

THE SECOND REGIONAL EXPERTISE TRAINING WORKSHOP ON PEST SURVEILLANCE

GCP/RAS/286/ROK

PEST SURVEY AND IDENTIFICATION ON FRUIT FLIES

(Tephritidae)

Dr. HÀ THANH HƯƠNG

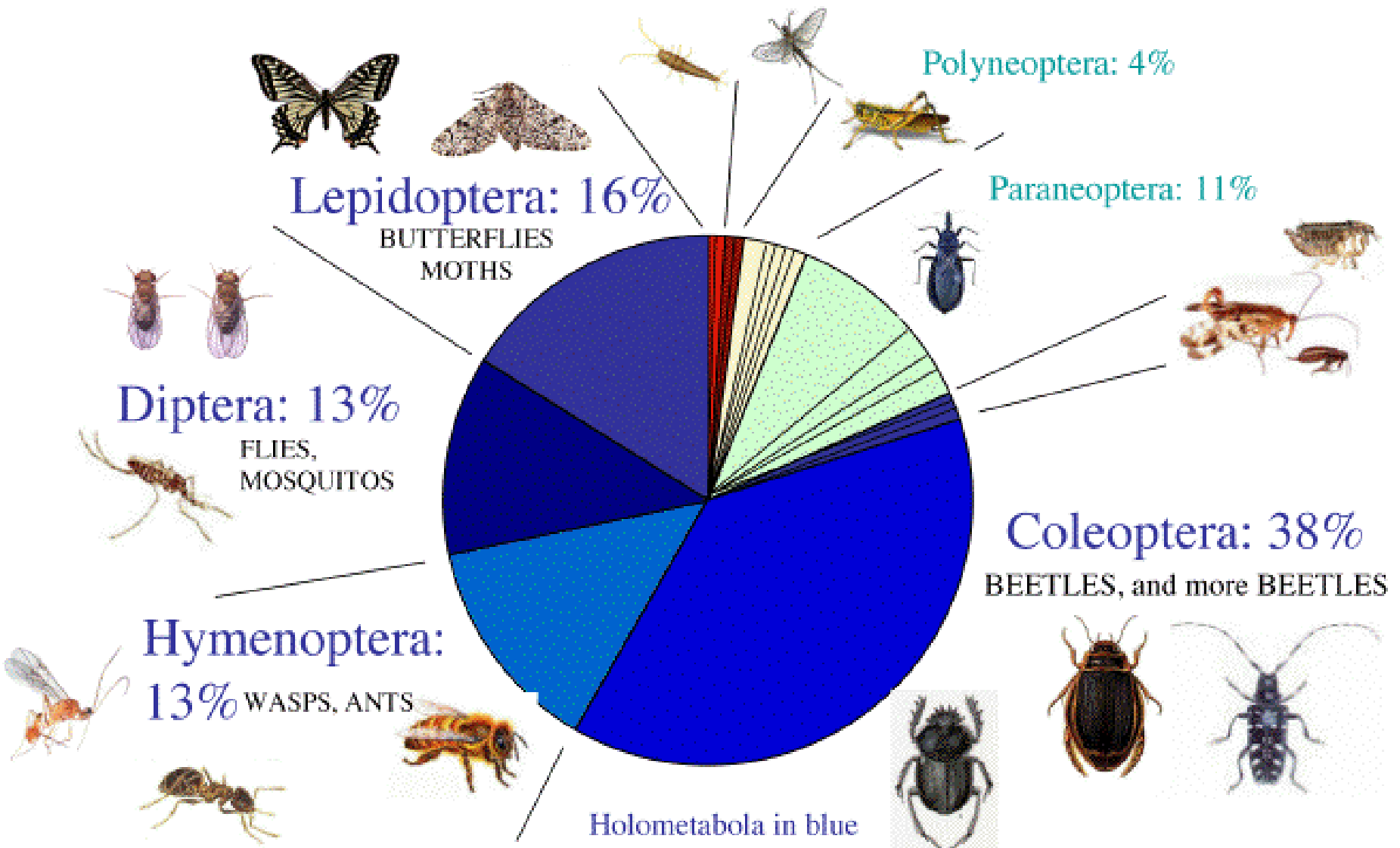


HANOI , VIETNAM- 29 JULY 2014

CONTENTS

- 1. Introduction of surveillance status on fruit flies in Vietnam**
- 2. Identification of some fruit flies species in Vietnam**
- 3. Activities on fruit flies in Vietnam**

Diversity of Species per Insect Order



Fruit flies (Diptera: Tephritidae) include some of the world's most serious agricultural pests. Besides causing billions of dollars in direct losses to a wide variety of fruit, vegetable and flower crops (e.g., citrus, apple, mango, sunflower), they limit the development of agriculture in many countries because of the strict trade quarantines imposed to prevent their spread. Of the more than 4,400 species known worldwide (Norrbon 2004), nearly 200 are considered pests.

Some fruit flies (Tephritidae) were quarantine pests of the USA, Australia, Japan, Vietnam,...



INTRODUCTION OF SURVEILLANCE STATUS ON FRUIT FLIES IN VIETNAM

ACHIEVEMENT SURVEILLANCE OF FRUIT FLIES

1. 1977-1978: Survey on 16 fruit tree species in Southern, including *Citrus* spp., *Mangifera indica*, *Musa* spp., *Annanas sativa*, *Zizyphus jujuba*, *Artocapus integrifolia* (Jackfruit), *Nephilium lappaceum* (rambutant), *Psidium guajava*, *Vitis vinifera*, *Euphoria longana*, *Hylocereus undatus*, *Durio zibethinus*, *Anona recticulata*, *Garcinia mangostana*, *Eugenia jambos*, *Spondias cytherea*

Fruit trees	Collected and identified
<i>Citrus</i> spp.	<i>Bactrocera dorsalis</i>
<i>Mangifera indica</i>	<i>Bactrocera dorsalis</i>
<i>Zizyphus jujuba</i>	<i>Bactrocera dorsalis</i>
<i>Psidium guajava</i>	<i>Bactrocera dorsalis</i> <i>Bactrocera cucurbitae</i>
<i>Vitis vinifera</i>	<i>Bactrocera dorsalis</i>
<i>Hylocereus undatus</i>	<i>Bactrocera dorsalis</i>
<i>Eugenia jambos</i>	<i>Bactrocera dorsalis</i>

ACHIEVEMENT SURVEILLANCE OF FRUIT FLIES

2. 1997-1998: Additional survey on 16 fruit tree species in Vietnam.

Fruit trees	Collected and identified
<i>Citrus</i> spp.	<i>Bactrocera dorsalis</i> <i>Bactrocera correcta</i>
<i>Euphoria longana</i> and <i>Litchi chinensis</i>	<i>Bactrocera dorsalis</i>
<i>Mangifera indica</i>	<i>Bactrocera dorsalis</i>
<i>Manilkara zapota</i> (L.) P. Royen	<i>Bactrocera dorsalis</i>
<i>Psidium guajava</i>	<i>Bactrocera dorsalis</i>
<i>Eugenia jambos</i>	<i>Bactrocera dorsalis</i>
<i>Nephilium lappaceum</i>	<i>Bactrocera dorsalis</i>
<i>Vitis vinifera</i>	<i>Bactrocera dorsalis</i>
<i>Hylocereus undatus</i>	<i>Bactrocera dorsalis</i>
<i>Prunus salicilas</i>	<i>Bactrocera dorsalis</i>

ACHIEVEMENT SURVEILLANCE OF FRUIT FLIES

3. 2006-2010: Conducted a surveillance on major crops and post-harvest products in Vietnam. Survey on 8 fruit tree species, including:
- Pomelo - *Citrus grandis*,
 - Orange - *Citrus sinensis*,
 - Lime - *Citrus limonia*,
 - Tangerine - *Citrus reticulata*,
 - Longan - *Euphoria longana*,
 - Dragon - *Hylocereus undatus*,
 - Lichee - *Litchi chinensis*,
 - Mango - *Mangifera indica*.
- Collected and identified: *Bactrocera dorsalis*, *Bactrocera correcta*

ACHIEVEMENT SURVEILLANCE OF FRUIT FLIES

4. 2010: Conducted a surveillance on major crops in south Vietnam

Stt	Scientific name of fruit fly	Host
1	<i>Bactrocera correcta</i> (Bezzi)	Mango
2	<i>Bactrocera dorsalis</i> (Hendel)	Mango

5. COOPERATION PROGRAM BETWEEN VIETNAM AND CHINA ON FRUIT FLIES MONITORING IN BORDER AREAS

- ◉ From 2009-2013:
- ◉ Trapped:
 - 2009: 169
 - 2010: 387
 - 2011: 216
 - 2012: 204
 - 2013: 236
 - Total: 1212
- ◉ Collected places:
 - 2009: 24
 - 2010: 27
 - 2011: 24
 - 2012: 24
 - 2013: 28
 - Total: 28

LIST OF MAJOR FRUIT FLIES IN VIETNAM

No	Scientific name of fruit fly	Traps
1	<i>Bactrocera correcta</i> (Bezzi)	Me, Pb
2	<i>Bactrocera dorsalis</i> (Hendel)	Cue, Me, Pb
3	<i>Bactrocera cucurbitae</i> (Coquillett)	Cue, Me, Pb
4	<i>Bactrocera tau</i> (Walker)	Cue, Pb

SURVEILLANCE METHOD

○ PURPOSE:

- Pest status and survey types
- Pest present under eradication. The pest is present and subject to control measures. Includes FFALPP
- Detection surveys, applied to determine if the pest is present in an area

○ METHOD FOR DETECTION

○ IDENTIFY

○ RECORD

METHOD FOR DETECTION

○ Fruit flies may be detected

- as eggs or larvae in fruit imports, as attacked growing fruit or as adults caught in detection
- as adults caught in monitoring traps

○ Collecting attacked fruit:

- Collected fruit had puncture marks made by the entry of the female's ovipositor in the field.
- Field sampling should be transported to the Lab.
- In Lab., sampling fruit should be placed in a container. Sample should be checked every 2 days for pupa and larvae have emerged should be discarded
- Pupa can be transferred to Petri dishes and provide some sugar solution as food for the emerging adults and to keep the adult alive for at least 4 days after emergence (flies will develop their full body coloration and normal shape)

COLLECTING ATTACKED FRUIT



METHOD FOR DETECTION

◉ Fruit fly trapping and baits

- Population of fruit flies are sometimes first detected in monitoring traps set in areas susceptible to fruit fly attack.
- The male of most *Bactrocera*, *Ceratitis*, *Dacus* genus can be collected in traps. Male lures are Methyl Eugenol (ME), Cue Lure (CuE), Trimedlure (TML)
- Both females and males of any fruit associated species may be collected in traps baited (e.g. yeast autolysate, hydrolyzed protein or ammonium carbonate)

TYPE OF ATTRACTANTS AND TRAPS



Attractive
Methyl
eugenol
(ME)



Attractive
Cuelure
(CuE)



