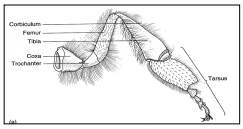
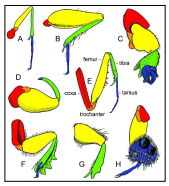
natatorial



pollen basket

1

Modifications of the leg segments can tell you something about the biology of the insect.



2

Disadvantages of an exoskeleton

Must shed exoskeleton for large increases in size

Process is known as molting
animal is very vulnerable during molting

All arthropods molt

3

Weight is a limiting factor

2X the muscle diameter
doubles the strength
but increases weight 3X

4

Where do the
largest arthropods live?

5

Sensory Perception

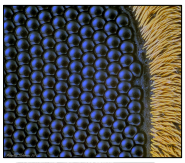
how insects perceive
their world

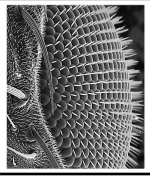
insects must obtain sensory input,
both external and internal
various types of receptors
provide this input

insects perceive many things that
we do not
wavelengths of light, chemicals,
magnetic fields

6

Vision compound



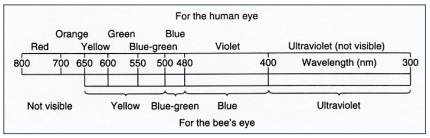
7

excellent vision in many directions
high flicker fusion frequency
can see up to 250 frames per second
excellent for detecting movement
excellent for seeing while moving rapidly

8

humans can see wavelengths of 400-750 nanometers

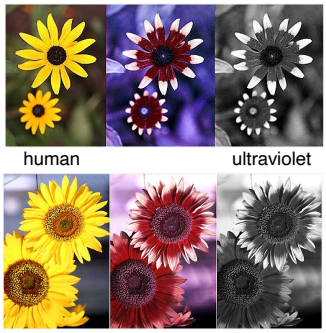
insects can see from 253-700 nanometers



many insects can see color, but most do not see the red portion of the spectrum well
do see blue-green, ultraviolet, and polarized light

nanometer = 1/1,000,000,000 meter

9

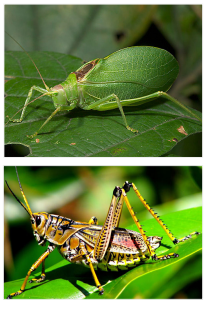


10

Sound

insects have evolved different mechanisms for producing sounds: wing buzzing, stridulation,

11

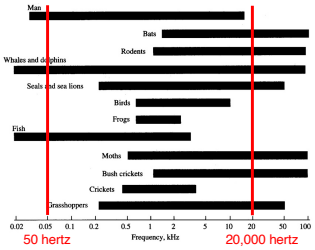


12

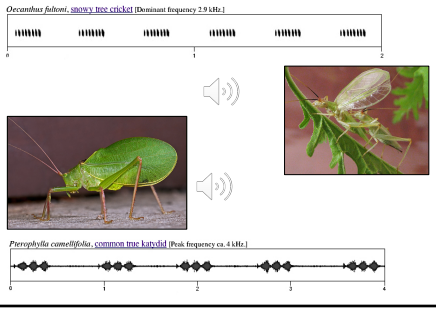
hearing structures on antennae, wings, legs, abdomen
Orthoptera, mantids, cicadas, lacewings, Lepidoptera, mosquitoes, flies

13

sound produced at frequency range of
5-100,000 Hertz
above 20,000 Hz is ultrasound, humans cannot hear above 20,000 Hz

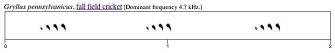


14



15

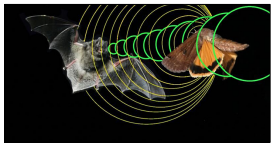
Gryllus pennsylvanicus, fall field cricket (Dominant frequency 4.7 kHz.)



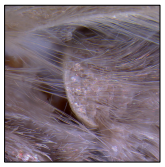
Gryllus assimilis, Jamaican field cricket (Dominant frequency 3.6 kHz.)

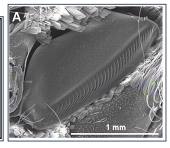
16

moth hearing and sound production



broadcast acoustic warning to bats
or jam their sonar





17

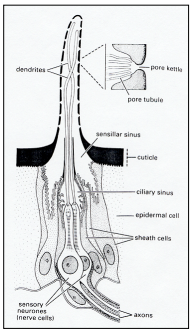
Chemical reception

taste and smell

detection of certain molecules by receptors
- taste--actual contact
- smell--airborne

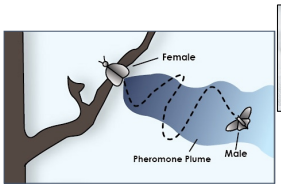
usually on antennae, mouthparts, tarsi, ovipositor

affect feeding, courtship, mating, habitat location, other behaviors



18

male moths with up to 60,000 sensilla and 150,000 sense cells on antennae
  most to detect pheromones from females
long distance communication



19

The power of pheromones.

