Evolution of the Vertebrate Y RNA Cluster

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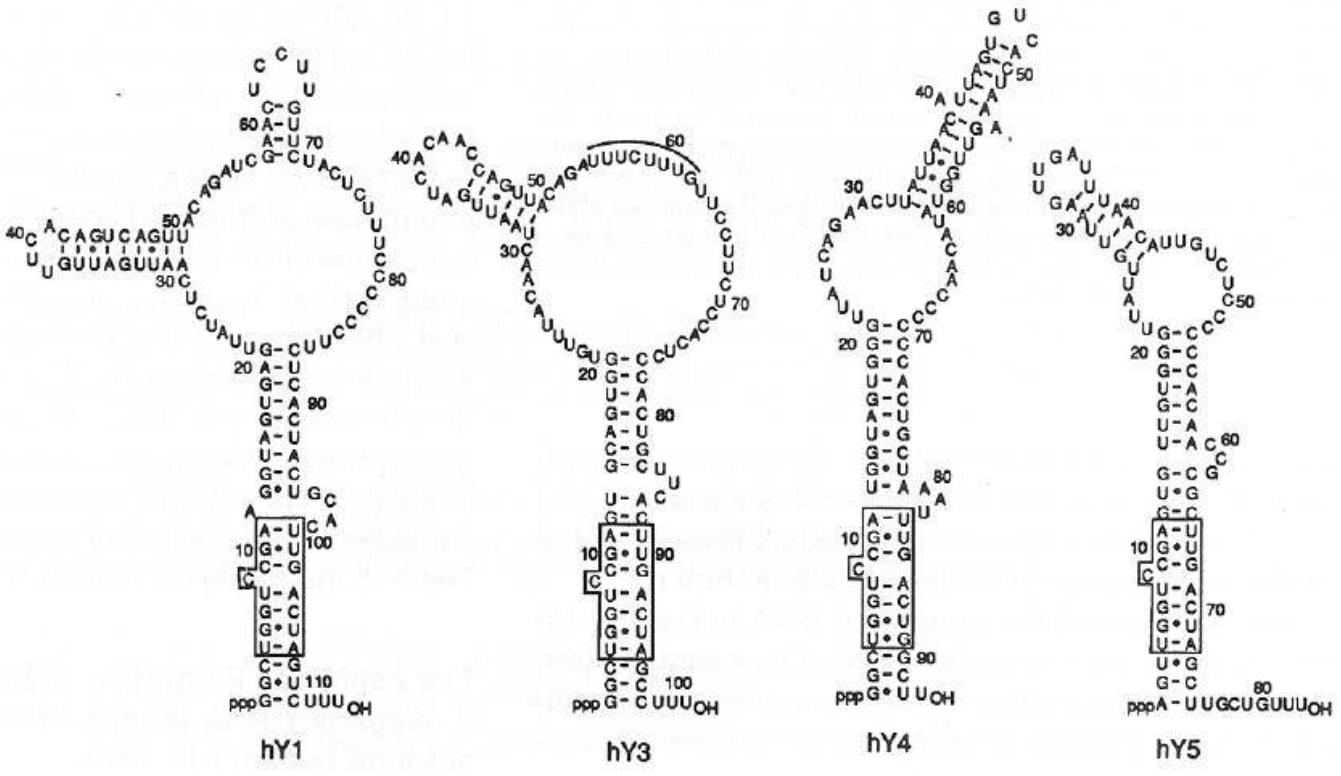
Bled, February 2007

Outline

What are Y RNAs?



