

Coll. RONDANI, Kasten 337, trägt folgende Etiketten von RONDANI: „²⁷“; „Aphidiperda Rndn Parma“. — An dem Exemplar fehlt der linke Flügel, das linke p_2 und p_3 und das Scutellum.

Der von mir mit Ex.-Nr. 1 designierte Lectotypus (♀) von *Leucopis* (*Leucopis*) *aphidivora* RONDANI (Fig. 3 und 4) ist mit den folgenden Etiketten von RONDANI gekennzeichnet: „²⁷“; „Aphidivora Rndn Parma“.

Originalbeschreibung von *aphidiperda* RONDANI in: N. Ann. Sci. Nat. [2] VIII. 1847, p. 435: *Leucopis*. — Von *aphidivora* RONDANI in: N. Ann. Sci. Nat. [2] VIII. 1847, p. 349: *Leucopis*.

Zusammenfassung

Um eine sichere Deutung der beiden RONDANISCHEN *Leucopis*-Arten zu ermöglichen und zum Vermeiden eventueller Beschreibungen neuer Arten, die die ohnehin komplizierten Synonymieverhältnisse in dieser Familie noch erschweren würden, werden die Abbildungen des Kopulationsapparates und des Legrohres der Typen von *aphidiperda* RONDANI und *aphidivora* RONDANI einer in Arbeit befindlichen Revision der palaearktischen *Chamaemyiidae* vorausgeschickt.

Summary

The genitalia and ovipositor of the types of *Leucopis aphidiperda* RONDANI and *aphidivora* RONDANI are figured.

Резюме

Для того, чтобы правильно истолковать оба вида *Leucopis* RONDANI и во избежание возможных описаний новых видов, которые еще затрудняли бы и без того сложные условия синонимов в этом семействе, публикуются рисунки аппарата копуляции и яйцеклада типов *aphidiperda* RONDANI и *aphidivora* RONDANI находящейся в работе ревизии палаеарктических *Chamaemyiidae*.

Parasites of fruit fly pests of the world

with brief notes on their bionomics,
habits and distribution

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Fruit flies have always been relentless insect pests of orchards and have been the main cause of bringing about a significant decrease in the yield of fruits and vegetables. This is not all. Their infestation even when not severe has resulted in the deterioration both of the quality as well as the excellence of the crop. The recently discovered chlorinated hydrocarbons and phosphorous compounds have to be applied with extreme care in infested orchards as the fruits have to go eventually to the market for human consumption. As LEYLAND COLE (1950) observes, "Although even today the food crops treated against insect pests are only a small fraction of the total protection, the increasing use of insecticides mostly more or less toxic to man has raised querris about their effect on

health". In such a situation as this the biological basis of insect control naturally suggests itself, but to make biological control experiments a success it is necessary to know all about the parasites that attack the pest, their biology and ecology.

Fruit flies belonging to Genera *Acanthophilus*, *Anastrepha*, *Carpomyia*, *Ceratitis*, *Dacus*, *Rhagoletis* are serious pests of fruits and vegetables and are worldwide in distribution. The authors have made an earnest endeavour to collect all the available information on these parasites in the present paper with the hope it would be of some value to the economic entomologists in all the fruit growing areas of the world to fight successfully fruit fly pests by means of natural enemies.

***Acanthophilus helianthi* ROSSI**

(Diptera: Trypetidae)

A. helianthi is a pest of safflower in India and most of the parasites that attack this pest have been bred from the infested flowers by PRUTHI & BHATIA (1940).

Parasites of *Acanthophilus* spp.

Hymenoptera : Ichneumonoidea

Family *Braconidae*

Opius afreutretae WILKINSON

WILKINSON, Bull. ent. Res., 18, 38, 1927

This parasitic species was bred from the pupae of *Afreutreta discoidalis* BEZZI, *A. bipunctata* Lw., and *Acanthophilus muiri* BEZZI from South Africa.

Hymenoptera : Cynipoidea

Family *Cynipidae*

Eucoila (Tropideucoila) sp.

PRUTHI (1941) recorded it on *A. helianthi* on safflower *Carthamus tinctorius* L., in Delhi.

Hymenoptera : Chalcidoidea

Family *Ormyridae*

Ormyrus sp.

PRUTHI (1941) reported it on *A. helianthi* on safflower, *Carthamus tinctorius* in Delhi.

Family *Eurytomidae*

Eurytoma sp.

This chalcid wasp has been found in association with *Ormyrus* sp. and *Stenomalus muscarum* L.

Family *Pteromalidae*

Stenomalus muscarum LINNAEUS

LINNAEUS, Syst. Nat., Ed. 10, p. 567, 1758

PRUTHI & BHATIA (1940) found it in association with *Ormyrus* sp. on *A. helianthi* infesting safflower. Its role is not known or worked out.

Neuroptera : Chrysopidae

Chrysopa virgestes BANKS

This is a predator on the maggots of *A. helianthi*.

Anastrepha ssp.

(Diptera: Trypetidae)

A. fraterculus (WIEDEMANN) — the South American fruit fly and *A. ludens* (LOEW) — the Mexican fruit fly are the more important species of the above genus. The former mainly attacks citrus spp., coffee, *Prunus* spp., *Eugenia* spp., *Spondias* spp., grape and guava etc. and is spread over from Mexico to Argentina and has also been recorded in Trinidad and Tobago. On the other hand *A. ludens* is distributed in Mexico and Central America and is a pest on mango, peach, *Sargentia greggii* etc.

Parasites of *Anastrepha* spp.

Hymenoptera: Ichneumonoidea

Family *Ichneumonidae*

Chromocryptus mesorufus CUSHMAN

CUSHMAN, Proc. U. S. Nat. Mus., 76, art. 25, No. 2822, p. 2, 1930

The ichneumonid was reared from *A. ludens* or *A. striata* in Mexico.

Family *Braconidae*

Bracanstrepha argentina BRÈTHES

BRÈTHES, Nunquam otiosus, 2, 8, 1924

This braconid wasp was bred from *A. fraterculus* in Argentina.

Coeloides anastrephae BRÈTHES

BRÈTHES, Nunquam otiosus, 2, 7, 1924

This braconid parasite was reared from *A. fraterculus* in Argentina.

Opius (Utetes) anastrephae VIERECK

VIERECK, Proc. U. S. Nat. Mus., 44, 563, 1913

It is a larval parasite and was reared from the mango fruit fly, *A. fraterculus* in Jamaica (GOWDEY, 1925).

O. (Biosteres) areolatus SZÉPLIGETI

SZÉPLIGETI, Boll. Lab. Zool. Portici, 5, 285, 1911

The parasite was reared from *A. fraterculus* pupae.

O. bellus GAHAN

GAHAN, Proc. U. S. Nat. Mus., 77, art. 8, No. 2831, p. 1, 1930

This braconid was bred from *A. fraterculus* in Panama Canal Zone.

O. (Biosteres) brasiliensis SZÉPLIGETI

SZÉPLIGETI, Boll. Lab. Zool. Portici, 5, 285, 1911

It was recorded on *A. fraterculus* in Brazil.

O. cereus GAHAN

GAHAN, Proc. ent. Soc. Washington, 21, 169, 1919

The parasite was bred from *A. serpentina* WIED. and *A. striata* SCHIN. in Trinidad as well as from *A. ludens* infesting fruits of *Sargentia greggii* in N. E. Mexico (PLUMMER & al., 1941).

O. (Diachasma) crawfordi VIERECK

VIERECK, Proc. U. S. Nat. Mus. 40, 161, 1911

KELLIN & PICADO, Bull. Sci. France Belgique, 47, 211, 1913

It was reared from *A. ludens* in Mexico and *A. striata* in Costa Rica. It parasitises the larvae of the fruit fly when these are partly hidden in the fruit.

O. humilis SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 106, 1914

The parasite attacks *A. suspensa* Lw. on pomarosa (*Eugenia jambos*), but did not oviposit in *A. mombinpraeoptans* SEIN infesting mangoes.

O. trinidadensis GAHAN

GAHAN, Proc. ent. Soc. Washington, 21, 168, 1919

It attacks *A. striata* & *A. serpentina* and is considered as geographical race of *O. crawfordi* VIERECK.

O. (Biosteres) tryoni CAMERON

CAMERON, Proc. Linn. Soc. N. S. Wales, 36, 343, 1911

It was reared on *A. mombinpraeoptans* on jubo and mango (BARTLETT, 1941).

N. B. — Parasites *O. perproximus* SILV., *O. fletcheri* SILV. and *O. fullawayi* SILV. were also introduced against these West Indian fruit flies in Puerto Rico (BARTLETT, 1941).

Hymenoptera : Cynipoidea

Family Cynipidae

Pseudeucoila brasiliensis (KIEFFER)

KIEFFER, Bull. Soc. Hist. nat. Metz, 26, 75, 1909

It was reared on *A. fraterculus* and *Drosophila* sp.

Eucoila (Psichara) pelleranoi BRÈTHES

BRÈTHES, Nunquam otiosus, 2, 10, 1924

The parasite was bred from *A. fraterculus* in Argentina (DA COSTA LIMA, 1940).

E. (Tropideucoila) weldi DA COSTA LIMA

DA COSTA LIMA, Ann. Acad. Bras. Sci., 12, 17, 1940

It was described from a single female specimen from *Lonchaea pendula* BEZZI in Brazil.

Ganaspis carvalhoi DETTMER

DETTMER, Bol. biol., No. 16, 70—74, 1929

The cynipid was reared from *Anastrepha fraterculus* and *A. serpentina* in Brazil.

Hymenoptera : Chalcidoidea

Family Chalcididae

Dirhinus giffardii SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 128, 1914

SILVESTRI, Bull. Board Agric. Forest. Hawaii, Div. Ent., No. 3, p. 117, 1914

This tiny chalcid wasp was introduced in Puerto Rico against *Anastrepha* and had been reared on *Musca domestica* L., *Anastrepha* spp. and papaya fruit fly *Toxotrypana curvicauda* GERST. (BARTLETT, 1941).

Family *Pteromalidae*

Pachycrepoideus dubius ASHMEAD

ASHMEAD, Mem. Carnegie Mus., 1, 329, 1904

GIRAULT & SAUNDERS, Psyche, 17, 110—14, 1910

It has been reared on *Anastrepha* spp., *Musca domestica* L., *Lyperosia* (*Haematobia*) *irritans* L., *Sarcophagula occidua* F.

Spalangia philippinensis FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 3, 292, 1917

This parasite was introduced in Puerto Rico from Hawaii but was recovered only on one occasion in a small field collection.

Hymenoptera : Proctotrupeoidea

Family *Diapriidae*

Ashmeadopria sp.

This diapriid was introduced in Puerto Rico against *Anastrepha* spp. (BARTLETT, 1941).

Trichopria anastrephae DA COSTA LIMA

DA COSTA LIMA, Ann. Acad. Bras. Sci., 12, 19, 1940

This parasite had been described from both sexes of *Anastrepha* sp. on *Spondias dulcis* and *A. serpentina*.

Diptera : Lonchaeidae

Lonchaea (Carpolonchaea) pendula BEZZI

It is believed to be a scavenger and was reared from infested fruits of *Sargentia greggii* of a summer crop in N. E. Mexico (PLUMMER & al., 1941).

Carpomyia vesuviana COSTA

(Diptera : Trypetidae)

C. vesuviana — the ber fruit fly is so far monophagous in India and is a serious pest of *Zizyphus jujuba*. It is active during winter months when the host fruit is available and thus differs from other fruit flies.

Parasites of *C. vesuviana* COSTA

Hymenoptera : Ichneumonoidea

Family *Braconidae*

Bracon fletcheri SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 160, 1916

It is a larval parasite and is commonly found in the beginning of the season in Nagpur (India). The parasite larva pupates outside the pulp of the fruit.

