Funded by the Horizon 2020 Framework Programme of the European Union

AIM
Aedes Invasive Mosquitoes

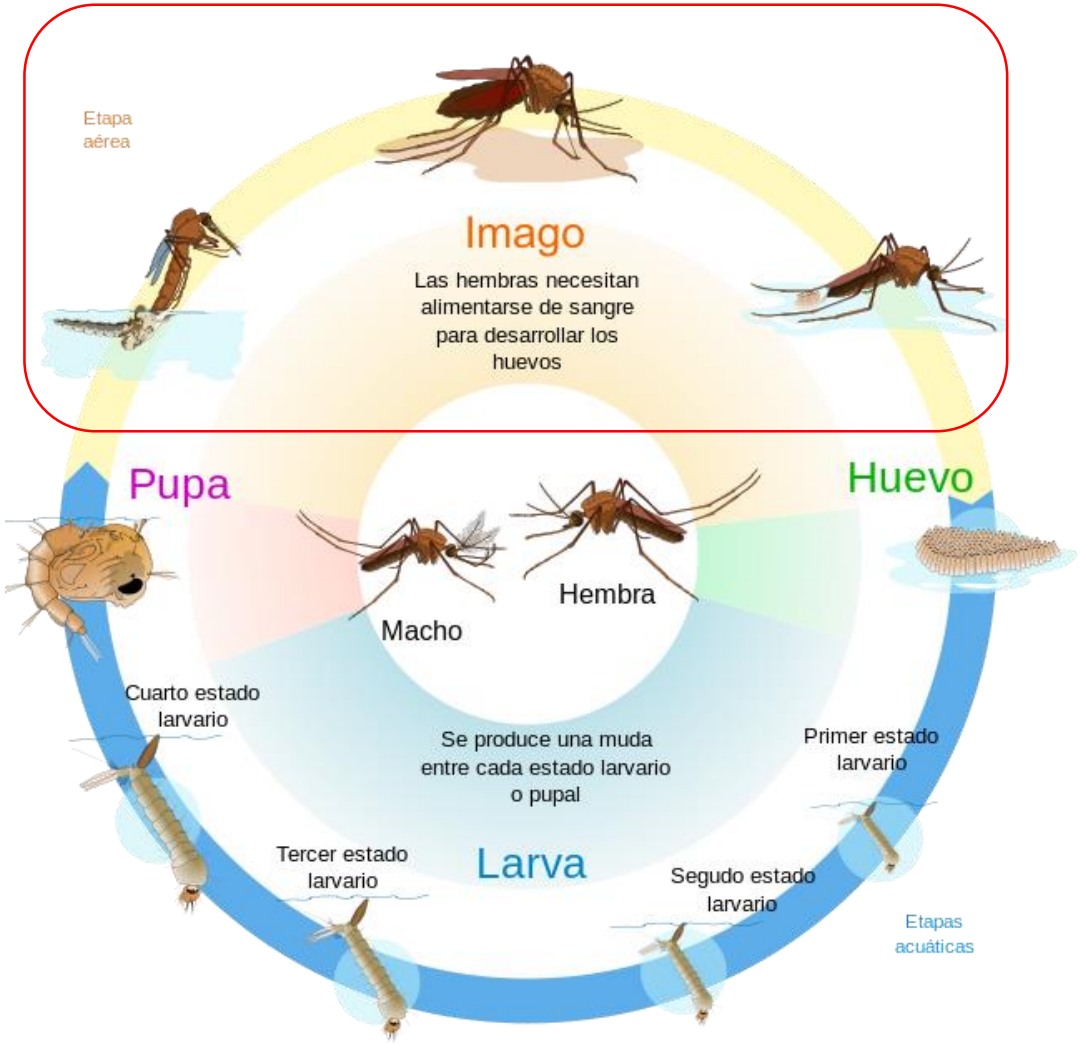
cost
EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

UIB
Universitat de les Illes Balears

Sampling Methods: Host seeking adults.

Dr. M.A. Miranda. University Balearic Islands (Spain)

Life cycle- Host Seeking Adults



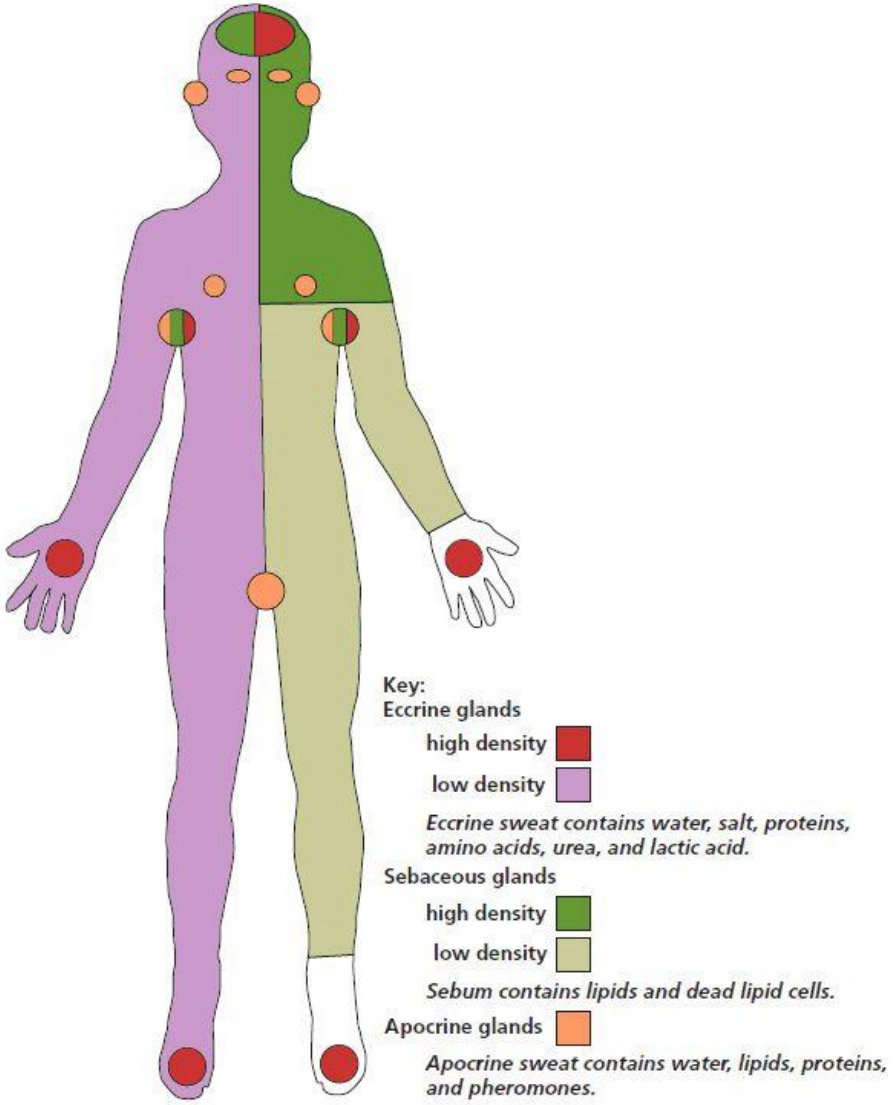
Why mosquitoes fly?

