

Development of asymmetry in caenogastropods *Amphissa columbiana* and *Euspira lewisii*



http://www.gastropods.com/6/Shell_8776.shtml



www.jaxshells.org/4899.htm

Meet The Authors

- **Carin A Bondar** – Graduate student in M. Sc. Program.
- **Louise R Page** – Associate Professor in the Department of Biology at the University of Victoria
-evolutionary developmental biology of gastropod mollusks



<http://web.uvic.ca/~lpage/>

Where was the work done?

- **University of Victoria**
Victoria, British Columbia,
Canada



<http://www.uvic.ca/buildings/pch.html>

The research facilities are remarkable.

-Animals are maintained at 9 degrees Celsius in a re-circulating sea water system.

The BIG Picture

- They studied the development of asymmetry in two species of the Caenogastropoda.
- Discover insights about the evolutionary phenomenon of gastropod torsion by looking at two selected aspects of ontogenic torsion.

What is torsion?

The stress or deformation caused when one end of an object is twisted in one direction while the other end is held motionless or twisted in the opposite direction.

Their Hypothesis/ Goal

- **The Goal:** To investigate the development of the mantle cavity and pleurovisceral nerve connective (visceral nerve loop) in two members of Caenogastropoda.
 - Observations of the displacements that both structures undergo are interpreted as major consequences of torsion.

Methods Used: Collection

- **Adults** of *A. columbiana* collected from Ogden Point Breakwater.
 - Provided with flowing sea water from re-circulating system.
 - Deposited egg capsules were collected and maintained in aerated sea water.
- **Egg** masses of *E. lewisii* collected directly from Patricia Bay in Saanich Inlet
 - Maintained in aerated sea water as before.

Methods Used: Fixation

- Embryos removed from egg capsules, after shell secretions had begun.
- Anaesthetized by incubation.
- Stored in fixative at 10 degrees Celsius for 1-2 weeks.
- Dehydrated with ethanol series.

Methods Used: Tools Used To Observe Displacements

- **Scanning electron micrographs** – Hitachi S-3500N variable pressure scanning electron microscope.
- **Histological sections** – Transverse sections acquired with a digital camera mounted on a compound microscope with software for 3-D reconstruction of histological sections.
- **Immunofluorescence images** – Intracellular injection of fluorescent probes to monitor dynamic morphogenic movements.

Results – Three major findings

- (1) The developing visceropallium (visceral organs, mantle, mantle cavity, and shell) twists by 90 degrees relative to the cephalopodium (head and foot).
- (2) The mantle initially forms on the right side, and then expands to the left (transverse sections).
- (3) The displacements of the visceral nerve loop become evident on the left side before the right side (the right limb of the nerve loop deflects to the left, producing the cross-over condition).

Authors' Interpretation

- Some authors still argue 180 degree rotation.
- Despite this, our authors argue that rotation of the visceropallium cannot account (entirely) for the definitive, dorsal position of the mantle cavity.
 - Why? After its initial formation on the right, subsequent expansion was not accompanied by rotation of the anus or shell.
 - Rather, our authors offer that the remodeling of epithelium lining the mantle cavity accounts for its enlargement.
- Overall, the current location of the mantle cavity is not due to torsion alone. Other mechanisms are involved.

Authors' Suggestions for Research

- Look at how early development throughout the Gastropoda converges on an embryonic organization in which the mantle cavity and anus are locaterally located.
 - They thought this was a highly conserved stage of developmental organization of gastropods.
- Why would this research be informative?
 - It would help to identify essential features in ancestral body plan.

My Assessment

- Equipment – State of the art.
- Procedures – High integrity.
- But, a wider set of sampled clades could provide more insight on gastropod torsion.
 - Our authors only chose two members of the Caenogastropods.