# CABBAGE STEM FLEA BEETLE MANAGEMENT

FaunaPhotonics

## PROJECT SUMMARY

Cabbage stem flea beetles (*Psylliodes chrysocephalus*) are a key pest in winter oil seed rape. The adults feed on seedlings as they emerge, causing shot-hole damage in leaves which, in large numbers, can lead to the death of the plant. The larvae can cause in some cases more extensive damage by boring into the stem of the plant, which can also destroy young plants.

It is therefore essential that the threat of cabbage stem flea beetles is well managed. Growing resistance to pesticides, as well as restrictions on the number of pesticide applications, has resulted in a need for better tools to help manage cabbage stem flea beetle populations. Development of management strategies which avoid or reduce the need for pesticides is vital.

This project demonstrates the use of a FaunaPhotonics sensor as a tool to support work in this area. The sensor can be used to help identify the first immigration and subsequent periods of peak flight activity to guide farmers to optimise application times for direct management. The sensor can also be used as a tool to support ongoing research into the efficacy of alternative management approaches such as the use of natural enemies.

## EXPERIMENTAL SETUP

Two sensors were placed in an oilseed rape field near Svendborg, Denmark in Autumn 2020. The first sensor, Sensor 1, was placed on the 2nd of September on the eastern field boundary, followed by the second sensor, Sensor 2, on the 4th of September which was placed further into the field near the southern field boundary. Sensor 1 continued to collect data until the 12th of October, whereas Sensor 2 was stopped on the 4th of October. The placement of the sensors in the field can be seen in Figure 1.

On the 16th, 22nd and 29th of September during the measurement period, rove beetles (*Atheta pasadenae*) were released close to Sensor 2 as a management strategy; however, these are not expected to affect the activity of adult cabbage stem flea beetles.

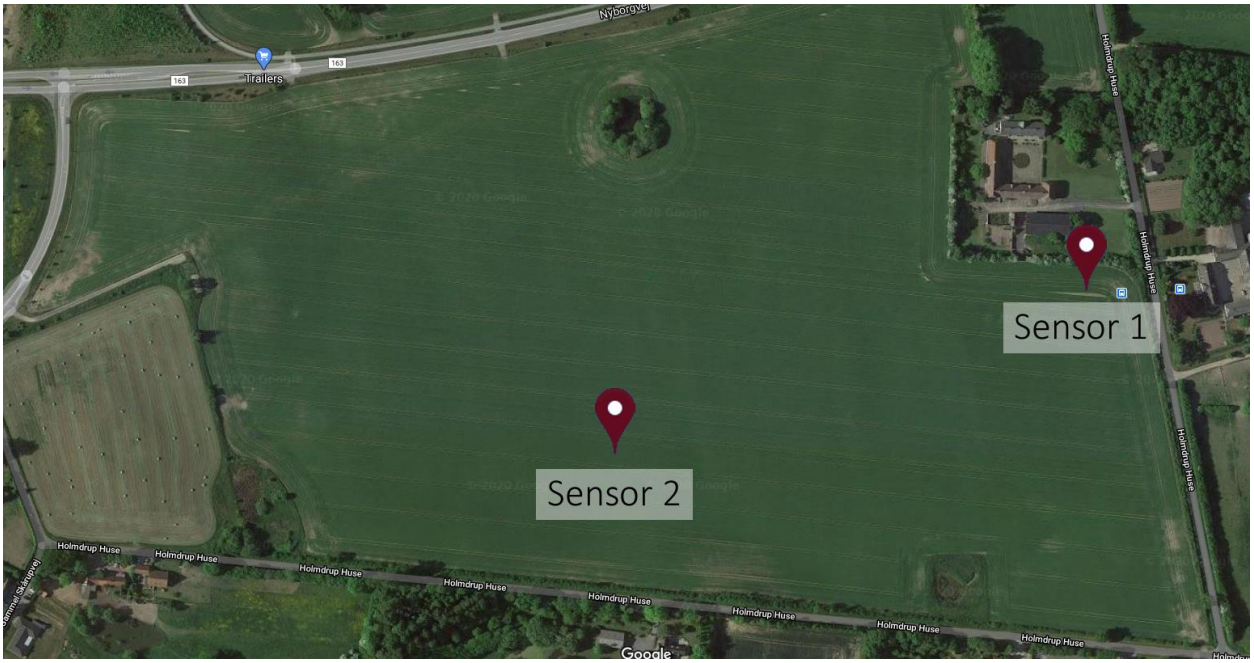


**Figure 1. Sensor placement in the field.**

# RESULTS

In the following analysis, only the 30 days between the 4th of September and the 4th of October where both sensors were active are considered. During this period Sensor 1 observed 23860 insect flight events and Sensor 2 observed 67499 insect flight events. This indicates clear differences in activity levels amongst the general insect population between the two locations, with Sensor 2 observing more than 2.8 times the number of insect flights than Sensor 1. This difference in activity may be caused by the relative locations of the sensors, where Sensor 1 was positioned much closer to the edge of the field, while Sensor 2 was positioned well within the crop. Differences in vegetation density, field geography, pollution, and sensor prominence, amongst other factors, may all contribute to differences in detected insect activity.

