

BSCI 120
ARMSTRONG

8/31/10.

• What is an insect?

- An arthropod.
- arthro - means jointed.
- pods - refers to feet or appendages.
- 3 distinct body regions: head, thorax, abdomen
- have 2 pairs of wings.
- has 1 pair of antennae
- 3 pairs of legs.

Entomology = Study of insects

Why study? b/c we encounter them daily; more kinds of insect than any other kinds of animals.



- over 1,000,000 species described
- maybe up to 10,000,000 species undiscovered.
- insects are everywhere.
 - occupy every terrestrial + aquatic habitat except:
- greatest ^(of insects) # occur in the tropics
- highly variable size.
- Insect Richness
- insects have been used in diff. cultures

Benefits of Insects:

- important pollinators
- one of nature's efficient "sanitation workers"
- serve as food for other animals.

- provide commercial products.
 - silk from silkworms)
 - honey + beeswax from honey bees.
 - cosmetics from royal jelly.
- perform services such as scavengers.
- help keep harmful animals + plants in check on crops, forests, + other human-managed resources
 - ladybugs, praying mantis.
- replenish nutrients to + aerate soil
- useful in medicine + scientific research
 - bee stings for arthritis
 - bio-terrorism
 - models for genetic + molecular studies.
 - models for understanding biological processes.
 - ... to develop robots.
- used as religious items or symbolic in many cult
- interesting
- provide jobs
 - Academia • fed. + state govt.

Harmful Effects of Arthropods.

- Some are responsible for enormous economic losses in agricultural store products.
- conflict w/ humans.
- many transmit disease causing agents to man/animals.

disease vectors:

- kissing/assassin bug - transfers protozoa.
- female mosquitoes (suck blood, males don't)
- tick
- soft tick

terrible diseases:

- malaria
- yellow fever
- plague

* Historically, during war times

Entomology includes:

- physiology
- morphology
- forensic entomology
- taxonomy
- integrated pest management
- medical + veterinary
- Genetics
- Ecology
- biological control

Hierarchical Classification

9/2/10.

- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

Classification: Kingdoms.

- Animalia - animals
- Monera.
-
-
-

Kingdom Animalia.

- consists of ~30 phyla.

Some familiar phyla: Chordata - vertebrates

Arthropoda, arthropods. Nematoda - roundworms, etc.

- Trilobites (extinct)
- Horseshoe crabs.
- Arachnids.
- Crustacea.
- millipedes.
- centipedes

Arthropod characteristics:

- exoskeleton
- jointed appendages
 - legs, mouthparts.
- show bilateral symmetry
- dorsal blood vessel; circulatory system found on top.
- ventral nerve chord.
- no vertebrae present
- well developed sensory systems.
- Striated muscles present

Classes of Arthropods.

- Class Arachnida (spiders, ticks, mites, scorpions).
- " Chilopoda. (centipedes)
- " Diplopoda. (millipedes)
- " Crustacea. (crabs, shrimps, etc)
- " Insecta. (Hexapoda)

Characteristics used to separate Arthropod classes.

- # of body regions
- legs
- antennae

evolution of arthropods.

- Annelids or segmented worms. (e.g. Marine worms, etc...)

Early Annelids

- mostly marine w/ segmented bodies.
- segment had fleshy, paddle-like appendage.

Modern Annelids:

• earthworms & leeches habitats range from soil to water; no fleshy paddle-like appendages on segments.

Phylum Onychophora.

Onychophorans are "linking ancestors" b/w annelids & arthropods.

Annelids

Arthropods.

Onychophorans

Velvet Worms

Habitats: mostly tropical in dark or damp areas. (f.e. Central + South America, Africa.)

Food source: omnivores.

Phylum Arthropoda

Subphylum Trilobita

Subphylum Chelicerata

Subphylum Mandibulata

extinct

Sea scorpions, horse shoe crabs,
arachnids.

crustaceans, millipedes
centipedes, insects.

Arthropoda: from arthro. and poda.

phylum of invertebrate animals that have insects.

Trilobites: the 1st arthropods.

- appeared in the Cambrian Period & dominated many habitats during the Paleozoic Era.
- All were extinct before Dinosaurs appeared on Earth.
- Oldest form of arthropods.
- lived > 500 million years ago (fossils).
- Scavengers on organic material.

