



Introductory training school on

POLLINATOR IDENTIFICATION

Marco **BONIFACINO**, Maarten **DE GROOT**,
Simone **FLAMINIO** & Hugo **GASPAR**



GOZDARSKI INŠTITUT SLOVENIJE
SLOVENIAN FORESTRY INSTITUTE



Consiglio per la ricerca in agricoltura
e l'analisi dell'economia agraria



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OUR ACTIVITIES

DAY 1

OUR ACTIVITIES

9h00 Welcome

9h15 Pollinators: introduction **HYBRID**

10h00 15' BREAK

10h15 Introduction to butterflies **HYBRID**

12h00 LUNCH

13h00 Identification of butterflies and specimen preparation

15h00 15' BREAK

17h00 FINISH

DAY 2

OUR ACTIVITIES

9h00 Introduction for bees: Biology, Ecology and Taxonomy

HYBRID

10h30 15' BREAK

12h00 LUNCH

13h00 Identification of bees

15h00 15' BREAK

17h00 FINISH

DAY 3

OUR ACTIVITIES

9h00 Introduction to hoverflies **HYBRID**

10h30 15' BREAK

12h00 LUNCH

13h00 Identification of hoverflies to tribe/genus level

14h30 15' BREAK

14h45 FINAL DISCUSSION



MODULE 1 Introductory training school on pollinator identification

POLLINATORS

IMPORTANCE, MAIN GROUPS, CONSERVATION STATUS AND MONITORING METHODS

Hugo **GASPAR**



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IMPORTANCE





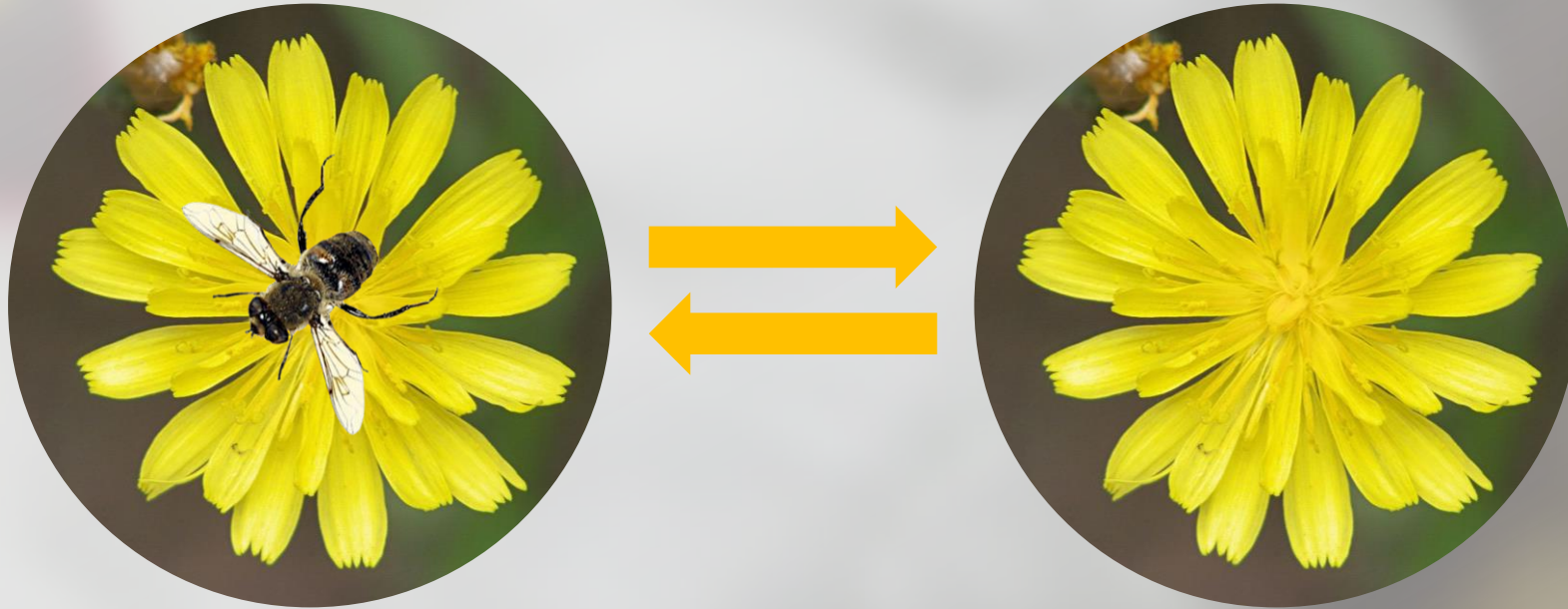
INSECT POLLINATION

pollen transport



INSECT POLLINATION

pollen transport





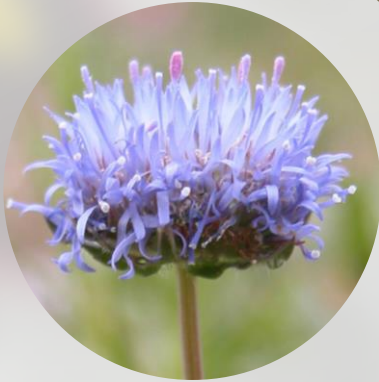








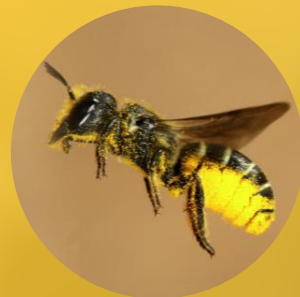
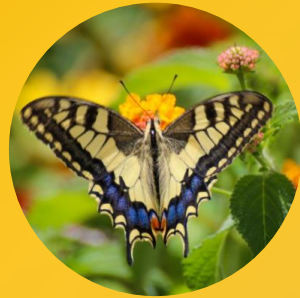
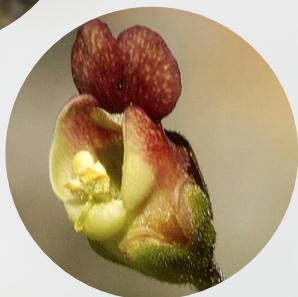




PLANTS WITH FLOWER

90% need animal vectors for pollen transport





color, shape, size, nectar and pollen content



CROPS POLLINATED BY INSECTS

75% of the species used by humans





POLLINATION SERVICES

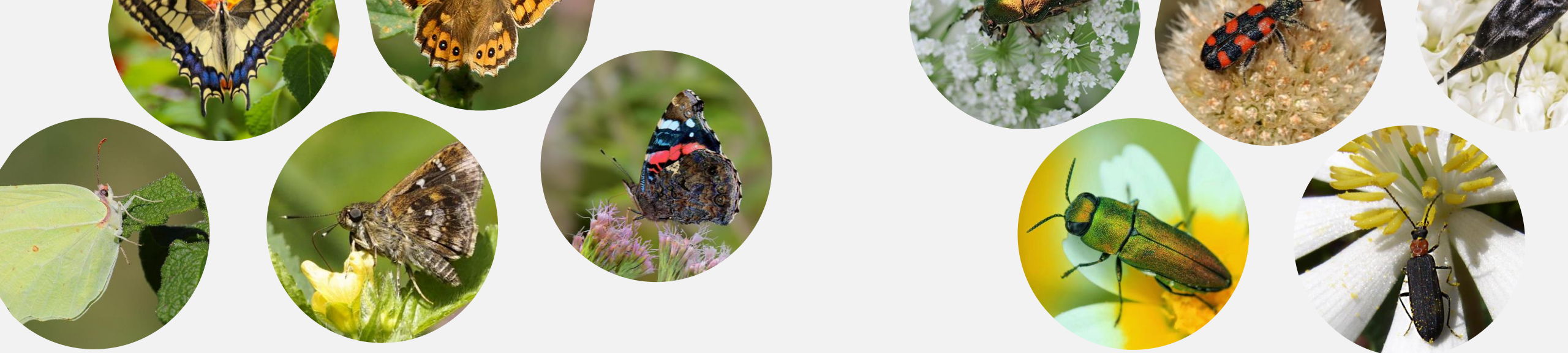


- quantity
- size
- flavor
- nutrient content
- shelf life
- resistance to pests and diseases





MAIN GROUPS



POLLEN or NECTAR FEEDING

with accidental pollen transport

thousands of species





WHO IS **THE BEST** POLLINATOR GROUP?



