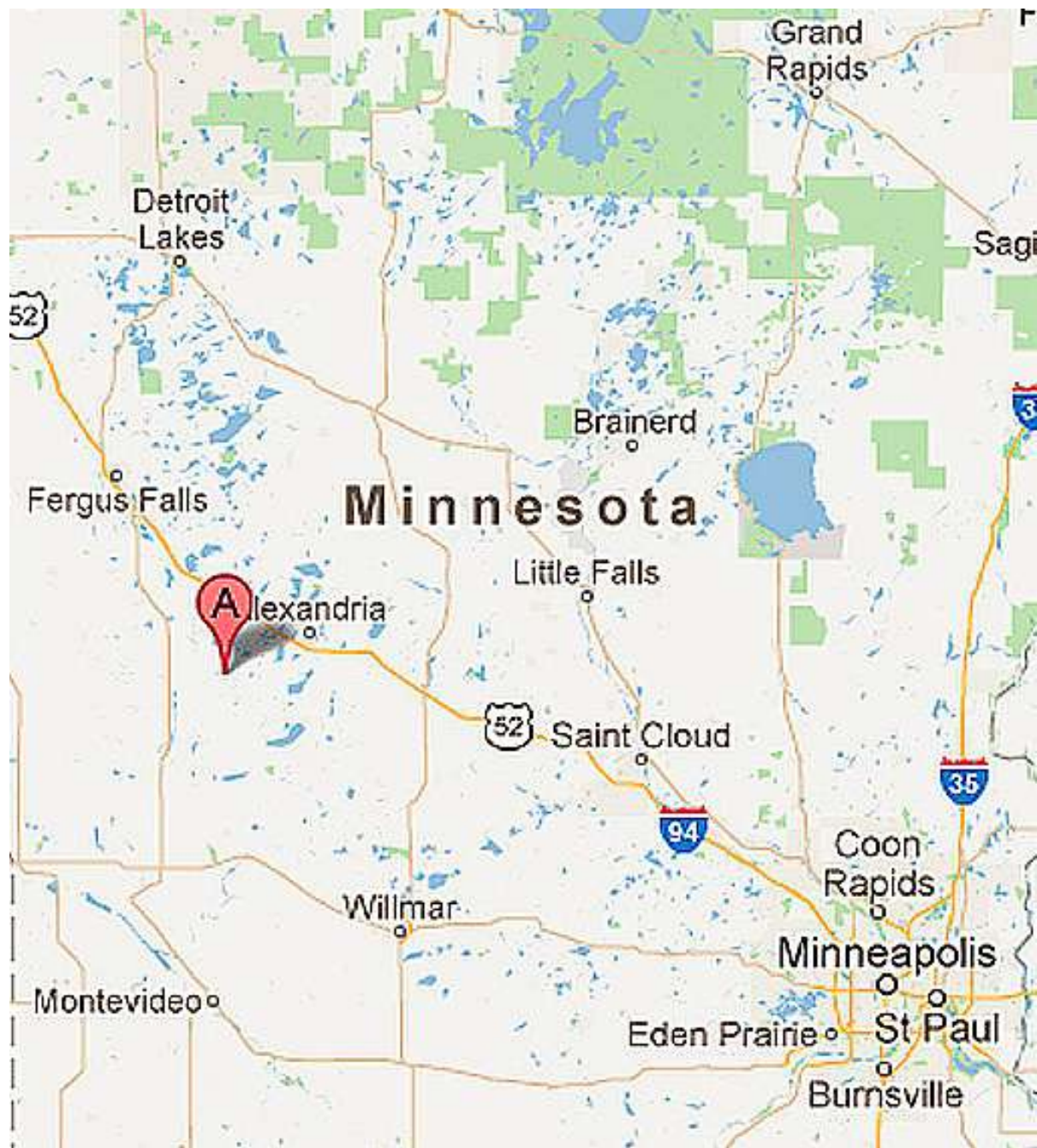


Pollinator Collecting for the Lab and Classroom

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- Previously at Great Plains Lutheran High School in Watertown, South Dakota (16 yrs)
- Team Echinacea in west central Minnesota as an RET in 2009.
- Repeated 2010-2012.
- Pollen collection, crossing experiment, pollinator collection on plants of focus



