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*Invertebrate Systematics*

## Supplementary Material

# Molecular phylogeny, systematics and biogeography of the subfamily Nemognathinae (Coleoptera, Meloidae)

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**Appendix 1. Details on the fossil used to calibrate the phylogeny proposed in this paper**

**Node calibrated**

MRCA of ((Nemognathini), Horiini), Palaestrini), Zoltanzonitini))

**Reference specimen and locality of fossil origin**

Baltic amber: Eocene, Kaliningrad, Yantarny, AMNH B-W 157 (Amber Collection, Division of Invertebrate Zoölogy, American Museum of Natural History, New York). Nine Meloidae triungulins in a single piece of amber and on the holotype female of *Protolithurgus ditomeus* Engel, 2005 (Hymenoptera, Megachilidae, Lithurginae). Identified as Nemognathinae indet.

**Phylogenetic placement**

[For an almost complete diagnosis of the fossil, see Engel 2005] This fossil of a first instar larva from Baltic amber (Engel, 2005) surely belongs to the subfamily Nemognathinae, because it is small (0.65 mm), phoretic on bees (Megachilidae), the general shape is navicular and the head is narrowed in front, differing from other phoretic taxa of Meloidae in the subfamily Meloinae (i.e. genera *Meloe*, *Cyaneolytta*, *Lyttomeloe*, *Epispasta*, etc.; Bologna 1991; Bologna and Pinto 2001). The navicular shape of the body and with the head narrowed in front are also characteristic of the phoretic larvae of the tribe Tetraonycini, which, however, can be excluded as the abdominal spiracle I is not greatly modified and pedunculate (Bologna 1991; Bologna and Pinto 2001).

Among Nemognathinae, only the tribe Stenoderini can be excluded as their larvae are not modified for phoresy (Bologna *et al*. 2002). As indicated by Engel (2005), the general body shape of the fossil is similar to that of the larvae of Nemognathini, but the synapomorphic conditions of the epipharynx with a dense tuft of thick setae, the tubular spiracles of VIII urite and the elongated caudal setae (Bologna and Pinto 2001) are not clearly visible in the amber fossil. Unfortunately, larvae of *Zoltanzonitis* have never been described. Based on our results, this genus belongs to an independent lineage (here proposed as a new tribe) sister to all the phoretic Nemognathinae, but we cannot exclude the presence of phoresy in its larvae, as well as other features observed on the fossil. Accordingly, we chose to use this fossil to calibrate the MRCA of all Nemognathinae excluding the non-phoretic tribe Stenoderini.

**Locality, geological and age information**

This fossil was found in Priabonian Baltic amber from Yantarny, in the Kaliningrad Region of the Russian Federation. The time span of the Priabonian stage is 33.9–37.8 Ma (Walker *et al*. 2018).

**Previous use as calibration**

We found no evidence of previous usage of this fossil in other dating analyses.

**Appendix 2. Time-stratified analysis implemented in biogeographic inference**

**Time slices**

Five time slices were selected for the analysis to account for the main paleoenvironmental changes that affected the continents in the period hereby considered:

The first slice runs from **46.35 to 30 Ma** and corresponds to the period in which the exchange of organisms between the African and the Eurasian continents was hindered by the absence of connection afterwards provided by the emersion of the Arabian Peninsula. Dispersion between Eurasia and North America was facilitated by the presence of the Bering Land Bridge (Marincovich and Gladenkov 1999; Milne 2006; Lomolino *et al*. 2017), whereas the southern part of Africa was potentially connected to Australia as a result of the Kergulean Plateau serving as a stepping stone allowing long distance dispersal for certain taxa (Schwarz *et al*. 2006).

The second slice runs from **30 to 20 Ma**. In this timeframe dispersal events between the African and the Eurasian continents began to be facilitated by the formation of the Arabian Peninsula (Jolivet and Faccenna 2000; Lomolino *et al*. 2017; Torfstein and Steinberg 2021).

The third time slice runs from **20 to 5 Ma** and encompasses the period in which Australia collided with Southeast Asia and connections were completely established between the African and Eurasian continents (Lomolino *et al*. 2017). At the same time, the Kergulean Plateau was submerged interrupting any connections between Australia and Africa (Schwarz *et al*. 2006).

The fourth slice runs from **5 to 3.5 Ma** and corresponds to the period in which taxa exchanges between North America and Eurasia were temporally interrupted due to the disappearance of the Bering Land bridge (Marincovich and Gladenkov 1999; Milne 2006; Lomolino *et al*. 2017). In the same period began the formation of the Isthmus of Panama that connected North and South America (Lomolino *et al*. 2017).

The fifth and last slice runs from **3.5 to 0.0 Ma** and corresponds to the period in which the formation of the Isthmus of Panama was completed allowing taxa exchanges between North and South America (Lomolino *et al*. 2017). In addition, during the Pleistocene glaciations the Bering land bridge between North America and Eurasia was restored, to disappear again after the Last Glacial Maximum (Marincovich and Gladenkov 1999; Milne 2006; Lomolino *et al*. 2017).

**Matrix of Area adjacencies**

For each time slice area adjacencies are provided based on the relative position of each area in the timeframe considered in this study. Each area, corresponding to the main biogeographic regions (Lomolino *et al*. 2017), is coded as follows: A. Afrotropical Region; B. Australian Region; C. Nearctic Region; D. Neotropical Region; E. Oriental Region; F. Palaearctic Region.

- **Time slices 1 (46-30 Ma) and 2 (30-20 Ma)**

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **A** | 1 | 0 | 0 | 0 | 0 | 1 |
| **B** | 0 | 1 | 0 | 0 | 1 | 0 |
| **C** | 0 | 0 | 1 | 0 | 0 | 1 |
| **D** | 0 | 0 | 0 | 1 | 0 | 0 |
| **E** | 0 | 1 | 0 | 0 | 1 | 1 |
| **F** | 1 | 0 | 1 | 0 | 1 | 1 |

- **Time slices 3 (20-5 Ma) and 4 (5-3.5 Ma)**

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **A** | 1 | 0 | 0 | 0 | 0 | 1 |
| **B** | 0 | 1 | 0 | 0 | 1 | 0 |
| **C** | 0 | 0 | 1 | 0 | 0 | 1 |
| **D** | 0 | 0 | 0 | 1 | 0 | 0 |
| **E** | 0 | 1 | 0 | 0 | 1 | 1 |
| **F** | 1 | 0 | 1 | 0 | 1 | 1 |

- **Time slice 5 (3.5-0.0 Ma)**

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **A** | 1 | 0 | 0 | 0 | 0 | 1 |
| **B** | 0 | 1 | 0 | 0 | 1 | 0 |
| **C** | 0 | 0 | 1 | 1 | 0 | 0 |
| **D** | 0 | 0 | 1 | 1 | 0 | 0 |
| **E** | 0 | 1 | 0 | 0 | 1 | 1 |
| **F** | 1 | 0 | 0 | 0 | 1 | 1 |

**Matrix of dispersal multipliers**

Dispersal rates (DR) used in this study (between 0 and 1) were calculated based on the geographical position of each area in any time slice, the presence of barriers and if the considered areas were separated by another area. The values of dispersal rates were as follow (modified from Kaminski *et al*. 2021): DR=0: no dispersal between areas; DR=0.01: long distance dispersal; DR=0.3: dispersal between two areas separated by one area; DR=0.7: presence of barriers; DR=1: no barriers between areas.

- **Time slice 46-30 Ma**

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **A** | 0 | 0.01 | 0 | 0 | 0 | 1 |
| **B** | 0.01 | 0 | 0 | 0 | 0 | 0 |
| **C** | 0 | 0 | 0 | 0 | 0 | 0.7 |
| **D** | 0 | 0 | 0 | 0 | 0 | 0 |
| **E** | 0 | 0 | 0 | 0 | 0 | 1 |
| **F** | 1 | 0 | 0.7 | 0 | 1 | 0 |

- **Time slice 30-20 Ma**

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **A** | 0 | 0.01 | 0 | 0 | 0.3 | 1 |
| **B** | 0.01 | 0 | 0 | 0 | 0 | 0 |
| **C** | 0 | 0 | 0 | 0 | 0 | 0.7 |
| **D** | 0 | 0 | 0 | 0 | 0 | 0 |
| **E** | 0.3 | 0 | 0 | 0 | 0 | 1 |
| **F** | 1 | 0 | 0.7 | 0 | 1 | 0 |

- **Time slice 20-5 Ma**

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **A** | 0 | 0 | 0 | 0 | 0.3 | 1 |
| **B** | 0 | 0 | 0 | 0 | 0.7 | 0.3 |
| **C** | 0 | 0 | 0 | 0 | 0 | 0.7 |
| **D** | 0 | 0 | 0 | 0 | 0 | 0 |
| **E** | 0.3 | 0.7 | 0 | 0 | 0 | 1 |
| **F** | 1 | 0.3 | 0.7 | 0 | 1 | 0 |

- **Time slice 5-3.5 Ma**

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **A** | 0 | 0 | 0 | 0 | 0.3 | 1 |
| **B** | 0 | 0 | 0 | 0 | 0.7 | 0.3 |
| **C** | 0 | 0 | 0 | 0.7 | 0 | 0 |
| **D** | 0 | 0 | 0.7 | 0 | 0 | 0 |
| **E** | 0.3 | 0.7 | 0 | 0 | 0 | 1 |
| **F** | 1 | 0.3 | 0 | 0 | 1 | 0 |

- **Time slice 3.5-0 Ma**

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **A** | 0 | 0 | 0 | 0 | 0.3 | 1 |
| **B** | 0 | 0 | 0 | 0 | 0.7 | 0.3 |
| **C** | 0 | 0 | 0 | 1 | 0 | 0 |
| **D** | 0 | 0 | 1 | 0 | 0 | 0 |
| **E** | 0.3 | 0.7 | 0 | 0 | 0 | 1 |
| **F** | 1 | 0.3 | 0 | 0 | 1 | 0 |

**Fig. S1** Multilocus (*16S*, *COI*, *CAD*, *ITS2* and *28S*) phylogenetic tree of Nemognathinae based on DS2. Topology corresponds to the Maximum Likelihood (ML) tree. Tribes are highlighted with different colours; clades within each tribe are indicated with letters (A-E). Only supported values of nodes (UFBootstrap, UFB ≥ 95; SH-aLRT ≥ 80%; Posterior Probability, PP ≥ 0.95) are reported (SH-aLRT/UFB/PP). Dashes (–) indicates non supported values. Support of nodes at intrageneric level, is shown in Fig. S3. Asterisks (*) near species names indicates specimens downloaded from GenBank. Section signs (§) near species names indicates specimens included only in DS2.

