JICA/NPQS Occasional Paper No. 3

PICTORIAL KEY TO FRUIT FLIES OF THE TRIBE DACINI (DIPTERA, TEPHRITIDAE) OF SRI LANKA

K. TSURUTA, G. B. J. P. RAJAPAKSE AND T. KAWASHITA

NATIONAL PLANT QUARANTINE SERVICES PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

KATUNAYAKE, SRI LANKA

(MARCH, 1999)

JICA/NPQS Occasional Paper No. 3

PICTORIAL KEY TO FRUIT FLIES OF THE TRIBE DACINI (DIPTERA, TEPHRITIDAE) OF SRI LANKA

K. TSURUTA, G. B. J. P. RAJAPAKSE AND T. KAWASHITA

NATIONAL PLANT QUARANTINE SERVICES PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

KATUNAYAKE, SRI LANKA

(MARCH, 1999)

PICTORIAL KEY TO FRUIT FLIES OF THE TRIBE DACINI (DIPTERA, TEPHRITIDAE) OF SRI LANKA

K. Tsuruta*, G. B. J. P. Rajapakse** and T. Kawashita***

ABSTRACT

A pictorial key to the dacine fruit flies occurring in Sri Lanka is given.

This key includes both pest and non-pest species totaling 30 species as follows; *Dacus (Callantra) discophorus, D.* (*C.*) sp. 1 (taxon A), *D. (Didacus) keiseri, D. (Leptoxyda) persicus, Bactrocera* (*Afrodacus*) sp. 1 (taxon B), members of *Bactrocera* species complex sensu Drew & Hancock(1994) [*B.* (*B.*) *dorsalis, B.* (*B.*) *kandiensis, B.* (*B.*) *verbascifoliae*, *B.* (*B.*) sp. 1 (taxon C), *B.* (*B.*) sp. 2 (taxon D), *B.* (*B.*) sp. 3 (taxon E), *B.* (*B.*) sp. 4 (taxon F), *B.* (*B.*) sp. 5 (taxon G), *B.* (*B.*) sp. 6 (taxon H), *B.* (*B.*) sp. 7 (taxon I)], *B.* (*B.*) *latifrons, B.* (*B.*) *correcta, B.* (*B.*) *zonata, B.* (*B.*) *versicolor, B.* (*B.*) sp. 8 (taxon J), *B.* (*B.*) sp. 9 near *nigrotibialis* (taxon K), *B.* (*Hemigymnodacus*) *diversa, B.* (*Javadacus*) *trilineata, B.* (*Paratridacus*) *garciniae, B.* (*Parazeugodacus*) *bipustulata, B.* (*Zeugodacus*) *cucurbitae, B.* (*Z.*) *caudata, B.* (*Z.*) *gavisa, B.* (*Z.*) *duplicata, B.* (*Z.*) sp. 1 near *tau* (taxon L).

BACKGROUND

Primary purpose of National Plant Quarantine Services (NPQS) Project is the technical transfer in plant quarantine. Fruit fly faunal survey is one of the main activities in this project, to enumerate the species occurring in Sri Lanka, and the survey is indispensable to decide the species of plant quarantine importance and to set up the quarantine disinfection standard against them.

Almost all species were caught by Steiner-type trap (length 20 cm, diameter 10 cm) with male attractants, Methyl eugenol or Cue-lure in the trapping survey, and several species were found from infested fruits and vegetables in the fruit survey.

Information on fruit flies present in Sri Lanka has been scanty (Tsuruta, 1994, 1996, ;Tsuruta et al., 1997), even though plant quarantine restrictions have been imposed on those not occurring in the country (Annon, 1981). Hence, a study was initiated in 1993 by K. Tsuruta before the commencement of NPQS project, and main activities were started in 1994 for improvement of identification, mass rearing, and disinfestation techniques related with fruit flies of quarantine importance. According to our island wide survey, about 30 species of dacine fruit flies are now known from Sri Lanka.

* Yokohama Plant Protection Station, MAFF, Japan
** National Plant Quarantine Services, Sri Lanka
*** National Plant Quarantine Services Project, JICA Expert

ADDITIONAL NOTES

The pictorial key consists of Key 1 to Key 18. First, key to the genera *Bactrocera* and *Dacus* is given. Next, keys to the species of the genus *Dacus* which include 4 species in 3 subgenera, *Callantra, Didacus, Leptoxyda* are given and to the species of genus *Bactrocera* which includes 26 species in 7 subgenera, *Afrodacus Bactrocera, Hemigymnodacus, Javadacus, Paratridacus, Parazeugodacus, Zeugodacus* are given. Finally morphological difference between *dorsalis* complex and *zonata* complex are indicated.

As this key intends to cover most of the known dacine species recorded from Sri Lanka, and considering an urgent requirement of such key, many undescribed species are included. These new species except for one *Dacus* (*Callanta*) species will be described elsewhere (Tsuruta & White, in prep.). Several species are not included, as they were still under examination. Regarding economically important species, refer to Tsuruta et al. (1997).

The characters and terminology used here are those of Drew (1989), or White & Hancock (1997). The definition of genus, subgenus, subgenus group and species complex followed those of Drew (1989), and Drew & Hancock (1994).

K. Tsuruta made all drawings based on the specimens collected in Sri Lanka, and on a few of specimens on loan from British Museum (Natural History).

30 species included in this key were listed in Table 1.

We hope that this pictorial key will help smooth identification of fruit flies of Sri Lanka. It could be used by plant quarantine inspectors, entomologists and also by those interested in this fruit fly group.

The staff members mainly engaged in this fruit fly faunal survey are as follows:

H. M. J. Bandara	(Plant Quarantine Division, Gannoruwa)
H. Rajapaksa	(former staff at NPQS, Katunayake)
S. B. M. U. C. Kahawatta	(present staff at NPQS, Katunayake)
G. B. J. P. Rajapaksa	(present staff at NPQS, Katunayake)
S. A. H. Sundaraperma	(present staff at NPQS, Katunayake)
K. Tsuruta	(former JICA expert, Yokohama Plant Protection Station, MAFF, Japan)
T. Kawashita	(JICA expert at NPQS project)

SOME OF IMPORTANT CHARACTERS USED IN IDENTIFICATION

Some of characters useful for identification are given below:

1 Head

(1) Hairs (Setae)

The place of setae and the numbers.

(2) Facial spots

Presence or absence of facial spots, their shape, whether separated circular or combined.

(3) Antennae

The length of segments of antenna as compared to the vertical length of head.

2 Thorax

(1) Lateral post-sutural vitta (stripe)

Numbers of lateral post-sutural vitta on scutum, their length and width.

(2) Hair (Setae)

The place of setae and the numbers.

(3) Femora (Legs)

Presence or absence of black markings on femora.

3 Wings

(1) Costal band

Costal band whether complete or incomplete, and its spread beyond the vein of R_{4+5}.

(2) Apical spot

Presence or absence of apical spot.

(3) Microtrichia

Presence or absence of small hairs in the base of cell br.

(4) Anal streak

Presence or absence of anal streak.

4 Abdomen

(1) Pecten

Presence or absence of pecten on 3rd tergite of male.

(2) 5th sternite of male

The shape of 5th sternite whether concavity or not.

ACKNOWLEDGEMENTS

The authors wish to thank Drs. M. H. J. P. Fernando, Director General, Department of Agriculture, S. L.Weerasena, Director, Seeds Certification and Plant Protection Centre, Department of Agriculture, S. M. C. Subasinghe, Head of National Plant Quarantine Service and Y. Ikegami, Team Leader, NPQS Project for their support in conducting our fruit fly survey. We are also grateful to Drs. I. M. White, London, UK and D. L. Hancock, Department of Primary Industries, Queensland, Australia for their valuable comments on each species in our collection.

K. Tsuruta wish to thank M. B. Abeykoon, C. B. Karandawella and J. Amarasena for their assistance in his field and laboratory works. Last but not least we wish to thank staff members of JICA Sri Lanka Office and Headquarter, Tokyo for their assistance in our activities.

REFERENCES

ANNON, (1981). Government notification on the plant protection ordinance. *The Gazette of the Democratic Socialist Republic of Sri Lanka*, No.165/2, 2nd Nov., 1981.

