

BIG4: Biosystematics, informatics and genomics of the big 4 insect groups- training tomorrow's researchers and entrepreneurs

Kick-Off Meeting
14-18 September 2015
Copenhagen, Denmark



This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 642241

Zoologisches Forschungsmuseum Alexander Koenig – ZFMK

Diptera collection

Dr. Ximo Mengual



Horizon 2020
MSCA-ITN 64241



ZFMK

- ▶ Located in Bonn (NRW).
- ▶ One of the largest natural-history-research museums in Germany.
- ▶ The museum was founded by private scholar Alexander Koenig (1858-1940).
- ▶ Founded in 1912 (Ornithological Museum from 1900), but publicly opened in 1934.



ZFMK

- ▶ After World War II the exhibition hall became the birth place of the Federal Republic of Germany.
- ▶ Facilities date from different times and the entire complex is listed as an historic monument.



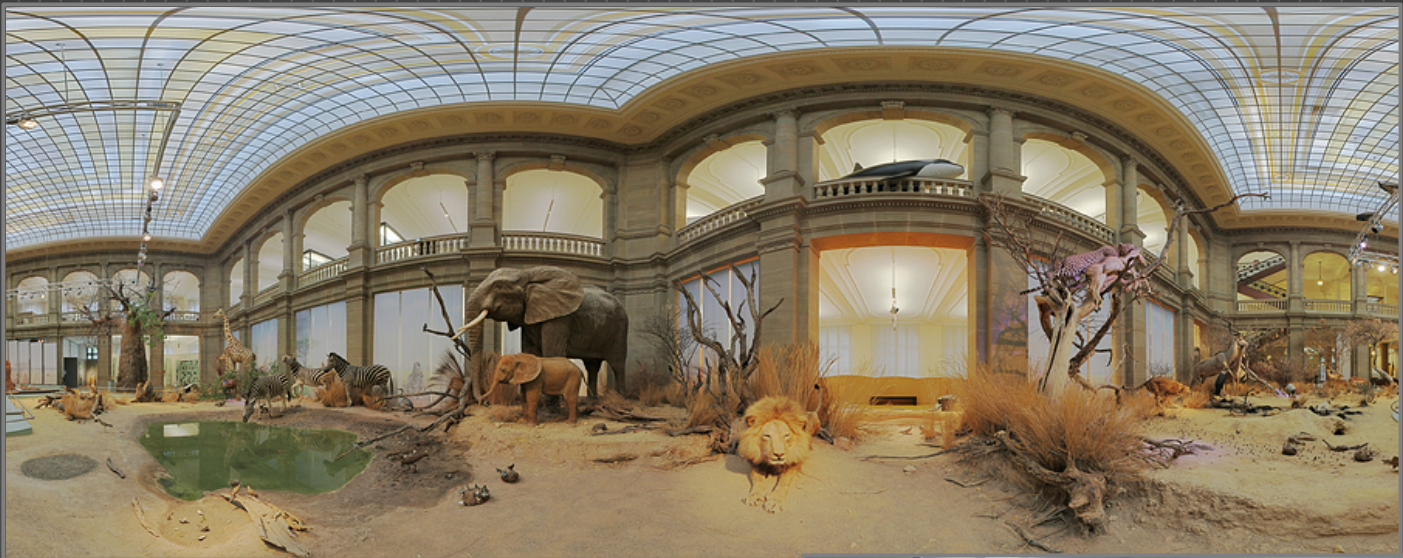




ZFMK

- ▶ Permanent and temporary exhibitions.
- ▶ The motto of the ZFMK is: “Bewahrung und Erforschung der Artenvielfalt von heute für die Welt von morgen!”





ZFMK

- ▶ 61 employees plus ca. 130 additional staff (15 scientists in externally funded projects, 100 diploma, PhD and federal exam students, 15 volunteers).
- ▶ Member of the **Leibniz Association**: ZFMK is the Leibniz Institute for Animal Biodiversity.
- ▶ The Leibniz Association is a network of 86 scientifically, legally and economically independent research institutes and scientific service facilities.
- ▶ Part of the MIWF.

Ministerium für Innovation,
Wissenschaft und Forschung
des Landes Nordrhein-Westfalen



Leibniz
Leibniz-Gemeinschaft

ZFMK

- ▶ The ZFMK is divided in three main centers: ZTE, ZMB and ZÖA.
- ▶ Zentrum für Taxonomie und Evolutionsforschung (ZTE) is divided in two departments: Vertebrates and **Arthropoda**.

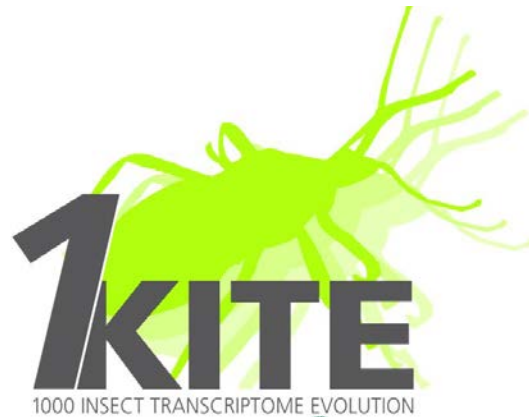


ZFMK

- ▶ The ZMB is the house of the molecular lab and the BioBank.
- ▶ The ZFMK is strong in the research of genomics, computational genomics and statistical phylogenomics, as well as metabarcoding.



DNA Bank
Network



ZFMK

- ▶ Other facilities: Library, High-Performance Computing, and Biohistoricum.



COLLECTIONS

Sektion	Anzahl Objekte in Sammlung	Typen (inkl. Paratypen)	Bereits digitalisiert	Anzahl noch zu digitalisieren	Geschätzte Rate (Individuen pro Stunde)	Erforderliche Personenjahre
Lepidoptera	2.000.000	10.000	5.000	1.995.000	10	104
Coleoptera	2.500.000	2.143	50.000	2.450.000	10	127
Hymenoptera	170.000	2.065	56.485	113.515	10	6
Ornithologie	145.000	1.268	26.623	118.377	4	15
Herpetologie	120.000	?	90.000	30.000	4	4
Ichthyologie	63.000	81	60.000	3.000	4	4
Myriapoda	20.000	40	4.000	16.000	10	0
Nied. Arthropoda	70.000	203	10.000	60.000	10	1
Diptera	175.000	642	1.500	173.500	10	3
Theriologie	100.000	85	1.500	98.500	4	1
Biobank	70.000	30	20.000	50.000	20	9
Summe	5.433.000	16.557	325.108	5.107.892		284
Anteil %	100,0		6,0	94,0		

COLLECTIONS

- ▶ The **Diptera Section** houses the collections of Diptera, Siphonaptera, Strepsiptera, Embioptera, Mecoptera, Megaloptera, Raphidioptera and Neuroptera.
- ▶ The main research focus of the Section is Diptera systematics, taxonomy, ecology and phylogeny.