- In 2009, I worked on a project with the pollen of the plants that flower at the same time and locations as *Echinacea angustifolia*.

pollen.wikispaces.com

- The Echinacea Project includes a longitudinal study of remnant prairie sites and common garden project.
 - <http://echinaceaproject.org/>
- The Echinacea Project maintains a field log online known as the “flog”.
 - <http://blog.lib.umn.edu/wage0005/echinacea/>



CHICAGO BOTANIC GARDEN

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National Science Foundation
WHERE DISCOVERIES BEGIN

Capture the pollinator?





08/31/2012



08/31/2012

- 60 bowls at 10 sites
- 6 bowls per site
- 2 m apart at flags, bowls on the ground, arranged in an east to west configuration.
- Add soap water to the top of the indented mark, place next to flag at each site
- Have 4 gallons of 5mL of soap in water at room temperature with soap added the night before.

- Collected July 12th Traps out between 830 and 930 AM at the following sites:
- Traps collected between 430 and 530 PM
- Rinsed the soap water and placed insects in 95% alcohol in marked jars.

- I collected insects at remnant prairie in Watertown, SD with 10th graders.
- Many similar plants – similar insects



Advantages: pan trap

- Ease of use – flag it, fill it, leave it
- Environment – Scientist is not “in the way”, soapy water is a safe alternative to kill jars, reusable collection device
- Flexibility – time is on your side, geographically friendly

Disadvantages

- Everything that enters does not get out – most insects (even species you may not expect terminate in soaped water)
- Interference with traps (wind, water, evaporation, tampering)
- Pan traps out of production?

Comparison of **yellow** and white **pan traps** in surveys of bee fauna in New South Wales, Australia (Hymenoptera: Apoidea: Anthophila).

- Authors: Gollan, John R.¹ john.gollan@austrmus.gov.au Ashcroft, Michael B.¹ Batley, Michael¹
- Source: Australian Journal of Entomology; May 2011, Vol. 50 Issue 2, p174-178, 5p
- Abstract: **Pan** trapping is a standardised and commonly used method for collecting bees, but characteristics of the **trap** may influence its effectiveness or bias results. The effect of **trap** colour on the species and numbers caught has been studied in the Northern Hemisphere, but not in the Australian region. Australia has a unique bee fauna and colour preferences, if any, may differ from those found in other continents. In four separate surveys across a wide area of New South Wales, it was tested whether there was a difference in the abundance or species richness captured by **yellow-** and white-coloured **pan traps**. In total, 1267 bees were collected, comprising 66 species, 50 of which are in the family Halictidae. In all surveys, **yellow pan traps** collected a significantly larger number and greater diversity of bees. Eight of the thirteen most common species were observed significantly more frequently ($P < 0.01$) in **yellow pan traps**, while the European honey bee (*Apis mellifera*) was found in larger numbers in white **traps**. Our results demonstrate that differently coloured **traps** collect different components of the Australian bee fauna. Therefore, a variety of **pan** colours should be used when sampling overall bee biodiversity, but specific colours may be more effective when targeting certain groups or species.

Sampling Hymenoptera along a precipitation gradient in tropical forests: the effectiveness of different coloured **pan traps**

Abrahamczyk et al. Effectiveness of different coloured **pan traps**.