Attractive
Trimedlure
(TML)



Protein
baits (Pb)



Steiner (S) trap (for Me, Cue và TML)



McPhail trap



ATTRACTANT AND TRAPS FOR FRUIT FLIES SURVEYS

- ◉ FOR MALE FRUIT FLIES SURVEYS
- ◉ ISPM 26, Appendix 1, table 2a
- ◉ Attracts the males of some *Bactrocera* spp.
 - 81 species recorded at methyl eugenol
 - 211 species recorded at cue lure
- ◉ FOR FEMALE FRUIT FLIES SURVEYS
- ◉ ISPM 26, Appendix 1, table 2b

DETECT A TRAP/BAIT PLACEMENT

- Used GPS to detect each trapping or bait

	A	B	C	D	E	F	G	H	I
1									
2	Số hiệu điểm bẫy	B. P. SINH		Số hiệu điểm bẫy	B. P. SINH		Số hiệu điểm bẫy	B. P. SINH	
3		Vĩ độ	Kinh độ		Vĩ độ	Kinh độ		Vĩ độ	Kinh độ
4	Me1	21°37.158N	107°42.852E	BPS1 Me1	21°38E694N	107°46E.452N	BPS1 Me1	21°38E704N	107°46E.447N
5	Me2	21°37.142N	107°42.869E	BPS1 Me2	21°38E699N	107°46E.448N	BPS1 Me2	21°38E713N	107°46E.456N
6	Me3	21°37.128N	107°42.857E	BPS1 Cue1	21°38E696N	107°46E.499N	BPS1 Cue1	21°38E702N	107°46E.453N
7	Me4	21°37.136N	107°42.843E	BPS1 Cue2	21°38E712N	107°46E459N	BPS1 Cue2	21°38E716N	107°46E451N
8	Cue1	21°37.173N	107°42.868E	BPS1 TML1	21°38E697N	107°46E456N	BPS1 TML1	21°38E709N	107°46E453N
9	Cue2	21°37.182N	107°42.839E	BPS1 TML2	21°38E703N	107°46E463N	BPS1 TML2	21°38E708N	107°46E444N
10	Cue3	21°37.178N	107°42.855E	BPS1 PB1	21°38E706N	107°46E458N	BPS1 PB1	21°38E700N	107°46E456N
11	Cue4	21°37.177N	107°42.833E	BPS1 PB2	21°38E698N	107°46E453N	BPS1 PB2	21°38E702N	107°46E448N
12	TML1	21°37.147N	107°42.850E	BPS2 Me1	21°37E147N	107°42E849N	BPS2 Me1	21°37E145N	107°42E882N
13	TML2	21°37.154N	107°42.866E	BPS2 Me2	21°37E144N	107°42E830N	BPS2 Me2	21°37E149N	107°42E887N
14	TML3	21°37.170N	107°42.838E	BPS2 Cue1	21°37E165N	107°42E863N	BPS2 Cue1	21°37E157N	107°42E853N
15	TML4	21°37.158N	107°42.864E	BPS2 Cue2	21°37E145N	107°42E878N	BPS2 Cue2	21°37E167N	107°42E861N
16	PB1	21°37.182N	107°42.865E	BPS2 TML1	21°37E170N	107°42E839N	BPS2 TML1	21°37E143N	107°42E868N
17	PB2	21°37.133N	107°42.862E	BPS2 TML2	21°37E177N	107°42E855N	BPS2 TML2	21°37E144N	107°42E873N
18	PB3	21°37.166N	107°42.861E	BPS2 PB1	21°37E175N	107°42E855N	BPS2 PB1	21°37E155N	107°42E839N
19	PB4	21°37.156N	107°42.838E	BPS2 PB2	21°37E538N	107°42E843N	BPS2 PB2	21°37E157N	107°42E855N
20	PB5	21°37.162N	107°42.840E	BPS3 Me1	21°37E538N	107°43E114N	BPS3 Me1	21°37E542N	107°43E118N
21	PB1	21°37.182N	107°42.865E	BPS3 Me2	21°37E526N	107°43E096N	BPS3 Me2	21°37E527N	107°43E103N
22	PB2	21°37.133N	107°42.862E	BPS3 Cue1	21°37E526N	107°43E103N	BPS3 Cue1	21°37E535N	107°43E111N

TRAP PLACEMENT

- Trap placement: 1.5 m above ground
- The distance between the trap: > 30m, other traps lure or bait must be separated by 3m
- The density of traps: Me, Cue and TML, each type 3-12 traps/km²
- Traps must have signs and use GPS positioning

TRAP PLECEMENT



TRAP PLACEMENT



ADDITIONAL OR REPLACEMENT ATTRACTANT AND TRAPS

- ①- **Me and Cue attractants** usually added 1month/time, each time adding 2-3ml. Cotton must be replaced after 2 months.
- ②- Each month instead **TML attractant**, each time 1 table.
- ③- Each 15 days instead **Pb bait**, each time 3 tables

COLLECTED METHODS

- ◉ Collect specimen in trap: 15 days/time
- ◉ Minimum number of specimen: at least 3 specimens /one species
- ◉ Curation method: Pinned
- ◉ Collection techniques: traps (attractive or bait)
- ◉ Keeping specimens:
 - Kill Jar: to keep only specimens from a single locality together with label
 - Freezer: to keep fresh specimens with label

PRESERVATION METHOD

- ◉ Specimen Labels, Types of Labels

- ◉ 1. Locality Label

- Country, state (territory, province), and county (township) information should be presented across the top of the label
- A general descriptive geographic location, including a site name, how many kilometers and compass direction from the nearest major specific map location; town, mountain peak, lake, specific park or refuge, etc
- A specific geographic location
- Date of collection: The date should include the year, month and day
- The name of the person(s) collecting the specimen should appear at the bottom of the label

- ◉ 2. Additional Information Labels

- ◉ 3. Taxonomic Name, Determination Label: provides the name of the specimen, to the lowest taxonomic rank possible (species or subspecies)

- ◉ Labels for Different Preservation Methods

- Specimenspinned dry: Labels are positioned under the specimen on the pin. A locality label is on top, and a taxonomic identification label underneath the locality label. The labels should be oriented parallel to the longitudinal axis of the specimen, positioned to be read from the left side of the specimen

Locality Label:

USA NM Bernlillo Co
1 km S I-25, 8 km W
Albuquerque, 1762 m el.
N 35 1.79 W 106 54.16
23 August 2000
Coll. R. Anderson

Other Information:

Desert grassland, 2000 m elev.
Sweep net from *Atriplex canescens*

Determination Label:

Aeolopledes elegans (Scudder)

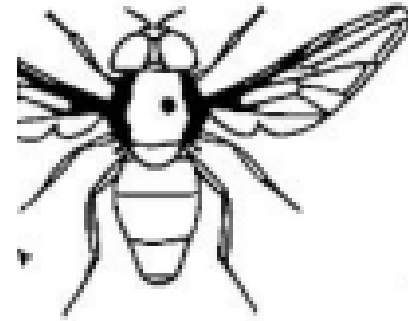
Det. D.C.Lightfoot 2001

Note: We recommend 4 font size, Arial font as used in the examples above. These labels were created with MS Word, using the line drawing feature. The lines around the labels are not necessary, but used above to define the appropriate label size

PRESERVATION METHOD

◎ ADULT:

- ◎ Pinning: Fruit flies are pinned dorsal side up at a specific place on their body.
- Diptera specimens are often glued to special paper points.
- The fruit flies is glued to the tip of the point dorsal side up.
- The point is then mounted on an insect pin about 6mm from the top of the pin



COLLETED SPECIMENTS



IDENTIFY

- From specimen of fruit flies to morphological identify to species

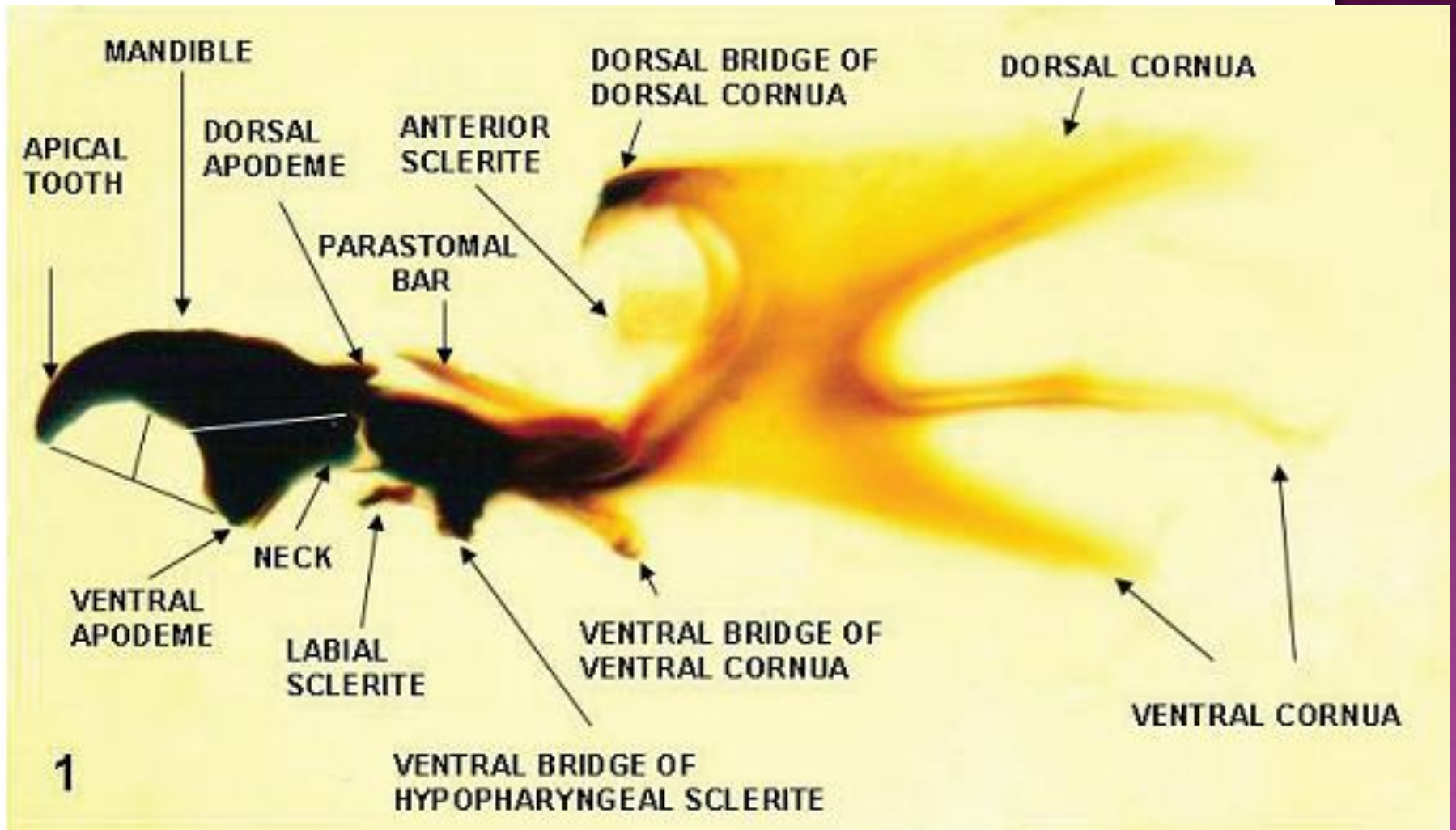


IDENTIFY

- ◉ **Key to adults:** White I.M and Elson-Harris M.M, 1992. Fruit flies of economic significance: their identification and bionomics, Page 53-111
 - Key to Bactrocera and Dacus species
 - Key to Anastrepha species
 - Key Ceratitis species
- ◉ **Morphological diagnosis of adult fruit flies include:**
 - Wing morphology and infuscation
 - Presence or absence of various setae, and relative setal size
 - Overall colour and colour patterning
 - Presence, shape and colour of thoracic vittae. A vitta is a band or stripe of colour