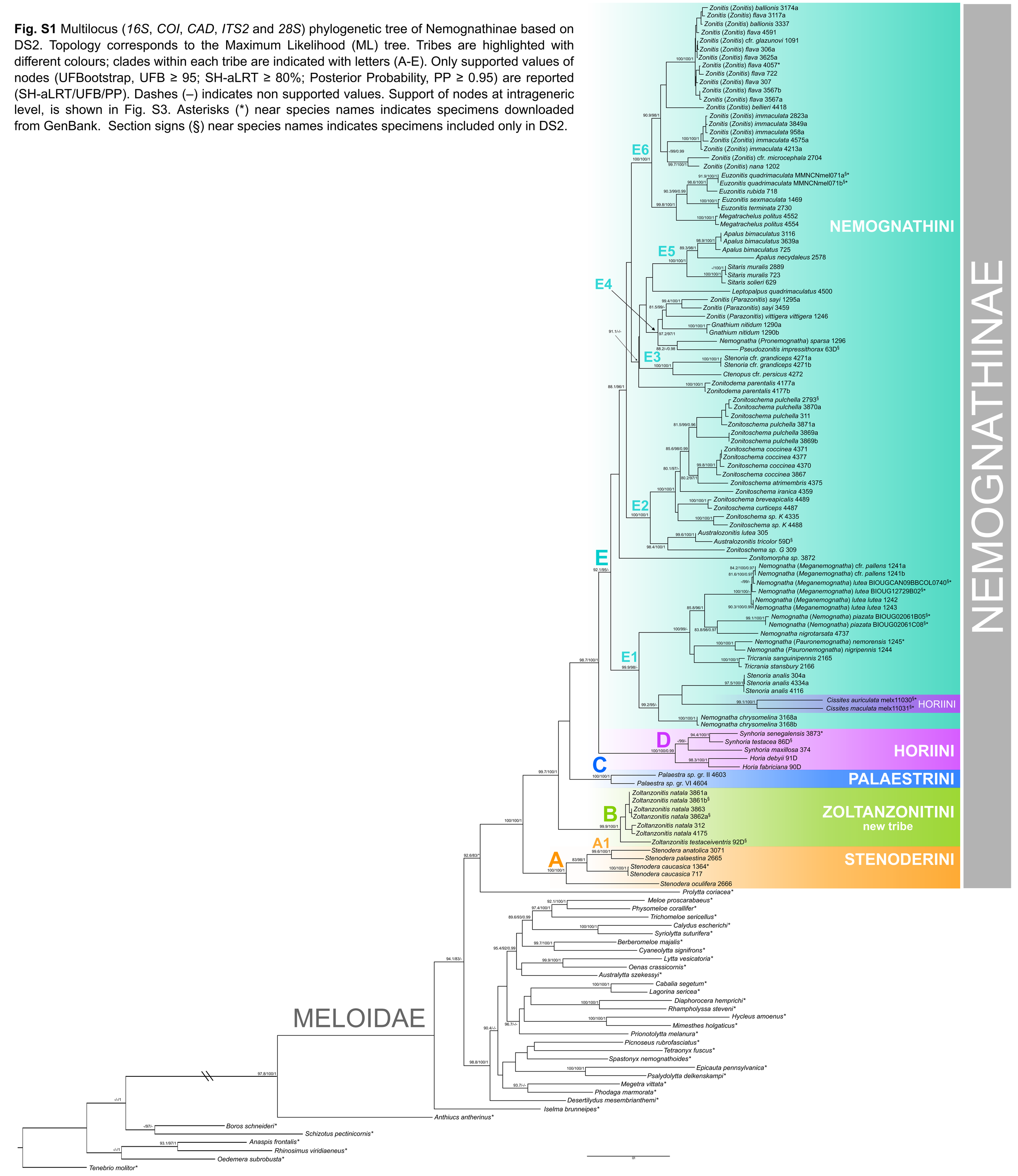


**Fig. S2** (a) Maximum likelihood phylogenetic tree of DS1 (*16S*, *COI*, *CAD*, *ITS2* and *28S*). UFBootstrap and SH-aLRT are reported as node support (SH-aLRT/UFB). Clades are highlighted with different colours referring to different tribes.

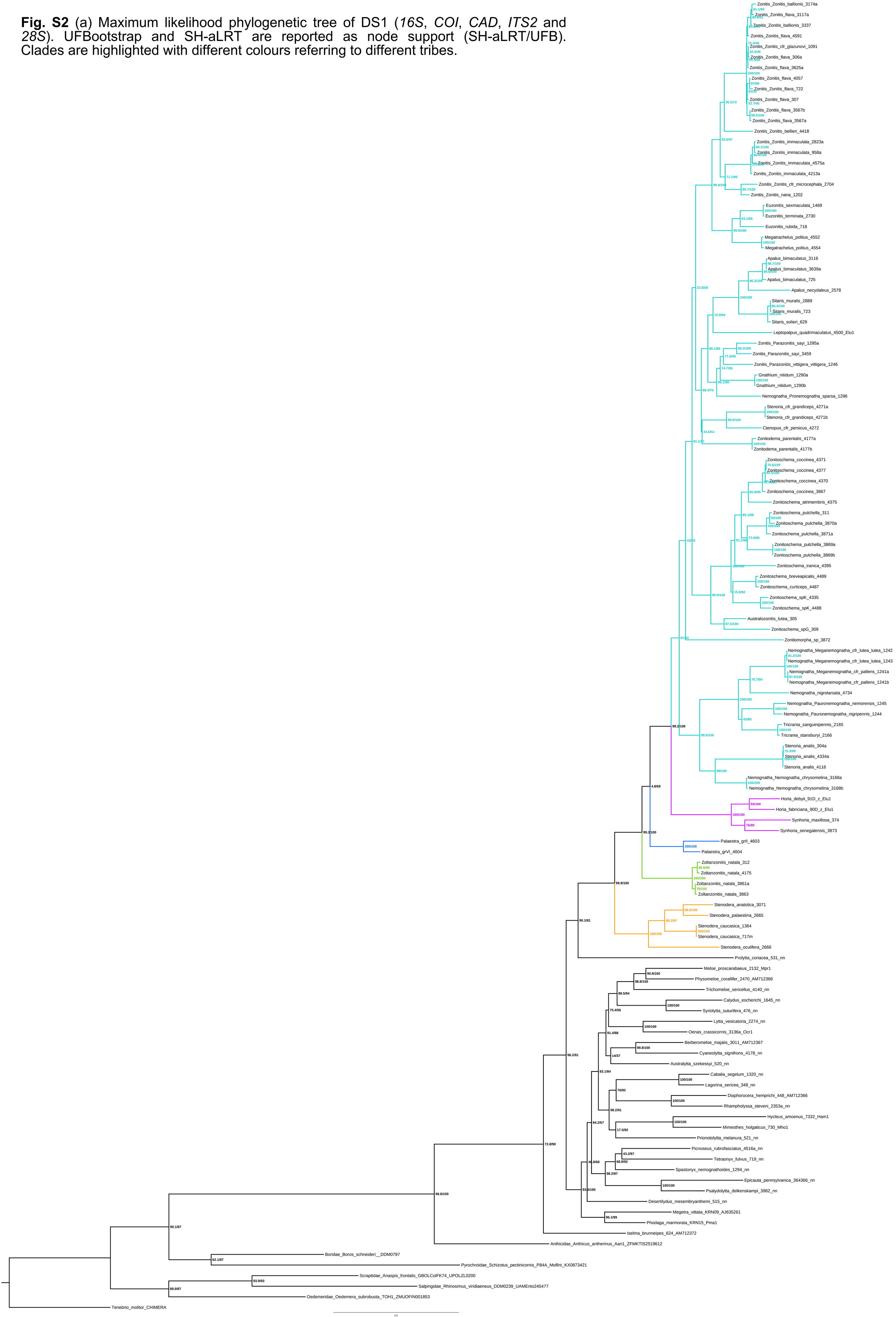


**Fig. S2.** (b) Bayesian inference phylogenetic tree of DS1 (*16S*, *COI*, *CAD*, *ITS2* and *28S*). Posterior probabilities values are reported as node support. Clades are highlighted with different colours referring to different tribes.

**Fig. S3.** (a) Maximum likelihood phylogenetic tree of DS2 (*16S*, *COI*, *CAD*, *ITS2* and *28S*). UFBootstrap and SH-aLRT are reported as node support (SH-aLRT/UFb). Clades are highlighted with different colours referring to different tribes.

**Fig. S3.** (b) Bayesian inference phylogenetic tree of DS2 (*16S*, *COI*, *CAD*, *ITS2* and *28S*). Posterior probabilities values are reported as node support. Clades are highlighted with different colours referring to different tribes.