Subphylum Chelicerata. Characteristics:

- two body sections.
 - cephalothorax (=Prosoma): the head & thorax fused together
 - abdomen (=Opisthoma)
- Six pairs of appendages on the cephalothorax:
 - 1st pair: chelicerae
 - 2nd " : pedipalps
 - 3rd thru 6th pairs: legs.

Examples of chelicerates:

- Sea Scorpions.
 - extinct - large 6-8ft. - Flourished in Devonian period (360 r year)
- Horseshoe Crabs.
 - found along eastern coast of Atlantic ocean + Orient
 - eat marine worms - Breathe via gills. - forked

importance:

- \$100 million/yr tourism industry
- \$50 million/yr biomedical industry: federal law requires intravenous be tested w/ horseshoe crab bi impurities.
- eggs are vital link in shorebirds migration from South America to arctic breeding grounds.

Arthropods -

- Brown reese spiders.

- Wolf Spiders.

- nocturnal carnivores.
- found in litter.
- spiderlings on back.

- Tarantulas.

- tarantula wasp.

- lays eggs on the inside of tarantulas.

- Trap-door spiders.

- found in Southern + Western U.S.

- Crab Spiders.

- crab-like in appearance
- common on litter or vegetation
- camouflage.
- pounce on prey + suck up predigested liquid.

- Jumping Spider.

- doesn't produce spider webs.

- Daddy long-legs.

- Arachnids
- always mating
- feed on decaying plant material

Arachnids Courtship Behavior.

- Male so small, he clambers ignored over body of female
- approach "direct," male pounces female w/ his pedipalps + legs, causing her to lose consciousness.
- some males vibrate strands of webbing, producing vibrations detected by female.
- dance in front of female.
- black widow spider courtship.

9/13/10 Discussion / Lab .

- Domain-species

- Kingdoms:

Plantae Animalia Fungi

Protista.

(multicellular, eukaryotic.)

eukaryotic, unicellular + multi

Eubacteria

Archaeobacteria.

(unicellular, prokaryotic.)

* harvestmen: "daddy-long leg"

Animalia

• multicellular

• require food from outside source

• nervous system

• ex: sponges, worms, mollusks, mammals, and arthropods.

Arthropods:

• have exoskeleton.

• jointed appendages.

• growth by molting.

• Tagmose and Segmentation

↓
"body regions"

↳ helps in movement

Arthropod Groups: ON ELMS.

hexapod: 6 legs.

Sub-Phylum: Trilobita.

- oldest + extinct arthropod.

Sub-phylum: Chelicerata.

" : Myriapoda.

Discussion/Lab.

9/20/10.

Dorsal: Top

Ventral: bottom / underside

Anterior: front

Posterior: back

Lateral: side

Tagmosis. - structure

head

thorax: 2nd body region: Prothorax, Mesothorax, + Metathorax

abdomen: spiracles for breathing. sternites, tergum

Grasshopper

head:

Antenna

Ocellus (ocelli)

Compound Eye

head:

Labrum

Mandible

Maxilla

Labium

Legs:

Femur (femora)

Tibia(e)

Tarsus (tarsi)

Females have an ovipositor

9/23/10. Lecture.

Exam 1: September 28, 2010

- Lectures in Packet
- Arthropods (pgs 2-9, 17-19)
- Diversity + Evolution (pgs 1, 20, 25-28)
- External Anatomy (pgs 32-34)
- **Internal Anatomy (pgs 35-40)**
 - Digestive, respiratory, circulatory, excretory, and reproductive systems.

Digestive Tract.

- Regions of digestive tract.
 - Foregut
 - Midgut
 - Hindgut

Midgut: (Ventriculus)

- Region of digestion and absorption
- Peritrophic membrane
 - Functions:
 - ~ Passage of nutrients
 - ~ Protects delicate epithelial cells
 - ~ Keep harmful microorganisms from entering epithelial cells

Hindgut

- ileum, - colon - rectum - anus

Nutrients:

Dietary Requirements: vitamins, amino acids, {steroids, lipids, carbohydrates,} salts & other substances to grow & develop.

Circulatory System

open vs closed:

~~P/annex~~

lab book * insects have open systems. *

Open: blood not confined w/in arteries, veins, etc.

