





A single-sexed gordiid species from Kenya
 Its implications for the general biology of the phylum and the need for a global gordiid survey.

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Introduction to Gordiids

- Nematomorpha is sister phylum to Nematoda
- Gordiids are freshwater nematomorphs
- Parasites of arthropods
- Dioecious; mating and egg production outside of host

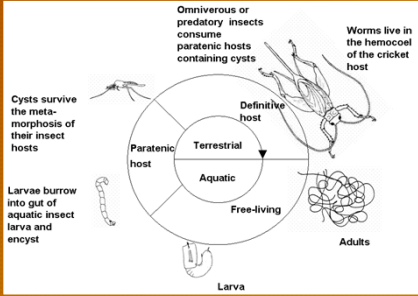


What we really know...

- Much of what we think we know about nematomorphs is based on lack of data
 - no empirical experiments
 - no observations
- Sadly, not many experiments nor observations have been done on this phylum
 - so, how much do we really know?



Gordiid life cycle



Omnivorous or predatory insects consume paratenic hosts containing cysts

Worms live in the hemocoel of the cricket host

Cysts survive the metamorphosis of their insect hosts

Larvae burrow into gut of aquatic insect larva and encyst

Paratenic host

Definitive host

Free-diving

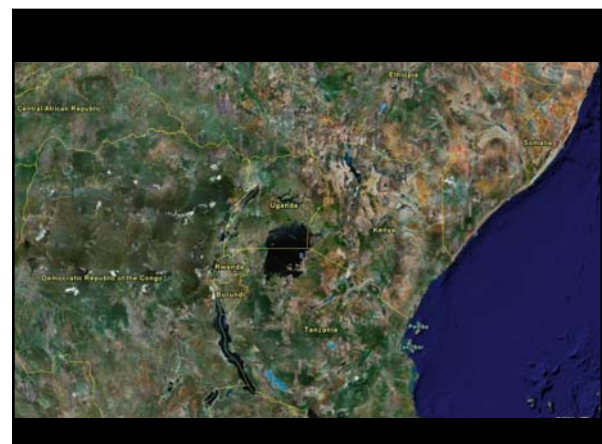
Adults

Larva



Collection of material

- Fall 2005
- Lake Victoria, Kenya
- Collection of *Biomphalaria* spp. for studies on *Schistosoma mansoni*
- One site in particular looked "good for nematomorphs".





Snail dissection

- Shell of snail was removed
- Tissues divided into thirds
- Tissues were flattened and scanned for parasites



Cyst similarity

Cordius robustus *Paragordius varius* *Chordodes morgani*

Proboscis hooks extend beyond body

Kenya worm

Minimum evolution (ME) tree based on ~500bp 18S

Life cycle experiments

Cysts were fed to *Acheta domestica* crickets

- Crickets 'tested' at 4, 8 and 12 weeks
- At 12 weeks, 7/20 hosts shed worms
 - all were female (n=11)
 - by 12 hrs all females began to oviposit.

Establishment of life cycle

- Eggs developed normally
- Larvae fed to *Physa* sp.
- The life cycle was maintained in the laboratory for 3 generations

Paragordius sp.

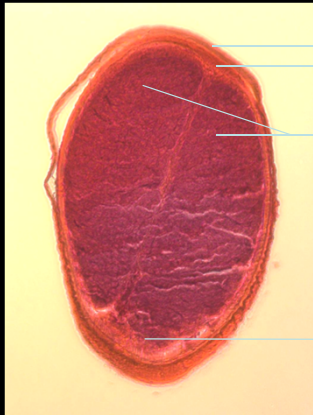
- Larval and adult features support grouping in genus *Paragordius*
- Supported by preliminary gene tree
- Cuticle features do not match previously-described species?



Posterior of *Paragordius* sp.

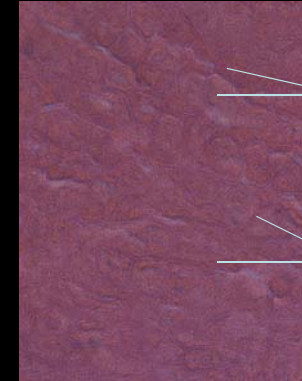
Reproductive mechanism

- Hermaphrodite: sexual reproduction by inseminating self
- Parthenogenesis: unfertilized egg develops into a new individual



Cuticle
Epidermis
Gonads-ovarian tubes
VNC

Cross section of *Paragordius* sp.



Oocytes
Nurse cells

Cross section of *Paragordius* sp.

Reproductive mechanism

- There is currently no evidence of true hermaphrodite-reproduction
 - There are no male gonads
 - No evidence of sperm storage
- Paired ovarian tubes imply a “normal” female
- These data suggest that the reproductive mechanism is by parthenogenesis

Implications

- This information adds a puzzle piece to the picture of Nematomorph biology
 - how big is this piece?
 - how many more pieces are there?
- With plans to build a permanent base on the moon, isn't it time to put increasing emphasis on understanding life on earth?

State of organismal biology

- Basic building blocks of understanding of an organism is its basic biology
- On this we can construct hypotheses regarding complex and integrative questions
- Model systems benefit from an existing understanding of their general biology
 - has caused a shift away from organismal parasitology

The future of “Nematomorphology”

- Global survey of species
 - better understanding of group
 - emergence of patterns
 - testable hypotheses
- Hypotheses can then be tested
 - tease apart patterns
 - basic biology
 - high tech methods/tools

Kenya worm example

- Search for gordiids in Kenya yielded a worm with very interesting characteristics
- Use microsatellites to support reproduction by parthenogenesis

The future looks bright

- Planetary Biodiversity Inventories (NSF)/ ALL Species Foundation
 - What kinds of living things exist? Where do they live? How are they related?
- E. O. Wilson foundation
 - preserve and describe biological diversity in the living environment by inventing and implementing business and educational strategies in the service of conservation

Acknowledgements

- Sam Loker
- Michelle Steinauer
- Sara Brant
- Boniface M. Mulika
- Ibrahim N. Mwangi
- Joseph M. Kinuthia