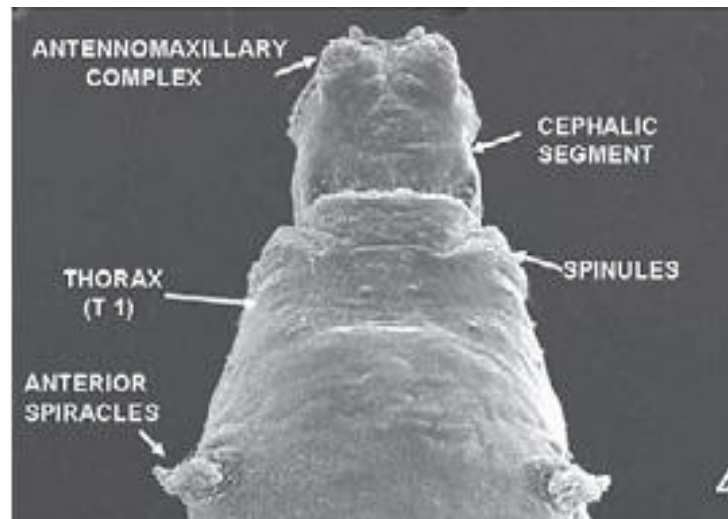
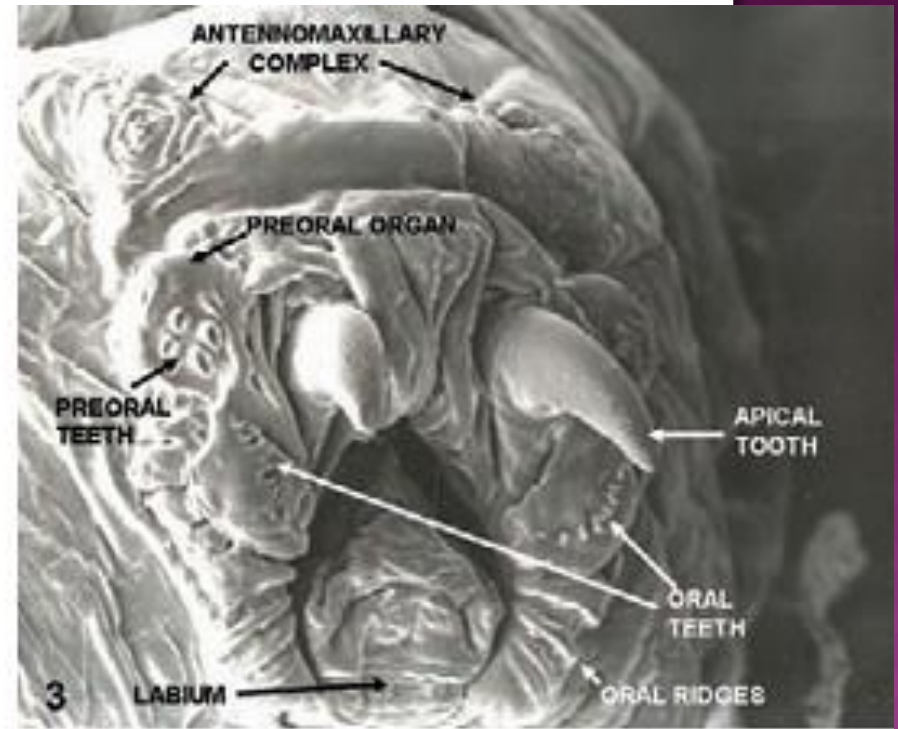
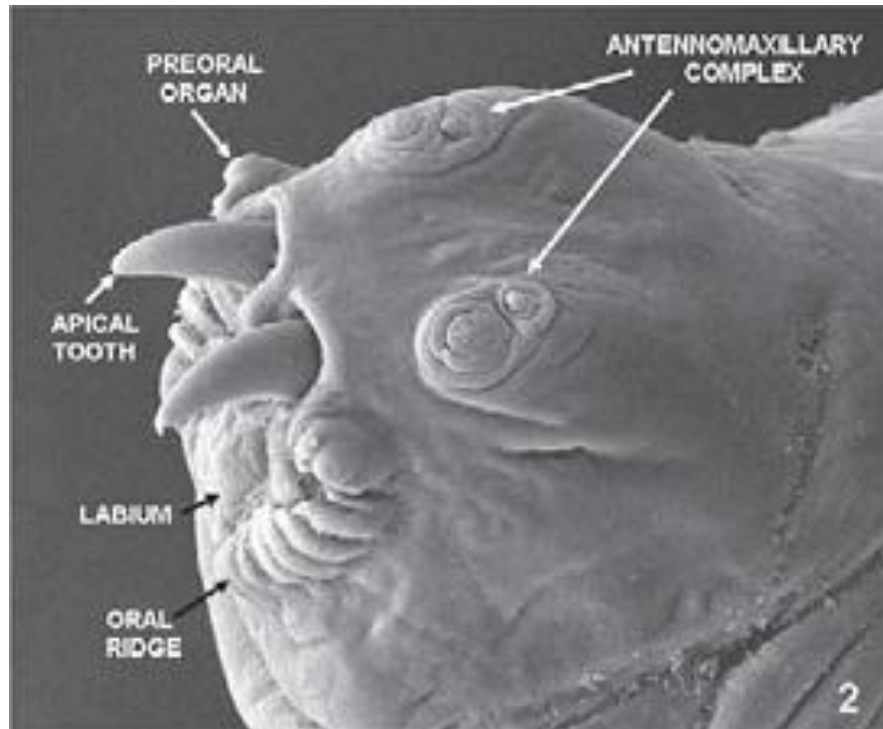
IDENTIFY

- **Key to third instar larvae:** White I.M and Elson-Harris M.M, 1992. Fruit flies of economic significance: their identification and bionomics, Page 112-127

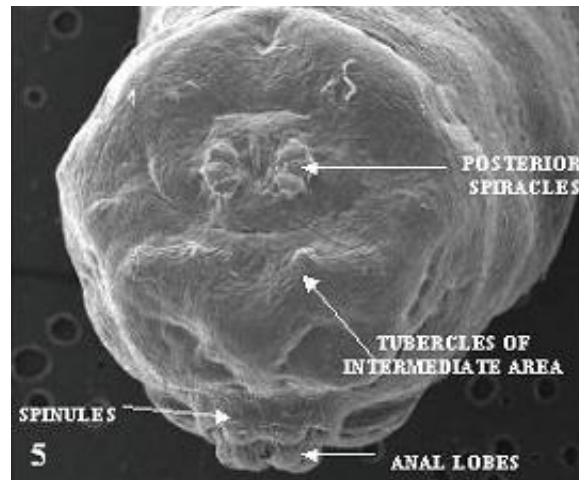


MOUTHHOOK OF THIRD INSTAR LARVA

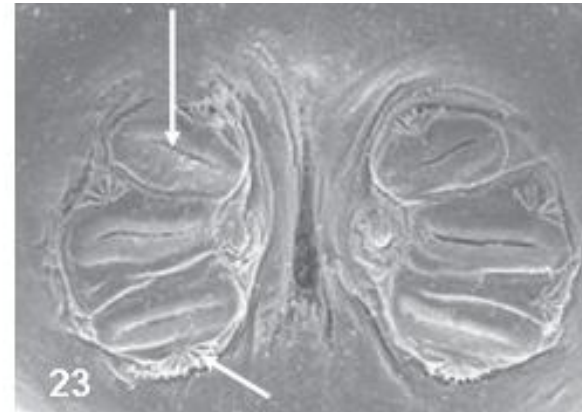
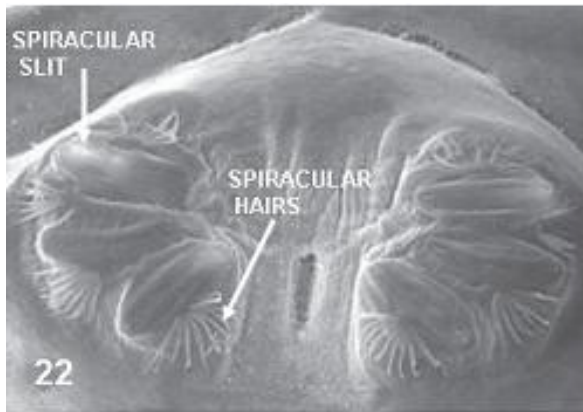
CEPHALIC SEGMENT OF THIRD INSTAR LARVA



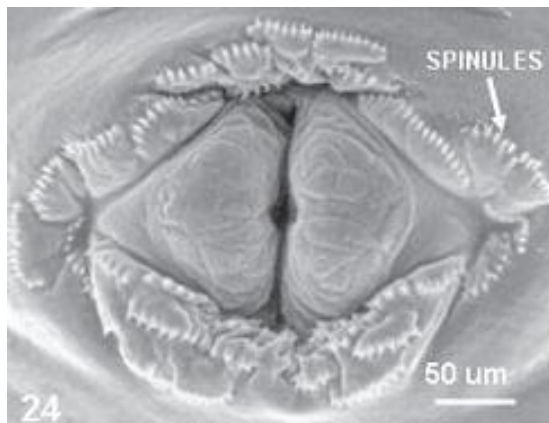
CAUDAL SEGMENT OF THIRD INSTAR LARVA



POSTERIOR
SPIRACLES
OF THIRD
INSTAR
LARVA



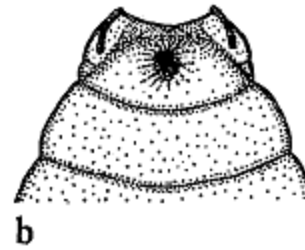
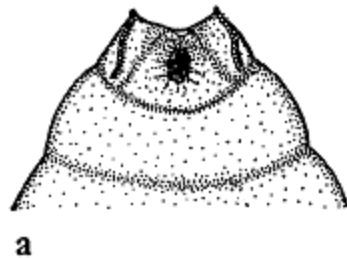
ANAL LOBES
AND
SPINULES OF
THIRD
INSTAR
LARVA