Closed: blood confined w/in arteries, veins, etc...

Dorsal vessel; ventral nerve cord.

various hearts.

aorta; hearts.

aorta, ostium, heart, hemocoel.

- Insect hemolymph (blood) doesn't carry oxygen since tracheal systems do that; blood not red + bathes the tissues/organs.



alary muscles (insect body; dorsal view)

Accessory pulsatile organs: wings, legs, antennae.

- These organs (small "hearts") pump blood to wings, legs, antennae.

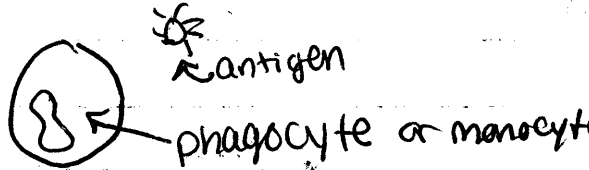

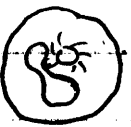

Blood Components

- Blood = hemolymph
- hemocytes
- water
- inorganic ions
- other organic molecules

Functions of blood:

- Nutrient transport
- Storage
- hydraulic pressure
- coagulation
- phagocytosis
- encapsulation
- wound healing

Phagocytosis

- ① phagocyte/monocyte approaches antigen 
- ② Engulfing 
- ③ Digesting 
- ④ Phagocytosis completed 

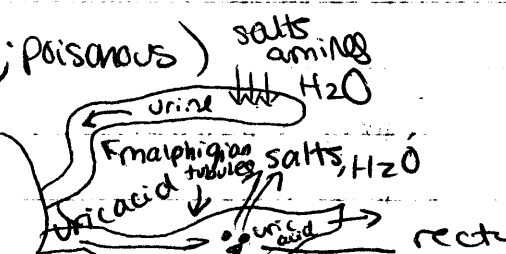
What's the difference between phagocytosis and encapsulation?
 encapsulation: covers & completely surrounds it
 phagocytosis:

NO hemoglobin present, so won't be red.

Excretory System

Function: remove metabolic waste products from the body

Forms of waste products:

- | | | |
|------------------|---|---|
| insects < | 1. ammonia (aquatic animals; poisonous) | salts
amino acids
H ₂ O |
| mammals/humans < | 2. uric acid (land, terrestrial) |  |
| | 3. urea | |

Malpighian tubules (tubes found @ junction of mid & hind area)

• remove nitrogenous (poisonous) wastes from the body
 They function like the kidney in our body.

Principle Waste Organs.

• Malpighian tubules:

- vary in # & found at midgut & hindgut junctions.

- Cryptophry

• Other waste product structures.

- fat bodies, urate cells and nephrocytes

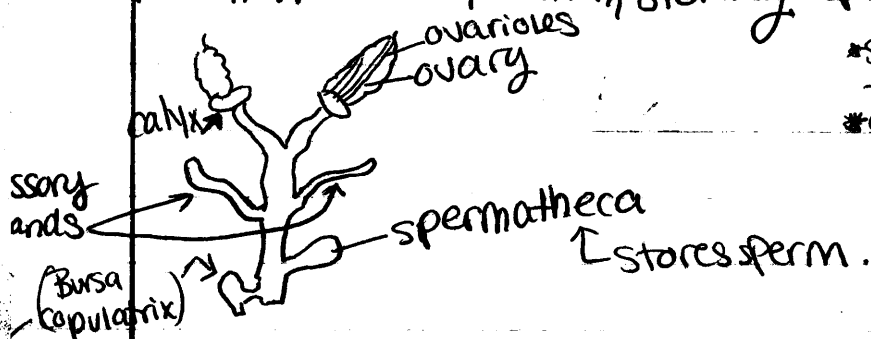
Reproductive System of Insects. (NOT on exam)

Function: perpetuation of species.

- mayflies: mate & die in day.

Female reproductive system.

Function: copulation, storing sperm, producing eggs.