1 female buck moth
Hemileuca maia
KPBS, 2020
Valerie Wright

20

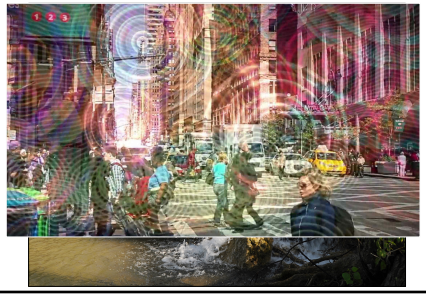
heat
blood-sucking insects can detect body heat of host and exhaled carbon

hygroreceptors--moisture, humidity

geomagnetic--sense magnetic fields, orientation

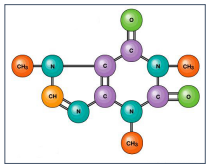
21

Insects see, hear, taste, smell, and perceive things that we cannot.



22

The caffeine molecule is my friend.



23

24

Ecological aspects

Herbivores

25

Ecological aspects

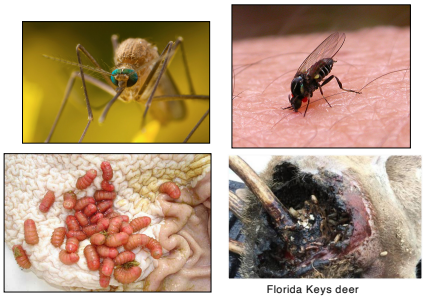
Predators
Prey

26

Ecological aspects

Parasites

27



Florida Keys deer

28

Ecological aspects

29

yucca moths and *Yucca*
completely dependent on each other

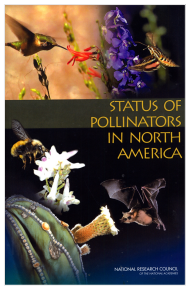
female moth gathers pollen from one yucca
lays eggs in a different yucca
fertilizes that yucca chemical marking
caterpillars feed on seeds

40M years

30

populations of pollinators have been declining for many years
wild bees declining for 20+ years

climate change
habitat destruction/change
insecticides
introduced species



31

Ecological aspects

Many adapted for aquatic or semi-aquatic life
there are even aquatic caterpillars


dragonfly


mayfly


dobsonfly

32

Ecological aspects

Bioindicators—bioassessment, use as measures of pollution, especially aquatic habitats

EPT = number of **E**phemeroptera, **P**lecoptera, **T**richoptera insect orders with known ranges of tolerance to pollution

Ephemeroptera, mayfly



many species intolerant of acidification and pesticides

33

Plecoptera, stonefly

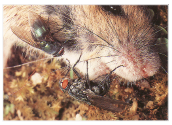
Trichoptera, caddisfly

many species intolerant of low oxygen content

34

Ecological aspects

Decomposers



estimated $57B per year in the USA: dung removal, pollination, pest control, wildlife nutrition (Cornell/BioScience, 2006)

35

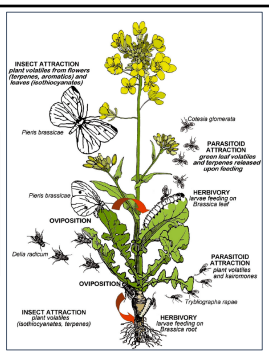
Ecological aspects

Mutualistic interactions

evolutionary arms races

36

Many plants can send a chemical signal to natural enemies when insects feed on them



37

How do you collect insects?

nets

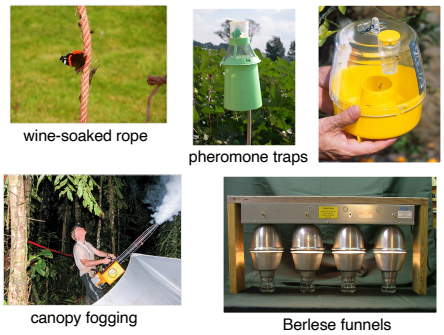
lights

38

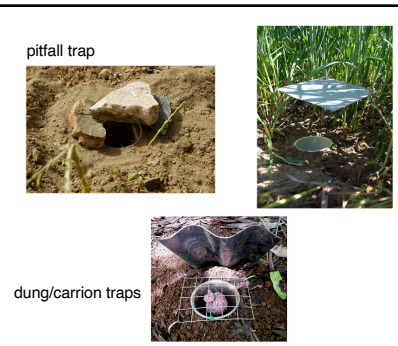
pan trap

bee bowl

39


wine-soaked rope
pheromone traps
canopy fogging
Berlese funnels

40


pitfall trap
dung/carrion traps

41


Malaise trap

42

Diptera

43

pan traps and Malaise traps in 2A, 20B

44

June 14--July 15
total of 21 collecting days
collected 13,104 specimens of Hymenoptera in 40 families