DREW, R.A.I.(1989). The tropical fruit flies (Diptera: Tephritidae:Dacinae) of the Australian and Oceanian regions. *Memoirs of the Queensland Museum*, 26: 1-521.

DREW, R.A.I. AND D.L. HANCOCK (1994). The *Bactrocera dorsalis* complex of fruit flies (Diptera:Tephritidae:Dacinae) in Asia., *Bulletin of Entomological Research Supplement Series Number 2.* 68 pp. Wallingford, UK, CAB International.

KAPOOR, V.C. (1993). *Indian fruit flies (Insecta: Diptera: Tephritidae)*, 228 pp. Oxford & IBH Publishing Co. Pvt. Ltd., India.

TSURUTA, K. (1994). Evaluation report for JICA Individual Plant Quarantine Technique Programme. (unpublished)

TSURUTA, K. (1996). Evaluation report for JICA National Plant Quarantine Services Project. (unpublished)

TSURUTA et al. (1997). A Preliminary Note on the Host-plants of Fruit Flies of the Tribe Dacini (Diptera, Tephritidae) in Sri Lanka. ESAKIA 37: 149-160.

TSURUTA et al. (1998). Pictorial key to Dacine fruit flies associated with economic plants in Sri Lanka. *Research Bulletin of Plant Protection Service Japan.* No. 34: 23-35.

WHITE, I.M. AND M.M. ELSON-HARRIS (1992). *Fruit flies of economic significance: their identification and bionomics.* 601 pp. Wallingford, UK, CAB International.

WHITE, I.M. AND D.L. HANCOCK (1997). *CABIKEY, Dacini of Indo-Australasia.* CAB International, Wallingford, UK.

Table 1 List of fruit flies in this key

No.	Scientific Name	Temporary Name	Attractant*1
1	*Dacus (Callantra) discophorus*		C*5
2	*Dacus (Caillantra)* sp. 1 (taxon A)		C
3	*Dacus (Didacus) keiseri*		–*2
4	*Dacus (Leptoxyda) persicus*		–*2
5	*Bactrocera (Afrodacus)* sp. 1 (taxon B)		C
6	*Bactrocera (Bactrocera) dorsalis*		M
7	*Bactrocera (Bactrocera) kandiensis*		M
8	*Bactrocera (Bactrocera) verbascifoliae*		M
9	*Bactrocera (Bactrocera)* sp. 1 (taxon C)	Hantana dorsalis	C
10	*Bactrocera (Bactrocera)* sp. 2 (taxon D)	Large dorsalis	C
11	*Bactrocera (Bactrocera)* sp. 3 (taxon E)	Wide costa dorsalis	C
12	*Bactrocera (Bactrocera)* sp. 4 (taxon F)	Laggala dorsalis 1*4	C
13	*Bactrocera (Bactrocera)* sp. 5 (taxon G)	Laggala dorsalis 2	C
14	*Bactrocera (Bactrocera)* sp. 6 (taxon H)	Brown dorsalis	C
15	*Bactrocera (Bactrocera)* sp. 7 (taxon I)	Jambu dorsalis*4	–*2
16	*Bactrocera (Bactrocera) latifrons*		–*2
17	*Bactrocera (Bactrocera) correcta*		M
18	*Bactrocera (Bactrocera) zonata*		M
19	*Bactrocera (Bactrocera) versicolor*		M
20	*Bactrocera (Bactrocera)* sp. 8 (taxon J)	Large brown	M
21	*Bactrocera (Bactrocera)* near *nigrotibialis* (taxon K)		C
22	*Bactrocera (Hemigymnodacus) diversa*		M*3
23	*Bactrocera (Javadacus) trilineata*		C
24	*Bactrocera (Paratridacus) garciniae*		–*2
25	*Bactrocera (Parazeugodacus) bipustulata*		C
26	*Bactrocera (Zeugodacus) cucurbitae*		C
27	*Bactrocera (Zeugodacus) caudata*		C
28	*Bactrocera (Zeugodacus) gavisa*		C
29	*Bactrocera (Zeugodacus) duplicata*		C
30	*Bactrocera (Zeugodacus)* sp. 1 near *tau* (taxon L)		C

*1Attractant; M: Methl eugenol, C: Cue-lure, –: Non-response species

*2Host plants; *Dacus (Didacus) keiseri* : bred from *Diplocyclos palmatus* (Cucurbitaceae)
D . (Leptoxyda) persicus : unkown
Bactrocera (Bactrocera) sp.7: bred from *Syzygium jambos* (Myrtaceae)
B . (B .) latifrons : bred from Solanaceae family plant.
B . (Paratridacus) garciniae : bred from *Garcinia xanthochymus* (Clusiaceae)

*3; White & Elson Harris (1992). In Sri Lanka, it was found from Cucurbitaceous flowers.

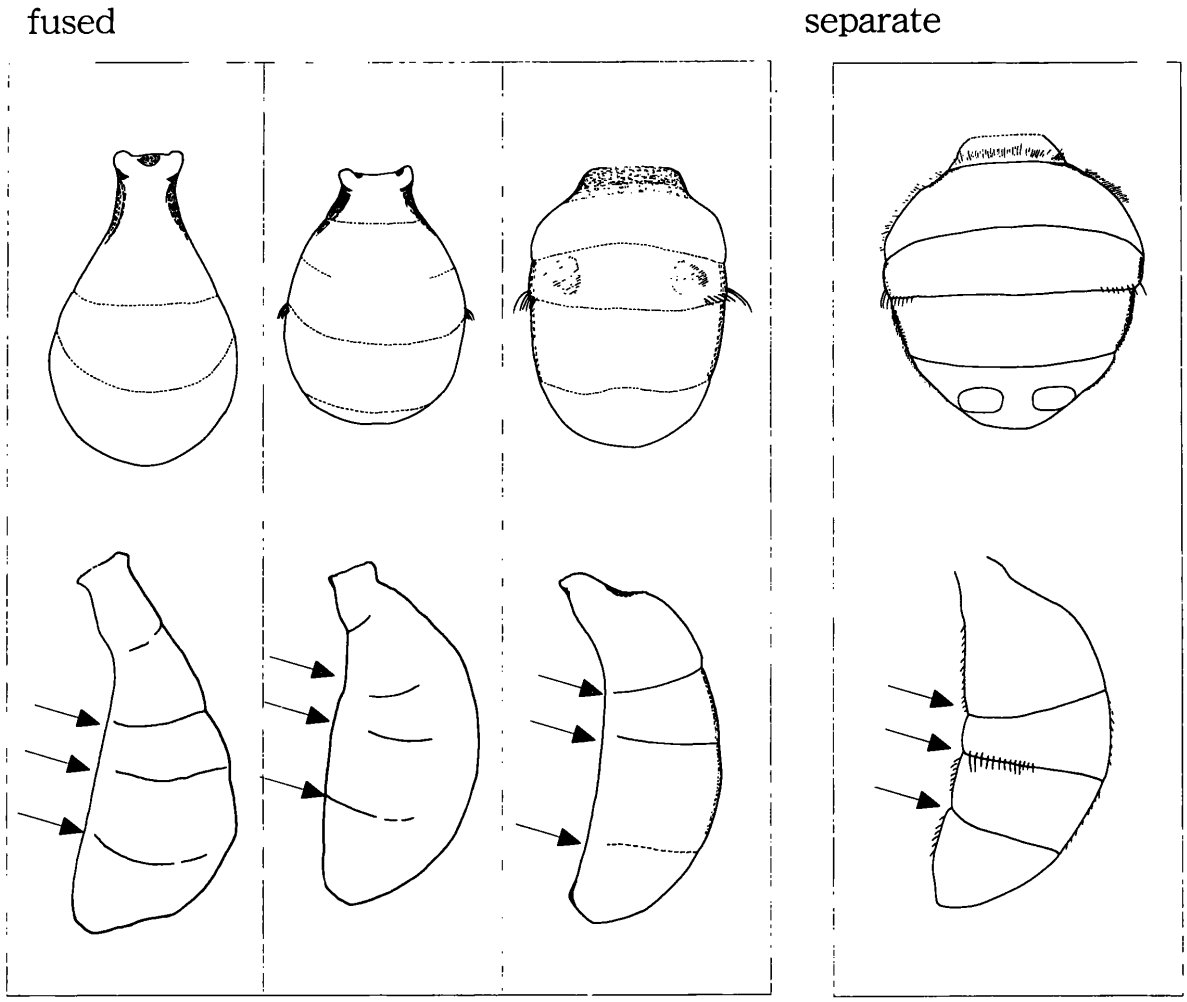
*4; Probably the same species. (No. 12 & No. 15)

*5; Only one male was attracted. Very rare case.