- Authors: Abrahamczyk, Stefan; Steudel, Bastian¹ Kessler, Michael¹
- Source: Entomologia Experimentalis et Applicata; Dec2010, Vol. 137 Issue 3, p262-268, 7p, 4 Charts, 3 Graphs
- Abstract: Measuring species richness of tropical insects is an important but considerable challenge. Several techniques have been developed to quantitatively sample the non-formicid Hymenoptera (bees and wasps). One of the most common is the use of colored **pan traps**. Although it is known that Hymenoptera are attracted differently by different colors, it is not yet known if these preferences shift in different habitats and hence affect comparisons of Hymenoptera diversity. We studied the effectiveness of differently-colored **pan traps** along a latitudinal, climatic, and forest structure gradient from tropical to subtropical forests. Overall, we found a strong increase in individual numbers from north to south. **Yellow traps** sampled significantly more individuals than blue ones, mainly due to the responses of the families Ichneumonidae, Nyssonidae, Pompilidae, and Crabronidae, but **trap** catch was also related to canopy cover. Notably, **traps** located at forest edges had **yellow/blue** ratios similar to those of forests with comparable canopy cover. This suggests that, in contrast to the overall number of individuals caught, the relative effectiveness of **yellow** vs. blue **traps** was driven by canopy cover and hence light conditions or visibility of the **traps**. Thus comparisons of **pan trap** results between forests having different structures should only be made with great care. [ABSTRACT FROM AUTHOR]

黄板、黄盆及灯光对麦长管蚜和禾谷缢管蚜的诱捕效果 / The relative effectiveness of **yellow sticky traps**, **yellow pan traps** and different light sources in capturing *Sitobion avenae* and *Rhopalosiphum padi*

- Authors: 巩中军 / GONG Zhong-Jun
武予清 / WU Yu-Qing
都振宝 / DU Zhen-Bao
苗进 / MIAO Jin
段云 / DUAN Yun
蒋月丽 / JIANG Yue-Li
Source: 昆虫知识 /
Chinese Bulletin of Entomology, Issue 6, p. 1703-1707, 2011. Publication Information: 中国昆虫学会 中科院动物所
- Yellow pan traps are much more effective 7.94:1

Colour-coded sampling: the **pan trap** colour preferences of oligolectic and nonoligolectic bees associated with a vernal pool plant.

- Authors: Leong, Joa N. M.^{1,2,3} Thorp, Robbin W.¹
- Source: Ecological Entomology; Aug99, Vol. 24 Issue 3, p329-335, 7p
- Abstract: Summary 1. **Pan traps** or water **traps** have been used widely to sample agricultural insect pests, but no formal studies have assessed the utility of these **traps** as sampling devices for bees. 2. Coloured **pan traps**, used as flower models, can efficiently and selectively sample an oligolectic bee, *Andrena* (*Hesperandrena*) *limnanthis*, and other bees associated with white-flowered *Limnanthes douglasii rosea*. 3. Females and males of *A. limnanthis* unexpectedly exhibit different colour preferences. Females are strongly attracted to white and blue **traps**, but discriminate against **yellow traps**. Males prefer white **traps** over blue and **yellow traps**. Consequently, blue **traps** are selective for females only, while white **traps** are selective for both sexes. 4. Non-*A. limnanthis* bees were caught in significantly greater numbers in **yellow** than in blue or white **traps**. These bees included generalists, as well as specialists that are oligolectic on mostly **yellow**-flowered species. 5. Colour of **traps** had a significant effect on the numbers of *A. limnanthis* females and males, and non-*A. limnanthis* bees caught in **traps**. These results indicate that quantitative sampling of bees by **pan trap** methods can be highly sensitive to **trap** colour. [ABSTRACT FROM AUTHOR]

The role of odour and visual cues in the **pan-trap** catching of hoverflies (Diptera: Syrphidae).