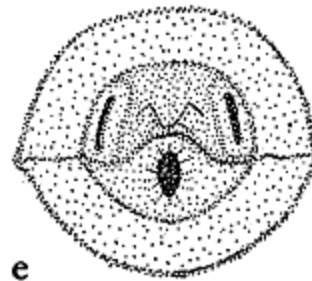
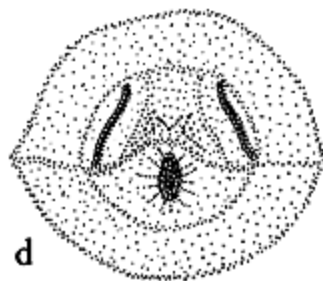
IDENTIFY

- Key to pupa: Teichi Yamada, Susumu Nakagawa and Hitoshi Kamasaki, 1963. Identification of three species of reared Hawaiian fruit fly pupae. Vol. XVIII, No.2, July 1963, Page 319-321

B. cucurbitae



B. dorsalis



a,b: anterior ends

d,e: anterior spiracles and a faint M-shaped row of pits of



[Diptera](#) [Order](#) [Common Names](#) [Names](#) [Distribution](#) [List](#) [Members](#) [Picture Gallery](#) [Media Resources](#) [External Resources](#) [Help](#)



Classification

Kingdom Animalia (Animals)
 Phylum Arthropoda (Arthropods)
 Subphylum Hexapoda (Hexapods)
 Class Insecta (Insects)
 Order Diptera (Flies)
 No Taxon ("Acalyptatae")
 Superfamily Tephritoidea
 Family Tephritidae (Fruit Flies)

Other Common Names

Picture-winged Flies (not recommended, as being more commonly applied to Ulidiidae/Otitidae)

Numbers

ca. 300 spp. in 55 genera in our area⁽¹⁾, >360 spp. in 62 genera in the Nearctic Region, ~4,500 spp. in almost 500 genera worldwide⁽²⁾

Overview of our fauna (* -taxa not yet in the guide; classification adapted from⁽²⁾):

Family Tephritidae

SUBFAMILY [*BLEPHARONEURINAE](#) **Blepharoneura*

SUBFAMILY [DACINAE](#)

Tribe [Dacini](#) *Bactrocera*

Tribe [Ceratitis](#) *Ceratitis*

SUBFAMILY [TRYPETINAE](#)

Tribe [Adramini](#) *Euphranta* (subgenus *Rhacochaena*)

Tribe [Carpomyini](#)

- Subtribe [Carpomyina](#) **Cryptodacus*, *Rhagoletis*, *Rhagoletotrypeta*, *Zonosemata*
- Subtribe [Paraterelliina](#) *Oedicarena*, **Paraterellia*

Tribe [Toxotrypanini](#) *Anastrepha*, **Hexachaeta*, *Toxotrypana*



UW Madison Department of Entomology *Insect ID*

[Home](#)[About Us](#)[Insect Diagnostic Lab](#)[Info Sheets](#)[Contact Us](#)
Search This Site

- [Home](#)
- [Ants](#)
- [Beetles](#)
- [Big Bugs](#)
- [Biting Insects](#)
- [Borers](#)
- [Bugs](#)
- [Fabric-Eating Insects](#)
- [Flowers](#)
- [Galls](#)
- [Indoor Flies](#)
- [Indoor Gnats](#)
- [Indoor/Kitchen Insects](#)
- [Indoor Worms](#)
- [Odd Insects](#)
- [Outdoor Insect Invaders](#)
- [Outdoor Worms](#)
- [Pine Insects](#)
- [Shrubs](#)
- [Spiders](#)
- [Tree Insects](#)
- [Wasps and Bees](#)

Indoor Flies

Click the thumbnail image to view a larger image and links to helpful information.

Blow Fly



Cluster Fly



Clusterfly 2



Clusterfly3



Drain Fly



Flesh Fly



Fruit Fly



Fruit Fly



Fruit Fly 3



Fungus Gnat



Fungus Gnat 2



Fungus Gnat 3



Fungus Gnat Larvae



Moth Fly



Phorid Fly



Small Dung Fly





PaDIL – High quality images and Information tools designed for Biosecurity and Biodiversity.

Biosecurity and Biodiversity : protecting against invasive pests and diseases and discovery of native species.

The Plant Biosecurity Cooperative Research Centre (PBCRC) has taken over responsibility for maintaining PaDIL during 2014 pending the development of a Business Plan to determine its future role and viability.

During this period, please email padil@pbcrc.com.au for all PaDIL related enquiries.

Biosecurity

Search-lite

Bowerbird

Biodiversity

Search-lite.

Search-lite is the simplest and fastest way to find something in PaDIL.

Bactrocera dorsalis : Oriental Fruit Fly

Species: :

Taxonomy:



« Search Again

Go To Species Page »

Go To Image Library »



THE AUSTRALIAN HANDBOOK FOR THE IDENTIFICATION OF FRUIT FLIES

Version 1.0

Species: Dactylocera bryoniae



Species: Dactylocera frauenfeldi



Species: Dactylocera kondanensis



Species: Dactylocera laxa



Species: Dactylocera trilineata



Species: Dactylocera umbrina



Species: Dactylocera zanthodes



Species: Dactylocera neumannii



Welcome to Flickr Hive Mind, almost certainly the best search engine for photography on the web. If you are a Flickr user and [Log into Flickr](#) you will be able to see your private photos, as well as larger thumbnails.
Hivemind: <http://flickrhivemind.net/Tags/bactrocera,tephritidae> Hits: 1231 Pages: 25 Flickr Hive Mind is a data mining tool for the Flickr photography database. Where do these thumbnails come from? How are the photos licensed?

