Remote monitoring of plant-related insects using web-based camera traps

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Taking pictures of the trap content…why?

- Too many traps to check
- Traps to be checked at difficult-to-reach places
- Traps to be checked at uncomfortable day moments (night)
- Traps to be checked many times in a day
- All the conditions above

"I always choose a lazy person to do a difficult job because he'll find an easy way to do it"

Bill Gates

efsa
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Aim:
Developing a tool useful for checking the content of a trap

Checking the presence of a *target species* (or group of species) at precise moments

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Tools: Cameras

- Short-distance pictures (wide angle)
- Reasonable image quality (according to the target species)
- Settable shoot time
- Pictures sent to a web-site (internal modem)

Cameras and on-line pictures storage provided by Mi5 Security Ltd. (Auckland, New Zealand)

2 models:

- 1 MegaPixels img
- 3 MegaPixels img

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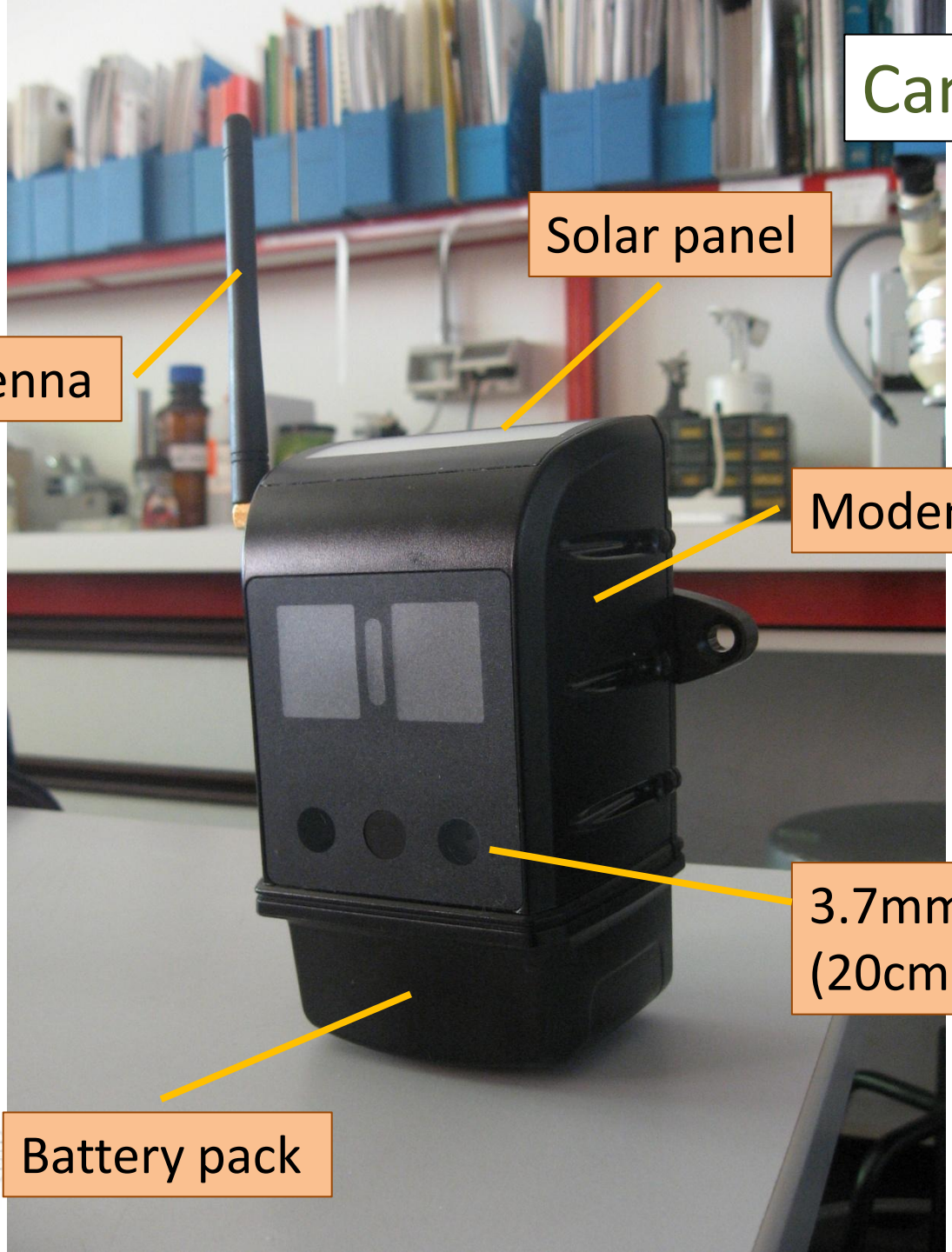
Camera 1MP