Key 1

Key to Genera, Subgenera and species

Abdominal terga



Genus Dacus

Genus Bactrocera

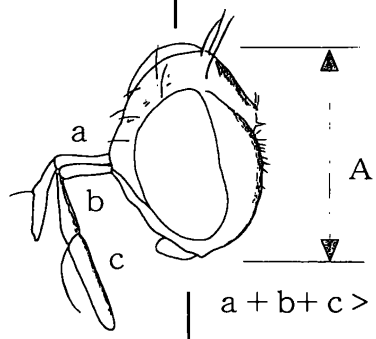
Key 2

Key 4

Key 2

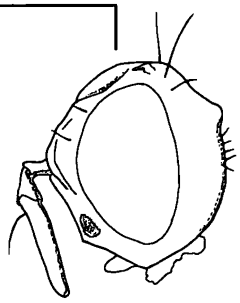
Combined length of antenna

longer than vertical length



a + b + c > A

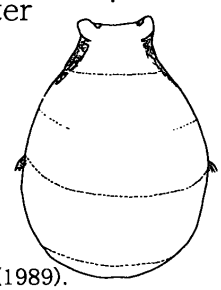
equal to or less than vertical length



a + b + c < A → Key 3

Abdominal tergite 1

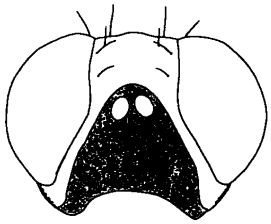
somewhat shorter than wide



Subgeneric stastus in this species is tentative, as this character is unfit for the definition given by Drew (1989).

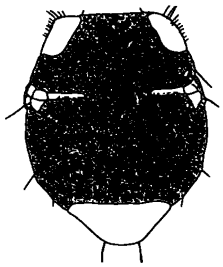
Face

entirely black



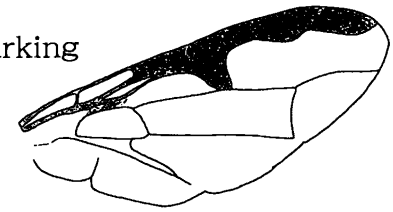
Scutum

without lateral vittae



Wing

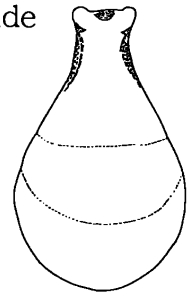
with black marking



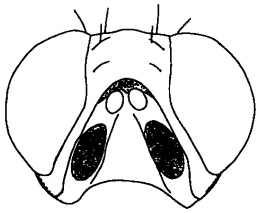
Dacus (*C.*) sp. 1 (taxon A)

Abdominal tergite 1

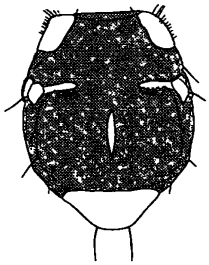
longer than wide



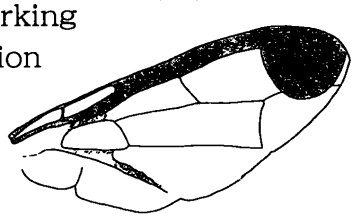
with elongate facial spots



with small medial vitta



with large marking at apical portion



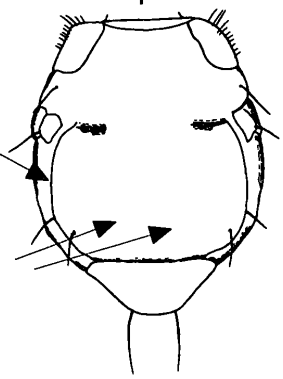
Dacus (*C.*) *discophorus*

Key 3

Scutum

without sa setae

without prsc setae

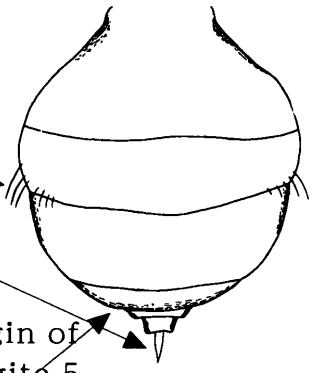


Abdominal tergite 3

with pecten

Ovipositor normal

Posterior margin of abdominal tergite 5 normal

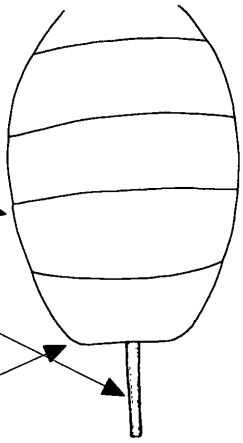


Subgenus *Didacus*

without pecten

cylindrical

truncate



Subgenus *Leptoxyda*

Scutum uniformly black

with presutural vittae

without lateral vittae

Dacus (Didacus) keiseri

with presutural vittae

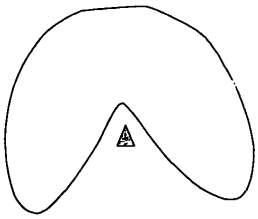
without lateral vittae

with elongate △ shaped medial vitta

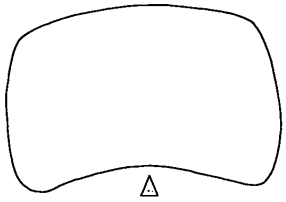
Dacus (L.) persicus

Key 4

Posterior margin of male sternite 5



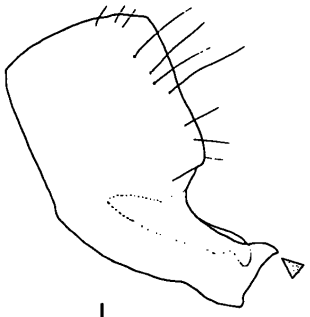
with deep concavity



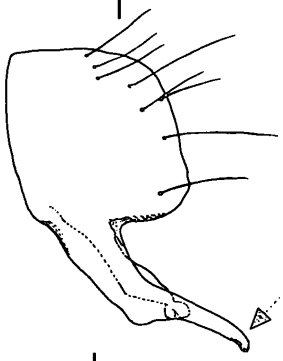
with slight concavity

Posterior lobe of surstylus

short



long



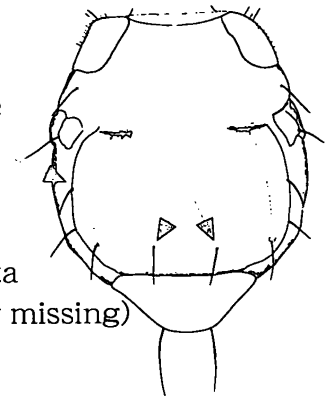
Bactrocera group of subgenera

Zeugodacus group of subgenera

Key 13

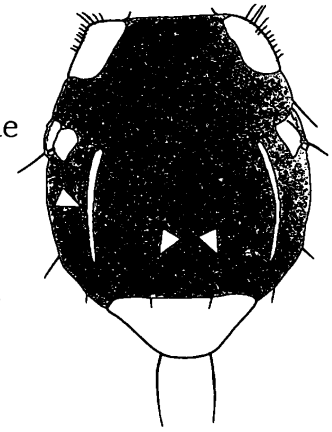
Scutum

with sa setae



with prsc seta (occasianally missing)