* Some females reproduce once or multiple times
* can choose the sex

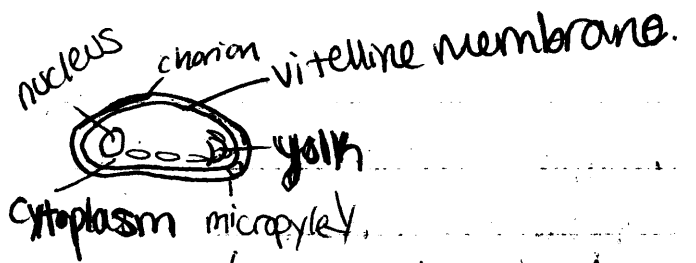
→ produce chorion & glue-like materials to adhere eggs to matrix in the environment.

→ temporarily stores sperm

Ovipositor: used to lay eggs in soil, trees, plants, & other materials. In stinging insects

Reproductive System

Insect egg cell
Chorion: egg shell



nucleus: contains the genetics

provide nutrients, spread throughout the egg
allows sperm to enter the egg

~~oocyte~~ aeropyle: allows oxygen to penetrate the egg
series of openings.

Oviparity: egg placed in environment

(e.g. hissing cockroach) →

Ovoviviparity: eggs retained w/in female's body but offspring received nutrients from yolk sacs of egg

Viviparity: eggs retained w/in female's body & receive nutrients from uterine device (e.g. tsetse fly, sheep ked); gives birth to live offspring

Male Reproductive System

• produce sperms

• produce spermatophores

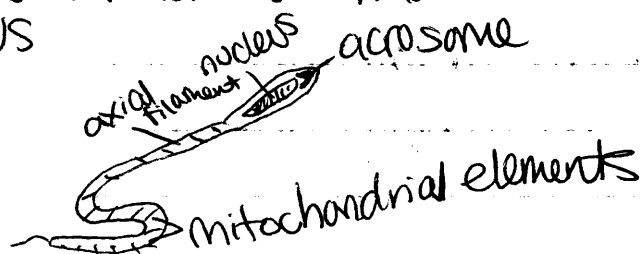
pair of testis, which contain sperm tubes.

once they're mature, they pass through vas deferens and into seminal vesicle where sperm is stored

accessory gland: provides nutrients & fluids for sperm

ejaculatory duct:

claspers: function is to hold female when not receptive to aedeagus



Sperm Transfer

Mo.

- Seminal Fluid
- spermatophores

nood

Are insects monoecious, dioecious, other?

Monoecious: both reproductive systems found in same sex.

Dioecious: males + females have individual reproductive system; copulation must occur to produce offspring

Asexual Reproduction:

- eggs)
- Polyembryony: single egg gives rise to multiple offspring
 - Parthenogenesis: offspring develops from unfertilized eggs.
 - Neoteny: immature insects having babies.

Muscular System

Functions: locomotion, maintaining posture, movement of organs.

Two Types of muscles: skeletal and visceral

Skeletal

- head
- legs
- wings

> associated with locomotion

visceral muscles.



Nervous System

Central

Peripheral

Stomodaei

brain,

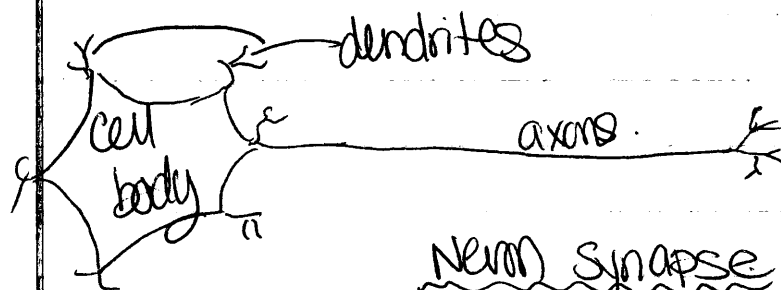
niraa

Peripheral: radiates from ventral nerve cord and makes connection with many of the internal organs. Thoracic ganglion are important in movement.

Stomodaei: Makes connections with innermost visceral organs (e.g. digestive tract).

Types of neurons ^(nerve cells) in insects:

Sensory neurons • Motor neurons • Association neuron



contains nucleus.

Neuro Synapse

axon dendrite



acetylcholine = transmitter substance

insects possess a variety of auditory, olfactory, tactile structures, and other

Internal Anatomy

Endocrine system

Functions:

- secretion of hormones
 - transported by nerves and circulatory system
- control and regulate insects development
- Reproduction (as adults)
- * gland or tissue produces and secretes hormones, "chemical messages" ... hormone stimulates or inhibits "target tissues".