Human Y RNAs: 4 paralogs located in a single cluster on Chr. 11

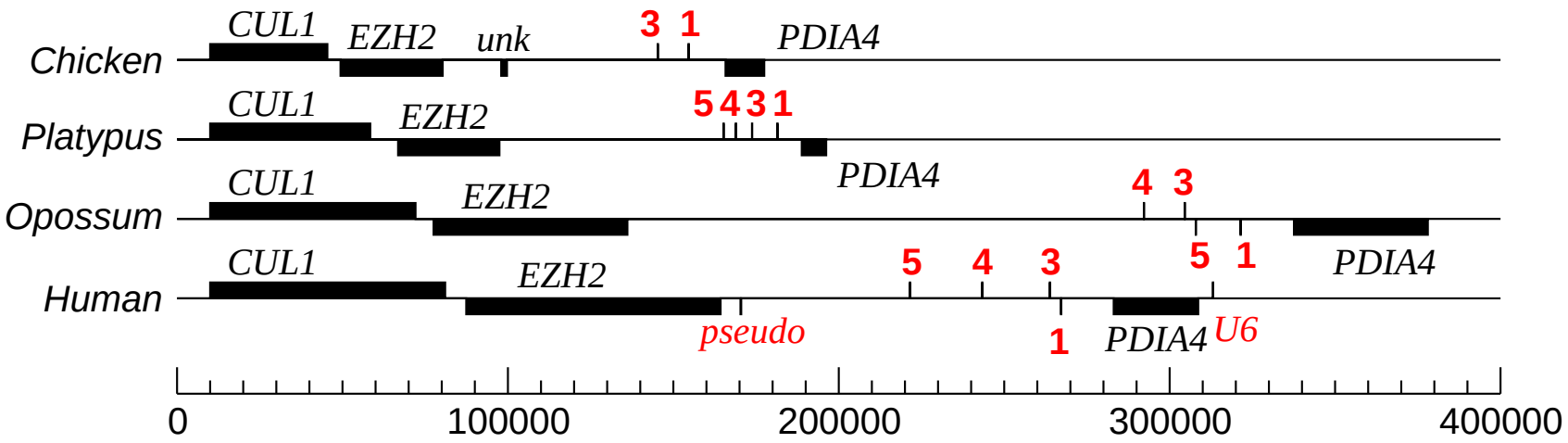
What are Y RNAs?

- Short non-protein-coding RNAs
- Transcribed by RNA polymerase III
  (like tRNAs, U6 RNA, vault RNAs, . . .)
- Part of the Ro ribonucleoparticle
- Located in close proximity in humans, mouse, and xenopus
- direct role for DNA replication
- In human: many pseudogenes, apparently only a single functional cluster