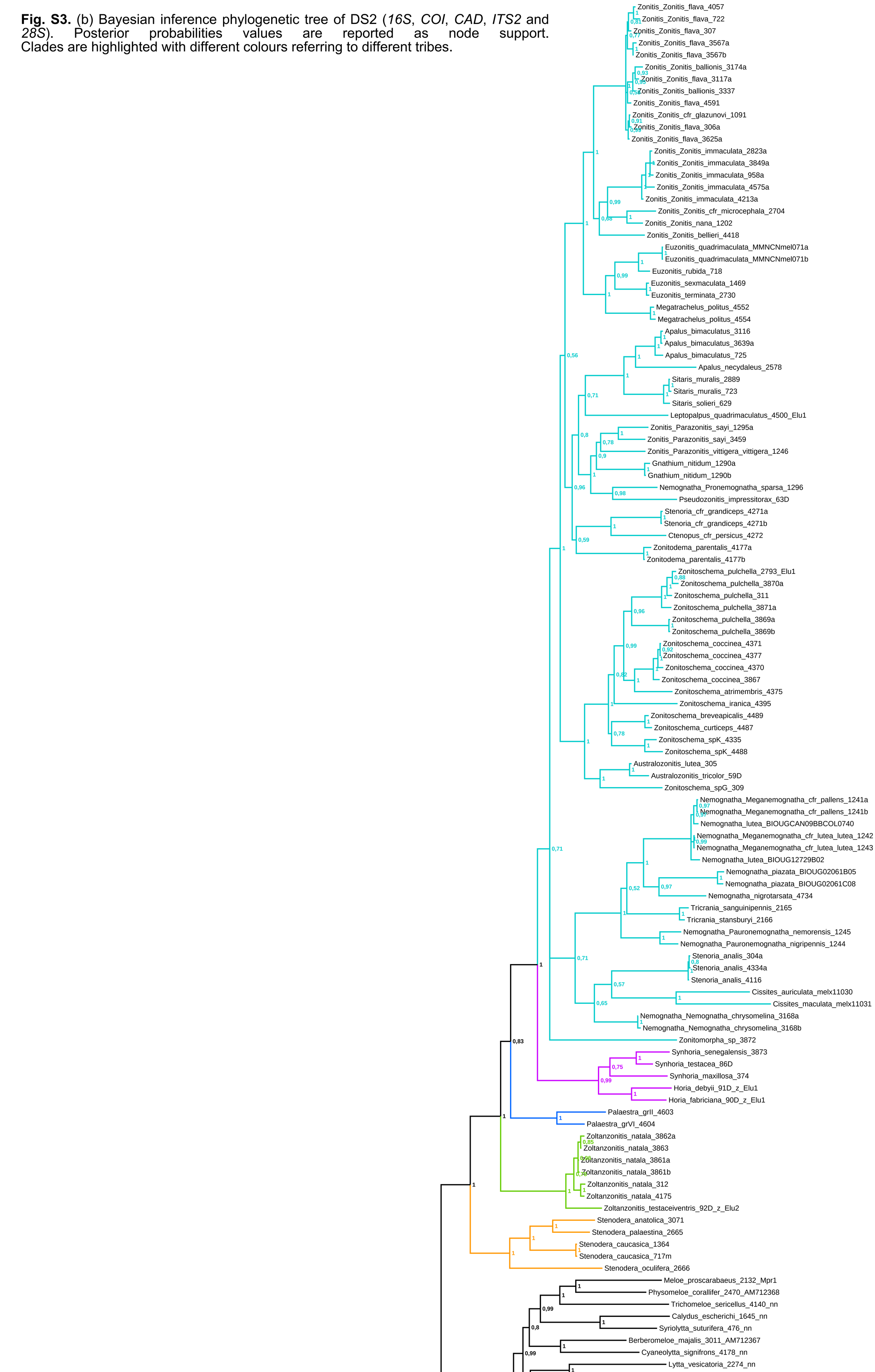


**Fig. S4.** (a) Maximum Likelihood, *16S.*

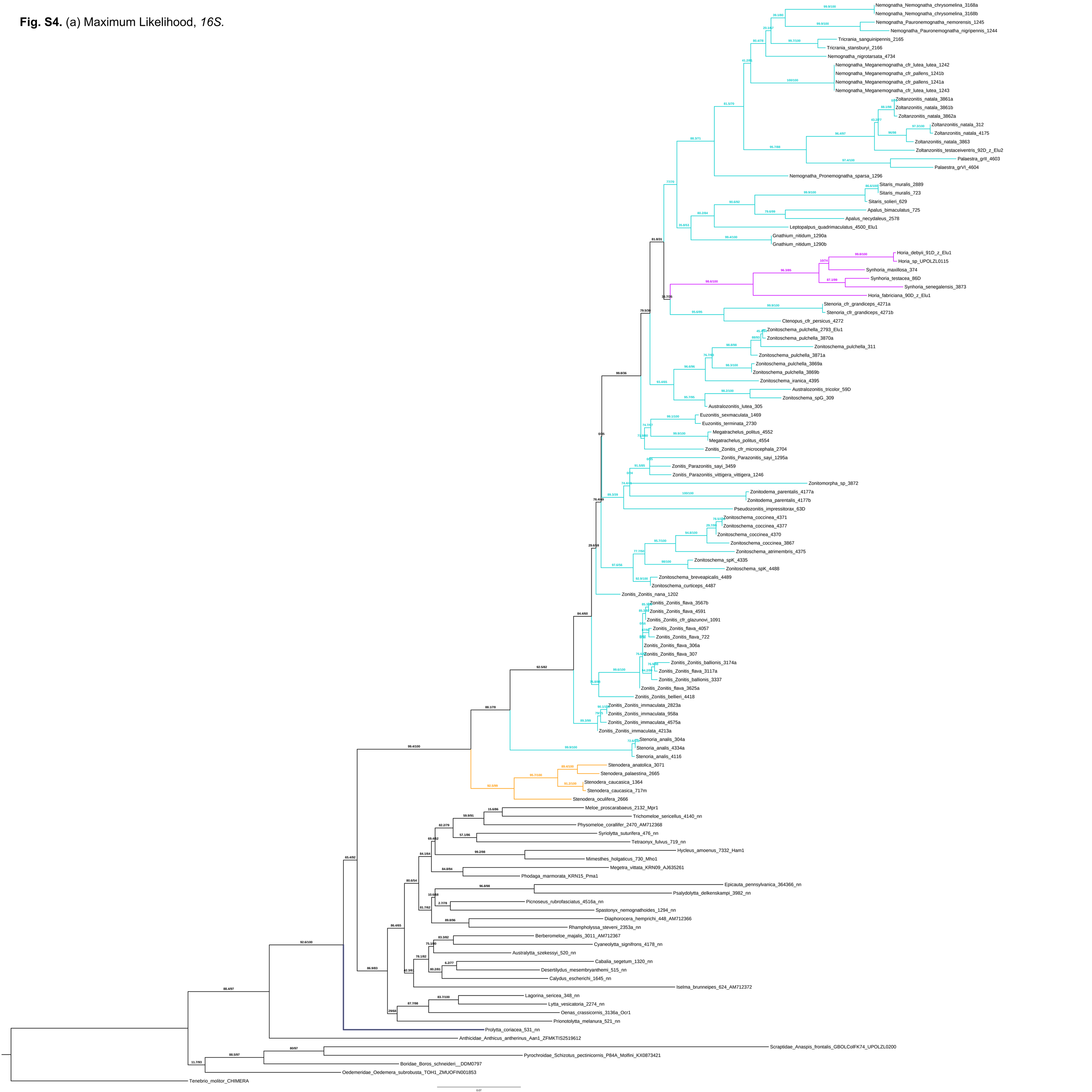


**Fig. S4.** (b) Bayesian Inference, *16S.*

**Fig. S4.** (c) Maximum Likelihood, *COI*.

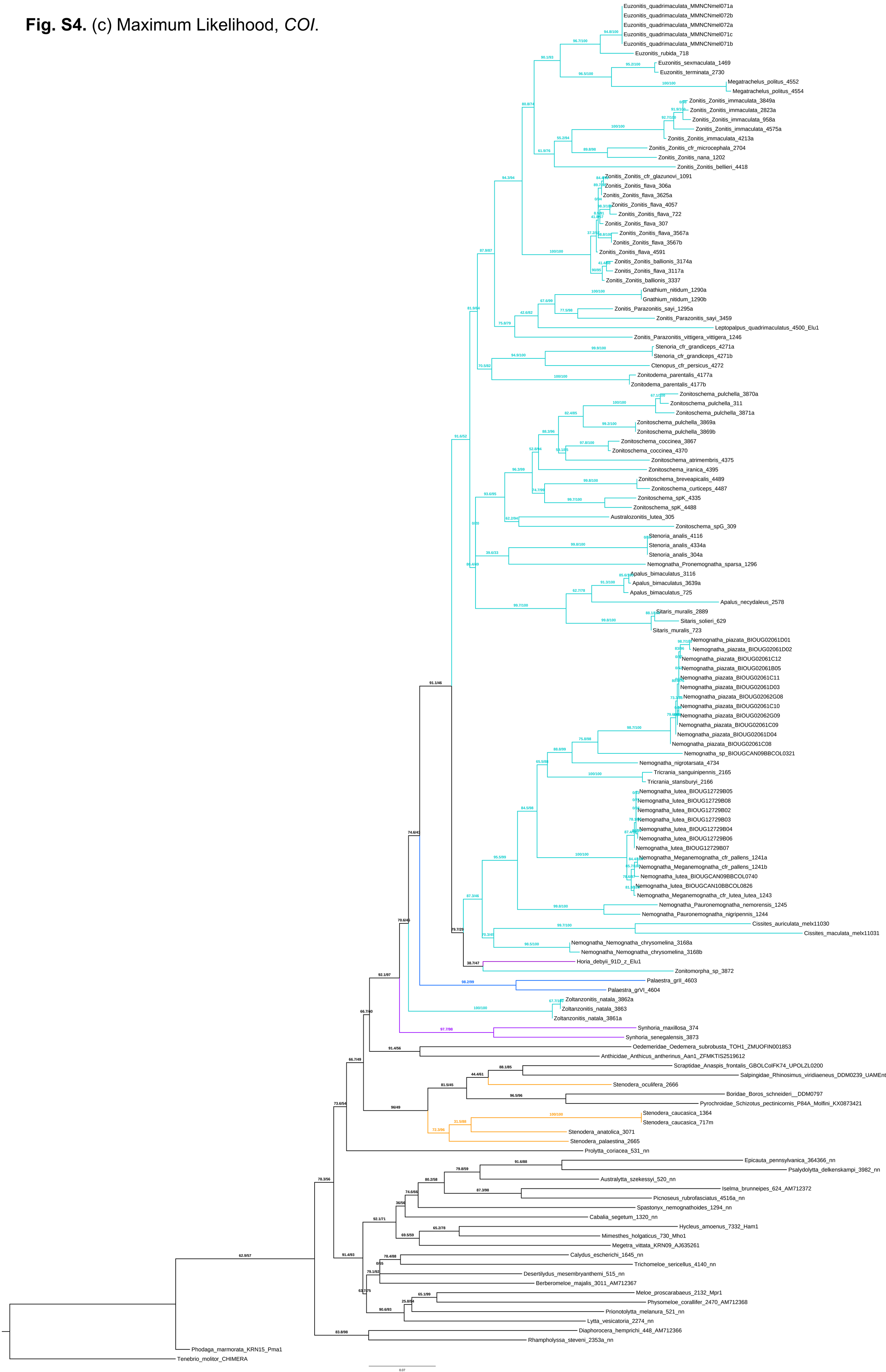


**Fig. S4.** (d) Bayesian Inference, *COI*.

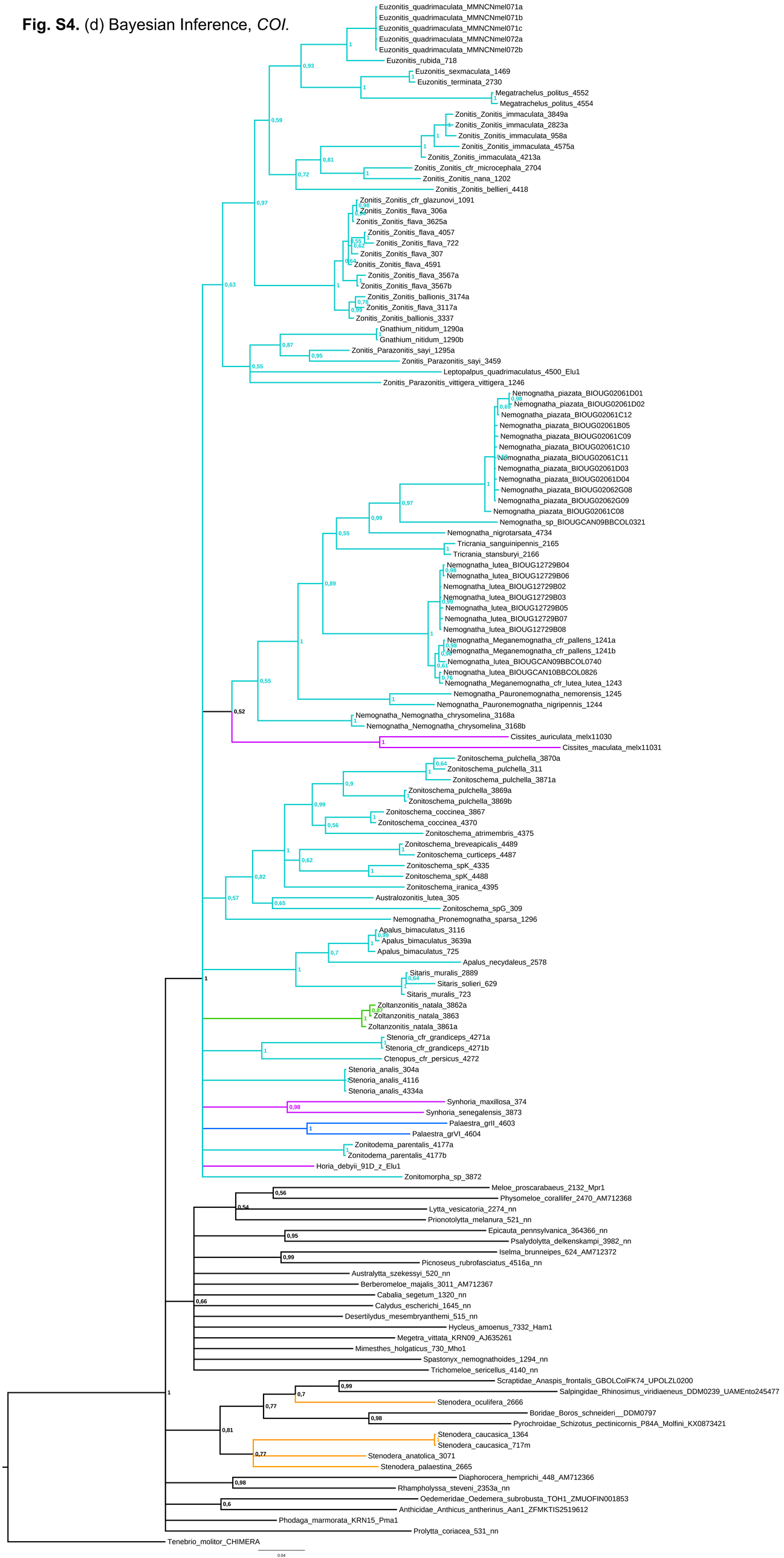


**Fig. S4.** (e) Maximum Likelihood, *CAD*.

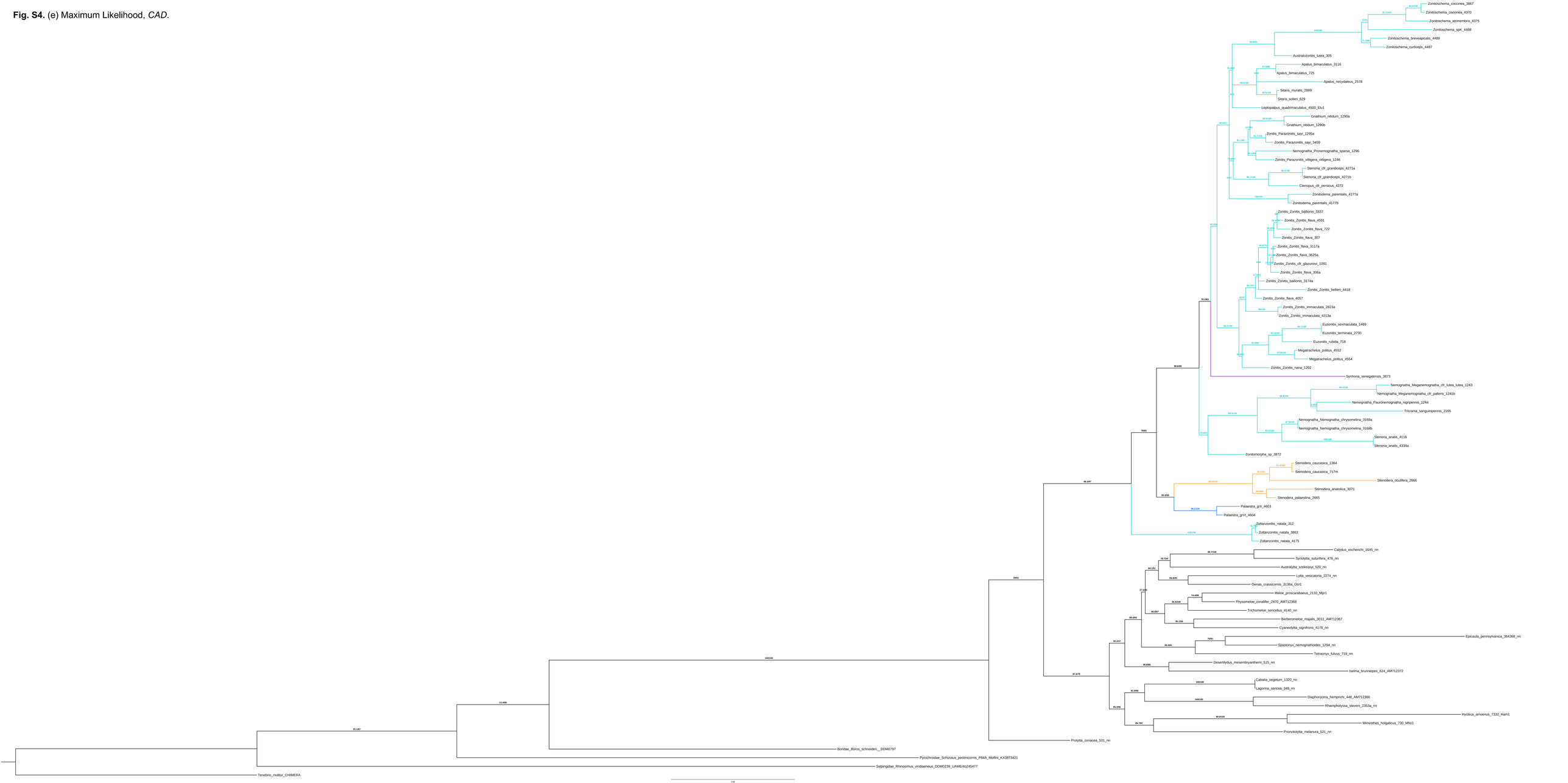