Important glands:

- corpus cardiacum
- protocerebrum

→ neurosecretory cells.

→ neurosecretory substance (brain hormone)

brain has these produce a (brain hormone) associated with growth + development of the insect

Corpora cardiaca (Found in thorax)

prothoracic gland; molting fluid cells, exoskeleton, integument, epidermal cell
ecdysone (molting hormone)

ecdysial sutures → exuvium → instar IV

Corpus allatum = produce juvenile hormone

10/4/10.

Discussion. Practical: week after 2nd exam.

Insect Respiration

Gas Exchange:

- oxygen taken up from the environment
- CO₂ released.

Insect "blood" (hemolymph) does not carry oxygen.

- What does it lack?

- It lacks respiratory pigments and therefore carries little oxygen.

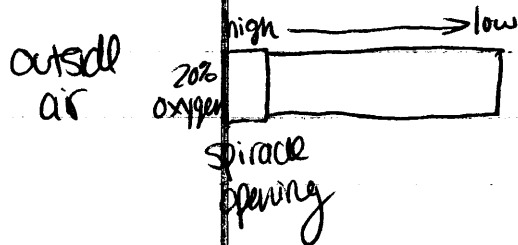
Spiracles

↓
Trachea

↓
Tracheole

↓
Tissues & organs.

Diffusion: movement of molecules from high to low concentration.



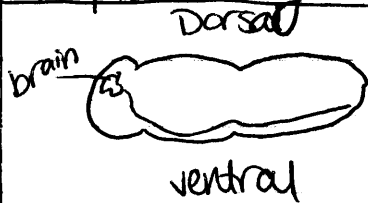
How does oxygen move through tracheal system
pumping of thorax + abdomen

Aquatic Life:

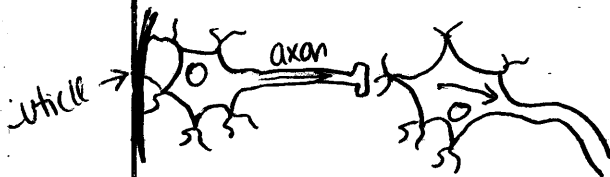
• Gills.

- movements creates currents of oxygenated water.
- oxygen diffuses through cuticle.

• Physical Lung.



Nervous System



neurotransmitters



Synapse

* insecticides cause it to go the wrong way. ←

10/14/10.

effects btw humans + insects in contact.
effects can be:

- Direct
- Indirect

Direct: occur as result of interaction

- Bites/stings
- envenomization
- Dermatitis
- entomophobia
- exsanguination
- urticating hairs
- vesicants
- Myiasis
- Allergic reactions
- annoyance

bites: when insects feel threatened. - some painful but discomfort varies.

e.g. giant water bug; horse flies/deer flies; wheel bug

wheel bug: wheel shaped part on thorax; have sharp mandibles on insects.

biting flies: (horse/deer fly)

1. Stinging insects/arthropods: Hymenoptera (bees, ants, wasps.

scorpions

stinger on end of scorpion.

fire ants; bees/wasps

Honey bee has teeth-like structure on stinger.

Venomous Arthropods: spiders, bees, wasps, ants, scorpions, Lepidoptera | (some) →

Inject via:

- fang-like chelicerae, bites, stinging structures.

- black widow acts on the nerves.
- brown recluse spider acts on the tissue.

4. Dermatitis: A disease condition that occurs from stinging activities.

- Skin irritations from feeding activities or body fragments of arthropods (e.g. follicle mites, mosquitos, ticks, lice, etc...)

5. Injury to sensory organs (eyes, nose, mouth, etc...)

- caused by accidental flight of insects...
eye frequenting moths...

6. Urticating Hairs.

- hairs/setae produce irritations due to poison/venom (e.g. saddleback caterpillars) puss caterpillar, hagmoth caterpillar

7. Production of vesicants/blistering agents.

- Blister beetles
- Cantharidan.

