

Quantifying the ecosystem service of scavenging by the sentinel method

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QUANTIFYING THE ECOSYSTEM SERVICE OF SCAVENGING BY THE SENTINEL METHOD

LAVIGNE LAMBERT

**TRAVAIL DE FIN D'ETUDES PRESENTE EN VUE DE L'OBTENTION DU DIPLOME DE
MASTER BIOINGENIEUR EN SCIENCES AGRONOMIQUES**

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(CO)-PROMOTEUR(S): FRANCIS FRÉDÉRIC; LÖVEI GABOR

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Annexes

Tables

Table 1 Coordinates of the sites used for this experiment in Terceira, Azores, Portugal.

Habitat	Site	Coordinates (latitude & longitude)
Native forests	Jungle_cross	38.747414 -27.198759
	Stoneage	38.745325 -27.198243
	Matela	38.745325 -27.198243
	Cedrorum	38.699495 -27.259701
Orchards	St Bartolomeu coriander	38.669922 -27.241139
	St Bartolomeu control	38.669922 -27.241139
	Bica coriander	38.680613, -27.275742
	Bica control	38.680853, -27.275897
Vineyards	Simas control	38.796424, -27.256487
	Simas coriander	38.797016, -27.256212
	Coop GR 1	38.796025, -27.264076
	Coop GR 2	38.796259, -27.262726
Urban area	site 1	38.659065, -27.232084
	site 2	38.658795, -27.233498
	site 3	38.658223, -27.233346
	site 4	38.658517, -27.234789

Table 2 Coordinates of the sites used for this experiment in Flakkebjerg, Zealand, Denmark.

Habitat	Site	Coordinates (latitude & longitude)
Sorø Forest	Sorø 1	55.378486 , 11.566446
	Sorø 2	55.378428, 11.564835
	Sorø 3	55.378292, 11.564348
	Sorø 4	55.378674, 11.565274
	Site 1	55.324718, 11.386774

Field	Site 2	55.324857, 11.386111
	Site 3	55.325035, 11.385982
	Site 4	55.324876, 11.386631
Field edge	Site 1	55.322522, 11.385412
	Site 2	55.321016, 11.386223
	Site 3	55.322478, 11.414045
	Site 4	55.322846, 11.414511
Urban area	Site 1	55.325884, 11.390910
	Site 2	55.326400, 11.391251
	Site 3	55.325831, 11.390279
	Site 4	55.325814, 11.389151

Pilot tests

Pilot experiment 1: Test the type of glue.

The experiment took place at the University of the Azores, Terceira, Portugal, between 24/03/2021 and 26/03/2021. It consisted of placing 15 cards with 25 *Drosophila* carcasses glued with three different glue types (5 replicates per treatment).

The gluing methods tested were: flour glue (water+flour), "Supertite" white glue, and "Bangi" double-sided tape.

A drop of glue was applied to the cards using the end of a toothpick. For the double-sided tape, 4mm squares were placed on the cards.

The cards were held face down 2-3cm above the ground supported by two toothpicks placed at two diagonally opposed corners. The cards were placed soils with and without vegetation. Soils without vegetation were prepared by manually removing grasses and other plants.

Results

Terceira, Portugal

Soils with no vegetation favour rate (mean=70.6%, sd= 33.3%, n=15) compared to soils

with vegetation (mean=52.8%, sd= 43%, n=15).

The overall scavenging rate were 58.4% (sd= 46.4%, n=15) for white glue, 76.8% (s.d.= 25%, n=15) for flour glue, and 44.8% (sd= 45.7%, n=15) for the double-sided tape. A Tukey test suggests that there was no difference between the scavenging rates on the different types of glue used during these trials.

Conclusion

To reduced biases, we selected white glue and decided to work with soils with no vegetation, i.e., standardisable by clearing a small area of 4 to 5 cm on each side when placing the cards.

Pilot experiment 2: Exposure time

In accordance with the literature (Tolonen, 1995), we exposed cards for 48h in different orchards, where 3 to 6 sites per habitat were selected and tested (Table 1).

Results

All cards were completely emptied of all larvae. However, sometimes it was possible to observe parts of the cuticle. Scavenging rates after 48h was 100% at all sites except for Bica (orchard). Some cards, particularly those in the orchards, showed traces of small mammal teeth (rats or mice). The experiment was repeated with 24h exposure time but scavenging rates was 100% everywhere.

Pilot experiment 3: Exclusion of mammals.

In agreement with the field observations, we wanted to exclude small mammals from our experiments. To do this, we created cages using clear plastic Tupperware, and taping a 1 x 1 cm net to allow arthropods but not small mammals to access the cards. (See Materials and Methods, Mammal Exclusion section)

Results

No significant difference between the cards could be observed. Moreover, the scavenging rates were always 100%.

Conclusion

Small mammals did not have a significant influence on the previous results. Arthropods removed all the carcasses from the cards in 24h or less.

Pilot experiment 4: Time

To ensure that the high scavenging rates observed were not due to the high density of larvae on the cards (25), we reduced this number to 10 larvae per card. On 12/05/21, we placed 5 cards in 4 sites in two orchards and recorded scavenging rates every 2h between 09:30 and 12:30 in San Bartolomeu and 09:45 and 12:45 in Bica. The cards were spaced more or less 5m apart.

Results

The final scavenging rates were 63% % (sd= 43.1%, n=4) in San Bartolomeu and 16.7% (sd= 40.8%, n=4) in Bica .

Conclusion:

It seems relevant to monitor the evolution of the scavenging rate over time over relatively short periods in order to highlight its variation according to the habitats.

Conclusion of the pilot tests

Following the pilot experiments, we decided to measure scavenging rates every 2 hours over a period of 10 hours.