**Supplementary file 4.**

#Nexus

Begin Trees;

 Translate

 1 Frog\_alpha,

 2 Frog\_beta,

 3 Frog\_delta,

 4 Frog\_gamma,

 5 Alungfish\_alpha,

 6 Alungfish\_beta,

 7 Alungfish\_gamma,

 8 BCod\_ASIC1,

 9 Arowana\_g\_like,

 10 Lancelet\_a\_like,

 11 Catfish\_alpha,

 12 Chicken\_alpha,

 13 Chicken\_beta,

 14 Chicken\_delta,

 15 Chicken\_gamma,

 16 Coelacanth\_ASIC1,

 17 Coelacanth\_alpha,

 18 Coelacanth\_beta,

 19 Coelacanth\_delta,

 20 Coelacanth\_gamma,

 21 Cow\_alpha,

 22 Cow\_beta,

 23 Cow\_delta,

 24 Cow\_gamma,

 25 Eshark\_alpha,

 26 Eshark\_ASIC1,

 27 Eshark\_beta,

 28 Eshark\_gamma,

 29 Elamprey\_ASIC1,

 30 Human\_alpha,

 31 Human\_beta,

 32 Human\_delta,

 33 Human\_gamma,

 34 JLamprey\_alpha,

 35 JLamprey\_beta,

 36 JLamprey\_gamma,

 37 JMedaka\_ASIC1,

 38 Lancelet\_g\_like,

 39 Ropefish\_beta,

 40 Ropefish\_gamma,

 41 Ropefish\_alpha,

 42 SLamprey\_alpha,

 43 SLamprey\_beta,

 44 SLamprey\_gamma,

 45 Salamander\_alpha,

 46 SpottedGar\_g\_like,

 47 WLungfish\_alpha,

 48 WLungfish\_beta,

 49 WLungfish\_gamma,

 50 Turtle\_alpha,

 51 Turtle\_beta,

 52 Turtle\_delta,

 53 Turtle\_gamma

 ;

 Tree tree\_1 = ((((10:0.240154,38:0.400628):0.26525,(9:0.332645,46:0.205856):0.672235):0.132642,(29:0.024507,

((8:0.020914,37:0.026452):0.020569,(26:0.041216,(11:0.054532,16:0.022955):0.024701):1E-06):0.059287):

0.917353):0.065548,(((34:0.004582,42:0.050101):0.445435,((19:0.339745,(3:0.354015,((52:0.082886,14:

0.103927):0.085846,(32:0.199417,23:0.044511):0.204):0.090769):0.102711):0.154028,(25:0.80082,(41:

0.214639,((5:0.090541,47:0.111692):0.0775,(17:0.249053,(1:0.178596,(45:0.221607,((50:0.067304,12:

0.056789):0.076495,(30:0.021723,21:0.082526):0.142622):0.057806):0.056807):0.093321):0.04201):0.04742):

0.02314):0.039558):0.032187):0.182706,(((36:0.007161,44:0.030747):0.356102,((28:0.247241,40:0.284502):

0.040389,(20:0.138309,((7:0.113037,49:0.120798):0.151714,(4:0.176153,((53:0.029715,15:0.054405):

0.057263,(33:0.014233,24:0.049296):0.128043):0.069185):0.046522):0.012495):0.042939):0.250399):0.186618,((35:0.037746,43:1E-06):0.193114,(39:0.259873,((18:0.135812,(27:0.296282,(6:0.093056,48:0.073352):

0.216967):0.012272):0.028046,(2:0.20256,((51:0.013166,13:0.029852):0.064836,(31:0.037238,22:0.057629):

0.087265):0.073248):0.067358):0.038976):0.116599):0.130724):0.134782):0.147799);

End;