8. Myiasis - invasion of animals organs/tissues by fly maggots.

- invasion by other insects can occur (beetles)
• WWI, blow fly larvae were used in treatment of wounds + osteomyelitis
• Allantoin (healing capabilities)

9. Annoyance

- Most insects can be annoying especially in summer when they are active.
- cockroaches, wasps, bees, mosquitos.

10. Allergic Reactions.

- Dust mites, scales of mayflies + body fragments/fluid from cockroaches and other insects.

11. Entomophobia: excessive and prolonged fear of insects/arthropods that may cause nervous disorder sometimes even hallucination.

12. Exsanguination: Blood loss due to feeding activities arthropods/insects on hosts.

Indirect Effects

- Caused by transportation/transmission of disease causing pathogens (e.g. Bacteria, Fungi, protozoa, viruses, etc).

ex: Lyme disease

- Diseases are generally caused by a pathogen + not insects/arthropods

Vectors:

- mechanical vs. biological

Parasite:

- ectoparasite vs. endoparasite.

Pathogen:

- viruses, protozoa, bacteria, fungi,

Missing: 10/5, 10/7, 10/12,

Discussion 10/18/10. Orders

Butterflies/moths - Lepidoptera

ants/bees/wasps. - Hymenoptera (2)

Flies. - Diptera

Dragonflies. - Odonata.

Beetles - Coleoptera.

Grasshoppers - Orthoptera

True bugs - Hemiptera.

cicadas/planthoppers. - Homoptera.

Mantids - Mantodea

Cockroaches - Blattodea.

Walking Sticks. - Phasmoda.

termites - Isoptera (not on discussion key)

tera - wings

Di - two

Homo - same size.

Hemi - 4 wing

haustellate - sucking mouthparts.

Hemiptera - segmented mouth parts.

cicadas - solid mouth part

proboscis - mouth part coiled up (butterfly)

Insect Communication.

The influence of signals from one organism on the behavior and/or physiology of another organism.

- warning
- Alarm
- food
- territory
- aggregation
- protection
- finding a mate
- death
- recognition

Intraspecific

signals b/w one species

Interspecific

signals b/w different species

Media

- sound
 - crada.
- vision
 - Light
 - fireflies.
 - larvae.
 - Chemical
 - caterpillar.

Warnings + Defense.

- yellow + black
- defense
- call for help.
- Startling displays.

Mimicry - camouflage
Cryptic and deceptive.
• hide from predators
• " " " preys

Batesian Mimicry

- try to look like another species.
- moth → spiders
- spiders → ants

Müllerian Mimicry

predators avoid a pattern^{as colors} b/c they're all dangerous and look alike.

- hormones,

brain → organ → does this.

• malaria

(anopheles)

• Lyme disease

• mosquitoes & ticks

• yellow fever

carried by mosquitoes.

• heartworm

in stinging insects, used to lay eggs in soil, trees, plants, & materials.

oviparity: egg placed in environment. oviparity: egg placed in environment.
copulation copulation contains genetics.

storing sperm storing sperm oviparity: egg placed in environment
producing eggs ^{producing eggs} some females can choose the sex
some reproduce once or multiple times. ^{some reproduce once or} multiple times.
some females can choose the sex.

oviparity: egg placed in environment. produce chorion + glue-like material.

Bursa Copulatrix: temporarily stores sperm.

Spermatheca: stores sperm.

chorion, nucleus, yolk, cytoplasm, aeropyle, micropyle, vitelline membrane.

What do accessory glands do in F.R.S.?

- produce chorion + glue-like material to adhere to materials in the environment.

Chorion - An egg shell ^{eggs retained with females} oviparity: but offspring receive nutrients

yolk - provide nutrients; spread throughout the egg. Ex: hiss.

Parts in insect egg shell. ^{cockroach}

chorion, vitelline membrane, micropyle, nucleus, yolk, cy

aeropyle chorion, yolk, cytoplasm, micropyle, vitelline memb

chorion, vitelline membrane, micropyle, nucleus, yolk, cytoplasm

chorion, vitelline membrane, nucleus, yolk, cytoplasm, micropyle,

aeropyle. viviparity: gives birth to live offspring

Micropyle allows sperm to enter the egg.

Micropyle: allows sperm to enter the egg.

aeropyle: Allows oxygen to penetrate the egg; sex

of opening. Viviparity: eggs + receive nutrients from ut

viviparity: gives birth to live offspring, device.

