Rotifers and Acathocephalans

The ‘Platyhelminthes-Rotifer-Lophotrochozoa’ group

Syndermata

- Syndermata possess a cuticle but do not molt (previously considered related to nematodes and the related minor phyla).
- Rotifers and acanthocephlans are considered related because both possess a syncytial epidermis and a peculiar stiffening network of protein fibers (and is supported by molecular evidence).

Rotifers

- 2,000 species
- Name means wheel-bearer in Latin
Rotifers and acanthocephalans have traditionally been classified as pseudocoelomates along with:

- gastrotrich
- gnathostomulids
- kinorhynchs*
- nematomorphs*
- nematodes*

However, this grouping appears not to reflect an evolutionary relatedness (i.e. it is paraphyletic). Those phyla marked above by an asterisk are now placed within the Ecdysozoa based on molecular evidence and re-interpretation of morphological evidence (e.g. the ability of the cuticle to molt).

**Characteristics**

- Small (<3mm), typically transparent, often with distinct ‘head’, ‘trunk’ and terminal ‘foot’. The external morphology is highly variable and reflecting mode of life.
- Non-molting cuticle (a non-cellular, secreted body covering)
- The epidermis is syncitial and a protective mesh of stiff protein filaments (as also in acanthocephalans).
- Complete digestive tract (mouth and anus).
- Corona used for locomotion and feeding. Muscular pharynx (mastax) with ‘jaws’ (trophi).
- Circular, longitudinal and diagonal bands of muscle
- Pair of protonephridia (resembling flatworms) for osmoregulation.
- Brain, sometime with simple ocelli
Reproduction

- Females often parthenogenetic (females produce diploid eggs without fertilization).

Why reproduce sexually?

Life Cycle

- Major component of the freshwater plankton community, (but also in benthic freshwater, interstitial spaces between sand, moist terrestrial and marine environments).
- Some active predators, others filter feeders
- Diverse: solitary (though occasionally colonial); planktonic, crawling, or sessile; (occasionally parasitic)

Phylogeny

- Most rotiferan classes are defined by their oral arrangement and coronal adaptations.
- Class Digononta – 2 ovaries and reduced corona
- Class Monogononta – 1 ovary and elaborate corona
- Origin of this phylum does not extend back to Cambrian. Why might this be?
Acanthocephala

- The spiny-headed worms

Characteristics shared with Rotifers (i.e. common to the Syndermata)
- Molecular data shows strong similarity to rotifers
- Cuticle but do not molt
- Possess a syncytial epidermis
- A peculiar stiffening network of protein fibers

- However, resemblance to fossil Priapulids of Burgess shale.
- LESSON: Acceptance of the rotifer-acanthocephlan relationship is based on the preponderance of evidence, but science allows for dissidence.

Characteristics not shared with Rotifers
- Spiny proboscis (usually retractable and protruded hydraulically), neck, and trunk
- All are gut parasites in vertebrates (economic importance: livestock disease). How does its distinguishing morphological feature relate to its ecological way of life?
- No prostonephrida as in rotifers (why?)
Phylogeny

- Molecular data suggesting that acanthocephalans evolved from one particular group of rotifers suggests that acanthocephalans and rotifers should be considered within a single phylum, the Syndermata, though other studies suggest these phyla are related as sister groups.
- Despite this controversy, both studies suggest Platyhelminthes, Rotifera, Acanthocephala and Gnathostomulida (and probably Gastrotricha) as a sister group to the annelid-mollusc (Lophotrochozoa).