without sa setae



with prsc seta

Subgenus *Bactrocera*

Key 5

Subgenus *Afrodacus*

B. (*A.*) sp. 1 (taxon B)

Key 6

All femora

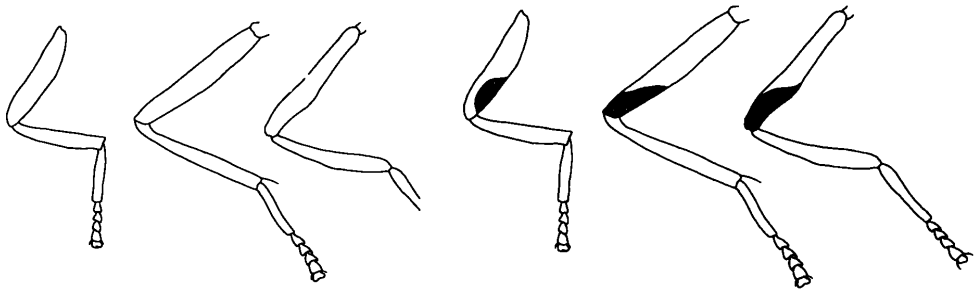
without black markings

All femora

with black markings

At least hind femora

with small black markings



Key 9

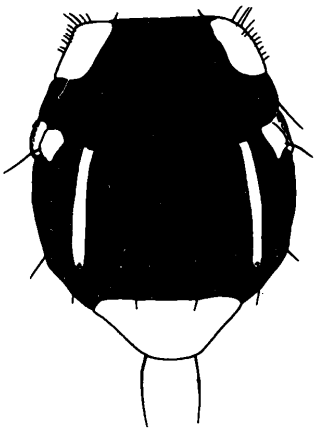
Key 8

Scutum

black to fuscous

Lateral vittae

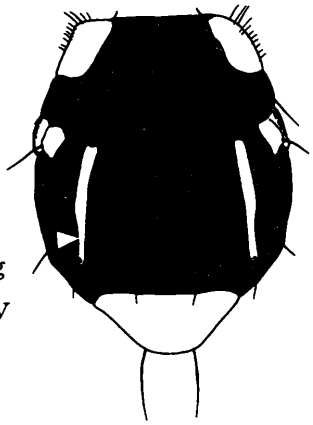
parallel sided



Key 7

black

narrowing posteriorly



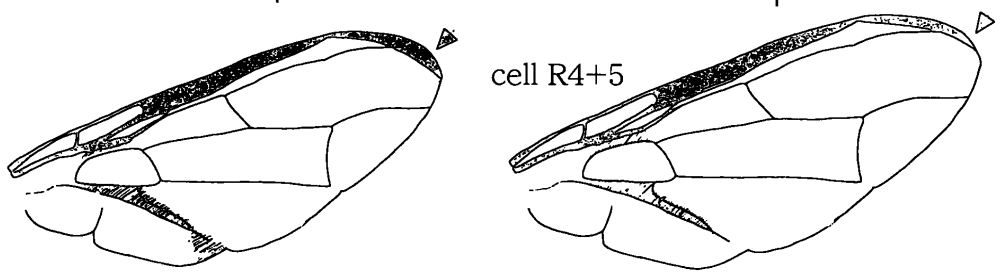
B. (*B.*) sp. 4 (taxon F)

laggala dorsalis 1

Key 7

Costal band
extends beyond the apical center of cell R4+5
becoming broad around apical extremity

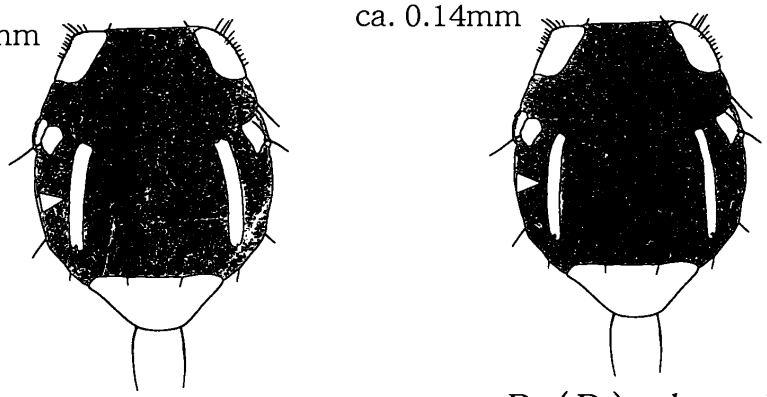
not extending beyond center of cell R4+5



B. (B.) verbascifoliae

Lateral vittae
broad
0.2-0.23 mm

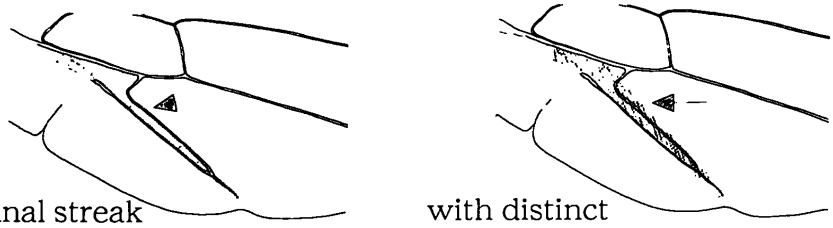
not broad
ca. 0.14mm



B. (B.) dorsalis

Cup-ex area
with weak anal streak

with distinct anal streak



B. (B.) sp. 1 (Taxon C)
Hantana dorsalis

B. (B.) sp. 7 (Taxon I)
Jambu dorsalis

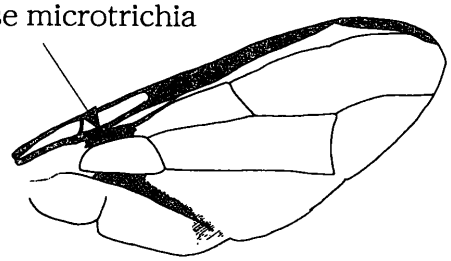
Key 8

Large speceis
Wing length ca. 7.5mm

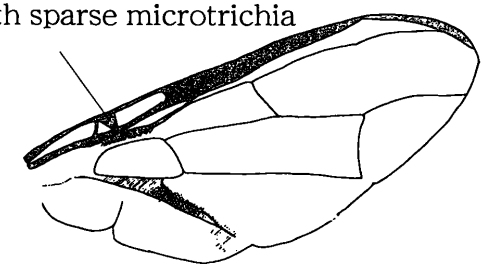
Medium species
Wing length ca. 6mm

Narrowed
part of cell br

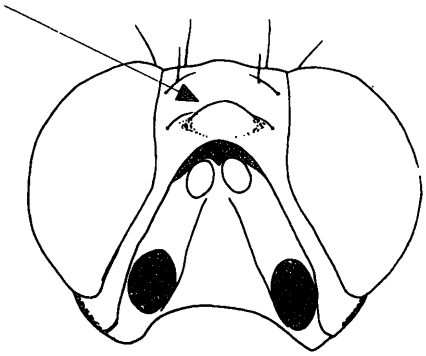
with dense microtrichia



with sparse microtrichia



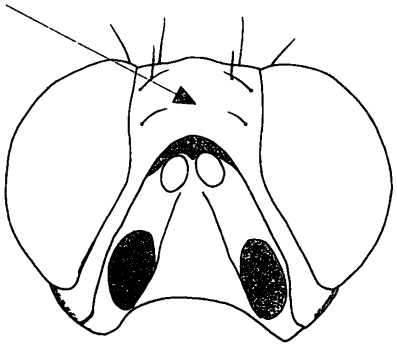
Face
with a swelling
at anterior portion