Nutrients from uterine device.

a testis; ejaculatory duct
all of testis; ejaculatory duct; accessory gland; claspers (some).
Sally glands: provide nutrients & fluids for sperm.
Xrs: to hold female when not receptive.

Main sperm tubes, once they are mature, they pass through vas deferens and seminal vesicle where sperm is stored.

Main sperm tubes, once they are mature, they pass through vas deferens & into seminal vesicle where sperm is stored.

Seminal fluid. Spermatophores.

11/9/10

Order Dermaptera. (Earwings)

- modified cerci, moist areas, paurometabolous, short forewings, mandibulates, phytophagous.

elytra

Defensive positions

Filiform antenna.

Cerci.

Nymphs look like adults.

Social insects: parents stay around w/ eggs until a born.

Order Isoptera (termites)

- economic importance: termites cause damage.

Common name: termites.

Characteristics:

- highly social group of insects with a caste system
- wings are membranous when present.
- antennae Filiform/Moniliform (beaded).
- Mandibulate mouthparts
- paurometabolous metamorphosis

worker termite

Soldier termite.

King termite

Queen termite.

• stays close to Queen.

• secondary reproductive, to lead nest

termites emerge Spring early Fall.

Workers: may be males or females.

Functions: feed & take care of the offspring, forage for food, and take care of the Queen.

Queen: mates w/ King several times, 1000s of eggs.

Soldier termites protect the nest from intruders & defend the nest. They may be females or males depending on needs of the nest. Enlarged mandibles.

↳ Nasuti Soldier:

- squirt glue from beak-like structure.

• Wings of termites are membranous and generally equal in size. They are usually found on swarmers.
(secondary reproductives) Termites shed wings.

• Once female finds suitable site, male follows her to become King soldiers, & workers follow and castes are established.

Termites

* feed on wood. * wood has cellulose

• Protozoans (found on inside of body breaks down cellulose)

• Regurgitation

• Proctodeal Feeding

Symbiotic relationship

• both organisms benefit

Trophallaxis:

(exchange of nutrients and pheromones blw members).

- African Termite Colonies. • Australian termites.
- Size & shape of termite nest vary.
- "termitaria"
- Termite Mounds: Litchfield National Park, Australia.

Types: (in U.S.)

- Dry wood termites (rare, occur only in a few places)
- Subterranean termites (most important in U.S., cause ~~the~~ year)
- predators feed on termites
- Economic loss due to termite damage.
- Necessary for Control
 - (1) - correct termite identification damage.
 - (2) - Detection: Drywood pellets.
 - (3) - inspecting for termite damage. Take screwdriver to touch

Best Way? Detection of Subterranean tubes.

- will make mud tunnels b/c if exposed to air they will dry out. Moisture of tunnel helps them survive. ^{length} vary

Prevention: Subterranean

Remove all wood from building site. Clean up wood and debris avoid wood contact w/ soil. Use treated and ventilation openings.

Annual inspection and chemical treatment.

Termite:

- beaded antennae
- abdomen broadly attached to thorax.
- wings same size.

Ant:

- elbowed antennae (bent).
- indentation b/w thorax + abdomen
- one pair of wings is larger than hind wings.

Discussion

11/15/10.

Forensic Entomology

The use of insect knowledge in the investigation of crimes.

When diff. decomposers colonize a diff. body.

- 1.) Determination of place of death. (country, habitat).
- 2.) Determine mode of death.
ex. cocaine, temp, humidity ... (environmental factors).
- 3.) Determine time of death

Decomposition: Insects are important decomposers of organic materials, recycling nutrients in the environment.

- insects use decomposing bodies as a food source or a place to rear young.

Phenology: the study of the order of timing of biological events.

Succession: different types of insects specialize on diff. parts of the body, and appear @ diff. times.

Fresh Stage (1-2 days)

Bacteria + other tiny organisms present in the body before death.

Bloated Stage (day 2-6)

Decay Stage (day 5-11).

Advanced decay (day 10-25)

dry skin, cartilage + bone remain.

Dry Stage (day 25+)

Bones + hair remains. Odor of normal soil + leaf litter.

Common Corpse insects.