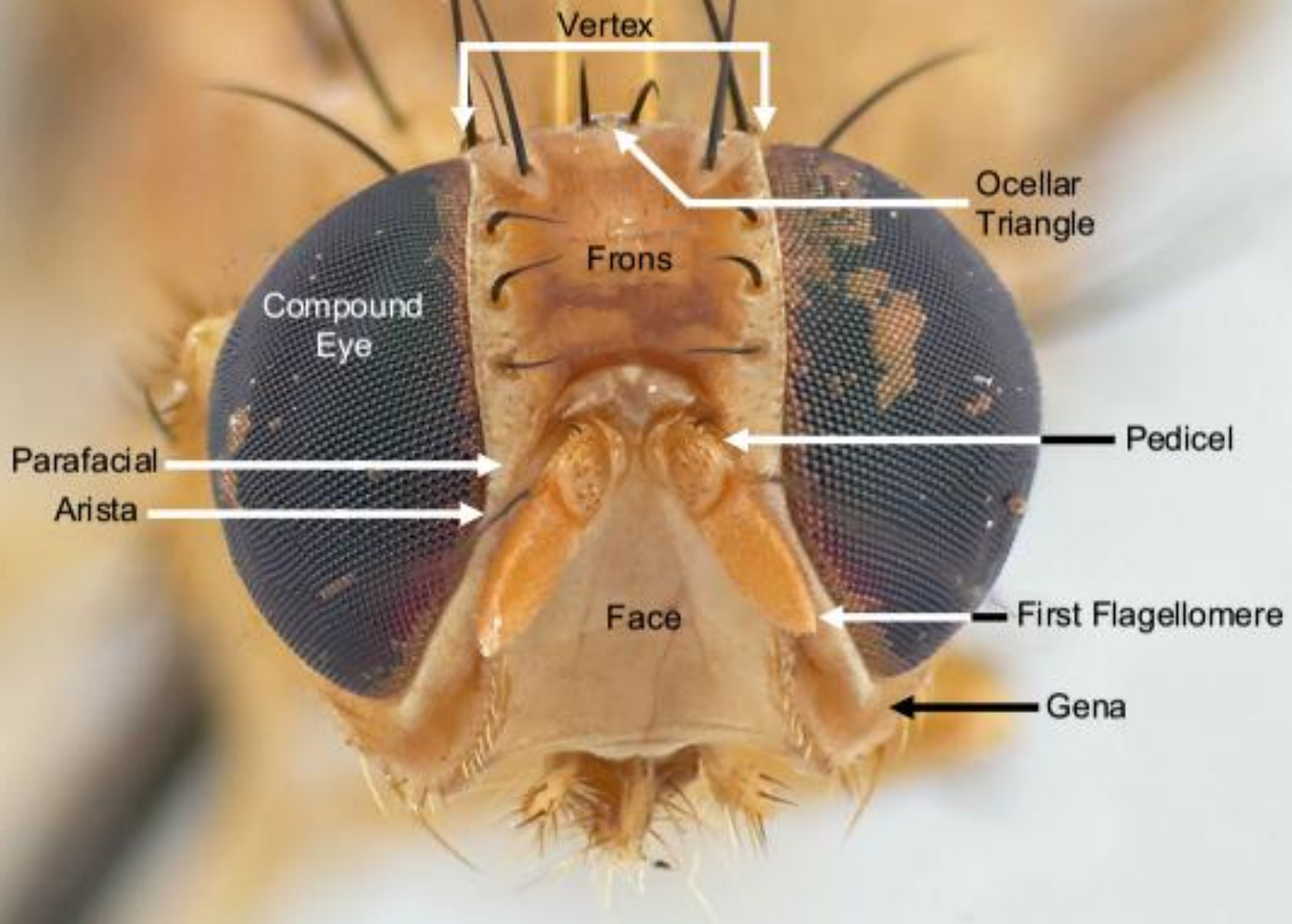


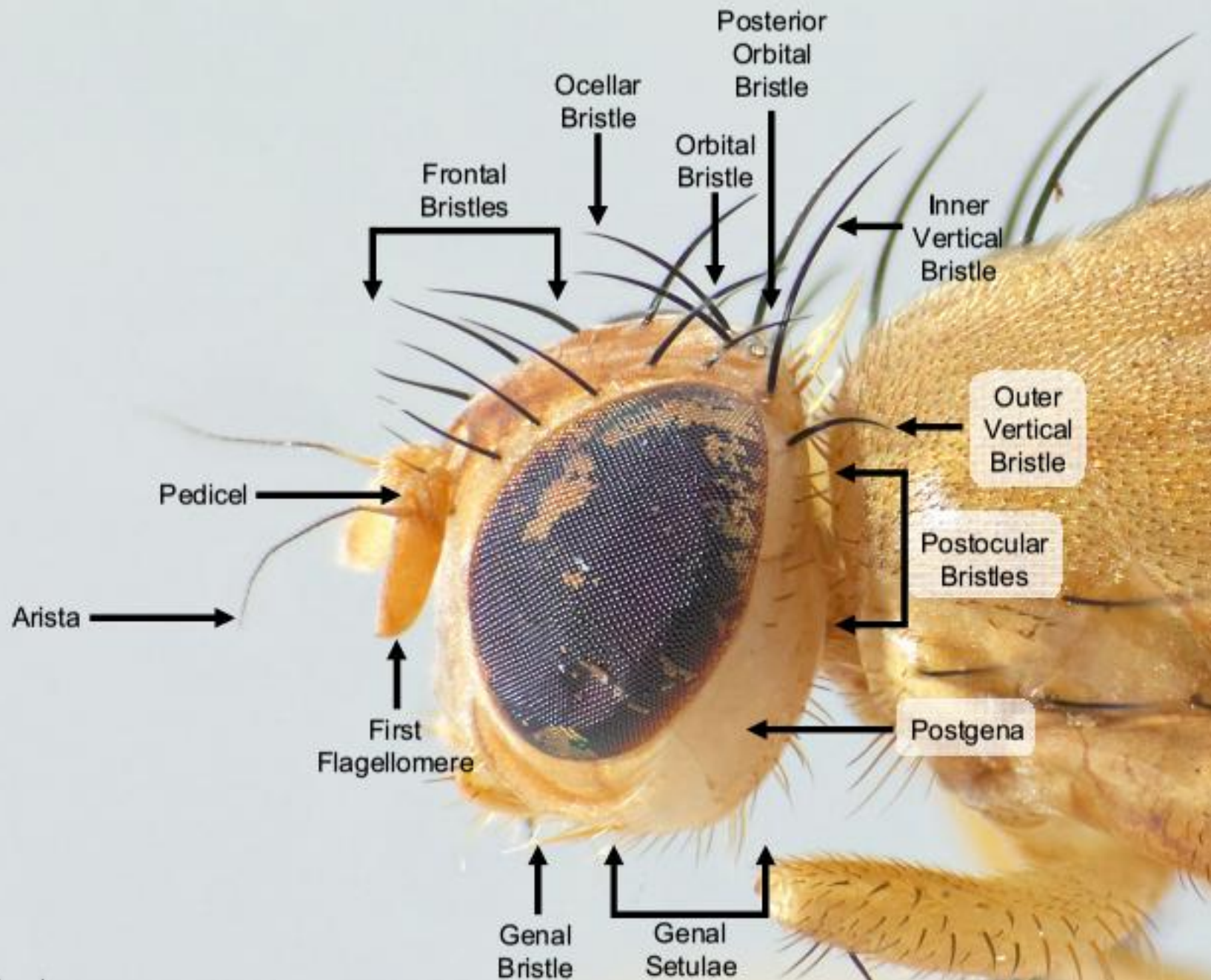
RECORD

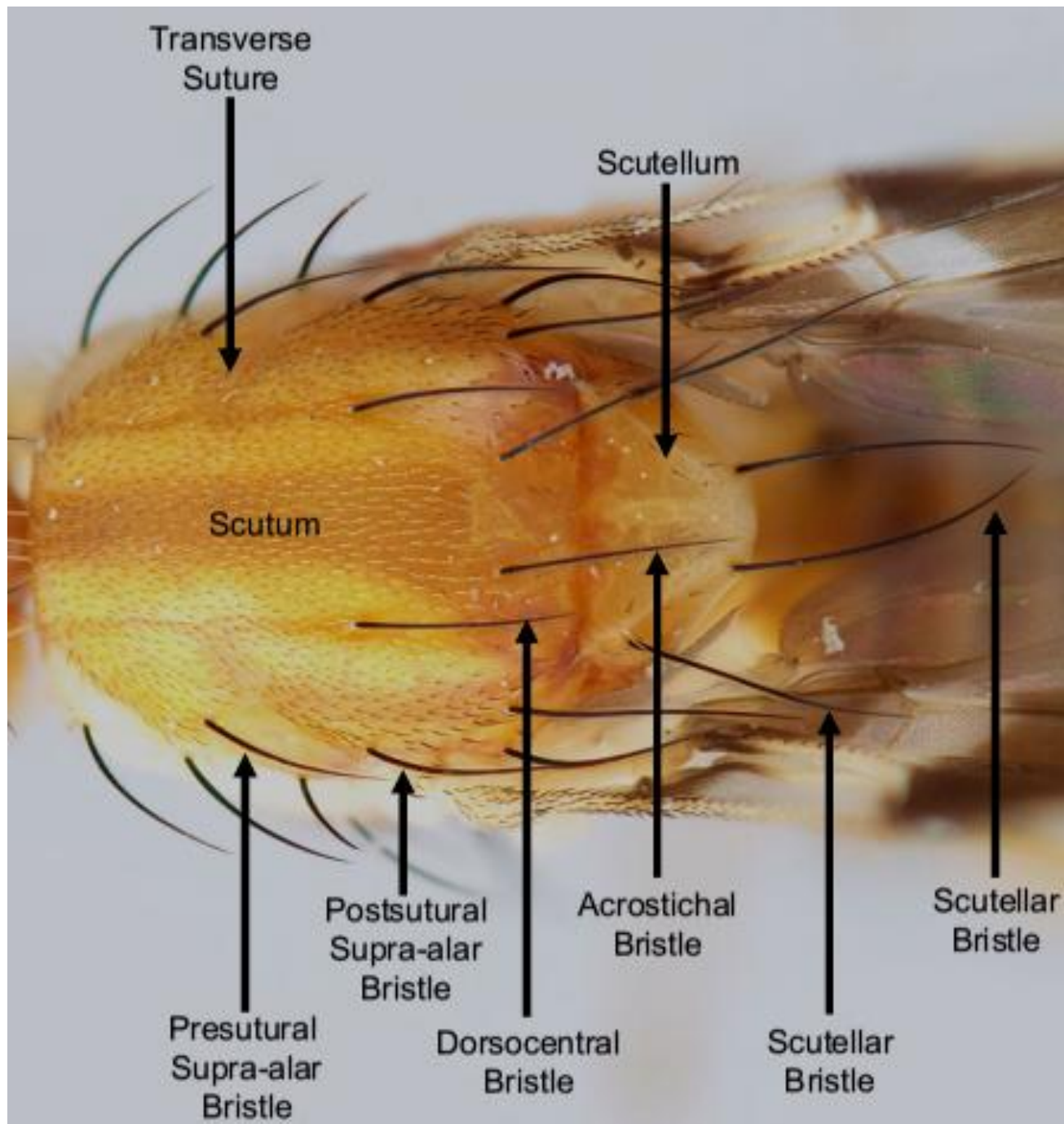
For example:

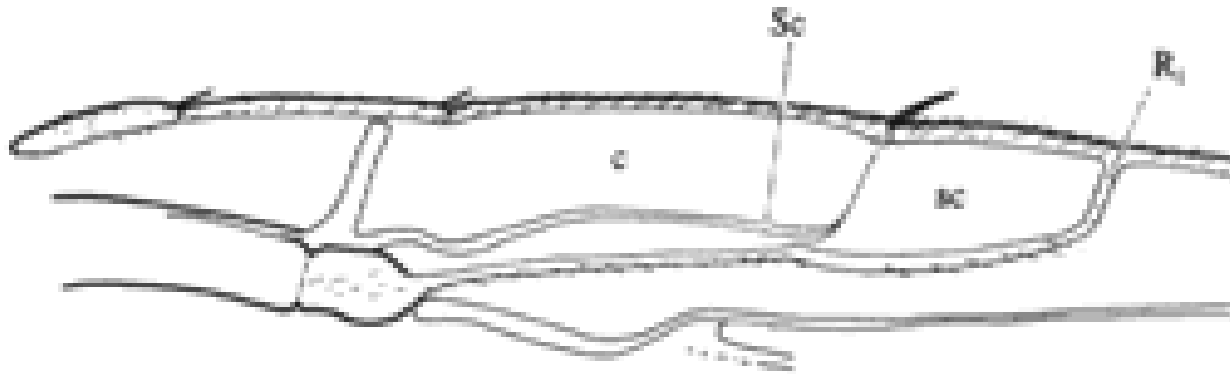
Code trap	Trap placement		Collected time	Identification results		
	Longitude	Latitude		Scientific name	No	Identified person
HN- Cue 1	21°58.258 N	106°42.636 E	15/06/2009	<i>Bactrocera.tau</i>	6	Ms. Hoang Le Hang
				<i>Bactrocera.cucubitae</i>	3	
HN- Me 3	21°58.138 N	106°42.616 E	15/06/2009	<i>Bactrocera dorsalis</i>	47	Ms. Hoang Le Hang
HN- PB 2	21°58.254 N	106°42.604 E	8/06/2009	<i>Bactrocera.dorsalis</i>	7	Ms. Hoang Le Hang
				<i>Bactrocera.cucurbitae</i>	2	
				<i>Bactrocera.tau</i>	3	