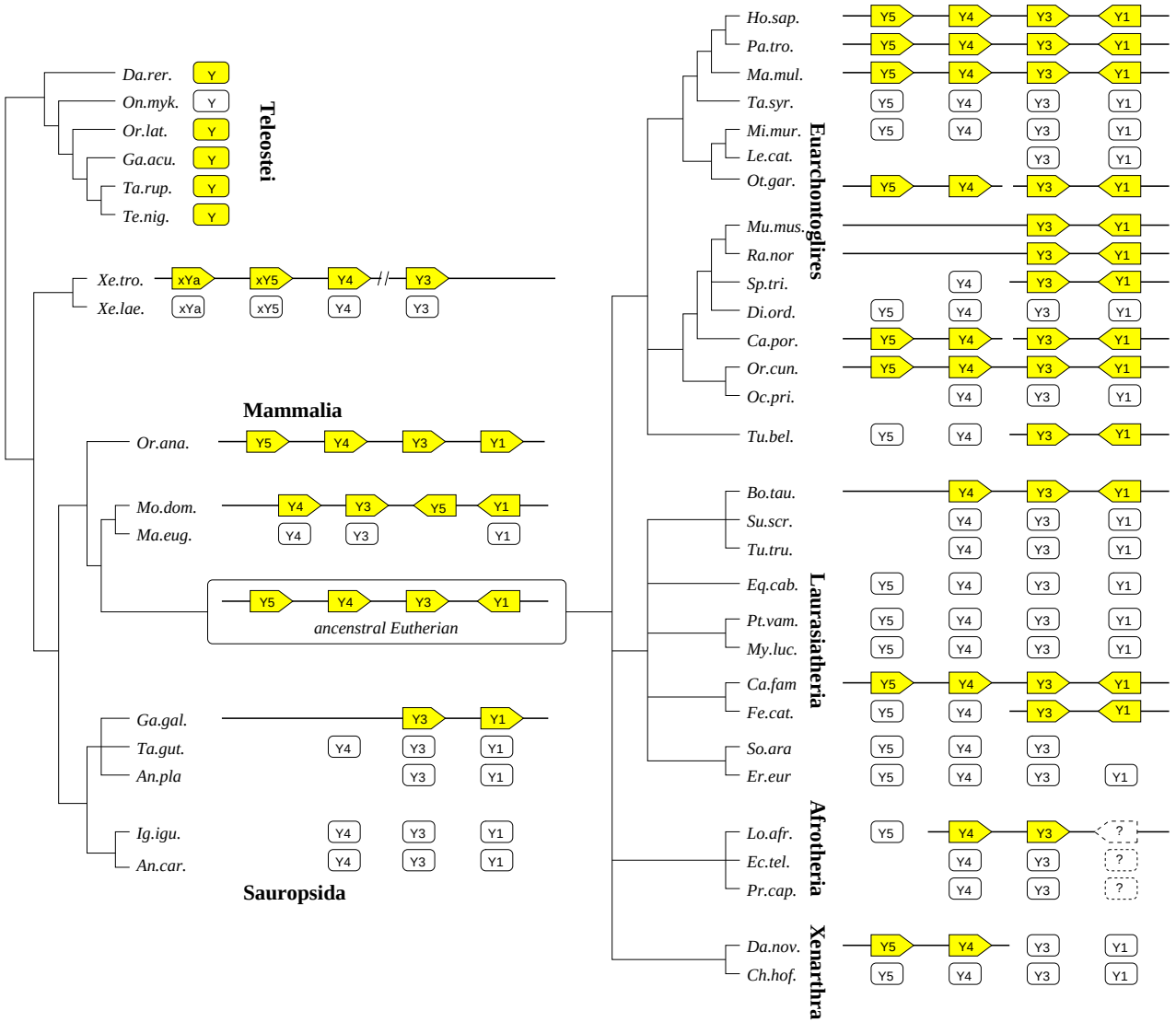
Previously known facts

- 4 Y RNAs in human but only two in mouse
- generally well conserved in mammals
- 2 Y RNAs in chicken
- 4 Y RNAs in xenopus, relation with mammalian ones unknown
- there are Y RNAs in teleost fishes

