

**Table S1.** Taxa used in the present study and their accession numbers.

| Superfamily                        | Family                           | Species                         | Mitogenome                  | H3                                | 18S rRNA                             | 28S rRNA                             |                                      |
|------------------------------------|----------------------------------|---------------------------------|-----------------------------|-----------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| Mantoidoidea                       | Mantoididae                      | <i>Mantoida</i> sp.             | BK062891                    | NA                                | OP962224                             | OP962222                             |                                      |
| Metallyticoidea                    | Metallyticidae                   | <i>Metallyticus splendidus</i>  | KY689122                    | FJ806762                          | FJ806399                             | FJ806598                             |                                      |
| Thespoidea                         | Thespidae                        | * <i>Thesprotiella</i> sp.      | OP831271                    | OP831576                          | OP856578                             | OP881396                             |                                      |
|                                    | Angelidae                        | * <i>Angela</i> sp.             | OP831256                    | OP831556                          | OP856558                             | OP881376                             |                                      |
|                                    | Coptopterygidae                  | <i>Brunneria borealis</i>       | BK062890                    | SRR1811961                        | KU557277                             | KU557282                             |                                      |
|                                    |                                  | * <i>Coptopteryx</i> sp.        | OP831272                    | OP831561                          | OP856563                             | OP881381                             |                                      |
|                                    |                                  | * <i>Metilia</i> sp.            | OP831277                    | OP831572                          | OP856574                             | OP881392                             |                                      |
| Acanthopoidea                      | Acanthopidae                     | <i>Acontista multicolor</i>     | BK062892                    | SRR1811954                        | KU320383<br>( <i>A. gracilis</i> )   | KU320487<br>( <i>A. gracilis</i> )   |                                      |
|                                    |                                  | * <i>Stenophylla lobivertex</i> | OP831269                    | EF384167                          | EF383589                             | EF383755                             |                                      |
|                                    | Liturgusidae                     | * <i>Hagiomantis</i> sp.        | OP831266                    | OP831568                          | OP856570                             | OP881388                             |                                      |
|                                    | Photinaidae                      | <i>Macromantis hyalina</i>      | MT370515                    | KU507864                          | KU320416                             | KU320520                             |                                      |
|                                    | Chroicopteroida                  | Chroicopteridae                 | * <i>Carvilia saussurii</i> | OP831259                          | OP831559                             | OP856561                             | OP881379                             |
| * <i>Gonypetella</i> sp.           |                                  |                                 | OP831265                    | OP831567                          | OP856569                             | OP881387                             |                                      |
| * <i>Leptomantella xizangensis</i> |                                  |                                 | OP831275                    | NA                                | NA                                   | NA                                   |                                      |
| Leptomantellidae                   |                                  | <i>Leptomantella albella</i>    | KJ463364                    | FJ806736                          | FJ806486                             | FJ806572                             |                                      |
|                                    |                                  | <i>Amorphoscelis singporana</i> | MT370512                    | FJ806730                          | FJ806366                             | FJ806565                             |                                      |
| Nanomantoidea                      |                                  | Nanomantidae                    | <i>Eomantis yunnanensis</i> | KY689138                          | EF384094 ( <i>E. guttatipennis</i> ) | EF383515 ( <i>E. guttatipennis</i> ) | EF383676 ( <i>E. guttatipennis</i> ) |
|                                    |                                  |                                 | <i>Tropidomantis tenera</i> | NC037205                          | FJ806738                             | FJ806375                             | FJ806574                             |
|                                    | <i>Pliacanthopus bimaculatus</i> |                                 | NC051490                    | NA                                | FJ806502 ( <i>P. mantispoides</i> )  | FJ806704 ( <i>P. mantispoides</i> )  |                                      |
|                                    | <i>Sceptuchus simplex</i>        |                                 | NC037206                    | EF384113                          | EF383534                             | EF383697                             |                                      |
|                                    | <i>Spilomantis occipitalis</i>   |                                 | KX091854                    | FJ806843 ( <i>S. nitens</i> )     | FJ806483 ( <i>S. nitens</i> )        | FJ806685 ( <i>S. nitens</i> )        |                                      |
|                                    | <i>Amantis nawai</i>             |                                 | NC037203                    | FJ806722 ( <i>A. reticulata</i> ) | FJ806337 ( <i>A. reticulata</i> )    | FJ806535 ( <i>A. reticulata</i> )    |                                      |
|                                    | <i>Theopompa</i> sp.             |                                 | KU201313                    | NA                                | NA                                   | NA                                   |                                      |
| Epaphroditoidea                    | Epaphroditidae                   | <i>Humbertiella nada</i>        | NC030264                    | EF384090 ( <i>H. similis</i> )    | FJ806501 ( <i>H. ocularis</i> )      | FJ806570 ( <i>H. ocularis</i> )      |                                      |
|                                    |                                  | * <i>Brancsikia freyi</i>       | OP831276                    | OP831558                          | OP856560                             | OP881378                             |                                      |
|                                    |                                  | * <i>Epaphrodita musarum</i>    | OP831278                    | OP831563                          | OP856565                             | OP881383                             |                                      |
| Haanioidea                         | Haaniidae                        | <i>Caliris</i> sp.              | KY689126                    | NA                                | NA                                   | NA                                   |                                      |
|                                    |                                  | <i>Arria pallida</i>            | NC051892                    | FJ806785 ( <i>A.</i>              | FJ806422 ( <i>A.</i>                 | FJ806624 ( <i>A.</i>                 |                                      |

|                  |                 |                                 |          |  |  |  |
|------------------|-----------------|---------------------------------|----------|--|--|--|
|                  |                 |                                 |          | <i>meghalayensis</i>                   | <i>meghalayensis</i> )                 | <i>meghalayensis</i><br>s)             |
|                  |                 | <i>Haania</i> sp.               | KY689130 | FJ806842 ( <i>H. lobiceps</i> )        | FJ806482 ( <i>H. lobiceps</i> )        | FJ806684 ( <i>H. lobiceps</i> )        |
| Hoplocoryphoidea | Hoplocoryphidae | * <i>Hoplocorypha</i> sp.       | OP831267 | OP831569                               | OP856571                               | OP881389                               |
| Miomantoidea     | Miomantidae     | * <i>Cilnia humeralis</i>       | OP831261 | OP831560                               | OP856562                               | OP881380                               |
| Galinthiadoidea  | Galinthiidae    | * <i>Galinthias amoena</i>      | OP831264 | OP831566                               | OP856568                               | OP881386                               |
|                  | Eremiaphilidae  | <i>Schizocephala bicornis</i>   | NC037207 | EF384087                               | EF383508                               | EF383669                               |
|                  |                 | * <i>Eremiaphila</i> sp.        | OP831274 | OP831564                               | OP856566                               | OP881384                               |
|                  | Amelidae        | <i>Yersinia mexicana</i>        | MW357303 | EF384197                               | EF383620                               | EF383787                               |
|                  |                 | * <i>Deiphobe yunnanensis</i>   | OP831262 | OP831562                               | OP856564                               | OP881382                               |
| Eremiaphiloidea  | Rivetinidae     | * <i>Bolivaria brachyptera</i>  | OP831258 | OP831557                               | OP856559                               | OP881377                               |
|                  |                 | <i>Stenotoxodera porioni</i>    | KY689118 | EF384105                               | EF383526                               | EF383689                               |
|                  | Toxoderidae     | <i>Paratoxodera polyacantha</i> | NC037697 | NA                                     | NA                                     | NA                                     |
|                  |                 | * <i>Idolomantis diabolica</i>  | OP831268 | OP831570                               | OP856572                               | OP881390                               |
|                  | Empusidae       | <i>Empusa pennata</i>           | BK062893 | FJ806752<br>( <i>Empusa</i> sp.)       | FJ806389<br>( <i>Empusa</i> sp.)       | FJ806588<br>( <i>Empusa</i> sp.)       |
|                  |                 | <i>Phyllocrania paradoxa</i>    | NC056869 | DQ874006                               | KR360536                               | KR360574                               |
|                  |                 | <i>Sibylla pretiosa</i>         | KY689116 | EF384142                               | FJ806391                               | FJ806590                               |
|                  |                 | <i>Odontomantis</i> sp.         | KY689121 | FJ806782 ( <i>O. pulchra</i> )         | FJ806419 ( <i>O. pulchra</i> )         | FJ806621 ( <i>O. pulchra</i> )         |
|                  |                 | <i>Anaxarcha zhengi</i>         | NC030268 | FJ806729 ( <i>A. limbata</i> )         | FJ806365 ( <i>A. limbata</i> )         | FJ806564 ( <i>A. limbata</i> )         |
|                  |                 | <i>Hymenopus coronatus</i>      | MZ573776 | AY491334                               | EF383476                               | EF383638                               |
| Hymenopoidea     |                 | <i>Theopropus elegans</i>       | KY689125 | FJ806735                               | FJ806372                               | FJ806571                               |
|                  | Hymenopodidae   |                                 |          | FJ806734                               |  |  |
|                  |                 | <i>Creobroter elongata</i>      | KX091851 | ( <i>Creobroter</i> sp.)               | KR360561                               | KR360594                               |
|                  |                 | <i>Parablepharis kuhlii</i>     | KY689117 | NA                                     | NA                                     | NA                                     |
|                  |                 | <i>Phyllothelys breve</i>       | MT024239 | EF384096 ( <i>P. westwoodi</i> )       | EF383517 ( <i>P. westwoodi</i> )       | EF383678 ( <i>P. westwoodi</i> )       |
|                  |                 | <i>Ceratomantis saussurii</i>   | KX091850 | EF384156<br>( <i>Ceratomantis</i> sp.) | EF383578<br>( <i>Ceratomantis</i> sp.) | EF383744<br>( <i>Ceratomantis</i> sp.) |
|                  |                 | <i>Hestiasula</i> sp.           | KX091855 | FJ806825 ( <i>H.</i>                   | FJ806464 ( <i>H.</i>                   | FJ806665 ( <i>H.</i>                   |

|           |                   |   |          |  |  |  |
|-----------|-------------------|---|----------|--|--|--|
| Mantoidea | Dactylopterygidae |   |          | <i>masoni</i> )<br>EF384085                  | <i>masoni</i> )<br>EF383506                  | <i>masoni</i> )<br>EF383667                  |
|           |                   | <i>*Ephestiasula</i> sp.                      | OP831273 | ( <i>Ephestiasula</i><br>sp.)                | ( <i>Ephestiasula</i> sp.)                   | ( <i>Ephestiasula</i><br>sp.)                |
|           |                   | <i>*Astyliasula</i><br><i>phyllopus</i>       | OP831257 | NA   | FJ806507                                     | FJ806710                                     |
|           |                   | <i>Psychomantis</i><br><i>borneensis</i>      | NC045876 | FJ806847                                     | KR360558                                     | FJ806689                                     |
|           |                   | <i>*Theopompella</i> sp.                      | OP831270 | OP831575                                     | OP856577                                     | OP881395                                     |
|           |                   | <i>Popa spurca</i>                            | NC056860 | KR478678                                     | EF383547                                     | EF383710                                     |
|           |                   | <i>*Euchomenella</i><br><i>heteroptera</i>    | OP831263 | OP831565                                     | OP856567                                     | OP881385                                     |
|           | Deroplatyidae     | <i>Deroplatys</i><br><i>desiccata</i>         | KY689113 | FJ806871                                     | FJ806515                                     | FJ806719                                     |
|           |                   | <i>Deroplatys lobata</i>                      | MT370513 | EF384141                                     | EF383563                                     | EF383729                                     |
|           |                   | <i>Deroplatys truncata</i>                    | MT370514 | FJ806872                                     | FJ806516                                     | FJ806720                                     |
|           |                   | <i>Orthodera</i><br><i>novaezealandiae</i>    | NC056862 | EF384078                                     | EF383473                                     | EF383635                                     |
|           |                   | <i>Asiadodis</i><br><i>yunnanensis</i>        | MN037794 | NA   | NA   | NA   |
|           |                   | <i>*Choeradodis</i><br><i>rhombicollis</i>    | OP831260 | AY491340                                     | EF383481                                     | EF383643                                     |
|           |                   | <i>Mantis religiosa</i>                       | MN356097 | AY491327                                     | EF383471                                     | EF383633                                     |
|           |                   | <i>Statilia maculata</i>                      | KX900484 | FJ806860                                     | FJ806503                                     | FJ806706                                     |
|           |                   | <i>Tenodera sinensis</i>                      | KY689132 | GU064792                                     | DQ874190                                     | AY125282                                     |
|           |                   | <i>Sphodromantis</i><br><i>lineola</i>        | KY689123 | GU064762                                     | EF383480                                     | EF383642                                     |
|           | Mantidae          | <i>Mekongomantis</i><br><i>quinquespinosa</i> | MN267041 | OP831571                                     | OP856573                                     | OP881391                                     |
|           |                   | <i>Tamolanica</i><br><i>tamolana</i>          | NC007702 | GU064764                                     | EF383483                                     | EF383645                                     |
|           |                   | <i>Hierodula</i><br><i>membranacea</i>        | NC048984 | GU066921                                     | NA   | EU414720                                     |
|           |                   | <i>Rhombodera</i><br><i>latipronotum</i>      | KX091864 | OP831573                                     | OP856575                                     | OP881393                                     |
|           |                   | <i>Rhombodera zhang</i>                       | MW357299 | OP831574                                     | OP856576                                     | OP881394                                     |
|           |                   | <i>Hierodulella</i> sp.                       | KY689136 | FJ806865 ( <i>H.</i><br><i>reticulata</i> )  | FJ806509 ( <i>H.</i><br><i>reticulata</i> )  | FJ806712 ( <i>H.</i><br><i>reticulata</i> )  |
|           |                   | <i>Stagmatoptera</i><br><i>biocellata</i>     | MW357302 | SRR1811993                                   | OP962223                                     | OP962221                                     |
|           |                   | <i>Pseudovates</i><br><i>peruviana</i>        | MW357301 | FJ806839 ( <i>P.</i><br><i>denticulata</i> ) | FJ806479 ( <i>P.</i><br><i>denticulata</i> ) | FJ806681 ( <i>P.</i><br><i>denticulata</i> ) |
|           |                   | <i>Mastotermes</i><br><i>darwiniensis</i>     | NC018120 | NA   | DQ882638                                     | AY125281                                     |
|           | Outgroups         |   |          |  |  |  |

|  |          |          |          |          |
|--|----------|----------|----------|----------|
| <i>Coptotermes lacteus</i>                 | KU925211 | NA       | FJ806332 | EU253670 |
| <i>Cryptocercus</i><br><i>kyebangensis</i> | NC030191 | KF855884 | FJ806324 | KP986242 |
| <i>Blattella germanica</i>                 | NC012901 | MF286993 | FJ806322 | EU253813 |

\* Taxa newly sequenced in this study. NA, not available.

