EXPERIENCES WITH REMOTE SENSING OF LEPIDOPTERAN HARMFUL SPECIES USING DIFFERENT ATTRACTANTS

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INTRODUCTION

In 2012 we started testing TrapView devices, a new technology in agricultural forecasting services. The new approach offers rationalisation of current procedures considering monitoring of arthropod pests. Time and material consuming field visual inspections are replaced with viewing images through web or mobile application. The device takes snapshots of field situation on daily basis, thus farmer, producer or expert entomologist are informed of situation in the field on time.

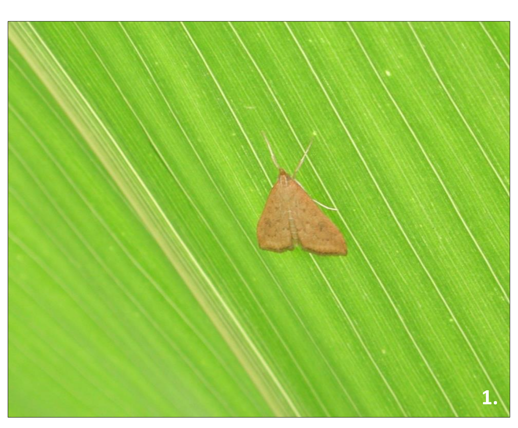
Keywords: remote sensing, pheromone trap, TrapView, *Ostrinia nubilalis*, *Cydia pomonella*, computer vision, agricultural forecasting

CHALLENGE

A proper forecasting issue for the Plant protection service is testing devices on harmful species which are complicated to attract and are also of significant economic importance. This is the reason why we focussed on European corn borer (*Ostrinia nubilalis*). Such polyphagous Lepidoptera is a threat of different types of crop. In agriculture of our south-east region it attacks corn, hops, millet, hemp, while in vegetables gives preference to pepper. It is also indicated to attack apples.

Pheromone luring show low efficiency due to phenotypic variation in attractant production and its perception. However the species morphological characteristics could allow faster recognition using computer vision techniques.

At the beginning preliminary results showed some lack in luring performance, but were promising in general. Subjects of observation suddenly became also species whose presence is difficult to mark due to their migrability: cotton bollworm (*Helicoverpa armigera*), *Noctua fimbriata* and *Noctua comes*. These are now easily detected with TrapView AURA.



Figures 1 and 2: European corn borer (*Ostrinia nubilalis*, adult and larva) is a polyphagous pest and is difficult to monitor with pheromone luring. Photo: D. Bajec

MATHERIALS AND METHODS

For most of Lepidoptera pests are nocturnal and consequently also attracted to light, we tested beta version device (TrapView AURA) with specific wave length light emitter. Also combinations of light and pheromone attractant were tried.

Figure 3: Field testing of TrapView AURA was performed in Krasinec, on a field with different neighbouring cultures: corn, peppers, tomato, cabbage, onion,…. Photo: D. Bajec

Figure 4: During activation, TrapView AURA emits near UV wavelength light. Activation and durance of emitting is managed remotely and easily. Photo: TrapView