DIPTERA

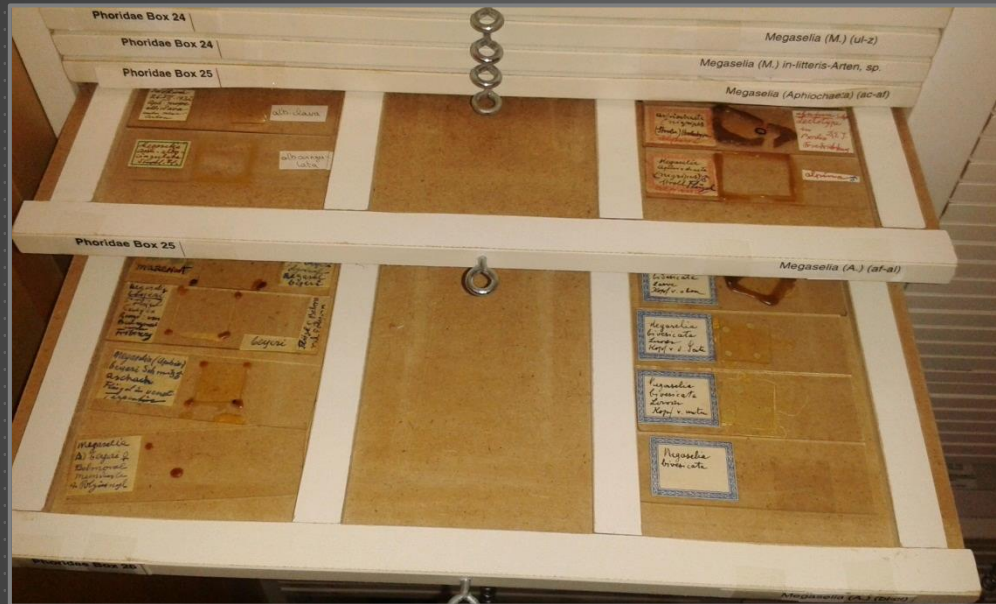
- ▶ The Diptera collection is ca. 200.000 specimens with 642 type individuals (including paratypes).
- ▶ The collection is under digitization and we use 'unique identifiers' for each specimen (dried, slide-mounted and in alcohol).



DIPTERA

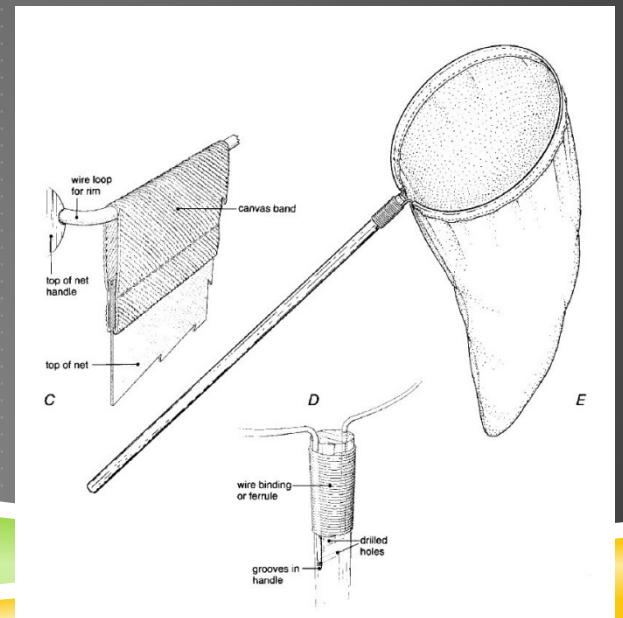


DIPTERA



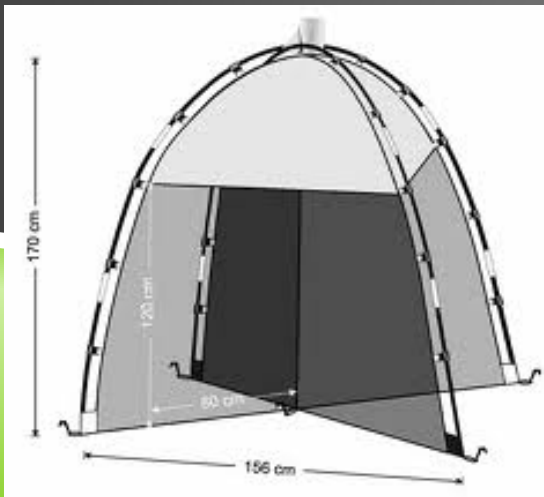
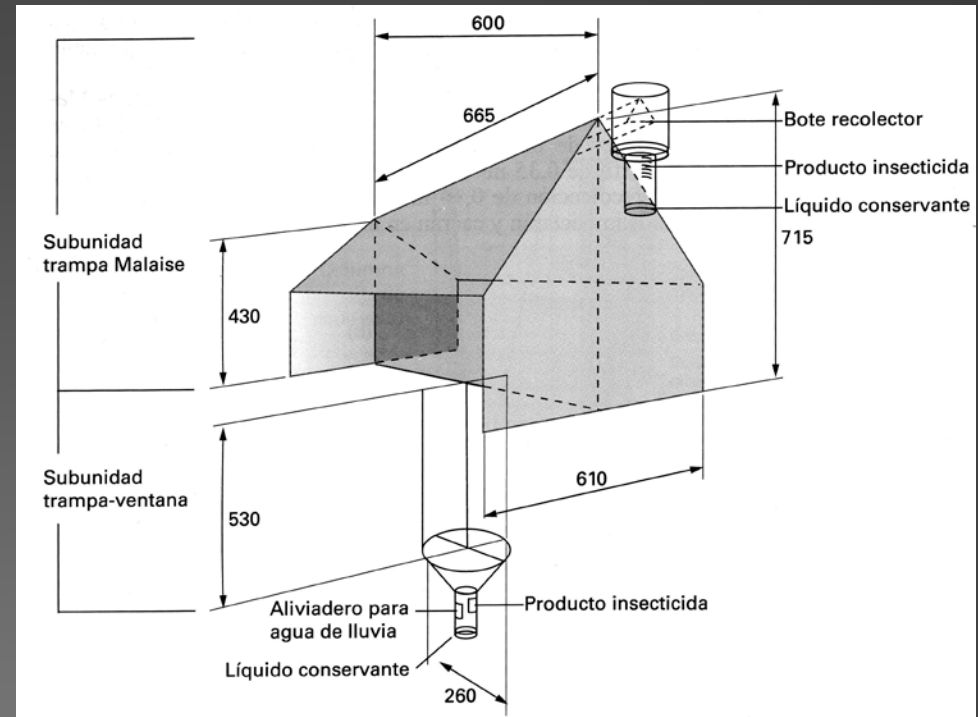
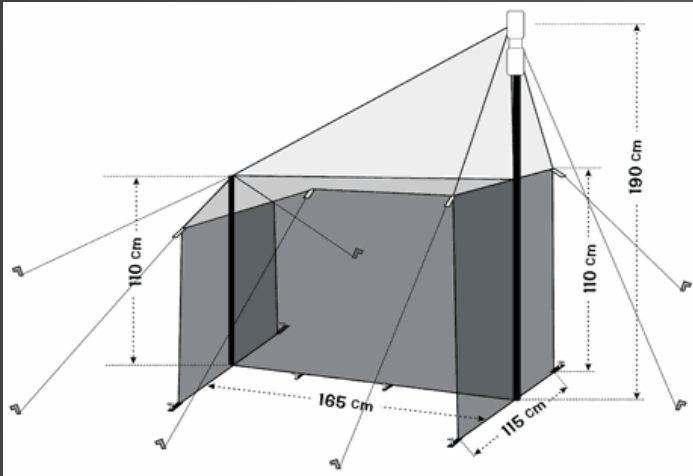
DIPTERA