**Table S2.** Collecting information for the newly sequenced Mantodea species.

| Family            | Species                          | Locality                | Collection date |
|-------------------|----------------------------------|-------------------------|-----------------|
| Thespidae         | <i>Thesprotiella</i> sp.         | Lima, Peru              | 2018-X-3        |
| Angelidae         | <i>Angela</i> sp.                | Lima, Peru              | 2018-X-3        |
| Coptopterygidae   | <i>Coptopteryx</i> sp.           | Argentina               | 2019-V-6        |
| Acanthopidae      | <i>Metilia</i> sp.               | Lima, Peru              | 2018-X-3        |
|                   | <i>Stenophylla lobivertex</i>    | Lima, Peru              | 2018-X-3        |
| Liturgusidae      | <i>Hagiomantis</i> sp.           | Lima, Peru              | 2021-XII-16     |
| Chroicopteridae   | <i>Carvilia saussurii</i>        | Etosha, Halali, Namibia | 2018-III-8      |
|                   | <i>Gonypetella</i> sp.           | Kibale, Uganda          | 2018-II-19      |
| Leptomantellidae  | <i>Leptomantella xizangensis</i> | Motuo, Xizang, China    | 2014-VII-25     |
| Majangidae        | <i>Brancsikia freyi</i>          | Madagascar              | 2021-VII-7      |
| Epaphroditidae    | <i>Epaphrodita musarum</i>       | Caribbean               | 2019-IV-4       |
| Hoplocoryphidae   | <i>Hoplocorypha</i> sp.          | Kamanjab, Namibia       | 2018-III-9      |
| Miomantidae       | <i>Cilnia humeralis</i>          | South Africa            | 2017-X-19       |
| Galinthiadidae    | <i>Galinthias amoena</i>         | South Africa            | 2017-X-19       |
| Eremiaphilidae    | <i>Eremiaphila</i> sp.           | Western Asia            | 2018-V-21       |
| Rivetinidae       | <i>Deiphobe yunnanensis</i>      | Chuxiong, Yunnan, China | 2019-VIII-20    |
|                   | <i>Bolivaria brachyptera</i>     | Yili, Xinjiang, China   | 2018-IX-3       |
| Empusidae         | <i>Idolomantis diabolica</i>     | Tanzania                | 2021-XI-6       |
| Hymenopodidae     | <i>Ephestiasula</i> sp.          | Sabah, Malaysia         | 2015-X-20       |
|                   | <i>Astyliasula phyllopus</i>     | Sabah, Malaysia         | 2016-X-15       |
| Dactylopterygidae | <i>Theopompella</i> sp.          | Gabon, Ndjole           | 2019-XI-29      |
| Deroplatyidae     | <i>Euchomenella heteroptera</i>  | Sabah, Malaysia         | 2016-X-14       |
| Mantidae          | <i>Choeradodis rhombicollis</i>  | Lima, Peru              | 2021-XII-12     |

**Table S3.** Optimal partitioning scheme and substitution model for datasets used in ML analysis.

| <b>Dataset and Partition type</b> | <b>Subset position</b> | <b>Best Model</b> |
|-----------------------------------|------------------------|-------------------|
| PCGRNA-no partition               |                        | GTR+F+I+G4        |
| PCGRNA-gene partition             | P1:(ATP6)              | GTR+F+I+G4        |
|                                   | P2:(ATP8)              | HKY+F+G4          |
|                                   | P3:(COI)               | GTR+F+I+G4        |
|                                   | P4:(COII)              | GTR+F+I+G4        |
|                                   | P5:(COIII)             | GTR+F+I+G4        |
|                                   | P6:(CYTB)              | GTR+F+I+G4        |
|                                   | P7:(ND1)               | TIM+F+I+G4        |
|                                   | P8:(ND2)               | TIM+F+I+G4        |
|                                   | P9:(ND3)               | GTR+F+I+G4        |
|                                   | P10:(ND4)              | TIM+F+I+G4        |
|                                   | P11:(ND4L)             | GTR+F+I+G4        |
|                                   | P12:(ND5)              | TIM+F+I+G4        |
|                                   | P13:(ND6)              | GTR+F+I+G4        |
|                                   | P14:(12S rRNA)         | GTR+F+I+G4        |
|                                   | P15:(16S rRNA)         | GTR+F+I+G4        |
| PCGRNA-codon partition            | P1:(ATP6_pos1)         | GTR+F+I+G4        |
|                                   | P2:(ATP6_pos2)         | TPM3u+F+I+G4      |
|                                   | P3:(ATP6_pos3)         | TN+F+I+G4         |
|                                   | P4:(ATP8_pos1)         | TIM2+F+I+G4       |
|                                   | P5:(ATP8_pos2)         | TVM+F+I+G4        |
|                                   | P6:(ATP8_pos3)         | K3Pu+F+G4         |
|                                   | P7:(COI_pos1)          | GTR+F+I+G4        |
|                                   | P8:(COI_pos2)          | TVM+F+I+G4        |
|                                   | P9:(COI_pos3)          | TIM2+F+I+G4       |
|                                   | P10:(COII_pos1)        | GTR+F+I+G4        |
|                                   | P11:(COII_pos2)        | GTR+F+I+G4        |

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|                  |                |
|------------------|----------------|
| P12:(COII_pos3)  | TPM2+F+I+G4    |
| P13:(COIII_pos1) | GTR+F+I+G4     |
| P14:(COIII_pos2) | TIM+F+I+G4     |
| P15:(COIII_pos3) | TPM2u+F+ASC+G4 |
| P16:(CYTB_pos1)  | GTR+F+I+G4     |
| P17:(CYTB_pos2)  | GTR+F+I+G4     |
| P18:(CYTB_pos3)  | TIM2+F+I+G4    |
| P19:(ND1_pos1)   | TPM2+F+I+G4    |
| P20:(ND1_pos2)   | GTR+F+I+G4     |
| P21:(ND1_pos3)   | TPM3+F+G4      |
| P22:(ND2_pos1)   | GTR+F+I+G4     |
| P23:(ND2_pos2)   | TVM+F+I+G4     |
| P24:(ND2_pos3)   | TVM+F+G4       |
| P25:(ND3_pos1)   | TIM2+F+I+G4    |
| P26:(ND3_pos2)   | TVM+F+I+G4     |
| P27:(ND3_pos3)   | TPM2u+F+ASC+G4 |
| P28:(ND4_pos1)   | TVM+F+I+G4     |
| P29:(ND4_pos2)   | TVM+F+I+G4     |
| P30:(ND4_pos3)   | K3Pu+F+I+G4    |
| P31:(ND4L_pos1)  | TPM2u+F+G4     |
| P32:(ND4L_pos2)  | TIM+F+G4       |
| P33:(ND4L_pos3)  | K3Pu+F+G4      |
| P34:(ND5_pos1)   | TIM2+F+I+G4    |
| P35:(ND5_pos2)   | GTR+F+I+G4     |
| P36:(ND5_pos3)   | TPM2u+F+G4     |
| P37:(ND6_pos1)   | TIM2+F+G4      |
| P38:(ND6_pos2)   | GTR+F+I+G4     |
| P39:(ND6_pos3)   | TPM2+F+ASC+G4  |
| P40:(12S rRNA)   | GTR+F+I+G4     |

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|                          |                  |             |
|--------------------------|------------------|-------------|
|                          | P41:(16S rRNA)   | GTR+F+I+G4  |
| PCG12RNA-no partition    |                  | GTR+F+I+G4  |
| PCG12RNA-gene partition  | P1:(ATP6)        | GTR+F+I+G4  |
|                          | P2:(ATP8)        | HKY+F+I+G4  |
|                          | P3:(COI)         | GTR+F+I+G4  |
|                          | P4:(COII)        | GTR+F+I+G4  |
|                          | P5:(COIII)       | GTR+F+I+G4  |
|                          | P6:(CYTB)        | GTR+F+I+G4  |
|                          | P7:(ND1)         | TIM+F+I+G4  |
|                          | P8:(ND2)         | TIM+F+I+G4  |
|                          | P9:(ND3)         | TIM+F+I+G4  |
|                          | P10:(ND4)        | GTR+F+I+G4  |
|                          | P11:(ND4L)       | GTR+F+G4    |
|                          | P12:(ND5)        | TIM+F+I+G4  |
|                          | P13:(ND6)        | TIM+F+I+G4  |
|                          | P14:(12S rRNA)   | GTR+F+I+G4  |
|                          | P15:(16S rRNA)   | GTR+F+I+G4  |
| PCG12RNA-codon partition | P1:(ATP6_pos1)   | GTR+F+I+G4  |
|                          | P2:(ATP6_pos2)   | TIM3+F+I+G4 |
|                          | P3:(ATP8_pos1)   | TIM3+F+I+G4 |
|                          | P4:(ATP8_pos2)   | TPM2+F+I+G4 |
|                          | P5:(COI_pos1)    | GTR+F+I+G4  |
|                          | P6:(COI_pos2)    | TVM+F+I+G4  |
|                          | P7:(COII_pos1)   | GTR+F+I+G4  |
|                          | P8:(COII_pos2)   | GTR+F+I+G4  |
|                          | P9:(COIII_pos1)  | GTR+F+I+G4  |
|                          | P10:(COIII_pos2) | TIM+F+I+G4  |
|                          | P11:(CYTB_pos1)  | GTR+F+I+G4  |
|                          | P12:(CYTB_pos2)  | GTR+F+I+G4  |



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|                         |                 |             |
|-------------------------|-----------------|-------------|
|                         | P13:(ND1_pos1)  | TPM2+F+I+G4 |
|                         | P14:(ND1_pos2)  | GTR+F+I+G4  |
|                         | P15:(ND2_pos1)  | GTR+F+I+G4  |
|                         | P16:(ND2_pos2)  | TVM+F+I+G4  |
|                         | P17:(ND3_pos1)  | TIM2+F+I+G4 |
|                         | P18:(ND3_pos2)  | TVM+F+I+G4  |
|                         | P19:(ND4_pos1)  | TVM+F+I+G4  |
|                         | P20:(ND4_pos2)  | GTR+F+I+G4  |
|                         | P21:(ND4L_pos1) | TIM2+F+G4   |
|                         | P22:(ND4L_pos2) | TIM+F+G4    |
|                         | P23:(ND5_pos1)  | TIM2+F+I+G4 |
|                         | P24:(ND5_pos2)  | GTR+F+I+G4  |
|                         | P25:(ND6_pos1)  | TIM2+F+G4   |
|                         | P26:(ND6_pos2)  | GTR+F+I+G4  |
|                         | P27:(12S rRNA)  | GTR+F+I+G4  |
|                         | P28:(16S rRNA)  | GTR+F+I+G4  |
| NGPCGRNA-no partition   |                 | GTR+F+I+G4  |
| NGPCGRNA-gene partition | P1:(ATP6)       | GTR+F+I+G4  |
|                         | P2:(ATP8)       | HKY+F+G4    |
|                         | P3:(COI)        | GTR+F+I+G4  |
|                         | P4:(COII)       | GTR+F+I+G4  |
|                         | P5:(COIII)      | GTR+F+I+G4  |
|                         | P6:(CYTB)       | GTR+F+I+G4  |
|                         | P7:(ND1)        | TIM+F+I+G4  |
|                         | P8:(ND2)        | TIM+F+I+G4  |
|                         | P9:(ND3)        | GTR+F+I+G4  |
|                         | P10:(ND4)       | TIM+F+I+G4  |
|                         | P11:(ND4L)      | GTR+F+I+G4  |
|                         | P12:(ND5)       | TIM+F+I+G4  |

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|                          |                  |                |
|--------------------------|------------------|----------------|
|                          | P13:(ND6)        | GTR+F+I+G4     |
|                          | P14:(12S rRNA)   | GTR+F+I+G4     |
|                          | P15:(16S rRNA)   | GTR+F+I+G4     |
|                          | P16:(H3)         | TIM+F+I+G4     |
|                          | P17:(18S rRNA)   | TNe+I+G4       |
|                          | P18:(28S rRNA)   | GTR+F+I+G4     |
| NGPCGRNA-codon partition | P1:(ATP6_pos1)   | GTR+F+I+G4     |
|                          | P2:(ATP6_pos2)   | TPM3u+F+I+G4   |
|                          | P3:(ATP6_pos3)   | TN+F+I+G4      |
|                          | P4:(ATP8_pos1)   | TN+F+I+G4      |
|                          | P5:(ATP8_pos2)   | TVM+F+I+G4     |
|                          | P6:(ATP8_pos3)   | HKY+F+G4       |
|                          | P7:(COI_pos1)    | GTR+F+I+G4     |
|                          | P8:(COI_pos2)    | TVM+F+I+G4     |
|                          | P9:(COI_pos3)    | TIM2+F+I+G4    |
|                          | P10:(COII_pos1)  | GTR+F+I+G4     |
|                          | P11:(COII_pos2)  | GTR+F+I+G4     |
|                          | P12:(COII_pos3)  | TPM2u+F+I+G4   |
|                          | P13:(COIII_pos1) | GTR+F+I+G4     |
|                          | P14:(COIII_pos2) | TIM+F+I+G4     |
|                          | P15:(COIII_pos3) | TPM2u+F+ASC+G4 |
|                          | P16:(CYTB_pos1)  | GTR+F+I+G4     |
|                          | P17:(CYTB_pos2)  | GTR+F+I+G4     |
|                          | P18:(CYTB_pos3)  | TIM2+F+I+G4    |
|                          | P19:(ND1_pos1)   | TPM2u+F+I+G4   |
|                          | P20:(ND1_pos2)   | GTR+F+I+G4     |
|                          | P21:(ND1_pos3)   | TPM3+F+G4      |
|                          | P22:(ND2_pos1)   | GTR+F+I+G4     |
|                          | P23:(ND2_pos2)   | TVM+F+I+G4     |