RESULTS

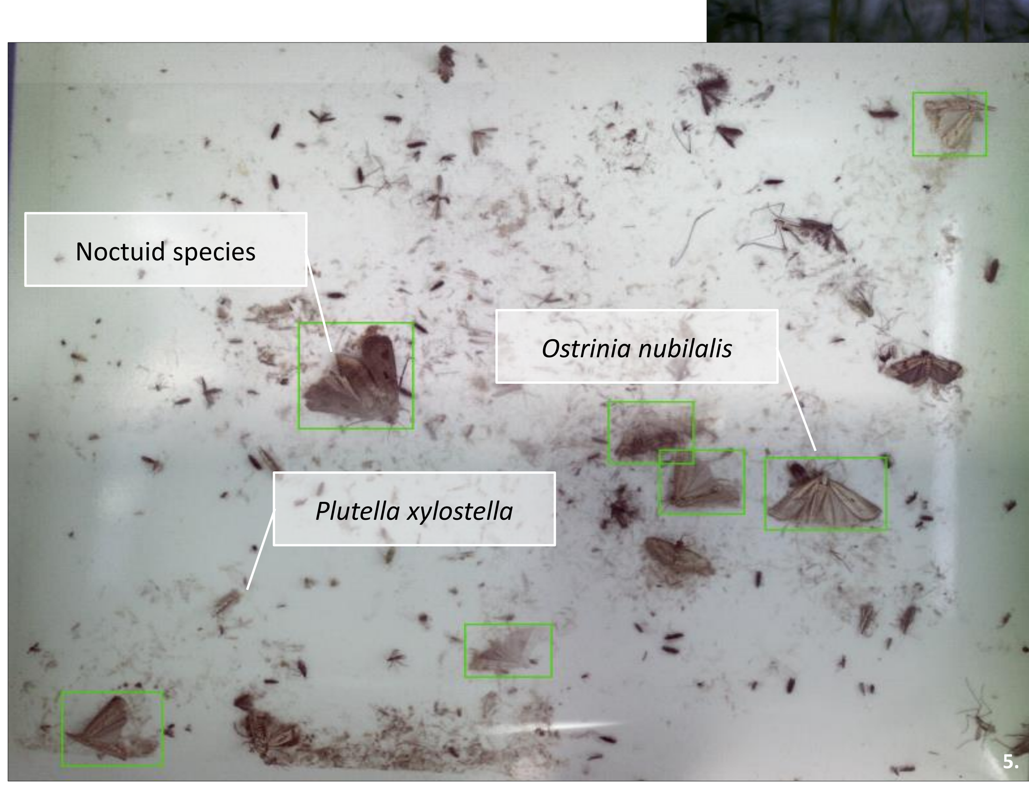


Figure 5: Pest species were recorded according to neighbouring host plants. Photo: D. Bajec

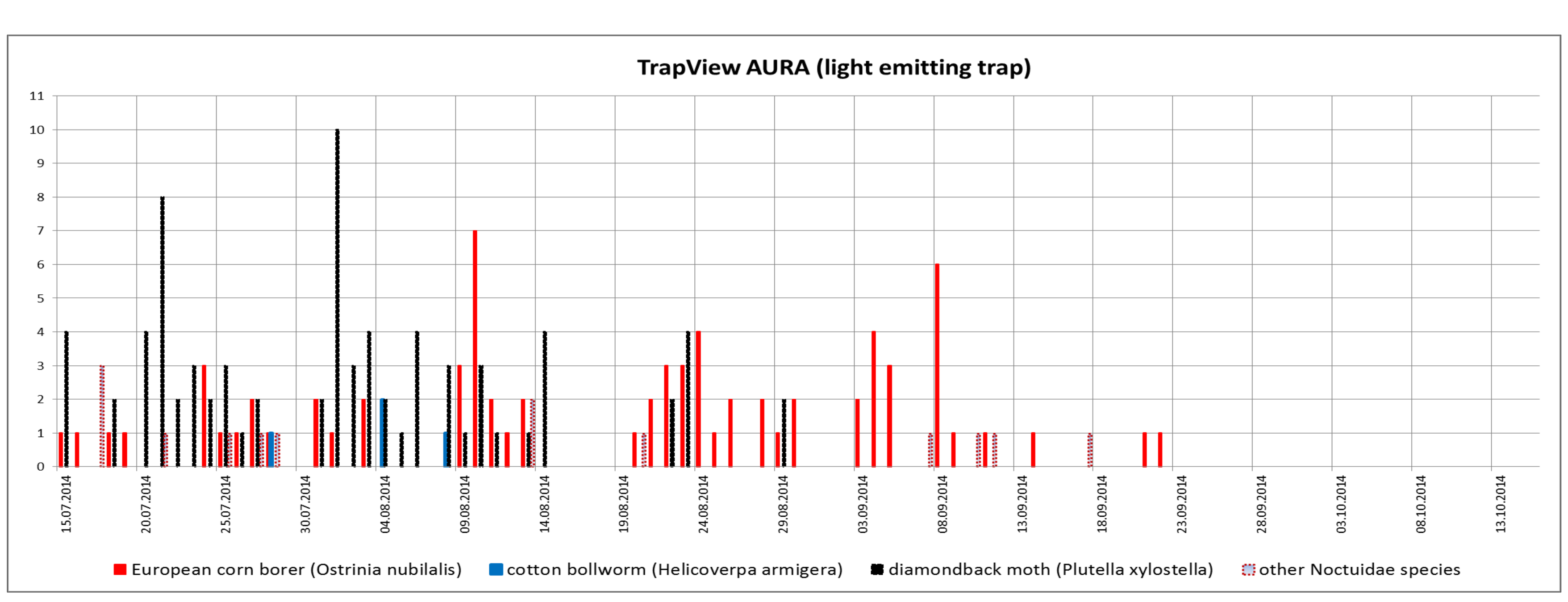


Chart 1: Display of Trapview AURA multiple trapping. Range of detected species can be stressed by adding specific pheromone dispenser.