Bracon sp.

It has been reared in India recently by NARAYANAN & BATRA (1960) from *C. vesuviana* infesting *Zizyphus jujuba*.

Opius bianchi FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 245, 1951

The parasite was described from 8 females reared from *C. vesuviana* puparia from Bareilly, India.

O. (Biosteres) carpomyae SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 165, 1916

It is a larval parasite that attacks the maggots when they protrude the posterior ends of their abdomen through the minute aperture on the surface of the fruits for respiration.

Opius sp.

This braconid parasite was recently reared by NARAYANAN & BATRA in India (1960).

Note: It is also attacked by *Opius fletcheri* SILVESTRI.

Hymenoptera : ChalcidoideaFamily *Eulophidae**Omphale* sp.

This eulophid has been bred recently by NARAYANAN and BATRA (1960) in India on *C. vesuviana*.

Ceratitis capitata (WIEDEMANN)

(Diptera : Trypetidae)

C. capitata known as the Mediterranean fruit fly is distributed in Africa, the Mediterranean area, South America, Central America, Australia, certain Atlantic and Pacific Islands including the Hawaiian Islands and Bermuda. It is a serious pest of citrus, mango, guava, papaya, peaches, loquat and others. The host index is indeed very large comprising more than 200 species of plants. There are a number of other species of *Ceratitis* found by BIANCHI in Africa and their specific species are also equally attacked by many of the parasitic species described below.

Parasites of *Ceratitis* spp.**Hymenoptera: Ichneumonoidea**Family *Ichneumonidae**Isurgus* sp.

According to RITCHIE (1935) it was reared from the trypetids on coffee. The prominent trypetids included *C. capitata*, *C. rosa* KSCH., *C. (Trirhithrum) nigerrima* BEZZI in Kilimanjaro.

Pimpla pomorum RATZEBURG

RATZEBURG, Ichneumonen der Forstinsekten, 2, 96, 1849

The ichneumonid was reared from *C. hispanica* BREME.

Family *Braconidae**Aphaereta minuta* (NEES)

NEES, Magaz. Ges. naturf. Fr. Berlin, 5, 5, 1811

MARTIN (1952) obtained it from the pupae of *C. capitata*. He observed the parasitism to be very low.

Hedylus clypeatus BRIDWELL

BRIDWELL, Proc. Hawaiian ent. Soc., 4, 14, 1919

This braconid parasite was recorded from unknown fruit fly larvae.

H. desideratus BRIDWELL

BRIDWELL, Proc. Hawaiian ent. Soc., 4, 172, 1919

It was obtained from *Dacus* and *Ceratitis* sp. in Nigeria.

Microbracon celer SZÉPLIGETI

SZÉPLIGETI, Boll. Lab. Zool. Portici, 7, 101, 1913

This braconid parasite was recorded on *C. nigra* GRAHAM by BIANCHI (1936) in Kenya.

Opius (Biosteres) caudatus SZÉPLIGETI *

SZÉPLIGETI, Boll. Lab. Zool. Portici, 7, 103, 1913

It was reared from *C. annonae* WLK. and *C. giffardii* BEZZI in French Cameroons and Sierra Leone in W. Africa.

O. concolor SZÉPLIGETI

SZÉPLIGETI, Bull. Soc. ent. France, 1910, p. 244, 1910

FÉRON (1954) reported that in 1951 both *C. capitata* and *O. concolor* were common in South area of Morocco and percentage of parasitism among a small collection of puparia was 27.5%.

O. cosyrae WILKINSON

WILKINSON, Bull. ent. Res., 18, 42, 1927

This braconid wasp parasitises *C. (Pardalaspis) cosyra* WLK. in Tanganyika.

O. fletcheri SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 160, 1916

This larva-pupal parasite can develop normally in the larvae of *C. capitata* (PEMBERTON & WILLARD, 1918).

O. (Diachasma) fullawayi SILVESTRI

SILVESTRI, Bull. Board Agric. Forest. Hawaii, Div. Ent., No. 3, p. 108, 1914

It was originally found in W. Africa by SILVESTRI in 1912 and was introduced to Hawaii by FULLAWAY in 1914 against *C. capitata*. It parasitises other species of *Ceratitis* also.

O. giffardii SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 113, 1914

It was described as *Hedylus* and BIANCHI (1936) recorded it on *C. capitata* in Tanganyika. It also parasitises *C. punctata* in Sierra Leone.

O. humilis SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 106, 1914

It was introduced in Hawaii by SILVESTRI in 1913; it soon established itself in Kona coffee district. It also attacked other species of *Ceratitis*.

O. longicaudatus ASHMEAD

ASHMEAD, Proc. U. S. Nat. Mus., 28, 970, 1905

Under laboratory conditions it was found capable of parasitising *C. capitata* in agar medium (MARUCCI & CLANCY, 1950).

O. perproximus SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 103, 1914

BIANCHI (1936) recorded it on *C. nigra* GRAHAM, *C. capitata* and *C. cosyra* WLK. etc., in East Africa.

O. (Diachasma) tryoni CAMERON

CAMERON, Proc. Linn. Soc. N.S.W., 36, 343, 1911

SILVESTRI introduced it in Hawaii in 1913 from N. S. Wales, and it soon established itself. It excelled other parasites in 1917.

Here we may point out to an interesting example of competition amongst parasites of *C. capitata*. It is on record how *Opius humilis* that was the dominant parasite in coffee berries in Kona, Hawaii, during 1914—1917 was replaced by *O. tryoni* and by 1918 became the dominant one. Later on by 1922 the second species *O. tryoni* was replaced by *O. fullawayi* and held the field from 1922—1929. During this period 1931—1933 *O. tryoni* was again dominant species. However, neither *O. tryoni* nor *O. fullawayi* actually were scarce during 1922—1933. During 1949—52 both these species were recovered many times but no specimen of *O. humilis* was collected from the field (BESS, 1953).

Hymenoptera : Cynipoidea

Family Cynipidae

Trybliographa sp.

Trybliographa sp. from Malaya readily bred on *C. capitata* larvae developing in an agar-base medium (MARUCCI & CLANCY, 1950).

Hymenoptera : Chalcidoidea

Family Chalcididae

Dirhinus giffardii SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 128, 1914

It is a pupal parasite and has been successfully bred on both *D. cucurbitae* Coq. and *D. dorsalis* HENDEL.

Family Pteromalidae

Pachycrepoideus dubius ASHMEAD

ASHMEAD, Mem. Carnegie Mus., 1, 329, 1904

GIRAULT & SAUNDERS, Psyche, 17, 110—114, 1910

ASHMEAD for some unknown reason did not describe this species. He had, however, described the genus in 1904 and named *P. dubius* as the type. GIRAULT & SAUNDERS in 1910 described *Pachycrepoideus dubius* ASHMEAD as sp. nov. and designated it as the type species of the genus. To avoid confusion both generic and specific names were retained.

Spalangia afra SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 134, 1914

BIANCHI (1936) recorded it on *Ceratitis* sp. in Zanzibar during his search for fruit fly parasites in East Africa.

S. cameroni PERKINS

PERKINS, Fauna Hawaiiensis, 2, 656, 1910

According to FULLAWAY (1918) this pteromalid species was also released in the Hawaiian Islands.

S. philippinensis FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 3, 292, 1917

This pteromalid had become established in Oahu in the Hawaiian Islands during campaign against this fly (DRESNER, 1954). *Spalangia* spp.

are pupal parasites and have been reared on the Mediterranean fruit fly, melon fruit fly — *Dacus cucurbitae* Coq.

Sphegigaster sp.

This parasite was recorded on *C. (Trirhithrum) nigerrima* BEZZI, *C. capitata* and *C. rosa*, etc. on coffee.

N. B. — BIANCHI (1936) also reared a miscogasterid from *C. colae* SILV. and *C. capitata* and an encyrtid on *C. nigra* GRAHAM.

Family *Eulophidae*

Tetrastichus dacicida SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 375, 1915

This eulophid from Africa was readily bred on *C. capitata* larvae developing in an agar-base medium (MARUCCI & CLANCY, 1950).

T. giffardii SILVESTRI

SILVESTRI, R. C. Acad. Lincei, 22, 2 sem., p. 205, 1913

It was imported in Brazil and was raised on *C. capitata* (PINTO DA FONSECA, 1938).

T. giffardianus SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 372, 1915

This parasite was introduced from Africa into Hawaii. It parasitises the larvae of *C. capitata* and is known to get into the damaged fruit also to locate the host larvae.

Syntomosphyrum indicum SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 4, 228—45, 1910

It was first recorded by COMPERE in 1907 in Bangalore, India. It was recorded on *Dacus dorsalis* HENDEL. It was introduced in Italy by SILVESTRI to check the damage caused by the Mediterranean fruit fly.

Hymenoptera : Proctotrupoidea

Family *Diapriidae*

Galesus silvestrii KIEFFER

KIEFFER, Boll. Lab. Zool. Portici, 7, 91, 1913

This is a pupal parasite and was introduced in Hawaii by SILVESTRI in 1913. This parasite readily attacks the hosts in confinement but had not been established in the field.

Trichopria capensis KIEFFER

KIEFFER, Boll. Lab. Zool. Portici, 7, 92, 1913

This hymenopterous parasite was collected by SILVESTRI from S. Africa and living adults were brought to Honolulu and bred there.

Hymenoptera : Formicoidea

Family *Formicidae*

Pheidole megacephala F.

Pheidole megacephala F. — this ant is predatory by habit and cosmopolitan in distribution — has been observed to reduce the population of the maggots on which it feeds.

Dacus bipartitus* GRAHAM(Diptera : Trypetidae)***Parasites of *D. bipartitus* GRAHAM****Hymenoptera : Chalcidoidea**Family *Eulophidae**Tetrastichus dacicida* SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 375, 1915

The eulophid was reared from *D. bipartitus* in Kamerun.***Dacus ciliatus* LOEW***(Diptera : Trypetidae)*

D. ciliatus is known as the Ethiopian fruit fly and is a pest of cucurbits. In Delhi—India, it is active during the months of May & June. It is distributed in India, Pakistan, Africa, etc.

Parasites of *D. ciliatus* LOEW**Hymenoptera : Ichneumonoidea**Family *Braconidae**Opius (Diachasma) brevistylis* PAOLI

PAOLI, Prodomo di entomologia agraria della Somalia Italiana Firenze, 1931—33, p. 349—51, (1934).

MARTELLI (1937) recorded it as a parasite of *D. ciliatus* LOEW (*brevistylus*, BEZZI) in melons in Italian Somaliland.

O. caudatus SZÉPLIGETI

SZÉPLIGETI, Boll. Lab. Zool. Portici, 7, 103, 1913

This parasite was reared from *D. ciliatus* in Dahomey, W. Africa (MUNRO, 1932).

O. incisi SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 164, 1916

This has been recorded on *D. ciliatus* in Mysore, India (PUTTARUDRIAH & USMAN, 1954).

O. perproximus SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 103, 1914

This was reared from *D. ciliatus*.

O. phaeostigma WILKINSON

WILKINSON, Bull. ent. Res., 18, 40, 1927

This braconid was reared from *D. ciliatus* in Natal.

Hymenoptera : ChalcidoideaFamily *Chalcididae**Dirhinus giffardii* SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 128, 1914

SILVESTRI, Bull. Board Agric. Forest. Hawaii, Div. Ent., No. 3, p. 117, 1914

D. luzonensis ROHWER

ROHWER, Philipp. Journ. Sci., 22, 348, 1923

Dirhinus spp. was the most abundant amongst the parasites collected in Mysore, India (PUTTARUDRIAH & USMAN, 1954).