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|                           |                 |               |
|---------------------------|-----------------|---------------|
|                           | P24:(ND2_pos3)  | TVM+F+G4      |
|                           | P25:(ND3_pos1)  | TIM2+F+I+G4   |
|                           | P26:(ND3_pos2)  | TVM+F+I+G4    |
|                           | P27:(ND3_pos3)  | TVM+F+ASC+G4  |
|                           | P28:(ND4_pos1)  | TVM+F+I+G4    |
|                           | P29:(ND4_pos2)  | TVM+F+I+G4    |
|                           | P30:(ND4_pos3)  | K3Pu+F+I+G4   |
|                           | P31:(ND4L_pos1) | TPM2u+F+G4    |
|                           | P32:(ND4L_pos2) | TIM+F+G4      |
|                           | P33:(ND4L_pos3) | TPM3u+F+G4    |
|                           | P34:(ND5_pos1)  | TIM2+F+I+G4   |
|                           | P35:(ND5_pos2)  | GTR+F+I+G4    |
|                           | P36:(ND5_pos3)  | TPM2u+F+G4    |
|                           | P37:(ND6_pos1)  | TIM2+F+I+G4   |
|                           | P38:(ND6_pos2)  | GTR+F+I+G4    |
|                           | P39:(ND6_pos3)  | TPM2+F+ASC+G4 |
|                           | P40:(12S rRNA)  | GTR+F+I+G4    |
|                           | P41:(16S rRNA)  | GTR+F+I+G4    |
|                           | P42:(H3)        | TIM+F+I+G4    |
|                           | P43:(18S rRNA)  | TNe+I+G4      |
|                           | P44:(28S rRNA)  | GTR+F+I+G4    |
| NGPCG12RNA-no partition   |                 | TVM+F+I+G4    |
| NGPCG12RNA-gene partition | P1:(ATP6)       | GTR+F+I+G4    |
|                           | P2:(ATP8)       | HKY+F+I+G4    |
|                           | P3:(COI)        | GTR+F+I+G4    |
|                           | P4:(COII)       | TIM2+F+I+G4   |
|                           | P5:(COIII)      | GTR+F+I+G4    |
|                           | P6:(CYTB)       | GTR+F+I+G4    |
|                           | P7:(ND1)        | TIM+F+I+G4    |

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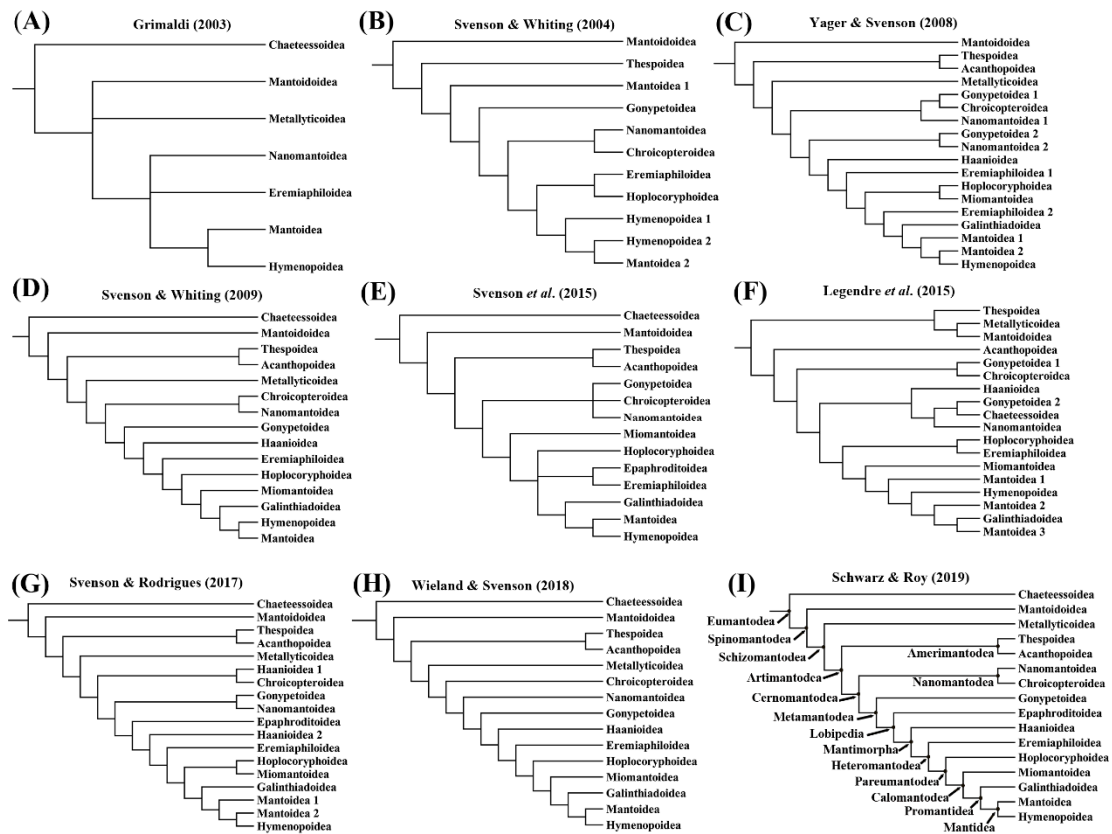
|                            |                  |              |
|----------------------------|------------------|--------------|
|                            | P8:(ND2)         | TIM+F+I+G4   |
|                            | P9:(ND3)         | TIM+F+I+G4   |
|                            | P10:(ND4)        | GTR+F+I+G4   |
|                            | P11:(ND4L)       | GTR+F+G4     |
|                            | P12:(ND5)        | TIM+F+I+G4   |
|                            | P13:(ND6)        | TIM+F+I+G4   |
|                            | P14:(12S rRNA)   | GTR+F+I+G4   |
|                            | P15:(16S rRNA)   | GTR+F+I+G4   |
|                            | P16:(H3)         | TIM+F+I+G4   |
|                            | P17:(18S rRNA)   | TNe+I+G4     |
|                            | P18:(28S rRNA)   | GTR+F+I+G4   |
| NGPCG12RNA-codon partition | P1:(ATP6_pos1)   | GTR+F+I+G4   |
|                            | P2:(ATP6_pos2)   | TPM3+F+I+G4  |
|                            | P3:(ATP8_pos1)   | TN+F+I+G4    |
|                            | P4:(ATP8_pos2)   | TPM2u+F+I+G4 |
|                            | P5:(COI_pos1)    | GTR+F+I+G4   |
|                            | P6:(COI_pos2)    | TVM+F+I+G4   |
|                            | P7:(COII_pos1)   | GTR+F+I+G4   |
|                            | P8:(COII_pos2)   | GTR+F+I+G4   |
|                            | P9:(COIII_pos1)  | GTR+F+I+G4   |
|                            | P10:(COIII_pos2) | TIM+F+I+G4   |
|                            | P11:(CYTB_pos1)  | GTR+F+I+G4   |
|                            | P12:(CYTB_pos2)  | GTR+F+I+G4   |
|                            | P13:(ND1_pos1)   | TPM2u+F+I+G4 |
|                            | P14:(ND1_pos2)   | GTR+F+I+G4   |
|                            | P15:(ND2_pos1)   | GTR+F+I+G4   |
|                            | P16:(ND2_pos2)   | TVM+F+I+G4   |
|                            | P17:(ND3_pos1)   | TIM2+F+I+G4  |
|                            | P18:(ND3_pos2)   | TVM+F+I+G4   |

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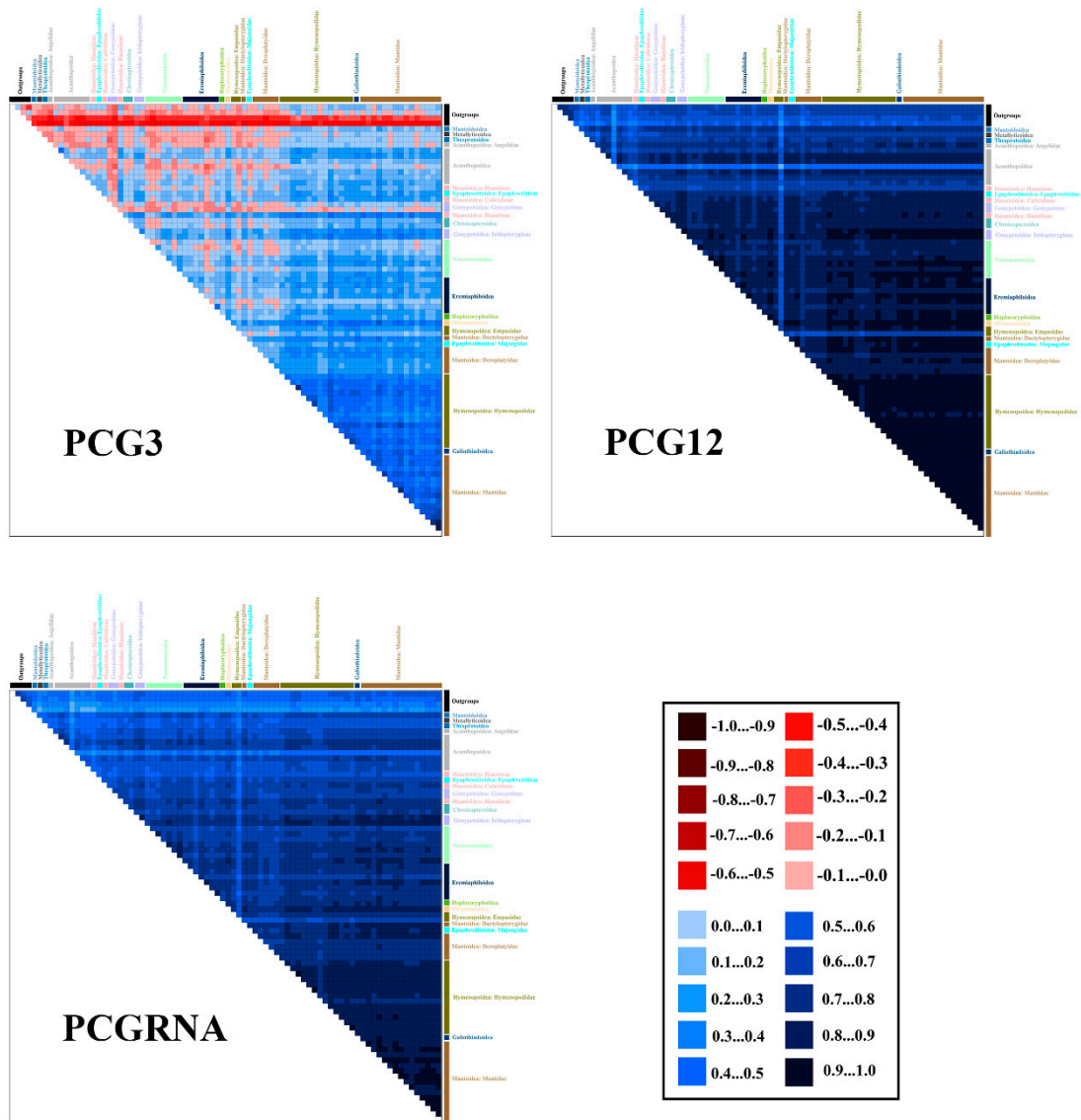
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|                 |             |
|-----------------|-------------|
| P19:(ND4_pos1)  | TVM+F+I+G4  |
| P20:(ND4_pos2)  | GTR+F+I+G4  |
| P21:(ND4L_pos1) | TPM2u+F+G4  |
| P22:(ND4L_pos2) | TIM+F+G4    |
| P23:(ND5_pos1)  | TIM2+F+I+G4 |
| P24:(ND5_pos2)  | GTR+F+I+G4  |
| P25:(ND6_pos1)  | TIM2+F+G4   |
| P26:(ND6_pos2)  | GTR+F+I+G4  |
| P27:(12S rRNA)  | GTR+F+I+G4  |
| P28:(16S rRNA)  | GTR+F+I+G4  |
| P29:(H3)        | TN+F+I+G4   |
| P30:(18S rRNA)  | TNe+I+G4    |
| P31:(28S rRNA)  | GTR+F+I+G4  |