ROUTINE

MATHERIALS AND METHODS

Standard delta trap and trapview were compared on codling moth (*Cydia pomonella*) in the apple orchard in Raka, Novo mesto. We used Trece Inc., Pherocon® codling moth pheromones in both traps. Pheromones were applied in beginning of April, before the moths begin to fly. Dispensers were changed on the monthly bases.

Figures 6 and 7: Codling moth (*Cydia pomonella*, adult and larva) is most common pest in apple, pear, and walnut orchards in Slovenia. Photo: D. Bajec

RESULTS

Monitored species is trapped adequately on both traps. The flight dynamics reflects regional population specifics with 1st and 2nd generation slightly overlapping and shows comparable data. Maximum catch of nine specimens (TrapView) per day is above local average records on standard delta pheromone trap.

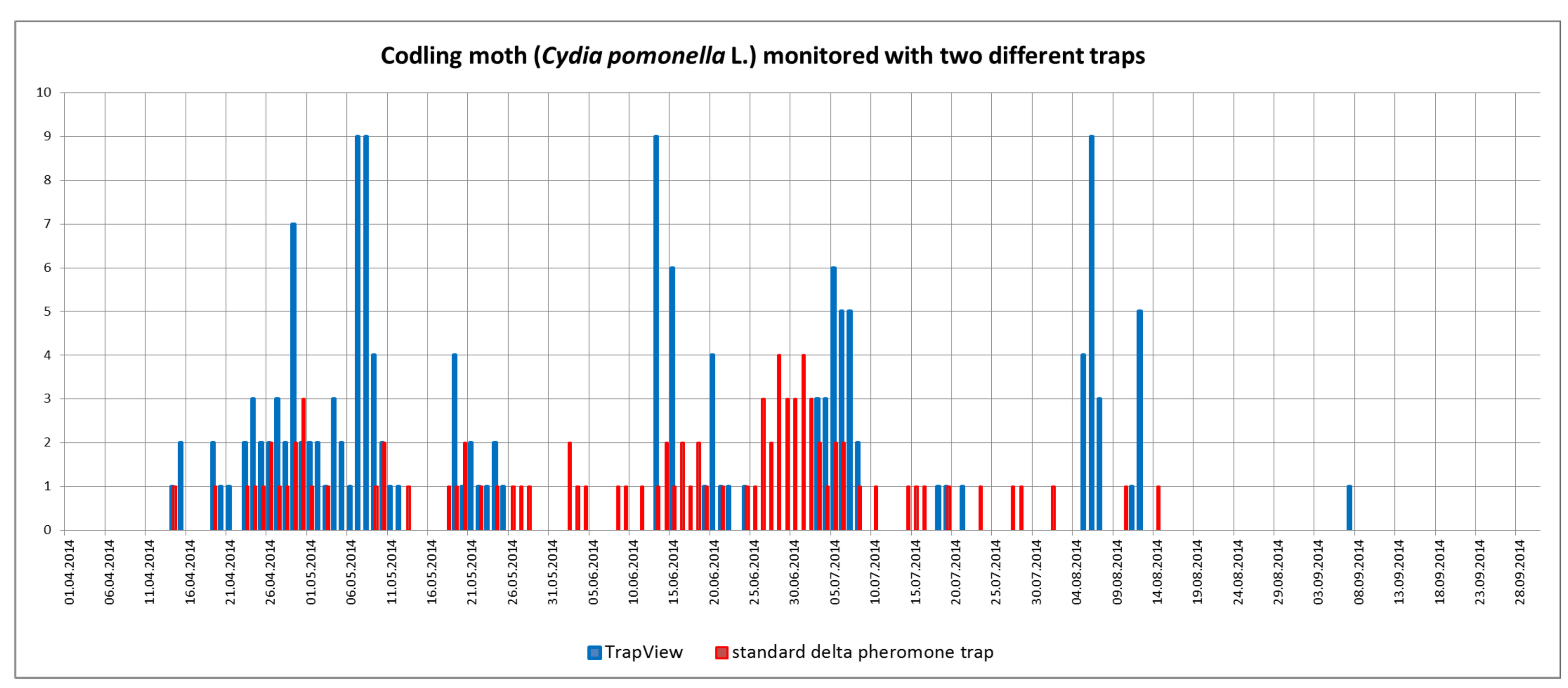


Chart 2: Comparable dynamics of codling moth caught on TrapView and standard delta trap.