Of the total measured insect flight events in each sensor over the same period, 399 were identified as cabbage stem flea beetle in Sensor 1 (1.7% of the total) and 494 (0.7% of the total) were identified as cabbage stem flea beetle in Sensor 2. Compared to the activity of the general insect population, the activity of cabbage stem flea beetles in the two locations is much more similar. This suggests that cabbage stem flea beetle distribution in the field is more even and less influenced by differences in conditions within the field compared to the general insect population.

Figure 2 shows the change of the general insect population activity over the measurement period. Figure 3 shows the same for cabbage stem flea beetles. There is a recognisable peak of general insect activity in Sensor 2 on the 14th of September, which coincides with a peak of cabbage stem flea beetle activity in Sensor 2 on the same date, and the day after in Sensor 1.

From previous FaunaPhotonics field trials it is known that insect flight activity can vary markedly in response to a variety of external factors such as temperature and wind speed, an effect which is broadly similar across most insect orders. When interpreting species-specific behaviour, it is therefore important to consider the wider context of insect activity in the field.

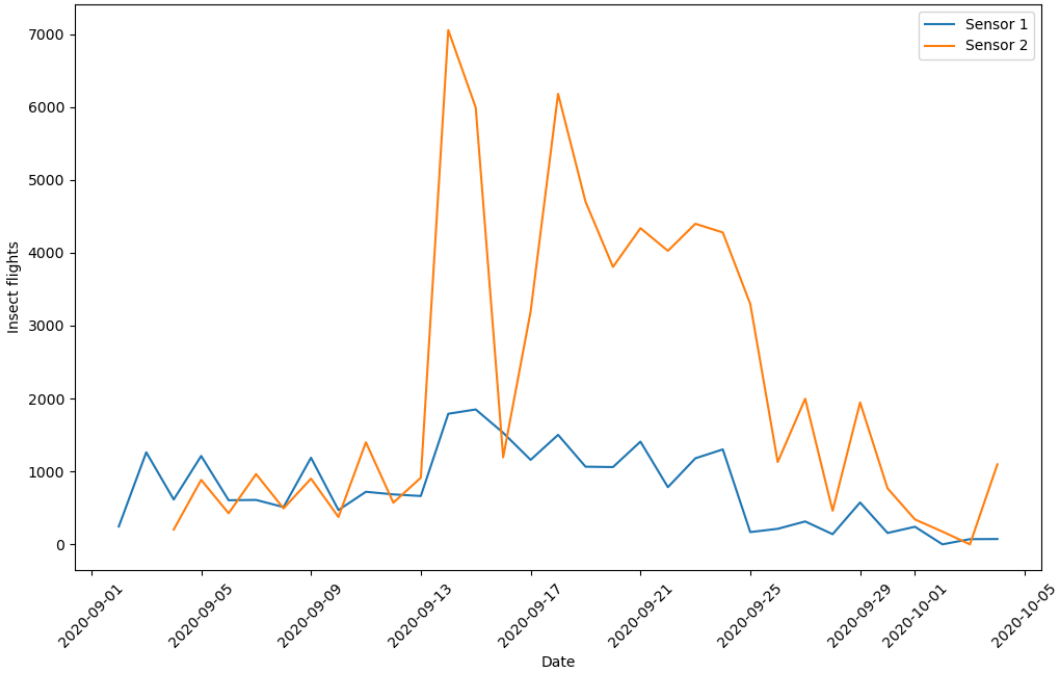


**Figure 2. Flight activity of the general insect population in the two locations.**

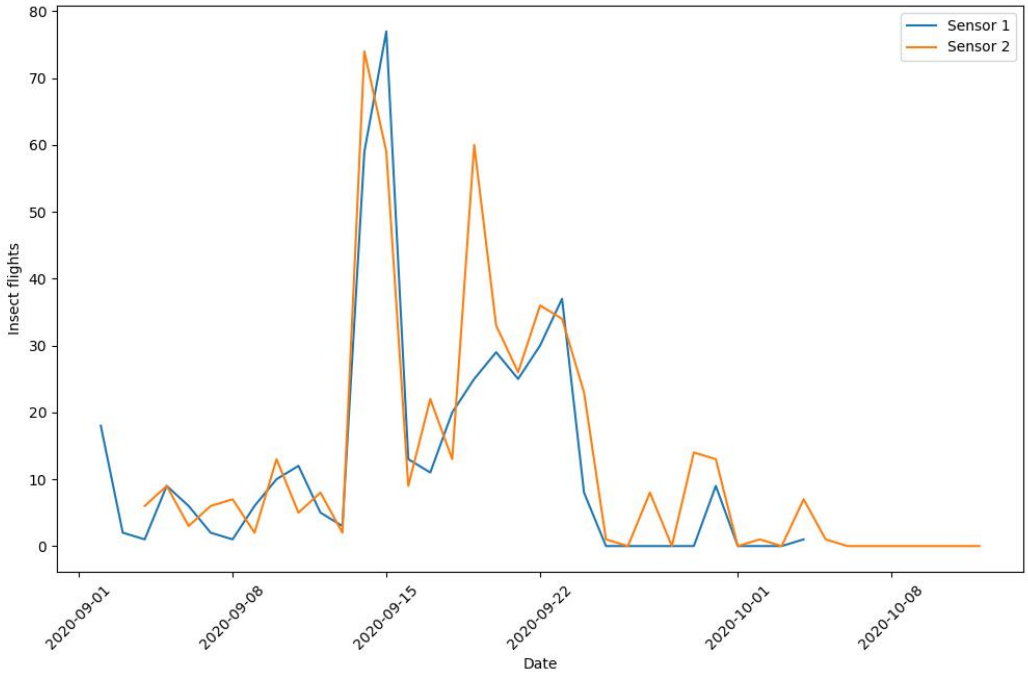


**Figure 3. Flight activity of cabbage stem flea beetles in the two locations.**

One of the research goals in this experiment was to determine the immigration date of the cabbage stem flea beetle. Immigration can start shortly after the field is drilled, towards the end of August; the sensors were not placed into the field until September 4th. Thus, we cannot determine if the detected peak in activity is from an immigration event or simply a weather induced increase in the activity of the cabbage stem flea beetles that were already established in the field before the sensors were installed. Any immigration events before sensor installation are not detected.

On the 14th of September, during the peak activity in Sensor 2, cabbage stem flea beetle activity accounted for 1.09% of the total activity, and on the 15th of September cabbage stem flea beetle activity in Sensor 1 was 4.00% of the total. This could be driven by the fact that there was an increase in the temperature on the 14th and 15th causing an overall increase in insect activity. That said, this peak corresponds well with cabbage stem flea beetle numbers collected by SEGES [1]. The peak found in the sensor data falls between two data points that showed the highest increases in cabbage stem flea beetles captured in SEGES' yellow water traps on