Superclass Hexapoda

Class and Order Protura
- about 200 species described
- ametabolous
- anamorphic
- minute and whitish with entognathous mouthparts
- lacking eyes and antennae; forelegs may function for latter
- no wings, no cerci, legs with 1-segmented tarsi, styli on first abdominal segments

Habitat – soil, humus, decaying vegetation, rotting wood and under bark
Abundance – rare and local
Collection – store in 95% ethanol

Class and Order Collembola
- about 6000 species described
- ametabolous
- epimorphic
- minute to small in size; body tubular to globose
- patches of 1 to many lateral eyes, 4-segmented antennae
- 6-segmented abdomen with tenaculum on third and furcula on fourth segment

Habitat – most species in soil and leaf litter
Abundance – ubiquitous, abundant
Collection – store in 95% ethanol with 1% glycerin

Class and Order Diplura
- about 800 species described
- ametabolous
- minute, slender, and whitish
- compound eyes absent, long thread-like antenna
- 1-segmented tarsi

Habitat – damp soil, under bark, under stones or logs, in rotting wood, in caves
Abundance – local and scarce
Collection – store in 70-80% ethanol

1 Ametabolous – lacking metamorphosis, i.e., little change in body form during development to the adult, except that the immature stages lack genitalia.
2 Anamorphic – immature stages have fewer abdominal segments than the adult; final number of segments is reached by adding segments at molts
3 Epimorphic – segment number is constant throughout the development.
Class Insecta

Subclass Apterygota

**Order Archeognatha**
- about 350 species described
- wings absent
- abdomen with rudimentary legs (styli)
- **compound eyes large**
- **cerci shorter than terminal filament**

*Habitat* – leaf litter, under bark, among rocks, cliffs

*Abundance* – local

*Collection* – store in 70-80% ethanol

**Order Thysanura**
- about 370 species described
- wings absent
- abdomen with rudimentary legs (styli)
- **compound eyes small or absent**
- **cerci similar in length to terminal filament**

*Habitat* – leaf litter, under bark, cellars, steam rooms

*Abundance* – very local

*Collection* – store in 70-80% ethanol
Subclass Pterygota
Infraclass Paleoptera

Order Odonata
- about 5,500 species described
- front and hindwings similar
- antennae short, bristlelike
- mouthparts chewing
- male with secondary copulatory organ on venter of second abdominal segment
- larva aquatic with prehensile labium

Habitat – generally associated with water; larvae are aquatic
Abundance – common to abundant around water
Collection – stored in envelopes; larvae stored in 70-80% ethanol

Order Ephemeroptera
- about 2,500 species described
- forewings larger than hindwings (sometimes hindwings absent)
- antennae short, bristlelike
- soft-bodied
- mouthparts nonfunctional
- very long, tread-like cerci
- larval stages aquatic, esp. well oxygenated, running waters

Habitat – generally associated with water (esp. well oxygenated); larvae are aquatic
Abundance – very common to abundant
Collection – adults and larvae should be stored in 70-80% ethanol
Infraclass Neoptera
Superorder Orthopteroidea
Series Exopterygota

Order Blattodea
- about 4,000 species described
- forewings leathery, hindwings fanlike
- antennae usually long, threadlike
- mouthparts chewing
- pronotum wide, shield like, covering head
- legs cursorial

Habitat – ranging from peri-domestic to native vegetation; generally nocturnal, hiding under objects by day
Abundance – locally common
Collection – pinned in metanotum; sometimes in Alcohol

Order Mantodea
- about 2,000 species described
- forewings leathery, hindwings fanlike
- prothorax very long, neck-like, head free
- front legs raptorial (spined)
- exclusively predaceous

Habitat – generally in vegetation
Abundance – two somewhat common species
Collection – pin through base of right wing

Order Isoptera
- about 2,300 species described
- social insects with different castes (sterile workers and soldiers, reproductive males and queen)
- white, soft-bodied
- antennae short, threadlike
- non-reproductive castes wingless

Habitat – wood, especially in dry sandy areas
Abundance – locally common
Collection – store in ethanol (75%)