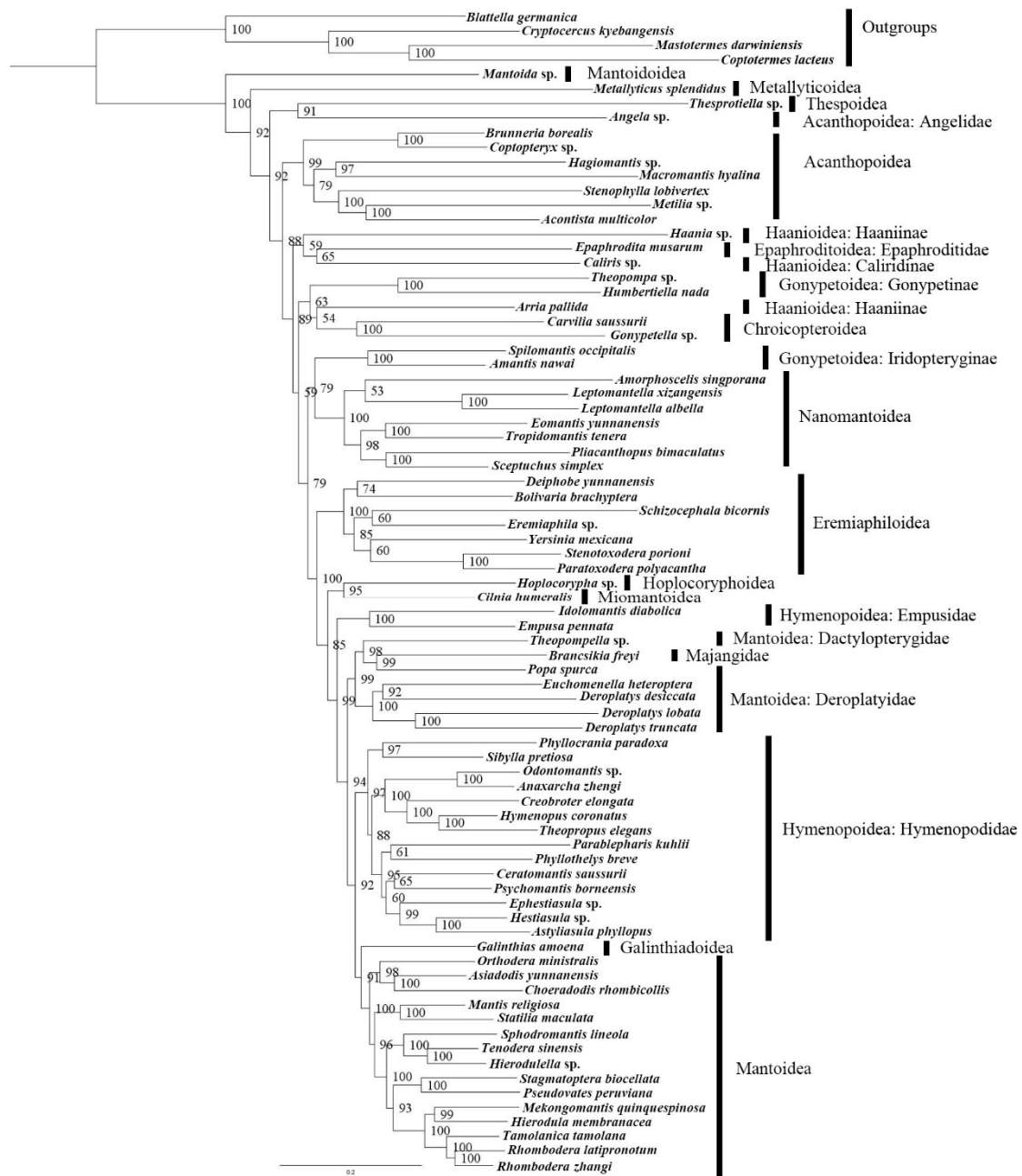
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**Figures S1.** Phylogenetic hypotheses of Mantodea published in the 21st century. (A) Phylogeny based on the morphology of fossil and extant species; (B) Maximum likelihood (ML) and maximum parsimony (MP) analyses based on five genes; (C) ML analysis based on seven genes (Chaeteessoidea was excluded from this topology owing to the data contamination problem indicated by the authors, Svenson and Whiting, 2009); (D) ML analysis inferred from nine genes; (E) Total evidence Bayesian inference (BI) phylogeny with an emphasis on Hymenopoidea; (F) ML analysis based on six genes; (G) ML analysis based on nine genes; (H) Cladistic summary of mantodean phylogeny (Epaphroditoidea unresolved); (I) The most recent taxonomic framework of Mantodea. Superfamily annotation followed the system of Schwarz and Roy (2019).

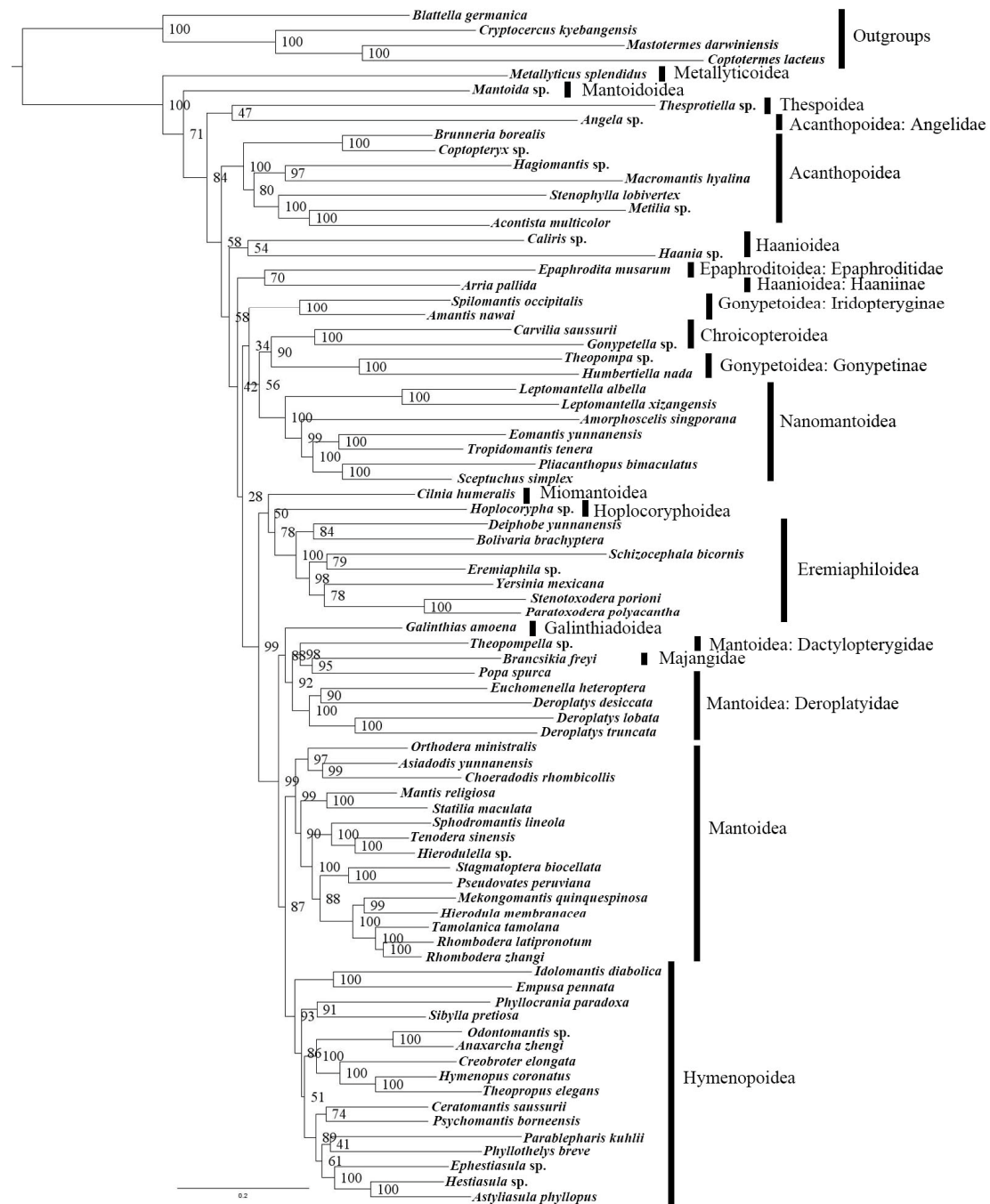


**Figures S2.** Heterogeneous sequence divergence within mantodean mitogenomic datasets. The mean similarity score between sequences is represented by a colored square, which can vary between -1 if distances are very different from the average for the entire data matrix (red coloring) to +1 for distances that match the average for the entire matrix (blue coloring).

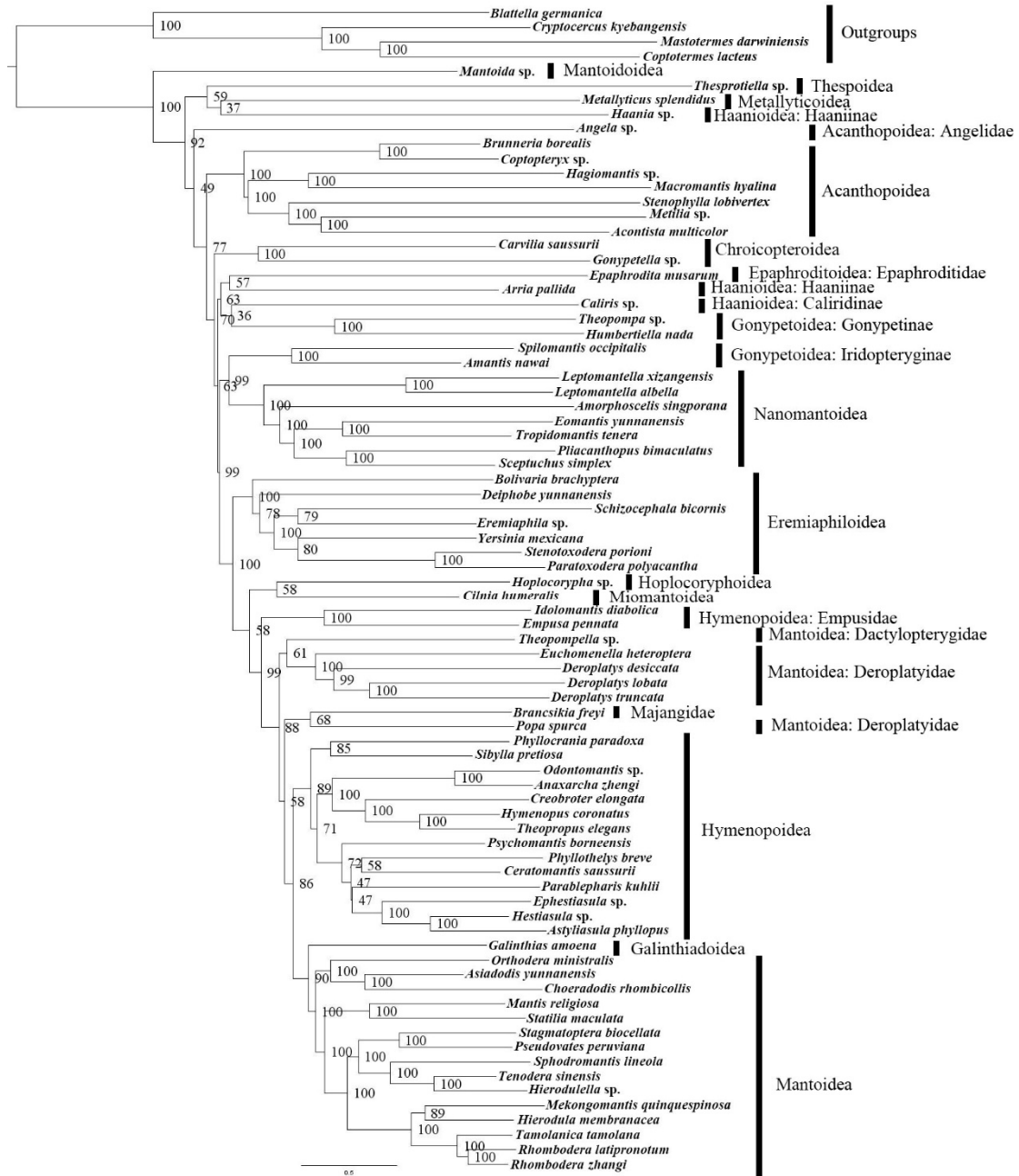


**Figures S3.** Phylogenetic tree inferred from ML analysis of PCGRNA without data partition under the site-homogeneous model. Bootstrap values of ML analyses were labeled at each node.