Fyn. Furthermore, cabbage stem flea beetle activity was also observed prior to the highest activity peak in both Sensor 1 and Sensor 2, which could be smaller, less significant immigrations, or imply that there was already an established population of cabbage stem flea beetles in the field prior to this date. It is therefore not certain from the collected data that the main immigration event of cabbage stem flea beetles fell over the 14th/15th of September.

Rove beetles could not be distinguished from the general insect population at this time due to limitations in reference data. The effect of rove beetle presence on the cabbage stem flea beetle population is not expected to be visible in the activity of adult cabbage stem flea beetles at the time of release, as rove beetles primarily predate on the eggs and larvae of cabbage stem flea beetles.

# CONCLUSION

FaunaPhotonics sensors found that cabbage stem flea beetle activity across the two field locations appeared to be broadly similar, despite large differences in overall total insect activity. The sensor which registered highest insect activity in the general insect population was installed deep in the field. This may have attracted insects, as some insects tend to swarm around the highest point in the immediate area. That said, this is not expected to affect cabbage stem flea beetle numbers in the area, as mainly Dipterans and Hymenopterans swarm in this way. This could therefore explain why a higher general insect activity is recorded in this position, but not a higher cabbage stem flea beetle activity.

Cabbage stem flea beetle activity varied markedly over time in both field locations; however, cabbage stem flea beetles were present to some degree over the entire measurement period. Furthermore, the relative pressure of cabbage stem flea beetles compared to the general insect

population during peak activity was never higher than 4%. This may be an indication that the sensors were installed in the field after the main immigration event and therefore were not able to identify the date of immigration, or that cabbage stem flea beetle pressure was simply low in this area.

Direct monitoring of rove beetles, or measurement of their influence, was not possible, however, follow-up studies in the same location may be able to show differences in adult activity of cabbage stem flea beetles during emergence as a result of rove beetle predation on eggs and larvae.

The FaunaPhotonics sensors show promise as a research tool in monitoring both general insect activity and species-specific insect activity in field conditions. However, care must be taken to ensure that sensors are installed before key events in order to support decision-making for pest management.

## REFERENCES

[1] SEGES Pest registration: registreringsnet.dlbr.dk/#/results/presentation/42