Solar panel
Antenna
Modem (SIM card)
3.7mm Camera
(20cm focus length)
Battery pack

1MP Camera features

- Low quality images (low resolution)
- Shaped for external use
- Good battery life-span (up to 1 month with 1 picture per day)
- All components separately manageable: SIM card choose by owner, SD memory card removable, able/disable modem mode (avoid sending pictures, just recorded on the memory card)
- Shoot setting through dedicated software

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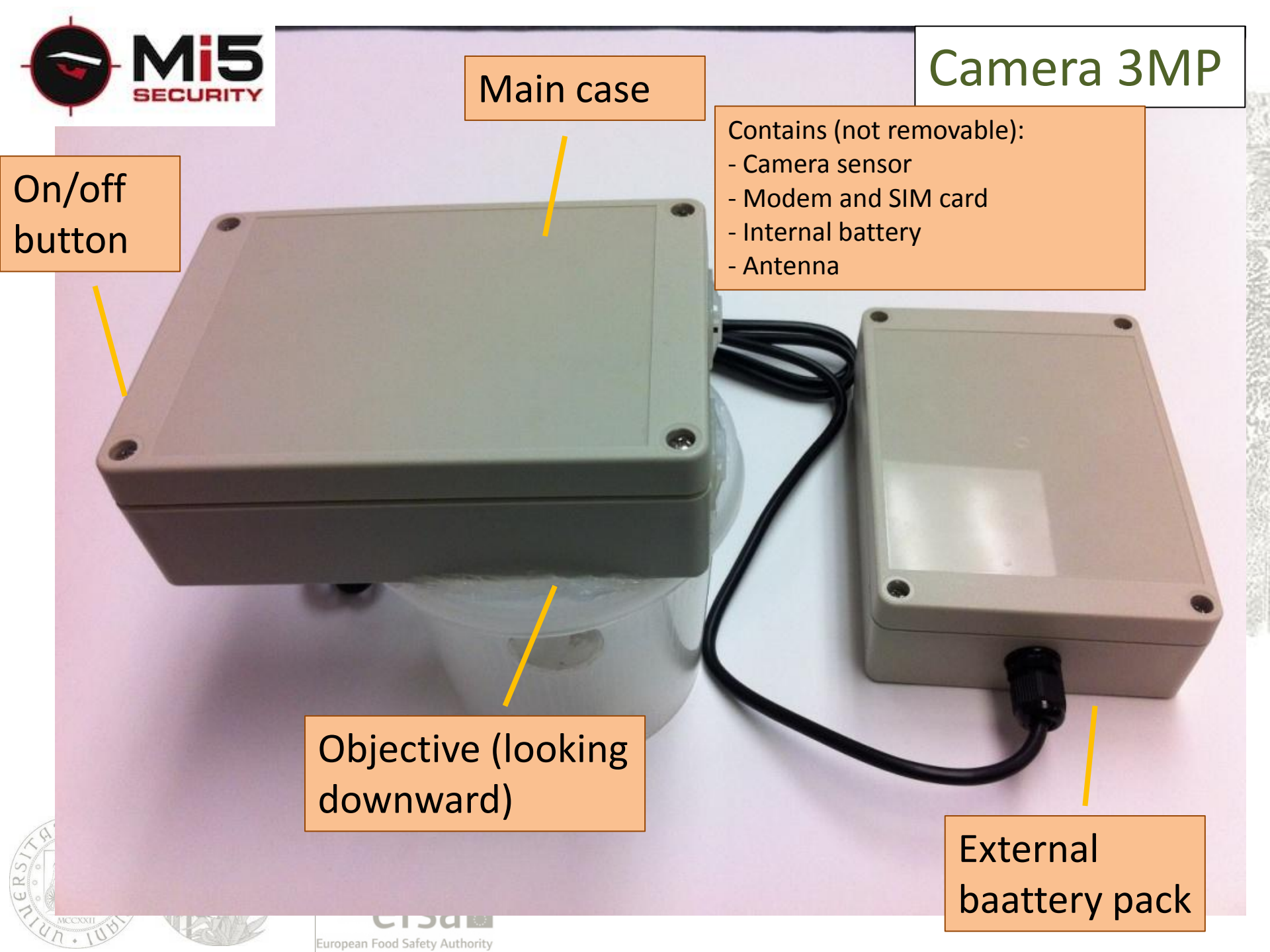
Camera 3MP