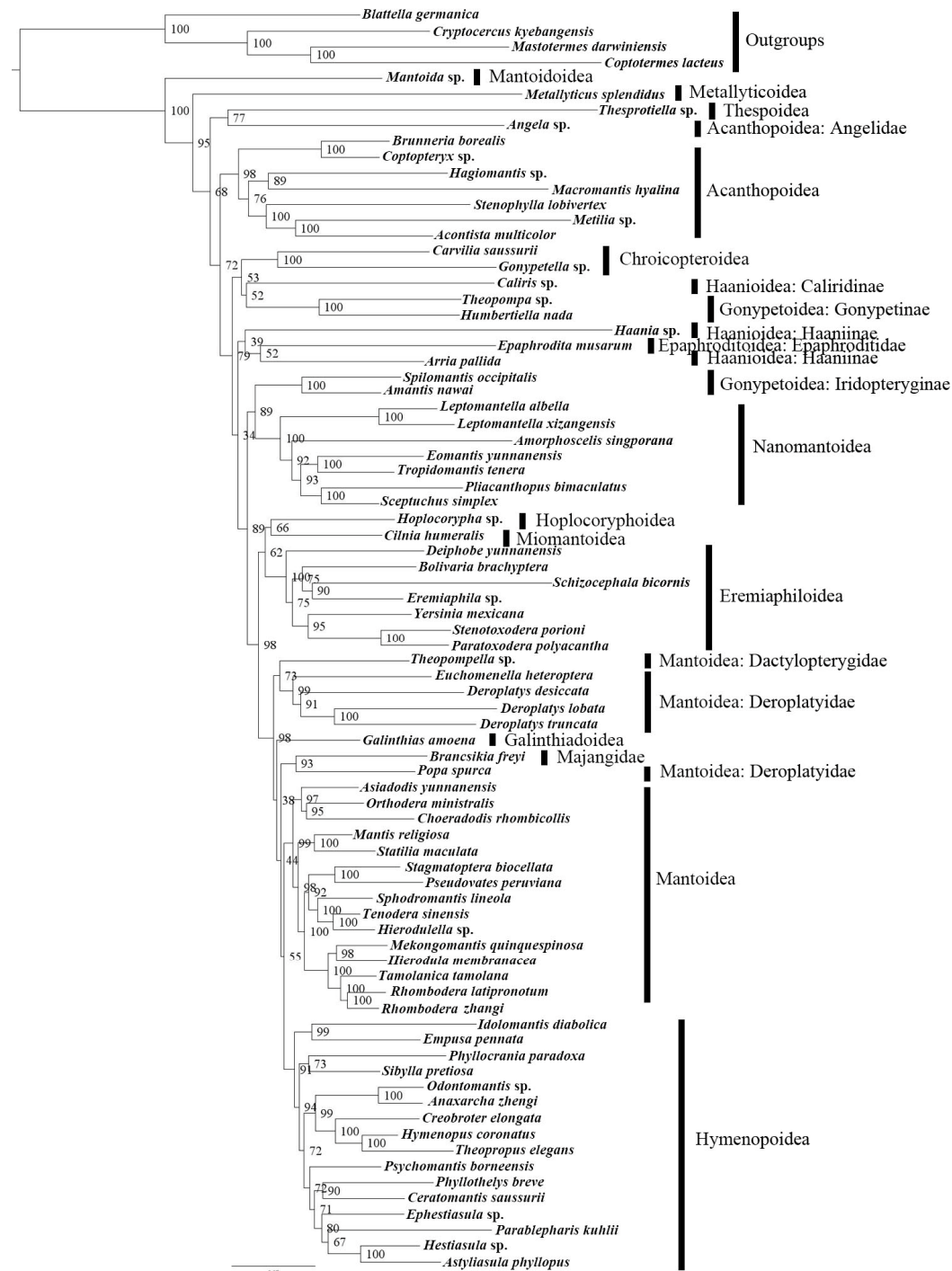




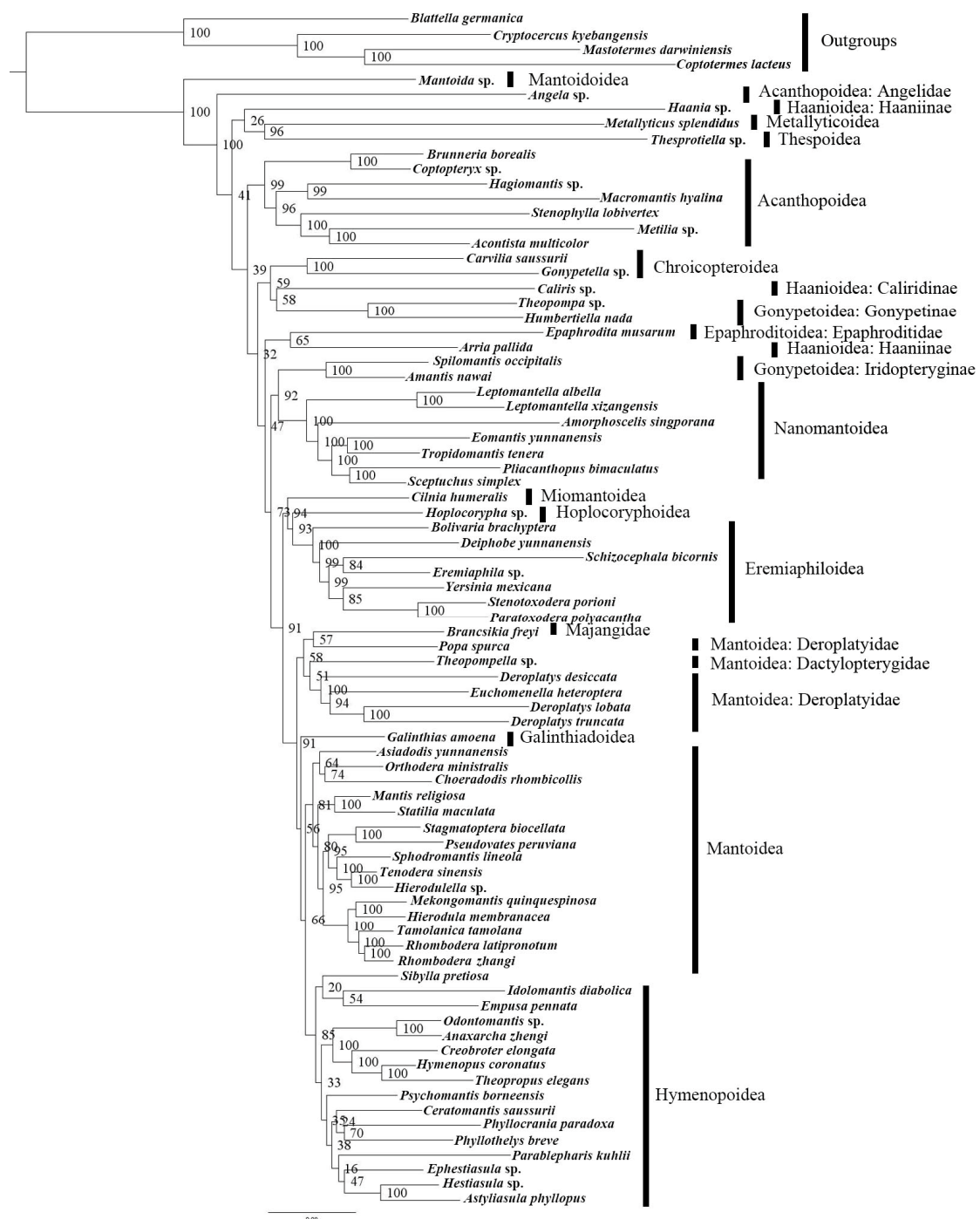
**Figures S4.** Phylogenetic tree inferred from ML analysis of PCGRNA with gene partition under the site-homogeneous model. Bootstrap values of ML analyses were labeled at each node.



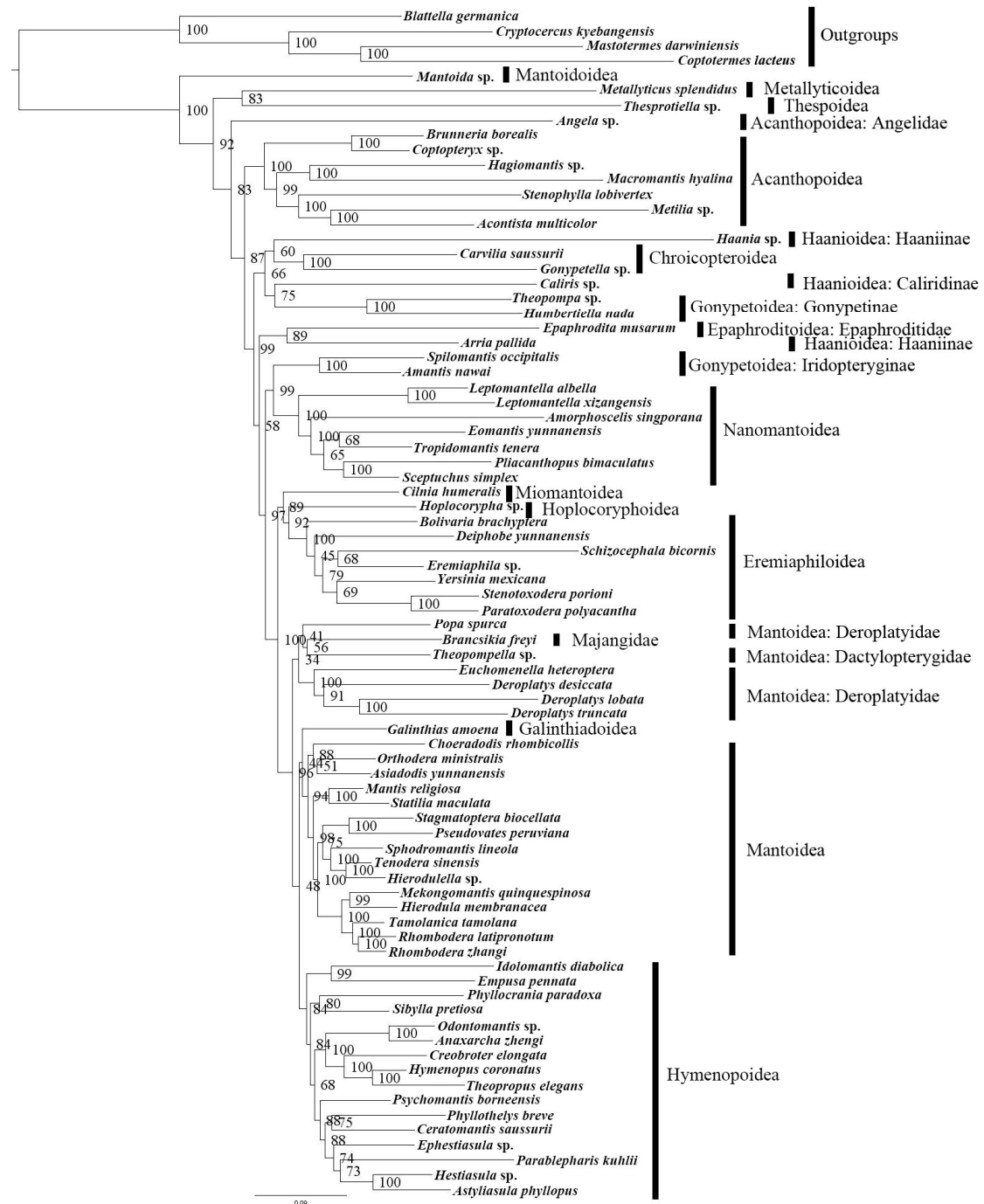
**Figures S5.** Phylogenetic tree inferred from ML analysis of PCGRNA with codon partition under the site-homogeneous model. Bootstrap values of ML analyses were labeled at each node.



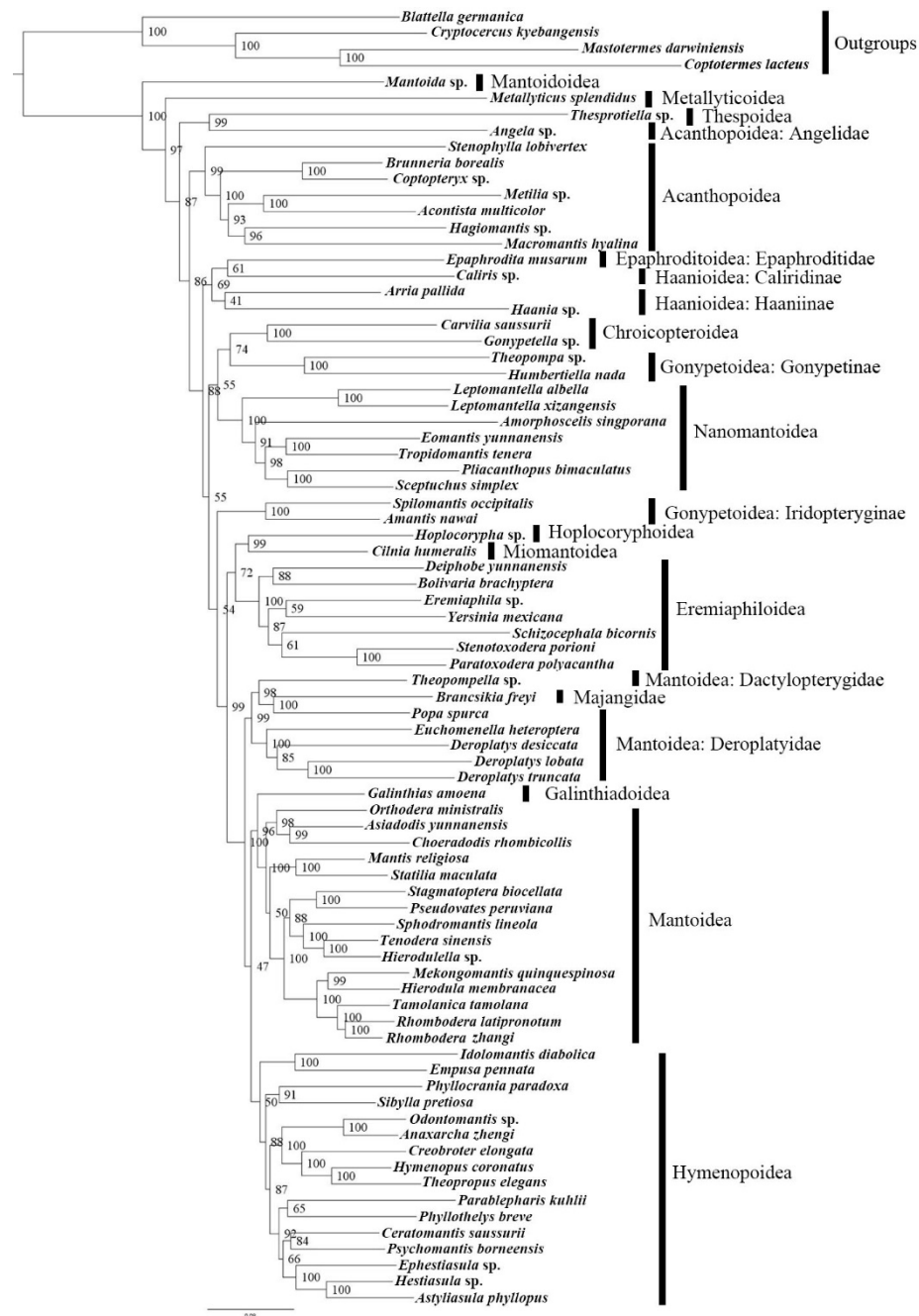
**Figures S6.** Phylogenetic tree inferred from ML analysis of PCG12RNA without data partition under the site-homogeneous model. Bootstrap values of ML analyses were labeled at each node.