- To avoid predators
- To look for food, sugar and/or proteins (blood)
- To mate
- To look for breeding sites (oviposition)
- To migrate

We take advantage mainly of the **host seeking** and **oviposition** behaviour.

What attracts a mosquito?

- Host seeking females are attracted mainly by:
  - Semiochemicals (Kairomones):
    - CO_2: breath
    - Sweat: produced by bacteria on the skin and proportion of sweat glands.
  - Physical cues
    - Shape
    - Heat



Primary locations of eccrine, sebaceous, and apocrine glands on the human body.

Methods for sampling host seeking adults:

We will refer to the most commonly used for the surveillance and monitoring of AIMs species.

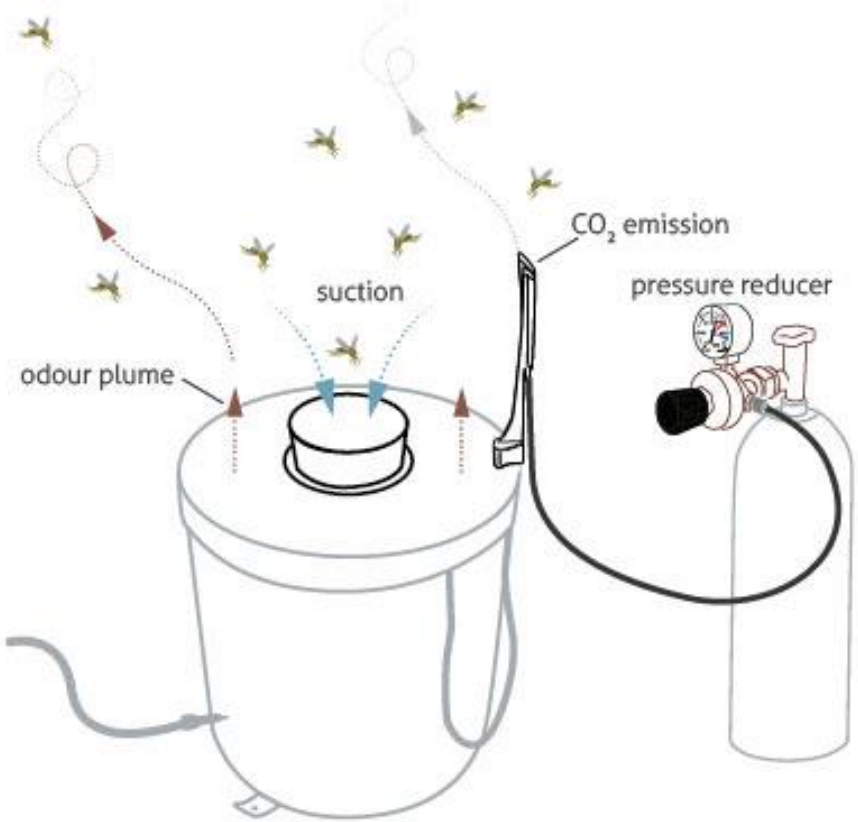
1.- CO_2-baited suction traps

2.- Light traps baited with CO_2

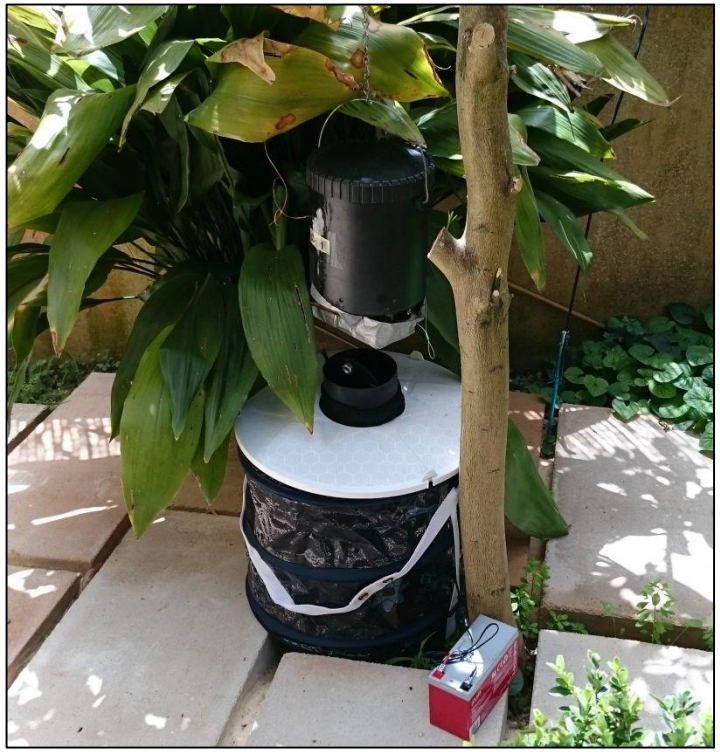
3.- Gravid traps

4.- Human landing collection (HLC)

1.- CO_2-baited suction traps



https://www.bg-sentinel.com/en/use.html



Components of BG Sentinel.