**Fig. S4.** (f) Bayesian Inference, *CAD*.

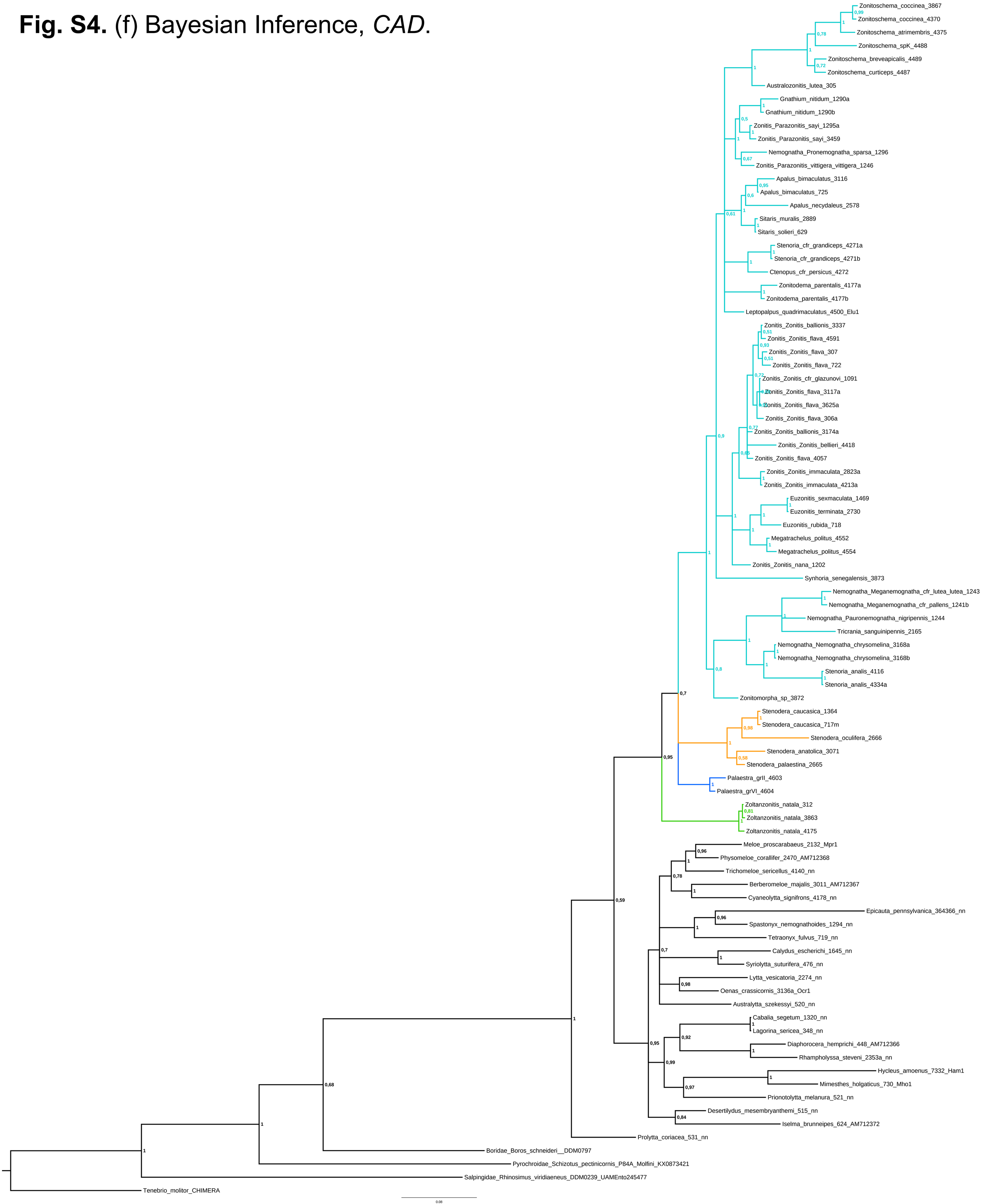


**Fig. S4.** (g) Maximum Likelihood, *28S*.

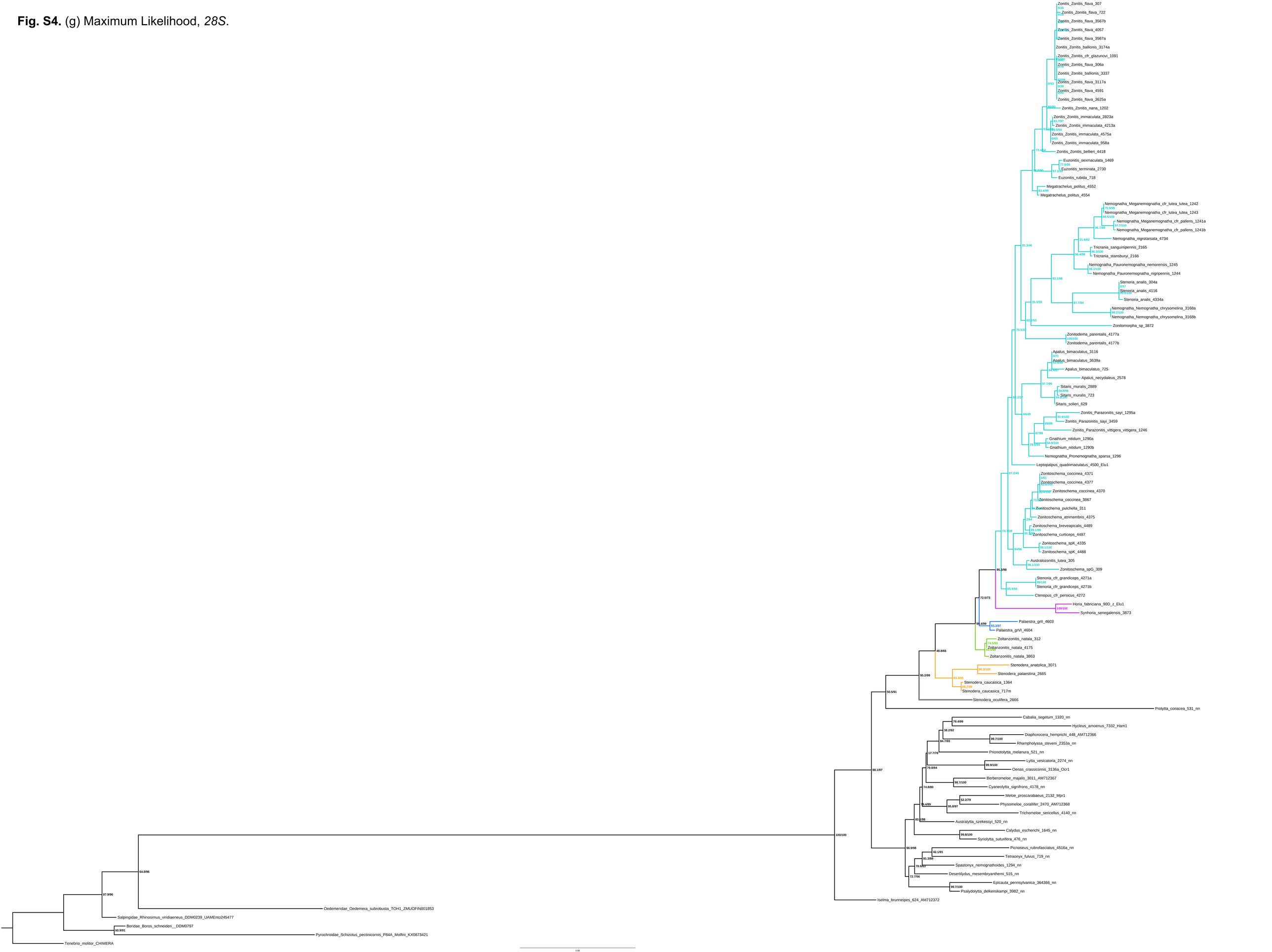


**Fig. S4.** (h) Bayesian Inference, *28S*.

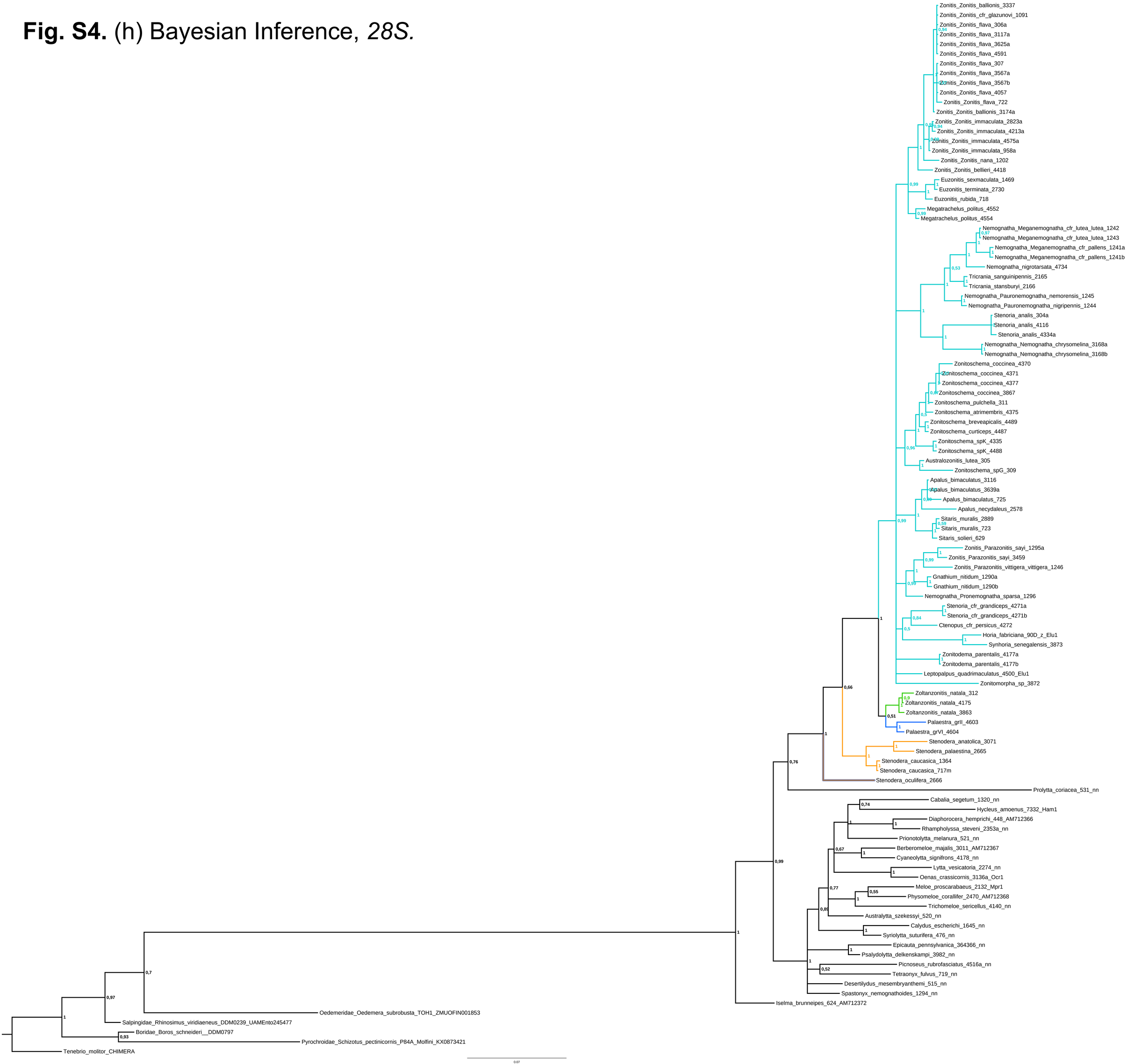


**Fig. S4.** (i) Maximum Likelihood, *ITS2*.

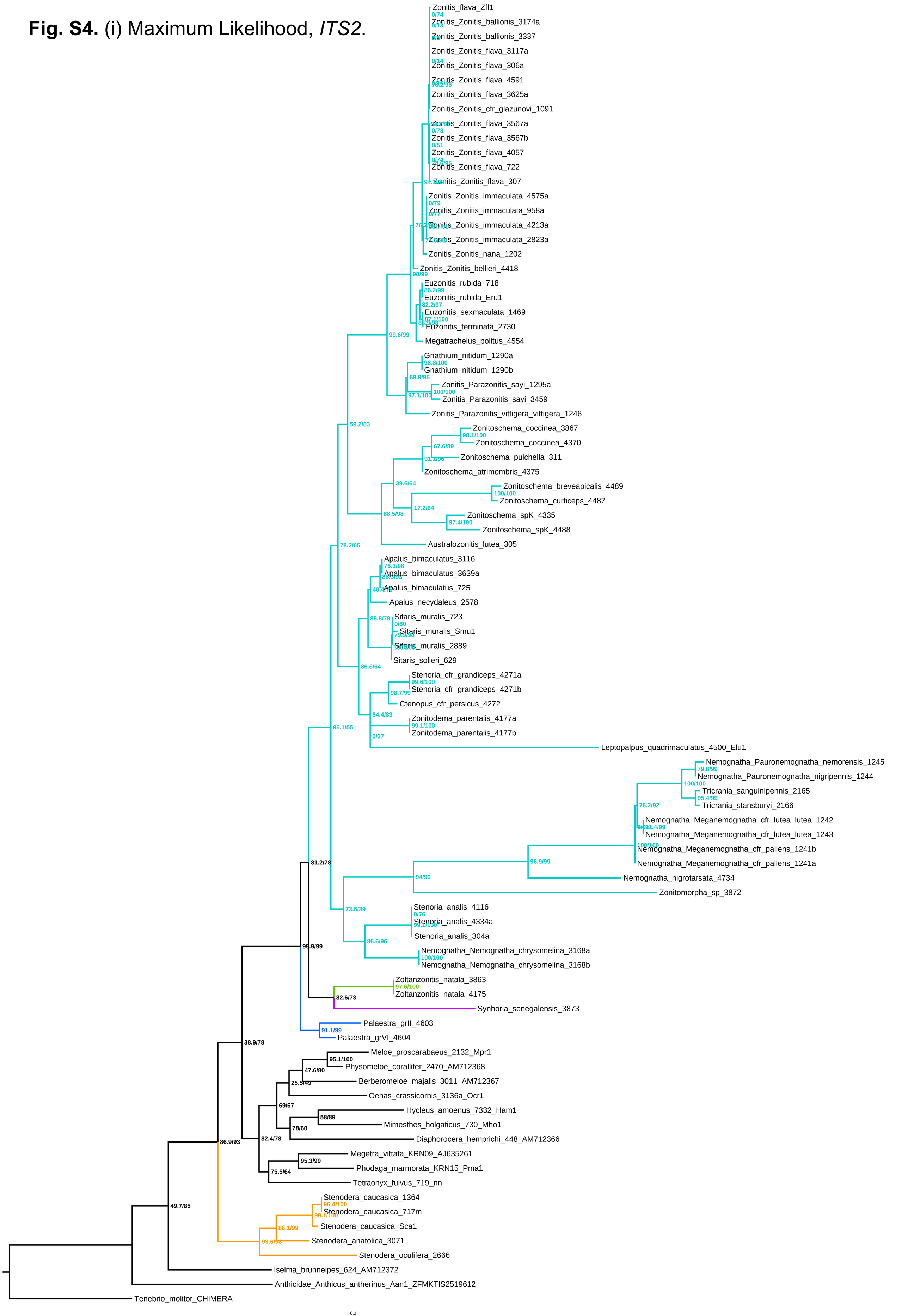


**Fig. S4.** (j) Bayesian Inference, *ITS2*.

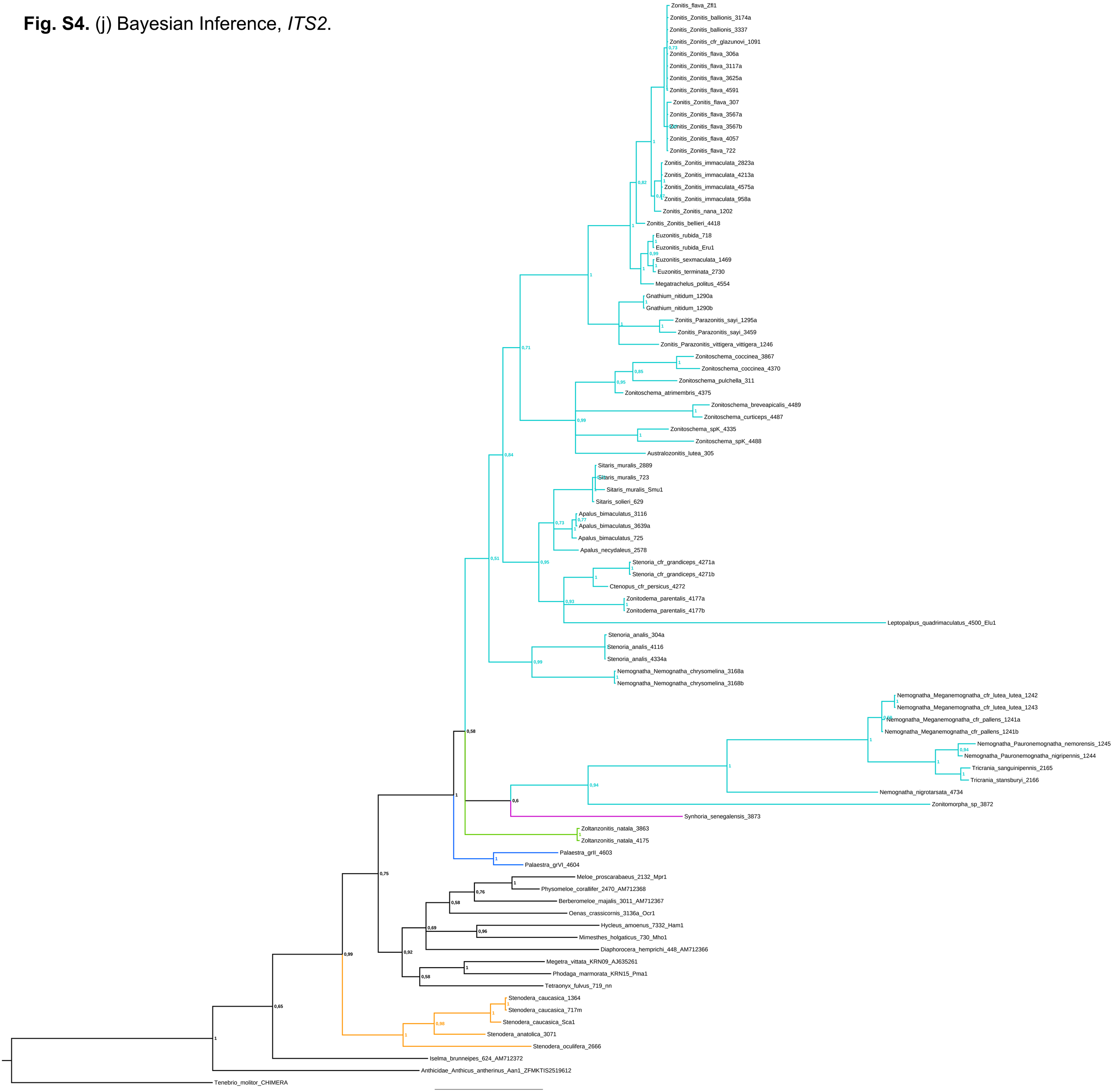
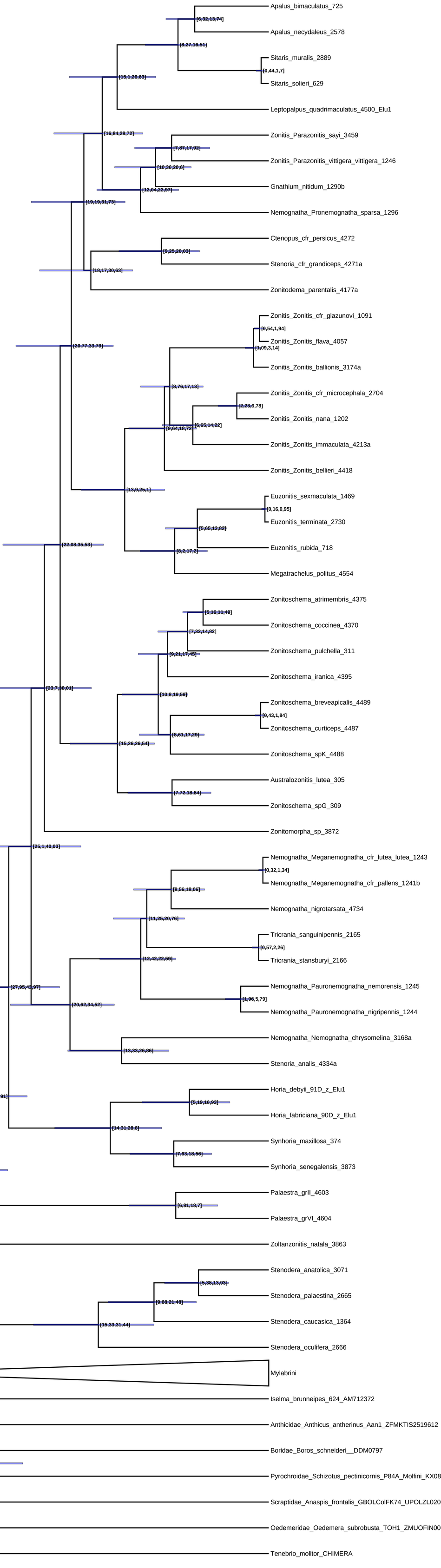