B. (*B.*) sp. 2 (Taxon D)

Large dorsalis

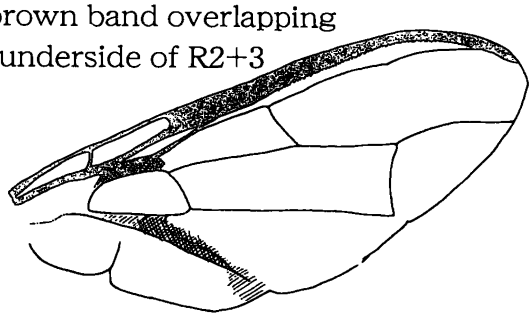
without a swelling
at anterior portion



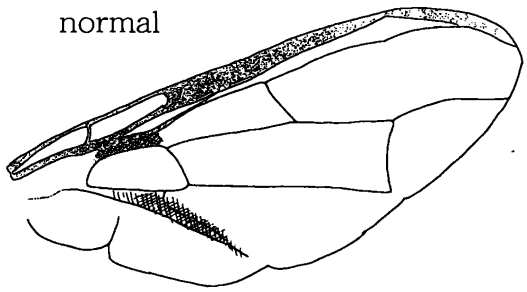
B. (*B.*) *kandiensis*

Key 9

Costal band
with brown band overlapping
along underside of R2+3

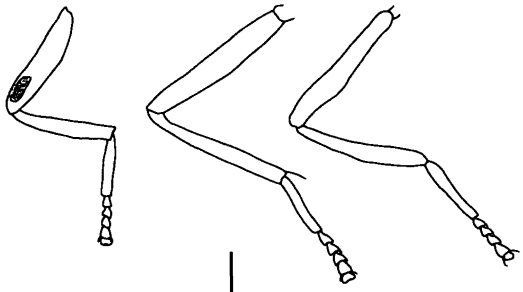


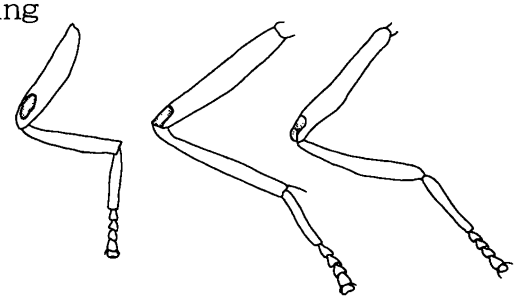
normal



Fore femur
with small
black marking

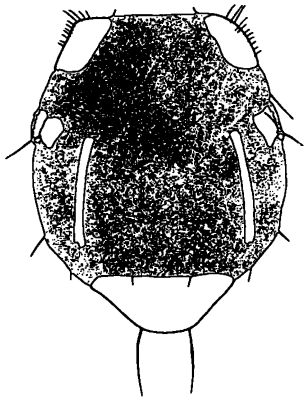
hind femur
with black marking
(fore or mid femora
sometimes black
marking

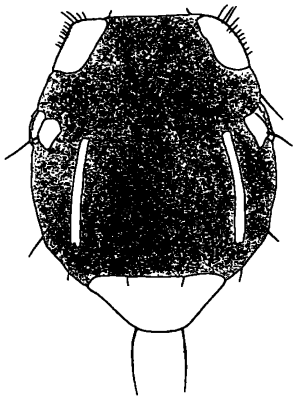




Scutum
uniformly black to
fuscous

with red brown area
shown as in illustration





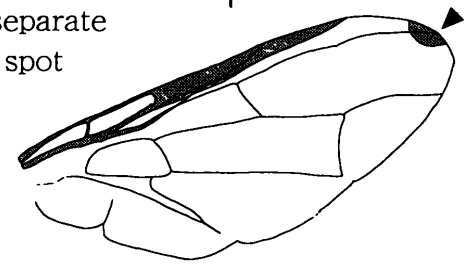
B. (*B.*) sp. 3 (Taxon E)
wide costa dorsalis

B. (*B.*) sp. 5 (Taxon G)
laggala dorsalis 2

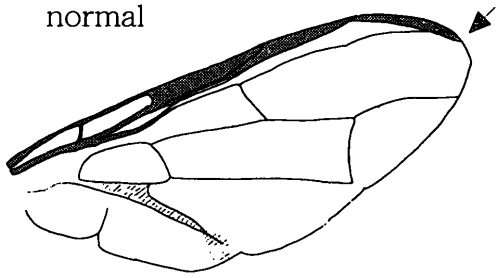
Key 10

Costal band

with separate apical spot

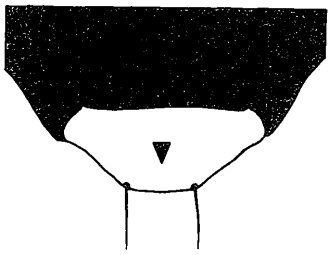


normal

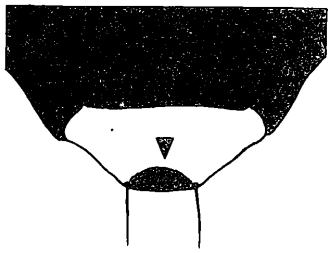


Scutellum

without apical marking



with apical marking

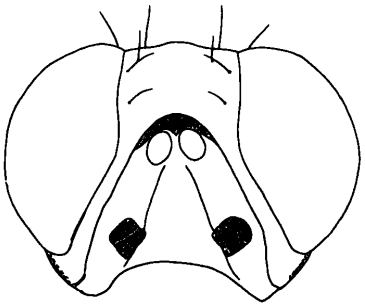


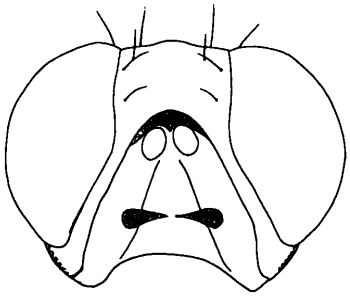
Face

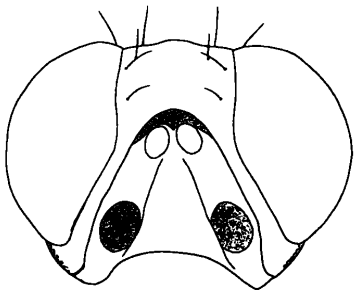
with separate spots

with transverse band

with separate spots



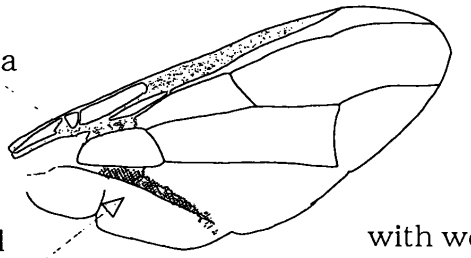




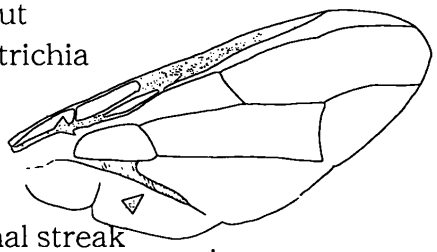
B. (B.) zonata *B. (B.) correcta* *B. (B.) versicolor*