Family *Pteromalidae*
Pachycrepoideus dubius ASHMEAD

ASHMEAD, Mem. Carnegie Mus., 1, 329, 1904

GIRAULT & SAUNDERS, Psyche, 17, 110—114, 1910

See note on the parasite on page 444.

Spalangia afra SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 134, 1914

S. grotiusi GIRAULT

GIRAULT, Mem. Queensland Mus., 2, 332, 1913

S. philippinensis FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 3, 292, 1917

S. stomoxysiae GIRAULT

GIRAULT, Soc. ent., 31, 57, 1916

Spalangia spp. were recorded on *D. ciliatus* by PUTTARUDRIAH & USMAN (1954).

Hymenoptera : Proctotrupeidea

Family *Diapriidae*

Galesus sp.

This diapriid was recorded in Mysore — India in 1954 (PUTTARUDRIAH & USMAN, 1954).

Diptera : Tachinidae

Sarcophaga flagellata VILLENEUVE

VILLENEUVE, Boll. Soc. ent. Ital., 62, 53, 1930

It was bred from *Dacus brevistylus* BEZZI by VILLENEUVE (1930).

Dacus correctus BEZZI

(Diptera : Trypetidae)

It is a pest of mango, guava, *Eugenia* sp., *Zizyphus jujuba* in Bangalore and Balehonnur — India.

Parasites of *D. correctus* BEZZI

Hymenoptera : Chalcidoidea

Family *Chalcididae*

Dirhinus sp.

It was collected from a puparium of *D. correctus* infesting rose apple in Mysore — India (PUTTARUDRIAH & USMAN, 1954).

Dacus cucurbitae COQUILLET

(Diptera : Trypetidae)

D. cucurbitae is the commonly known melon fly and it attacks cucurbits and vegetables. It has got about 80 host plants. It is distributed in Nepal, Pakistan, Ceylon, Burma, Malaya, China, Formosa, Hawaiian Islands and East Africa.

Parasites of *D. cucurbitae* COQUILLET

Hymenoptera : Ichneumonoidea

Family *Braconidae**Opius angaleti* FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 411, 1952

This parasite from North Borneo was reared from pupae collected from *Luffa acutangula* and has not given encouraging results in the Hawaiian Islands so far. It is even thought that its parasitism of melon fly larvae may have been due to forced breeding and imperfect adoption and this may be actually the parasite of *D. nubilus* HENDEL and *Callantra smieroides* WALKER (CLANCY, 1952).

O. (Biosteres) compensans SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 168, 1916

It is found parasitising 10–12% pupae of *D. ciliatus* and *D. cucurbitae* in October and beginning of November (PRUTHI, 1941). It also parasitises the larvae of *D. dorsalis* HENDEL in small numbers.

O. fletcheri SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 160, 1916

Maggots are attacked when they are full fed and make their exit from the fruit for pupation. The parasitic larva completes its development within the pupae of the melon fly. In India the effect of the parasite is observed late in August by which time a good deal of damage has been done. The maximum parasitism recorded is 20% in the months of September and October. The parasite has been recorded from the whole of the Indian Union.

O. watersi FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 249, 1951

This braconid species emerged from 22000 pupae out of *Luffa* sp. collected in Bareilly (India) and is a new parasite of melon fly.

Hymenoptera : Chalcidoidea

Family *Chalcididae**Dirhinus auratus* ASHMEAD

ASHMEAD, Proc. U. S. Nat. Mus., 29, 402, 1905

According to HUTSON (1939) it is established as a parasite of *D. cucurbitae* in cucurbit fields in Ceylon.

D. giffardii SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 128, 1914

SILVESTRI, Bull. Board Agric. Forest. Hawaii, Div. Ent., No. 3, p. 117, 1914

D. luzonensis ROHWER

ROHWER, Philipp. Journ. Sci., 22, 348, 1923

Note: See note on the parasite on p. 446.

Family *Pteromalidae**Pachycrepoideus dubius* ASHMEAD

ASHMEAD, Mem. Carnegie Mus., 1, 329, 1904

GIRAULT & SAUNDERS, Psyche, 17, 110–114, 1910

Note: See note on the parasite on p. 444.

Spalangia afra SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 134, 1914

S. grotiusi GIRAULT

GIRAULT, Mem. Queensland Mus., 2, 332, 1913

S. philippinensis FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 3, 292, 1917

S. stomoxysiae GIRAULT

GIRAULT, Soc. ent., 31, 57, 1916

Coleoptera : Staphylinidae

Philonthus sp.

The staphylinid species from South China has been bred from the melon fly. The adults of this staphylinid died before they reached Honolulu in the Hawaiian Islands (CLANCY & al., 1954). More details are wanting of this predator.

***Dacus dorsalis* HENDEL**

(Diptera : Trypetidae)

D. dorsalis is popularly known as the oriental fruit fly. It has been recorded from Pakistan, Ceylon, Siam, Java, Malaya, Formosa, Hawaiian Islands, etc. There are over 150 species of fruits and vegetables which it attacks. Some of these are guava, mango, loquat, peaches, apricot, plum, jack fruit, etc.

Parasites of *D. dorsalis* HENDEL

Hymenoptera : Ichneumonoidea

Family *Braconidae*

Opius arisanus SONAN

SONAN, Trans. nat. Hist. Soc. Formosa, 22, 67, 1932

This braconid parasite of *D. dorsalis* from Formosa was described by SONAN.

O. (Biosteres) compensans SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 168, 1916

This parasite attacks the maggots of the fly, but the percentage of parasitism is very low.

O. (Biosteres) formosanus FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 6, 283, 1926

The parasite was imported into Hawaii from Formosa in 1949—50 against *D. dorsalis* (GRESSET & MAA TSING CHAO, 1953).

O. incisi SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 164, 1916

The species has been recorded from Bangalore and South Coorg — India.

O. longicaudatus ASHMEAD

ASHMEAD, Proc. U. S. Nat. Mus., 28, 970, 1905

The parasites of *O. longicaudatus* complex are known to attack the late stages of *D. dorsalis* larvae.

O. makii SONANSONAN, Trans. nat. Hist. Soc. Formosa, **22**, 68, 1932SONAN described this braconid parasite of *D. dorsalis*.*O. manii* FULLAWAYFULLAWAY, Proc. Hawaiian ent. Soc., **14**, 246, 1951It parasitises *D. dorsalis* larvae in Mysore, India (PUTTARUDRIAH & USMAN, 1954).*O. oophilus* FULLAWAYFULLAWAY, Proc. Hawaiian ent. Soc., **14**, 248, 1951This braconid parasite is an egg-larval parasite of *D. dorsalis*.*O. persulcatus* SILVESTRISILVESTRI, Boll. Lab. Zool. Portici, **11**, 167, 1916This parasite and *O. oophilus* form about 23% of the total parasite population in Mysore — India (PUTTARUDRIAH & USMAN, 1954).

During the biological control campaign against *D. dorsalis* in the Hawaiian Islands there has been an interesting development of competition among its parasites. *Opius longicaudatus* ASHMEAD, which parasitises the 2nd and 3rd instar larvae after remaining abundant for a year was replaced by *Opius vandenboschi* FULLAWAY (presumably *O. persulcatus*) that attacks the first instar larvae. Later this too after about a year was replaced by *O. oophilus*.

In the case of multiparasitism *O. longicaudatus* eggs and larvae are inhibited in their development in hosts which contain either of the two parasites. However, when *O. vandenboschi* and *O. oophilus* occur in the same host the latter prevents the former from developing.

During superparasitism the elimination of supernumerary individuals differs in *O. longicaudatus* and *O. vandenboschi* and *O. oophilus*. In the former there is vigorous physical fight and the fittest survives while in the latter the first larva to hatch prevents the others from developing; hence the death is due to physiological reactions (VANDENBOSCH & HARAMOTO, 1953).

Hymenoptera : CynipoideaFamily *Cynipidae**Cothonaspis* sp.PUTTARUDRIAH & USMAN (1954) reared the cynipid from *D. dorsalis*.*Trybliographa daci* WELDWELD, Proc. Hawaiian ent. Soc., **14**, 331, 1951It can be reared on *D. dorsalis* larvae developing in agar-base media (MARUCCI & CLANCY, 1950)*Pilinothrix* sp.

The cynipid wasp emerged from the pupae received in the Hawaiian Islands from KRAUSS in Malaya (CLANCY, 1950).

Hymenoptera : ChalcidoideaFamily *Chalcididae**Dirhinus giffardii* SILVESTRISILVESTRI, Boll. Lab. Zool. Portici, **8**, 128, 1914

SILVESTRI, Bull. Board Agric. Forest. Hawaii, Div. Ent., No. 3, p. 117, 1914

D. luzonensis ROHWER

ROHWER, Philipp. Journ. Sci., 22, 348, 1923

Dirhinus sp.

Adults mate immediately after emergence and females oviposit on the day of emergence. Males emerge 24 hours before the females. Development period is 19—20 days. Oviposition is on the ventral central portion of the host puparium. Nearly all eggs are deposited at the ventral junction of the thorax and abdomen. Occasionally eggs are found on the head or near anus but are always on the ventral side.

Family *Pteromalidae*

Pachycrepoideus dubius ASHMEAD

ASHMEAD, Mem. Carnegie Mus., 1, 329, 1904

GIRAULT & SAUNDERS, Psyche, 17, 110—114, 1910

The developmental period of this species is about 24 days. There is no difference in the developmental period in the males and females. It can be reared on *Drosophila* sp. also.

Spalangia afra SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 134, 1914

SILVESTRI, Bull. Board Agric. Forest. Hawaii, Div. Ent., No. 3, p. 120, 1914

S. grotiusi GIRAULT

GIRAULT, Mem. Queensland Mus., 2, 332, 1913

S. philippinensis FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 3, 292, 1917

S. simplex PERKINS

PERKINS, Faun. Hawaiiensis, 2, 657, 1910

S. stomoxysiae GIRAULT

GIRAULT, Soc. ent., 31, 57, 1916

Spalangia spp.

These can be easily reared in the laboratory in large numbers if supplied with fresh fruit fly puparia, a sugar cube and wet wick supply. Developmental period is 3 to 4 weeks. Length varies from 2—6 mms. Variation in length is associated with species rather than the host. These can be reared on *C. capitata*, *D. cucurbitae*, *Drosophila* sp. and *Musca domestica*.

The death of host puparia occurring early in the feeding period of the parasite larvae or soon after oviposition suggests saprophytic habits.

Family *Eulophidae*

Tetrastichus dacicida SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 375, 1915

This eulophid from Africa could readily be bred on *D. dorsalis* and *Ceratitis capitata* WIED. larvae developing in agar base media (MARUCCI & CLANCY, 1950).

Syntomosphyrum indicum SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 4, 228—245, 1910

This parasite was introduced by COMPERE in Australia and New South Wales LOUNSBURG introduced the parasite in Cape and SILVESTRI in Italy to check the damage caused by Mediterranean fruit fly. The parasite, however, did not establish itself in any of these countries. Though this

parasite has been recorded in India, very little is known about its biology and degree of parasitisation and check that it brings about. This parasite needs further study. According to PUTTARUDRIAH & USMAN (1954) 65.5% of the total parasite population consists of this species in Mysore, India.

Hymenoptera : Proctotrupeoidea

Family *Diapriidae*

Galesus spp.

The parasite has been recorded from Mysore, India.

Trichopria sp.

The diapiiid from India could not establish on the fruit fly in Hawaii (DRESNER, 1954).

Coleoptera : Staphylinidae

Thyreocephalus albertisi (FAUVEL)

This staphylinid predator on fruit fly larvae in Luzon (Northern Philippines) was imported into the Hawaiian Islands. These were reared and released but no recoveries were made and was not known to have established itself in the Hawaiian Islands.

Dermaptera : Labiduridae

Anisolabis eteronoma BORELLI

The earwig is a predator on the *D. dorsalis* larvae and feeds on these in the rotten fruit as well as in the soil.