**Fig. S5.** (a) Time calibrated tree with dates reported at each node.

**Fig. S5.** (b) Time calibrated tree with High Posterior Densities (95%HPD) represented as bars and reported as numerical values on the branches.



DIVALIKE+j results:

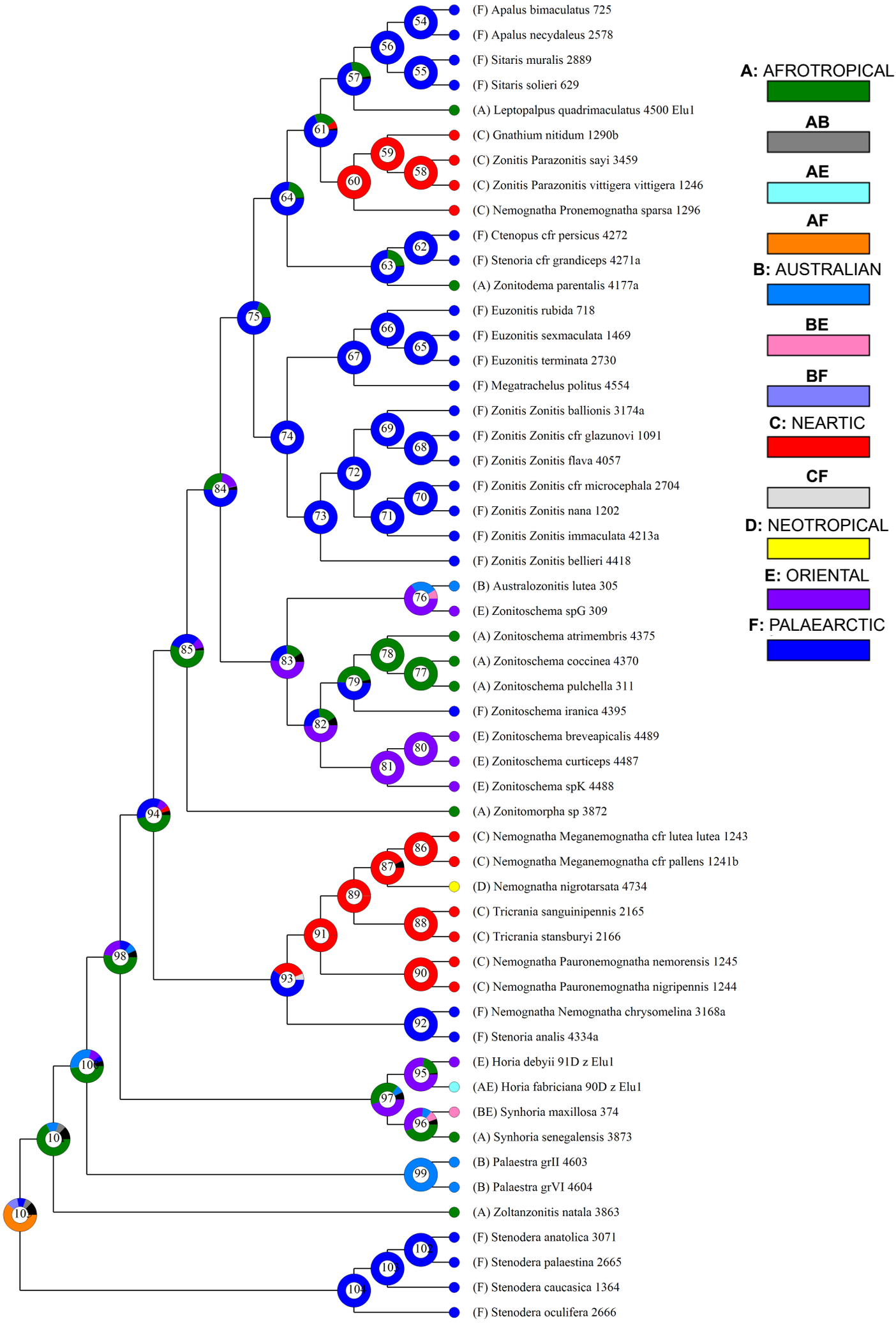



**Fig. S6.** Reconstruction of the ancestral states obtained with RASP using the DIVALIKE+J model, showing all the possible ancestral areas for each node with the relative probability represented as a pie chart.

