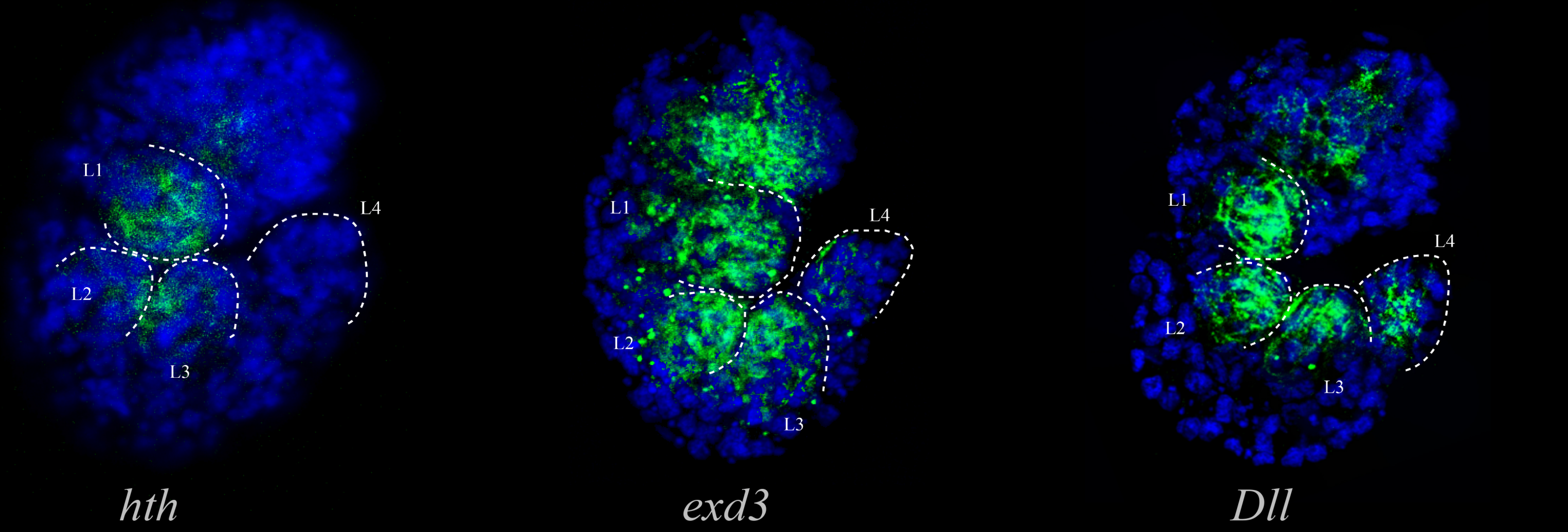


# Genomic and developmental origins of tardigrade legs

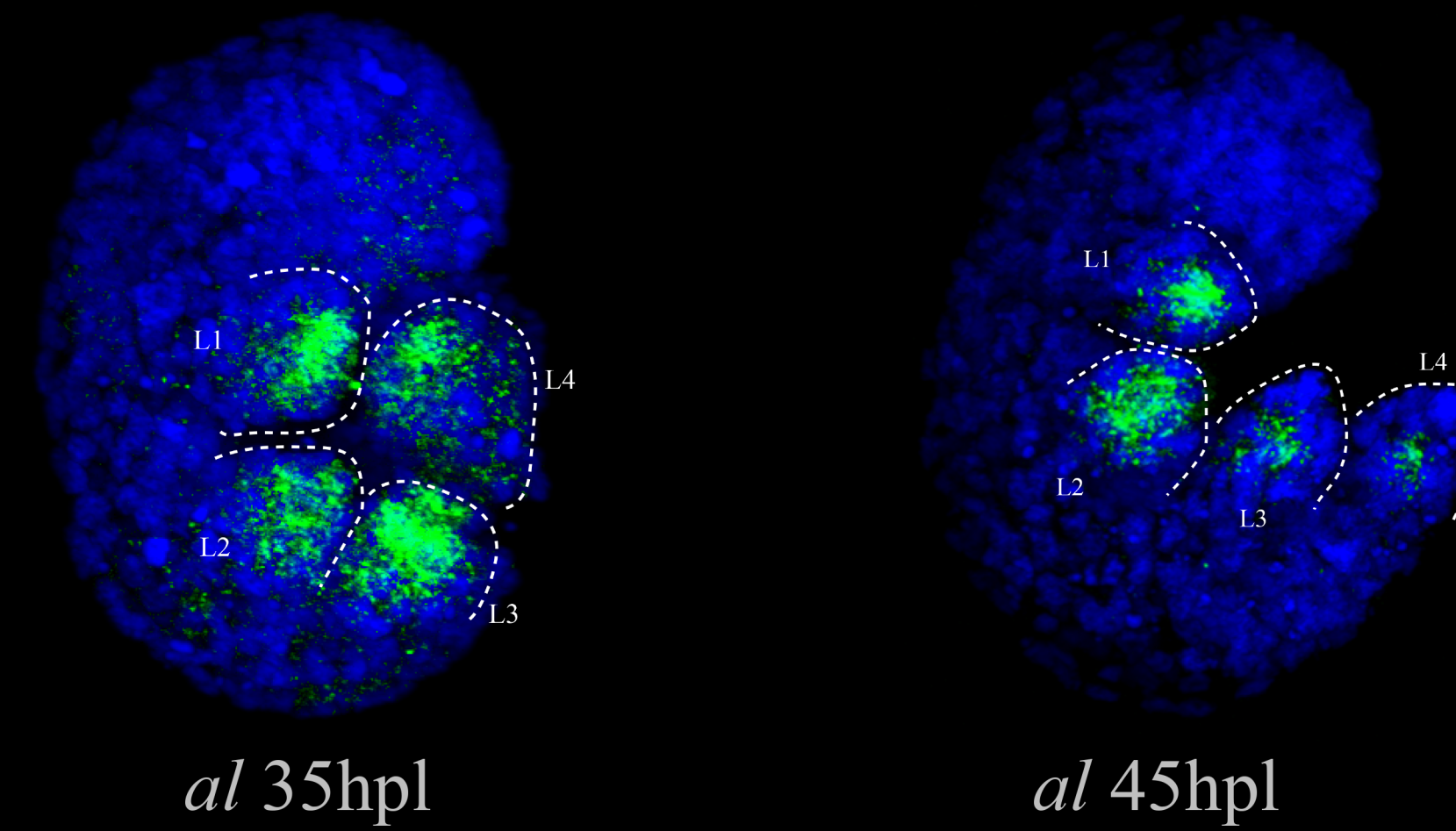