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deposition capacity



WHO IS **THE BEST** POLLINATOR GROUP?

deposition capacity

visitation rate

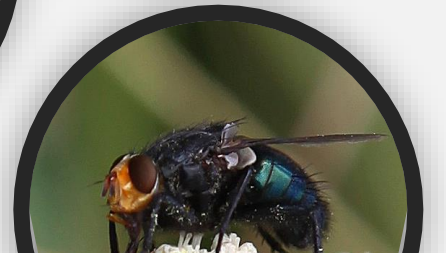


WHO IS **THE BEST** POLLINATOR GROUP?

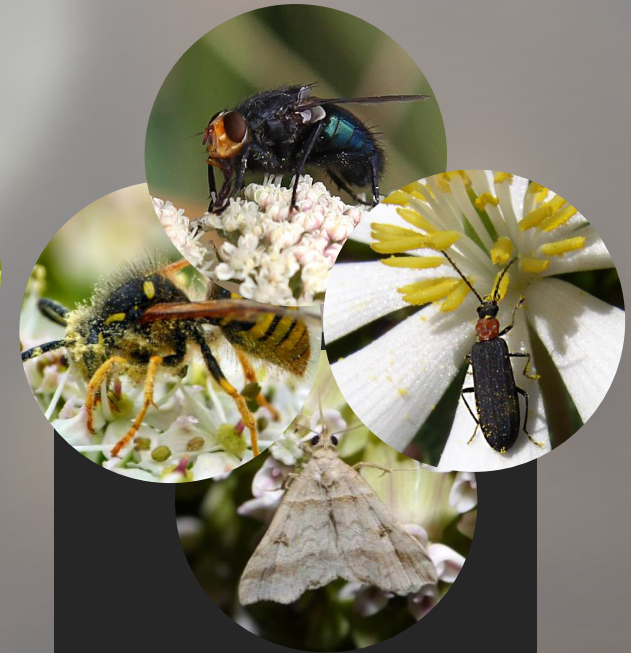
deposition capacity

visitation rate

abundance



WHO IS **THE BEST** POLLINATOR GROUP?





MAIN POLLINATOR GROUPS

bees *Anthophila:Hymenoptera*

hoverflies *Syrphidae:Diptera*

diurnal butterflies *Rhopalocera:Lepidoptera*





NEEDS FOR LIFE CYCLES

plant or animal food
shelter or nesting places
nesting materials



DAY 3

Maarten **DE GROOT**





HERBIVORES



PREDATORS



DETRITIVORES





DAY 1

Marco **BONIFACINO**



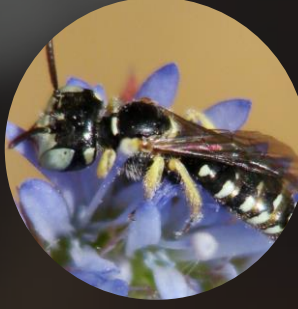
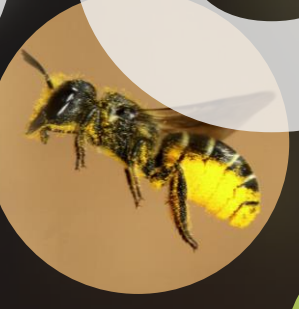
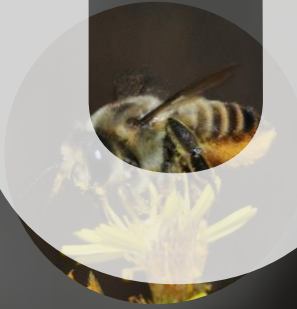
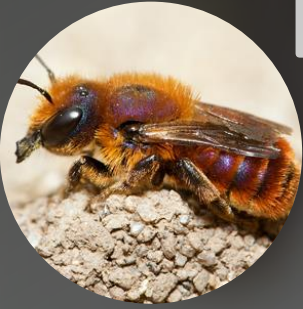
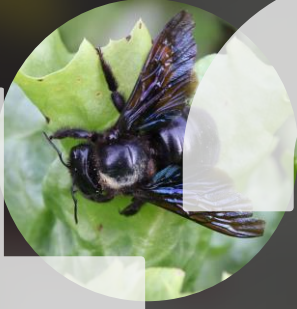
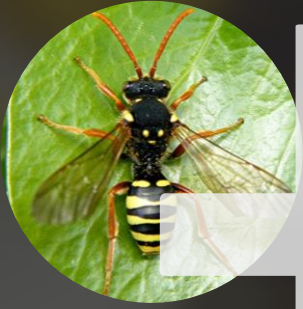
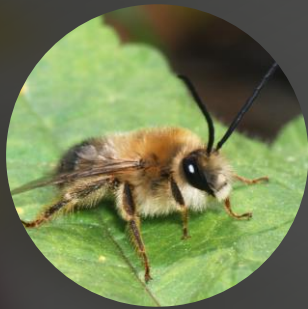
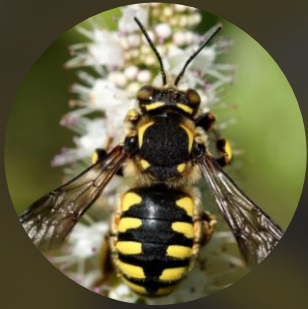