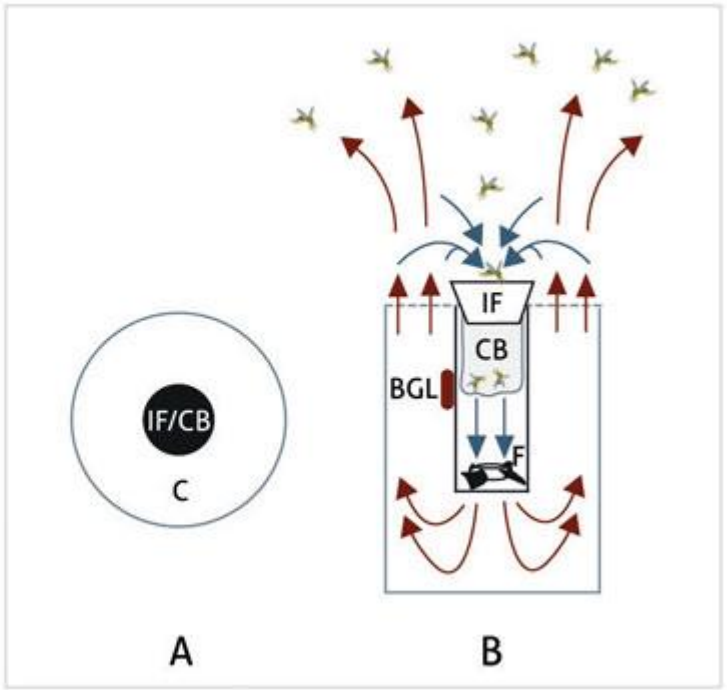
A: Top view

IF/CB: Intake funnel with catch bag
C: Cover with small wholes

B: Side view

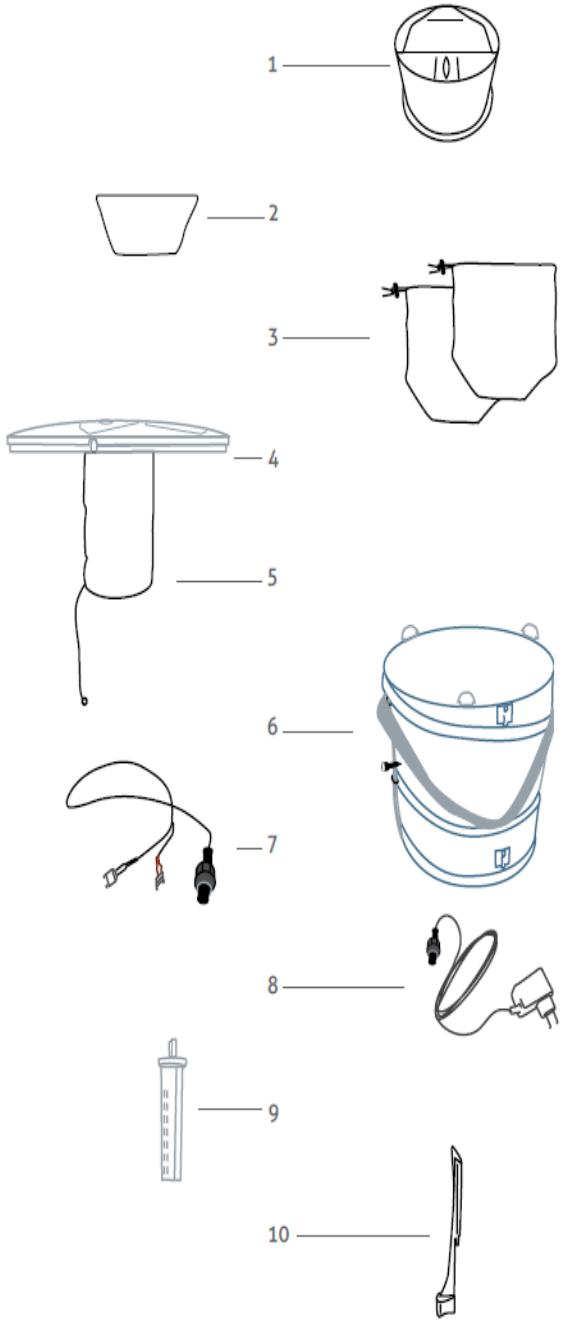
IF: Intake funnel
CB: Catch bag
F: Fan
BGL: BG-Lure

Arrows symbolize the direction of airflow.



Product components

1. Intake funnel
2. Funnel net
3. Catch bag (2x)
4. Trap cover
5. Inner cylinder with attached ventilator
6. Trap body
7. Battery cable
8. Power cord with transformer (optional)
9. BG-Lure cartridge (optional)



https://www.bg-sentinel.com/downloads/BG_Sentinel_2_Manual_EN_web.pdf

Bg Sentinel with 20Kg CO_2 bottle plus timer. Mains electricity powered.


CO_2 Noozle

Use of CO_2 bottles with BG traps.

Previous system with regulator with two tubes of two colors (red and blue):

Consumption Table of Carbon Dioxide			
CO_2 Tube with Sinter Plug	CO_2 Flow Rate in ml / min	CO_2 Flow Rate in grams / day	Number of days a 10kg CO_2 cylinder lasts
Blue - CO_2 Flow Rate	70	200	50
Red - High CO_2 Flow Rate	175	500	20