**Table S1. Distribution of Nemognathinae tribes and genera in the main biogeographic regions.**

| Tribes and genera | Afrotropical | Palaearctic | Oriental | Australian | Nearctic | Neotropical |
|---|---|---|---|---|---|---|
| **Stenoderini** | | X | | | | |
| *Stenodera* | | X | | | | |
| **Zoltanzonitini** | X | | | | | |
| *Zoltanzonitis* | X | | | | | |
| **Palaestrini** | X | | X | X | | |
| *Palaestra* | X | | X | X | | |
| **Horiini** | X | | X | X | | X |
| *Cissites* | | | | | | X |
| *Horia* | X | | X | X | | |
| *Synhoria* | X | | X | X | | |
| **Nemognathini** | X | X | X | X | X | X |
| *Allendesalazaria* | | X | | | | |
| *Apalus* | ? | X | | | | |
| *Australozonitis* | X | | | X | | |
| *Cochliophorus* (?) | | X? | | | | |
| *Coriologiton* | X | | | | | |
| *Ctenopus* | | X | | | | |
| *Euzonitis* | | X | | | | |
| *Glasunovia* | | X | | | | |
| *Gnathium* | | | | | X | |
| *Gnathonemula* (?) | | X | | | | |
| *Hornia* | | | | | X | |
| *Leptopalpus* | | X | | | | |
| *Longizonitis* | | X | | | | |
| *Megatrachelus* | | X | | | | |
| *Nemognatha* | X | X | X | | X | X |
| *Neozonitis* | | | | | X | |
| *Palaestrida* | | | | X | | |
| *Parazonitis* | | | | | X | |
| *Pronemognatha* | | | | | X | |
| *Pulchrazonitis* | | | | X | | |
| *Pseudozonitis* | | | | | X | X |
| *Rhyphonemognatha* | | | | | X | X |
| *Sitaris s.l.* (inc. *Onycthenus*) | X | X | X | | | |
| *Sitarobrachys* | | X | | | | |
| *Sitaromorpha* (?) | | X | | | | |
| *Stenoria s.l.* | (X) | X | | | | |
| *Tricrania* | | | | | X | |
| *Zonitis s.l.* | (X) | X | | | | |
| *Zonitodema* | X | | | | | |
| *Zonitolytta* | | | | | | X |
| *Zonitomorpha* | X | | X | | | |
| *Zonitoschema* | X | x | X | X | | |

Genera marked with (?) are doubtful.

## Table S2. Species, Specimen code, sample localities, genes and GenBank accession numbers for the specimens included in this study.

| Family | Subfamily | Tribe | Species | Subgenus | Specimen Code | *16S* | *COI* | *CAD* | *ITS2* | *28S* | Collection Data | Latitude | Longitude | DATASET |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meloidae | Nemognathinae | Stenoderini | *Stenodera anatolica* | *Stenoderina* | 3071 | OP516272 | OP524524 | OP494622 | OP549911 | OP549986 | Turkey, Gümüşhane prov., 13-15 km N Kelkit, 6 km N Ülüpinar, 1800-2150 m | 40°9'11.69"N | 39°17'4.76"E | DS1, DS2 |
| Meloidae | Nemognathinae | Stenoderini | *Stenodera caucasica* | *Stenodera* | 717 | OP516273 | OP524526 | OP494623 | OP549913 | OP549987 | Turkey, Bilecik prov., Zemzemiye 15 Km E Bozüyük | 39°53'4.55"N | 30°16'1.60"E | DS1, DS2 |
| Meloidae | Nemognathinae | Stenoderini | *Stenodera caucasica* | *Stenodera* | 1364 | OM181816* | OP524525 | OM160745* | OP549912 | OM181921* | Turkey, Sinop prov., Küre Dağlari, 2 km W of Hidirli, Dranaz Geçidi S, 1103 m | 41°39'44.76"N | 34°52'28.42"E | DS1, DS2 |
| Meloidae | Nemognathinae | Stenoderini | *Stenodera oculifera* | | 2666 | OP516274 | OP524527 | OP494624 | OP549914 | OP549988 | Israel, Tel Hadid, Ben Shemen, Forest, 125 m | | | DS1, DS2 |
| Meloidae | Nemognathinae | Stenoderini | *Stenodera palaestina* | *Stenoderina* | 2665 | OP516275 | OP524528 | OP494625 | - | OP549989 | Israel, Tel Hadid, Ben Shemen, Forest, 125 m | | | DS1, DS2 |
| Meloidae | Nemognathinae | Zoltanzonitini | *Zoltanzonitis natala* | | 312 | OP516285 | - | OP494631 | - | OP549997 | South Africa, Mpumalanga, Kruger NP, Skukuza, 243 m | 24°59'31.73"S | 31°35'4.15"E | DS1, DS2 |
| Meloidae | Nemognathinae | Zoltanzonitini | *Zoltanzonitis natala* | | 3863 | OP516288 | OP524539 | OP494632 | OP549923 | OP549998 | Ivory Coast, Comoe, Kolomabira, 228 m | 8°29'19.21"N | 3°45'24.28"O | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Zoltanzonitini | *Zoltanzonitis natala* | | 4175 | OP516289 | - | OP494633 | OP549924 | OP549999 | South Africa, KwaZulu Natal, False bay | | | DS1, DS2 |
| Meloidae | Nemognathinae | Zoltanzonitini | *Zoltanzonitis natala* | | 3861a | OP516286 | OP524537 | - | - | - | Ivory Coast, Comoe, Zamou, 245 m | 8°32'50.10"N | 3°46'7.50"O | DS1, DS2 |
| Meloidae | Nemognathinae | Zoltanzonitini | *Zoltanzonitis natala* | | 3861b | OP516287 | - | - | - | - | Ivory Coast, Comoe, Zamou, 245 m | 8°32'50.10"N | 3°46'7.50"O | DS2 |
| Meloidae | Nemognathinae | Zoltanzonitini | *Zoltanzonitis natala* | | 3862a | - | OP524538 | - | - | - | Ivory Coast, Comoe, Zamou, 245 m | 8°32'50.10"N | 3°46'7.50"O | DS2 |
| Meloidae | Nemognathinae | Zoltanzonitini | *Zoltanzonitis testaceiventris* | | 92D | OP516290 | - | - | - | - | Kenya, SW of Voi | | | DS2 |
| Meloidae | Nemognathinae | Palaestrini | *Palaestra* gr. II | | 4603 | OP516266 | OP524519 | OP494618 | OP549906 | OP549981 | Australia, Western Australia, Charles Darwin Reserve | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Palaestrini | *Palaestra* gr. VI | | 4604 | OP516267 | OP524520 | OP494619 | OP549907 | OP549982 | Australia, Queensland, 35km W of Mt. Garnet | 17°54'36.00"S | 144°52'48.00"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Horiini | *Cissites auriculata* | | melx11030 | - | HF586634* | - | - | - | | | | DS2 |
| Meloidae | Nemognathinae | Horiini | *Cissites maculata* | | melx11031 | - | HF586635* | - | - | - | | | | DS2 |
| Meloidae | Nemognathinae | Horiini | *Horia debyii* | | 91D | OP516252 | OP524507 | - | - | - | Malaysia, W Kelantan, 30km NW Gua Musang, Ulu Lalat Mt.,Kampong Sungai om., 800-1000 m | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Horiini | *Horia fabriciana* | | 90D | OP516253 | - | - | - | OP549968 | Tanzania, Savanne Dodoma | | | DS1, DS2, Mol.Clock |

| Family | Subfamily | Tribe | Species | Subgenus | Specimen Code | *16S* | *COI* | *CAD* | *ITS2* | *28S* | Collection Data | Latitude | Longitude | DATASET |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meloidae | Nemognathinae | Horiini | *Synhoria maxillosa* | | 374 | OP516281 | OP524534 | - | - | - | Thailand, Chiang Mai prov., Doi Istanon Nat. Park, Mae Klang Waterfall, 400 m | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Horiini | *Synhoria senegalensis* | | 3873 | OM181817* | OM179741* | OM160746* | OP549920 | OM181922* | Ivory Coast, Man, Mt. Tonkoui, 1200 m | 7°27'11.17"N | 7°38'14.35"O | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Horiini | *Synhoria testacea* | | 86D | OP516282 | - | - | - | - | South Africa, Limpopo, Waterberg, Dombeya Res. | | | DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Apalus bimaculatus* | | 725 | OP516243 | OP524498 | OP494600 | OP549886 | OP549959 | Italy, Piemonte, Cuneo prov., Racconigi | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Apalus bimaculatus* | | 3116 | - | OP524496 | OP494599 | OP549884 | OP549957 | Hungary, Budapest, Újpest, 114 m | 47°33'34.77"N | 19°4'55.16"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Apalus bimaculatus* | | 3639a | - | OP524497 | - | OP549885 | OP549958 | Hungary, Budapest, Újpest, 114 m | 47°33'34.77"N | 19°4'55.16"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Apalus necydaleus* | | 2578 | OP516244 | OP524499 | OP494601 | OP549887 | OP549960 | Greece, Crete, Anogia, 500 m | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Australozonitis lutea* | | 305 | OP516245 | OP524500 | OP494602 | OP549888 | OP549961 | Australia, Camberra, Black Mountains | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Australozonitis tricolor* | | 59D | OP516246 | - | - | - | - | Australia, New South Wales, lower Widden Valley, near Widden | | | DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Ctenopus* cfr. *persicus* | | 4272 | OP516247 | OP524501 | OP494603 | OP549889 | OP549962 | Iran, Esfahan, W Na'in, Alun Abad, 2195 m | 32°54'59.01"N | 52°30'51.11"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Euzonitis quadrimaculata* | | MMNCNmel071a | - | EU448111* | - | - | - | | | | DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Euzonitis quadrimaculata* | | MMNCNmel071b | - | EU448112* | - | - | - | | | | DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Euzonitis rubida* | | 718 | - | OP524502 | OP494604 | OP549890 | OP549963 | Turkey, Içel prov., Çamalan-Gülek, 670 m | 37°9'45.59"N | 34°48'45.68"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Euzonitis sexmaculata* | | 1469 | OP516248 | OP524503 | OP494605 | OP549891 | OP549964 | Turkey, Bingöl prov., Bingöl, 8 km NE vs Erzurum, 1145 m | 38°56'21.99"N | 40°38'12.99"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Euzonitis terminata* | | 2730 | OP516249 | OP524504 | OP494606 | OP549892 | OP549965 | Israel, Mt. Tuv, SE slope | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Gnathium nitidum* | | 1290a | OP516250 | OP524505 | OP494607 | OP549893 | OP549966 | USA, Oregon, Laka Co., 11 mil SW Christhmas valley | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Gnathium nitidum* | | 1290b | OP516251 | OP524506 | OP494608 | OP549894 | OP549967 | USA, Oregon, Laka Co., 11 mil SW Chrysthmas valley | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Leptopalpus quadrimaculatus* | | 4500 | OP516254 | OP524508 | OP494609 | OP549895 | OP549969 | Oman, Dhofar, 20 km N of RaKijut, 1040 m | 16°47'53.93"N | 53°17'2.99"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Megatrachelus politus* | | 4552 | OP516255 | OP524509 | OP494610 | - | OP549970 | China, Inner Mongolia, Chifeng City, Ongniud Qi, Qigan, 617 m | 42°55'43.62"N | 119°18'44.16"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Megatrachelus politus* | | 4554 | OP516256 | OP524510 | OP494611 | OP549896 | OP549971 | China, Inner Mongolia, Chifeng City, Ongniud Qi, Qigan, 617 m | 42°55'43.62"N | 119°18'44.16"E | DS1, DS2, Mol.Clock |

