VIII Phylum Acanthocephala ["Thorny-headed worms"] (Chapter 32) 2009
Page and figure numbers are from 8th edition of Roberts & Janovy

A. Characteristics (Figs. 32-1 & 32-3)
    1. ACANTHO = thorn; CEPHALA = head
    2. PROBOSCIS
        a. Bears hooks or spines
        b. May be bulb-like
        c. Imbedded in host as an anchor

Slide #1: Scanning Electron Micrograph of a Acanthocephalan Proboscis (Fig. 32.1, p. 496)

    3. Trunk
        a. No digestive system
        b. No heart
        c. LACUNAR SYSTEM (p. 496)
            (1) Gives cells access to host fluids
            (2) Probably helps evert proboscis
            (3) Branch throughout body and open onto surface of worm

Slide #2: Lacuna System of the Acanthocephala (Fig. 32.5. & 32.6)

    4. Reproduction (pp. 498-99)
        a. Females usually bigger than males
        b. Only body opening is a posterior gonopore
        c. CEMENT GLANDS
            (1) Male seals off female gonopore after copulation
                (a) Prevents escape of sperm
                (b) Prevents other males from copulating with female

Slide #3: Basic Morphology of the Acanthocephala (Fig. 32.3, p. 498)

            (2) Homosexual rape?
                (a) Males have been observed to seal gonopores of other males
                (b) Reduce competition for mates (= form of castration?)

B. Life Cycle
    1. Adults
        a. In lumen of vertebrates
        b. Move around digestive tract (proboscis can be removed)
    2. Eggs
        a. Some mimic phytoplankton
        b. Eaten by arthropods which become intermediate hosts
            (1) Crustaceans in aquatic systems
            (2) Insects in terrestrial systems

Slide #4 Life-cycle of *Moniliformis dubius*

    3. CYSTACANTH or ACANTHOR are cysts in intermediate host
    4. Paratenesis common
        (1) Young cystacanths become cystacanths (not adults) if intermediate host eaten by predator is unsuitable for adult stage
        (2) A host species can serve as both definitive and intermediate hosts
    5. Flexibility in life cycle increases likelihood that . . .

(1) Adult stage will occur in top predators of ecosystem
(2) Species will be widely distributed

6. No asexual reproduction: 1 egg = 1 cystacanth = 1 adult

C. Important species

1. *Macracanthorhynchus hirudinaceus* (p. 504)
   a. Adults infect pigs and sometimes humans
   b. Intermediate hosts are scarab beetles
2. *Polymorphus minutus*
   a. Adults parasitize chickens and water fowl
   b. Intermediate host is a crustacean amphipod
      (1) Parasitic castration
         (a) Intermediate hosts do not mature
         (b) Intermediate hosts attain a greater size than uninfected
      (2) Behavior of intermediate host changed when infected
         (a) Stay at surface
         (b) Twirl
3. *Neoechinorhynchus*
   a. Occurs in over 40 species of fish
      (1) Most hosts are found in freshwater
      (2) Found in North America, Europe, & Asia
   b. Evolutionary question: How can this parasite have such a wide distribution if their hosts live in freshwater habitats that are isolated from one another by salt water?
      (1) Paratenesis enables a great diversity of hosts
      (2) Some hosts migrate in and out of marine and fresh environments
         (a) Trout
         (b) Salmon

D. Classic paper by Janice Moore [1983] Responses of an avian predator and its isopod prey to an acanthocephalan parasite, *Ecology* 64:1000-1015.

1. First demonstration with field and lab studies that a parasite could influence host behavior in a manner that would increase predation by the definitive host
2. Organisms
   a. Pillbug Armadillidium vulgare = intermediate host
   b. Starlings = definitive host

Slides #5 & 6 of pillbug and starling

   c. Acanthocephalan *Plagiorhynchus cylindraceus* = parasite
3. Experimental Results
   a. Humidity preference
      (1) Parasitized & unparasitized pillbugs preferred humid to dry side of chamber
      (2) However, parasitized pillbugs, especially females, spent more time on dry side than unparasitized (would increase exposure to predation)
   b. Shelter preference

(1) Unparasitized pillbugs showed high preference for shelter
(2) Parasitized pillbugs showed randombehavior for shelter (would increase exposure to predation)

c. Background preference
(1) Parasitized pillbugs more likely to be on white substrate than unparasitized
(2) Parasitized pillbugs would be more easily seen

d. Starling predation studies
(1) Field experiment (Table 9)
(a) Nestlings were ligatured using a pipe-cleaner
i Birds couldn't swallow
ii Collected pillbugs fed to nestlings by parents
(b) Prevalence of worms in nestlings was much higher than expected based on parasite prevalence in pillbugs collected by investigator near nest
i 1979: 7 of 22 = 31.8% vs. 1 of 244 = 0.004%
ii 1980: 4 of 34 = 11.8% vs. 2 of 1,000 = 0.002%

Slide #7 Table 9 from Moore (1983)

(2) Cage feeding experiment (Table 12)
(a) Floor of cage
i. Black & white areas were equal in size
ii. Black portion was moist/humid
(b) Five different starlings were allowed to feed on about 20 pillbugs each [approximately half of which were infected]
(c) More parasitized isopods (33/46 = 71.7%) were eaten than unparasitized (23/52 = 44.2%)

Slide #8 Table 12 from Moore (1983)

e. Moore concluded that apparent preference for parasitized isopods was a result of increased encounters with parasitized pillbugs