Mandy Game | Frank W. Smith



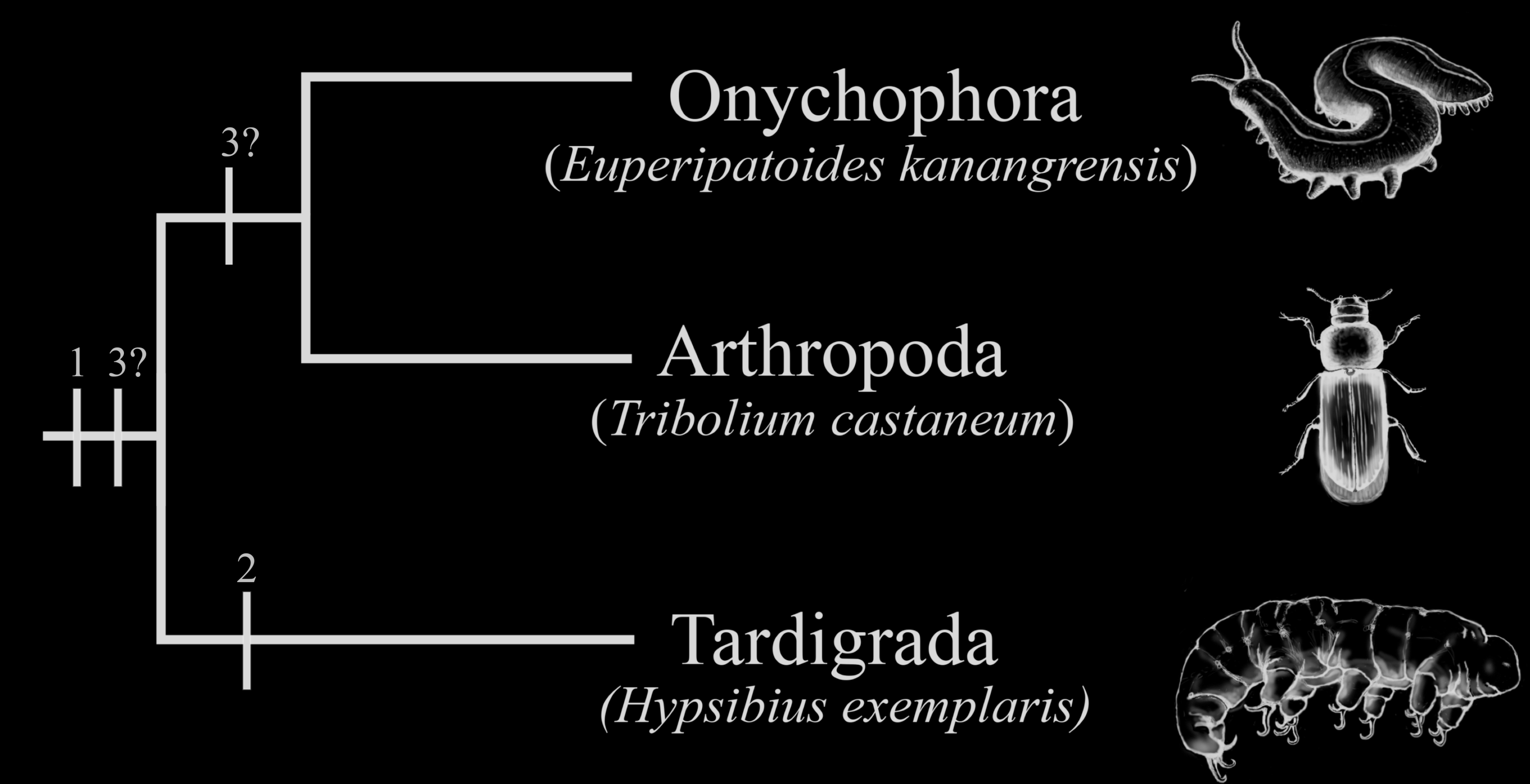
Introduction: Tardigrades lost proximal and intermediate leg domains.