- ▶ In the field.



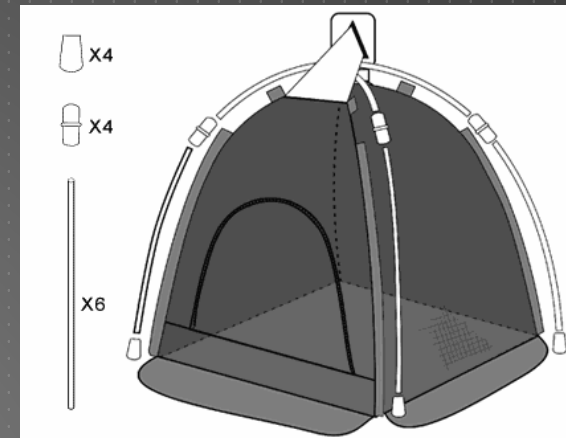
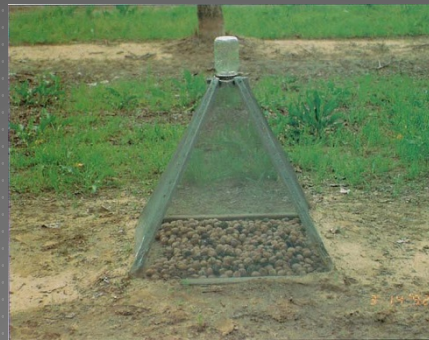
DIPTERA

► Malaise trap

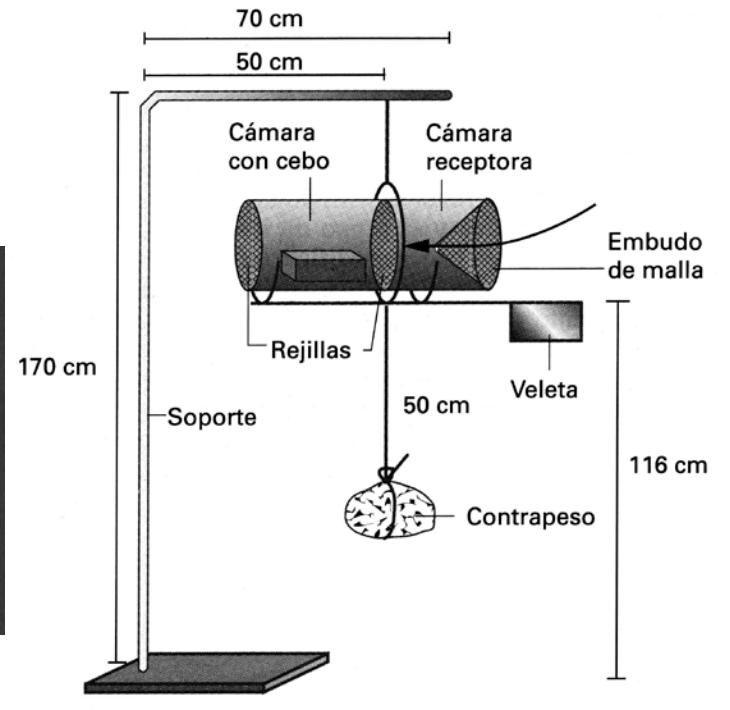
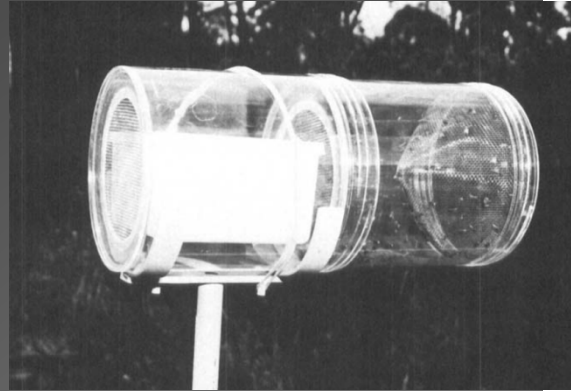


DIPTERA

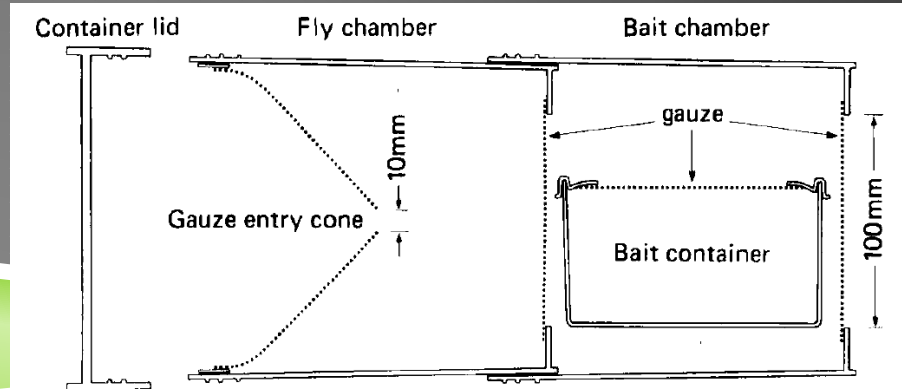
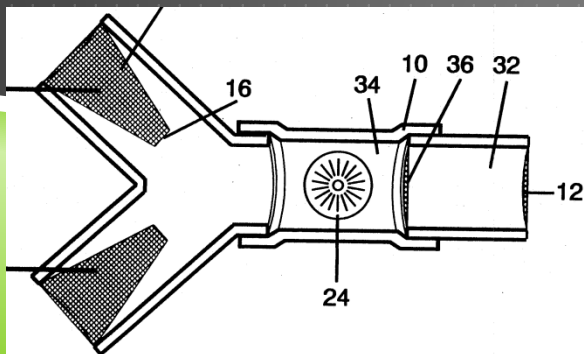
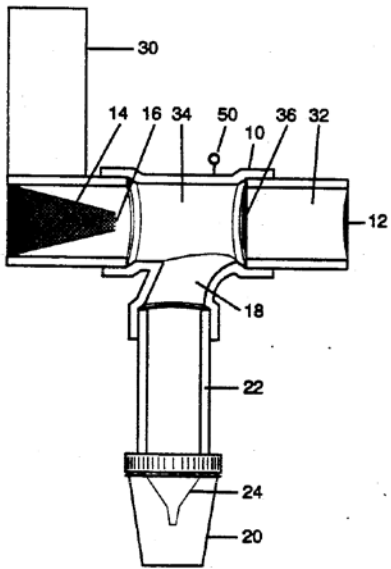
► Emergence traps