Order Plecoptera
- about 2,000 species described
- hindwings wider than front ones
- antennae long, threadlike
- mouthparts chewing, weakly developed in adults
- cerci long, segmented
- larvae in fast flowing waters, rich in oxygen

Habitat – associated with water; immatures aquatic
Abundance – common
Collection – pin adults in thorax or store in 70-80% ethanol; immatures in ethanol
Order Orthoptera
- about 21,000 species described
- forewings thickened or small and padlike, hindwings fanlike
- antennae threadlike
- hindlegs modified for jumping (saltatorial)
- lateral tympanal organ on abdominal base
- ovipositor very short

Habitat – almost all terrestrial environments, often associated with vegetation
Abundance – common to abundant
Collection – pin in right posterior of prothorax

Order Dermaptera
- about 1,800 species described
- forewings leathery, padlike; hindwings fanlike, with complicated folding system
- antennae short or long, threadlike
- cerci enlarged, forcepslike
- pronotum square

Habitat – under litter, bark, some under rocks and wrack on shoreline, gardens, agricultural fields
Abundance – common
Collection – pin in right elytron

Optional - Order Mantophasmatodea
- newly described order; 13 species only
- 2-3 cm long, no wings; similar to Orthoptera, Mantodea, and Phasmatodea, but hindlegs not saltatorial, forelegs not raptorial, and head hypognathous not prognathous
- carnivores with chewing mouthparts

Habitat – low shrubby vegetation in dry areas
Abundance – common where they occur
Collection – pin at base of mesothorax (but you won’t find them unless you go to Africa)

Optional - Order Grylloblattodea
- about 24 species described
- wings absent
- antennae long, threadlike
- mouthparts chewing
- cerci long, segmented
- eyes reduced or absent

Habitat – live in cold places, alongside glaciers or in caves (not present in New England)
Collection – store in 75% ethanol
### Optional - Order Embiidina

- about 200 species described
- **front and hindwings very similar**
- antennae shorter than body, threadlike
- **basal tarsomere of foreleg swollen** *(silk-producing)*

*Habitat* – semi-social insects, living in silken galleries constructed on bark or rocks (not present in New England)

*Collection* – store in ethanol; winged adults may be carefully pinned.

### Order Phasmatodea

- about 2,500 species described
- wings usually absent; if present then hindwings much bigger than forewings, fan-like
- **body strongly elongated** *(sticklike)* or **flattened** *(leaflike)*
- herbivorous

*Habitat* – on vegetation or buildings; sometimes near lights

*Abundance* – locally common in our area

*Collection* – pin at base of mesothorax.

### Superorder Hemipteroidea

### Optional - Order Zoraptera

- about 30 species described
- **forewings somewhat larger than hindwings**; sometimes wings absent
- antennae 9-segmented
- **gregarious or semi-social insects**
- feed on fungus spores and dead arthropods

*Habitat* – occur in rotten wood, sawdust piles, under bark (not present in New England)

*Abundance* - local and scarce

*Collection* – store in ethanol.

### Order Psocoptera

- about 3,000 species described
- forewings somewhat larger than hindwings
- antennae shorter than body, threadlike
- mouthparts chewing, with chisel-like maxillae
- no cerci
- small insects, feeding on algae, lichens and dead organic matter (including dead insect specimens!)
- **bulging clypeus**

*Habitat* – on foliage, bark, wood, stored products

*Collection* – store in ethanol; some large species may be pinned.
Order Phthiraptera
- about 5,500 species described
- wingless, strongly flattened dorsoventrally
- external parasites of birds and mammals
- mouthparts piercing, sucking, and modified chewing
- tarsi 1-2 segmented, with 1 or 2 terminal claws
- entire life cycle on the host

Habitat – ectoparasites of vertebrates

Abundance – common
Collection – store in ethanol

Order Hemiptera
- about 80,000 species described
- distal portion of forewing usu. membranous, resting roof-like on abdomen; hindwings membranous
- herbivorous or predaceous
- mouthparts sucking
- sometimes front legs raptorial, sometimes hind legs saltatorial
- many species gregarious

Habitat – typically associated with vegetation, some found on ground with fallen seeds, some predaceous, several aquatic families