DAY 2

Simone **FLAMINIO** &
Hugo **GASPAR**



42000



ONLY FEEDS ON
POLLEN OR NECTAR

CARNIVORE LARVAE



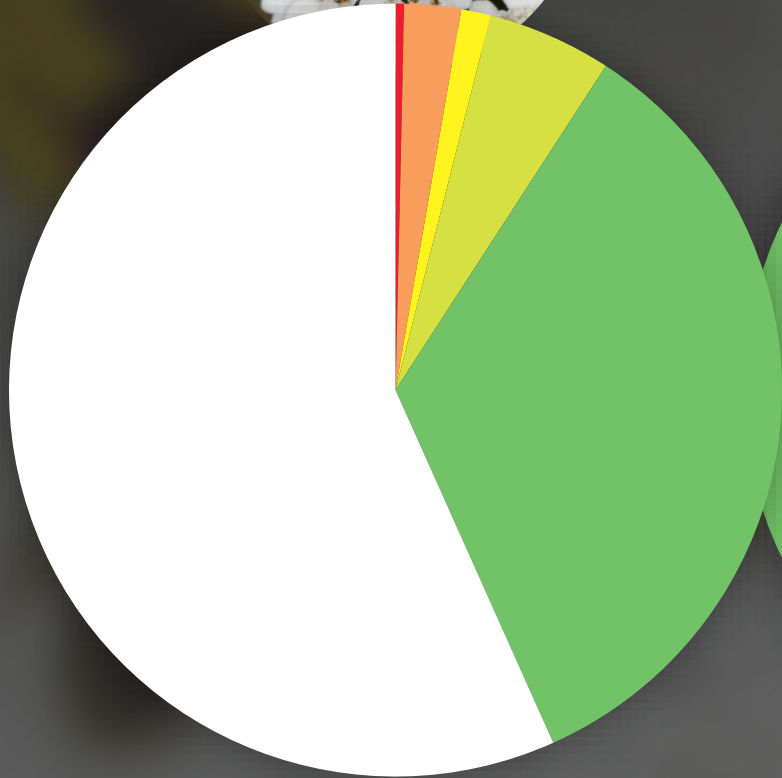
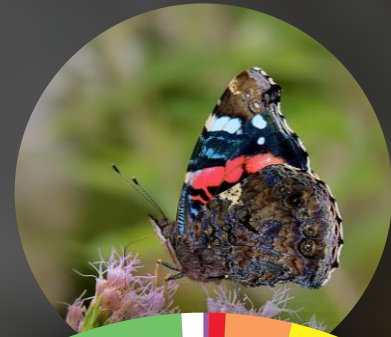
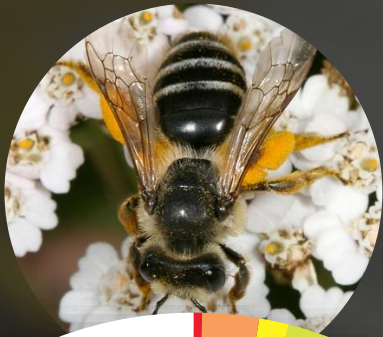
PREDATORY LARVAE



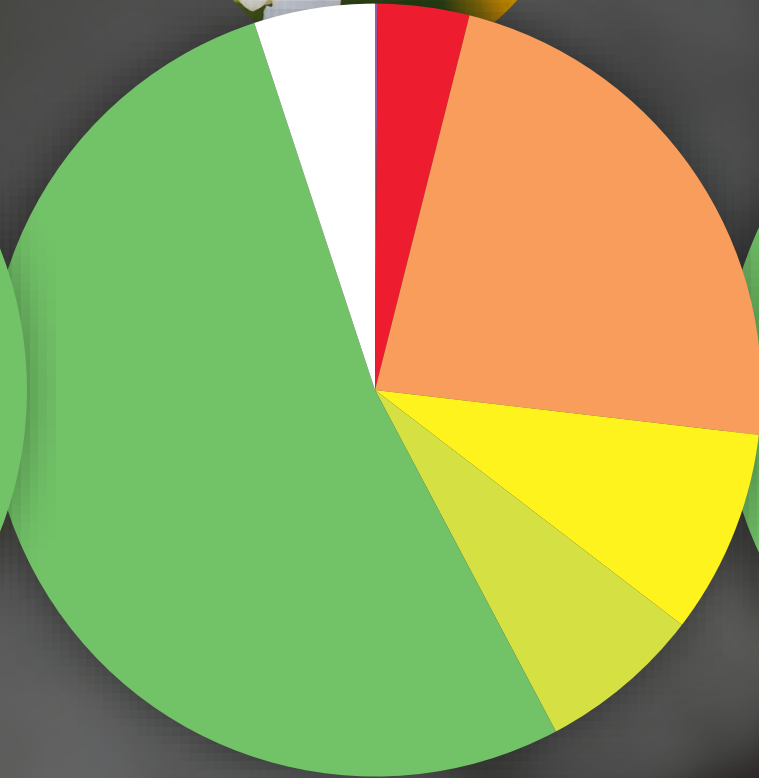
PARASITOID LARVAE



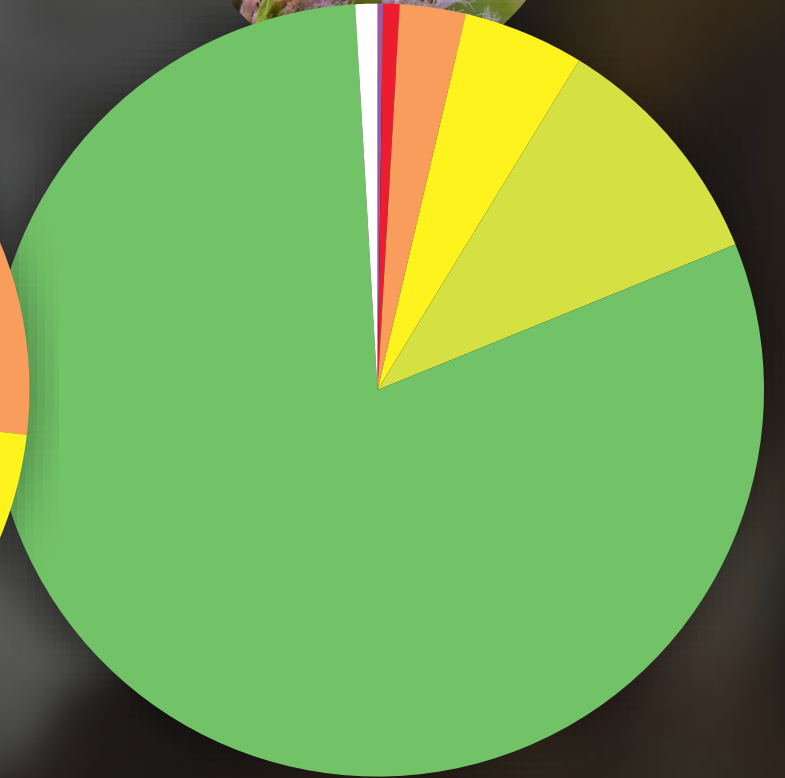
CONSERVATION STATUS



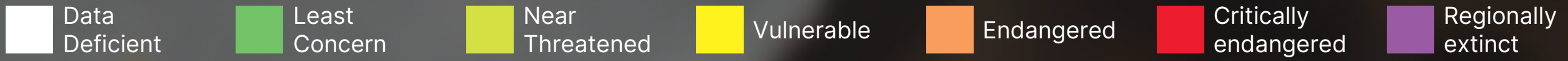
2014

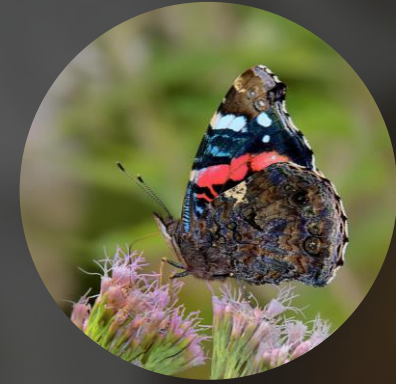
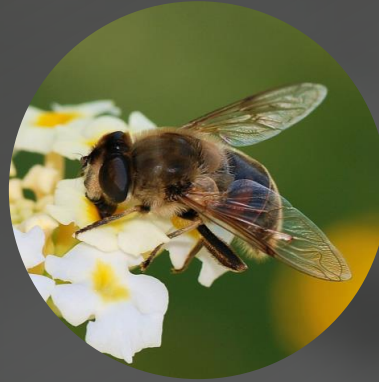
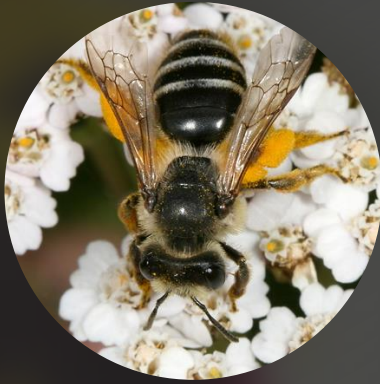