Key 5

Narrowed part of Cell br with microtrichia



without microtrichia

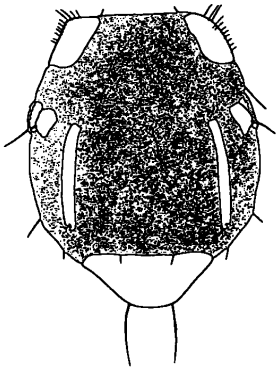


Wing with anal streak

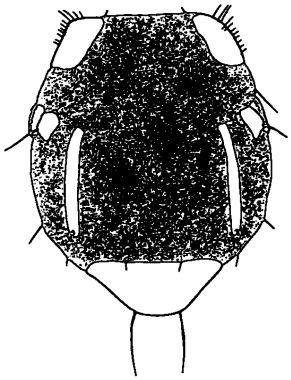
with weak anal streak

Members of *Bactrocera zonata* complex → Key 10

Scutum black to fuscous

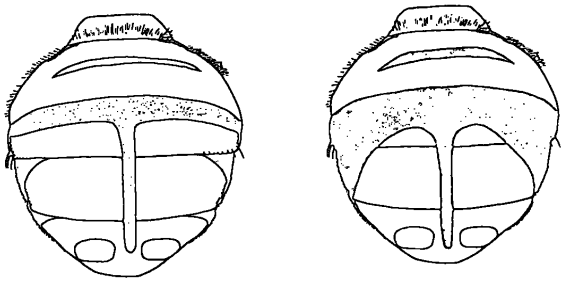


Black

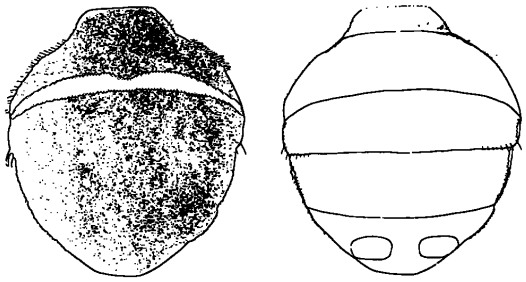


Abdominal tergites

with various markings



all black or without distinct black markings



Members of *Bactrocera dorsalis* complex

Key 6

Species not placed in species complex

Key 11

Key 11

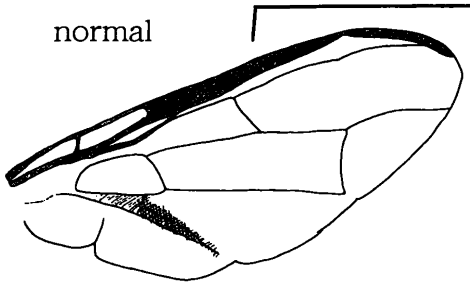
Black species

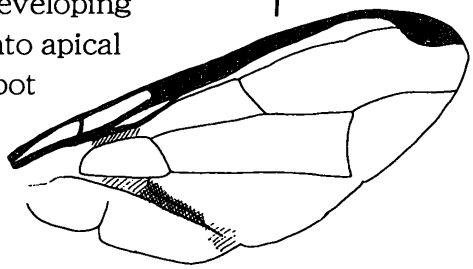
Key 12

Costal band

normal

developing into apical spot

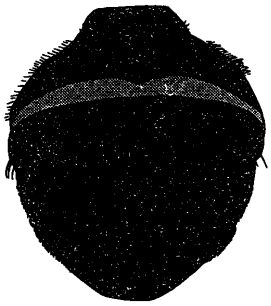


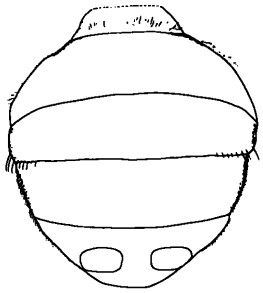


abdominal tergites

black

without distinct black markings

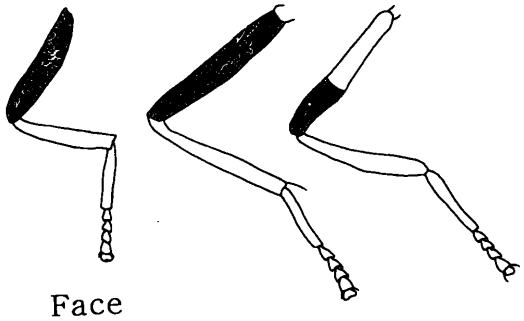


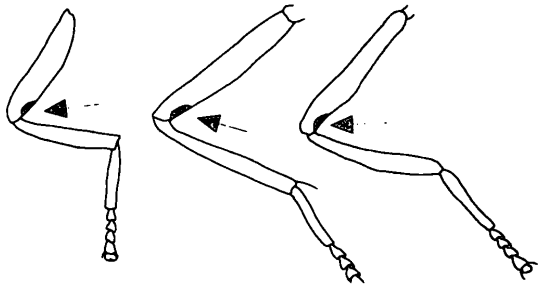


Marking on femora

as in illustrations

with black marking

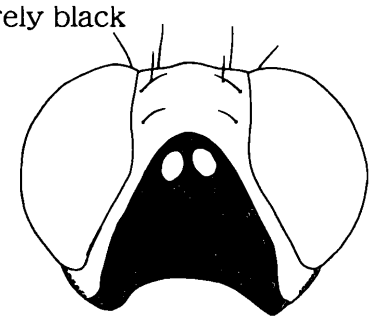


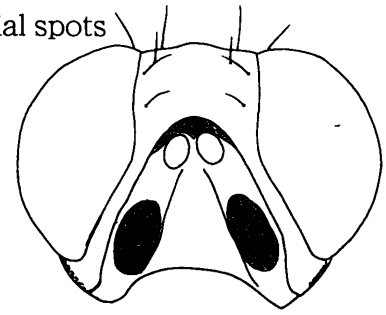


Face

entirely black

with facial spots





B. (*B.*) sp. near *nigrotibialis* (taxon K)

B. (*B.*) *latifrons*

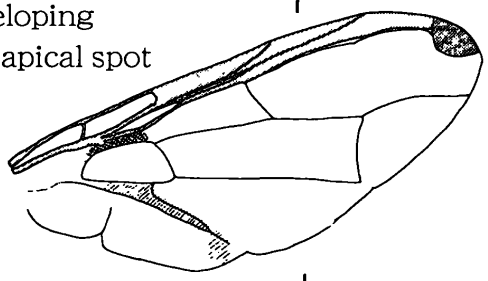
Key 12

Brown species

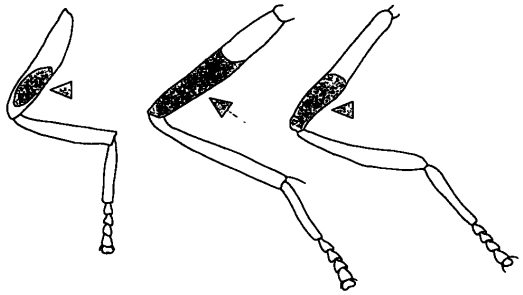
Large species

Wing length ca. 7.5mm

Costal band developing into apical spot

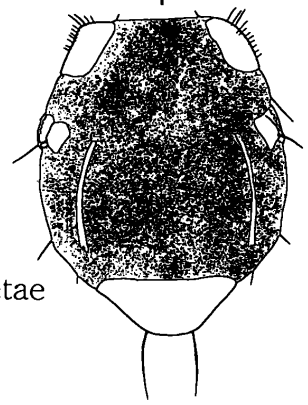


All femora with black markings



Lateral vittae very narrow

Scutum without prsc setae



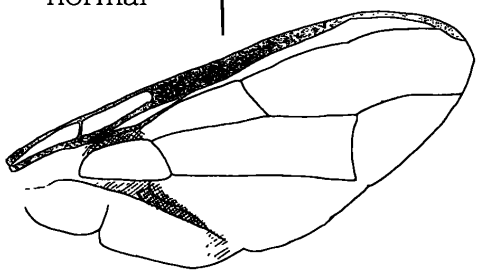
B. (*B.*) sp. 8 (Taxon J)

Large brown

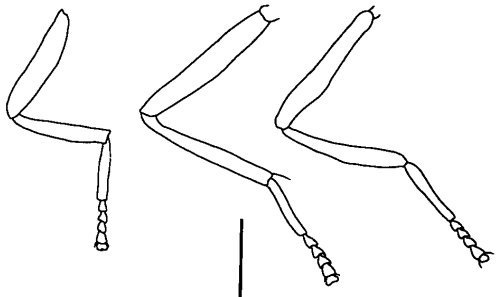
Medium species

Wing length ca. 6mm

normal

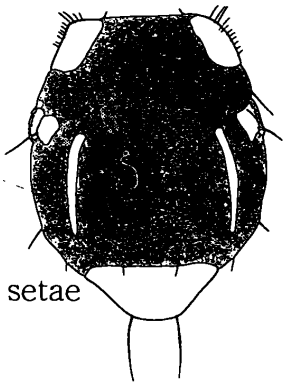


without black marking



tapering posteriorly

with prsc setae



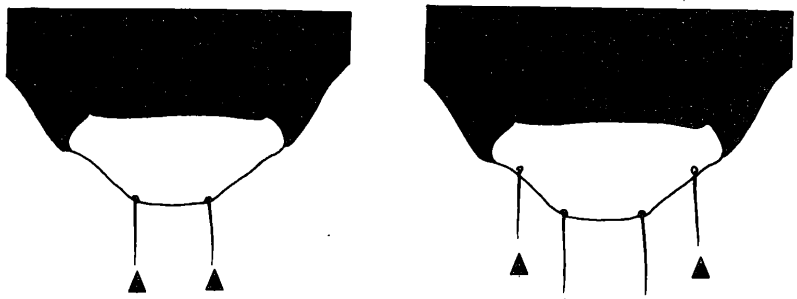
B. (*B.*) sp. 6 (Taxon H)