Abundance – common to abundant
Collection – pin in upper right of scutellum

Order Thysanoptera
- about 4,500 species described
- both pairs of wings very slender with wide fringe of hairs; venation strongly reduced
- mouthparts sucking, asymmetrical
- minute insects

Habitat – small insects feeding on plant juices or predaceous; found in flowers, leaf litter, galls, and fungi

Abundance – very common
Collection – store in ethanol

Division Endopterygota
Superorder Neuropteroidea

Order Neuroptera
- about 5,000 species described
- forewings and hindwings similar with dense venation
- antennae many-segmented, threadlike
- predaceous
- mouthparts chewing
- front legs sometimes raptorial

Habitat – ubiquitous; larvae terrestrial or aquatic

Abundance – locally common
Collection – store in ethanol or pin in thorax
Optional - Order Raphidioptera

- about 175 species described
- forewings and hindwings similar, membranous
- larvae terrestrial
- pronotum strongly elongated, neck-like

Habitat – often associated with oak woodlands; larvae often under bark (none in eastern United States)

Abundance – locally common
Collection – pin b/w wing bases or store in ethanol

Order Megaloptera

- about 300 species described
- forewings and hindwings similar with dense venation
- sometimes mandibles strongly enlarged

Habitat – near streams or lakes, sometimes at lights; larvae aquatic

Abundance – locally common
Collection – pin through thorax or store in ethanol

Order Coleoptera

- more than 300,000 species described
- forewings hardened, forming protective elytra; hindwings membranous, usually hidden under elytra

Habitat – everywhere (perhaps 1 out of 5 macroscopic species on Earth)

Abundance – abundant
Collection – pin in upper portion of right elytron

Order Strepsiptera

- about 525 species described
- forewings reduced, forming halteres; hindwings large, membranous
- females with all appendages reduced, body sacklike; males free-living

Habitat – parasites of other insects, mostly Hymenoptera (esp. sphecids and andrenids; Polistes common host in New England)

Abundance – rare
Collection – females from parasitized hosts, males sometimes at lights – point adults or preserve in ethanol
Superorder Mecopteroidea

Order Mecoptera
- about 500 species described
- forewings and hindwings similar, sometimes absent
- face elongated
- predaceous or omnivorous
- males with bulbous genital capsule at end of abdomen

Habitat – damp, often shady areas, mesic woodlands
Abundance – locally common
Collection – pin in thorax or store in ethanol

Order Siphonaptera
- about 2,400 species described
- wings absent
- mouthparts piercing-sucking; palpi present
- legs saltatorial
- body strongly flattened laterally
- larval development in nest of host (not on host body)

Habitat – external parasites of vertebrates
Abundance – locally common
Collection – preserve in ethanol

Order Diptera
- about 150,000 species described
- hindwings reduced, forming halteres; forewings large, membranous
- mouthparts sucking or piercing, of very variable structure

Habitat – In almost any habitat
Abundance – ubiquitous, abundant
Collection – pin in thorax

Order Lepidoptera
- about 150,000 species described
- forewings and hindwings covered with scales
- mouthparts of adults sucking, tube-like, formed from maxillae; mandibles reduced or absent

Habitat – ubiquitous, often at flowers, common at lights; larvae (caterpillars) primarily terrestrial
Abundance – ubiquitous, abundant
Collection – pin in thorax and spread wings
Order Trichoptera
- about 7,000 species described
- forewings and hindwings similar, densely covered with hairs
- antennae long, often held forward

Habitat – adults usually near water or at lights; immatures aquatic, most build cases

Abundance – abundant near water

Collection – pin in mesonotum or store in ethanol; immatures should be stored in ethanol

Superorder Hymenopteroidea

Order Hymenoptera
- about 180,000 species described
- hindwings smaller, attaching to forewings by series of hooklets; wings often absent; abdomen sometimes with constriction (petiole)
- many social with reproductive and non-reproductive castes
- mouthparts chewing but maxillae and labium often modified for sucking
- ovipositor often modified into stinger

Habitat – ubiquitous; many parasitic; often at flowers

Abundance – ubiquitous, abundant

Collection – pin in thorax