- Authors: Laubertie, E. A.^{1,2} laubere2@lincoln.ac.nz Wratten, S. D.¹ Sedcole, J. R.³
- Source: Annals of Applied Biology; Apr 2006, Vol. 148 Issue 2, p173-178 6p
- Abstract: Coloured **pan traps** are frequently used to attract and catch insects, such as in the monitoring of populations of beneficial insects in classical or conservation biological control. They are also used in the evaluation of the recovery of insect populations after disturbance and in many other situations where an estimate of relative insect numbers is required. However, the fact that **traps** may be visible to the insects over a considerable distance can influence the interpretation of catch data. This difficulty may arise, for example, if **traps** along a transect can attract insects from some or all of the other transect positions. This study compared the effect of different coloured **traps** on attraction and catch of hoverflies. The hypothesis was that completely **yellow traps** would attract hoverflies from a distance, while **traps** that were green outside and **yellow** inside would catch fewer flies because only those from above or near the **trap** can see the **yellow** stimulus. A subsidiary hypothesis was that rose water would enhance hoverfly capture rates. For the two main hoverfly species captured, *Melanostoma fasciatum* (Macquart) and *Melangyna novaezelandiae* (Macquart), significantly more individuals were caught in completely **yellow traps** than in **yellow** and green or in completely green **traps**. Moreover, the addition of rose water increased the number of hoverflies caught significantly. It is suggested that if a measure of hoverfly numbers relating to a particular distance along a transect is required, consideration should be given to the ability of hoverflies to see **yellow traps** from a distance. The use of **traps** that are green outside would more accurately reflect the local abundance of hoverflies. If higher **trap** catches of hoverflies are needed for statistical purposes, rose water can enhance catches. [ABSTRACT FROM AUTHOR]

Is **pan**-trapping the most reliable sampling method for measuring and monitoring bee biodiversity in agroforestry systems in sub-Saharan Africa?

- Authors:Théodore Munyuli, M.B.^{1,2}
- Source:International Journal of Tropical Insect Science. Mar2013, Vol. 33 Issue 1, p14-37. 24p.
- Abstract: Little is known about the efficacy of sampling methods for monitoring bee communities in agricultural landscapes in sub-Saharan Africa, in general, and in Uganda, in particular. To provide baseline information on the effectiveness of different sampling methods, 26 sites with varying landscape characteristics were sampled in 2006 in agricultural landscapes in Uganda. Bees were sampled using line transect count, coloured **pan trap** and hand net methods. In total, 80,883 bee individuals were collected. Totals of 59, 314 and 559 bee species were recorded in transect counts, **pan traps** and hand nets, respectively. Thus hand nets captured the most species overall. There were few species that overlapped across the three sampling methods. Wild bees were significantly more abundant in **yellow pan traps** than in blue or white ones. In contrast, bee species richness was significantly higher in blue **pan traps** than in white or **yellow pan traps**. Overall, **pan**-trapping was found to be a complementary method to hand-netting for monitoring bee communities in Uganda.[ABSTRACT FROM AUTHOR]

Seasonal activity and abundance of *Orosius orientalis* (Hemiptera: Cicadellidae) at agricultural sites in Southeastern Australia.

- Authors: Trębicki, P.^{1,2} Harding, R. M.¹ Rodoni, B.³ Baxter, G.⁴ Powell, K. S.²
kevin.powell@dpi.vic.gov.au
- Source: Journal of Applied Entomology; Mar2010, Vol. 134 Issue 2, p91-97, 7p, 2 Charts, 2
- Abstract: *Orosius orientalis* is a leafhopper vector of several viruses and phytoplasmas affecting a broad range of agricultural crops. Sweep net, **yellow pan trap** and **yellow sticky trap** collection techniques were evaluated. Seasonal distribution of *O. orientalis* was surveyed over two successive growing seasons around the borders of commercially grown tobacco crops. *Orosius orientalis* seasonal activity as assessed using **pan** and sticky **traps** was characterised by a trimodal peak and relative abundance as assessed using sweep nets differed between field sites with peak activity occurring in spring and summer months. **Yellow pan traps** consistently trapped a higher number of *O. orientalis* than **yellow sticky traps**.

Effectiveness of **Pan** Trapping as a Rapid Bioinventory Method of Freshwater Shoreline Insects of Subtropical Texas.