| Family | Subfamily | Tribe | Species | Subgenus | Specimen Code | *16S* | *COI* | *CAD* | *ITS2* | *28S* | Collection Data | Latitude | Longitude | DATASET |
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| Meloidae | Nemognathinae | Nemognathini | *Nemognatha lutea* | *Meganemognatha* | BIOUG12729B02 | - | KR491014* | - | - | - | | | | DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha lutea* | *Meganemognatha* | BIOUGCAN09BBCOL0740 | - | HM433374* | - | - | - | | | | DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha lutea lutea* | *Meganemognatha* | 1242 | OP516257 | - | - | OP549897 | OP549972 | USA, Colorado, Otero Co., Rd to Vogel Can | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha lutea lutea* | *Meganemognatha* | 1243 | OP516258 | OP524511 | OP494612 | OP549898 | OP549973 | USA, Arizona, Mohave Co., Rt. 389, 3.5 mil W Kaibab, Paiute Indian Res. | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha* cfr. *pallens* | *Meganemognatha* | 1241a | OP516259 | OP524512 | - | OP549899 | OP549974 | USA, Utah, Wayne Co., Rt. 95 2.8-7.0 mil. S Hanskville | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha* cfr. *pallens* | *Meganemognatha* | 1241b | OP516260 | OP524513 | OP494613 | OP549900 | OP549975 | USA, Utah, Wayne Co., Rt. 95 2.8-7.0 mil. S Hanskville | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha chrysomelina* | | 3168a | OP516261 | OP524514 | OP494614 | OP549901 | OP549976 | Kazakhstan, Gulshat env. | 46°37'30.89"N | 74°21'28.94"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha chrysomelina* | | 3168b | OP516262 | OP524515 | OP494615 | OP549902 | OP549977 | Kazakhstan, Gulshat env. | 46°37'30.89"N | 74°21'28.94"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha nemorensis* | *Pauronemognatha* | 1245 | OM181788* | OM179726* | - | OP549904 | OM181900* | USA, New York, Seneca Co., Junius Ponds Sand Area | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha nigripennis* | *Pauronemognatha* | 1244 | OP516264 | OP524517 | OP494616 | OP549905 | OP549979 | USA, Utah, Garfeld Co., 14 mil. E Escalante | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha nigrotarsata* | *Nemognatha* | 4734 | OP516263 | OP524516 | - | OP549903 | OP549978 | Chile, Reg. Metrop. Santiago, Cajon del Maipo, El Manzano, 1135 m | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha piazata* | *Nemognatha* | BIOUG02061B05 | - | BBCCA2487-12** | - | - | - | | | | DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha piazata* | *Nemognatha* | BIOUG02061C08 | - | BBCCA2502-12** | - | - | - | | | | DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Nemognatha sparsa* | *Pronemognatha* | 1296 | OP516265 | OP524518 | OP494617 | - | OP549980 | USA, North Dakota, 2 mil N Belfield | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Pseudozonitis impressitorax* | | 63D | OP516268 | - | - | - | - | Bolivia, Santa Cruz prov., Pampa Grande | | | DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Sitaris muralis* | *Sitaris* | 723 | OP516270 | OP524522 | - | OP549909 | OP549984 | Italy, Umbria, Perugia prov., Barattano, Gualdo Cattaneo | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Sitaris muralis* | *Sitaris* | 2889 | OP516269 | OP524521 | OP494620 | OP549908 | OP549983 | Italy, Lazio, Roma prov., Roma Pietralata | 41°55'1.63"N | 12°33'34.09"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Sitaris solieri* | *Sitaris* | 629 | OP516271 | OP524523 | OP494621 | OP549910 | OP549985 | Italy, Sardegna, Sud Sardegna prov., Gonnosfanadiga, Monte Linas, Ovile Linas, 710 m | 39°27'7.05"N | 8°38'29.25"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Stenoria analis* | *Stenoria* | 4116 | OP516277 | OP524530 | OP494626 | OP549916 | OP549991 | Italy, Lazio, Roma prov., Castelporziano, Fosso quartacci | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Stenoria analis* | *Stenoria* | 304a | OP516276 | OP524529 | - | OP549915 | OP549990 | France, Loire-atlantique prov., Assèrac | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Stenoria analis* | *Stenoria* | 4334a | OP516278 | OP524531 | OP494627 | OP549917 | OP549992 | Italy, Lazio, Roma prov., Roma Verano | 41°54'5.45"N | 12°31'13.03"E | DS1, DS2, Mol.Clock |

| Family | Subfamily | Tribe | Species | Subgenus | Specimen Code | *16S* | *COI* | *CAD* | *ITS2* | *28S* | Collection Data | Latitude | Longitude | DATASET |
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| Meloidae | Nemognathinae | Nemognathini | *Stenoria* cfr. *grandiceps* | *Stenoria* | 4271a | OP516279 | OP524532 | OP494628 | OP549918 | OP549993 | Iran, Esfahan, W Na'in, Yurtga, 2318 m | 32°50'25.32"N | 52°43'50.15"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Stenoria* cfr. *grandiceps* | *Stenoria* | 4271b | OP516280 | OP524533 | OP494629 | OP549919 | OP549994 | Iran, Esfahan, W Na'in, Yurtga, 2318 m | 32°50'25.32"N | 52°43'50.15"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Tricrania sanguinipennis* | | 2165 | OP516283 | OP524535 | OP494630 | OP549921 | OP549995 | USA, New York, Herkimer Co., Rt8, 3 mi. E jct. Rts8 & 365 | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Tricrania stansburyi* | | 2166 | OP516284 | OP524536 | - | OP549922 | OP549996 | USA, Montana, Ravalli Co., 6 mil NW of Florence | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis ballionis* | *Zonitis* | 3337 | OP516295 | OP524544 | OP494638 | OP549929 | OP550004 | Iran, Nord Khorasan, Koppe Mts., 6 Km S of Kardeh, 1300 m | 36°20'58.63"N | 59°24'0.27"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis ballionis* | *Zonitis* | 3174a | OP516294 | OP524543 | OP494637 | OP549928 | OP550003 | Kazakhstan, Zhongghar Alatau, near Qyzylashy village | 45°32'59.90"N | 80°29'24.32"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis bellieri* | *Zonitis* | 4418 | OP516296 | OP524545 | OP494639 | OP549930 | OP550005 | Italy, Sicilia, Siracusa prov., Porto Palo | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis* cfr. *glazunovi* | *Zonitis* | 1091 | OP516297 | OP524546 | OP494640 | OP549931 | OP550006 | Greece, Tripoli prov., rd Tripoli-Sparti, 890 m | 37°18'31.16"N | 22°25'21.18"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis* cfr. *microcephala* | *Zonitis* | 2704 | OP516298 | OP524547 | - | - | - | Israel, Lahav, 340 m | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis flava* | *Zonitis* | 307 | OP516300 | OP524549 | OP494642 | OP549933 | OP550008 | Morocco, fes prov., Oued Matmata, rd P1, 260 m | 34°6'48.17"N | 4°32'18.42"O | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis flava* | *Zonitis* | 722 | OP516305 | OP524555 | OP494646 | OP549940 | OP550014 | Morocco, Berrechid, rd P7 | 33°13'21.65"N | 7°34'32.16"O | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis flava* | *Zonitis* | 4057 | OM181823* | OM179744* | OM160752* | OP549938 | OM181929* | France, Aveyron prov., 3 km E St. Affrique, 575 m | 44°0'37.00"N | 3°0'38.00"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis flava* | *Zonitis* | 4591 | OP516304 | OP524554 | OP494645 | OP549939 | OP550013 | Italy, Sicilia, Caltannissetta prov., Gela, contrada Feudo nobile | 37°3'25.09"N | 14°24'49.96"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis flava* | *Zonitis* | 306a | OP516299 | OP524548 | OP494641 | OP549932 | OP550007 | Italy, Lazio, Roma prov.,, Tolfa, Valle F. Lenta, Seccareccio | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis flava* | *Zonitis* | 3117a | OP516301 | OP524550 | OP494643 | OP549934 | OP550009 | Hungary, Dabas | 47°8'52.82"N | 19°18'40.04"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis flava* | *Zonitis* | 3567a | - | OP524551 | - | OP549935 | OP550010 | Tunisia, Nabeul, rd. C26 15 km S Tazoghrane, 1340 m | 36°49'22.70"N | 10°40'12.00"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis flava* | *Zonitis* | 3567b | OP516302 | OP524552 | - | OP549936 | OP550011 | Tunisia, Nabeul, rd. C26 15 km S, Tazoghrane, 1340 m | 36°49'22.70"N | 10°40'12.00"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis flava* | *Zonitis* | 3625a | OP516303 | OP524553 | OP494644 | OP549937 | OP550012 | Italy, Sicilia, Agrigento prov., Selinunte | 37°35'3.02"N | 12°49'58.17"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis immaculata* | *Zonitis* | 2823a | OP516306 | OP524556 | OP494647 | OP549941 | OP550015 | Italy, Sicilia, Messina prov., Mandanici | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis immaculata* | *Zonitis* | 3849a | - | OP524557 | - | - | - | Italy, Lazio, Viterbo prov., Tarquinia | 42°14'46.79"N | 11°46'45.27"E | DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis immaculata* | *Zonitis* | 4213a | OP516307 | OP524558 | OP494648 | OP549942 | OP550016 | Spain, Granada prov., Diezma | 37°18'47.57"N | 3°20'8.89"O | DS1, DS2, Mol.Clock |

| Family | Subfamily | Tribe | Species | Subgenus | Specimen Code | *16S* | *COI* | *CAD* | *ITS2* | *28S* | Collection Data | Latitude | Longitude | DATASET |
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| | | | | | | | | | | | Cemetery, 1200 m | | | |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis immaculata* | *Zonitis* | 4575a | OP516308 | OP524559 | - | OP549943 | OP550017 | Cyprus, 1 km N Archiata | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis immaculata* | *Zonitis* | 958a | OP516309 | OP524560 | - | OP549944 | OP550018 | Greece, Patra prov., N Erimanthos Mts, above Kato Vlassia, 1560-1580 m | 37°57'38.10"N | 21°54'31.57"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis nana* | *Zonitis* | 1202 | OP516310 | OP524561 | OP494649 | OP549945 | OP550019 | Turkey, Kastamonu prov., Ilgaz Dağlari N, 5 km N of Sümenler, 1404 m | 41°4'30.90"N | 33°18'59.30"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis sayi* | *Parazonitis* | 3459 | OP516292 | OP524541 | OP494635 | OP549926 | OP550001 | USA, Arizona, Cochise Co, Huachaca Mts., Gouracem can. | 31°23'58.55"N | 110°17'59.78"O | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis sayi* | *Parazonitis* | 1295a | OP516291 | OP524540 | OP494634 | OP549925 | OP550000 | USA, North Dakota, 2 mil N Belfield | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitis vittigera vittigera* | *Parazonitis* | 1246 | OP516293 | OP524542 | OP494636 | OP549927 | OP550002 | USA, New York, Seneca Co., Junius Ponds Sand Area | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitodema parentalis* | | 4177a | OP516311 | OP524562 | OP494650 | OP549946 | OP550020 | South Africa, Eastern Cape, Groot Winterberg | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitodema parentalis* | | 4177b | OP516312 | OP524563 | OP494651 | OP549947 | OP550021 | South Africa, Eastern Cape, Groot Winterberg | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitomorpha* sp. | | 3872 | OP516313 | OP524564 | OP494652 | OP549948 | OP550022 | Ivory Coast, Comoe, Kolomabira, 228 m | 8°29'19.21"N | 3°45'24.28"O | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema atrimembris* | | 4375 | OP516314 | OP524565 | OP494653 | OP549949 | OP550023 | Gabon, Ogoué-Ivindo, Ivindo N.P., Ipassa | 0°30'44.93"N | 12°48'10.02"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema breveapicalis* **n. comb.** | | 4489 | OP516315 | OP524566 | OP494654 | OP549950 | OP550024 | Vietnam, Thanh Hoa, Ba Thuoc, Thanh Lam, Pu Long nat res, 450 m | 20°26'49.18"N | 105°8'52.69"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema coccinea* | | 3867 | OP516316 | OP524567 | OP494655 | OP549951 | OP550025 | Ivory Coast, Comoe, Kolomabira, 228 m | 8°29'19.21"N | 3°45'24.28"O | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema coccinea* | | 4370 | OP516317 | OP524568 | OP494656 | OP549952 | OP550026 | Gabon, Ogoué-Ivindo, Ivindo N.P., Ipassa | 0°30'44.93"N | 12°48'10.02"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema coccinea* | | 4371 | OP516318 | - | - | - | OP550027 | Gabon, Ogoué-Ivindo, Ivindo N.P., Ipassa | 0°30'44.93"N | 12°48'10.02"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema coccinea* | | 4377 | OP516319 | - | - | - | OP550028 | Gabon, Ogoué-Ivindo, Ivindo N.P., Ipassa | 0°30'44.93"N | 12°48'10.02"E | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema curticeps* **n. comb.** | | 4487 | OP516320 | OP524569 | OP494657 | OP549953 | OP550029 | Vietnam, Thanh Hoa, Ba Thuoc, Thanh Lam, Pu Long N.R., 450 m | 20°26'49.18"N | 105°8'52.69"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema iranica* | | 4395 | OP516321 | OP524570 | - | - | - | Saudi Arabia, Riyadh, Ibex Res. Prot. Area, Wof | 23°21'7.00"N | 46°21'36.01"E | DS1, DS2, Mol.Clock |