TEPHRITIDAE FAMILY



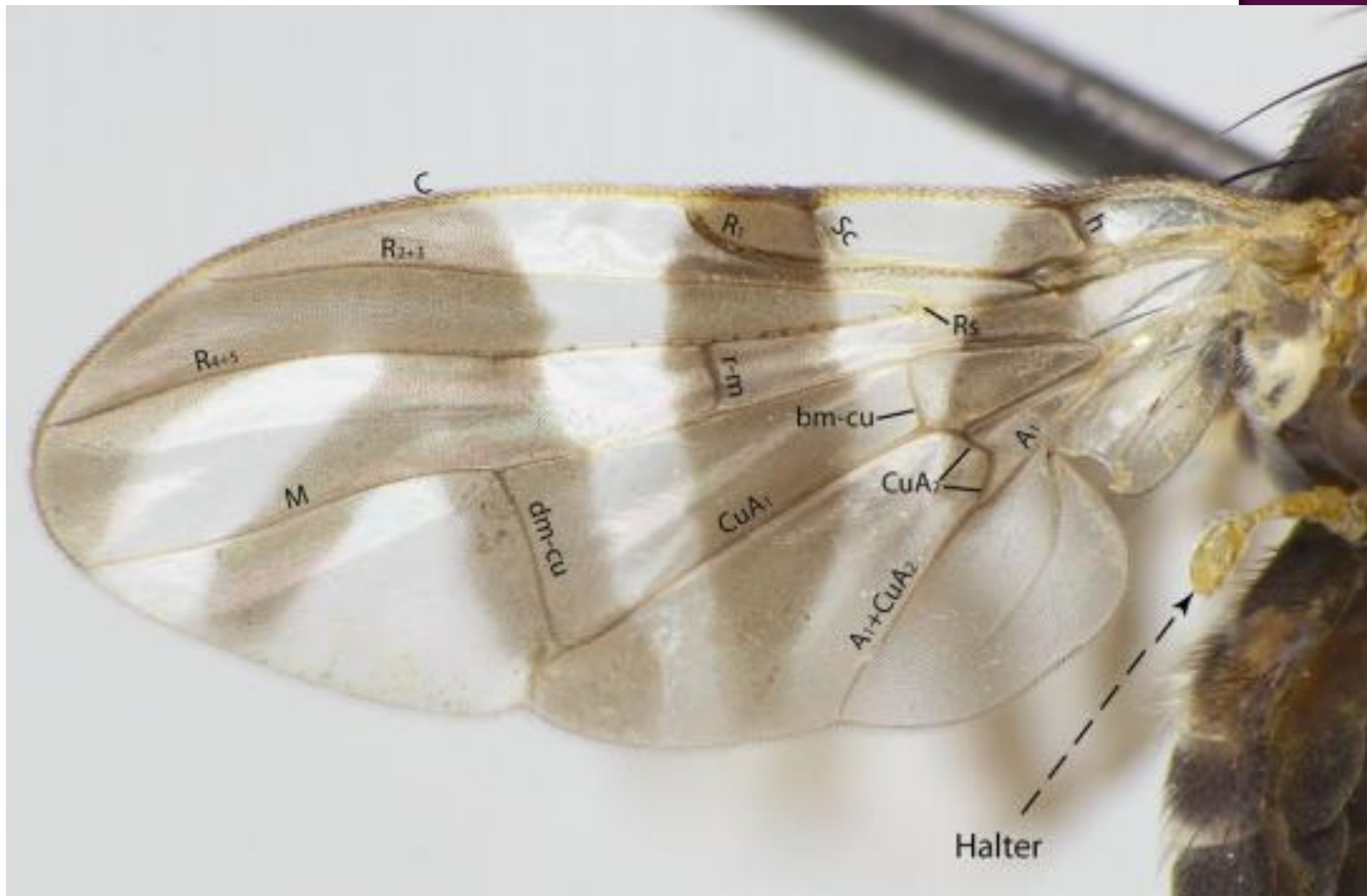


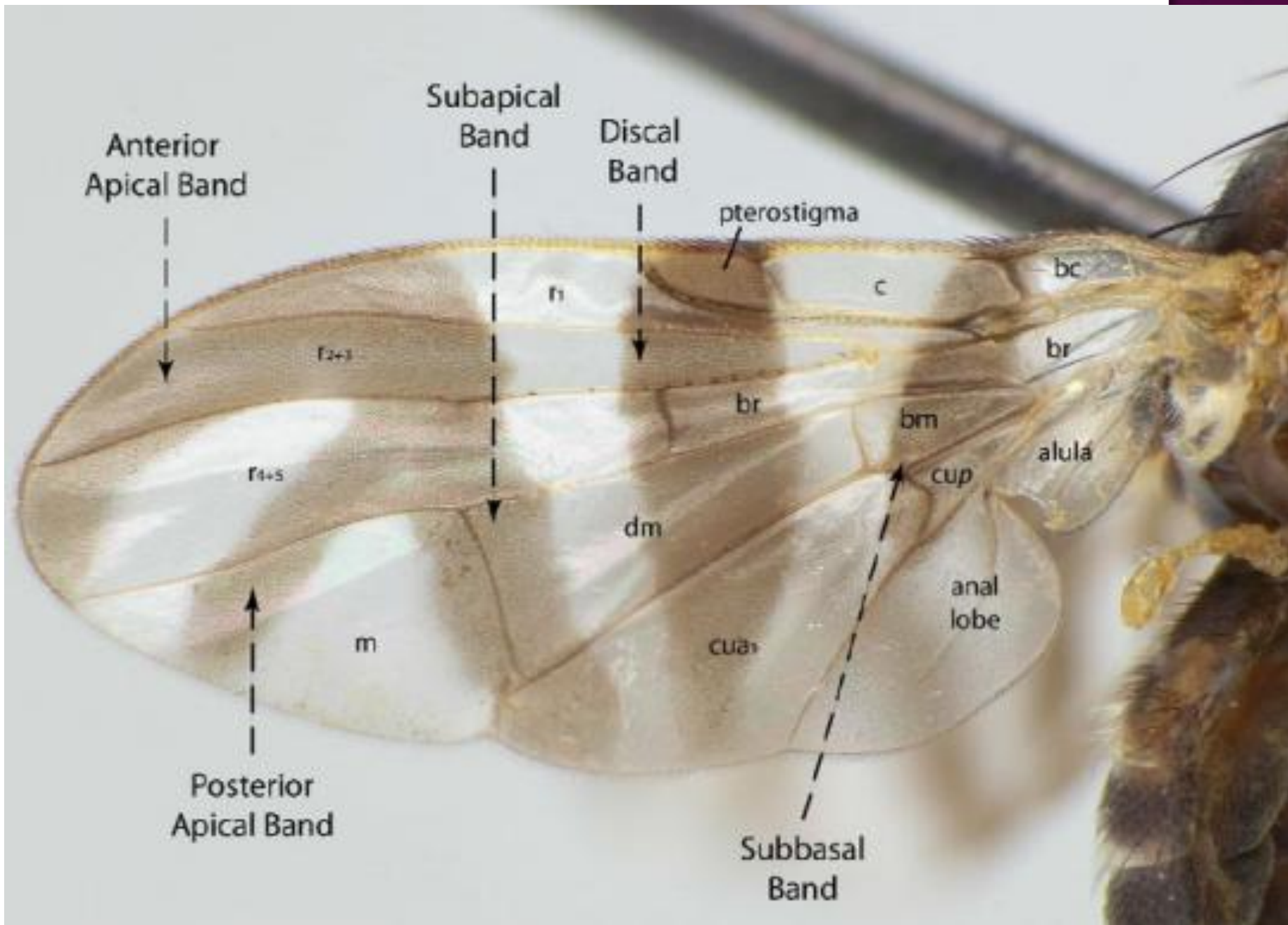


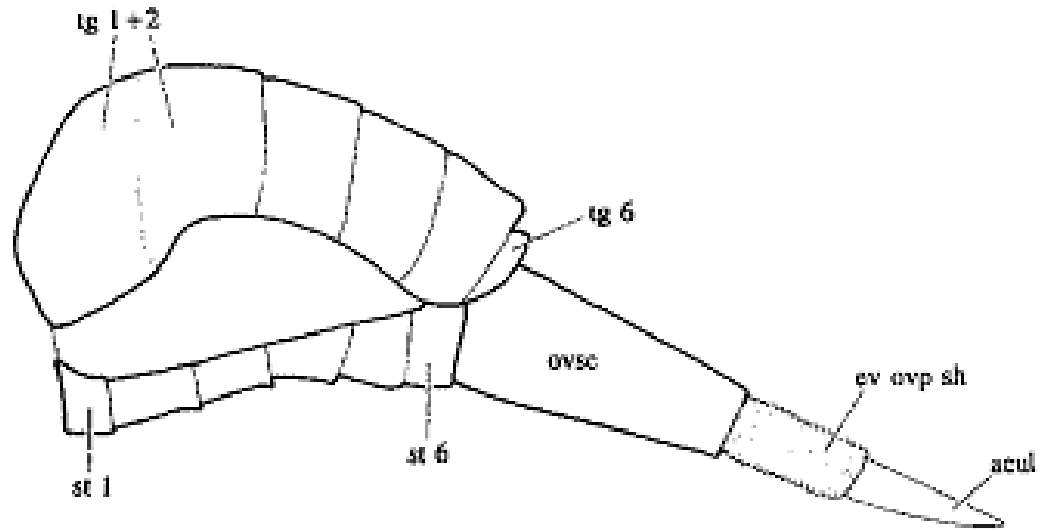
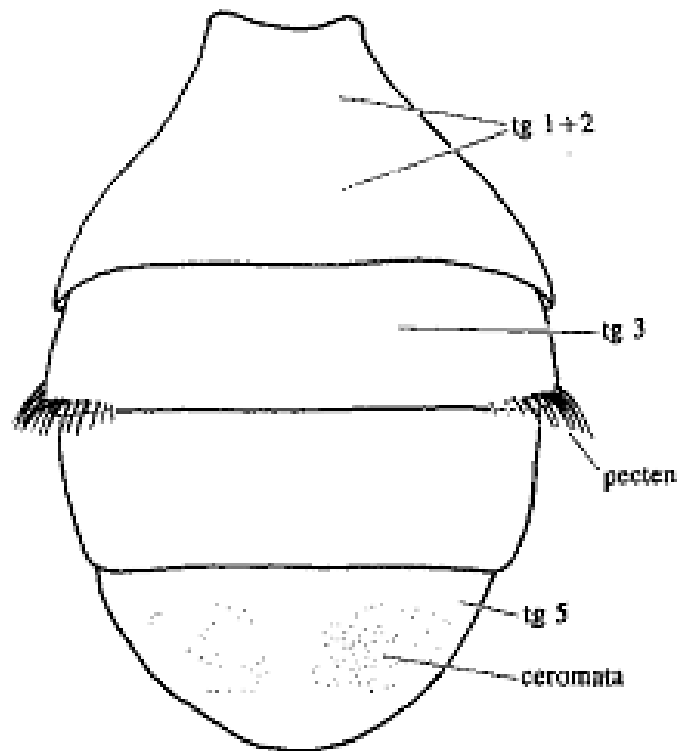