Dermaptera : Labiidae

Sphingolabis hawaiiensis (BORMANS)

Like *Anisolabis eteronoma* this earwig is also a predator on the larvae of *D. dorsalis*.

***Dacus emmerezii* BEZZI**

(Diptera : Trypetidae)

Parasites of *Dacus emmerezii* BEZZI

Hymenoptera : Ichneumonoidea

Family *Braconidae*

Opius phaeostigma WILKINSON

WILKINSON, Bull. ent. Res., 18, 40, 1927

This braconid species was reared from *D. emmerezii* BEZZI and *D. ciliatus* in South Africa (MOUTIA, 1934).

***Dacus ferrugineus* FABRICIUS¹⁾**

(Diptera : Trypetidae)

D. ferrugineus is a pest of guava, mango and *Solanum* sp. It occurs along with *D. zonatus* SAUNDERS and *D. incisus* WALKER.

¹⁾ This species is now considered as a synonym of *D. dorsalis*.

Parasites of *D. ferrugineus* FABRICIUS

Hymenoptera : Ichneumonoidea

Family *Braconidae*

Opius incisus SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 164, 1916

This braconid parasitises the larvae of *D. ferrugineus*.

O. javanus FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 4, 260—61, 1920 = *Opius vandenboschi*

FULLAWAY new name since 1952

FULLAWAY recorded this parasite on *D. ferrugineus* infesting *Capsicum*.

O. longicaudatus ASHMEAD

ASHMEAD, Proc. U. S. Nat. Mus., 28, 970, 1905

This braconid was reared from larvae of *D. ferrugineus*.

O. manii FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 246, 1951

This has been described from two females and one male specimen reared from material labelled as *D. ferrugineus* var. *incisus* WALKER from *Solanum verbascifolium* at Coonoor, India, August, 1935.

O. persulcatus SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 167, 1916

This parasite was bred from *D. ferrugineus* larvae infesting *Solanum auriculatum* in Madras Presidency, India.

Hymenoptera : Chalcidoidea

Family *Chalcididae*

Dirhinus auratus ASHMEAD

ASHMEAD, Proc. U. S. Nat. Mus., 29, 402, 1905

It did not establish itself in citrus area in Ceylon (HUTSON, 1939). In India, in Madras Presidency it was observed as parasite of *D. ferrugineus* infesting *Solanum auriculatum*.

Tachinaephagus sp.

According to CORBETT (1937) HADDEN recorded this Chalcid parasite on *D. ferrugineus* during his search for parasites in Malaya.

Family *Pteromalidae*

Spalangia philippinensis FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 3, 292, 1917

The pteromalid parasitised the pupae of *D. ferrugineus* infesting *Solanum*.

Family *Eulophidae*

Syntomosphyrum indicum SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 4, 228—45, 1910

GURNEY (1936) reared it on the puparia of *D. ferrugineus* FABRICIUS infesting guava and some wild fruits and sent it to New South Wales.

Tetrastichus sp.

CORBETT (1937) reported that HADDEN recorded this eulophid on *D. ferrugineus*.

Hymenoptera : ProctotrupeoideaFamily *Diapriidae**Galesus* sp.

According to the report of CORBETT (1937) HADDEN bred the diapiiid from the pupae of *D. ferrugineus* in Malaya.

***Dacus (Tridacus) humeralis* BEZZI**

(Diptera: Trypetidae)

Parasites of *Dacus (Tridacus) humeralis* BEZZI**Hymenoptera : Ichneumonoidea**Family *Braconidae**Opius caudatus* SZÉPLIGETI

SZÉPLIGETI, Boll. Lab. Zool. Portici, 7, 103, 1913

The braconid species parasitised in French Cameroons.

Opius sp.

This braconid was recorded by BIANCHI (1936).

Hymenoptera : ChalcidoideaFamily *Eulophidae**Tetrastichus giffardii* SILVESTRI

SILVESTRI, R. C. Acad. Lincei, 22, 2. sem, p. 205, 1913

BIANCHI (1936) recorded this eulophid in Tanganyika.

***Dacus incisus* WALKER**

(Diptera : Trypetidae)

It is a pest of guava, orange, cucurbits, *Ficus* sp. and *Coffea robusta*.**Parasites of *D. incisus* WALKER****Hymenoptera : Ichneumonoidea**Family *Braconidae**Opius compensans* SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 168, 1916

This parasite has been bred from *D. incisus* by SILVESTRI (1916) and PUTTARUDRIAH & USMAN (1954).

O. incisi SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 164, 1916

This braconid was reared from *D. incisus* larvae by SILVESTRI (1916) and PUTTARUDRIAH & USMAN (1954).

O. oophilus FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 248, 1951

This braconid parasitises larvae of *D. incisus*.*O. persulcatus* SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 167 1916

This parasite has been bred a number of times from the larvae of *D. incisus*.

Hymenoptera : Cynipoidea

Family *Cynipidae*

Cothonaspis sp.

These were bred from *D. incisus* by PUTTARUDRIAH & USMAN (1954).

Pseudeucoila spp.

These cynopid parasites of *D. incisus* were recorded in Mysore (PUTTARUDRIAH & USMAN, 1954).

Trybliographa daci WELD

WELD, Proc. Hawaiian ent. Soc., 14, 331, 1951

The cynipid parasitises the larvae in Mysore, India

Hymenoptera : Chalcidoidea

Family *Chalcididae*

Dirhinus giffardii SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 128, 1914

SILVESTRI, Bull. Board Agric. Forest. Hawaii, Div. Ent., No. 3, p. 117, 1914

PUTTARUDRIAH & USMAN (1954) reared this Chalcid wasp from *D. incisus*.

D. luzonensis ROHWER

ROHWER, Philipp. Journ. Sci., 22, 348, 1923

Like *D. giffardii* this parasite was bred from *D. incisus*.

Family *Pteromalidae*

Pachycrepoideus dubius ASHMEAD

ASHMEAD, Mem. Carnegie Mus., 1, 329, 1904

GIRAULT & SAUNDERS, Psyche, 17, 110—114, 1910

This pteromalid parasite was bred from *D. incisus*.

Spalangia spp.

Spalangia spp. parasitised *D. incisus* pupae, but the percentage of parasitism reported was very low (PUTTARUDRIAH & USMAN, 1954).

Family *Eulophidae*

Syntomosphyrum indicum SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 4, 228—45, 1910

This was recorded from India.

Hymenoptera : Proctotrupoidea

Family *Diapriidae*

Trichopria sp.

The diapriid parasite was reported by PUTTARUDRIAH & USMAN (1954).

***Dacus (Strumeta) laticaudatus* HARDY**

(Diptera : Trypetidae)

HARDY (1950) described this species from the material collected by KRAUSS near Deeral, Queensland, Australia in 1949.

Parasites of *D. laticaudatus* HARDY**Hymenoptera : Ichneumonoidea**Family *Braconidae**Opius deeralensis* FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 65, 1950

The braconid parasite emerged from the pupae sent by KRAUSS from Deeral-Australia.

O. froggatti FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 67, 1950

This parasite was bred from *D. laticaudatus* pupae collected at Deeral — Australia.

O. perkinsi FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 66, 1950

This was reared from the pupae of *D. laticaudatus*.

***Dacus latifrons* WIEDEMANN**

(Diptera : Trypetidae)

D. latifrons is a pest of *Solanum sisymbriifolium* and *Solanum* sp. and cucurbits like snake gourd and cucumbers. It is distributed in India.

Parasites of *D. latifrons* WIEDEMANN**Hymenoptera : Ichneumonoidea**Family *Braconidae**Opius oophilus* FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 248, 1951

This parasite was reared from puparia of *D. latifrons* infesting *Solanum sisymbriifolium* and *Solanum* sp. but the natural parasitism was very low and seemed to be of no potential importance at all (PUTTARUDRIAH & USMAN, 1954).

O. persulcatus SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 167 1916

This braconid parasite was reared from the puparia of *D. latifrons* collected from *Solanum* sp. and *S. sisymbriifolium* in Mysore, India (PUTTARUDRIAH & USMAN, 1954).

Hymenoptera : ChalcidoideaFamily *Chalcididae**Dirhinus giffardii* SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 128, 1914

SILVESTRI, Bull. Board Agric. Forest. Hawaii, Div. Ent., No. 3, p. 107, 1914

D. luzonensis ROHWER

ROHWER, Philipp. Journ. Sci., 22, 348, 1923

A small number of parasites was bred from *D. latifrons* puparia.

Family *Pteromalidae**Pachycrepoideus dubius* ASHMEAD

ASHMEAD, Mem. Carnegie Mus., 1, 329, 1910

GIRAULT & SAUNDERS, Psyche, 17, 110—114, 1910

Spalangia spp.

Like braconid and chalcid parasites, these parasites were bred only in very small number.

It was observed that the parasites emerging from the puparia of *D. latifrons* collected from South China could not develop on the Hawaiian fruit flies. It was thought that they probably developed on lepidopterous borer also infesting the *Solanum* spp. rather than on *D. latifrons* (CLANCY & al., 1952).

Dacus oleae GMEL.

(Diptera : Trypetidae)

Dacus oleae is known as the olive fly and attacks *Olea* spp. It is distributed in West Asia and North-East and South Africa and Mediterranean basin.

Parasites of *Dacus oleae* GMEL.

Hymenoptera : Ichneumonoidea

Family *Braconidae**Bracon celer* SZÉPLIGETI

SZÉPLIGETI, Boll. Lab. Zool. Portici, 7, 101, 1913

It is an ectoparasite of *D. oleae* larvae.*Opius africanus* SZÉPLIGETI

SZÉPLIGETI, Boll. Lab. Zool. Portici, 4, 346, 1910

This braconid parasitises the *D. oleae* larvae.*O. africanus* var. *orientalis* SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 195, 1915

SILVESTRI, Bull. Board Agric. Forest. Hawaii, Div. Ent., No. 3, p. 107, 1914

SILVESTRI, Boll. Lab. Zool. Portici, 8, 112, 1914

SILVESTRI recorded this braconid parasite on *D. oleae* larvae.*O. concolor* SZÉPLIGETI

SZÉPLIGETI, Bull. Soc. ent. France, 1910, p. 244, 1910

According to NONELL COMAS (1927) this parasite failed to establish against *D. oleae* in Catalonia. It, however, parasitises the larvae.

O. dacicida SILVESTRI

SILVESTRI, Dispense di Entomologia agraria, p. 520, Portici, 1911

This braconid species parasitises *D. oleae*.*O. ponerophagus* SILVESTRI

SILVESTRI, Rend. Acad. Lincei Roma, 25, 426—427, 1916

This braconid parasite of *D. oleae* var. *asiatica* from India is considered to be allied to *O. concolor* and *O. dacicida*.

O. siculus MON ASTERO

MONASTERO, Atti R. Acad. Palermo, (3) 16, 199, 1931

MONASTERO recorded this endoparasite of *D. oleae*.*Sigalphus daci* SZÉPLIGETI

SZÉPLIGETI, Boll. Lab. Zool. Portici, 5, 323, 1911

This parasite was recorded on *D. oleae* by SILVESTRI.

Hymenoptera : Chalcidoidea

Family Chalcididae

Dirhinus giffardii SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 128, 1914

SILVESTRI, Bull. Board Agric. Forest, Hawaii, Div. Ent., No. 3, p. 117, 1914

MARTELLI (1937) found that *Dirhinus giffardii* could also be reared on *D. oleae*.

Family Eurytomidae

Eurytoma rosae NEES

NEES, Hymen. Ichneum. affin. Monogr., 2, 415, 1834

This chalcid wasp parasitises the larvae of *D. oleae* in Greece.