DIPTERA



► Wind Oriented Trap (WOT)



DIPTERA

- ▶ Collecting bottles or “killing jars”
- Glass, never plastic
- Screw cap
- Label it!
- Ethyl acetate or cyanides (Na, K, Ca)
- Always dry

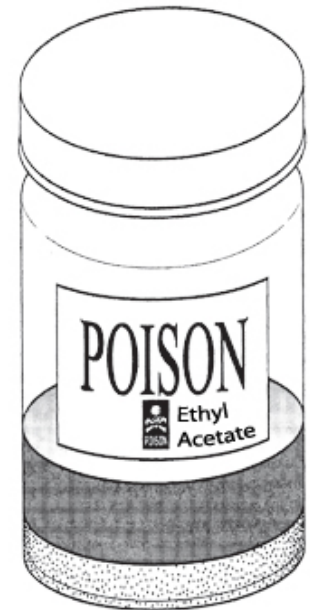
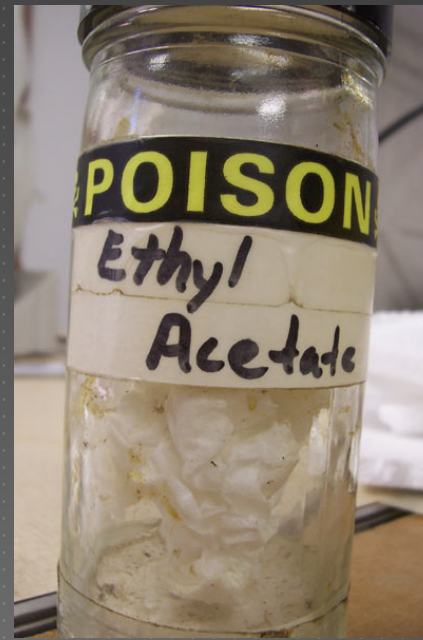
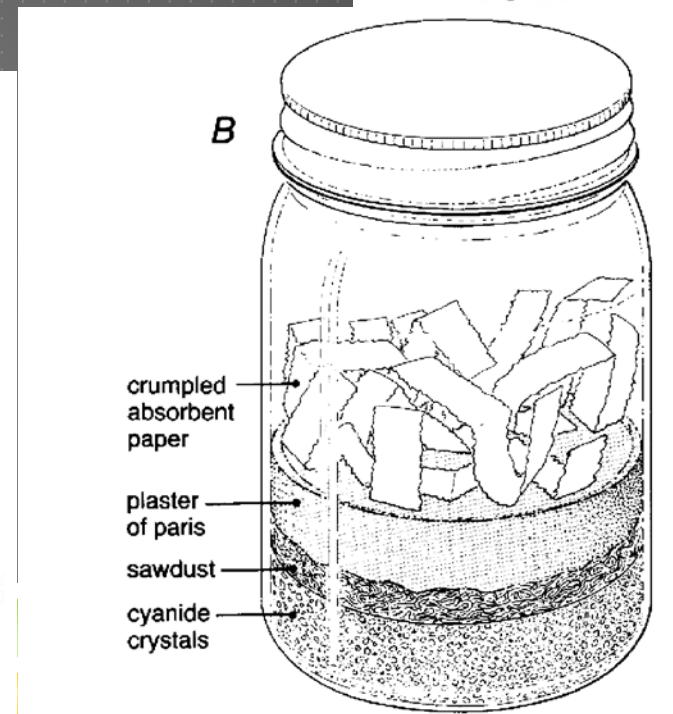
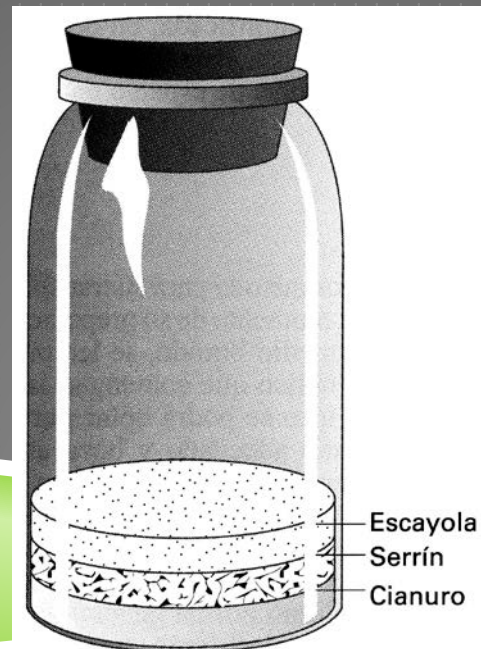
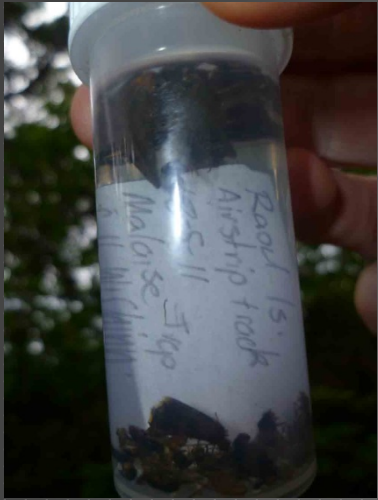


Figure 7



DIPTERA

► In the lab.



ASHEVILLE, NC.
AUG. 20, 1979
J. P. KROUS-COLL.



DIPTERA: preserving

- ▶ Up to the insect kind; some are dry preserved (w/o pin) and others in liquid agents.
- ▶ Must be killed with **gaseous or liquid agents**, and be preserved in optimal conditions.
- ▶ **Freezing** is a very good method to dry mounting posteriorly.
- ▶ Generally **ethanol** to kill and preserve. The higher percentage (more pure), the more rigid (stiffer) the specimen.
- ▶ Larvae may be slowly boiled, and then be fixed in 70% ethanol.

DIPTERA: preserving

► Storage:

- Ethanol (room Ta or freezer).
- “Papering”: dry in boxes, envelopes, tubes, ... never for Diptera! Always with absorbent or drying paper (ordinary newsprint).
- Entomological pins (dry pinned).
- Glassine paper or grease-proof paper.