- Authors:Dirrigl Jr., Frank J.¹Source:Southwestern Entomologist. Jun2012, Vol. 37 Issue 2, p133-139. 7p.
- Abstract: **Pan** trapping proves to be an effective method for field surveying insects, especially Diptera. This manuscript examines the effectiveness of the method for the rapid bioinventory of freshwater shoreline insects. **Pan traps** at ground level, above ground, and elevated and of different colors were evaluated for their ability to attract and capture insects. Abundance (n), taxonomic richness (T), and hierarchical diversity indices (H') allowed for the determination of efficacy among methods. **Yellow pan** (n = 141, T = 10, H' = 1.15) and elevated **yellow pan traps** (n = 113, T = 5, H' = 1.18) were most effective at capturing the highest diversity of insects. Blue (n = 12, H' = 1.18) and green (n = 51, H' = 0.74) **traps** had similar richness (T = 4); however differed in the total insects captured and diversity. The results provide entomologists in South Texas and other subtropical environments with information to assist them with planning surveys in the field and with further study potentially developing pollution tolerance values for different insect taxa.[ABSTRACT FROM AUTHOR]

Is colour an important factor influencing the behaviour of butterflies (Lepidoptera: Hesperioidea, Papilionoidea)?

- Authors: Kočíková, Lenka¹ lenka.kocikova@student.upjs.sk Miklisová, Dana² Čanády, Alexander¹ Panigaj, L'uírbom¹
- Source: European Journal of Entomology. 2012, Vol. 109 Issue 3, p403-410. 8p
- Abstract: Coloured Moericke water **pan traps** were used to determine the effect of colour on the preference behaviour of butterflies (Lepidoptera: Hesperioidea, Papilionoidea) over the period 2001 to 2003 in grassland habitats in Eastern Slovakia (Košícká kotlina basin). A total of 912 individuals belonging to 53 species and 7 families of butterflies were trapped. The colour of the **traps** that caught the most butterflies was white, followed by blue, violet, **yellow** and finally the least were caught by red coloured **traps**. Ordination analysis showed that some butterfly families and species were more likely to be caught by **traps** of a specific colour. Measurements of the wavelengths of the colours used revealed that butterflies preferred short-wavelengths light. The effect of colour on the catches did not differ significantly among the sites. The butterflies were more likely to be caught by **traps** of a certain colour even though the other features of the **traps** were the same. [ABSTRACT FROM AUTHOR]

Effects of distance from field edge on aphidophagous insects in a wheat crop and observations on **trap** design and placement.

- Authors: Bowie, M. H.¹ Gurr, G. M.² Hossain, Z.² Baggen, L. R.² Frampton, C. M.³
- International Journal of Pest Management; Jan-Mar1999, Vol. 45 Issue 1, p69-73,
- Abstract: Observations were made in a wheat crop to determine the effects on cereal aphids and their natural enemies of an adjacent crop of flowering canola (*Brassica napus* L.). More hoverflies (Diptera: Syrphidae) were caught adjacent to the canola than within the wheat crop, and apterous *Rhopalosiphum padi* (L.) (Hemiptera: Aphididae) were less numerous in the margin than at distances of 64 m or more into the wheat. Large amounts of canola pollen were present in hoverfly guts, especially for insects caught close to, or within, the canola. Earlier tests determined optimal colour, design and position of **traps**. **Yellow traps** caught most hoverflies in two six-colour comparisons of water **pan traps** conducted on grassed areas. In wheat, **yellow** water **pan traps** at ground level caught as many hoverflies as did **yellow** sticky **traps** laid horizontally on the soil surface or vertically oriented **yellow** sticky **traps** placed at either ear height or at soil level. Only water **pan traps** caught large numbers of hoverfly larvae. Significantly lower numbers of *Aphidius* spp. (Hymenoptera: Braconidae) adults were caught on sticky **traps** placed at ear height within the crop than by other **traps**.

Vertical and seasonal variation in the abundance and the species richness of Attelabidae and Cantharidae (Coleoptera) in a suburban mixed forest.