Family Pteromalidae

Cyrtopyx (Dinarmus) dacicida (MASI)

MASI, Boll. Lab. Zool. Portici, 2, 20, 1907

This pteromalid parasitises the larvae of *D. oleae* in Greece, Italy and Libya.*Halticoptera daci* SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 204, 1915

This pteromalid was recorded as a parasite of *D. oleae* in Africa by SILVESTRI.

Family Eupelmidae

Eupelmus afer SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 202, 1915

SILVESTRI recorded it on *D. oleae* in Africa.*E. martelli* MASI

MASI, Boll. Soc. ent. Ital., 73, 109, 1941

It is a parasite of *D. oleae* larvae in N. Africa.*E. urozonus* DALMAN

DALMAN, Svensk. Vet. Akad. Handl., 61, 378, 1820

This parasite has been recorded from *D. oleae* in Spain, Italy and Greece.

Family Eulophidae

Achrysocharis formosa var. *meridionalis* SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 210, 1915

The parasite is known to attack small larvae of *D. oleae* in Cape colony.*Euderus cavasolae* (SILVESTRI)

SILVESTRI, Boll. Lab. Zool. Portici, 9, 217, 1915

The eulophid was recorded as an ectoparasite of *D. oleae* by SILVESTRI.

Metricocharis atrocynae SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 216, 1915

This species is considered as a doubtful parasite of *D. oleae*.

M. viridis SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 215, 1915

Like *M. atrocynae*, it is a doubtful parasite of *D. oleae*.

Pnigalo (Eulophus) longulus (ZETTERSTEDT)

ZETTERSTEDT, Insect Lappon., 1, 430, 1838

This eulophid parasitises the larvae of *D. oleae* in Greece.

P. mediterraneus FERRIÈRE & DELUCCHI

FERRIÈRE & DELUCCHI, Entomophaga, 2, 123, 1957

Previously this chalcid parasite was identified as *P. longulus* (ZETT.) but later on it was found that it was a new species.

Teleopterus notandus SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 213, 1915

It is an egg-larval parasite. It was recorded by SILVESTRI.

Hymenoptera : Proctotrupoidea

Family *Diapriidae*

Galesus silvestrii KIEFFER

KIEFFER, Boll. Lab. Zool. Portici, 7, 91, 1913

MARTELLI (1913) found that *G. silvestrii* a parasite of *Ceratitis capitata* could also be reared on *D. oleae*.

Diptera : Cecidomyiidae

Lasioptera brevicornis MELIS

MELIS, Redia, 16, 41—43, 1927

The cecidomyiid fly was reared from fruits infested with *D. oleae* (GMEL.) by MELIS (1927).

Lasioptera (Prolasioptera) berlesiana (PAOLI)

It is a predator on the eggs of *D. oleae* and is associated with the fungus *Macrophoma dalmatica* (ISAAKIDÈS, 1954).

Coleoptera : Staphylinidae

Belonuchus rufipennis F. (*formosus* GRAV.)

SILVESTRI (1945) introduced this predator of the larvae of *D. oleae* in Italy from Brazil. He reared it on the larvae of *Rhagoletis cerasi* L. in cherries, *Ceratitis capitata* in bitter oranges, *Drosophila* sp. and *Anastrepha* sp. He also reported two other predators, namely, *B. mexicanus* SOLSKY and *B. decipiens* SHARP from São Paulo, Brazil.

Dacus passiflorae FROGGATT

(Diptera : Trypetidae)

D. passiflorae is known to attack citrus, orange, granadillas, mandarins, guava, *Eugenia* sp., papaya, cotton bolls etc. and is distributed in Fiji.

Parasites of *D. passiflorae* FROGG.

Hymenoptera : Ichneumonoidea

Family *Braconidae**Opius fijiensis* FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 9, 179, 1936

This parasite was reared from *Dacus passiflorae* FROGG. and the percentage parasitism was 12½% (SIMMONDS, 1937).

O. hageni FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 412, 1952

This braconid parasite was described from 8 female and 8 male specimens. These were reared from *Dacus passiflorae* in *Ochrosia* fruits.

O. humilis SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 106, 1914

This braconid was imported into Fiji from the Hawaiian Islands against *D. passiflorae* in 1935 (SIMMONDS, 1936).

Opius sp. (later identified as *Opius hageni*)

This parasite described as *Biosteres* sp. by SIMMONDS (1936) is considered to be *O. hageni* FULLAWAY.

Phaenocarpa leveri NIXON

NIXON, Proc. R. ent. Soc. London, (B) 8, 66—67, 1939

This braconid parasite was collected in Viti Levu and Taveuni Islands and was reared from *D. passiflorae* FROGG.

Note: *Opius tryoni* CAMERON and *Opius fletcheri* SILVESTRI were also reared from *D. passiflorae* and *D. xanthodes* (LEVER, 1938).

Hymenoptera : Chalcidoidea

Family *Chalcididae**Dirhinus* sp.

This pupal parasite was imported in Fiji in 1937 from the Hawaiian Islands and it did not prove effective (LEVER, 1946).

Family *Pteromalidae**Pachycrepoideus dubius* ASHMEAD

ASHMEAD, Mem. Carnegie Mus., 1, 329, 1904

GIRAULT & SAUNDERS, Psyche, 17, 110—114, 1910

It was recorded for the first time in Fiji when it was reared from the pupae of *Dacus passiflorae* FROGG. *Musca domestica vicina* MACQ. and a *Sarcophaga* sp. Its developmental period was 16—17 days (LEVER, 1945).

Pachyneuron sp.

This pteromalid was reared from *Dacus passiflorae* (LEVER, 1945).

Spalangia cameroni PERKINS

PERKINS, Fauna Hawaiiensis, 2, 656, 1910

This parasite was bred from the pupae of *D. passiflorae* and *D. xanthodes* BROUN (LEVER, 1938).

Spalangia sp.

Spalangia sp. has been reared from *D. passiflorae* and *D. xanthodes* (LEVER, 1944).

Family *Eulophidae*

Syntomosphyrum indicum SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 4, 228—245, 1910

This parasite was introduced in Fiji from New South Wales against *D. passiflorae* and *D. xanthodes* BROWN and was liberated on the Island of Viti Levu where low parasitism was observed in the larvae collected from guava after the first liberation (LEVER, 1938).

Tetrastichus giffardianus SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 372, 1915

This eulophid failed to establish itself against *D. passiflorae* in Fiji (SIMMONDS, 1937).

Hemiptera : Lygaeidae

Germalus pacificus KIRK.

It is an egg predator of *D. passiflorae* and *D. xanthodes* infesting guava (SIMMONDS, 1936).

Dacus (Tridacus) pectoralis WLK.

(Diptera : Trypetidae)

Parasites of *D. (Tridacus) pectoralis* WLK.

Hymenoptera : Chalcidoidea

Family *Chalcididae*

Dirhinus sp.

BIANCHI (1936) collected the Chalcid on *D. pectoralis* in Zanzibar — East Africa.

Family *Pteromalidae*

Spalangia afra SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 134, 1914

BIANCHI (1936) recorded the parasite in Zanzibar.

Dacus punctatifrons KARSCH

(Diptera : Trypetidae)

Parasites of *Dacus punctatifrons* KARSCH

Hymenoptera : Chalcidoidea

Family *Eulophidae*

Tetrastichus giffardianus SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 372, 1915

This eulophid parasitised *D. punctatifrons*.

Dacus (Strumeta) tryoni (FROGG.)

(Diptera : Trypetidae)

Dacus (Strumeta) tryoni or Queensland fruit fly is distributed in Queensland and New South Wales and in recent years it has made its appearance

in Victoria and South Australia. It is a serious pest of guava, citrus and tomato.

Parasites of *D. (Strumeta) tryoni* (FROGG.)

Hymenoptera : Ichneumonoidea

Family *Braconidae*

Opius africanus SZÉPLIGETI

SZÉPLIGETI, Boll. Lab. Zool. Portici, 4, 346, 1910

This parasite probably parasitises *D. tryoni*.

O. fletcheri SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 160, 1916

This braconid parasite probably parasitises *D. tryoni*.

O. kraussi FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 249, 1951

This is a native parasite of the *D. tryoni* in Queensland.

O. tryoni CAMERON

CAMERON, Proc. Linn. Soc. N.S.W., 36, 343, 1911

This braconid species like *O. kraussi* parasitises *S. tryoni*.

Tetrastichus giffardianus, *O. fullawayi*, *O. humilis*, *O. tryoni* and *Syntomosphyrum indicum* were introduced in N.S. Wales but none of these except *O. tryoni* was established. Similarly *O. persulcatus* and *O. incisi* failed to breed on *Strumeta tryoni*. Recently attempts were made on a laboratory scale to breed *O. oophilus* FULLAWAY and of *O. longicaudatus* on *D. tryoni*. These laboratory experiments were not very successful and only few parasites could be recovered (WILSON, 1960).

***Dacus (Bactrocera) umbrosus* F.**

(Diptera : Trypetidae)

Parasites of *D. umbrosus* F.

Hymenoptera : Ichneumonoidea

Family *Braconidae*

Phaenocarpa (Asobara) bactrocerae GAHAN

GAHAN, Philipp. Journ. Sci., 27, 83-109, 1925

This parasite was bred from *Dacus umbrosus*.

***Dacus zonatus* SAUNDERS**

(Diptera : Trypetidae)

D. zonatus SAUNDERS is a pest of peach and mango. It is distributed in India, West Pakistan, Ceylon & Egypt.

Parasites of *D. zonatus* SAUNDERS

Hymenoptera : Ichneumonoidea

Family *Braconidae*

Opius (Austroopius) sp.

AYYAR (1920) recorded this parasite on *D. zonatus* infesting mango.

Dacus spp.

Parasites of *Dacus* spp.

(*Diptera* : *Trypetidae*)

Hymenoptera : Ichneumonoidea

Family *Braconidae*

Hedylus clypeatus BRIDWELL

BRIDWELL, Proc. Hawaiian ent. Soc., 4, 174, 1919

It was reared from unknown fruit fly larvae.

H. desideratus BRIDWELL

BRIDWELL, Proc. Hawaiian ent. Soc., 4, 172, 1919

This braconid parasite was bred from *Dacus* sp. and *Ceratitis* sp. in Nigeria.

Opius angaleti FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 411, 1952

The braconid was reared from fruit fly pupae collected in N. Borneo and is now tried against melon fly — *D. cucurbitae* in Hawaii.

O. fletcheri SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 11, 160, 1916

This was bred from *Dacus* spp., *D. passiflorae* and *D. xanthodes* (LEVER, 1938).

O. kraussi FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 249, 1951

The parasite was reared from the material collected at Deeral — Australia and is now on field trials in the Hawaiian Islands.

O. skinneri FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 247, 1951

This braconid wasp was reared from the puparia taken from cucurbits collected at Pongi Mina — Philippines.

O. (Biosteres) tryoni CAMERON

CAMERON, Proc. Linn. Soc. N.S.W., 36, 343, 1911

The parasite was bred from *Dacus* spp., *D. passiflorae* and *D. xanthodes*.

O. watersi FULLAWAY

FULLAWAY, Proc. Hawaiian ent. Soc., 14, 249, 1951

This parasite reared from fruit fly puparia in *Luffa* is now on trials against melon fly — *D. cucurbitae* in the Hawaiian Islands.

Phaenocarpa leveri NIXON

NIXON, Proc. R. ent. Soc. London, (B) 8, 66—67, 1939

This braconid parasite parasitises *Dacus* spp. in Fiji.

Hymenoptera : Chalcidoidea

Family *Chalcididae*

Dirhinus auratus ASHMEAD

ASHMEAD, Proc. U. S. Nat. Mus., 29, 402, 1905

This pupal parasite was bred in Mauritius for use against *Dacus* spp. (MOUTIA, 1941).