DIPTERA: preserving

- ▶ Alcohol storage:
 - Care about the paper kind used for labels, ink, and cap material (avoid cork, rubber, metal, neoprene).
 - Dark, cold rooms or closets.
 - Safe places against fire and ventilated.
- ❖ Molecular studies a posteriori: frozen with 95-100% ethanol.

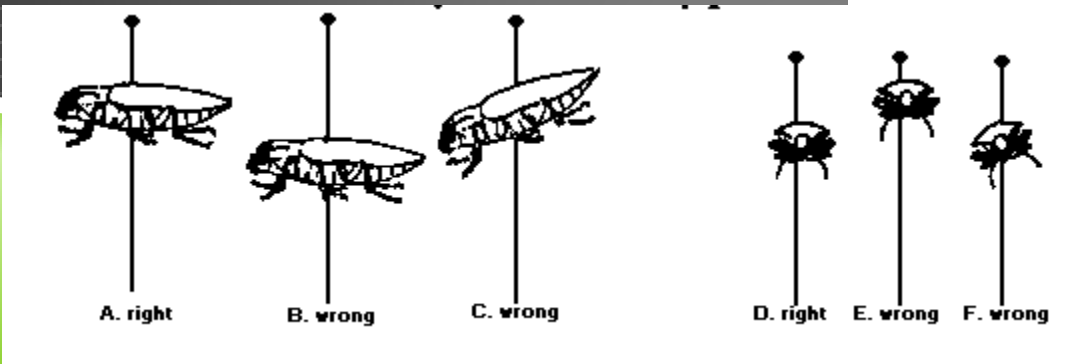
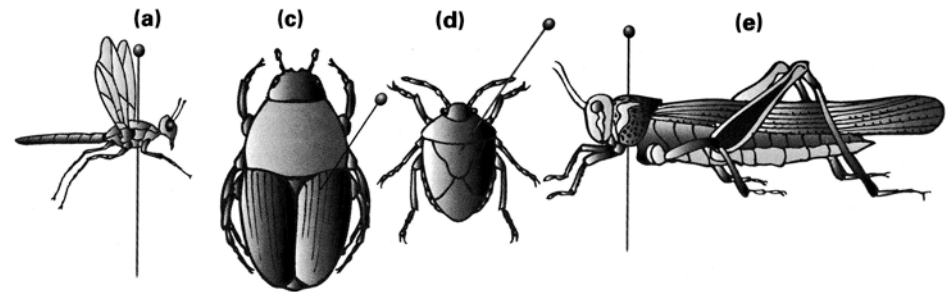
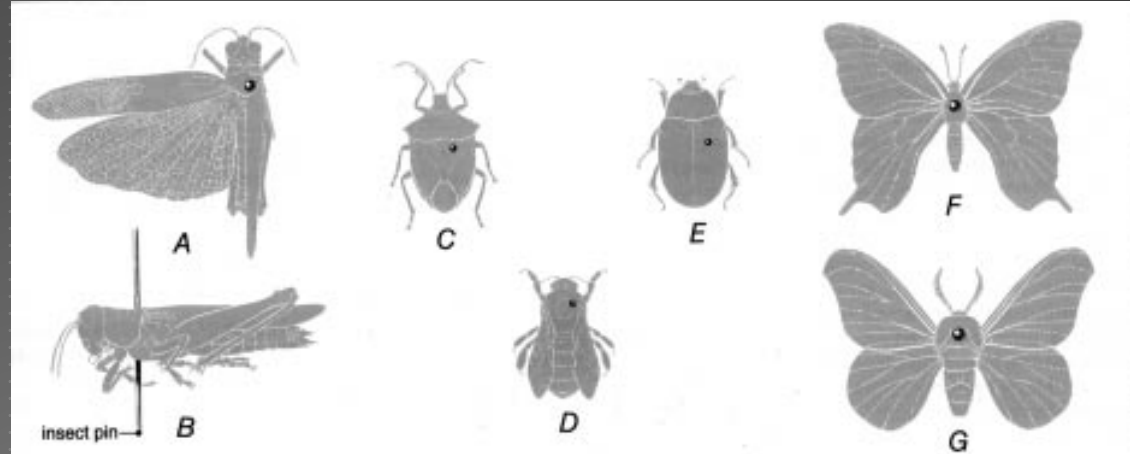
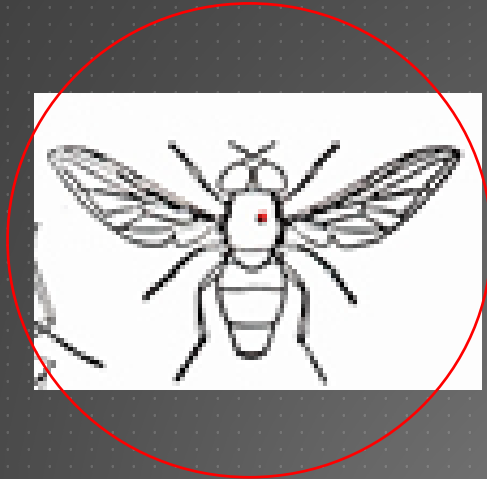