2022



2010





LOSS OF HABITAT AND CONNECTIVITY

AGRICULTURAL INTENSIFICATION OR ABANDONMENT

CLIMATE CHANGE

INTENSIFICATION OF HUMAN
RELATED DEVELOPMENT

A person wearing a light-colored t-shirt, dark pants, and a hat is walking through a field of green grass and yellow wildflowers. They are holding a large white net, likely used for collecting insects or other small organisms. The field is enclosed by a wire fence with wooden posts. In the background, there are more green fields and a line of trees under a clear blue sky.

MONITORING METHODS





target group
identification level
pollen analysis



plant type
spatial and temporal **scales**



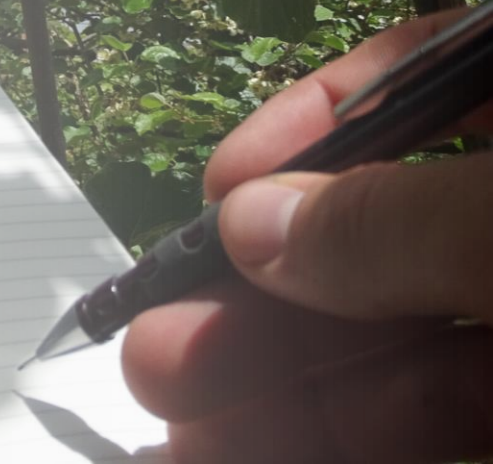
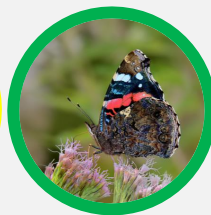
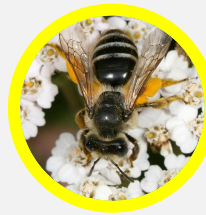
available **workforce**



record **interaction**
abundance
diversity

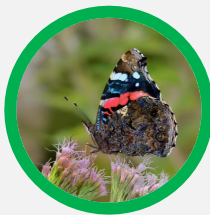
OBSERVATION

flower patch
transept



OBSERVATION

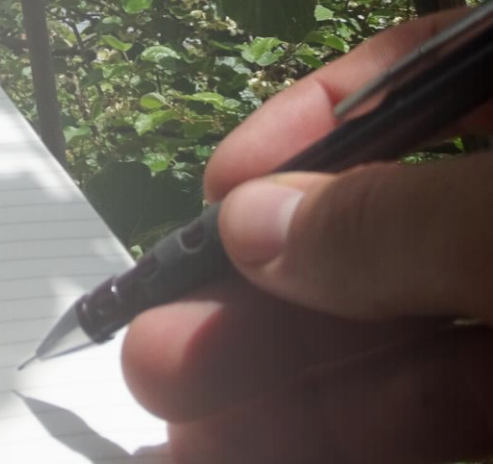
flower patch
transept



plant-poll interaction
(visitation rate, behavior)

non lethal

no special material



OBSERVATION

flower patch
transept



plant-poll interaction
(visitation rate, behavior)

non lethal

no special material



limited identification
(user bias, big insects)

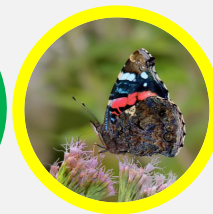
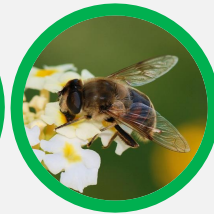
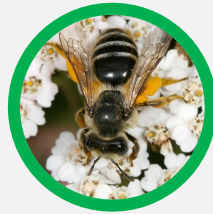
mostly hard to fly away species

very time consuming



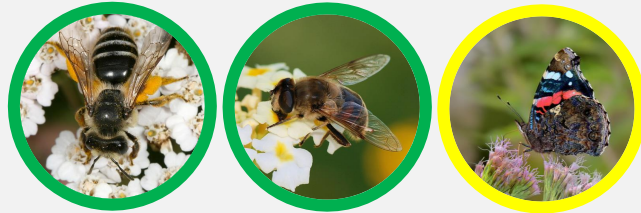
NETTING

targeted
sweep



NETTING

targeted
sweep



specimen selection
gets easy to fly away species
lab identification



NETTING

targeted
sweep

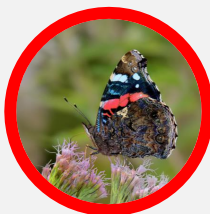


specimen selection
gets easy to fly away species
lab identification

- high sampling effort
- sweep without interaction
- lethal method (most times)