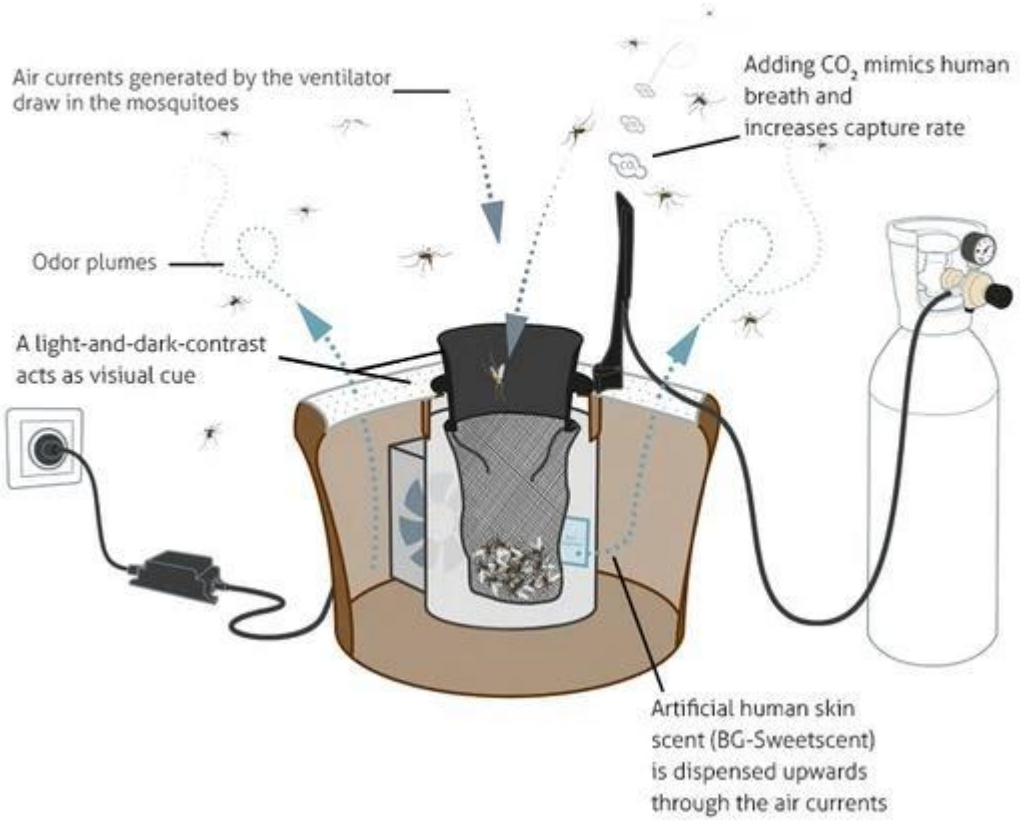
New system, with the regulator already set for a flow rate of 0.5 kg/day (red marker on the display) or of 0.2 kg/day (blue marker on the display).

Bg Sentinel with BG-Lure. Battery powered.

Very important tool!!

Bg Mosquitaire with BG - Sweetscent and $C0_2$.

Same principle as BG- Sentinel but more robust and designed for mosquito control (e.g. gardens)

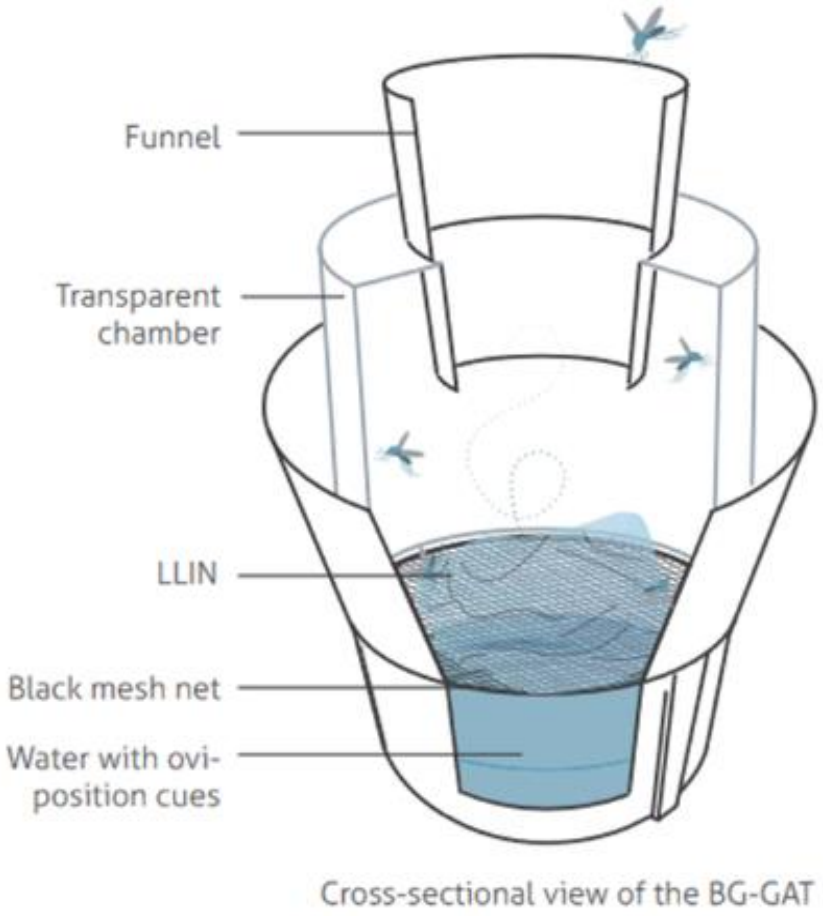


https://eu.biogents.com/wp-content/uploads/BG-Mosquitaire-CO2-manual-EN-DE-FR-web.pdf

Issues to take care when using BG Sentinel traps:

- Position
- Pressure of CO_2
- Pets and people (children)
- Electric instalation
- Ants and snails