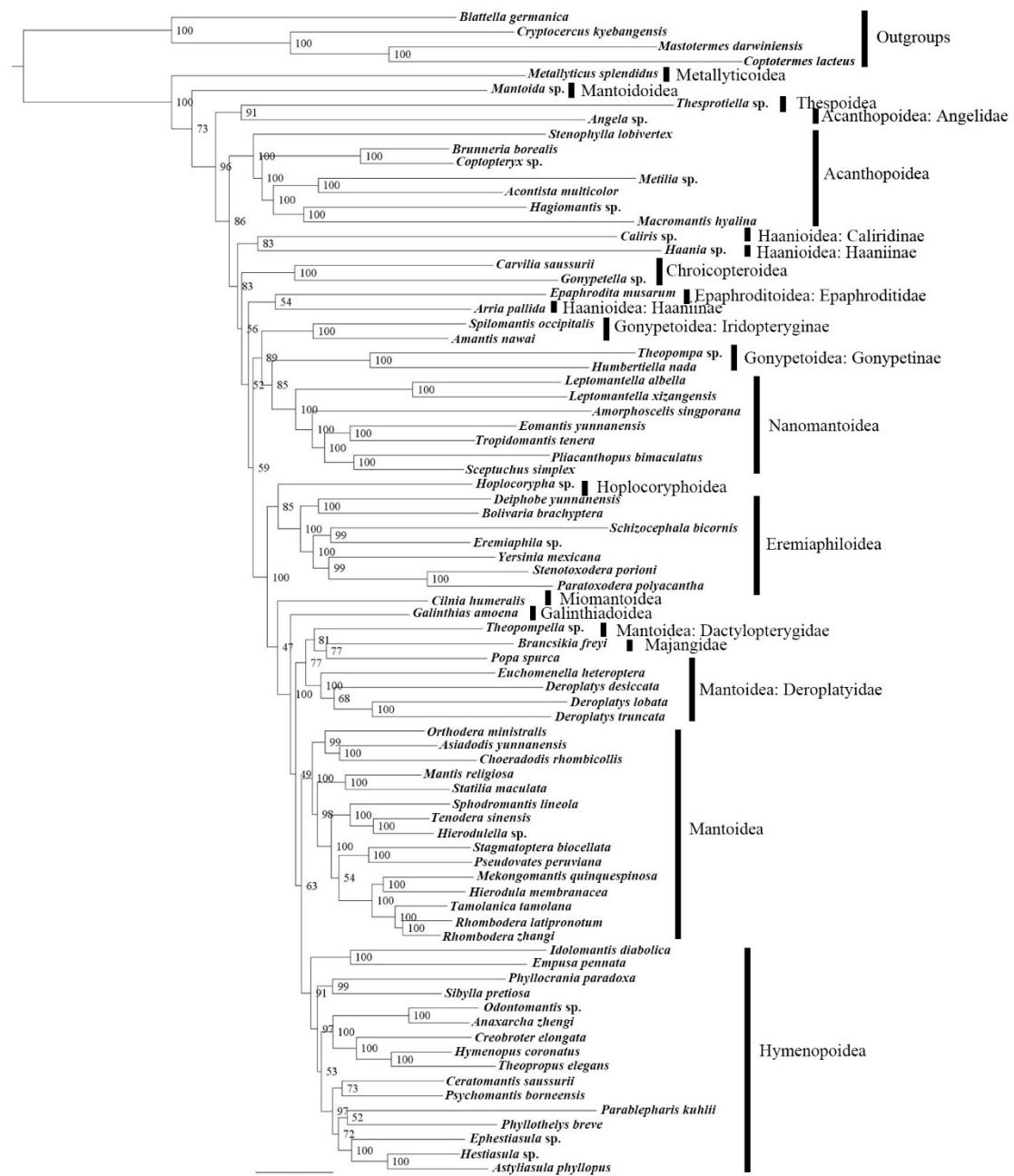
**Figures S7.** Phylogenetic tree inferred from ML analysis of PCG12RNA with gene partition under the site-homogeneous model. Bootstrap values of ML analyses were labeled at each node.



**Figures S8.** Phylogenetic tree inferred from ML analysis of PCG12RNA with codon partition under the site-homogeneous model. Bootstrap values of ML analyses were labeled at each node.

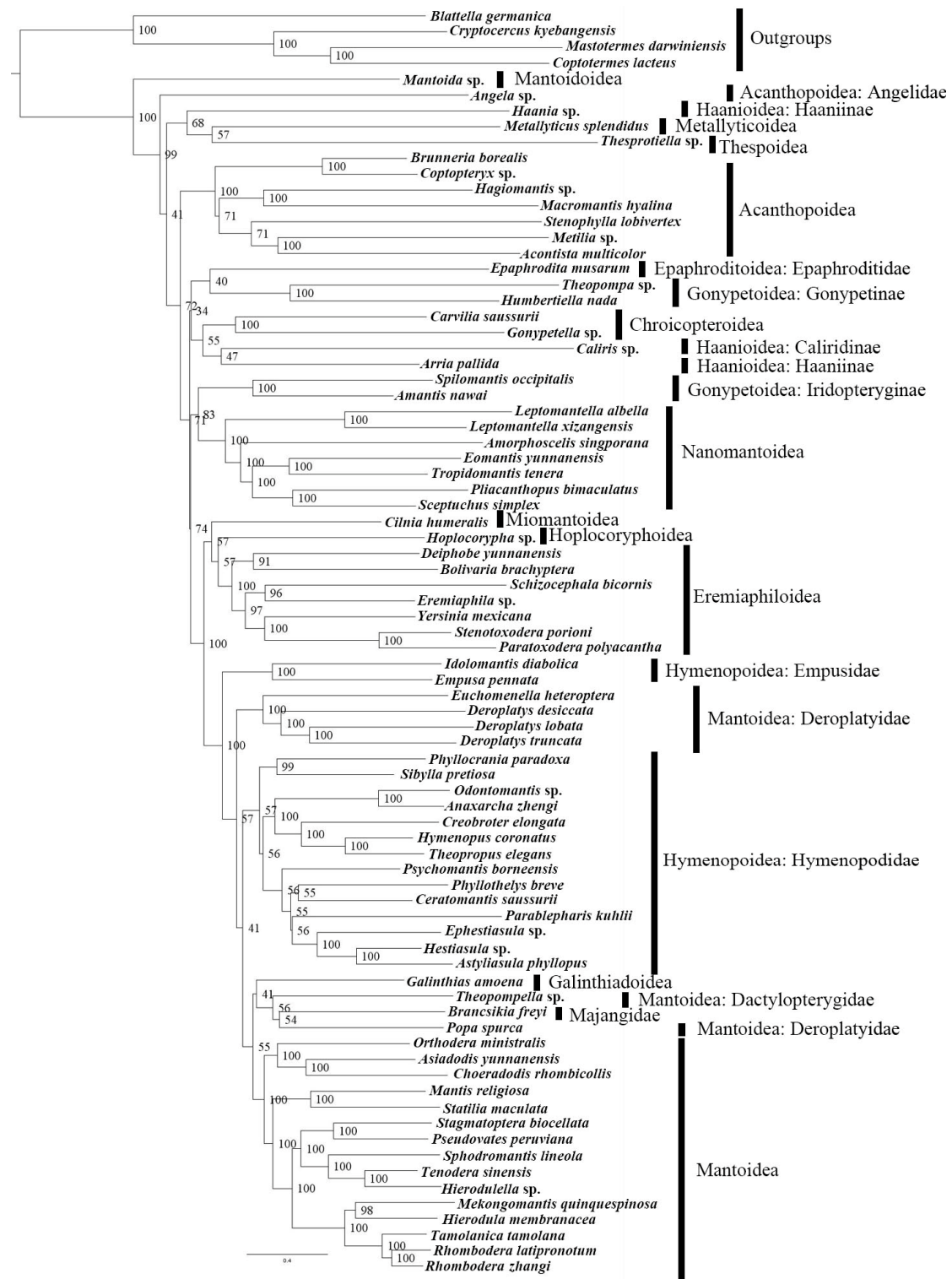


**Figures S9.** Phylogenetic tree inferred from ML analysis of NGPCGRNA without data partition under the site-homogeneous model. Bootstrap values of ML analyses were labeled at each node.



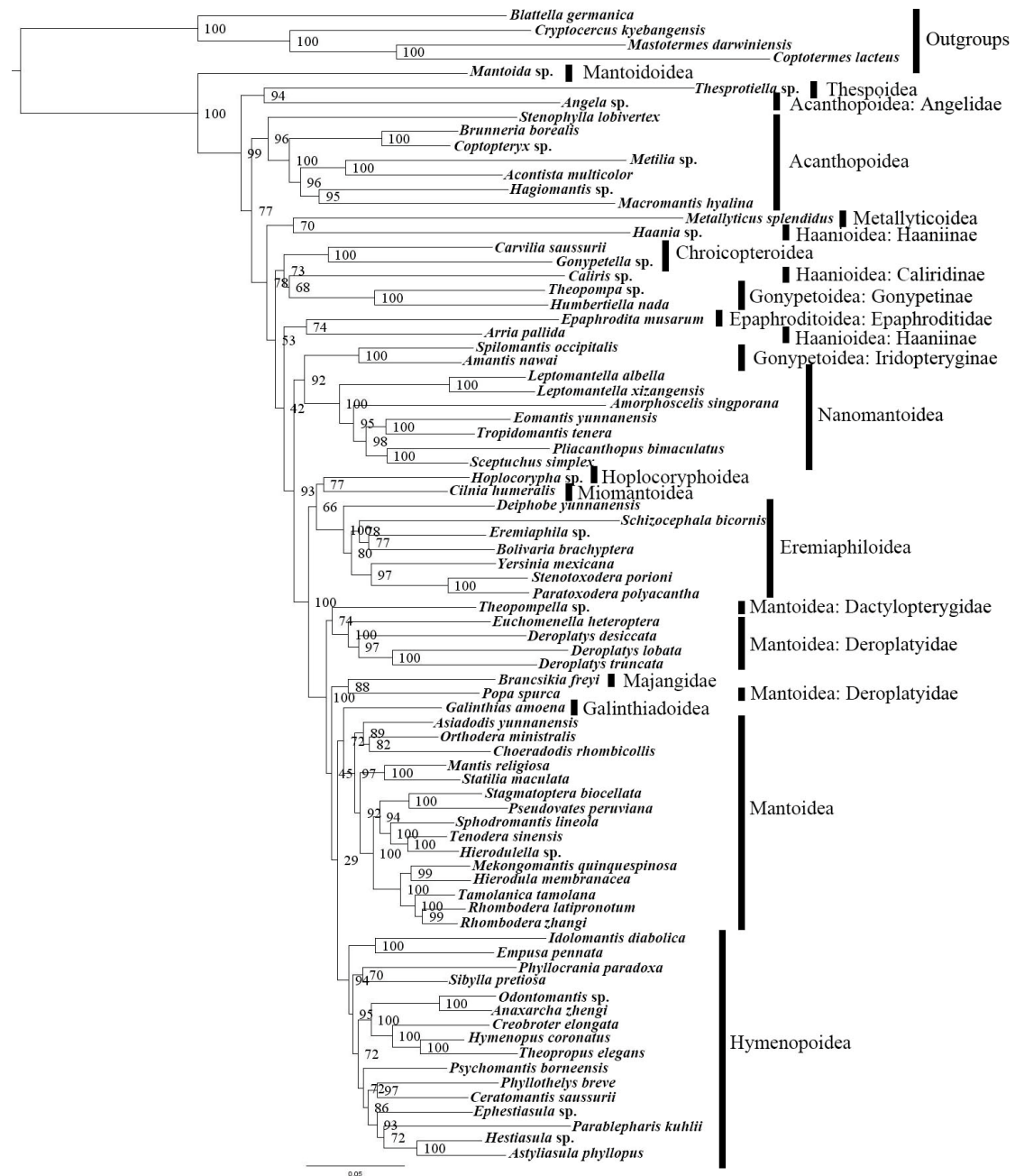
**Figures S10.** Phylogenetic tree inferred from ML analysis of NGPCGRNA with gene partition under the site-homogeneous model.. Bootstrap values of ML analyses were labeled at each node.



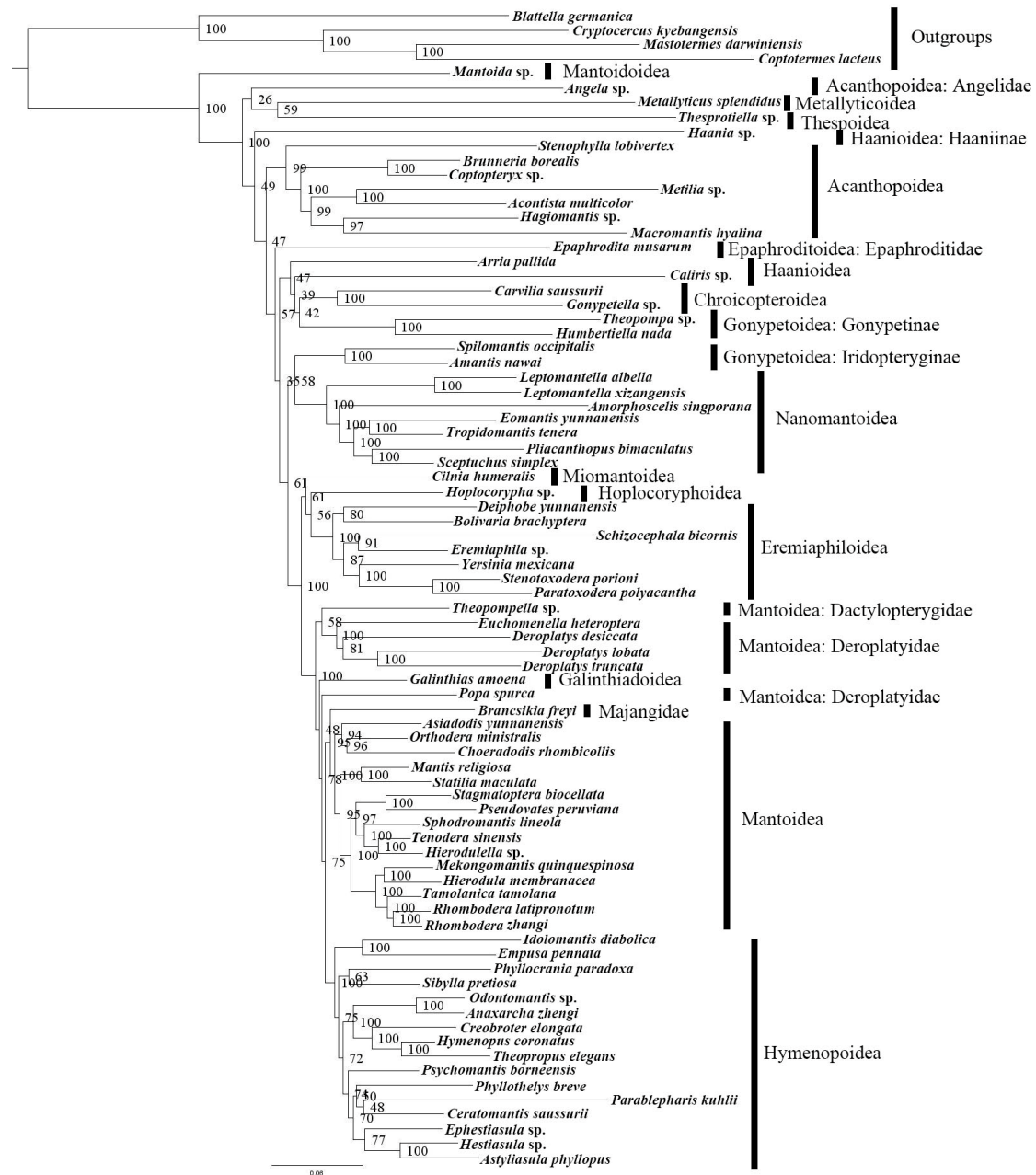


**Figures S11.** Phylogenetic tree inferred from ML analysis of NGPCGRNA with codon partition under the site-homogeneous model. Bootstrap values of ML analyses were labeled at each node.