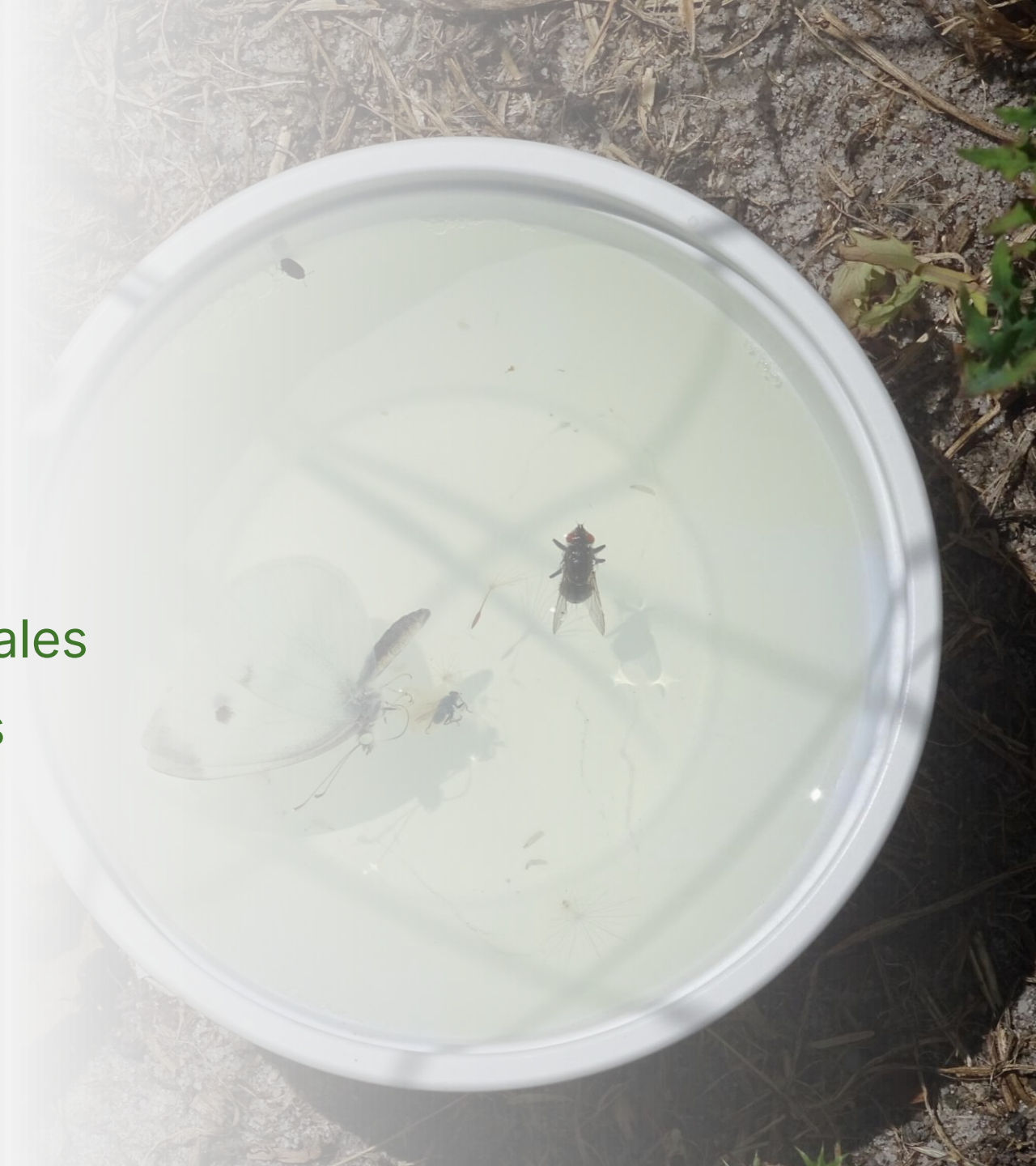
PAN-TRAP



PAN-TRAP



large spatial and temporal scales
gets easy to fly away species
lab identification



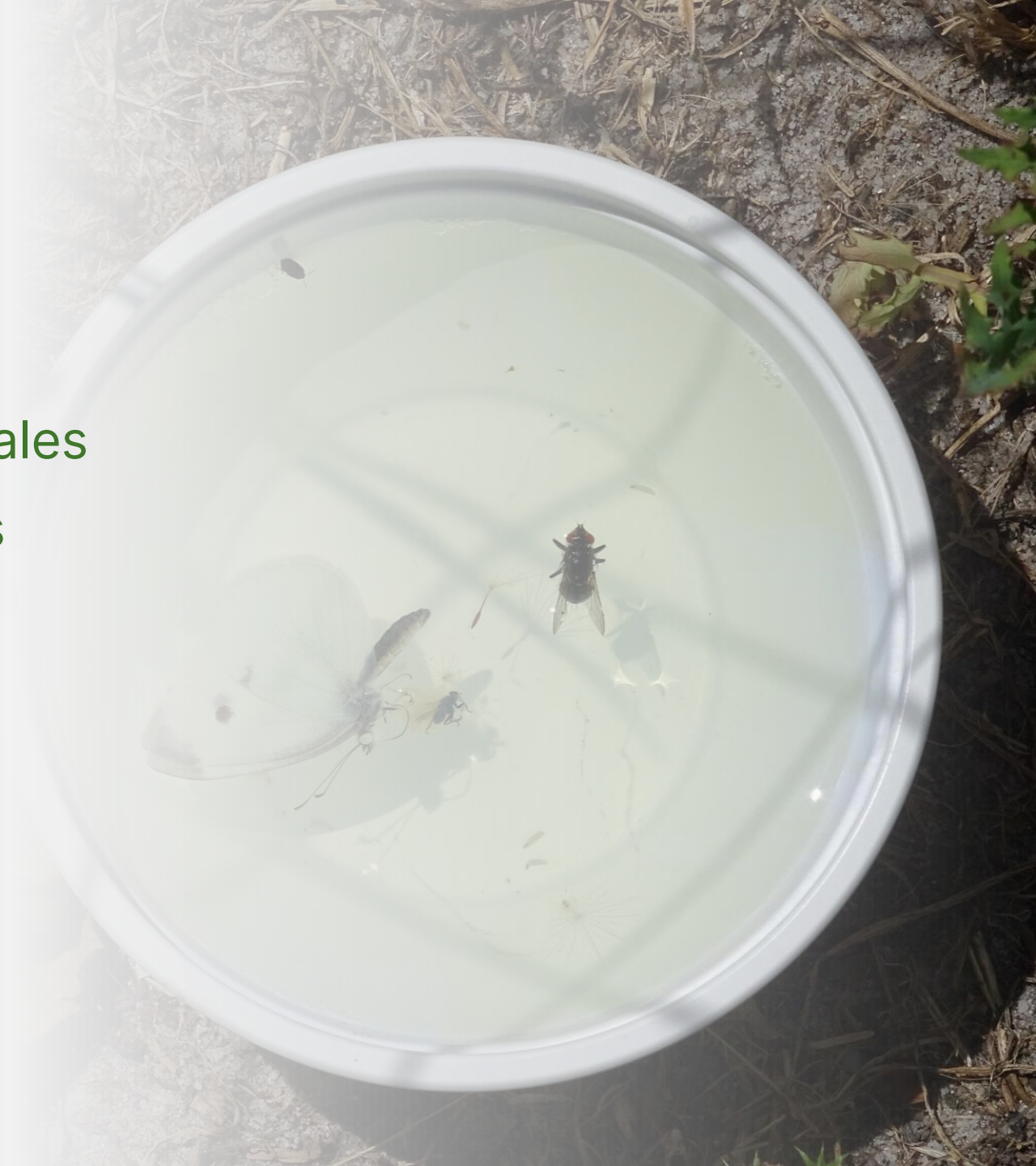
PAN-TRAP



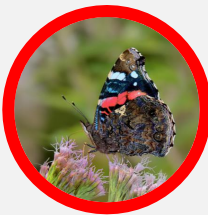
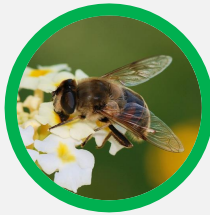
large spatial and temporal scales
gets easy to fly away species
lab identification



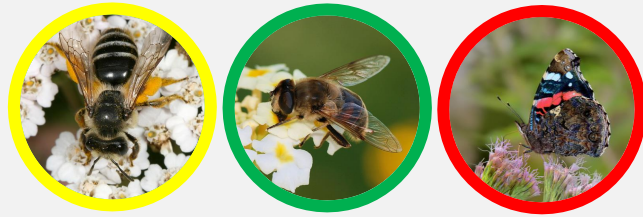
specimen poor condition
no plant-poll interaction
bias towards some species
lethal method



MALAISE-TRAP



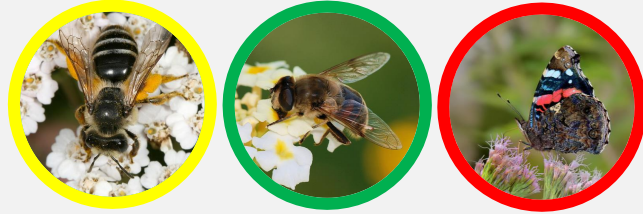
MALAISE-TRAP



large spatial and temporal scales
gets easy to fly away species
lab identification



MALAISE-TRAP



large spatial and temporal scales
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lab identification



specimen poor condition
no plant-poll interaction
bias towards some species
lethal method



WHAT TO CHOOSE ?