45

How many species of insects are there in Kansas or on Konza Prairie?

I have no idea.

Checklists or smaller works on different insect groups: Orthoptera, Hemiptera, Coleoptera, Lepidoptera

~60 species of butterflies ~500 species of Noctuoidea
~38 species of grasshopper

46

Effect of fire on insects?

It depends on the species.

47

Article | Open Access | Published: 15 June 2020

Effects of prescribed fire and social insects on saproxylic beetles in a subtropical forest

Michael D. Ulyshen, Andrea Lucky & Timothy T. Work

Scientific Reports **10**, Article number: 9630 (2020) | Cite this article

678 Accesses | 3 Altmetric | Metrics

Abstract

We tested the immediate and delayed effects of a low-intensity prescribed fire on beetles, ants and termites inhabiting log sections cut from moderately decomposed pine trees in the southeastern United States. We also explored co-

Systematic Review | Open Access | Published: 20 August 2018

What is the effect of prescribed burning in temperate and boreal forest on biodiversity, beyond pyrophilous and saproxylic species? A systematic review

Jacqualyn Eales, Neal R. Haddaway, Claes Bernes, Steven J. Cooke, Bengt Gunnar Jonsson, Jari Kouki, Gillian Petrokofsky & Jessica J. Taylor

Environmental Evidence **7**, Article number: 19 (2018) | Cite this article

6188 Accesses | 12 Citations | 24 Altmetric | Metrics

48

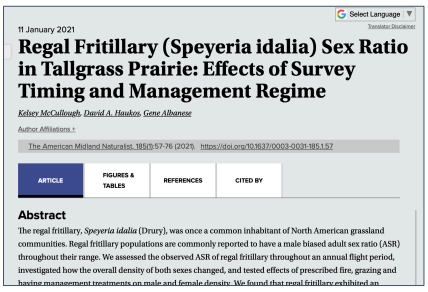

ORIGINAL PAPER

Status of the regal fritillary (*Speyeria idalia*) and effects of fire management on its abundance in northeastern Kansas, USA

Alicia F. L. A. Powell · William H. Busby · Kelly Kindscher

Regal fritillary
host plants are violets
overwinter as larvae
in litter
larva active in April

49


Select Language

Translator Disclaimer

11 January 2021

Regal Fritillary (Speyeria idalia) Sex Ratio in Tallgrass Prairie: Effects of Survey Timing and Management Regime

Kelsey McCullough, David A. Haukos, Gene Albanese

Author Affiliations ↑

The American Midland Naturalist, 185(1):57-76 (2021). https://doi.org/10.1637/0003-0031-185.1.57

ARTICLE | FIGURES & TABLES | REFERENCES | CITED BY

Abstract

The regal fritillary, *Speyeria idalia* (Drury), was once a common inhabitant of North American grassland communities. Regal fritillary populations are commonly reported to have a male biased adult sex ratio (ASR) throughout their range. We assessed the observed ASR of regal fritillary throughout an annual flight period, investigated how the overall density of both sexes changed, and tested effects of prescribed fire, grazing and having management treatments on male and female density. We found that regal fritillary exhibited an

50

Insects most likely to be adversely affected by fire:
remnant-dependent
uncommon host plant
exposed in larval stage
low vagility

effects and interactions not known for many species


Chad Hellinger

patch burns provide more varied habitat than annual burns
2x number of bees, 3x number of bee species

51

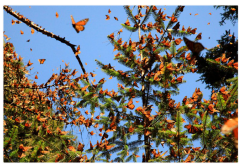
There are more species of insects than any other animal.

There are a number of reasons insects have been so successful in terms of number of species and time on the planet.

52

Insects perceive many sensations and stimuli that we do not.

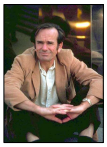
Insects have many roles in ecosystems, including many that are not found in vertebrates.



53

Insects won't inherit the earth. They own it now.

~Thomas Eisner



54


When your friend is alone on the dancefloor and needs a wingman

55