© CAB International

Tephritidae: Vein Sc bent almost 90 degrees and then reduced to a fold







9

10

acul – aculeus

ev ovp sh – eversible ovipositor
sheath

ovsc – oviscape

st – sternites numbered 1-5 in
the male and 1-6 in the female

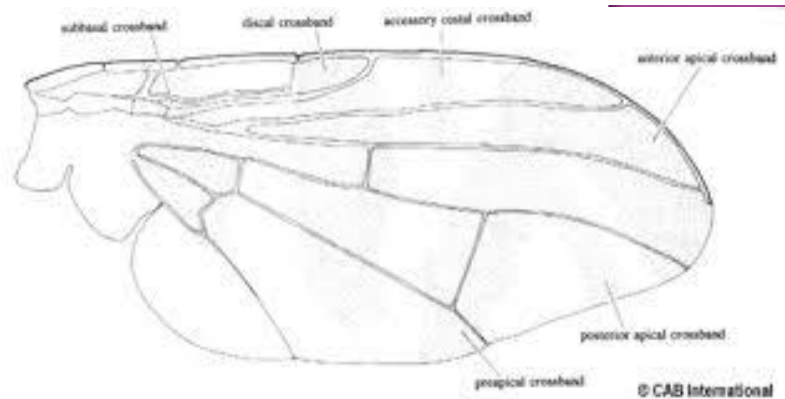
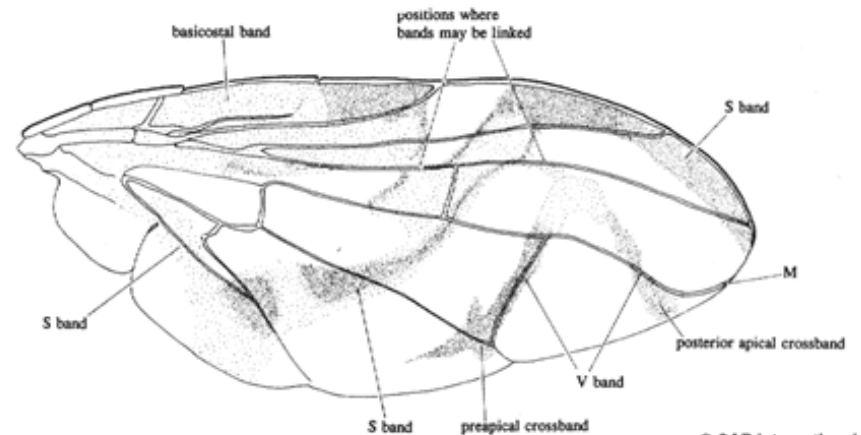
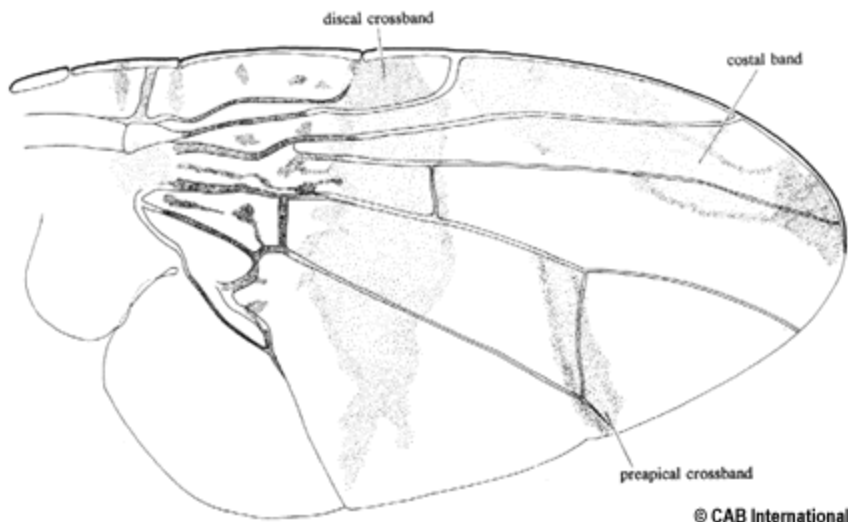
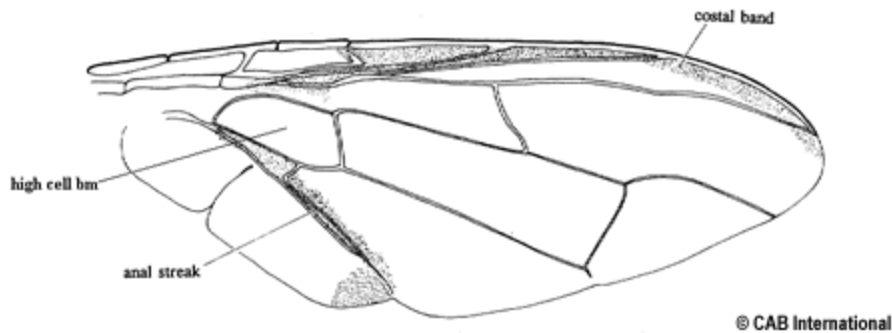
tg – tergites where 1+2 are fused to
form sytergosternite 1+2, followed by
tergites 3-5 in the male and 3-6 in the
female

Adult abdomen: male with pecten; female with extended ovipositor

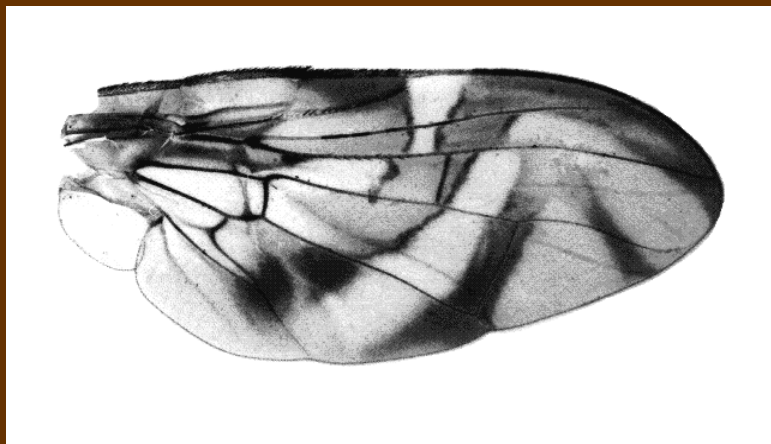
IDENTIFY

○ Simplified Key to major fruit fly genera

- Bactrocera and Dacus: cell bm twice height of cell bcu, cell bcu extension very long
- Anastrepha: vein M curved forward near end
- Ceratitis: cell bcu extension swollen, dark flecks basally
- Rhagoletis: cell bcu with a short extension



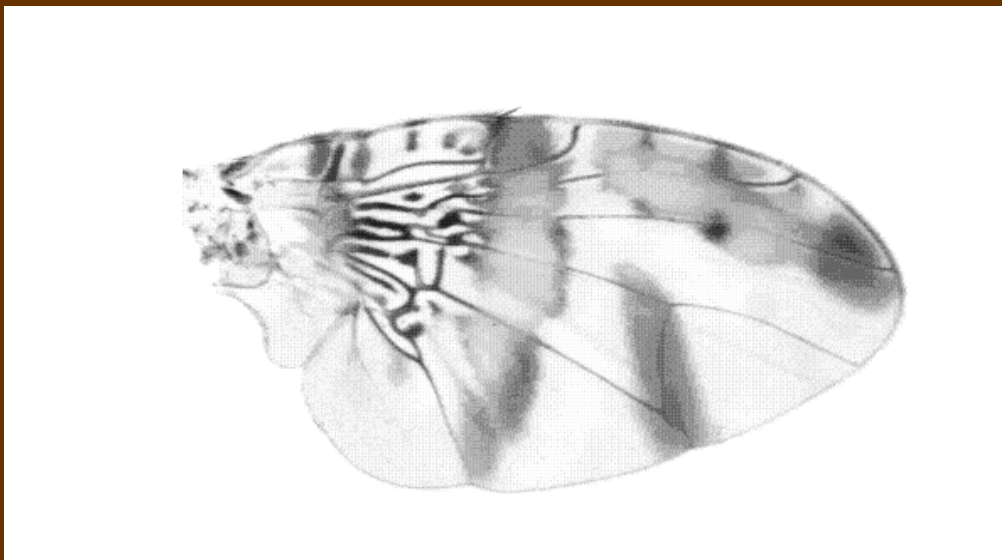
WINGS TYPE OF 3 GENUS OF TEPHRITIDAE



Anastrepha



Bactrocera



Ceratitis

Dacus GENUS



Dacus

Abdomen petiolate and elongate

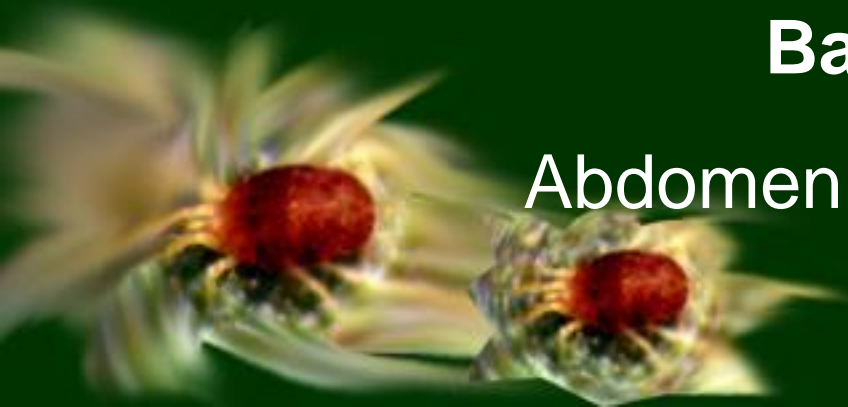


Bactrocera GENUS



Bactrocera

Abdomen oval or elongate



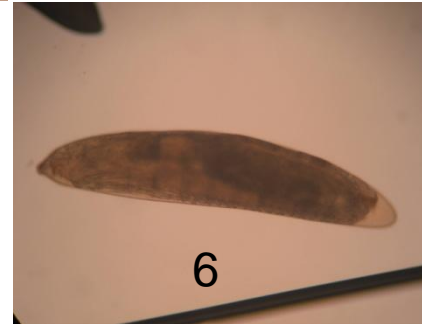
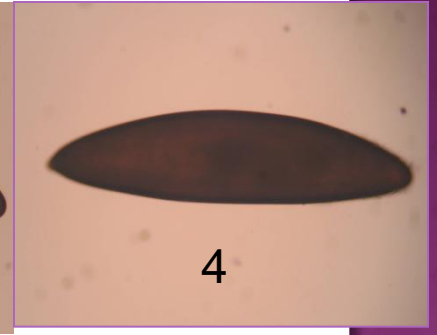
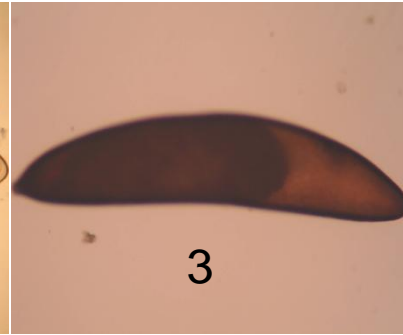
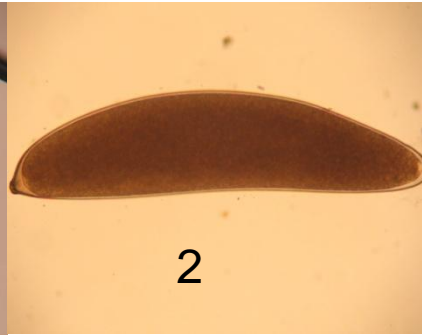
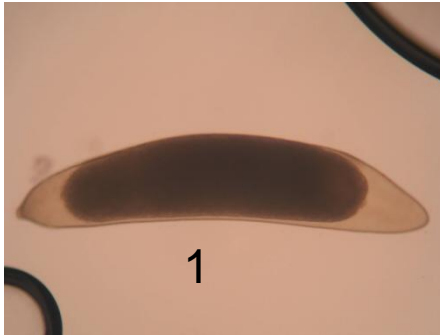
IDENTIFICATION OF SOME FRUIT FLIES SPECIES IN VIETNAM