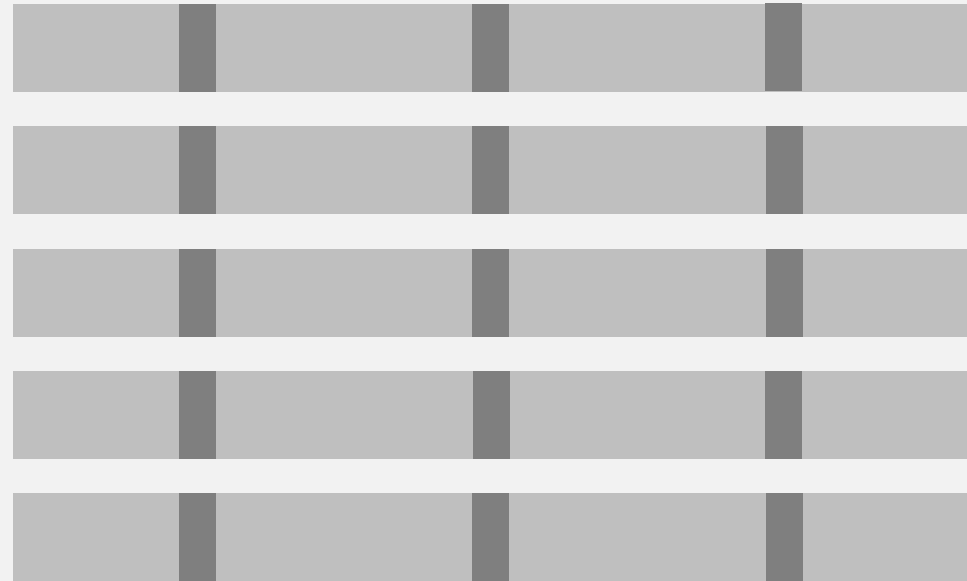
plant-poll interaction

taxonomic identification

visitation rates

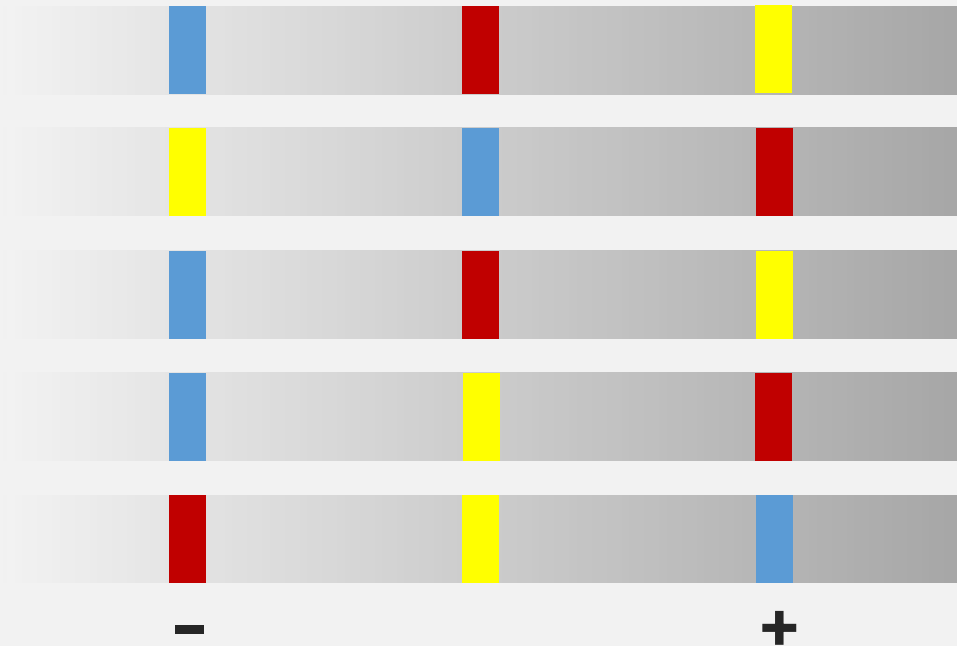
not bias for some species

data/sampling effort ratio



WHAT TO CHOOSE ?

plant-poll interaction
taxonomic identification
visitation rates
not bias for some species
data/sampling effort ratio



A collection of pinned bumblebee specimens is displayed in a white tray. The bees are arranged in rows, with some pinned to small white labels. A teal rectangular box is overlaid in the center of the image, containing the text "ENTOMOLOGICAL COLLECTIONS" in bold, black, uppercase letters. The background is slightly blurred, focusing attention on the text and the specimens.

ENTOMOLOGICAL COLLECTIONS

location with coordinates
date of collection
collector
individual code



location with coordinates
date of collection
collector
individual code



capture method
plant where it was caught on
habitat description

PRODUCE KNOWLEDGE



location with coordinates
date of collection
collection number
individual collector

capture method
plant where it was caught on
habitat description

distribution
diet
taxonomy
ecology
reference material

A photograph of a museum display case containing numerous pinned bumblebee specimens. The bees are arranged in rows on white trays. Each specimen is mounted on a small white card with a QR code and handwritten text. The bees are shown from various angles, including dorsal, ventral, and lateral views. The background is a plain, light-colored wall.

HOW TO PIN THEM?

A collection of pinned bumblebee specimens in a museum display case. The bees are arranged in rows, with some pinned to a white background and others to a light-colored surface. Each specimen is accompanied by a small label and a QR code. The background is a light, neutral color.