D. giffardii SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 128, 1914

SILVESTRI, Bull. Board Agric. Forest. Hawaii, Div. Ent., No. 3, p. 117, 1914

The Chalcid parasite was introduced in Fiji against *Dacus* sp., *D. passiflorae* and *D. xanthodes* (LEVER, 1946).

Family *Pteromalidae**Spalangia cameroni* PERKINS

PERKINS, Fauna Hawaiiensis, 2, 656, 1910

The pteromalid was reared from *Dacus* spp. in Fiji.

Family *Eulophidae**Tetrastichus giffardianus* SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 372, 1915

The eulophid was introduced against *Dacus* spp. in Fiji (SIMMONDS), 1936).

Hymenoptera : Proctotrupoidea*Trichopria capensis* KIEFFER

KIEFFER, Boll. Lab. Zool. Portici, 7, 92, 1913

SILVESTRI (1914) bred this diapiiid.

Dacus (Tridacus) spp.

(Diptera : Trypetidae)

Parasites of *Dacus (Tridacus)* spp.**Hymenoptera : Ichneumonoidea**Family *Braconidae**Opius (Diachasma) fullawayi* SILVESTRI

SILVESTRI, Bull. Board Agric. Forest, Hawaii, Div. Ent., No. 3, p. 108, 1914

This parasite was recorded by BIANCHI (1936) in Africa.

O. perproximus SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 8, 103, 1914

Like *O. fullawayi* this braconid was recorded on *Dacus* spp.

Rhagoletis spp.

(Diptera : Trypetidae)

Fruit flies of this genus *Rhagoletis* which include *R. cingulata* (LOEW) and *R. fausta* (O. S.), are serious pests of Cherry in the Pacific North West and are apparently spreading South-West into California while *Rhagoletis completa* CESS — wall nut husk fly attacks *Juglans* spp. and is distributed to Western United States. In addition, there is a *R. pomonella* WALSH — apple maggot, or blue berry maggot, which is confined mainly to North-East U. S. and South-East Canada and attacks apples, blue berries, pears, plums, etc.

Parasites of *Rhagoletis* spp.

Hymenoptera : Ichneumonoidea

Family *Ichneumonidae*

Gelis bremeri HABERMEHL

HABERMEHL, Konowia, 9, 110, 1930

This parasitises *R. cerasi* L. in Naumburg, Germany (SACHTLEBEN, 1934) and Switzerland (VOGEL, 1950).

Phygadeuon wiesmanni SACHTLEBEN

SACHTLEBEN, Arb. morphol. taxon. Ent., 1, 79, 1934

It has been recorded in Switzerland on *R. cerasi* (WIESMANN, 1933) and Germany: Naumburg (SACHTLEBEN, 1933) and Stade (SPEYER, 1936) and is known to attack the larvae when entering the ground to pupate (SPEYER, 1936).

Family *Braconidae*

Aphaereta muscae ASHMEAD

ASHMEAD, Proc. U. S. Nat. Mus., 11, 647, 1889

MIDDLEKAUFF (1941) bred it from *R. pomonella* puparia.

Opius alloeus MUESEBECK

MUESEBECK, Ent. News, 67, 101, 1956

This braconid was recorded on *R. pomonella* in Maine by MUESEBECK.

O. downesi GAHAN

GAHAN, Proc. ent. Soc. Washington, 21, 164, 1919

The parasite was reared from *R. pomonella* pupae.

O. ferrugineus GAHAN

GAHAN, Proc. U. S. Nat. Mus., 49, 75, 1915

This parasite had been bred from *R. pomonella* and *R. cingulata*.

O. lectoides GAHAN

GAHAN, Proc. U. S. Nat. Mus., 77, Art. 8, No. 2831, p. 2, 1930

The parasite was recorded in U.S.A. on *R. pomonella*.

O. lectus GAHAN

GAHAN, Proc. ent. Soc. Washington, 21, 167, 1919

MIDDLEKAUFF (1941) bred it from *R. pomonella* puparia.

O. melieus GAHAN

GAHAN, Proc. U. S. Nat. Mus., 49, No. 2095, p. 73, 1915 = *Biosteres rhagoletis* RICHMOND, Canad. Entomol., 47, 294, 1915 (GAHAN, 1919)

The braconid attacks *R. pomonella* and its biology has been studied by LATHROP & NEWTON (1933).

O. muliebris MUESEBECK

MUESEBECK, Ent. News, 67, 101, 1956

In Washington it was reared from the western race of *R. cingulata* *indifferens*.

O. richmondi GAHAN

GAHAN, Proc. ent. Soc. Washington, 21, 165, 1919

This braconid parasite was recorded on *R. pomonella* in company with *O. melleus* GAHAN.

O. rhagoleticolus SACHTLEBEN

SACHTLEBEN, Arb. morphol. taxon. Ent., 1, 76, 1934

It attacks the larvae of *R. cerasi* L., recorded from Germany: Naumburg (SACHTLEBEN, 1934) and Stade (SPEYER, 1936).

Hymenoptera : Cynipoidea

Family *Cynipidae**Eucoila* sp.

It was one of the parasites bred from *R. fausta* pupae by MIDDLEKAUFF (1941).

Hymenoptera : Chalcidoidea

Family *Pteromalidae**Pachycrepoideus dubius* ASHMEAD

ASHMEAD, Mem. Carnegie Mus., 1, 329, 1904

GIRAULT & SAUNDERS, Psyche, 17, 110—114, 1910

The pteromalid was bred from the puparia of *R. fausta* by MIDDLEKAUFF (1941).

Family *Eulophidae**Tetrastichus faustus* BURKS

BURKS, Proc. U. S. Nat. Mus., 93, No. 3170, p. 582, 1943

The eulophid was reared from *R. fausta*.

T. giffardianus SILVESTRI

SILVESTRI, Boll. Lab. Zool. Portici, 9, 372, 1915

It is thought that this eulophid may parasitise *Rhagoletis suavis completa* CRESSON (MARLATT, 1933).

Family *Mymaridae**Patasson (Anaphoides) conotracheli* GIRAULT

GIRAULT, Ent. News, 16, 220, 1905

This mymarid is an egg parasite of *R. pomonella* in Connecticut (PORTER & ALDEN, 1921).

Hymenoptera : Proctotrupeoidea

Family *Diapriidae**Galesus* sp.

MIDDLEKAUFF (1941) recorded it on *R. pomonella*.

Polypeza försteri KIEFF.

KIEFFER, *Proctotrypidae*. In: ANDRÉ, Species des Hyménoptères d'Europe et d'Algérie, 10, 718, Paris 1911

SACHTLEBEN (1934) recorded the parasite on *R. cerasi* in Naumburg, Germany.

According to CLAUSEN (1956) the three parasites of the Mediterranean fruit fly, *Ceratitis capitata* WIED., — *Opius tryoni* CAM., *O. humilis* SILV. and *Tetrastichus giffardianus* SILV. — were imported and colonized under the auspices of the University of California in 1931—32 but failed to establish against *R. completa* in the California orchards. In 1937 attempts were made to establish *O. melleus* GAHAN from New York in Pomona district. No recoveries were made. Similarly *O. formosanus* failed to establish itself.

| | Host Parasite Index | Remarks |
|---|---------------------|-------------------------|
| <i>Acanthiophilus helianthi</i> ROSSI | Diptera | : Trypetidae |
| <i>Opius afreutretae</i> WILK. | Hymenoptera | : Braconidae Larval |
| <i>Eucoila (Tropideucoila)</i> sp. | -do- | : Cynipidae -do- |
| <i>Ormyrus</i> sp. | -do- | : Ormyridae -do- |
| <i>Eurytoma</i> spp. | -do- | : Eurytomidae -do- |
| <i>Stenomalus muscarum</i> LINN. | -do- | : Pteromalidae -do- |
| <i>Chrysopa virgestes</i> BANKS | Neuroptera | : Chrysopidae Predator |
| <i>Anastrepha</i> spp. | Diptera | : Trypetidae |
| <i>Chromocryptus mesorufus</i> CUSHMAN | Hymenoptera | : Ichneumonidae |
| <i>Bracanstrepha argentina</i> BRÈTHES | -do- | : Braconidae Larval |
| <i>Coeloides anastrephae</i> BRÈTHES | -do- | : -do- -do- |
| <i>Opius (Utetes) anastrephae</i> VIERECK | -do- | : -do- -do- |
| <i>O. (Biosteres) areolatus</i> SZÉPLIGETI | -do- | : -do- -do- |
| <i>O. bellus</i> GAHAN | -do- | : -do- -do- |
| <i>O. (Biosteres) brasiliensis</i> SZÉPLIGETI | -do- | : -do- -do- |
| <i>O. cereus</i> GAHAN | -do- | : -do- -do- |
| <i>O. (Diachasma) crawfordi</i> VIERECK | -do- | : -do- -do- |
| <i>O. humilis</i> SILVESTRI | -do- | : -do- -do- |
| <i>O. trinidadensis</i> GAHAN | -do- | : -do- -do- |
| <i>O. Biosteres tryoni</i> (CAMERON) | -do- | : -do- -do- |
| <i>Pseudeucoila</i> <i>brasiliensis</i> (KIEFFER) | -do- | : Cynipidae Larval |
| <i>E. (Psichara) pelleranoi</i> BRÈTHES | -do- | : -do- -do- |
| <i>E. (Tropideucoila) weldi</i> DA COSTA LIMA | -do- | : -do- -do- |
| <i>Ganaspis carvalhoi</i> DETTMER | -do- | : -do- -do- |
| <i>Dirhinus giffardii</i> SILVESTRI | -do- | : Chalcididae Pupal |
| <i>Pachycrepoideus dubius</i> ASHMEAD | -do- | : Pteromalidae -do- |
| <i>Spalngia philippinensis</i> FULLAWAY | -do- | : -do- -do- |
| <i>Ashmeadopria</i> sp. | -do- | : Diapriidae |
| <i>Trichopria anastrephae</i> DA COSTA LIMA | -do- | : -do- |
| <i>Lonchaea (Carpolonchaea)</i> <i>pendula</i> BEZZI | Diptera | : Lonchaeidae Scavenger |
| <i>Carpomyia vesuviana</i> COSTA | Diptera | : Trypetidae |
| <i>Bracon fletcheri</i> SILVESTRI | Hymenoptera | : Braconidae Larval |
| <i>Bracon</i> sp. | -do- | : -do- -do- |
| <i>Opius bianchi</i> FULLAWAY | -do- | : -do- -do- |
| <i>O. (Biosteres) carpomyae</i> SILVESTRI | -do- | : -do- -do- |
| <i>Opius</i> sp. | -do- | : -do- -do- |
| <i>Omphale</i> sp. | -do- | : Eulophidae -do- |