3.- Gravid traps



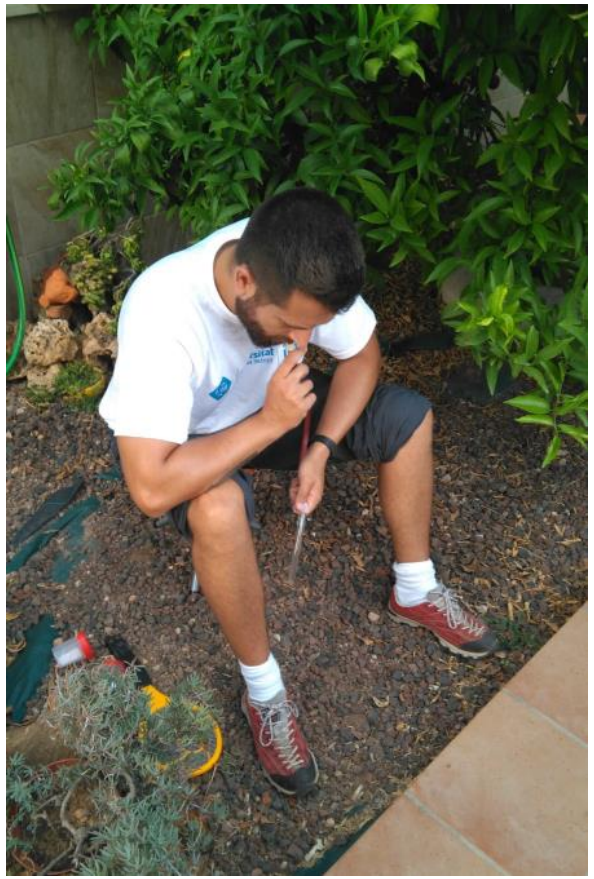
Cross-sectional view of the BG-GAT

Source: Biogents

2.- Light traps baited with CO2

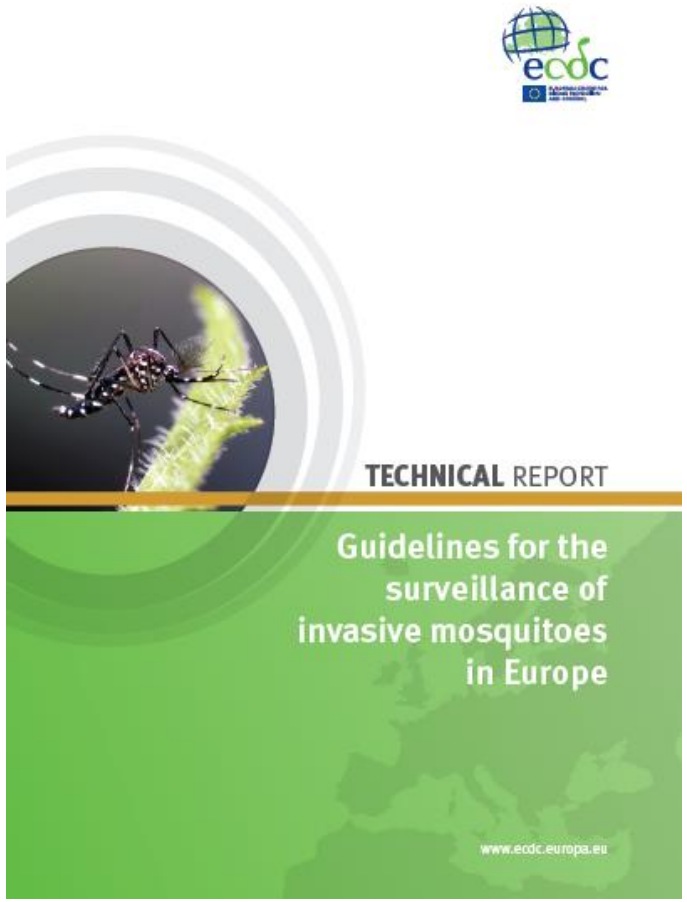
4.- Human landing collection (HLC):

- Usually 15 min collecting time, reduced to 5 min if high pressure. Some species have interrupted feeding (*Ae. alb.*)
- Biting should be avoided
- Ethics issues in areas with VBD transmission



Video (in Catalan) https://ib3.org/campanya-de-prevencio-i-control-del-moscard-tigre

More detailed information at: Guidelines for the surveillance of invasive mosquitoes in Europe



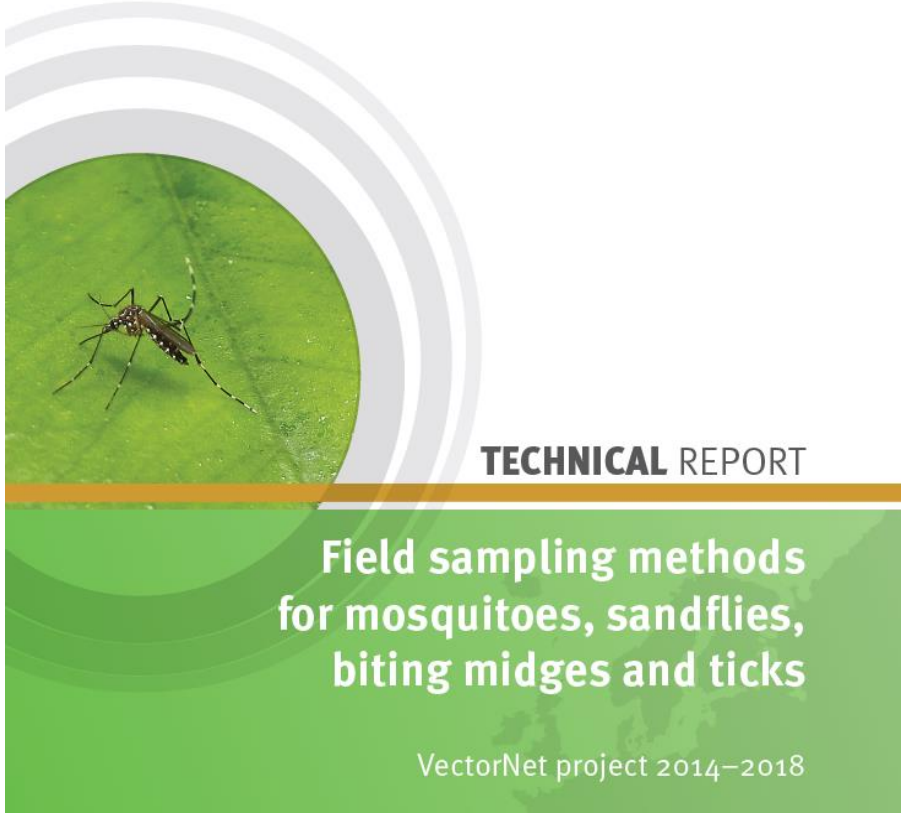
Scenario 1	Scenario 2	Scenario 3	Surveillance aim and sites	Methods and traps	Density of traps	Frequency of trapping	Period of trapping
(✓)	✓	✓	Quality and efficacy of control measures	• Ovitraps • BG-Sentinel, HLC	• 20/site • 4/site	Before and after applications	
			Persistence in colonised area				
	✓		Inspection of colonised area	• Ovitraps (BG-Sentinel, MM) • HLC • Larval search	• 1/5 ha • 1/20 ha • 3 or 4 • 40 vessels	Twice a month Twice a month Twice a month Twice a month	Apr–Nov Apr–Nov Apr–Nov Apr–Nov
	(✓)	✓	Abundance and seasonal dynamics	• Ovitraps (BG-Sentinel or • CO_2-baited traps or gravid traps)	• 6/site or • 2/site	Twice a month Twice a month	Jan–Dec[4] Jan–Dec[4]
		(✓)	Other mosquito population parameters (e.g. biting behaviour)	• Baited traps • HLC • Aspirators	2/site	Monthly	Jun–Sep
		✓	Infection of IMS by pathogens	• Gravid traps • BG-Sentinel	2/site	Weekly	During and after outbreaks
	✓	✓	Quality and efficacy of control measures	• Ovitraps • BG-Sentinel • HLC	• 20/site • 4/site	Before and after applications	
			Spread into areas surrounding colonised areas				
	✓	✓	Inspections around colonised areas	Ovitraps	1/15 ha	Monthly	Apr–Nov
		✓	Quality and efficacy of control measures	• Ovitraps • BG-Sentinel • HLC	• 20/site • 4/site	Before and after applications	