Blow Flies (Diptera: Calliphoridae): Shiny, metallic; 1st to colonize human remains. lay eggs.

Flesh Flies: give birth to live maggots directly on corpse. large w/ gray + black stripes

Carrier beetles (Coleoptera) Large + brightly colored. feed + lay eggs on carrion; some bury the bodies of mammals.

Rove beetles (Coleoptera: Staphylinidae): predators & feed on fly eggs & maggots. Common through decay process.

Skin/Museum beetles: small; appear late in decomposition a pest in museum collections.

Summary

blc we know how long it takes for diff. kinds of insects to reach each life stage, we can estimate an approximate time of death.

lice: What happens when they interbreed?

head lice (vs.) body lice?

location

Species: A group of organisms that interbreed & produce viable offspring under natural conditions.

w/out human intervention.

↑
offspring can reproduce.

Exam 3 November 18th 2010

Insect Orders

Collembola, Thysanura, Odonata, Ephemeroptera, Plecoptera, Orthoptera, Blattodea, Phasmatodea, Mantodea, Dermaptera, Isoptera, Lice, Thysanoptera.

Hemiptera (True Bugs)

Hemiptera and Homoptera.

↓ cicadas, scale insects

40,000 species of true bugs.

• stink bug, assassin bug, boxelder bug, ambush bug, milkweed bug

Characteristics:

- forewing of two textures: leather-like at base + membranous tip.
- 2 pair of wings.
- hemelytron = thickened + membranous-like section @ tip
- 2nd pair - membranous
- Scutellum: triangular shaped structure on bug, b/w hemelytra.
- scent glands give off odor when disturbed.
- some phytophagous, predaceous or hematophagous (blood feeders)
- Haustellate mouthparts originate from anterior head for
- Paucimetabolous metamorphosis.

harlequin life cycle.

► Stink Bugs (bad odor)

Plant eating true bugs.

- Phytophagous.
- monophagous (one plant)
- polyphagous (variety of plants)

True Bugs.

- Terrestrial phytophagous bug
- " predaceous bug
- Aquatic " bug

Terrestrial phytophagous bugs:

Examples: Lace Bug, Plant Bugs: leaf footed bugs; stink Bugs

Lace Bug: sculptured lacy bugs, feed on variety of vegetation causing damages to shrubs, flowers (ex lace bug of oaks)

Leaf footed bugs: feed on variety of plants or fruits on plants.

Stink Bugs: Brown. Mamorated stink bug (in the news). In China Japan, Korea. 1900s 1st observed in PA, MD, VA, NC, WA, CA. Feed on plants, fruits, caused decayed area where insects are eating white stripes on antennae; black + white banding.

Terrestrial Predacious Bugs

Examples: Bed Bugs, Assassin Bugs, Wheel Bug, Ambush bug.

Bed Bug: Blood Suckers producing dermatitis in humans. Hide in cracks, crevices, furniture, etc, during day + find victims @ night. Produce Musty odor.

~~Discussion 11/22/10.~~

(Bed Bug cont'd)

Welts caused by bed bug bites.

Unusual mating behavior

- Males transfer sperm to special pouch on 3rd abdominal segment. Sperm leave pouch, get into hemolymph & make way to oviduct where eggs are fer

Habitats: largely nocturnal & hide in available cracks & the day

Transmission: on clothing, luggage, or furniture, or from house to house when close together.

Assassin Bug

- largest true bugs. (med to large size).
- Predaceous on many insects
- Painful bites to man
- Some hematophagous on man
 - "kissing bugs" ... feed near mouth or on face
- Vector protozoa that causes Chagas' disease in C and South America.

Wheel Bug: feeds on insects found on plants.

Ambush Bug: occurs on vegetation; painful bite kind of assassin

Aquatic Predaceous Bugs...

Water striders

- Glide on water surfaces; prey on variety of aquatic animals
- lay eggs on objects floating on body of water

Water scorpion

- painful bite

Backswimmers

- light dorsal side, so swim on back (which is darker)

Water Boatman

- Resembles backswimmer; in Mexico, eggs used as flour source; important as fish food.

Giant Water Bug

- largest ^{aquatic} true bug in U.S.
- sometimes attracted to lights near water
- when outside of water, plays dead.
- woman lays eggs on back of male.
- inflicts painful bites.