3MP Camera features

- No software to set-up
- Case specifically designed for top pictures in delta traps
- Easy to manage (only on/off button on the case)
- Low battery life (about 1 week)
- Shoot setting through SMS (only three settings per SMS)

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Setting texts (examples)

Setting timer for taking pictures

```
settimer 08.00, 12:00, 15:00
```

Information about the camera status

```
stat
```

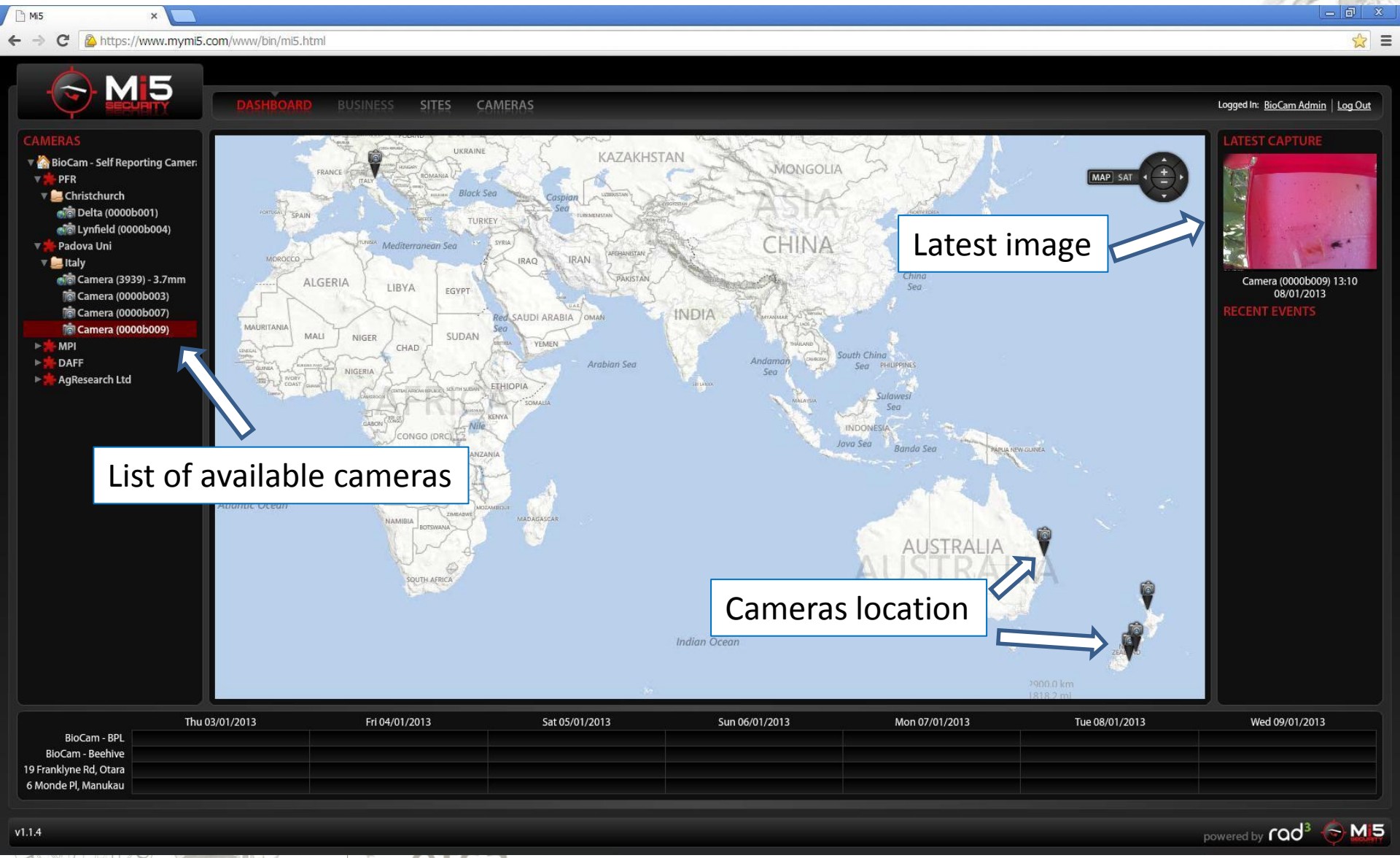
Reboot the camera system

```
reboot confirmed yes
```