According to the scenario, procedures are listed as key (in bold) or optional (in brackets); several complementary sampling/trapping methods can be performed simultaneously (e.g. ovitraps and adult traps); required densities and frequencies are indicative averages which must be adapted to the risk level and the size of the area; ovitraps are run permanently over the period, other traps for 24h, 48h or one week, depending to the available power source; HLC can be performed when visiting the trap sites; trapping periods are given for central Europe and must be adapted to local climate.

[1] Storage sites for goods or equipment able to retain rain water could also be surveyed (e.g. sites with stone fountains, junkyards with damaged vehicles or equipment).
[2] Includes parking lots at commercial centres close to country borders.
[3] Ports with international trade; tourist ferry ports and marinas with colonised areas.
[4] Required during the first year; can later be limited to the period of development in the local climate.

https://www.ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/TER-Mosquito-surveillance-guidelines.pdf

More detailed information at: Field sampling methods for mosquitoes, sandflies, biting midges and ticks. EFSA, ECDC



What type of trap should be used?

- If possible, use the following trap types in parallel to test their performance:
  - CO_2-baited EVS trap
  - CO_2-baited CDC miniature light trap with light
  - CO_2-baited CDC miniature light trap, but with the light bulb removed
  - CO_2-baited BG-Sentinel trap with Sweetscent lure.

  This will allow for performance comparisons between different trap types and help evaluate cost effectiveness, resulting in the selection of the best trap type for presence/absence and abundance surveys. If such comparisons are not possible, use a CO_2-baited CDC miniature light trap with light and a CO_2-baited BG-Sentinel trap with Sweetscent lure. One of these traps should be used for longitudinal abundance sampling during the following sampling surveys of a project. See Table 2 for specific protocols for VectorNet field sampling.
- Select a standard trap after testing several trap types during the first field sampling year; decide on standard batteries, standard chargers, standard CO_2 release rate or standard dry ice pallet size and quantity.

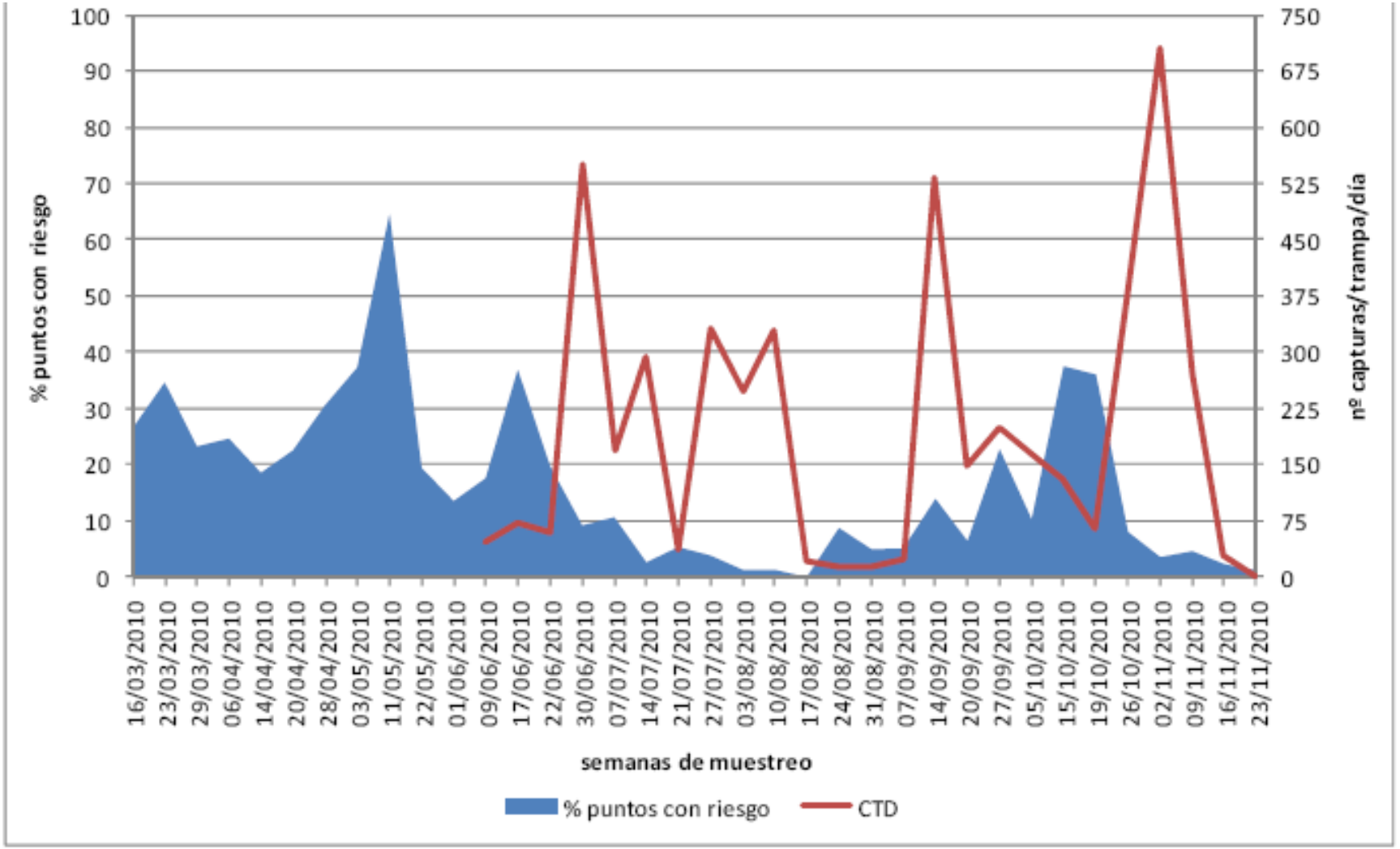
Table 2. Specific protocols used for the VectorNet field sampling surveys

