eastern parts of the country.
Widespread in Africa.
Status: major economic pest in South Africa; recorded from *Cucumis metuliferus*, *Cucurbita* sp. and *Peponium mackenii* (Cucurbitaceae).
Attractant: attracted to cuelure and proteinaceous bait (records of attraction to other male attractants need confirmation).

Dacus purpurifrons Bezzi, 1924

South Africa: dispersed records from the northern and eastern parts of the country.
Also recorded from Democratic Republic of Congo, Mozambique, and Zimbabwe.
Status: non-pest (host unknown).
Attractant: no attractant known.

Dacus rubicundus Bezzi, 1924

South Africa: single records from the provinces of Eastern (East London, Makana District) and Western (Mossel Bay) Cape.
Only known from South Africa.
Status: non-pest (host unknown).
Attractant: no attractant known.

Dacus rufus Bezzi, 1915

South Africa: dispersed records from the northern and southern parts of the country.
Also recorded from Southern Africa and Tanzania.
Status: non-pest. No host records known from South Africa.
Attractant: attracted to cuelure (records of attraction to other male attractants need confirmation).

Dacus scaber Loew, 1862

South Africa: dispersed records from southern and central parts of the country.
Also recorded from Lesotho.
Status: non-pest (host unknown).
Attractant: attracted to proteinaceous bait.

Dacus serratus (Munro, 1984)

South Africa: single records from Gauteng province (Roodeplaat, Rosslyn)
Also recorded from Nigeria and Zimbabwe.
Status: non-pest (host unknown).
Attractant: no attractant known.

Dacus siliqualactis Munro, 1939

South Africa: dispersed records from northeastern part of the country.
Widespread in Eastern and Southern Africa.
Status: non-pest. Recorded from *Gomphocarpus fruticosus* (Apocynaceae).
Attractant: attracted to proteinaceous bait (records of attraction to male attractants need confirmation).

Dacus sphaerostigma (Bezzi, 1924)

South Africa: single coastal records from the provinces of KwaZulu-Natal (Durban) and Eastern Cape (East London).
Also recorded from Democratic Republic of Congo and Malawi.
Status: non-pest (host unknown).
Attractant: no attractant known.

Dacus stentor Munro, 1929

South Africa: dispersed records from the provinces of Limpopo, Mpumalanga and KwaZulu-Natal.
Only known from South Africa.
Status: non-pest (host unknown).
Attractant: attracted to proteinaceous bait.

Dacus temnopterus Bezzi, 1928

South Africa: single records from the provinces of Eastern Cape (Makana District) and Limpopo (Polokwane/Pietersburg).
Only known from South Africa.
Status: non-pest (host unknown).
Attractant: a single record for attraction to methyl eugenol needs confirmation.

Dacus venetatus Munro, 1939

South Africa: dispersed records from the provinces of Limpopo and Mpumalanga.
Only known from South Africa.
Status: non-pest. Recorded from *Adenia digitata* (Passifloraceae).
Attractant: attracted to proteinaceous bait (a single record of attraction to zingerone needs confirmation).

Dacus vertebratus Bezzi, 1908

South Africa: widely distributed throughout the country.
Widespread in Africa.
Status: major economic pest in South Africa. Daiber (1992) lists *Citrullus lanatus* as commercial host in South Africa. Furthermore, recorded from *Cucumis myriocarpus* (Cucurbitaceae).
Attractant: attracted to cuelure, vertlure, zingerone and proteinaceous bait (records of attraction to other male attractants need confirmation).

Dacus viator Munro, 1939

South Africa: dispersed records from the provinces of North West, Gauteng, Free State, KwaZulu-Natal and Eastern Cape.
Only known from South Africa.
Status: non-pest. Recorded from *Ceropegia barberae* (Apocynaceae).
Attractant: no attractant known.

Dacus woodi Bezzi, 1917

South Africa: dispersed records from the provinces of KwaZulu-Natal and Eastern Cape.
Also recorded from Malawi and Tanzania.
Status: non-pest (host unknown).
Attractant: attracted to cuelure, zingerone and proteinaceous bait.

Dacus xanthopus Bezzi, 1924

South Africa: dispersed records from the provinces of Limpopo, Mpumalanga and KwaZulu-Natal.
Also recorded from Malawi and Zimbabwe.
Status: non-pest (host unknown).
Attractant: attracted to proteinaceous bait.

Gastrozonini

Genus: Clinotaenia Bezzi, 1920

The genus *Clinotaenia* comprises six endemic species. There are no known host records for representatives of this genus. An identification key for five species is provided by Hancock (1999). *Clinotaenia angusticeps* (Bezzi 1923) was later transferred to this genus by De Meyer (2006).

Clinotaenia grata (Wiedemann, 1830)

South Africa: dispersed records from northeastern and eastern parts of the country.
Only known from South Africa.
Status: non-pest (host unknown).
Attractant: no attractant known.

DISCUSSION

Diversity

In total, 105 species are herewith reported from South Africa. Recently published checklists for dacine fruit flies in Africa are limited to Tanzania (117 species reported) and Mozambique (57 species). Published checklists for the family Tephritidae comprise 65 dacine species for Zimbabwe (Hancock 2003), 18 species for Namibia (Hancock et al. 2001, 2003) and 32 species for Madagascar (Rasolofoarivao et al. 2022a). Compared to these, the relatively high number for the country is a reflection of the fact that the South African fauna appears to be either diverse or relatively well sampled. In the majority of cases, it appears to be the latter: South Africa and Tanzania have been the subject of intensive fruit fly research for several decades. Only Tanzania has a comparable diversity. Also, both countries have more diverse biomes and bioregions compared to, for example, Namibia or even Mozambique. However, a higher diversity would be

expected for Zimbabwe and Madagascar based on differentiated ecological niches present in the country and we suspect the low diversity is due to undersampling of the tephritid fauna.