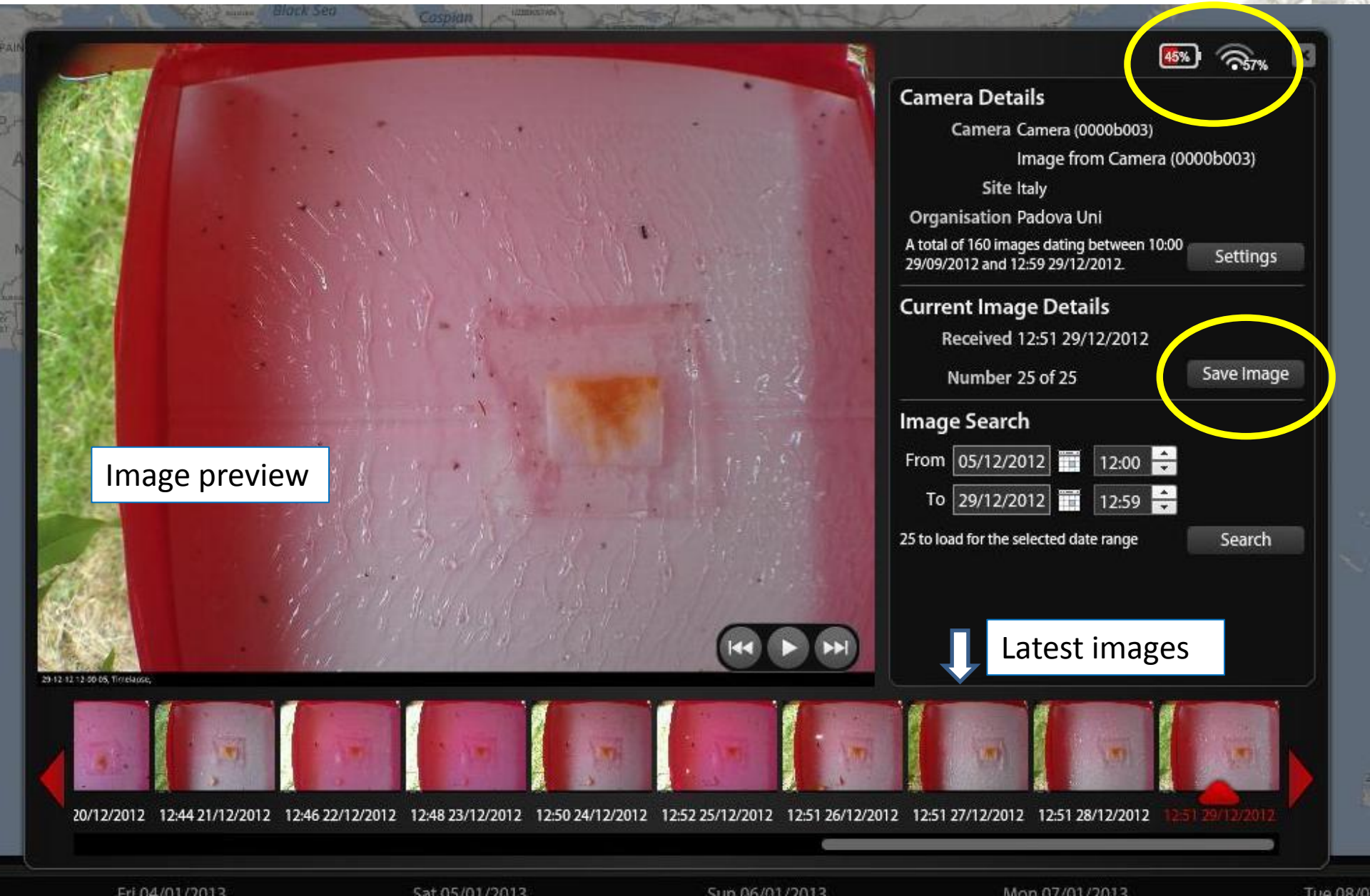
In case of more than 3 pics per day on-line softwares or sms schedulers are avaible mainly for smart phones (Android or iPhone)