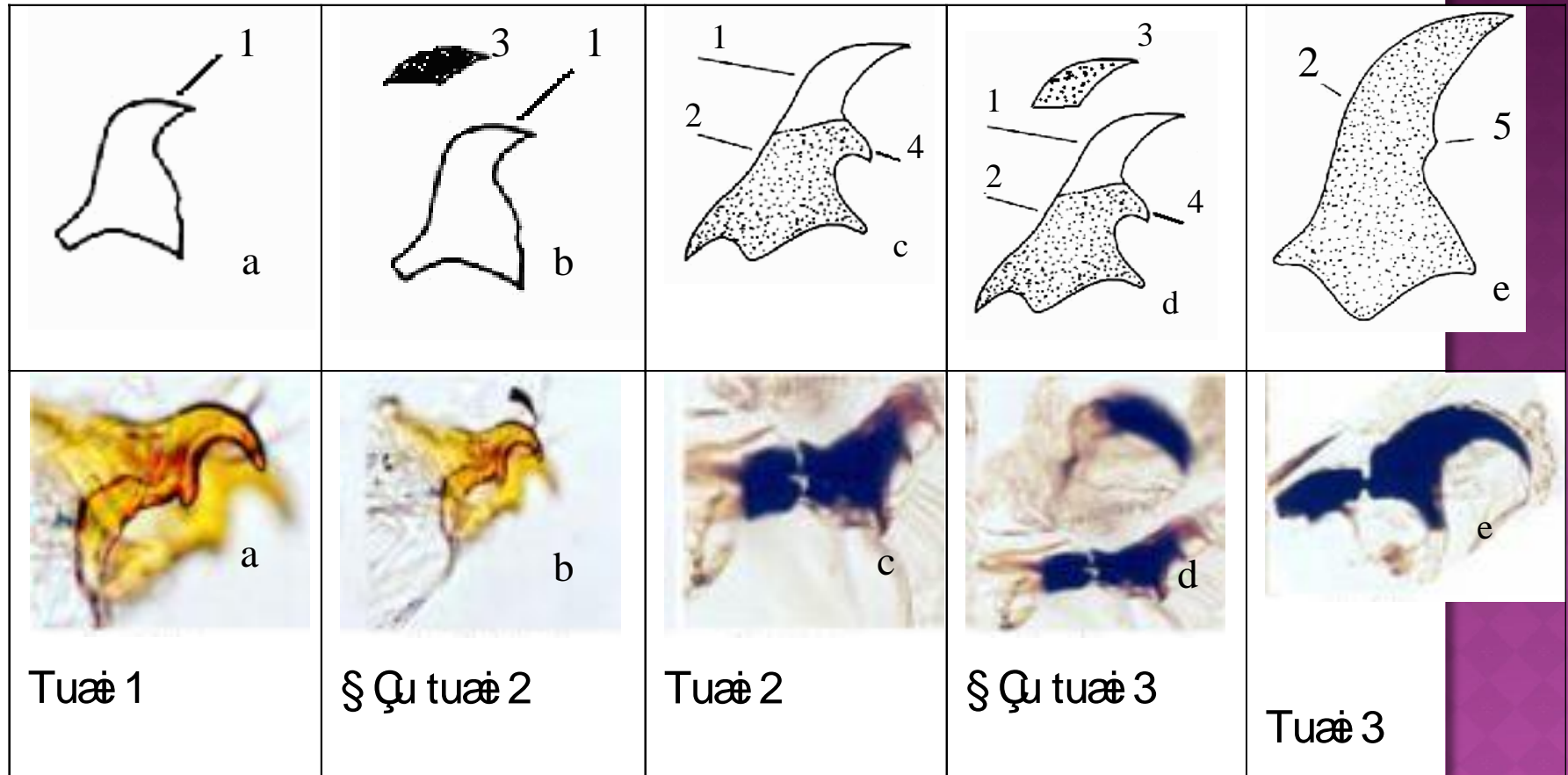
Bactrocera (Bactrocera) dorsalis (Hendel)



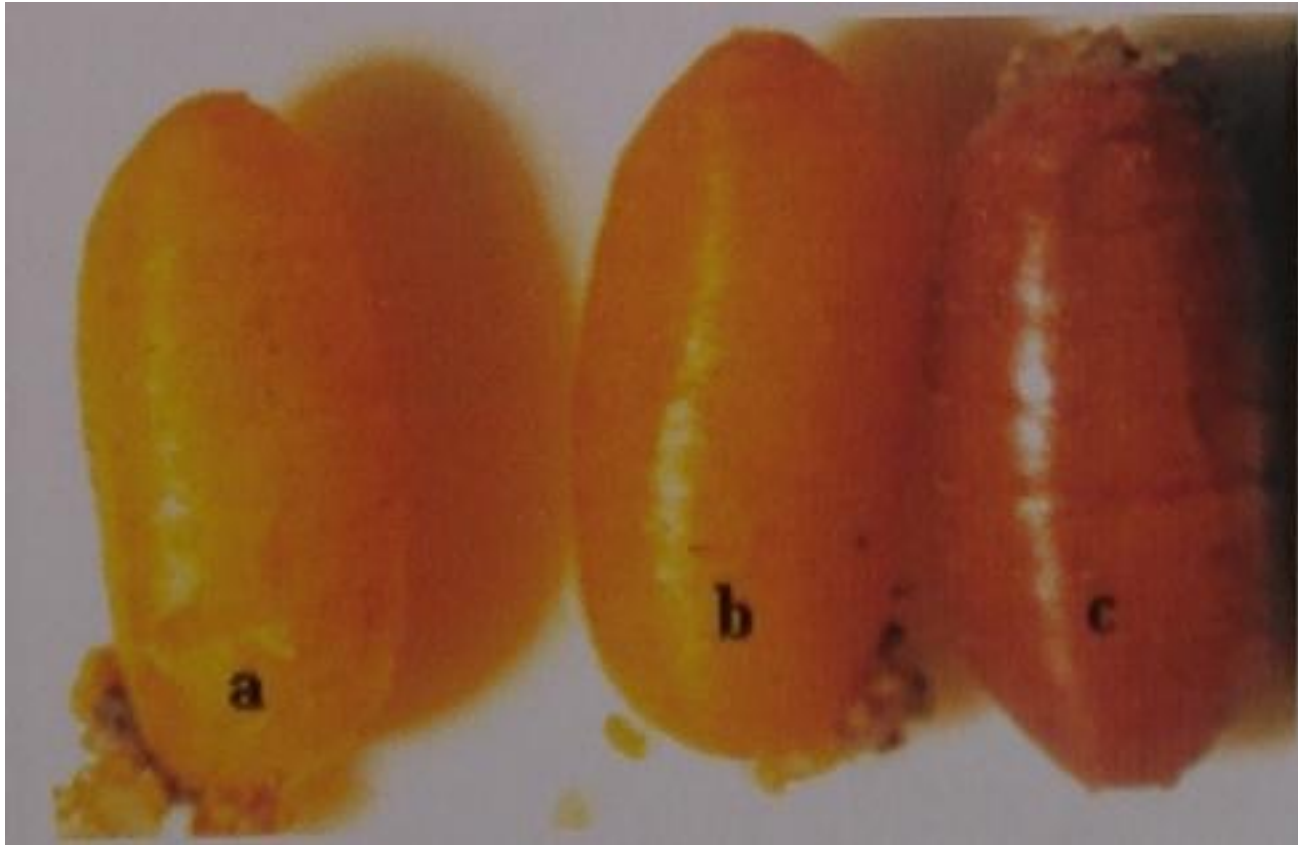
Eggs of *Bactrocera* (*Bactrocera*) *dorsalis* (Hendel)



Larva of *Bactrocera (Bactrocera) dorsalis* (Hendel)



Pupa of Bactrocera (Bactrocera) dorsalis (Hendel)



1 day after
immature

3 day after
immature

7 day after
immature

Bactrocera (Zeugodacus) cucurbitae (Coquillett)



Bactrocera (Bactrocera) correcta (Bezzi)



Bactrocera (Zeugodacus) tau (Walker)

2 mm

7/17/2009



Lo 38 Dorsal Body

0.5 mm

7/17/2009



Lo38 Head front





7/17/2009

0.5 mm



Lo38 Thorax side



Fruit flies	Dimensions (mm)		Wing	
	Body	Wing		
<i>B. dorsalis</i>	7,56±0,14 (7,0-8,30)	6,14±0,05 (6,0-6,20)		
<i>B. correcta</i>	6,27±0,15 (6,20-6,80)	5,12±0,03 (5,0-5,20)		
<i>B. cucurbitae</i>	9,62 ±0,22 (8,40-10,0)	6,12 ±0,02 (6,0-6,20)		
<i>B. tau</i>	9,44±0,16 (9,05-10,07)	6,73±0,06 (6,61-6,83)		

ACTIVITIES ON FRUIT FLIES IN VIETNAM

VIETNAM DRAGON FRUIT

- ◉ **For Japan, Korea and New Zealand market access**
- ◉ Vietnam exported dragon fruit into Japan by Vapor Heat Treatment (VHT) to treat fruit flies on this fruit before exportation
- ◉ **For the United States market access**
- ◉ Vietnam exported dragon fruit into the United States by Irradiation to treat fruit flies on this fruit before exportation

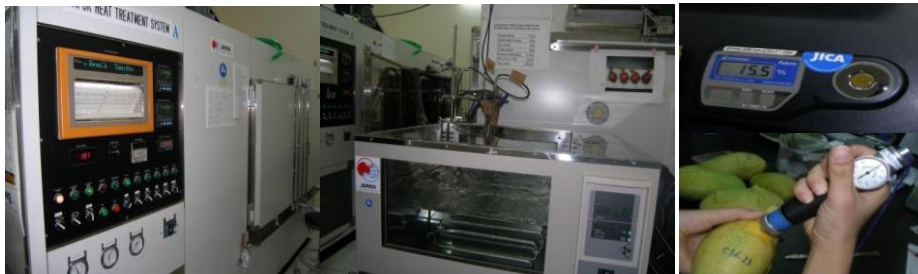
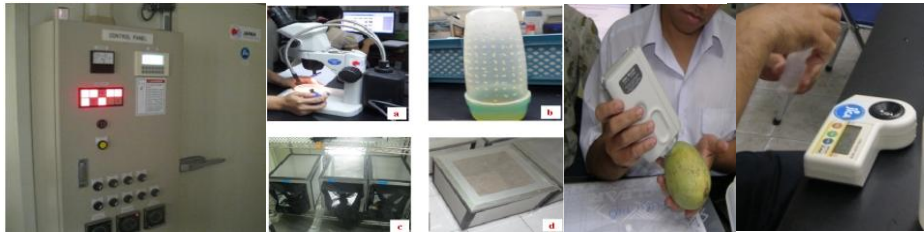
VIETNAM MANGO FRUIT

- ◉ **For Japan market access**
- ◉ Start submitted technical information packages for NPPO's Japan since 2011, NPPO's Vietnam has so far completed experiments with fruit flies by Vapor Heat Treatment (VHT) and sent to Japan the research results to consider
- ◉ **For Korea and New Zealand market access**
- ◉ Vietnam exported mango fruit into Korea by Vapor Heat Treatment (VHT) to treat fruit flies on this fruit before exportation

VIETNAM RAMBUTAN FRUIT

- ◉ **For the United States market access:**
- ◉ Vietnam exported rambutan fruits into the United States by Irradiation to treat fruit flies on this fruit before exportation

EXPERIMENTS OF VHT FOR FRUIT FLIES IN LAB.



VAPOR HEAT TREATMENT FACILITY

SORTING AND CLEANED



FRUITS ARE PROCESSED IN VHT MACHINE AND SET TEMPERATURE SENSORS



INSTALL THE HEAT TREATMENT SYSTEM



COOLING AND ISOLATED ROOM



PACKAGING AND STORAGE



TRANSPORT TO EXPORT



THANK YOU
FOR YOUR ATTENTION