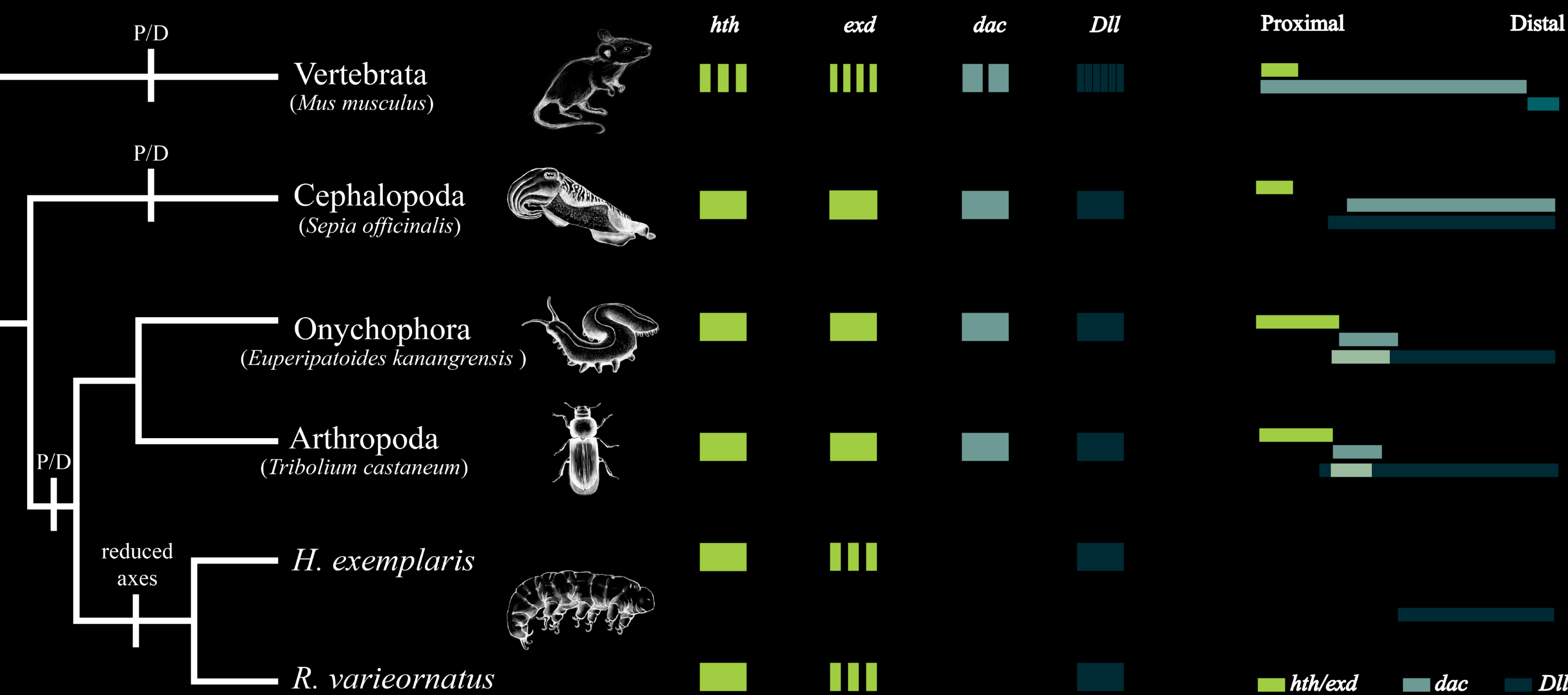
Part II: Where are candidate distal appendage patterning genes expressed?