DIPTERA: preserving

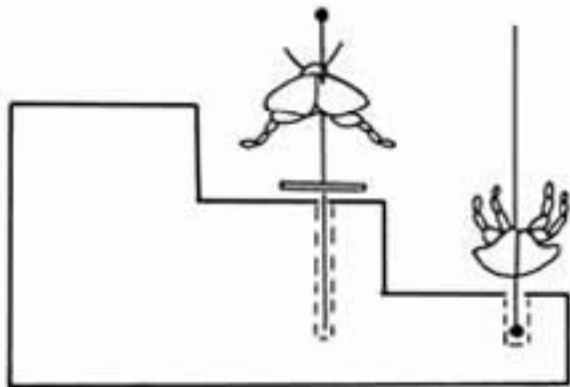
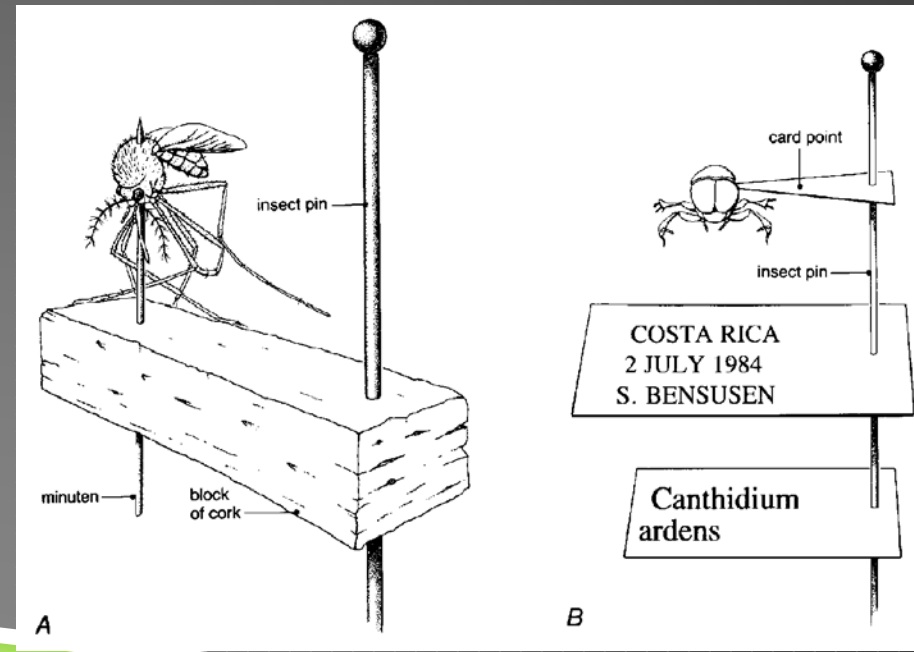
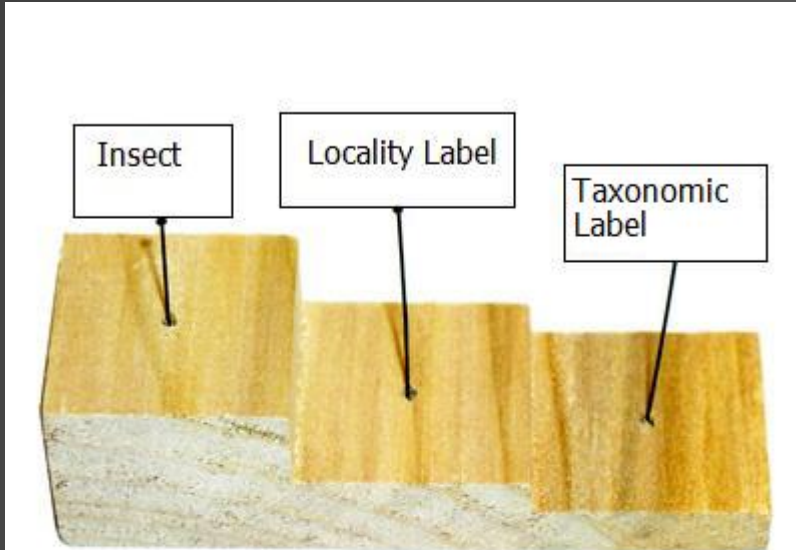
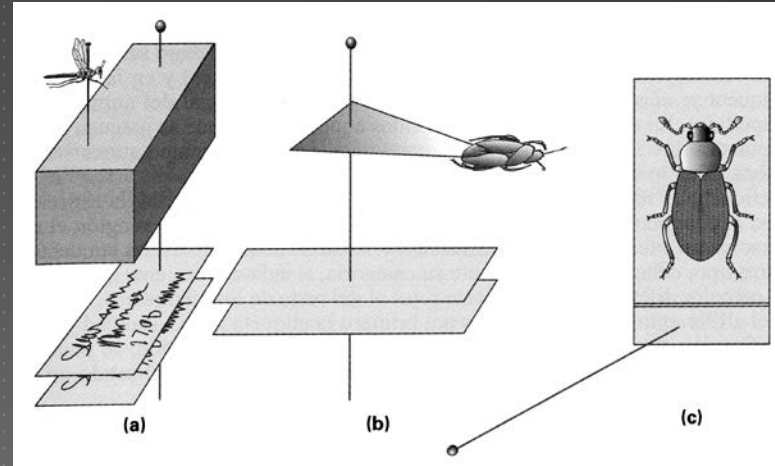
- ▶ Dry mounting:
 - Preferably fresh (soft) individuals.
 - Different techniques according to the insect orders.
 - Relaxing (wet) chambers.



DIPTERA: preserving



DIPTERA: preserving



DIPTERA: preserving



Slide mounted specimens

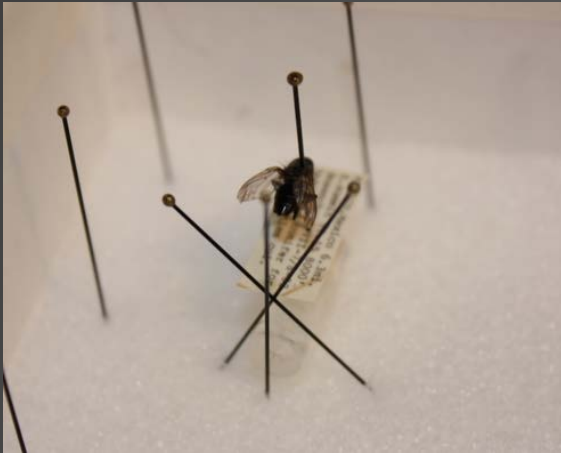


DIPTERA: preserving

- ▶ Artificial drying:
 - CPD.
 - Chemicals: hexamethyldisilazane (HMDS), ethyl acetate, acetone...

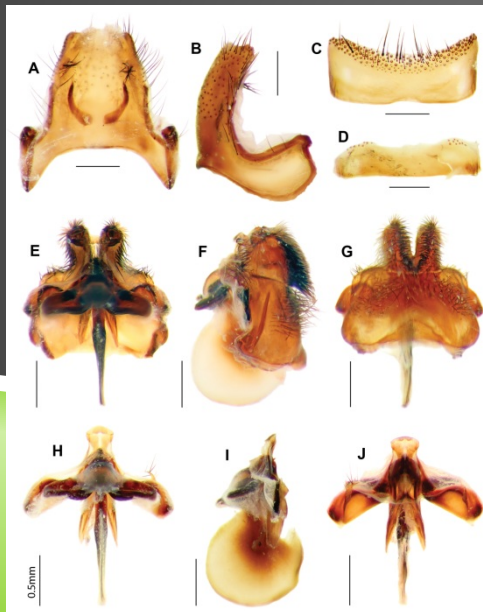


DIPTERA: preserving



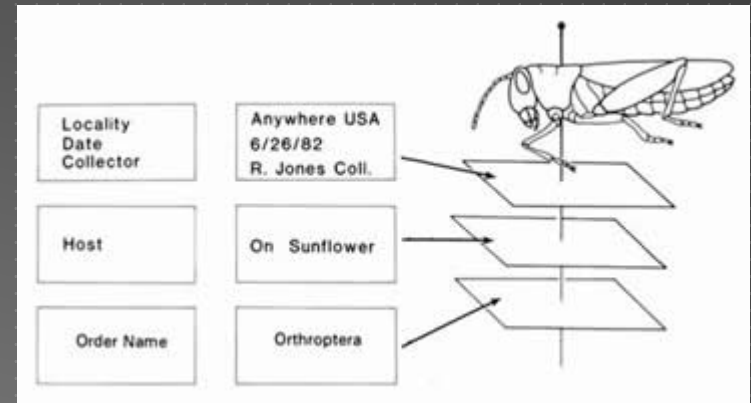
Maceration of genitalia

- 1- Relaxing chamber
- 2- Removal of genitalia
- 3- Bath with 10% KOH (heat or not) or lactic acid
- 4- Clean with water
- 5- Bath with an acid (ethanol)



DIPTERA: preserving

- ▶ Locality label.
- ▶ Identification label.
- ▶ Barcode.