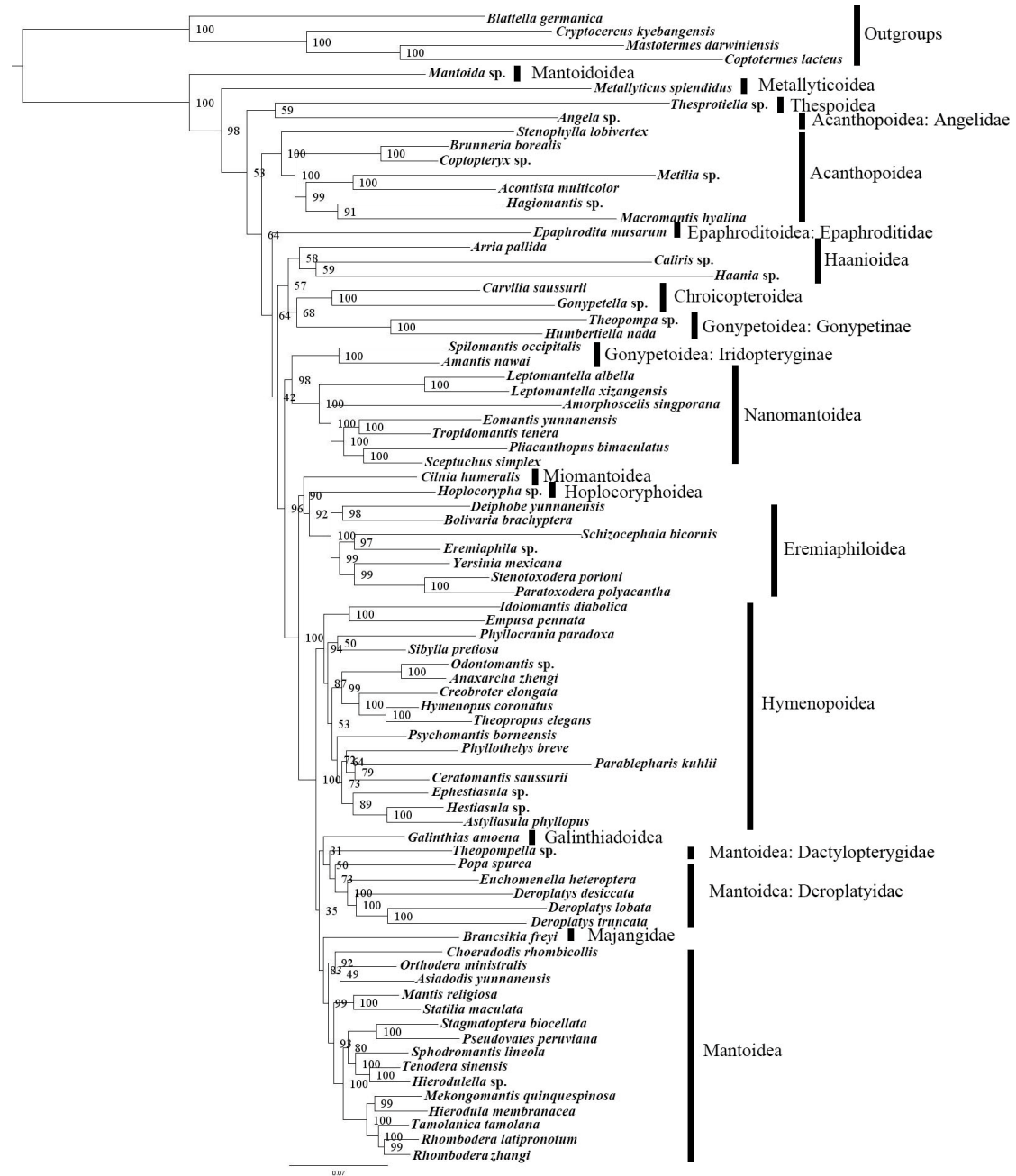




**Figures S12.** Phylogenetic tree inferred from ML analysis of NGPCG12RNA without data partition under the site-homogeneous model. Bootstrap values of ML analyses were labeled at each node.

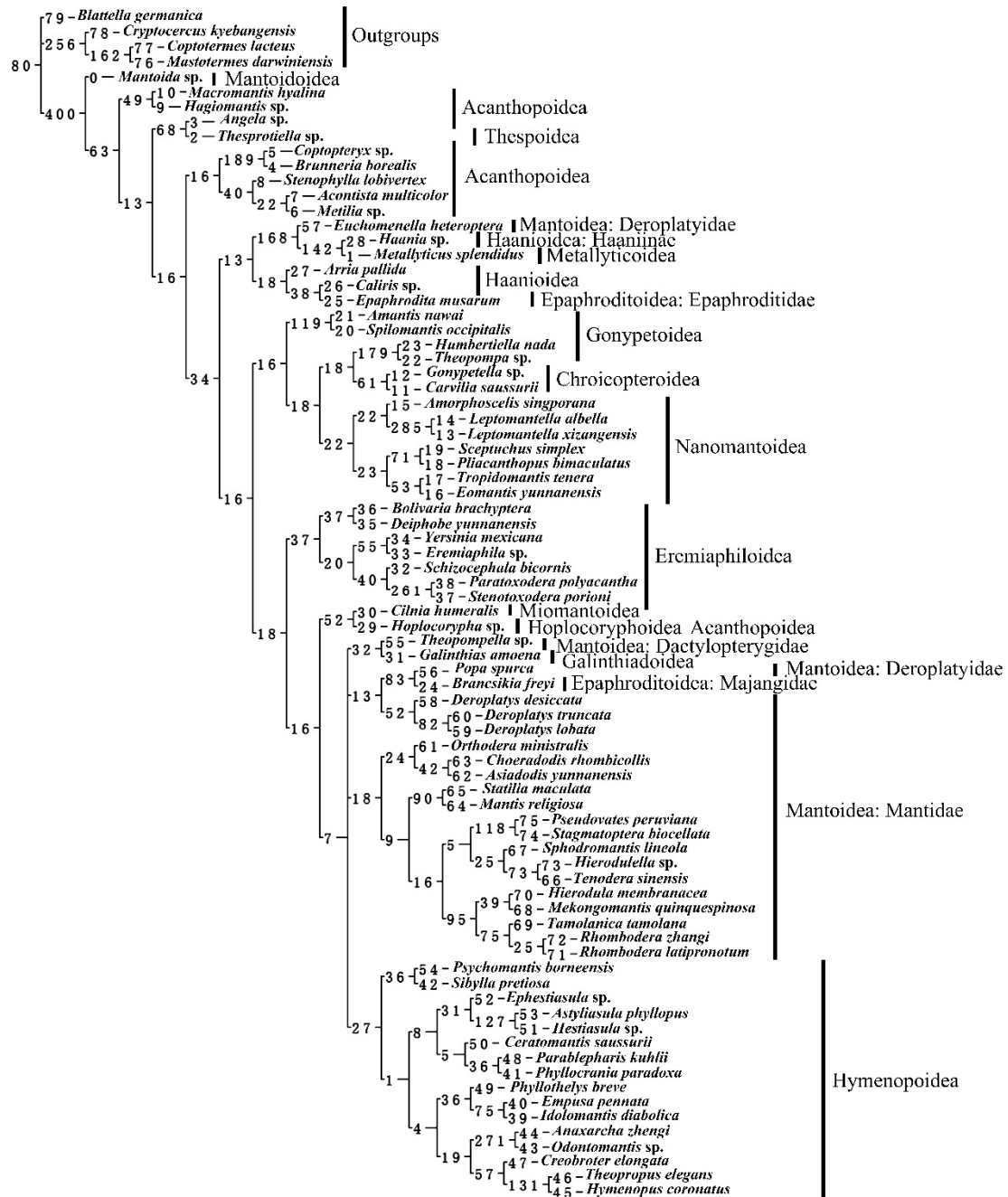


**Figures S13.** Phylogenetic tree inferred from ML analysis of NGPCG12RNA with gene partition under the site-homogeneous model. Bootstrap values of ML analyses were labeled at each node.



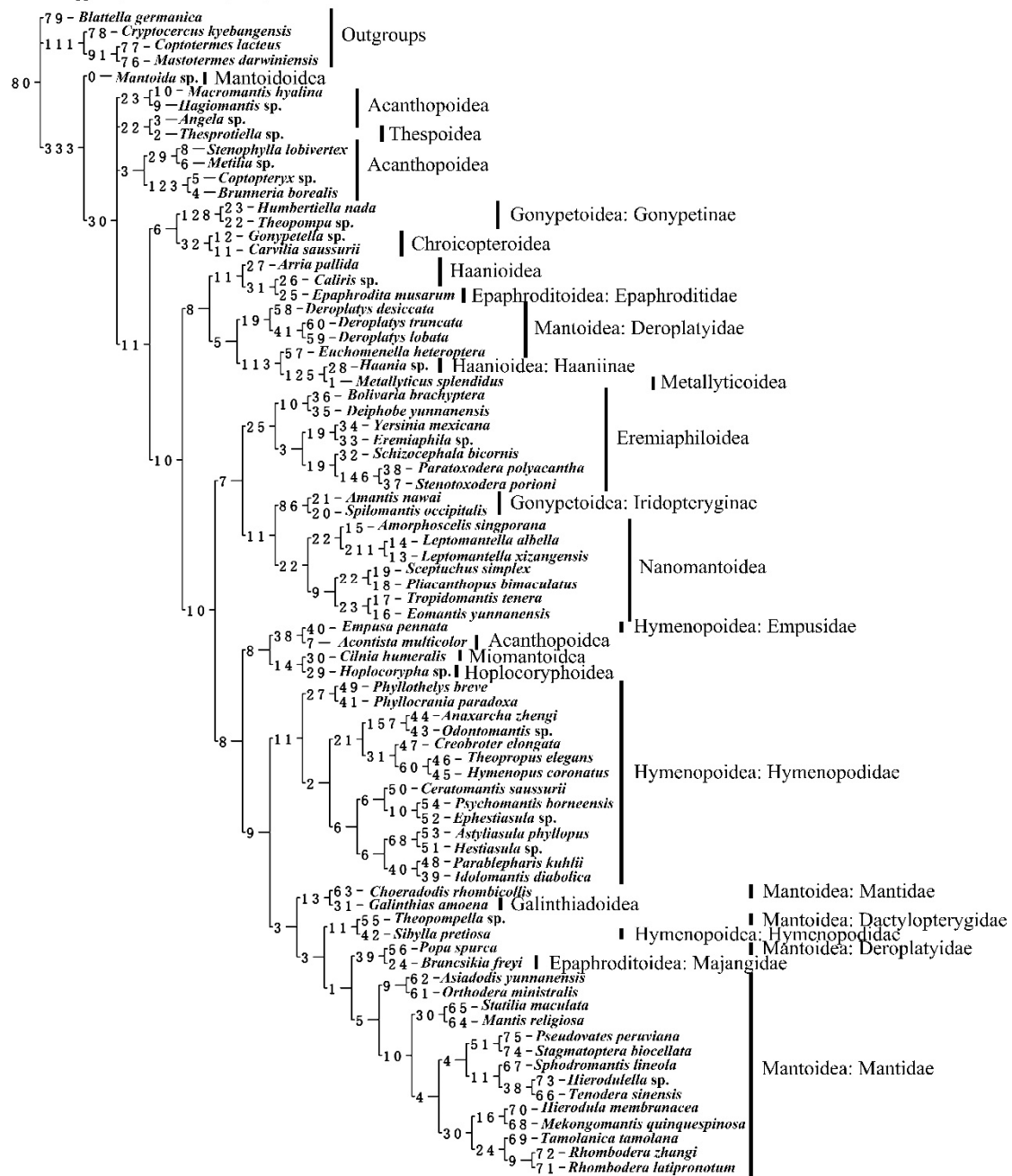
**Figures S14.** Phylogenetic tree inferred from the ML analysis of NGPCG12RNA with codon partition under the site-homogeneous model. Bootstrap values of ML analyses were labeled at each node.