17-11-12 21-20-11, Timelapse,

Mi5 personal web page



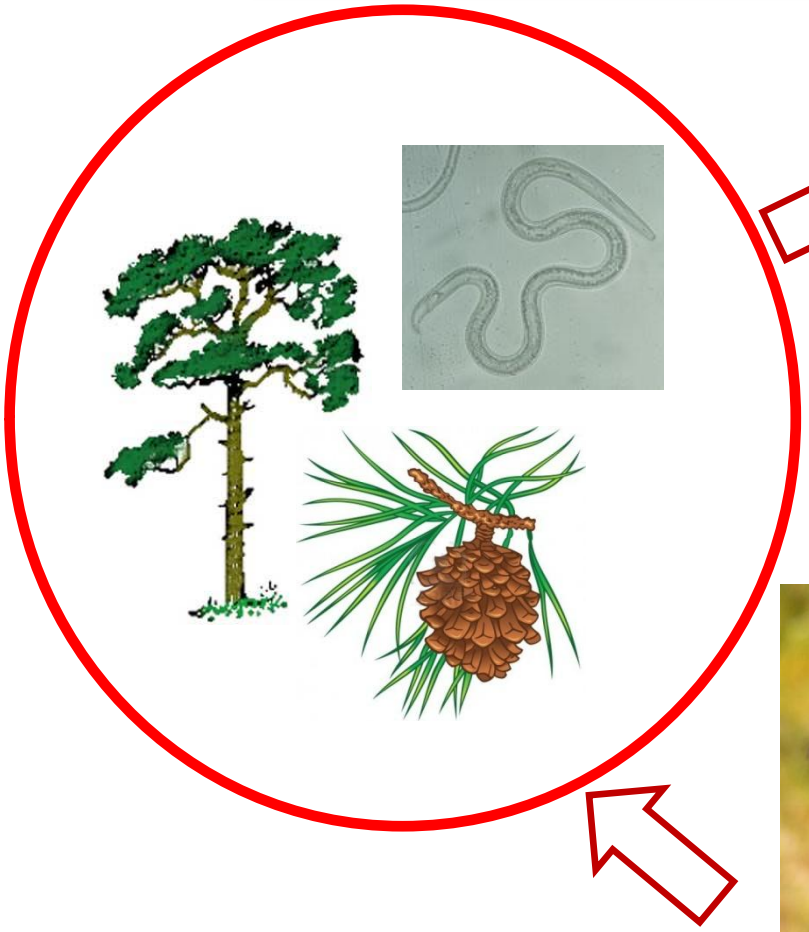
Camera window



- Camera assembled with the container
- Image caught from inside the container (top image)
- Container modified: transparent structure, net as bottom

Camera applications: 1MP

Monochamus galloprovincialis life cycle



Pine Wood Nematode
Bursaphelenchus xylophilus

- Responsible of Pine Wilt Disease (PWD)
- Needs a vector to colonize wood
- Associated to different species of bark beetles and wood borers
- Most often associated to Longhorn beetles of the genus *Monochamus*

Monitoring in Monfalcone Harbor (NE Italy)

August 2012 – verify the accuracy of the method

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Importance of early detection of both vectors and pathogens arriving from potentially infested areas

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Steps for Early Detection

- Set monitoring in “bottle neck” areas through which the pathogen could arrive
- Traps combined with web-based cameras to check remotely the presence of target insects (vectors)
- On-site molecular confirmation of the Insect species and presence of the pathogen

