

Study Guide (preliminary)  
EEB 4274- Exam 3  
(Fall 2014)

**Phylum Nematoda:** range of habitats; synapomorphies and other distinctive features of the phylum; phylum monophyletic but parasitic groups are not; blastocoelom- what is it? (diagram); nervous system, outermost body layers (surface coat, cuticle, hypodermis - what are they? what do they do?), excretory system, arrangement of musculature- what is unusual?, digestive system- filariform vs. rhabditiform esophagus and implications for feeding; reproductive system: dioecious, configuration of organs in male and female systems, understand specialized structures of male system (e.g. spicules, copulatory bursa, etc.); generalized life-cycle; two classes (Chromadorea and Enoplea).

**Class Chromadorea**

**Infraorder Oxyuridomorpha-** common name and its derivation; typical hosts; general and distinguishing features (e.g., male with only 1 spicule, form of esophageal bulb, alae, etc.); site generally inhabited by adults in hosts; *Enterobius vermicularis*: host; life-cycle, stage infective to humans; mechanism for facilitating transfer between hosts; diagnosis; geography; pathogenesis; treatment.

**Infraorder Ascaridomorpha-** typical hosts; general and distinguishing features, sites generally inhabited by adults in host; *Ascaris lumbricoides* and *Ascaris suum*- typical hosts, general features, global prevalence, two explanations for high prevalence; life-cycle of *Ascaris suum*, stage infective to pigs (and humans)? Pathogenesis of juveniles, pathogenesis of adults; diagnosis; McDonald College *Ascaris suum* incident; *Toxocara cati* and *Toxocara canis*- normal hosts, transplacental transmission, as zoonotic agents of visceral larval migrans in humans- what is it? Pathogenesis; how are infections acquired? Anisakids- heteroxenous, natural hosts, how do humans acquire infections? disease caused; pathogenesis; geography. *Baylisascaris procyonis*-natural hosts, how humans acquire infection, disease caused in humans.

**Infraorder Rhabditomorpha-** Family Ancylostomidae- common name and its derivation, general and distinguishing features (e.g., buccal capsule, buccal capsule teeth/plates, copulatory bursa), 2 species normally found in humans, distinguishing features, symptoms and pathology associated with 3 stages of infection in humans, infective stage and how infection is contracted in humans, sites occupied, symptoms and pathogenesis of hookworms in normal hosts, relationship between pathology and intensity of infection, diagnosis of hookworm infection; 2 species normally found in dogs, distinguishing features; life-cycle of *Ancylostoma caninum*, disease caused and pathogenicity of dog species in abnormal (i.e., human) hosts, how is infection contracted? sites occupied. Lungworms: *Parelaphostrongylus tenuis*- sites occupied in natural host; site(s) occupied and pathogenesis in abnormal hosts. General geographic distributions of all of above.

**Infraorder Spiruromorpha-** most diverse group of parasitic nematodes. Filarial worms- general features. For 4 species of consequence to humans (and/or their pets): generalized life-cycle, typical intermediate hosts, typical definitive hosts, sites normally inhabited by adults (and other stages if relevant) in definitive hosts, relationship with *Wolbachia*, diagnosis, pathogenesis, general geography, and treatment in definitive host. For *Dirofilaria immitis*- common name, details of life-cycle, stages infective to mosquito and to dog; diagnosis of infection in dog; why are adults only found in right side of heart? Diagnosis of infection in mosquito? *Wuchereria bancrofti*- elephantiasis- what is it? periodicity of microfilaria; pathogenesis (acute and obstructive phases); *Onchocerca volvulus*- River blindness- what is it? Why/how does blindness result? *Loa loa*- common name. **Infraorder Dracunculomorpha-** *Dracunculus medinensis*- how are infections acquired? mode of exit from definitive host; intermediate host and its relationship to control; possible relationship to the medical caduseus.

**Class Enoplea-** synapomorphy

**Order Trichinellida-** *Trichuris trichiura*- common name and distinctive aspect of morphology, typical hosts, life-cycle, stage infective to humans, pathogenesis, diagnosis, treatment; *Trichinella spiralis* (and kin), typical hosts, geography; disease caused, life-cycle (sylvatic vs. urban variations), life-cycle and its unusual feature (same animals serves as both intermediate & definitive host), specific cells parasitized within host (intracellular parasite as adult); nurse cells- what are they? How are they formed? 3 phases of pathogenesis associated with disease; diagnosis; treatment.

**Phylum Acanthocephala-** general and distinguishing features, dioecious, sexually dimorphic, approx. diversity; are free-living species known? Heteroxenous; typical definitive hosts and site occupied in these hosts, typical intermediate hosts; free-living phylum to which closely allied? Are humans typically parasitized?

**Phylum Nematomorpha-** common name; approx. diversity; similarities and differences to nematodes; adults free-living, larvae parasitic in what hosts? distinguishing between sexes. Are humans typically parasitized?

**Phylum Cnidaria-** Myxozoans: general and distinguishing features, approx. diversity; are free-living species known? heteroxenous- typical definitive and intermediate hosts; *Myxobolus cerebralis*- disease, pathogenicity, site occupied; free-living phylum with which it may share close affinities, and the evidence for these relationships.

**Phylum Mollusca**- most species free-living; at least one family with parasitic members, stage that is parasitic, type of hosts parasitized by glochidia (obligate relationship).

**Phylum Annelida**- primarily free-living predators; some ectoparasitic on vertebrates, common name, types of food consumed (blood, tissue fluids, etc.)

