BEESPOKE Frisian clay area: pan trap protocol and analysis.

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Problem: In the framework of the BEESPOKE project, general insect biodiversity plays an important role. Pollinators are important in agriculture, but also other groups are functional, for example as pest control species. Measuring pollinators and pest control species can be done in different ways. However, any measurement system has its own set of problems. Any method has particular biases, related to subjective observer differences, and/or specific aspects of objective catching methods. Insect catches are always biased towards certain species groups of interest, or favored by a particular catching method. We adopted yellow sticky traps as a highly standardizable easy and cheap way to measure Insects (See Strijkstra et al. 2023 for detailed description). However, Sticky traps of course have limitations and biases, and are currently not a widely used standard way of sampling insects.

In order to see if flower strips change biodiversity in different groups of Insects, we also adopted other catching methods and other species groups of interest: pitfall traps for soil roaming species, pan traps for flower attracted insects, and moth buckets for night active Moths. In this Factsheet we explain the methods for our use of pan traps and the analysis.

Pan traps: Pan traps usually consist of horizontal colored plates or colored cups with a catch and conservation fluid in it, to catch the color attracted insects. Usually 3 colors are used: blue, yellow and white. We copied this setup by using standard blue, yellow and white bowls (Ikea) of 13cm diameter. The 3 bowls were attached to a 2.2x2.8x38cm wooden slat with Velcro. Self-adhesive Velcro (2.5cmx2.5cm) was applied to the center underside of the bowls and applied and stapled on the slat at 4cm, 16cm and 34cm. At 24cm, a 15mm hole was drilled. To perch the slat with the bowls at the right height, a 1.50m long 15mm diameter standard metal heating pipe was hammered in the soil for ~30cm with a wooden or rubber hammer. The slat was attached to the pipe by pushing the 15mm hole in the slat over the pipe and adjusting the height by applying 2 standard clothes-pegs under the slat around the pipe. The bowls were filled to 2/3rd with lightly sugared water (50g/l) and a drop op dishwashing detergent to break the surface tension of the water.

The pan traps were adjusted to the height of the flowering vegetation whenever possible. The pan traps were always used for 2 days, which showed to yield reasonable catches after 2 complete daily cycles. The same timing was used for sticky traps and pitfall traps.

Catches were gathered by emptying the bowl over a standard plastic tea sieve, and storing the catch in a 60ml plastic container with a screw cap in 70% Ethanol.

Analysis: From these pan traps, we assessed quantitative biodiversity indexes by looking at variation at Order and Family taxonomic levels, and for a specific catchable and relevant Species group Hoverflies. Hoverflies contain pollinating species, as well as pest control species.

These measures can be used to contrast species richness and diversity by seeing if 1) more Orders or 2) more Families (with more diversity) and 3) more relevant Species (with more diversity) make use of the location.

Methods. Pan trap catches were transferred to a Petri dish, where the animals were isolated and determined to the nearest easily attainable taxonomic level, using a standard 10-40x binocular microscope. Species were determined using standard determination literature, adapted for the Dutch situation. Hoverflies, Bees, Dragonflies and Butterflies were determined to species level.

Measures of Insect numbers and diversity: From these data, measures for insect biodiversity were derived. These included numbers of individuals per Class, Order, Family and Species. For Family and Species level, also estimated species group numbers (CHAO-1; Chao, A. 1984) and estimated biodiversity (Shannon entropy; Chao et al. 2013) were made, using the biodiversity calculation program SpadeR (Chao et al. 2015).

Measures of Insect biomass: From the length and calculated biomass (mg) data, numbers of individuals and biomass are calculated per mm category. This yields an indication of the contribution of different sized insects sizes to the available biomass of flying insects in the system.

References

Chao, A. 1984. Nonparametric estimation of the number of classes in a population. Scandinavian Journal of Statistics, 11(4), 265–270.

Chao, A., Wang, Y.T., Jost, L. 2013. Entropy and the species accumulation curve: a novel entropy estimator via discovery rates of new species. Methods in Ecology and Evolution 2013, 4, 1091–1100.

Chao, A., Ma, K.H., Hsieh, T.C., Chiu, C-H. 2015. Species-richness Prediction And Diversity Estimation in R. Online Program available at https://chao.shinyapps.io/SpadeR/.

Strijkstra, A.M., Boersma, A.S., Boersma, R. 2023. Factsheet BEESPOKE Frisian clay area - Sticky trap protocol and analysis. https://northsearegion.eu/beespoke/guides-evalution-tools-other-publications/