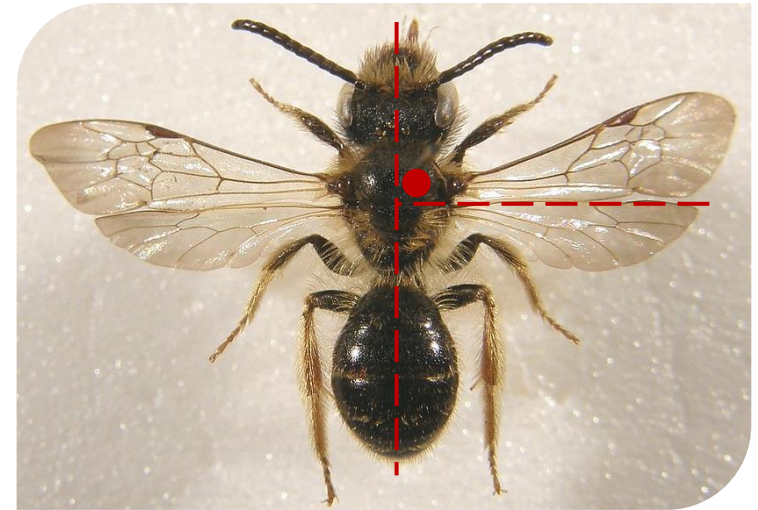
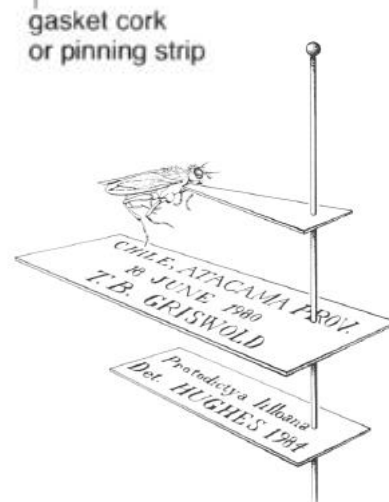
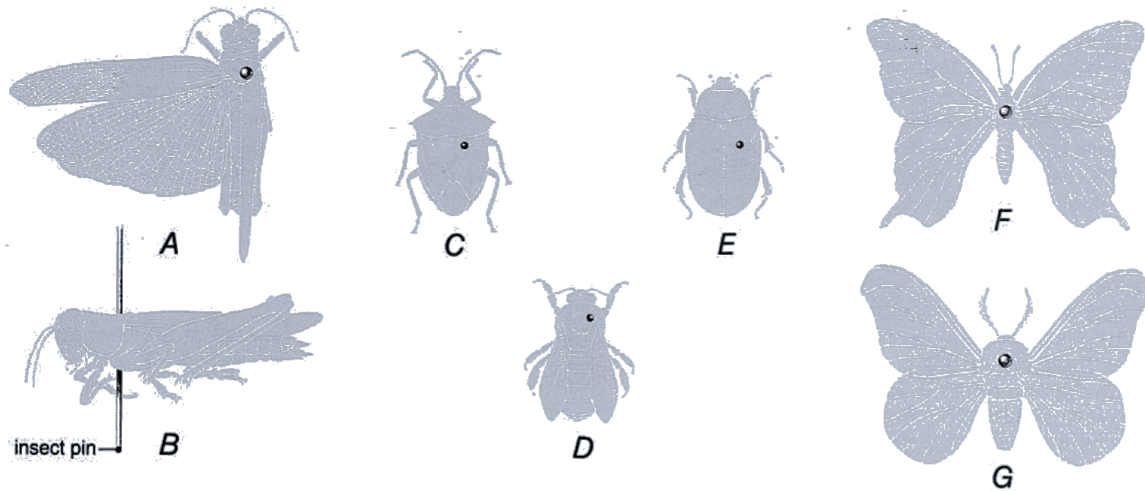
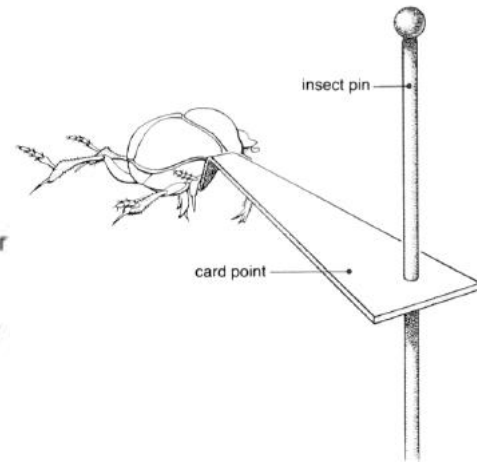
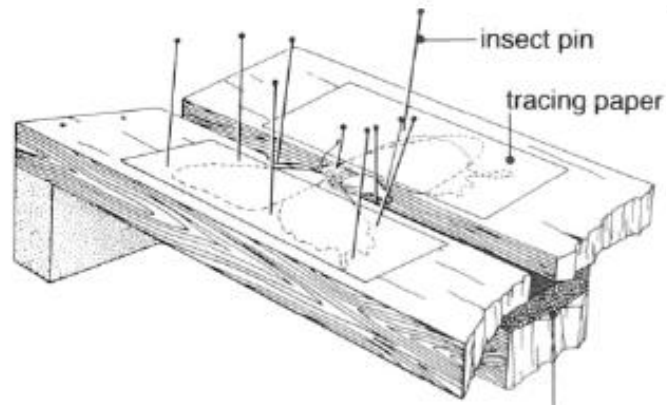
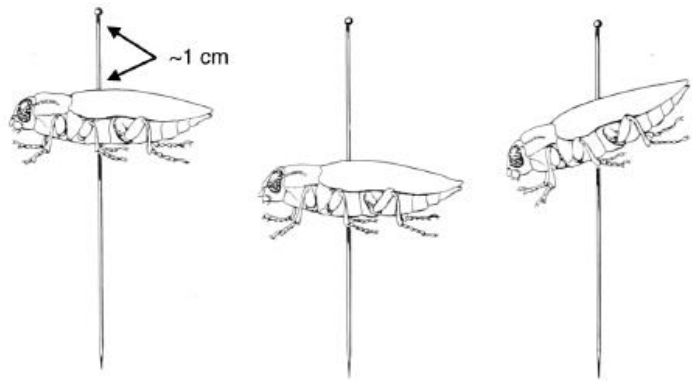
HOW TO PIN THEM?

2017. Frost Entomological Museum. SOP 03: Specimen Preparation Guide 1997?. Schauff, M. E.. Collecting and preserving Insects and mites: Techniques and tools



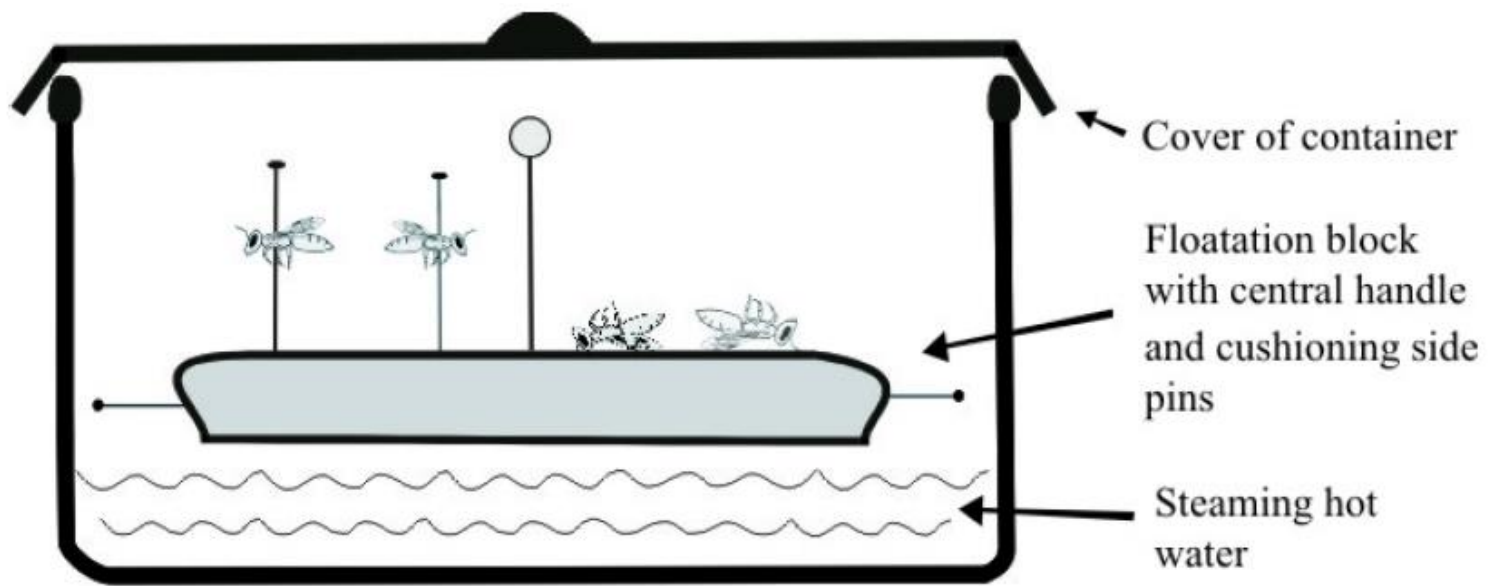
Handwritten text on a piece of paper at the bottom of the image, likely a specimen log or checklist. The text is partially obscured and difficult to read, but appears to include columns for specimen identification and collection data.

