Pollinators in peril
Our “other” native pollinators – who are they and how can we help to conserve them?

Carmen Greenwood – SUNY Cobleskill

Overview

• The other pollinators
  – Who are they?
  – What do they do?
  – What challenges do they face?
  – How can we help?

– SUNY Cobleskill will be implementing native pollinator conservation plots on campus thanks to New York State Community IPM Projects

Thank you!

Biodiversity

• Pie chart represents the Animal Kingdom in terms of diversity with over 1.2 million species described thus far
• Arthropods make up about 80%
• Insects make up the largest proportion of the arthropods

Pollination

• Not all plants require living pollinators
• Primitive plants – wind pollinated and water “pollinated”
• Co-evolution of flowering plants & insects
• Pollination usually involves a “reward” in exchange for carrying pollen

Pollination doesn’t always reward the pollinator
Insect-mimicking flowers

• Male bees are sometimes “tricked” by orchids that mimic female bees
• A reward of pollen or nectar is not provided
• “pseudocopulation”

Diversity of Species per Insect Order

• Lepidoptera: 16%
• Hymenoptera: 12%
• Coleoptera: 38%
• Diptera: 13%
• Arachnida: 4%
• Insecta: 30%
Types of pollinators

- Cantharophily - beetle pollination
- Myophily - fly pollination
- Sphecophily - wasps
- Myrmecophily - ants
- Phalaenophily - moths
- Psychophily - butterflies
- Anthrophily - humans
- Different levels of specialization (e.g. Fig wasp)

Insects and plant reproduction

- Anthopholous (flower-frequenting) insect taxa include: Bees/wasps, moths/butterflies, beetles, flies and thrips
- Pollen: protein, fat, starch, sugar, vitamins
- Nectar: high in sugars

Example of fly-pollinated produce

- Mango
- Cashew
- Tea
- Cacao
- Onions
- Strawberries
- Cauliflower
- Mustard
- Carrots
- Apples
- Leeks
- Cassava

Pollination on 2 wings

- Diptera – among the earliest pollinators
- Second only to bees and in some cases as effective
- One of the 3 largest families of animals on the planet (> 160,000 spp.)
- Over 70 different families of Diptera include anthopholous species
- Over 1000 flowering plant species are documented to be pollinated or visited by anthopholous flies
- More than 100 cultivated plants are pollinated by flies

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Syrphidae – “flower flies” or “hover flies”

- Most lack specialized structures to carry pollen
- *Platychereis* spp. enlarged tarsi to squeeze pollen out of anthers
- Some accumulate pollen in their hairs

Syrphid fly larvae provide pest suppression

- Some species of hover flies lay their eggs in vegetation
- Their larval forms prey on soft-bodied insects like aphids
- Bee flies also prey upon and parasitize other insects eggs and larvae

Photos by Alex Wild

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**Eristalis** sp. (*Syrphidae*)

- *used in greenhouse pollination of peppers* (Jarlan et al. 1997)
- *laboratory-reared and used in the production of seeds for seed banks* (Rosso et al. 1994; Gladis 1994).

**Muscidae and Calliphoridae spp.**

- *Raised commercially*
- *Used as pollinators for*:
  - Canola
  - Sunflower
  - Buckwheat
  - Garlic
  - Lettuce
  - Peppers
- *To increase production of greenhouse tomatoes, peppers and umbelliferous plants (celery, carrot, many aromatic herbs)*

**Pollination of Carrots**

*With Blue Bottle Flies*

http://www.forkedtreeranch.com/

**Bee flies**

- *Large family (>4500 spp)*
- *Adults feed on pollen and are the main pollinators of some desert plant species*
- *Larval stages are predators or parasitoids of eggs and larvae of other insects (females often lay eggs in the burrows of beetles or solitary wasps and bees)*
Flies as pollinators in the forest understory
Herbaceous plants and shrubs with numerous small inconspicuous flowers

- Small flies
  - Phoridae
  - Sciaridae
  - Mycetophilidae
  - Piophilidae
  - Bibionidae
  - Culicidae

Flies as pollinators in arctic and alpine systems

Fig. 1 Relative importance of flies, bees and beetles in plant
flower visitor systems relative to latitude (Kempen and
Olesen 2000)

Specialization between plants and pollinators to form a
“pollinator guild” helps to ensure the fidelity of
pollination to the same species.

Lapeirousia anceps is pollinated by Moegistorhynchus longirostris (Diptera: Nemestrinidae)

Nemestrinidae

Apioceridae – “flower loving flies”
Beetles as pollinators

Beetles comprise the largest set of pollinating animals, due to sheer numbers. They are responsible for pollinating 88% of the 240,000 flowering plants globally (U.S. Forest Service).

Beetles:
- Probably the oldest anthophophilous group
- Still pollinate some of the ancient lineages of plants (i.e., magnolia, spicebush)
- Beetles rely heavily on smell and prefer “spicy” varieties
- Also capable of color vision

Coleoptera: Mordellidae

Tumbling flower beetles on Magnolia blossom

Pollination by butterflies

- Daytime active
- Good color vision
- Less efficient at pollen transport than other insects (long legs; lack pollen carrying structures)
- Many flowering plants have obligate butterfly pollinators

Pollination by moths

- Many are nocturnal (not all)
- Flowers that bloom nocturnally are often white or dull in color
- Produce high quantities of nectar but may be specialized (nectar may be difficult to reach)
Yucca plants and Yucca moth – a symbiosis

- Female moth collects pollen from one flower then goes to another flower and applies pollen to the stigma; then makes a small hole in the ovary where she lays her eggs
- When the eggs hatch, the larvae feed on yucca seeds within the fruit.
- Typically, there are more seeds than the larvae in a particular flower can eat (since the plant aborts flowers that are too heavily laden with eggs).

Challenges faced by “other” pollinators

- Many of the same challenges that are facing native bees and honeybees
  - Pesticides
  - Large monocultures
  - Invasive species (plant and animal)
  - Natural enemies
- Impacts of honeybees on native pollinators?
- Both are important but both need space and accommodation

What can we do to help our native pollinators?

- **BE AWARE** of native pollinators (native bees, flies, beetles, moths and butterflies) and honeybees (which are not native and may impact native pollinators)
  - To attract (and conserve) native pollinators, native plants are best
  - A mixture of plants that flower early, mid and late season
  - AM and PM blooms
  - Annuals and perennials
  - White, yellow, blue are preferred but red is ok
  - Plant lists for New York are available through a number of sources:
    - Pollinator guide: [http://www.pollinator.org/guides.htm](http://www.pollinator.org/guides.htm)

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