| | | | | |
|---|--------------------|---|----------------------|----------|
| <i>Ceratitidis capitata</i> (WIEDEMANN) | <i>Diptera</i> | : | <i>Trypetidae</i> | |
| <i>Isurgus</i> sp. | <i>Hymenoptera</i> | : | <i>Ichneumonidae</i> | -do- |
| <i>Pimpla pomorum</i> RATZBURG | | : | -do- | -do- |
| <i>Aphaereta minuta</i> (NEES) | | : | <i>Braconidae</i> | -do- |
| <i>Hedylus clypeatus</i> BRIDWELL | | : | -do- | -do- |
| <i>H. desideratus</i> BRIDWELL | | : | -do- | -do- |
| <i>Microbracon celer</i> SZÉPLIGETI | | : | -do- | -do- |
| <i>Opius</i> (<i>Biosteres</i>) <i>caudatus</i> SZÉPLIGETI | | : | -do- | -do- |
| <i>O. concolor</i> SZÉPLIGETI | | : | -do- | -do- |
| <i>O. cosyrae</i> WILKINSON | | : | -do- | -do- |
| <i>O. fletcheri</i> SILVESTRI | | : | -do- | -do- |
| <i>O. (Diachasma) fullawayi</i> SILVESTRI | | : | -do- | -do- |
| <i>O. giffardii</i> SILVESTRI | | : | -do- | -do- |
| <i>O. humilis</i> SILVESTRI | | : | -do- | -do- |
| <i>O. longicaudatus</i> ASHMEAD | | : | -do- | -do- |
| <i>O. perproximus</i> SILVESTRI | | : | -do- | -do- |
| <i>O. (Diachasma) tryoni</i> CAMERON | | : | -do- | -do- |
| <i>Trybliographa</i> sp. | | : | <i>Cynipidae</i> | -do- |
| <i>Dirhinus giffardii</i> SILVESTRI | | : | <i>Chalcididae</i> | Pupal |
| <i>Pachycrepoideus dubius</i> ASHMEAD | | : | <i>Pteromalidae</i> | -do- |
| <i>Spalangia afra</i> SILVERI | | : | -do- | -do- |
| <i>S. cameroni</i> PERKINS | | : | -do- | Pupal |
| <i>S. philippinensis</i> FULLAWAY | | : | -do- | -do- |
| <i>Sphégigaster</i> sp. | | : | -do- | Larval |
| <i>Tetrastichus dacicida</i> SILVESTRI | | : | <i>Eulophidae</i> | -do- |
| <i>T. giffardii</i> SILVESTRI | | : | -do- | -do- |
| <i>T. giffardianus</i> SILVESTRI | | : | -do- | -do- |
| <i>Syntomosphyrum indicum</i> SILVESTRI | | : | -do- | -do- |
| <i>Galesus silvestrii</i> KIEFFER | | : | <i>Diapriidae</i> | Pupal |
| <i>Trichopria capensis</i> KIEFFER | | : | -do- | -do- |
| <i>Pheidole megacephala</i> F. | | : | <i>Formicidae</i> | Predator |
| | | | | |
| <i>Dacus bipartitus</i> GRAHAM | <i>Diptera</i> | : | <i>Trypetidae</i> | |
| <i>Tetrastichus dacicida</i> SILVESTRI | <i>Hymenoptera</i> | : | <i>Eulophidae</i> | Larval |
| | | | | |
| <i>Dacus ciliatus</i> LOEW | <i>Diptera</i> | : | <i>Trypetidae</i> | |
| <i>Opius (Diachasma) brevistylis</i> PAOLI | <i>Hymenoptera</i> | : | <i>Braconidae</i> | Larval |
| <i>O. caudatus</i> SZÉPLIGETI | | : | -do- | -do- |
| <i>O. incisi</i> SILVESTRI | | : | -do- | -do- |
| <i>O. perproximus</i> SILVESTRI | | : | -do- | -do- |
| <i>O. phaeostigma</i> WILKINSON | | : | -do- | -do- |
| <i>Dirhinus giffardii</i> SILVESTRI | | : | <i>Chalcididae</i> | Pupal |
| <i>D. luzonensis</i> ROHWER | | : | -do- | -do- |
| <i>Pachycrepoideus dubius</i> ASHMEAD | | : | <i>Pteromalidae</i> | -do- |
| <i>Spalangia afra</i> SILVESTRI | | : | -do- | -do- |
| <i>S. grotiusi</i> GIRAULT | | : | -do- | -do- |
| <i>S. philippinensis</i> FULLAWAY | | : | -do- | -do- |
| <i>S. stomoxysiae</i> GIRAULT | | : | -do- | -do- |
| <i>Galesus</i> sp. | | : | <i>Diapriidae</i> | -do- |

| | | | |
|---|-------------|-----------------|------------|
| <i>Sarcophaga flagellata</i> VILLENEUVE | Diptera | : Tachinidae | |
| <i>Dacus correctus</i> BEZZI | Diptera | : Trypetidae | |
| <i>Dirhinus</i> sp. | Hymenoptera | : Chalcididae | -do- |
| <i>Dacus curcubitae</i> COQUILLET | Diptera | : Trypetidae | |
| <i>Opius angaleti</i> FULLAWAY | Hymenoptera | : Braconidae | Larval |
| <i>O. Biosteres compensans</i> SILVESTRI | -do- | : -do- | Larval |
| <i>O. fletcheri</i> SILVESTRI | -do- | : -do- | -do- |
| <i>O. watersi</i> FULLAWAY | -do- | : -do- | -do- |
| <i>Dirhinus auratus</i> ASHMEAD | -do- | : Chalcididae | Pupal |
| <i>D. giffardii</i> SILVESTRI | -do- | : -do- | -do- |
| <i>D. luzonensis</i> ROHWER | -do- | : -do- | -do- |
| <i>Pachycrepoideus dubius</i> ASHMEAD | -do- | : Pteromalidae | -do- |
| <i>Spalangia afra</i> SILVESTRI | -do- | : -do- | Larval |
| <i>S. grotiusi</i> GIRAULT | -do- | : -do- | |
| <i>S. philippinensis</i> FULLAWAY | -do- | : -do- | -do- |
| <i>S. stomoxysiae</i> GIRAULT | -do- | : -do- | -do- |
| <i>Philonthus</i> sp. | Coleoptera | : Staphylinidae | Predator |
| <i>Dacus dorsalis</i> HENDEL | Diptera | : Trypetidae | |
| <i>Opius arisanus</i> SONAN | Hymenoptera | : Braconidae | Larval |
| <i>O. (Biosteres) compensans</i> SILVESTRI | -do- | : -do- | -do- |
| <i>O. (B.) formosanus</i> FULLAWAY | -do- | : -do- | -do- |
| <i>O. incisi</i> SILVESTRI | -do- | : -do- | -do- |
| <i>O. longicaudatus</i> ASHMEAD | -do- | : -do- | -do- |
| <i>O. makii</i> SONAN | -do- | : -do- | -do- |
| <i>O. manii</i> FULLAWAY | -do- | : -do- | -do- |
| <i>O. oophilus</i> FULLAWAY | -do- | : -do- | Egg larval |
| <i>O. persulcatus</i> SILVESTRI | -do- | : -do- | -do- |
| <i>Cothonaspis</i> sp. | -do- | : Cynipidae | |
| <i>Trybliographa daci</i> WELD | -do- | : -do- | Larval |
| <i>Pilinothrix</i> sp. | -do- | : -do- | |
| <i>Dirhinus giffardii</i> SILVESTRI | -do- | : Chalcididae | Pupal |
| <i>D. luzonensis</i> ROHWER | -do- | : -do- | -do- |
| <i>Pachycrepoideus dubius</i> ASHMEAD | -do- | : Pteromalidae | -do- |
| <i>Spalangia afra</i> SILVESTRI | -do- | : -do- | -do- |
| <i>S. grotiusi</i> GIRAULT | -do- | : -do- | -do- |
| <i>S. philippinensis</i> FULLAWAY | -do- | : -do- | -do- |
| <i>S. simplex</i> PERKINS | -do- | : -do- | -do- |
| <i>S. stomoxysiae</i> GIRAULT | -do- | : -do- | -do- |
| <i>Tetrastichus dacicida</i> SILVESTRI | -do- | : Eulophidae | Larval |
| <i>Syntomosphyrum indicum</i> SILVESTRI | -do- | : -do- | |
| <i>Galesus</i> sp. | -do- | : Diapriidae | Pupal |
| <i>Trichopria</i> sp. | -do- | : -do- | |
| <i>Thyrecephalus albertisi</i> (FAUVEL) | Coleoptera | : Staphylinidae | Predator |
| <i>Anisolabis eteronoma</i> BORELLI | Dermaptera | : Labiduridae | -do- |
| <i>Sphingolabis hawaiiensis</i> (BORMANS) | -do- | : Labiidae | -do- |

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| <i>Dacus emmerzei</i> BEZZI | Diptera | : Trypetidae | |
| <i>Opius phaeostigma</i> WILKINSON | Hymenoptera: | : Braconidae | Larval |
| <i>Dacus ferrugineus</i> FABRICIUS | Diptera | : Trypetidae | |
| <i>Opius incisi</i> SILVESTRI | Hymenoptera | : Braconidae | -do- |
| <i>O. javanus</i> FULLAWAY | -do- | : -do- | -do- |
| <i>O. longicaudatus</i> ASHMEAD | -do- | : -do- | -do- |
| <i>O. manii</i> FULLAWAY | -do- | : -do- | -do- |
| <i>O. persulcatus</i> SILVESTRI | -do- | : -do- | -do- |
| <i>Dirhinus auratus</i> ASHMEAD | -do- | : Chalcididae | Pupal |
| <i>Tachinaephagus</i> sp. | -do- | : -do- | |
| <i>Spalangia philippinensis</i> FULLAWAY | -do- | : Pteromalidae | -do- |
| <i>Syntomosphyrum indicum</i> SILVESTRI | -do- | : Eulophidae | |
| <i>Tetrastichus</i> sp. | -do- | : -do- | Larval |
| <i>Galesus</i> sp. | -do- | : Diapriidae | Pupal |
| <i>Dacus (Tridacus) humeralis</i> BEZZI | Diptera | : Trypetidae | |
| <i>Opius caudatus</i> SZÉPLIGETI | Hymenoptera | : Braconidae | Larval |
| <i>Opius</i> sp. | -do- | : -do- | -do- |
| <i>Tetrastichus giffardii</i> SILVESTRI | -do- | : Eulophidae | -do- |
| <i>Dacus incisus</i> WALKER | Diptera | : Trypetidae | |
| <i>Opius compensans</i> SILVESTRI | Hymenoptera | : Braconidae | -do- |
| <i>O. incisi</i> SILVESTRI | -do- | : -do- | -do- |
| <i>O. oophilus</i> FULLAWAY | -do- | : -do- | -do- |
| <i>O. persulcatus</i> SILVESTRI | -do- | : -do- | -do- |
| <i>Cothonaspis</i> sp. | -do- | : Cynipidae | |
| <i>Pseudeucoila</i> sp. | -do- | : -do- | |
| <i>Trybliographa daci</i> WELD | -do- | : -do- | Larval |
| <i>Dirhinus giffardii</i> SILVESTRI | -do- | : Chalcididae | Pupal |
| <i>D. luzonensis</i> ROHWER | -do- | : -do- | -do- |
| <i>Pachycrepoideus dubius</i> ASHMEAD | -do- | : Pteromalidae | -do- |
| <i>Spalangia</i> spp. | -do- | : -do- | -do- |
| <i>Syntomosphyrum indicum</i> SILVESTRI | -do- | : Eulophidae | |
| <i>Trichopria</i> sp. | -do- | : Diapriidae | |
| <i>Dacus (Strumeta) laticaudatus</i> HARDY | Diptera | : Trypetidae | |
| <i>Opius deeralensis</i> FULLAWAY | Hymenoptera | : Braconidae | Larval |
| <i>O. froggatti</i> FULLAWAY | -do- | : -do- | -do- |
| <i>O. perkinsi</i> FULLAWAY | -do- | : -do- | -do- |
| <i>Dacus latifrons</i> WIEDEMANN | Diptera | : Trypetidae | |
| <i>Opius oophilus</i> FULLAWAY | Hymenoptera | : Braconidae | Larval |
| <i>O. persulcatus</i> SILVESTRI | -do- | : -do- | -do- |
| <i>Dirhinus giffardii</i> SILVESTRI | -do- | : Chalcididae | Pupal |
| <i>D. luzonensis</i> ROHWER | -do- | : -do- | -do- |
| <i>Pachycrepoideus dubius</i> ASHMEAD | -do- | : Pteromalidae | -do- |
| <i>Spalangia</i> spp. | -do- | : -do- | -do- |