Brown dorsalis

Key 13

No. of scutellar setae

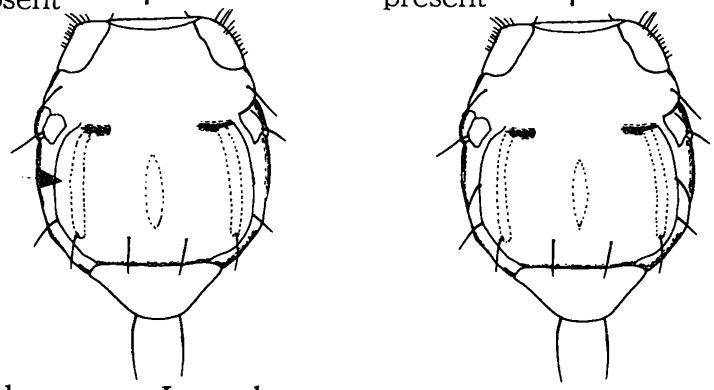
one pair (usually) — two pairs



→ Key 16

sa setae

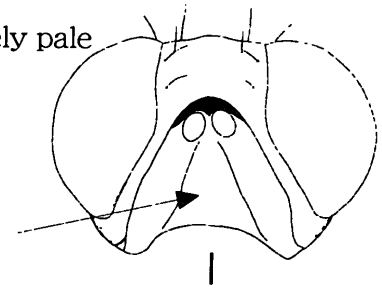
absent — present



Subgenus *Javadacus*

Face

entirely pale



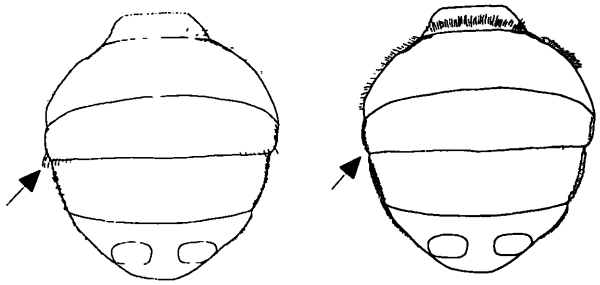
Scutum

black with small median vitta

B. (J.) trilineata

Abdominal tergite 3

with pecten — without pecten



Subgenus *Hemigymnodacus*

Key 15 — Key 14

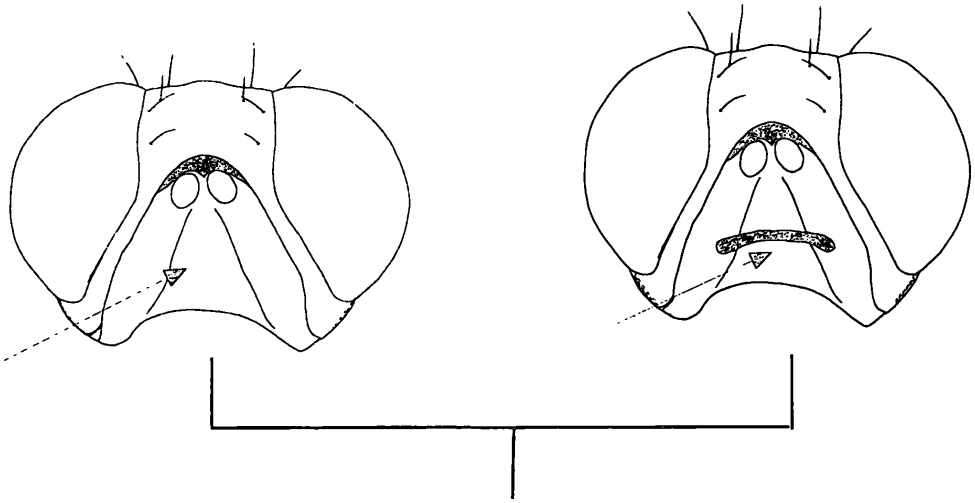
Key 14

Face in male

entirely pale

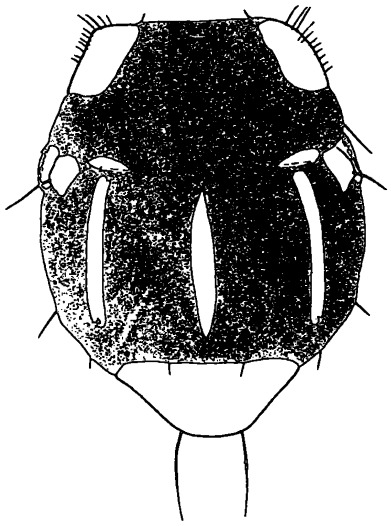
Face in female

with transverse band



Scutum

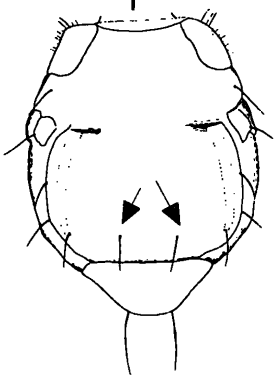
black with lateral and medial vittae



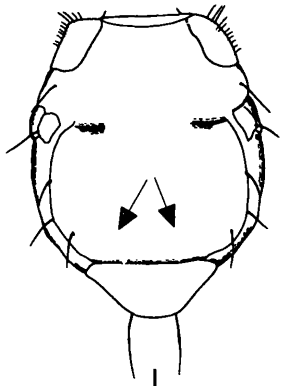
B. (Hemigymnodacus) diversa

Key 15

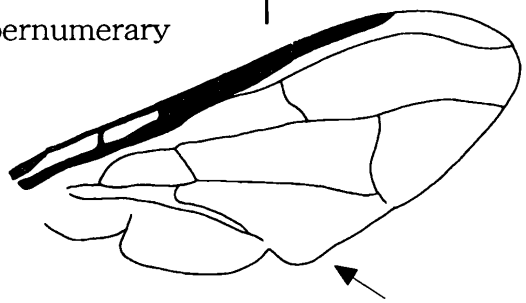
prsc setae
present



absent



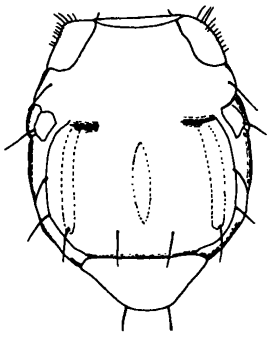
Wing in male
with supernumerary
lobe



Subgenus *Paradacus*
not recorded in Sri Lanka

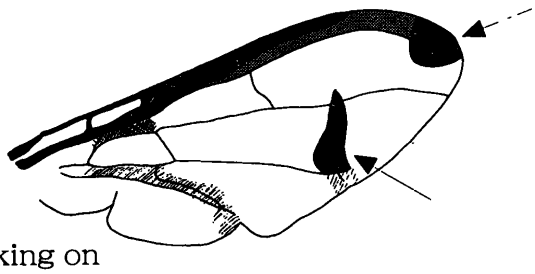
Subgenus *Zeugodacus*
(some species)

with lateral vittae
with medial vitta



Costal band
extending
into spot

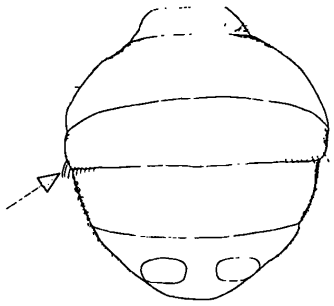
Wing
with a marking on
dm-cu cross vein



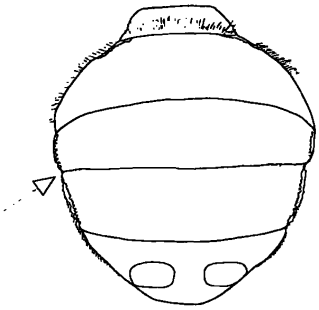
B. (Z.) cucurbitae

Key 16

Abdominal tergite 3 with pecten

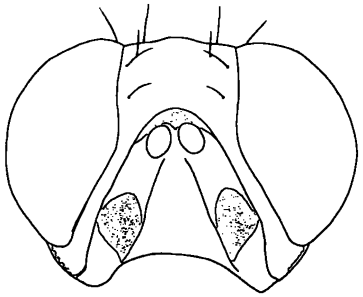


without pecten

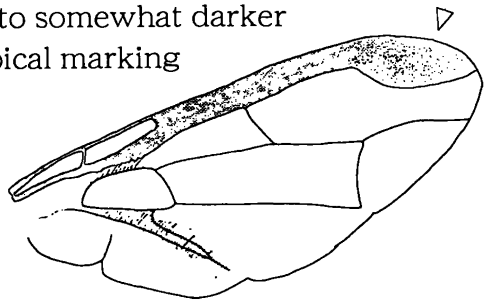


Subgenus *Paratridacus*

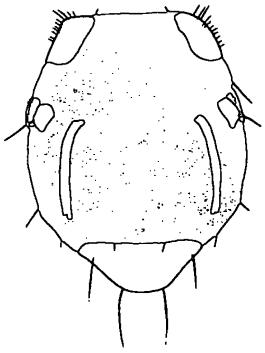
Face with facial spots



Costal band broad and developing into somewhat darker apical marking



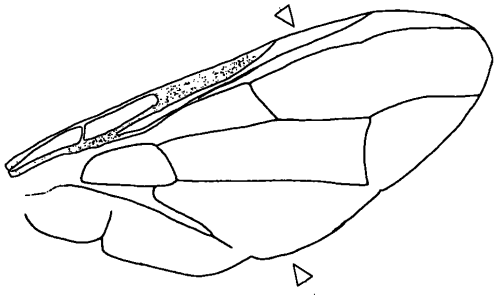
Scutum with lateral vittae



B. (Paratridacus) garciniae

Wing

without costal band



without supernumerary lobe (male)