Part III: Where did distal appendage patterning genes evolve their roles?



1. Recruitment of *al*, *apt*, *BarH1*, and *dpp* as part of the co-option of an A/P nervous system patterning network to appendage development.
2. Loss of leg patterning roles of *apt*, *BarH1*, and *dpp*.
3. Other genes studied may have evolved their leg patterning roles after they split from Tardigrada, or are ancestral to Panarthropoda, but lost in Tardigrada.



A regulatory network was co-opted independently for the evolution of appendages (P/D) from a role in nervous system patterning (A/P).

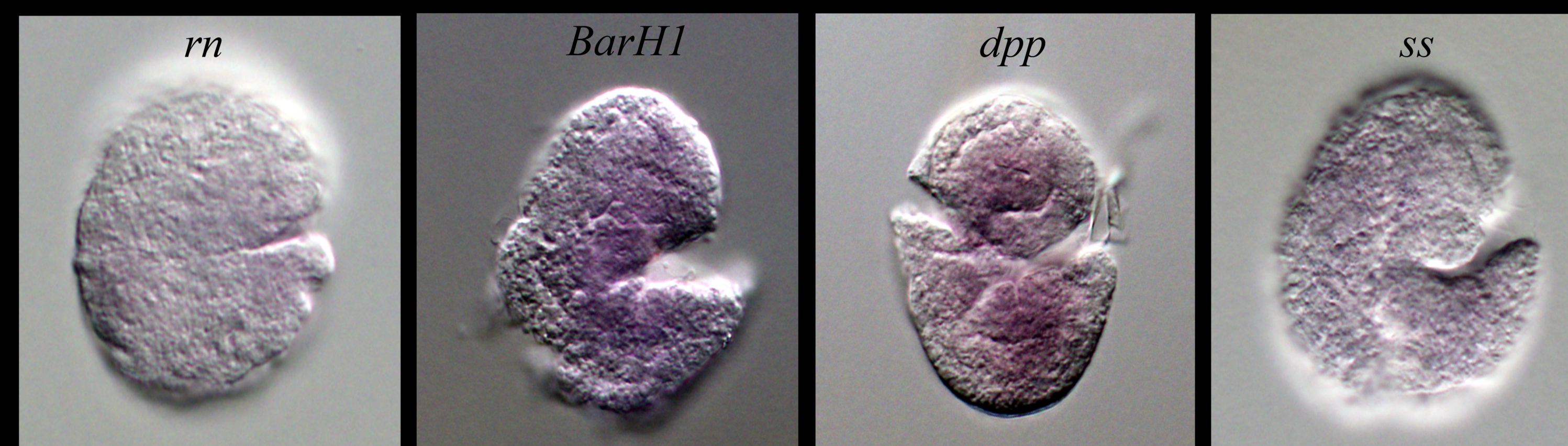
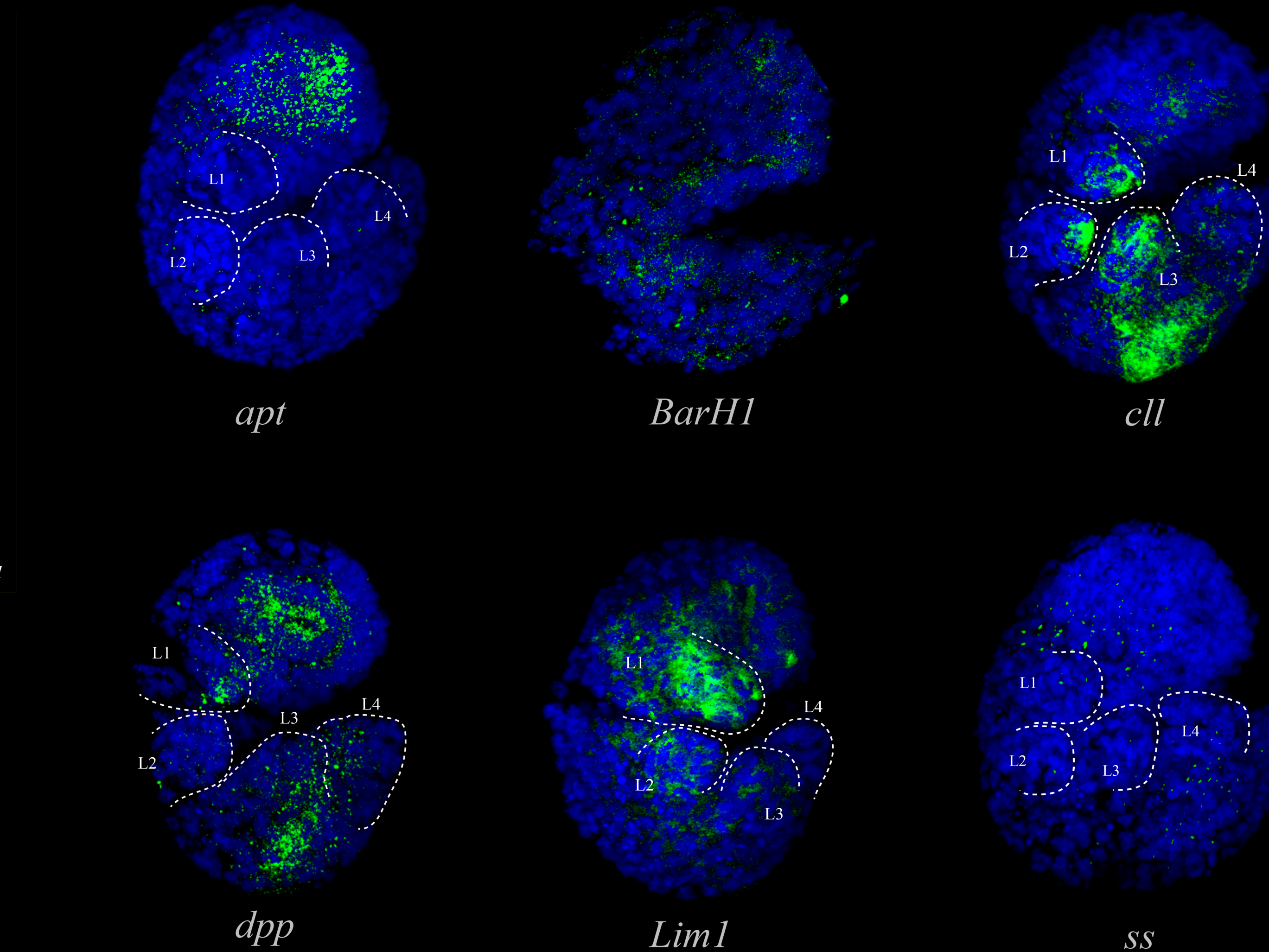
Tardigrades have lost a *dac* ortholog.

The tardigrade legs retain only distal identity.

Part 1: What candidate distal patterning genes are in tardigrades?

Table 1	<i>H. exemplaris</i>	<i>R. varieornatus</i>	<i>B. pennaki</i>
<i>al</i>	+	+	?
<i>apt</i>	+	+	?
<i>BarH1</i>	+	+	+
<i>cil</i>	+	+	+
<i>dpp</i>	+	+	+
<i>Lim1</i>	+	+	?
<i>nub</i>	+	+	?
<i>rn</i>	+	+	+
<i>ss</i>	+	+	?
<i>zfh2</i>	+	+	+

Coverage = 108x Total length = 266 Mb N50 = 1586



Confocal images and brightfield images of leg patterning genes using *in situ* hybridization. Anterior is toward the top. All embryos are mounted laterally, facing right, and developed to 45 hours post laying (hpl), unless otherwise specified. Dashed lines trace leg buds (L1-L4).

## Conclusions

Part I: Candidate distal appendage patterning genes are conserved in tardigrade genomes.

Part II: Expression of *al* supports distal identity of tardigrade legs. Other genes studied are not expressed in one or more legs during development.

Part III: Tardigrades possess a secondarily simplified leg patterning network. Some genes may have been recruited to leg patterning in the arthropod/onychophoran lineage after it split from Tardigrada.