Sampling	Objectives	Trapping methods
Cross-section sampling	Presence/absence	• Follow the general procedure: use the four types of traps listed above; if not possible, use a CO_2-baited CDC miniature light trap with light and a CO_2-baited BG-Sentinel trap with Sweetscent lure.
	Vectorial capacity data (field component)	• Follow the general procedures and use the two traps mentioned in the bullet point above or gravid traps when *Culex* spp. are targeted. • Samples should be collected every day in order to have a high number of live mosquitoes; this avoids having to separate live from dead mosquitoes.
Longitudinal sampling	Presence/absence	• Follow the general procedures: preferably use two different types of traps (see: What type of trap should be used?)
	Population dynamics (e.g. seasonality, density peaks, number of generations)	• Follow the general procedures: preferably use the four types of traps listed under: What type of trap should be used? Use the same type of trap/s at all localities and for all sampling dates in order to make results more comparable.
	Abundance data	• This sampling protocol is designed for sampling of adults from a group of *Culex* species (*Cx. pipiens complex, Cx. torrentium, Cx. perexiguus, Cx. tritaeniorhynchus*). • In case of comparing abundance data; a trap type must be selected optimally combining attractiveness, reliability/robustness and cost efficacy (see more below). • This 'sustainable' trap type will be chosen after analysis of the data gathered during the first sampling season.

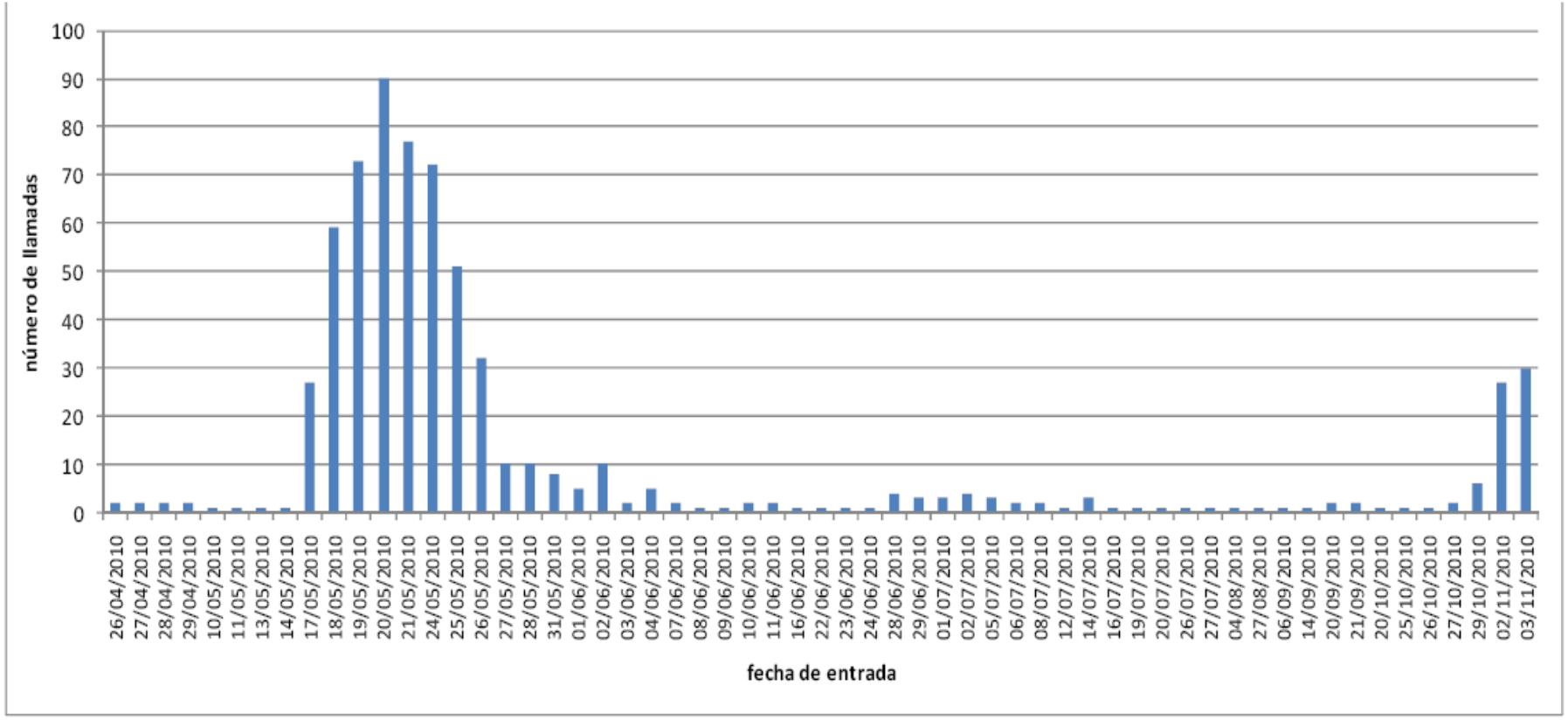
https://www.ecdc.europa.eu/sites/default/files/documents/Vector-sampling-field-protocol-2018.pdf

Some examples of using host seeking adults sampling methods

Larvae abundance (3-30 larvae dipper blue) and adults monitoring (Mini CDC, red) for wetland mosquitoes. Year 2010