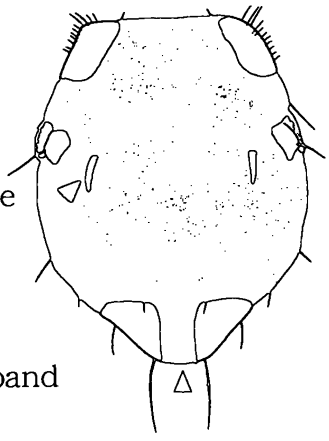
with supernumerary lobe

Key 17

Subgenus *Parazeugodacus*

Scutum with small lateral vittae

Scutellum with black band



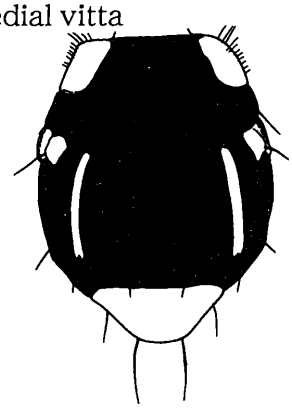
B. (Parazeugodacus) bipustulata

Key 17

Subgenus *Zeugodacus* (some species)

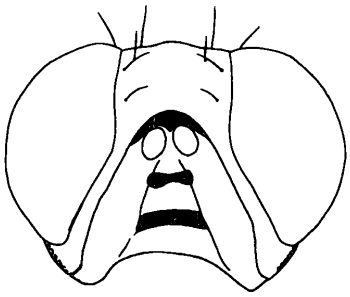
Scutum

with lateral vittae
without medial vitta



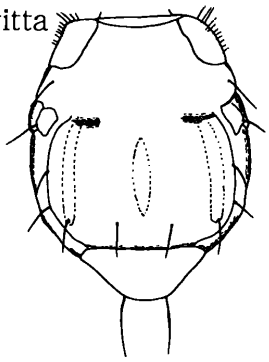
Face

with two transverse band



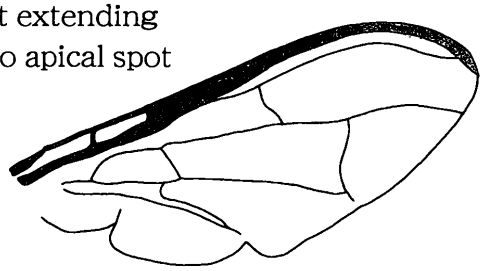
B. (Z.) duplicata

with lateral vittae
with medial vitta



Costal band

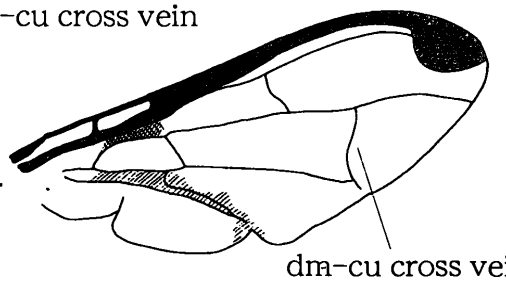
not extending into apical spot



► Key 18

Wing

without a marking on dm-cu cross vein

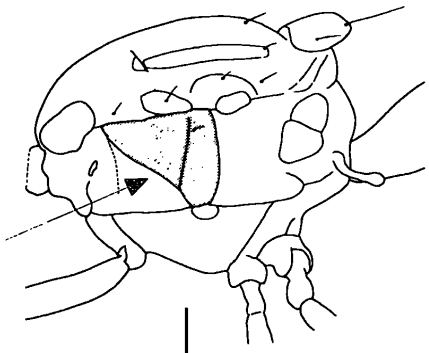


▼

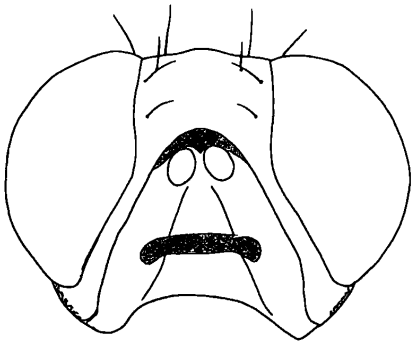
B. (Z.) sp. near tau (Taxon L)

Key 18

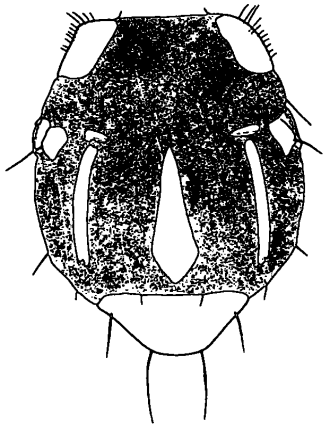
Anepisternal stripe without concavity at anterior margin



Face with transverse band

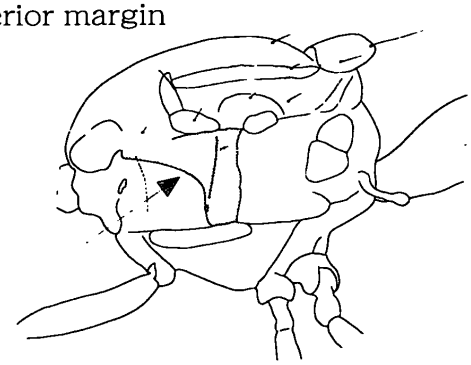


Scutum without brown area in anterior portion

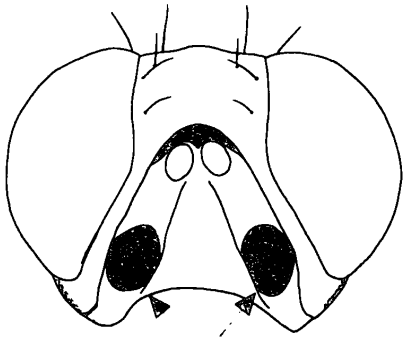


B. (Z.) caudata

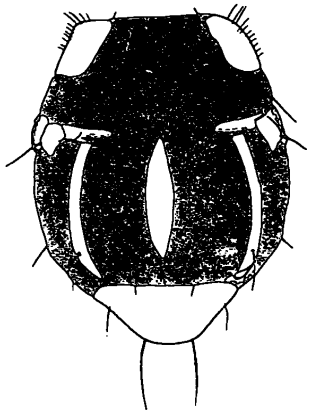
with deeply excavated at anterior margin



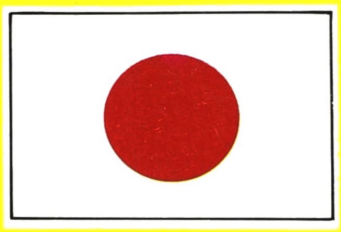
with facial spots



with brown area in anterior portion



B. (Z.) gavisa



NATIONAL PLANT QUARANTINE SERVICES PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY
KATUNAYAKE, SRI LANKA

JICA

PRINTED IN MARCH, 1999

PRINTED BY AITKEN SPENCE PRINTING (PVT) LTD.

National Digitization Project

National Science Foundation

Institute : Department of Agriculture

1. Place of Scanning : Department of Agriculture, Peradeniya
2. Date Scanned : 2018/02/22
3. Name of Digitizing Company : Sanje (Private) Ltd, No 435/16, Kottawa Rd, Hokandara North, Arangala, Hokandara
4. Scanning Officer

Name : N.S. Karunarathna.

Signature : Sithara.

Certification of Scanning

I hereby certify that the scanning of this document was carried out under my supervision, according to the norms and standards of digital scanning accurately, also keeping with the originality of the original document to be accepted in a court of law.

Certifying Officer

Designation : Chief Librarian

Name Saumya Upamalika.

Signature :

Date : 2018/02/22

"This document/publication was digitized under National Digitization Project of the National Science Foundation, Sri Lanka"