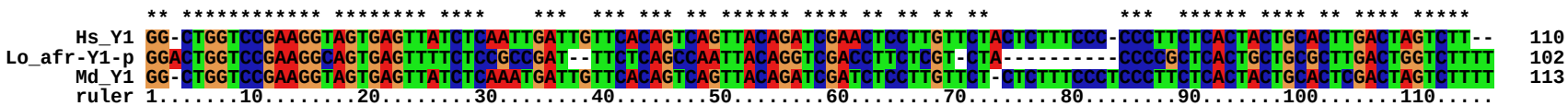
Genomic Location



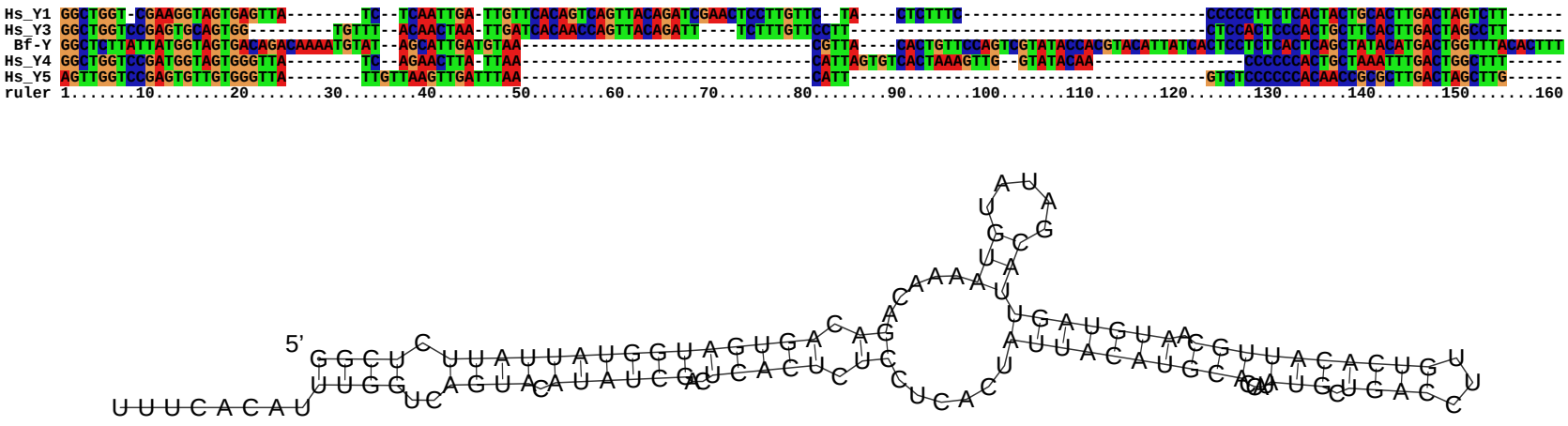
Inventory


Da.rer.
On.myk.
Or.lat.
Ga.acu.
Ta.rup.
Te.nig.
Y
Teleostei
Xe.tro.
Xe.lae.
xYa
xY5
Y4
Y3
Mammalia
Or.ana.
Mo.dom.
Ma.eug.
Y5
Y1
ancenstral Eutherian
Ga.gal.
Ta.gut.
An.pla
Ig.igu.
An.car.
Sauropsida
Ho.sap.
Pa.tro.
Ma.mul.
Ta.syr.
Mi.mur.
Le.cat.
Ot.gar.
Mu.mus.
Ra.nor
Sp.tri.
Di.ord.
Ca.por.
Or.cun.
Oc.pri.
Tu.bel.
Euarchontoglires
Bo.tau.
Su.scr.
Tu.tru.
Eq.cab.
Pt.vam.
My.luc.
Ca.fam
Fe.cat.
So.ara
Er.eur
Laurasiatheria
Lo.afr.
Ec.tel.
Pr.cap.
Afrotheria
Da.nov.
Ch.hof.
Xenarthra
?