Distribution patterns

Of the 105 species listed, 16 are known only from South Africa: *C. munroi*, *C. scaevolae, N. alboscutellata, P. amazuluana, P. dryades, P. umbrina, T. viride, B. lucida, D. delicatus, D. lotus, D. rubicundus, D. stentor, D. temnopterus, D. venetatus, D. viator,* and *C. grata*. This is a relatively high number of presumed endemics. Additionally, there are also a number of near endemics (i.e. species known only from South Africa and one or more of the neighbouring countries): *D. namibiensis* (additionally known from Namibia), *P. unita* (additional record from Zimbabwe), *T. nitidum* (additionally known from Mozambique), *D. bistrigulatus* (Botswana, Namibia, Lesotho), *D. eclipsis* (Mozambique, Zimbabwe), *D. mulgens* (Lesotho, Mozambique), *D. scaber* (Lesotho). This indicates that there is an Afrotropical dacine fauna that appears to be restricted to South or Southern Africa. Furthermore, we observe a fairly large proportion of species that are reported from Eastern Africa, spreading southwards and reaching their southernmost distribution range in the northeastern part of South Africa. This pattern is not unique to dacine fruit flies but is a generally recognised distribution for a wide group of organisms (Burgess et al. 2004). However, one should be cautious in making definite conclusions on a continental scale as more intensive sampling could highlight much wider distribution ranges than previously recognised, as was shown in a revision of West African dacine fruit flies (De Meyer et al. 2013).

The same applies to any pattern observed within South Africa. Nine species are known from singletons while an additional 38 species are known from very limited (2-5) recorded localities, which means that for about 40% of the South African species, our knowledge of local distribution is probably too limited to draw any conclusion. For those remaining taxa, for which we have more extensive records, information on their distribution is limited. South Africa has nine biomes (Rutherford et al. 2006). Kirk-Spriggs and Muller (2017) pointed out that the South African dipteran fauna is extremely rich in some bioclimatic regions that are peculiar or unique, such as the Cape Floral region (represented by the Fynbos and succulent Karoo biomes) and the Afromontane environment of the Drakensberg Escarpment (situated in the Grassland biome). In these regions, a radiation has taken place of floral diversity, which is paralleled by a very diverse Diptera fauna for particular groups. Although among these, tephritids represented by the subfamily Tephritinae are singled out for the succulent Karoo Biome, none of the above-mentioned regions have a noteworthy rich dacine diversity and species whose distribution is limited to these are rare. The only possible exception could be *Bactrocera lucida* (Fynbos Biome; host unknown).

The main pattern we observed is species whose distribution is limited to the northeastern part of the country (i.e. mainly Limpopo and Mpumalanga provinces), occasionally extending into either North-West, Gauteng and/or KwaZulu-Natal provinces. This largely corresponds with the Savanna Biome and particularly with Mopane, Lowveld and Central Bushveld Bioregions, sometimes extending southward into the Sub-Escarpment Savanna Bioregion (Rutherford et al. 2006). These Bioregions within the Savanna Biome are characterised by a relatively higher annual precipitation (Mukhawana et al. 2023), while there could also be a correlation with the host range for those particular species. An example is *Ceratitis cosyra,* which, although rather abundant, shows a restricted range within South Africa corresponding with the above-mentioned pattern but also corresponds largely with the natural occurrence of its main wild host, marula (Van Wyk et al. 2012). This pattern is related to the wider geographical range of particular species observed in the Afrotropics (cf above).

Similar links with a particular biome and associated host plant are observed mainly for species with a coastal appearance, related to the Indian Ocean Coast Belt Biome, sporadically spreading into the Albany Thicket. The best example for this is *Ceratitis scaevolae*, whose distribution corresponds with its known host *Scaevola plumieri.* The same could apply to *Carpophthoromyia litterata* and its host *Drypetes natalensis.* However, the known host plant range cannot always be considered as a predictive indicator of potential distribution. This is demonstrated by the disparate distribution pattern of *Ceratitis divaricata* and *C. munroanum* which both have as known host *Ekebergia capensis* but largely different distribution patterns.

Host plant records for fruit flies in South Africa largely are in line with the patterns observed throughout the African continent, with indications of the same restricted (monophagy, stenophagy) or wider range (oligophagy with occasionally records of non-convential hosts, polypaghy). All specific hosts listed concern native plants for South Africa, except for a number of fruits and shrubs grown for commercial purposes (e.g. papaya, mango, guava, solanaceous crops), ornamentals (e.g. *Feijoa sellowiana*) or invasive weeds (e.g. *Psidium cattleianum*, *Syzygium jambos*). However, the exact host range is unknown for the majority of species and would require intensive sampling of fruits (both wild and commercially grown) and subsequent rearing of fruit flies, as was done in other parts of the Afrotropical Region (Copeland et al. 2005, 2006; Moquet et al. 2020; Zida et al. 2020; Rasolofoarivao et al. 2022b).

We suggest that, in general, more intensive sampling surveys should be organised throughout the country in order to obtain a more accurate impression of the endemicity, host range, and distribution patterns within the country and that such surveys should preferably use different collecting methods (i.e. lure and bait trapping, malaise trapping, hand-netting, and in particular rearing from presumed hosts).

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