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| <i>Dacus oleae</i> GMEL. | <i>Diptera</i> | : <i>Trypetidae</i> | |
| <i>Bracon celer</i> SZÉPLIGETI | <i>Hymenoptera</i> | : <i>Braconidae</i> | Larval |
| <i>Opius africanus</i> SZÉPLIGETI | -do- | : -do- | -do- |
| <i>O. africanus</i> var. <i>orientalis</i> | -do- | : -do- | -do- |
| SILVESTRI | | | |
| <i>O. concolor</i> SZÉPLIGETI | -do- | : -do- | -do- |
| <i>O. dacicida</i> SILVESTRI | -do- | : -do- | -do- |
| <i>O. ponerophagus</i> SILVESTRI | -do- | : -do- | -do- |
| <i>O. sculus</i> MONASTERO | -do- | : -do- | -do- |
| <i>Sigalphus daci</i> SZÉPLIGETI | -do- | : -do- | -do- |
| <i>Dirhinus giffardii</i> SILVESTRI | -do- | : <i>Chalcididae</i> | Pupal |
| <i>Eurytoma rosae</i> NEES | -do- | : <i>Eurytomidae</i> | |
| <i>Cyrtoptyx (Dinarmus) dacicida</i> | -do- | : <i>Pteromalidae</i> | Larval |
| (MASI) | | | |
| <i>Halticoptera daci</i> SILVESTRI | -do- | : -do- | -do- |
| <i>Eupelmus afer</i> SILVESTRI | -do- | : <i>Eupelmidae</i> | -do- |
| <i>E. martelli</i> MASI | -do- | : -do- | -do- |
| <i>E. urozonus</i> DALMAN | -do- | : -do- | -do- |
| <i>Achrysocharis formosa</i> var. | -do- | : <i>Eulophidae</i> | -do- |
| <i>meridionalis</i> SILVESTRI | | | |
| <i>Euderus cavasolae</i> (SILVESTRI) | -do- | : -do- | -do- |
| <i>Metrocharis atrocynae</i> SILVESTRI | -do- | : -do- | -do- |
| <i>M. viridis</i> SILVESTRI | -do- | : -do- | -do- |
| <i>Pnigalo (Eulophus) longulus</i> | -do- | : -do- | -do- |
| ZETT. | | | |
| <i>P. mediterraneus</i> FERRIÈRE & | -do- | : -do- | -do- |
| DELUCCHI | | | |
| <i>Teleopterus notandus</i> SILVESTRI | -do- | : -do- | Egg larval |
| <i>Galesus silvestrii</i> KIEFFER | -do- | : <i>Diapriidae</i> | Pupal |
| <i>Lasioptera brevicornis</i> MELIS | <i>Diptera</i> | : <i>Cecidomyiidae</i> | Predator |
| <i>L. (Prolasioptera)</i> | -do- | : -do- | -do- |
| <i>berlesiana</i> (PAOLI) | | | |
| <i>Belonuchus rufipennis</i> F. | <i>Coleoptera</i> | : <i>Staphylinidae</i> | -do- |
| <i>Dacus passiflorae</i> FROGGATT | <i>Diptera</i> | : <i>Trypetidae</i> | |
| <i>Opius fijiensis</i> FULLAWAY | <i>Hymenoptera</i> | : <i>Braconidae</i> | Larval |
| <i>O. hageni</i> FULLAWAY | -do- | : -do- | -do- |
| <i>O. humilis</i> SILVESTRI | -do- | : -do- | -do- |
| <i>O. sp.</i> | -do- | : -do- | -do- |
| <i>Phaenocarpa leverii</i> NIXON | -do- | : -do- | -do- |
| <i>Dirhinus sp.</i> | -do- | : <i>Chalcididae</i> | Pupal |
| <i>Pachycrepoideus dubius</i> | -do- | : <i>Pteromalidae</i> | -do- |
| ASHMEAD | | | |
| <i>Pachyneuron sp.</i> | -do- | : -do- | |
| <i>Spalangia cameroni</i> PERKINS | -do- | : -do- | -do- |
| <i>Spalangia sp.</i> | -do- | : -do- | -do- |
| <i>Syntomosphyrum indicum</i> | -do- | : <i>Eulophidae</i> | |
| SILVESTRI | | | |
| <i>Tetrastichus giffardianus</i> | -do- | : -do- | Larval |
| SILVESTRI | | | |
| <i>Germalus pacificus</i> KIRK. | <i>Hemiptera</i> | : <i>Lygaeidae</i> | Predator |
| <i>Dacus (Tridacus) pectoralis</i> WLK. | <i>Diptera</i> | : <i>Trypetidae</i> | |
| <i>Dirhinus sp.</i> | <i>Hymenoptera</i> | : <i>Chalcididae</i> | Pupal |
| <i>Spalangia afra</i> SILVESTRI | -do- | : <i>Pteromalidae</i> | -do- |

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| <i>Dacus punctatifrons</i> KARSCH | <i>Diptera</i> | : | <i>Trypetidae</i> | |
| <i>Tetrastichus giffardianus</i> SILVESTRI | <i>Hymenoptera</i> | : | <i>Eulophidae</i> | Larval |
| <i>Dacus (Strumeta) tryoni</i> (FROGG.) | <i>Diptera</i> | : | <i>Trypetidae</i> | |
| <i>Opius africanus</i> SZÉPLIGETI | <i>Hymenoptera</i> | : | <i>Braconidae</i> | Larval |
| <i>O. fletcheri</i> SILVESTRI | -do- | : | -do- | -do- |
| <i>O. kraussi</i> FULLAWAY | -do- | : | -do- | -do- |
| <i>O. tryoni</i> CAMERON | -do- | : | -do- | -do- |
| <i>Dacus (Bactrocera) umbrosus</i> F. | <i>Diptera</i> | : | <i>Trypetidae</i> | |
| <i>Phaenocarpa (Asobara)</i> <i>bactrocerae</i> GAHAN | <i>Hymenoptera</i> | : | <i>Braconidae</i> | |
| <i>Dacus zonatus</i> SAUNDERS | <i>Diptera</i> | : | <i>Trypetidae</i> | |
| <i>Opius</i> (= <i>Austroopius</i>) sp. | <i>Hymenoptera</i> | : | <i>Braconidae</i> | Larval |
| <i>Dacus</i> spp. | <i>Diptera</i> | : | <i>Trypetidae</i> | |
| <i>Hedylus clypeatus</i> BRIDWELL | <i>Hymenoptera</i> | : | <i>Braconidae</i> | Larval |
| <i>H. desideratus</i> BRIDWELL | -do- | : | -do- | -do- |
| <i>Opius angaleti</i> FULLAWAY | -do- | : | -do- | -do- |
| <i>O. fletcheri</i> SILVESTRI | -do- | : | -do- | -do- |
| <i>O. kraussi</i> FULLAWAY | -do- | : | -do- | -do- |
| <i>O. skinneri</i> FULLAWAY | -do- | : | -do- | -do- |
| <i>O. (Biosteres) tryoni</i> CAMERON | -do- | : | -do- | -do- |
| <i>O. watersi</i> FULLAWAY | -do- | : | -do- | -do- |
| <i>Phaenocarpa leveri</i> NIXON | -do- | : | -do- | |
| <i>Dirhinus auratus</i> ASHMEAD | -do- | : | <i>Chalcididae</i> | Pupal |
| <i>D. giffardii</i> SILVESTRI | -do- | : | -do- | -do- |
| <i>Spalangia cameroni</i> PERKINS | -do- | : | <i>Pteromalidae</i> | -do- |
| <i>Tetrastichus giffardianus</i> SILVESTRI | -do- | : | <i>Eulophidae</i> | Larval |
| <i>Trichopria capensis</i> KIEFFER | -do- | : | <i>Diapriidae</i> | |
| <i>Dacus (Tridacus)</i> spp. | <i>Diptera</i> | : | <i>Trypetidae</i> | |
| <i>Opius (Diachasma) fullawayi</i> SILVESTRI | <i>Hymenoptera</i> | : | <i>Braconidae</i> | |
| <i>O. perproximus</i> SILVESTRI | -do- | : | -do- | Larval |
| <i>Rhagoletis</i> spp. | <i>Diptera</i> | : | <i>Trypetidae</i> | |
| <i>Gelis bremeri</i> HABERMEHL | <i>Hymenoptera</i> | : | <i>Ichneumonidae</i> | |
| <i>Phygadeuon wiesmanni</i> SACHT- LEBEN | -do- | : | -do- | Larval |
| <i>Aphaereta muscae</i> ASHMEAD | -do- | : | <i>Braconidae</i> | -do- |
| <i>Opius alloeus</i> MUESEBECK | -do- | : | -do- | -do- |
| <i>O. downesi</i> GAHAN | -do- | : | -do- | Larval-Pupal |
| <i>O. ferrugineus</i> GAHAN | -do- | : | -do- | Larval |
| <i>O. lectoides</i> GAHAN | -do- | : | -do- | -do- |
| <i>O. lectus</i> GAHAN | -do- | : | -do- | -do- |
| <i>O. melleus</i> GAHAN | -do- | : | -do- | -do- |
| <i>O. muliebrius</i> MUESEBECK | -do- | : | -do- | -do- |
| <i>O. richmondi</i> GAHAN | -do- | : | -do- | -do- |
| <i>O. rhagoleticolus</i> SACHTLEBEN | -do- | : | -do- | -do- |

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| <i>Eucoila</i> sp. | -do- | : <i>Cynipidae</i> | Larval-Pupal |
| <i>Pachycrepoideus dubius</i> ASHMEAD | -do- | : <i>Pteromalidae</i> | Pupal |
| <i>Tetrastichus faustus</i> BURKS | -do- | : <i>Eulophidae</i> | Larval |
| <i>T. giffardianus</i> SILVESTRI | -do- | : -do- | -do- |
| <i>Patasson</i> (<i>Anaphoides</i>) <i>conotracheli</i> GIRAULT | -do- | : <i>Mymaridae</i> | Egg |
| <i>Galesus</i> sp. | -do- | : <i>Diapriidae</i> | Pupal |
| <i>Polypeza fürsteri</i> KIEFFER | -do- | : -do- | |

Summary

Based upon their own study on this subject and collecting all the available information on the parasites of fruit fly pests of the world the authors give notes on the bionomics, habits, and distribution of these natural enemies.

Zusammenfassung

Auf der Grundlage ihrer eigenen Untersuchungen und unter Heranziehung aller verfügbaren Informationen über Parasiten von Fruchtfliegen geben die Autoren eine Zusammenstellung über Bionomie und Verbreitung dieses Komplexes natürlicher Feinde der Fruchtfliegen.

Резюме

На основе собственных исследований и на основе использования всех получаемых информации о паразитах плодовых мух авторы дают составление бionомии и распространения этого комплекса естественных врагов плодовых мух.

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Three new species of *Hadrophanurus* Kieffer from India with a key to species

(Hymenoptera: Scelionidae)

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(With 3 Plates)

Hadrophanurus testaceus n. sp.

Female: Head and thorax blackish; abdomen brownish yellow, except the sixth and seventh segments which are brownish. Scape yellowish-brown, rest of the antennal segments dark brown. Wings hayaline, veins and hairs yellowish-brown. Legs yellowish, except coxae which are brownish and proximal two-thirds of fore femur which is yellowish-brown and third, fourth and fifth tarsal segments of foreleg brownish; second, third and fourth tarsal segments of middle leg and hind leg yellowish-brown, and last tarsal segment of middle and hind legs brownish.

Head, finely hairy, reticulate and broader than thorax; frons with a longitudinal shallow depression having transverse striations and a longitudinal keel at the base of the antennae. The distance between median and lateral ocelli slightly more than half the distance between the lateral ocelli; lateral not close to the eyes; eyes hairy. Antenna twelve-segmented