Deviant Y1 in Afrotheria

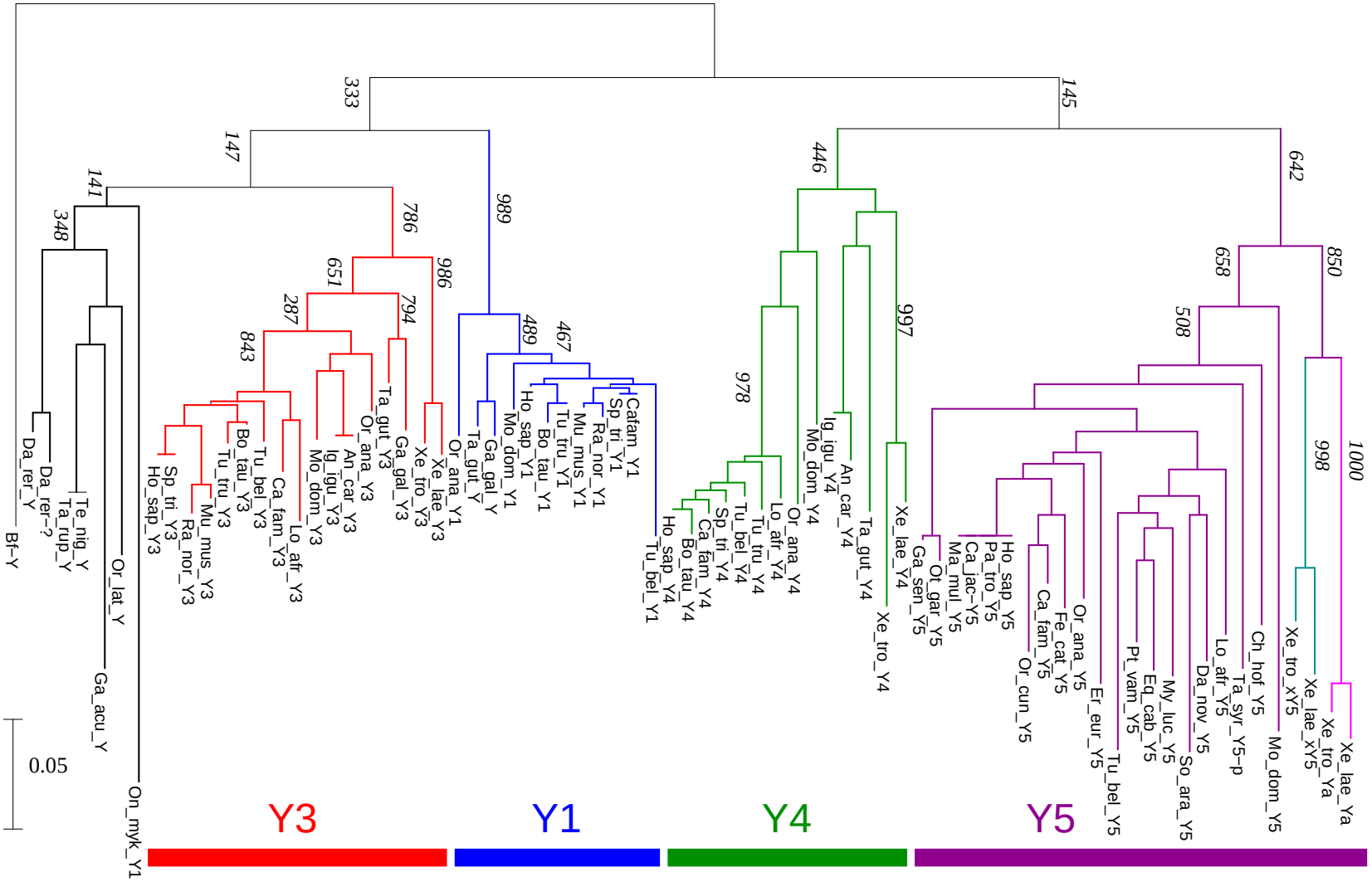


An Amphioxus Candidate

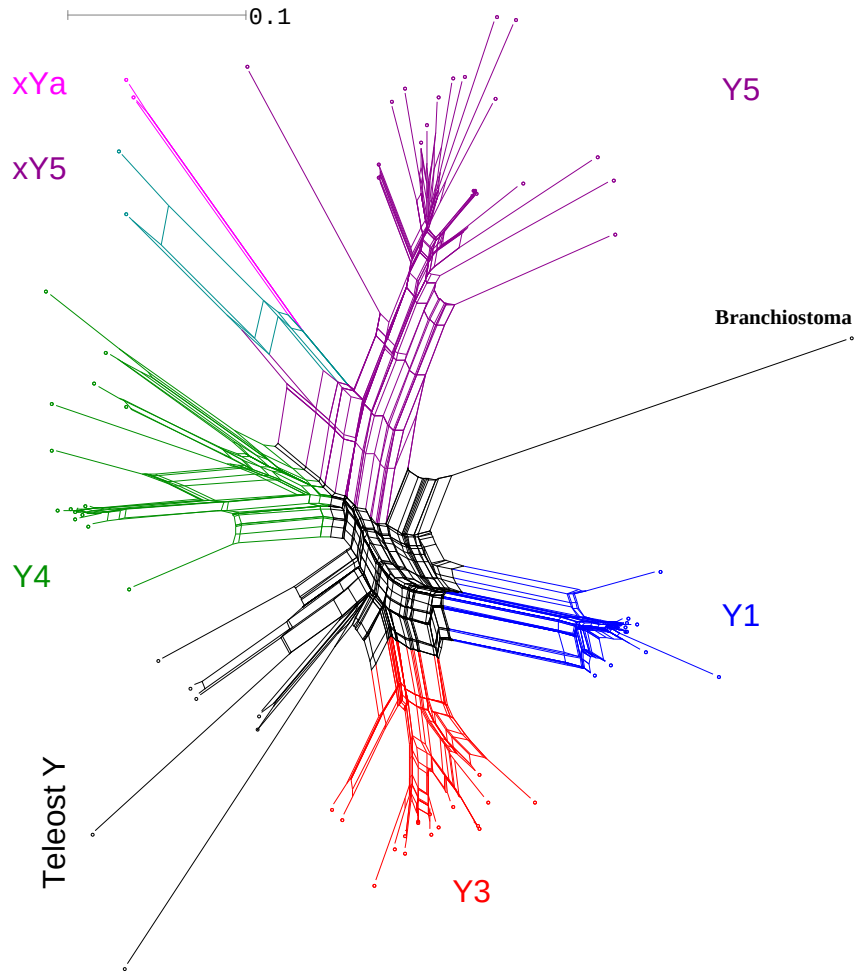


found using `fragrep`

Neighborjoining Tree



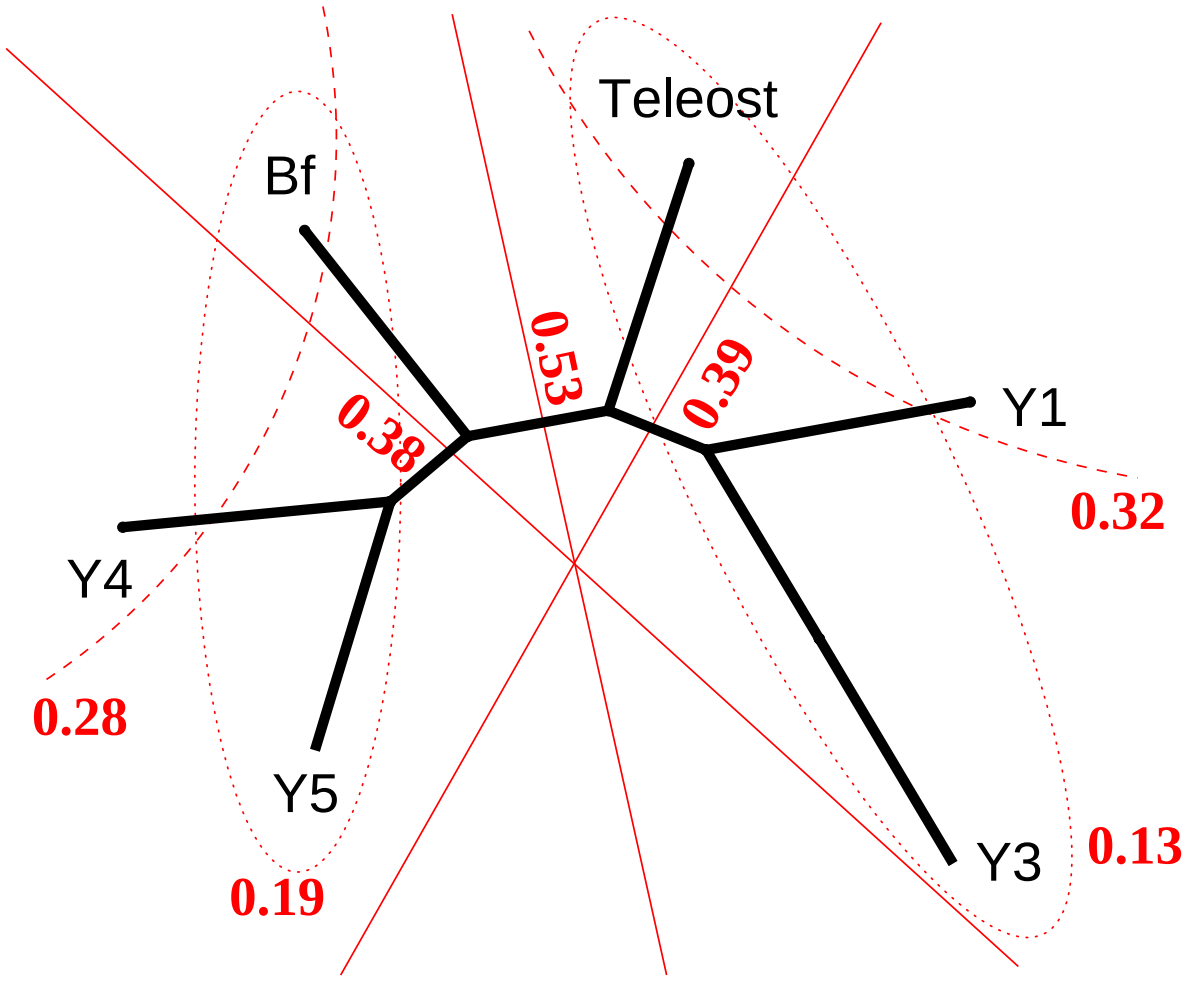
Neighbor Net



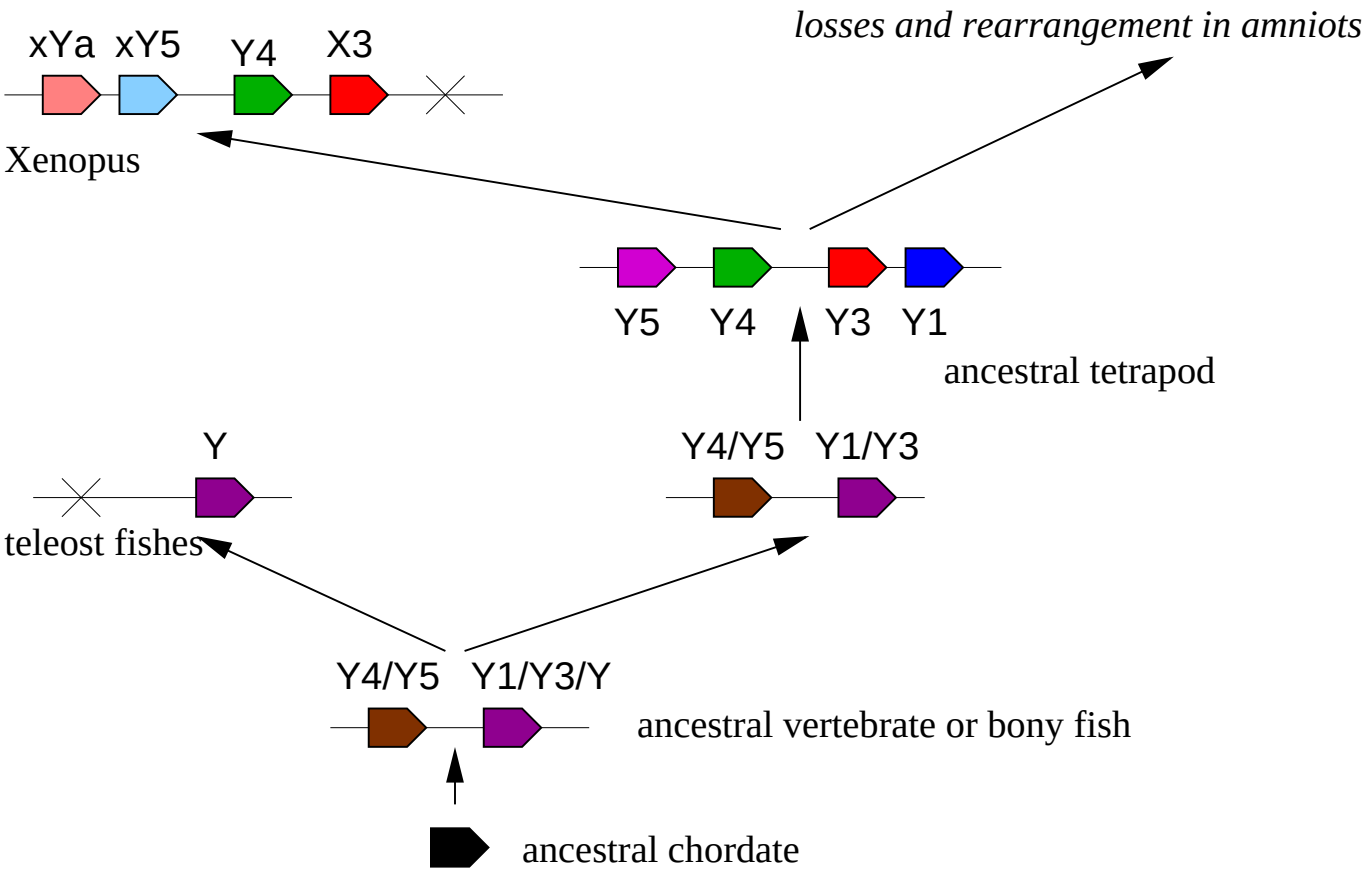
Splits between groups

- Assume that Y1, Y3, Y4, Y5 (incl xY5 and xYa), and teleost Y are monophyletic
- Choose one sequence from each of these 5 groups plus the Amphioxus sequence
- For each combination compute a neighborjoining tree
- Extract the three non trivial splits from this tree
- Record the most frequently occuring splits
  This defines the *strict consensus tree* from the three most frequent splits

Splits between groups



Summary: The most likely szenario



Open Questions

- Y RNAs have also been reported in *C. elegans* and in the bacterium *Deinococcus radiodurans*
- So far, no successful search for Y RNAs in flies, basal deuterostomes, plants, etc, although the Ro protein is evolutionarily old

Acknowlegements

- Axel Mosig & Meng Guofeng (Shanghai)
- Peter F. Stadler (U. Leipzig)