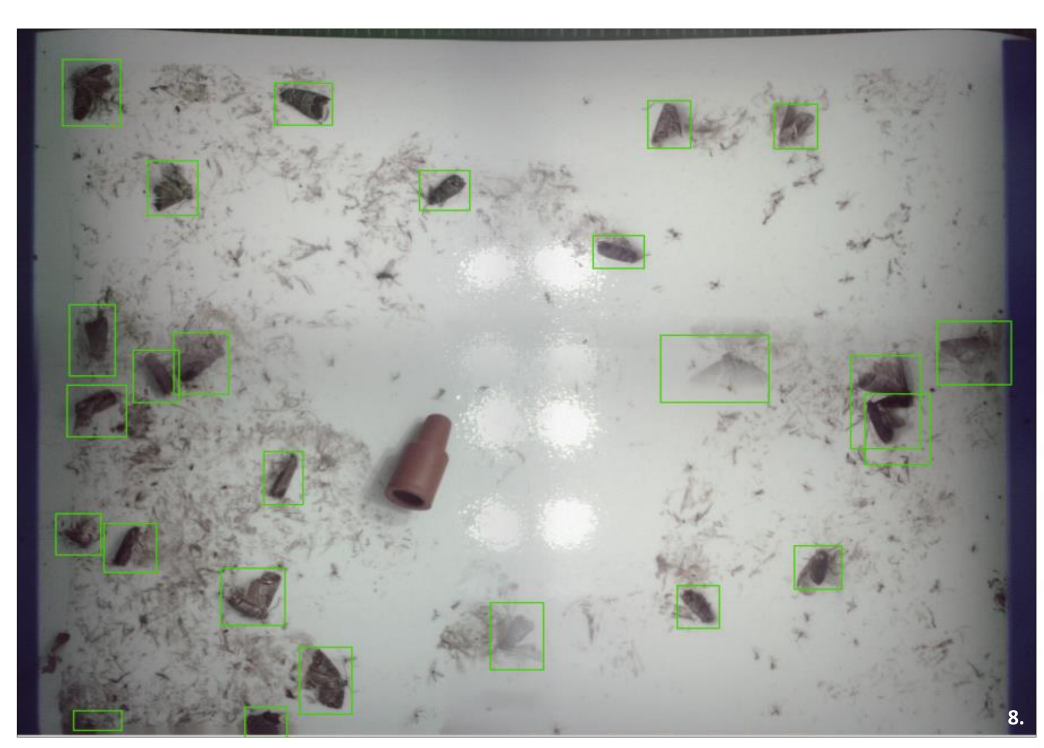


Figure 8: Picture of codling moth caught on the adhesive layer. Moths are automatically detected and marked. Photo: D. Bajec

CONCLUSIONS

As expected, while testing TrapView on Tortricid species codling moth (*Cydia pomonella*), which is usually not complicated to monitor, a positive experience comparable with traditional delta pheromone traps is established. Both attraction and automated detection with pest marking work well. It also seems, that the TrapView's housing attract more moths.

During the process several modifications were made. Results are noticed in better image production. Slides of adhesive insert layer are stitched together from four photos taken in optionally or periodically appointed time interval.

Depending on location of trap application, the catch in TrapView AURA can be diverse and host plant specific. In monoculture less different species will appear. While tests with most of these species still show no greater abundance, they are important as an efficient perception system for instant decision making. Low threshold pests demand only two options to choose from – to act or to hold.

Light emitting remote sensing device with cloud based web application as TrapView is developing into powerful forecasting tool and a good early warning system. Non-skilled users can easily identify insects caught by selective attractant (pheromone). However help from skilled entomologist is needed when non selective attractant (light) is used or when difficult to determine insects are monitored.