Supplementary Data 1

Inference methods

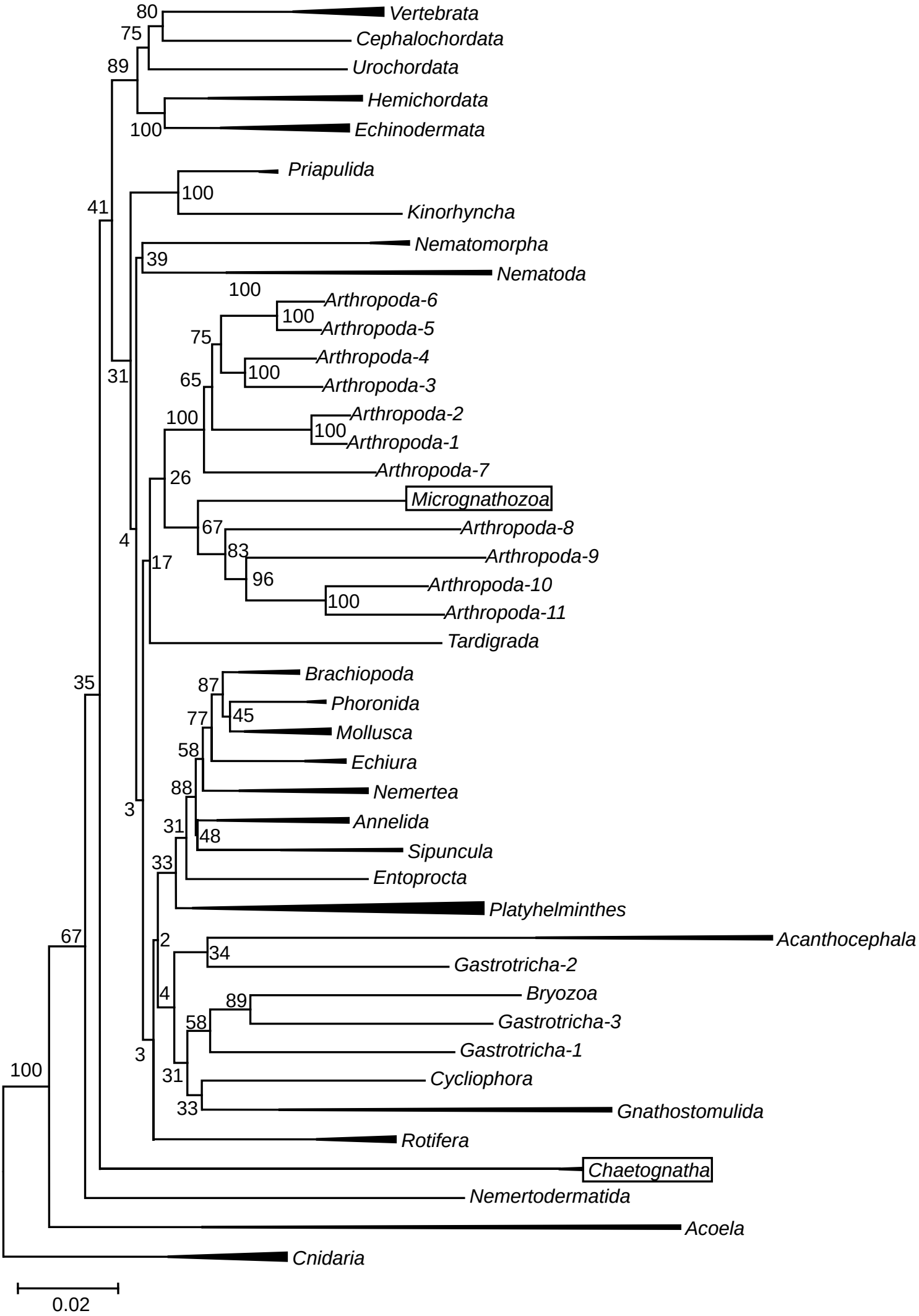
The results obtained with NJ (Supplementary Fig. 1A), Treefinder and PhyML (Supplementary Fig. 1B) show some groupings that never appear in the trees inferred by BI and RaxML (Fig. 1 main text) and that are contradictory to well stablished clades. As an example:

1. NJ (Supplementary Fig. 1A) places Micrognathozoa within the Arthropoda, while Chaetognaths appear splitting after acoelomorphs and sistergroup to the rest of bilaterians.
2. PhyML (Supplementary Fig. 1B) recovers a group made up by nemertodermatids, chaetognaths and micrognathozoans inside ecdysozoans, as sistergroup to Panarthropoda
3. Treefinder (not shown) anomalies appear mainly in the subsets trees:

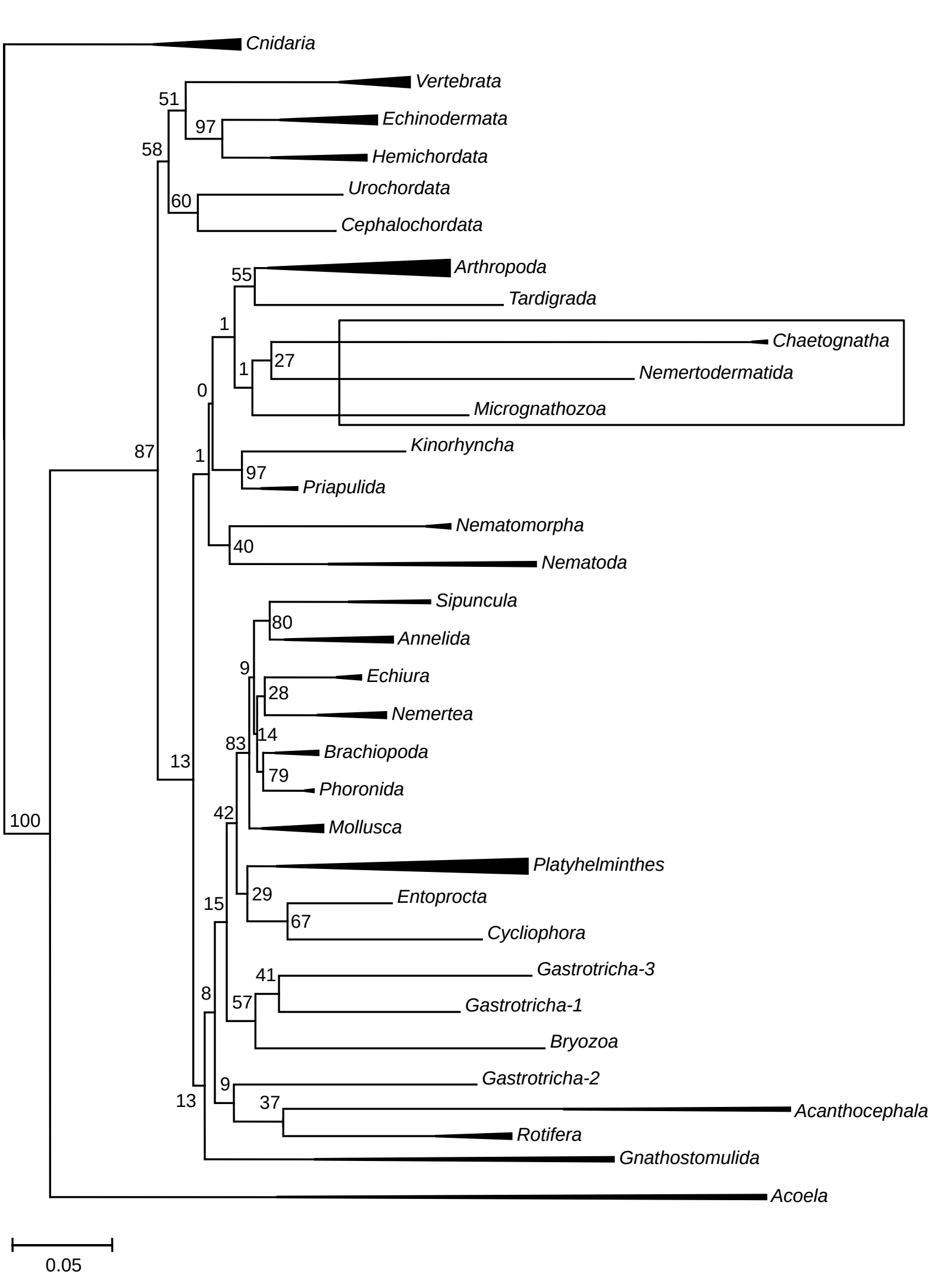
    a. *Acoelomorpha* dataset: Tardigrada at the bilaterian base, splitting after *Nemertodermatida*; *Micrognathozoa* within Arthropoda.
    b. *Gnathifera* dataset: *Urochordata* at bilaterian base; *Micrognathozoa* within Arthropoda.
    c. *Bryozoa* dataset: at the bilaterian base shows *Bryozoa* + ((*Cycliophora* + *Entoprocta*) + rest of bilaterians); *Micrognathozoa* within *Arthropoda*.
    d. *Chaetognatha* dataset: *Micrognathozoa* within *Arthropoda.*

The differences found could be due to an inefficiency on the heuristic search of the first group of methods. In order to test this hypothesis we calculated with Treefinder the likelihood of the best RAxML tree with branch length optimization; the value obtained (lnL= -72,953.36) was better than the likelihood obtained by the original Treefinder search (lnL= -72,967.834). Hence, indicating that Treefinder had not been able to find the best tree.

Supplementary Figure 1. Topology obtained by NJ (A) and PhyML (B) with the All-set.


Vertebrata
Cephalochordata
Urochordata
Hemichordata
Echinodermata
Priapulida
Kinorhyncha
Nematomorpha
Nematoda
Arthropoda-6
Arthropoda-5
Arthropoda-4
Arthropoda-3
Arthropoda-2
Arthropoda-1
Arthropoda-7
Micrognathozoa
Arthropoda-8
Arthropoda-9
Arthropoda-10
Arthropoda-11
Tardigrada
Brachiopoda
Phoronida
Mollusca
Echiura
Nemertea
Annelida
Sipuncula
Entoprocta
Platyhelminthes
Acanthocephala
Gastrotricha-2
Bryozoa
Gastrotricha-3
Gastrotricha-1
Cycliophora
Gnathostomulida
Rotifera
Chaetognatha
Nemertodermatida
Acoela
Cnidaria
0.02

A


Cnidaria
Vertebrata
Echinodermata
Hemichordata
Urochordata
Cephalochordata
Arthropoda
Tardigrada
Chaetognatha
Nemertodermatida
Micrognathozoa
Kinorhyncha
Priapulida
Nematomorpha
Nematoda
Sipuncula
Annelida
Echiura
Nemertea
Brachiopoda
Phoronida
Mollusca
Platyhelminthes
Entoprocta
Cycliophora
Gastrotricha-3
Gastrotricha-1
Bryozoa
Gastrotricha-2
Acanthocephala
Rotifera
Gnathostomulida
Acoela
51
97
58
60
55
1
27
1
0
87
1
97
40
80
9
28
14
83
13
79
42
100
29
15
67
41
8
57
9
13
37
0.05
B