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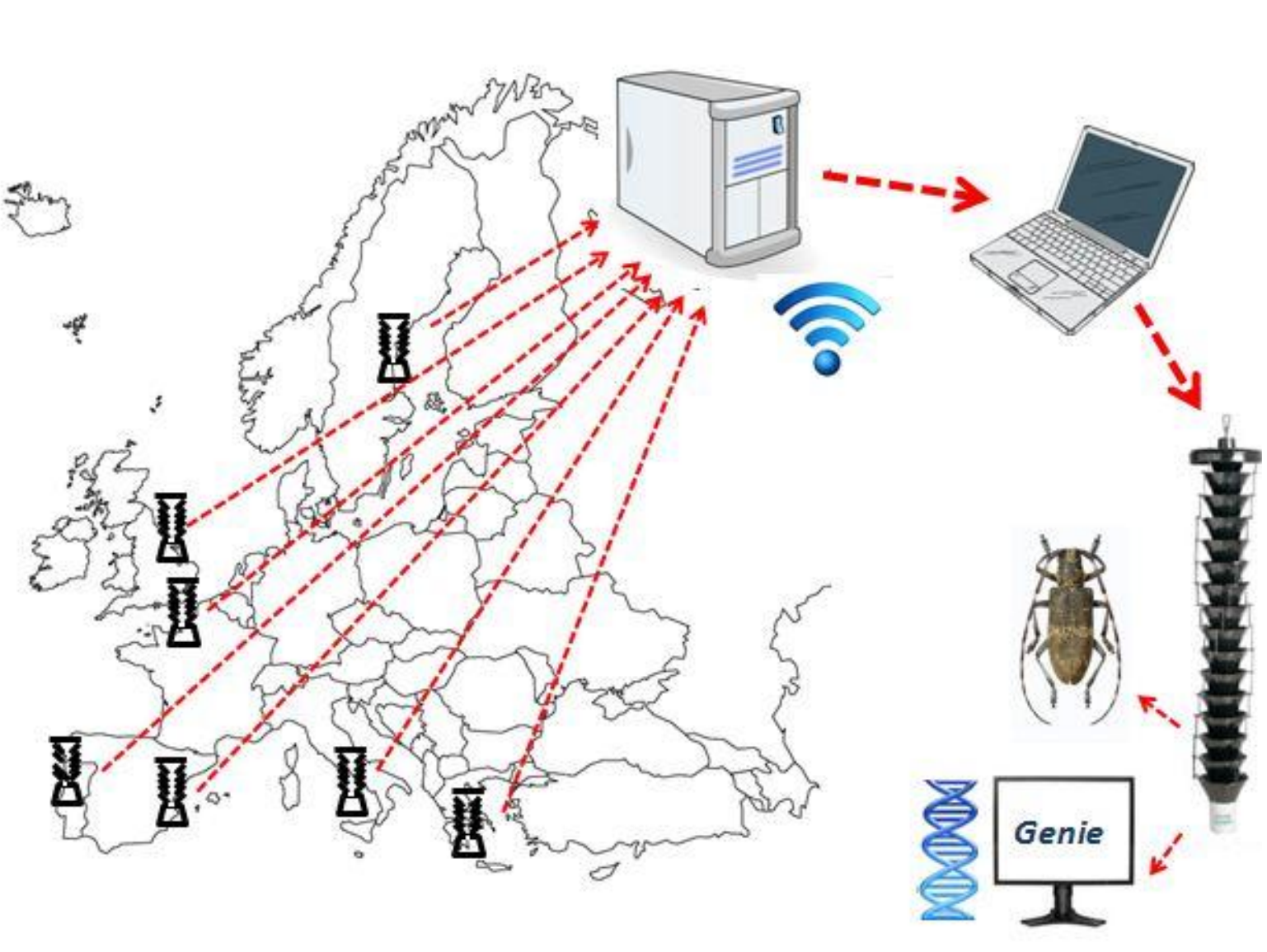

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LAMP (Loop mediated amplification)

Notomi *et al.*, 2000

OptiGene Genie® II

In conclusion (1/2)

- Devices easy to set-up (cameras) and use (Genie II), little training for operators
- Vector monitoring manageable from an office
- Trap-check and molecular analysis only for the traps showing the presence of target species
- Confirmation of pathogen presence with regular PCR procedures only for positive cases

In conclusion (2/2)

- Field work limited to empty the traps and confirm the presence of target insect

- Constant check of pictures allows an immediate detection of the vector insect

EARLY DETECTION

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Thanks for your attention…