**Phylum Arthropoda**- distinguishing features: exoskeleton, articulated appendages (most diverse of animal phyla); 3 subphyla (“Uniramia”, Chelicerata, and Crustacea) with parasitic members and their respective subgroups.

**Subphylum “Uniramia”**: Class Hexapoda: distinguishing features (e.g., 3 prs legs): Order Phiraptera- common name. Chewing lice: diet, all species parasitic as adults, types of hosts, morphological adaptations to parasitism, features distinguishing from sucking lice, basic life-cycle, typical examples from dogs, cats, cattle. Sucking lice: diet, all species parasitic as adults, types of hosts, morphological adaptations to parasitism, features distinguishing from chewing lice; 3 forms (2 subspecies; 1 additional species) found on humans- identity, common names, distinguishing characteristics (of species), site on host, pathogenesis of each (and types of diseases vectored if any). Order Siphonaptera- common name, general features (combs, etc.), all species parasitic as adults only, morphological adaptations to parasitism, generalized life-cycle; dog, rat flea; diseases vectored by fleas; *Tunga*- what is it? How does its association with its host differ from that of dog, etc. fleas? Order Diptera- why mosquitoes etc. are NOT considered to be parasitic; 1 family parasitic as adults -its common name, adaptations to parasitism, pupiparous- what is it? Dipterans parasitic as larvae; what is myiasis? cutaneous, atrial and intestinal myiasis- provide examples of each; general life-cycle of *Gasterophilus intestinalis*, stage infective to horse, pathogenesis; Order Hemiptera- *Cimex lectularis* common name, general morphology, pathogenesis.

**Subphylum Chelicerata**: Class Arachnida: Subclass Acari- common name, distinguishing features (e.g. capitulum and idiosoma, etc.); ticks vs. mites—are they monophyletic relative to one another? Are the Acari monophyletic? Ticks: distinguishing features, synapomorphy, all parasitic; general morphology, larvae vs. nymphs and adults, sexual dimorphism; 2 families (Ixodidae and Argasidae), their common names, general features and differences in feeding strategies; Ixodidae- sexual dimorphism, typical life-cycle, differences among 1, 2 and 3-host ticks; *Ixodes scapularis* as vector of etiological agent of Lyme disease (what is that agent?), hosts? Tick pathogenesis: diseases caused by ticks themselves (e.g. anemia, exsanguination, etc.); diseases caused by organisms vectored by soft versus hard ticks (what are the organisms? what diseases do they cause?). Mites: 3 important families (Sarcoptidae, Demodicidae, Trombiculidae) of external mites and 1 family (Dermanyssidae) of internal mites; examples of each family and the pathogenesis these taxa can cause.

**Subphylum Crustacea**: unique nauplius larva, habitat of parasitic groups; Class Malacostraca: Order Isopoda- primarily free-living, a few parasitic as larvae, some as adults; hosts and sites parasitized, the curious case of *Cymothoa*, asymmetrical body common. Order Amphipoda- primarily free-living; whale-lice, closest free-living relatives? Class Ostracoda- a few parasitic species, hosts? Sites? Class Maxillopoda: Subclass Branchiura- *Argulus*, common name; hosts; morphology, attachment structures, how differ from copepods? Subclass Pentastomida- general features, approx. diversity; heteroxenous- basic types of intermediate and definitive hosts; Pentastomiasis- 2 forms (visceral and nasopharyngeal) and the general (not specific) etiological agents and pathogenesis associated with each; Subclass Cirripedia- common name, distinguish a phoretic from a parasitic barnacle, *Sacculina*- morphology of adult and its relationship with its host, general types of animals parasitized by *Sacculina*, method of infection of host, pathogenesis; Subclass Copepoda: only some parasitic; habitat, general 6 trends in adaptation to parasitism exhibited by parasitic copepods from free-living copepod (i.e., *Cyclops*) form, and examples of each: modification of existing appendages for attachment (*Ergasilus*, *Sphyrion*), evolution of new attachment structures (bulla = non-living secreted plug), dorsoventral flattening (*Lepeophtheirus*), incorporating segments under cephalic shield (*Lepeophtheirus*), loss of appendages/segmentation (*Sphyrion*), extreme sexual dimorphism (*Sphyrion*). Copepod (*Lepeophtheirus*) problematic in salmon culture, pathology, secondary infection Control strategies to prevent high intensities of copepods (fallowing period, harvest early, cleaner fish, plankton nets). Drugs through feed or baths to treat infected salmon.

**Parasite Ecology**: Biotic and abiotic factors as they relate to parasites; sites in hosts as habitats and microenvironments; ecological niche of a parasite: over course of lives (different hosts, different sites of same host); challenges of fully characterizing niche of parasite. Location of parasites in trophic hierarchy. Understand distinction between parasite component community and infracommunity, and component population and infrapopulation; interspecific interactions in interactive communities -example of site specificity in helminth community of intestine of eared grebe. Intraspecific interactions (e.g., crowding effect in *H. diminuta* in rats). Important differences between micro and macroparasites wrt size, host having to deal with original vs. original and subsequent infections. Prevalence, intensity, the negative binomial as it relates to parasite infection intensity in a population of hosts. Epidemiology: transmission strategies: the 5 “Fs”; trophic transmission; penetration/injection.

**Parasite Evolution**: origins of parasitism; NOT monophyletic in general, or within phyla that include both free-living and parasitic members, has arisen multiple times; problems with fossil record of parasites; examples of parasite fossils; evolutionary associations between parasites and hosts—general rules (e.g., Manter’s rule; Fahrenholz’s rule); assume cospeciation; does it appear this has been the case?