COUNTRY: Province/state,
City/area, point, coordinates,
altitude, date, trap, **host**
Leg.: Collector's name(s)

TYPE material?
Genus' name
Specific epithet Author, Year
Det.: Identifier's name(s), Year

DIPTERA: preserving

MALAY PENIN:
Pahang, F.M.S.
Gunong Tahan...
Seat Point, 5460'
Dec: 21st. 1922...
H.M. Pendlebury,

Citrogramma ♀
clarum
(HERVE-BAZIN)
K.D. Ghorpade det. 198

Xanthogramma
citrinum.
Brun. ♀
Det. E. Brunetti 1923

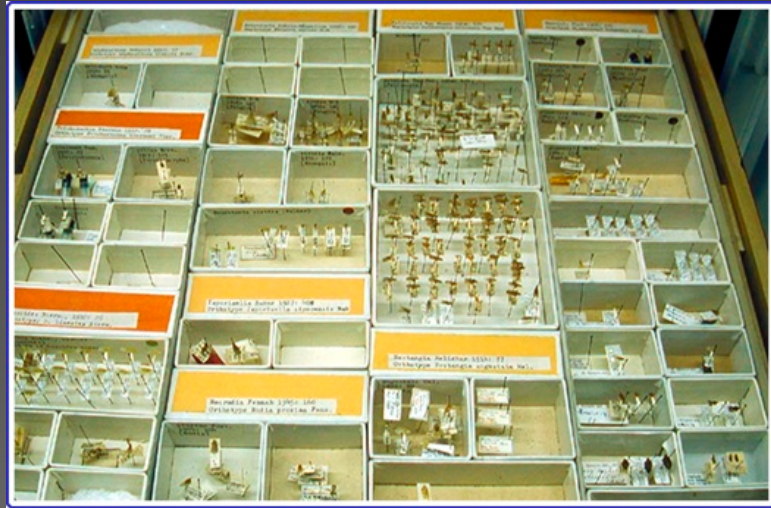
TYPE
Syrphus
pendleburyi
No. Curran

COSTA RICA INBIO
CRI001
782568

Est. Pitilla, 9 Km S. Santa Cecilia, Prov.
Guana, COSTA RICA. 700 m. SET 1994, P.
Rios, L N 330200_380200 # 3206

Pres. by
Fed. Malay States
Museum.
B.M. 1934-74.

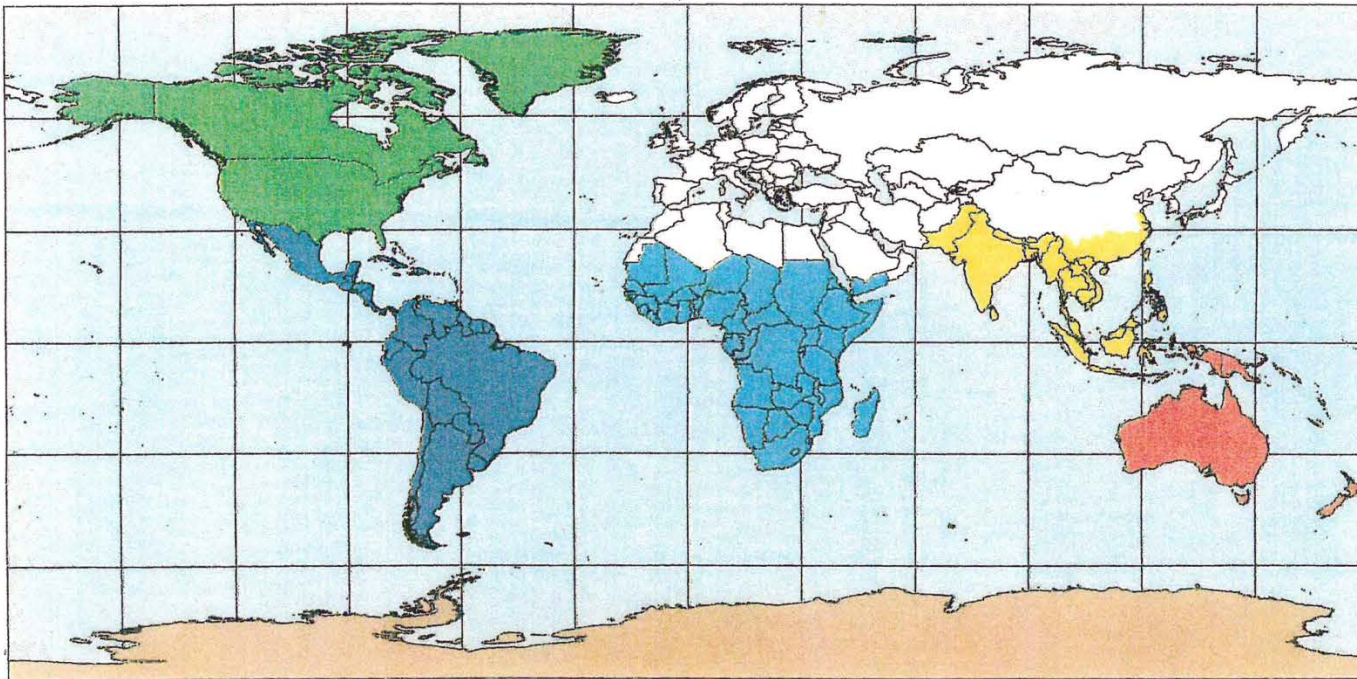
Holo-
type



basalis (Loew, 1856)
Oreogeton



spp. indet.
Oreogeton



-  Nearktische Region
-  Neotropische Region
-  Palearktische Region
-  Äthiopische Region
-  Orientalische Region
-  Australische Region
-  Antarktische Region





NEDERLAND
Woudseveen
8. 2005
Y. Jongema

NEDERLAND Gld.
Woudseveen
21.05.2005
Y. Jongema

NEDERLAND Gld.
Woudseveen
21.05.2005
Y. Jongema

NEDERLAND Gld.
Woudseveen
21.05.2005
Y. Jongema

NEDERLAND Ov.
Panthuizen
20.08.2005
Y. Jongema

Wales Trefa
24.VII.1982
K.W.R. Zwart

Wales Cader Idris
24.VII.1982
K.W.R. Zwart

England Plymouth
VII. XIII. 1982
K.W.R. Zwart

Wales Cader Idris
24.VII.1982
K.W.R. Zwart

Wales Cader Idris
24.VII.1982
K.W.R. Zwart

Wageningen
21.05.2005
Y. Jongema

Nl Edelelland
Wageningen
21.05.2005
Y. Jongema

Nl Edelelland
Wageningen
21.05.2005
Y. Jongema

Nl Wageningen
in gelbouw
21.05.2005
Y. Jongema



DIPTERA: packing and shipping

- ▶ Follow international legislation (IATA).
- ▶ Use “peanuts”.
- ▶ Appropriate container.