- Authors: Leksono, Amin Setyo¹ leksono72@yahoo.com Nakagoshi, Nobukazu¹ Takada, Kenta² Nakamura, Koji²
- Entomological Science; Sep2005, Vol. 8 Issue 3, p235-243, 9p, 2 Charts, 8 Graphs, 1 MapDocument
- Abstract: A continuous sampling of canopy beetles was carried out to determine variation in the abundance and the species richness of the Attelabidae and Cantharidae in a suburban mixed forest. Changes in the abundance and the species richness were monitored in three vertical strata of the forest from May to November in 1999, using **yellow** and blue water **pan traps**. The results showed significant variation in the abundance and the species richness of Attelabidae and Cantharidae between the layers, **trap** colors and seasons. Rare species were found in the bottom and middle layers, but were absent in the upper layer. In contrast, common species were more abundant in the upper layer than in the lower layers. The **yellow traps** had better trapping efficiency than the blue **traps** for both families, with the exception of an attelabid species, *Cycnotrachelus reolofsi*, which was more abundant in the blue **traps**. The abundance and the species richness were generally greater in spring than in summer. In spring, the abundance was consistently highest in the **yellow traps** in the upper layer. Season and layer were determinant factors in the species composition of the Attelabidae, while only season explained variation in species composition of the Cantharidae.

The Neonicotinoid Insecticide Imidacloprid Repels Pollinating Flies and Beetles at Field-Realistic Concentrations.

- Authors: Easton, Amy H.¹ Goulson, Dave¹ *dave.goulson@stir.ac.uk* Source: PLoS ONE. Jan 2013, Vol. 8 Issue 1, Special section p1-4. 4p.
- Abstract: Neonicotinoids are widely used systemic insecticides which, when applied to flowering crops, are translocated to the nectar and pollen where they may impact upon pollinators. Given global concerns over pollinator declines, this potential impact has recently received much attention. Field exposure of pollinators to neonicotinoids depends on the concentrations present in flowering crops and the degree to which pollinators choose to feed upon them. Here we describe a simple experiment using paired **yellow pan traps** with or without insecticide to assess whether the commonly used neonicotinoid imidacloprid repels or attracts flying insects. Both Diptera and Coleoptera exhibited marked avoidance of **traps** containing imidacloprid at a field-realistic dose of $1 \mu\text{g L}^{-1}$, with Diptera avoiding concentrations as low as $0.01 \mu\text{g L}^{-1}$. This is to our knowledge the first evidence for any biological activity at such low concentrations, which are below the limits of laboratory detection using most commonly available techniques. Catch of spiders in **pan traps** was also slightly reduced by the highest concentrations of imidacloprid used ($1 \mu\text{g L}^{-1}$), but catch was increased by lower concentrations. It remains to be seen if the repellent effect on insects occurs when neonicotinoids are present in real flowers, but if so then this could have implications for exposure of pollinators to neonicotinoids and for crop pollination. [ABSTRACT FROM AUTHOR]

Diversity of Cicadellidae in agricultural production areas in the Ovens Valley, north-east Victoria, Australia.

- Abstract: There is a paucity of data on the distribution of Cicadellidae (leafhoppers) in Australia. This study quantifies the relative abundance, seasonal activity and diversity of leafhoppers in the Ovens Valley region of north-east Victoria, Australia. Species diversity and abundance was assessed at four field sites in and around the field borders of commercially grown tobacco crops using three sampling techniques (**pan trap**, **sticky trap** and sweep net). Over 51 000 leafhopper samples were collected, with 57 species from 11 subfamilies and 19 tribes identified. Greater numbers and diversity of leafhoppers were collected in **yellow pan traps**. The predominant leafhopper collected was *Orosius orientalis* (Matsumura). Twenty-three leafhopper species were recorded for the first time in Victoria and eight economically important pest species were recorded. Seasonal activity of selected leafhopper species, covering two sampling seasons, is presented. [ABSTRACT FROM AUTHOR]
- Authors: Trębicki, Piotr^{1,2}
Harding, Rob M.¹
Rodoni, Brendan³
Baxter, Gary⁴
Powell, Kevin S.² kevin.powell@dpi.vic.gov.au USource: Australian Journal of Entomology; Aug2010, Vol. 49 Issue 3, p213-220, 8p, 1 Diagram, 1 Chart, 2 Graphs