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| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema pulchella* | | 311 | OP516323 | OP524571 | - | OP549954 | OP550030 | Hotat Bani Tamim, 709 m Mozambique, Matutuine distr., Gala | 26°37'44.90"S | 32°50'13.70"E | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema pulchella* | | 2793 | OP516322 | - | - | - | - | Gabon, Ogoué-Ivindo, Ivindo N.P., Ipassa | 0°30'44.93"N | 12°48'10.02"E | DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema pulchella* | | 3869a | OP516324 | OP524572 | - | - | - | Ivory Coast, Comoe, Zamou, 245 m | 8°32'50.10"N | 3°46'7.50"O | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema pulchella* | | 3869b | OP516325 | OP524573 | - | - | - | Ivory Coast, Comoe, Zamou, 245 m | 8°32'50.10"N | 3°46'7.50"O | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema pulchella* | | 3870a | OP516326 | OP524574 | - | - | - | Ivory Coast, Comoe, Zamou, 245 m | 8°32'50.10"N | 3°46'7.50"O | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema pulchella* | | 3871a | OP516327 | OP524575 | - | - | - | Ivory Coast, Comoe, Zamou, 245 m | 8°32'50.10"N | 3°46'7.50"O | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema* sp. G | | 309 | OP516328 | OP524576 | - | - | OP550031 | China, Zhejiang, Wuyantag | | | DS1, DS2, Mol.Clock |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema* sp. K | | 4335 | OP516329 | OP524577 | - | OP549955 | OP550032 | Vietnam, Kon Tum Province, Kon Plong env., 1120 m | | | DS1, DS2 |
| Meloidae | Nemognathinae | Nemognathini | *Zonitoschema* sp. K | | 4488 | OP516330 | OP524578 | OP494658 | OP549956 | OP550033 | Vietnam, Thanh Hoa, Ba Thuoc, Thanh Lam, Pu Long N.R., 450 m | 20°26'49.18"N | 105°8'52.69"E | DS1, DS2, Mol.Clock |
| Meloidae | Eleticinae | Derideini | *Iselma brunneipes* | | | OM181742* | OM179712* | OM160700* | AM712372* | OM181856* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Cerocomini | *Diaphorocera hemprichi* | | | OM181738* | OM179710* | OM160696* | AM712366* | OM181853* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Cerocomini | *Rhampholyssa steveni* | | | OM181814* | OM179739* | OM160743* | - | OM181919* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Epicautini | *Epicauta delkenskampi* | | | OM181809* | OM179735* | | - | OM181916* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Epicautini | *Epicauta pennsylvanica* | | | OM181741* | OM179711* | OM160699* | - | OM181855* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Eupomphini | *Megetra vittata* | | | MK024640* | MK024504* | | AJ635261* | - | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Eupomphini | *Phodaga marmorata* | | | MK024645* | MK024509* | | AJ635260* | - | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | *Incertae sedis* | *Spastonyx nemognathoides* | | | OM181815* | OM179740* | OM160744* | - | OM181920* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lineage III *sensu* Riccieri *et al.*, 2022 | *Trichomeloe sericellus* | | | OM181822* | OM179743* | OM160751* | - | OM181928* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lineage IV *sensu* Riccieri *et al.*, 2022 | *Calydus escherichi* | | | OM181733* | OM179707* | OM160690* | - | OM181847* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lineage IV *sensu* Riccieri *et al.*, 2022 | *Syriolytta suturifera* | | | OM181818* | | OM160747* | - | OM181923* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lineage IX *sensu* Riccieri *et al.*, 2022 | *Australytta szekessy* | | | OM181723* | OM179698* | OM160682* | - | OM181836* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lineage V *sensu* Riccieri *et al.*, 2022 | *Berberomelo majalis* | | | OM181729* | OM179703* | OM160687* | AM712367* | OM181841* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lineage V *sensu* Riccieri *et al.*, 2022 | *Cyaneolytta signifrons* | | | OM181736* | | OM160693* | - | OM181850* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lineage VI *sensu* Riccieri *et al.*, 2022 | *Cabalia segetum* | | | OM181732* | OM179706* | MF426751* | - | OM181846* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lineage VI *sensu* Riccieri *et al.*, 2022 | *Lagorina sericea* | | | OM181743* | | OM160701* | - | - | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lineage VII *sensu* Riccieri *et al.*, 2022 | *Prionotolytta melanura* | | | OM181803* | OM179732* | OM160738* | - | OM181911* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lineage VIII *sensu* Riccieri *et al.*, 2022 | *Prolytta coriacea* | | | OM181805* | OM179733* | OM160740* | - | OM181913* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lineage X *sensu* Riccieri *et al.*, 2022 | *Desertilydus mesembrianthemi* | | | OM181737* | OM179709* | OM160695* | - | OM181852* | | | | DS1, DS2, Mol.Clock |

| Family | Subfamily | Tribe | Species | Subgenus | Specimen Code | *16S* | *COI* | *CAD* | *ITS2* | *28S* | Collection Data | Latitude | Longitude | DATASET |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meloidae | Meloinae | Lyttini | *Lytta vesicatoria* | | | OM181774* | OM179719* | OM160720* | - | OM181888* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Lyttini | *Oenas crassicornis* | | | OM181791* | | OM160734* | AJ635263* | OM181903* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Meloini | *Meloe proscarabaeus* | | | OM181785* | OM179724* | OM160728* | AJ635265* | OM181897* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Meloini | *Physomeloe corallifer* | | | OM181797* | OM179727* | OM160737* | AM712368* | OM181907* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Mylabrini | *Hycleus amoenus* | | | - | MN849957* | MN845387* | AM712360* | MN848637* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Mylabrini | *Mimesthes holgaticus* | | | - | MH668518* | MH668491* | AM712364* | - | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Pyrotini | *Picnoseus rubrofasciatus* | | | OM181799* | OM179729* | | - | OM181908* | | | | DS1, DS2, Mol.Clock |
| Meloidae | Meloinae | Tetraonycini | *Tetraonyx fulvus* | | | AM712135* | | OM160749* | AM712377* | OM181925* | | | | DS1, DS2, Mol.Clock |
| Anthicidae | | | *Anthicus antherinus* | | | AM712136* | KU906310* | | AM712378* | - | | | | DS1, DS2, Mol.Clock |
| Boridae | | | *Boros schneideri* | | | - | | KP812767* | - | KP419374* | | | | DS1, DS2, Mol.Clock |
| Oedemeridae | | | *Oedemera subrobusta* | | | LC136621* | KJ964804* | | - | LC136761* | | | | DS1, DS2, Mol.Clock |
| Pyrochroidae | | | *Schizotus pectinicornis* | | | KX087342* | OM179745* | OM160753* | - | OM181930* | | | | DS1, DS2, Mol.Clock |
| Salpingidae | | | *Rhinosimus viridianaeus* | | | - | KU876093* | KP813007* | - | KP419629* | | | | DS1, DS2 |
| Scraptidae | | | *Anaspis frontalis* | | | FJ903776* | KM441263* | | | - | | | | DS1, DS2, Mol.Clock |
| Tenebrionidae | | | *Tenebrio molitor* | | | AJ633673* | KR915361* | KU233967* | AJ635266* | KU233744* | | | | DS1, DS2, Mol.Clock |

Asterisks (*) indicate Genbank data; double asterisks (**) indicate BOLD data. Information about collection data is given only for those samples newly obtained in this paper. Coordinates are indicated only when available. The column "Dataset" indicates in which dataset the samples were included: DS1, Dataset1; DS2, Dataset2; Mol.Clock, molecular clock analysis.

**Table S3. List of primers used in this work and their sequences.**

| Gene | Primer | Sequence | Thermal cycle |
|---|---|---|---|
| ***16S*** | 16SK1 [1] | CATGTCTTTTTGWTAATTAT | 94°C for 5 min; (94°C for 1:00 min; 51°C for 1:30 min; 72°C for 1:30 min) × 40; 72° for 10 min |
| | 16SK2 [1] | AAAGTTTYAAAAGTCGAACAGACT | |
| ***COI*** | LCO1490 [2] | GGTCAACAAATCATAAAGATATTGG | 94°C for 3:00 min; (94°C for 1:00 min; 46°C for 1:30 min; 72°C for 1:30 min) × 5; (94°C for 1:00 min; 48°C for 1:30 min; 72°C for 1:30 min) × 35; 72°C for 6:00 min |
| | HCO2198 [2] | TAAACTTCAGGGTGACCAAAAATCA | |
| | COIMelZ2 [3] | GGGTCAAAGAARGATGTATT | |
| ***CAD*** | CD439F [4] | TTCAGTGTACARTTYCAYCCHGARCAYAC | 94°C for 2 min; (94°C for 0:30 min; 55°C for 0:30 min; 72°C for 1:00 min) × 5; (94°C for 0:30 min; 50°C for 0:30 min; 72°C for 1:00 min) × 5; (94°C for 0:30 min; 45°C for 0:30 min; 72°C for 1:00 min) × 35; 72° for 3:00 min |
| | CD688R [4] | TGTATACCTAGAGGATCDACRTTYTCCATRTTRCA | |
| | CD668R [4] | ACGACTTCATAYTCNACYTCYTTCCA | |
| ***28S*** | 28S01 [5] | GACTACCCCCTGAATTTAAGCAT | 94°C for 2:00 min (94°C for 1:00 min; 56°C for 1:00 min; 72°C for 2'00 min) × 35; 72° for 3:00 min |
| | 28SR01 [5] | GACTCCTTGGTCCGTGTTTCAG | |
| ***ITS2*** | 3D [6] | GCATCGATGAAGAACGCAGCWAA | 94°C for 5:00 min (94°C for 0:30 min; 55°C for 0:45 min; 72°C for 1:00 min) × 40; 72° for 7:00 min |
| | 4R[6] | AGTTTCTTTTCCTCCGCTTA | |

PCR Thermal Cycle conditions for each gene are also reported. References cited are: [1] Pitzalis 2007; [2] Folmer *et al.* (1994); [3] Salvi *et al.* (2019); [4] Wild and Maddison (2008); [5] Kim *et al.* (2000); [6] Oliverio and Mariottini (2001).

**Table S4. Results of the model test performed with BioGeoBEARS implemented in RASP (ver. 4.2).**

| | LnL | numparams | d | e | j | AICc | AICc_wt |
|---|---|---|---|---|---|---|---|
| DEC | -87.77 | 2 | 0.0039 | 0.0068 | 0 | 179.8 | 6.80E-09 |
| DEC+J | -68.6 | 3 | 0.0007 | 1.00E-12 | 0.034 | 143.7 | 4.70E-01 |
| DIVALIKE | -86.63 | 2 | 0.0045 | 0.0043 | 0 | 177.5 | 2.10E-08 |
| DIVALIKE+J | -68.55 | 3 | 0.0007 | 1.00E-12 | 0.037 | 143.6 | 4.90E-01 |
| BAYAREALIKE | -98.8 | 2 | 0.0044 | 0.029 | 0 | 201.8 | 1.10E-13 |
| BAYAREALIKE+J | -71.05 | 3 | 0.0005 | 1.00E-07 | 0.038 | 148.6 | 0.04 |

# Use the highest AICc_wt to select the best model

==========

| alt | null | LnLalt | LnLnull | DFalt | DFnull | DF | Dstatistic | pval | test | Tail(s) | AIC 1 | AIC 2 | AICwt 1 | AICwt2 | AICweight_ratio _model1 | AICweight_ratio _model2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DEC+J | DEC | -68.6 | -87.77 | 3 | 2 | 1 | 38.35 | 5.90E-10 | $\chi^2$ | 1 | 143 | 180 | 1 | 1.30E-08 | 7.82E+07 | 1.30E-08 |
| DIVALIKE+J | DIVALIKE | -68.55 | -86.63 | 3 | 2 | 1 | 36.16 | 1.80E-09 | $\chi^2$ | 1 | 143 | 177 | 1 | 3.80E-08 | 2.61E+07 | 3.80E-08 |
| BAYAREALIKE+J | BAYAREALIKE | -71.05 | -98.8 | 3 | 2 | 1 | 55.51 | 9.30E-14 | $\chi^2$ | 1 | 148 | 202 | 1 | 2.40E-12 | 4.17E+11 | 2.40E-12 |

# The p-value of the LRT (Likelihood Ratio Test) tells you whether or not you can reject

# the null hypothesis that without J and +J confer equal likelihoods on the data.

[END]

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