DIPTERA: packing and shipping

- ▶ Bad shipping.



DIPTERA: packing and shipping

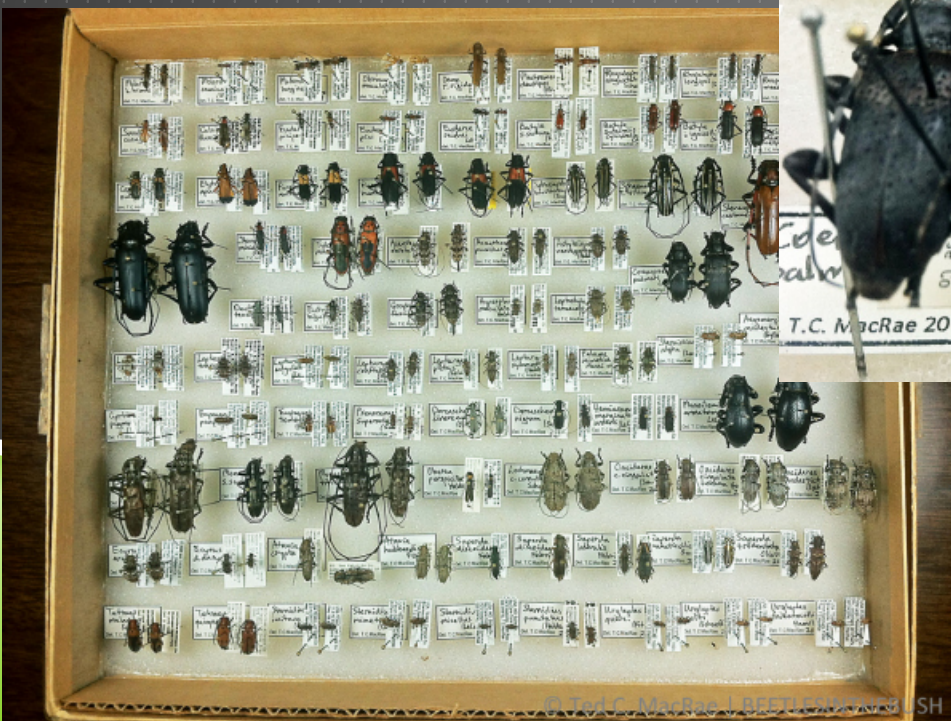
- ▶ Bad shipping.



DIPTERA: packing and shipping



© Ted C. MacRae | BEETLESINTHEBUSH



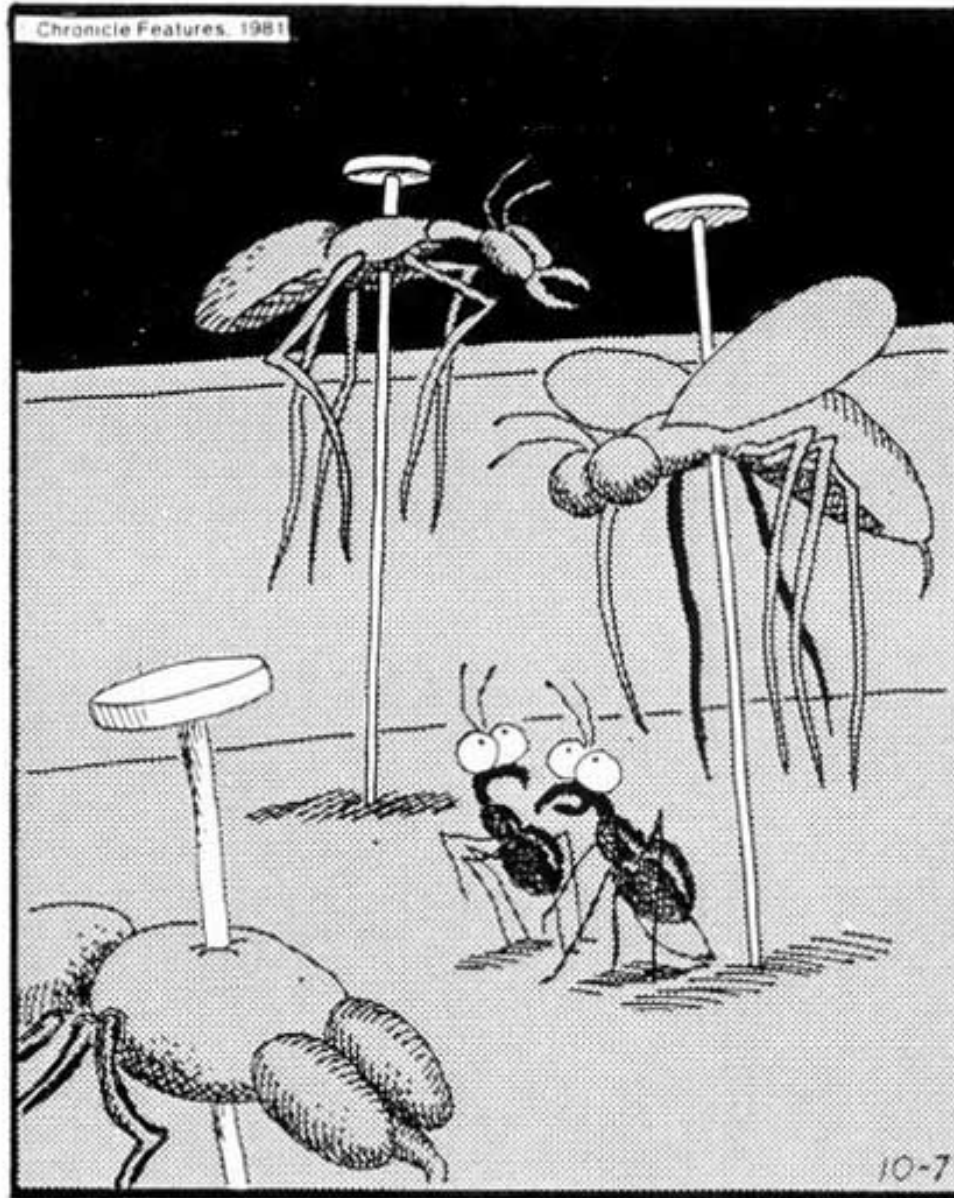
© Ted C. MacRae | BEETLESINTHEBUSH

DIPTERA: packing and shipping



THE FAR SIDE

By GARY LARSON



"Gad, I hate walking through this place at night."