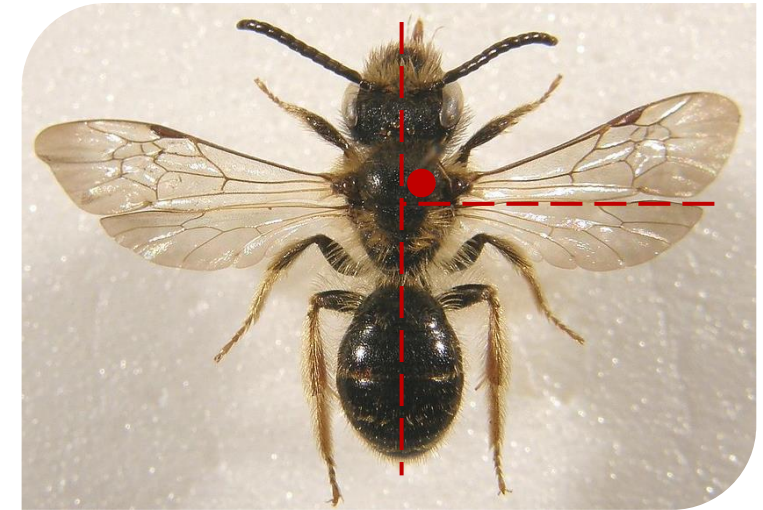
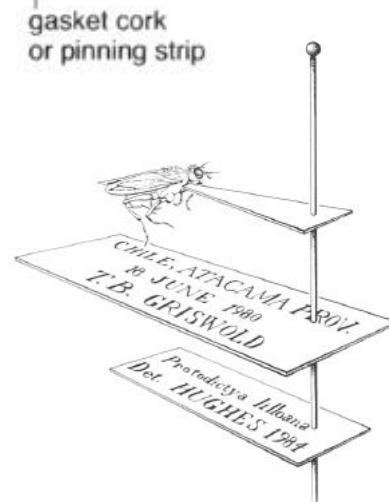
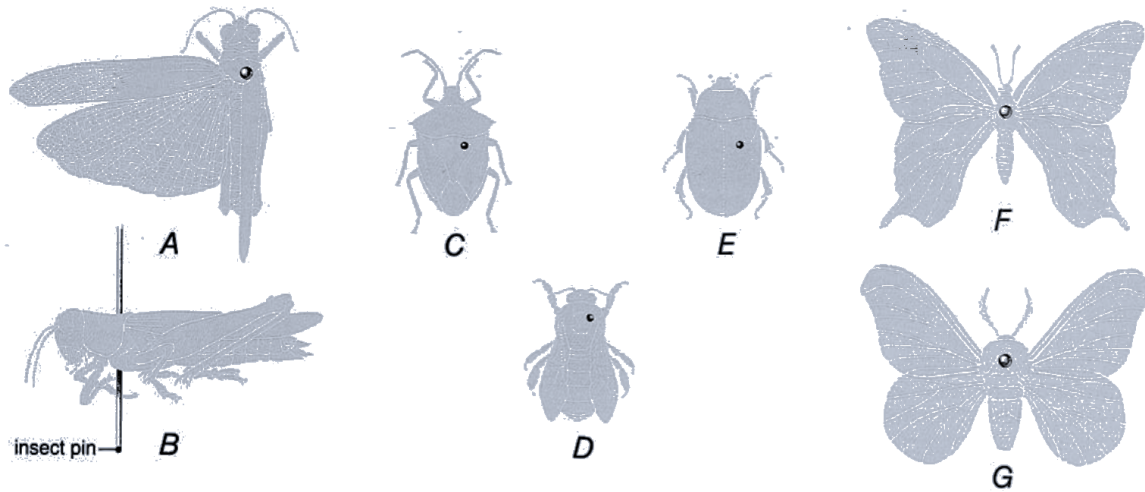
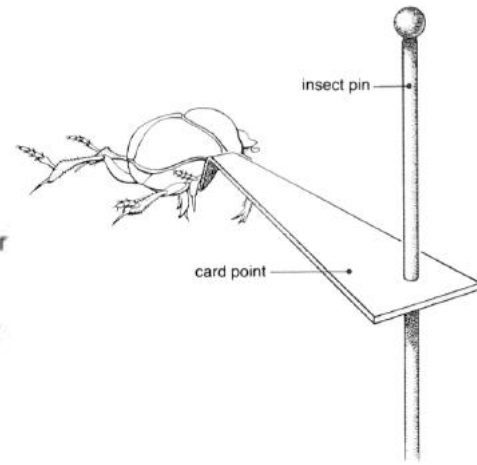
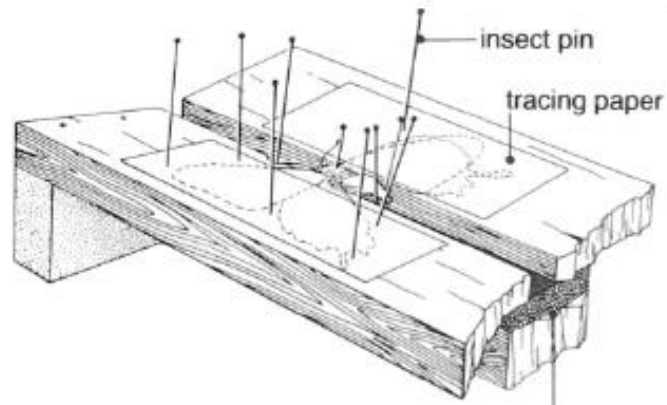
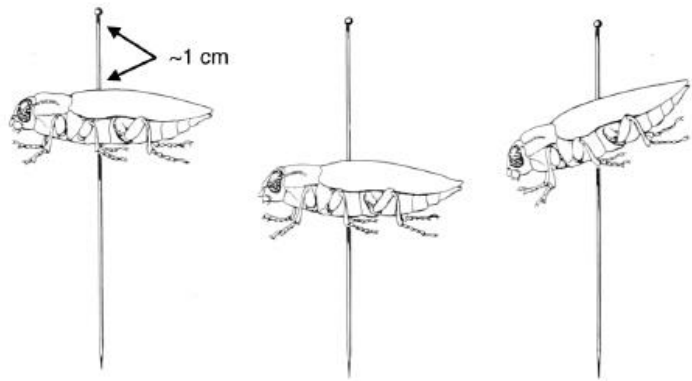
Specimen ID	Species	Sex	Age	Location	Date
1	Apis mellifera	♀	Worker
2
3
4
5
6
7
8
9
10



PERIODIC INSPECTION, IF NEEDED, FREEZING TREATMENTS

CONSTANT TEMPERATURE AND HUMIDITY, ISOLATED





PERIODIC INSPECTION, IF NEEDED, FREEZING TREATMENTS

CONSTANT TEMPERATURE AND HUMIDITY, ISOLATED



MODULE 1 Introductory training school on pollinator identification

POLLINATORS

IMPORTANCE, MAIN GROUPS, CONSERVATION STATUS AND MONITORING METHODS

Hugo **GASPAR**



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