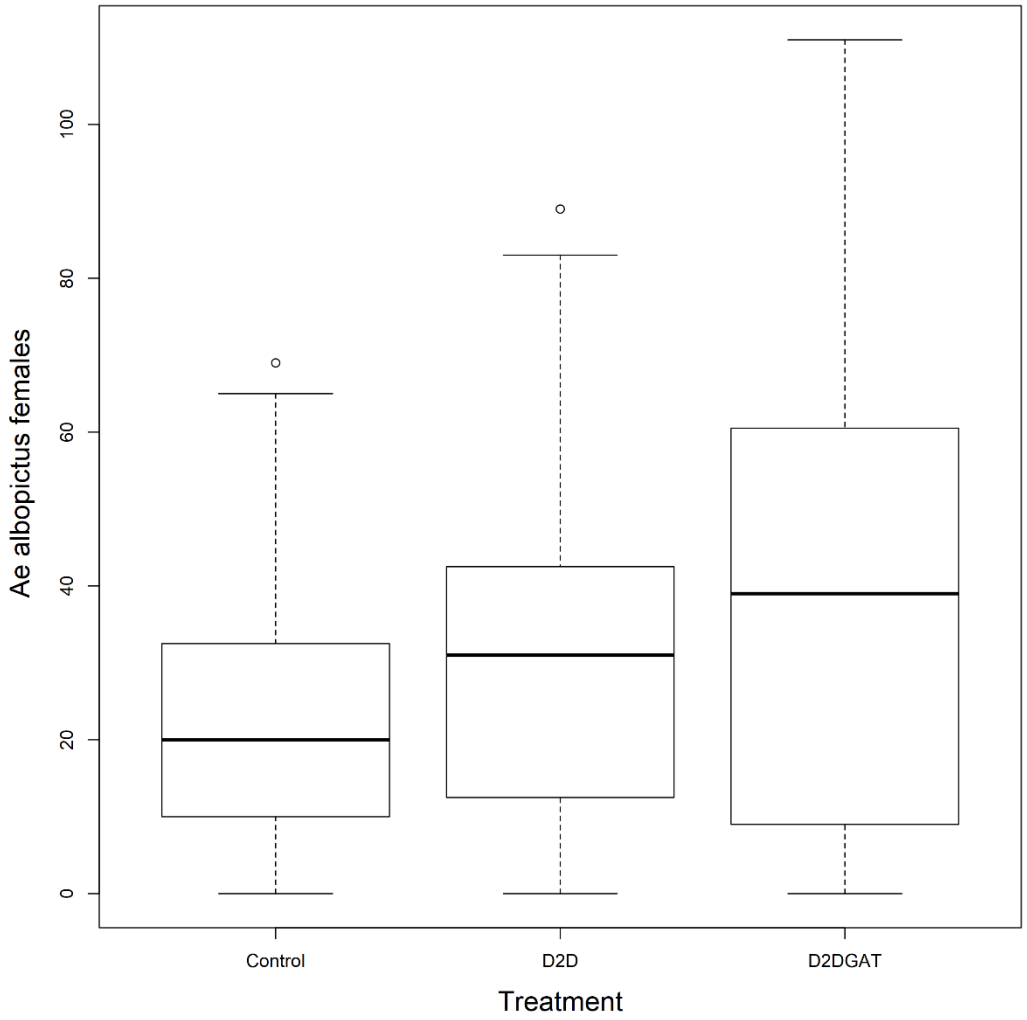


Resident's communications 26th/04 to 3rd/11. Year 2010.

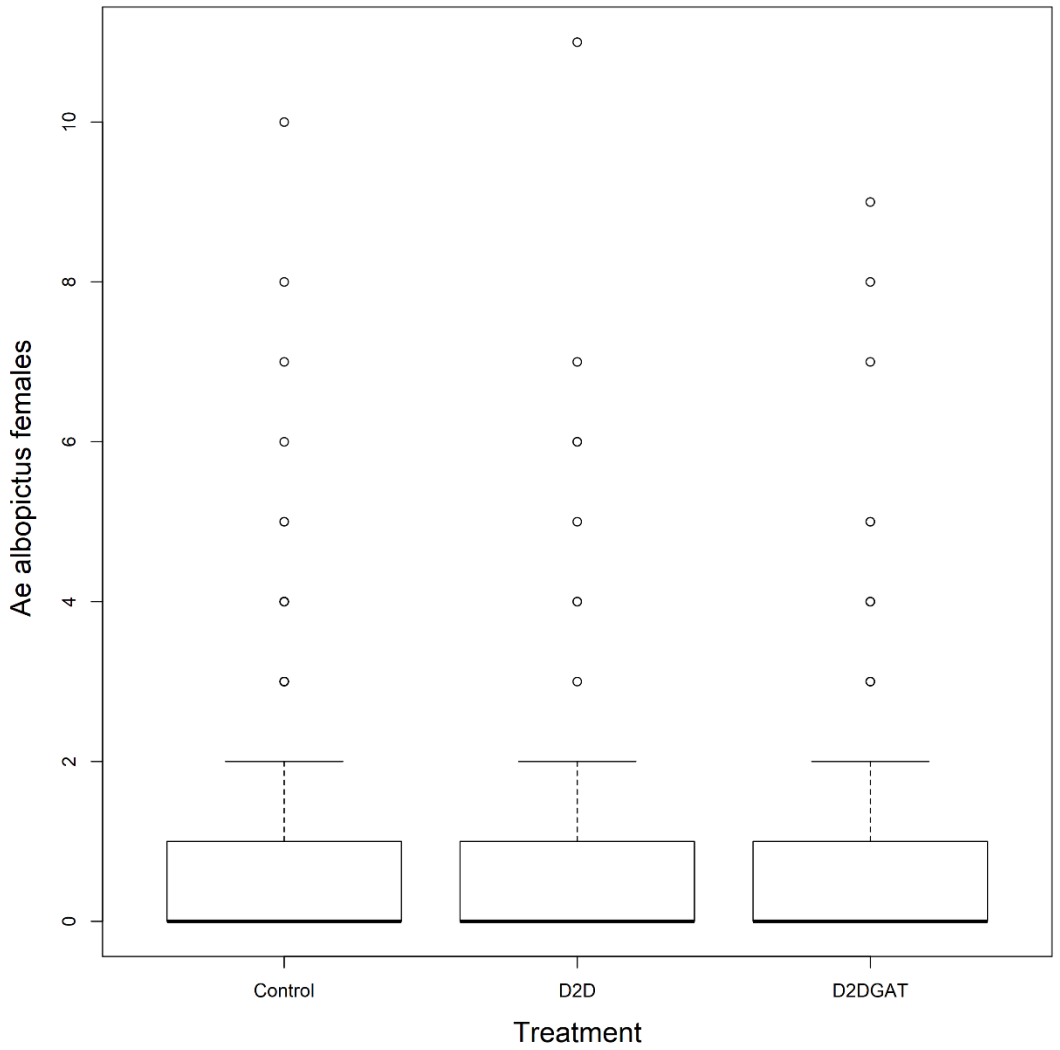


Comparing HLR and BG- traps (Source: ECDC, IRAD, UIB 2019)

BG-traps (postreatment)



HLR (postreatment)



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Thanks for your attention!