Bremer supports (from 91516 trees, cut 0)

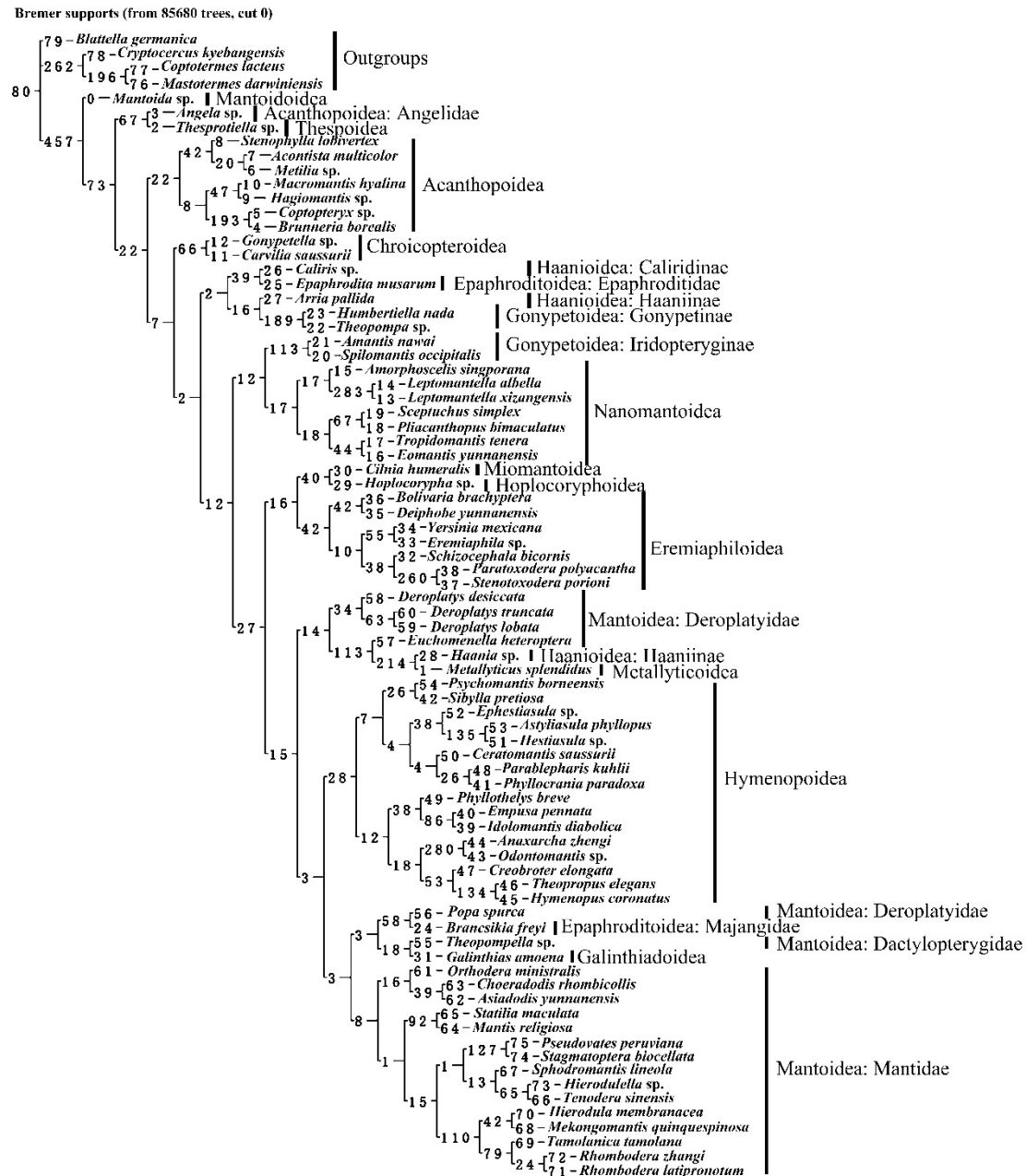


**Figures S15.** Phylogenetic tree inferred from MP analysis of PCGRNA. Bremer support values of MP analyses were labeled at each node.

Bremer supports (from 96017 trees, cut 0)

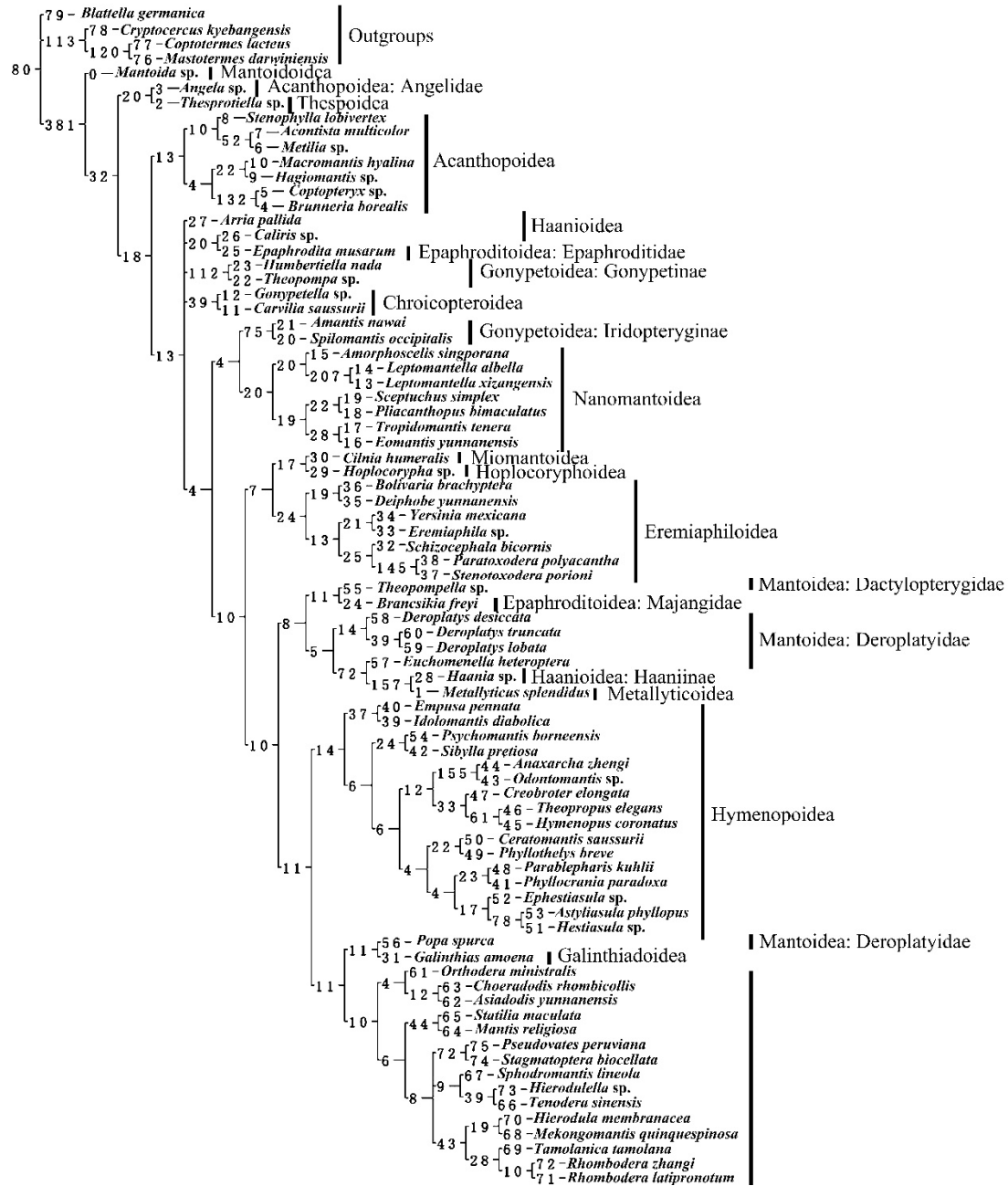


**Figures S16.** Phylogenetic tree inferred from MP analysis of PCG12RNA. Bremer support values of MP analyses were labeled at each node.

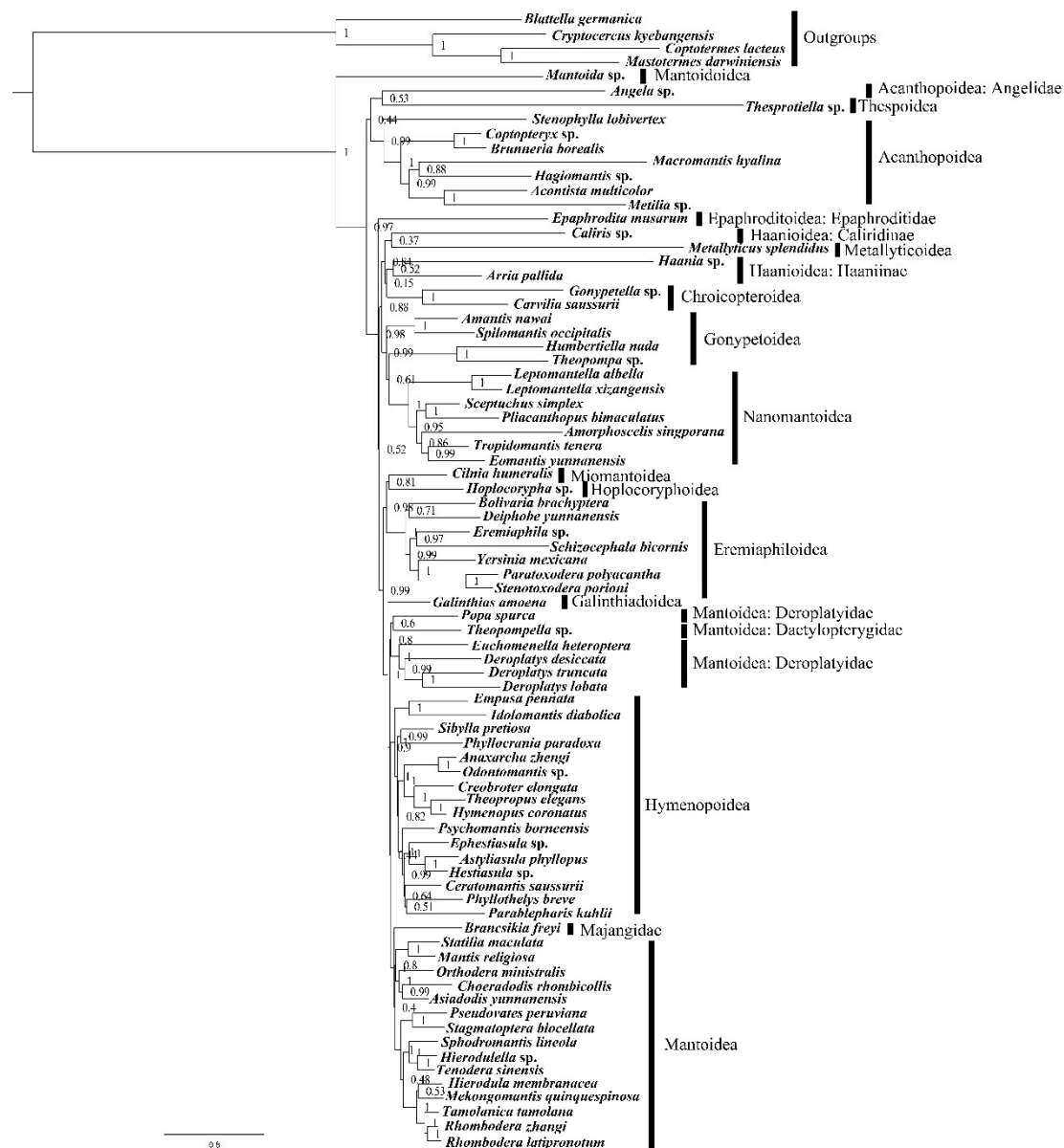


**Figures S17.** Phylogenetic tree inferred from MP analysis of NGPCGRNA. Bremer support values of MP analyses were labeled at each node.

Bremer supports (from 93868 trees, cut 0)

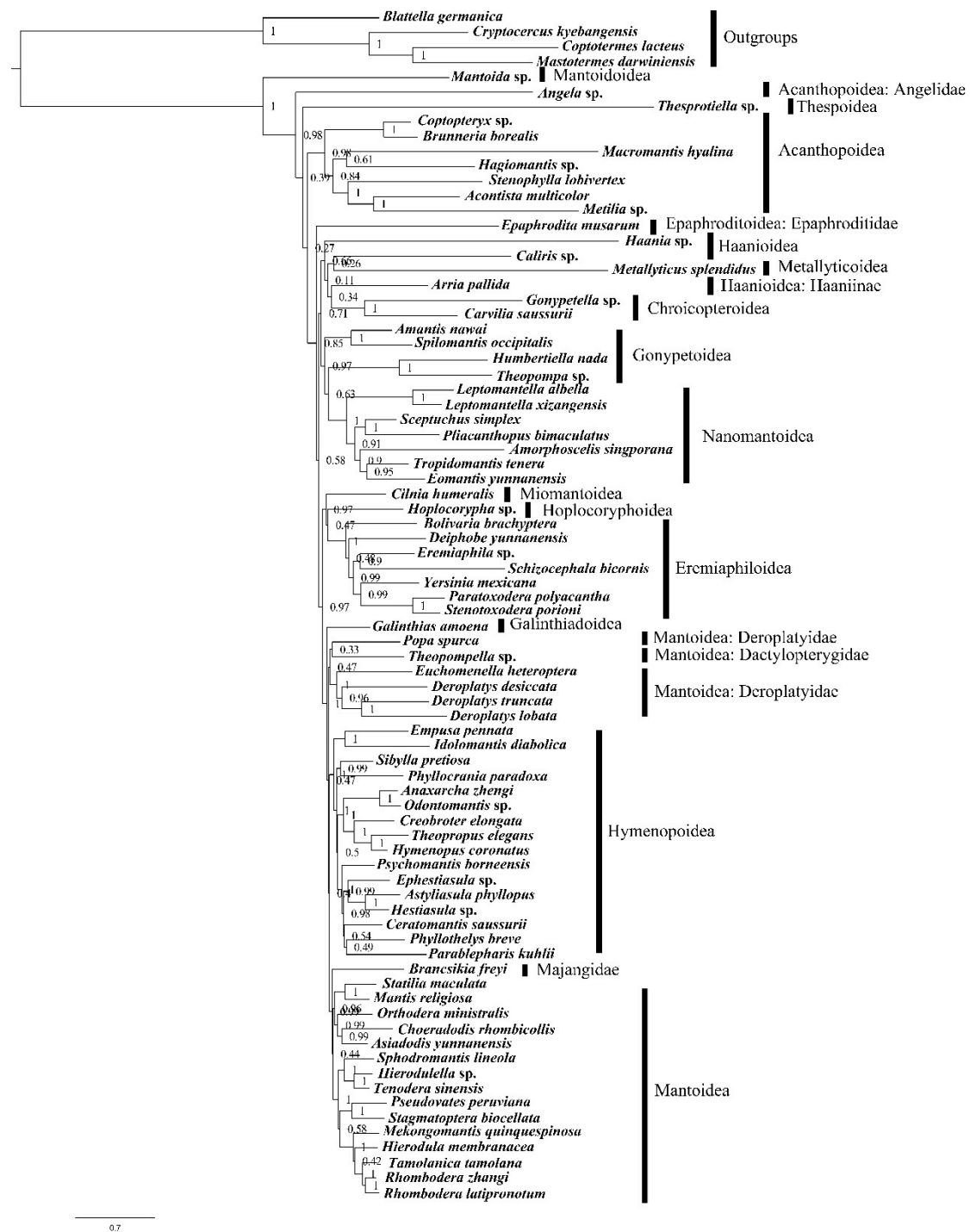


**Figures S18.** Phylogenetic tree inferred from MP analysis of NGPCG12RNA. Bremer support values of MP analyses were labeled at each node.

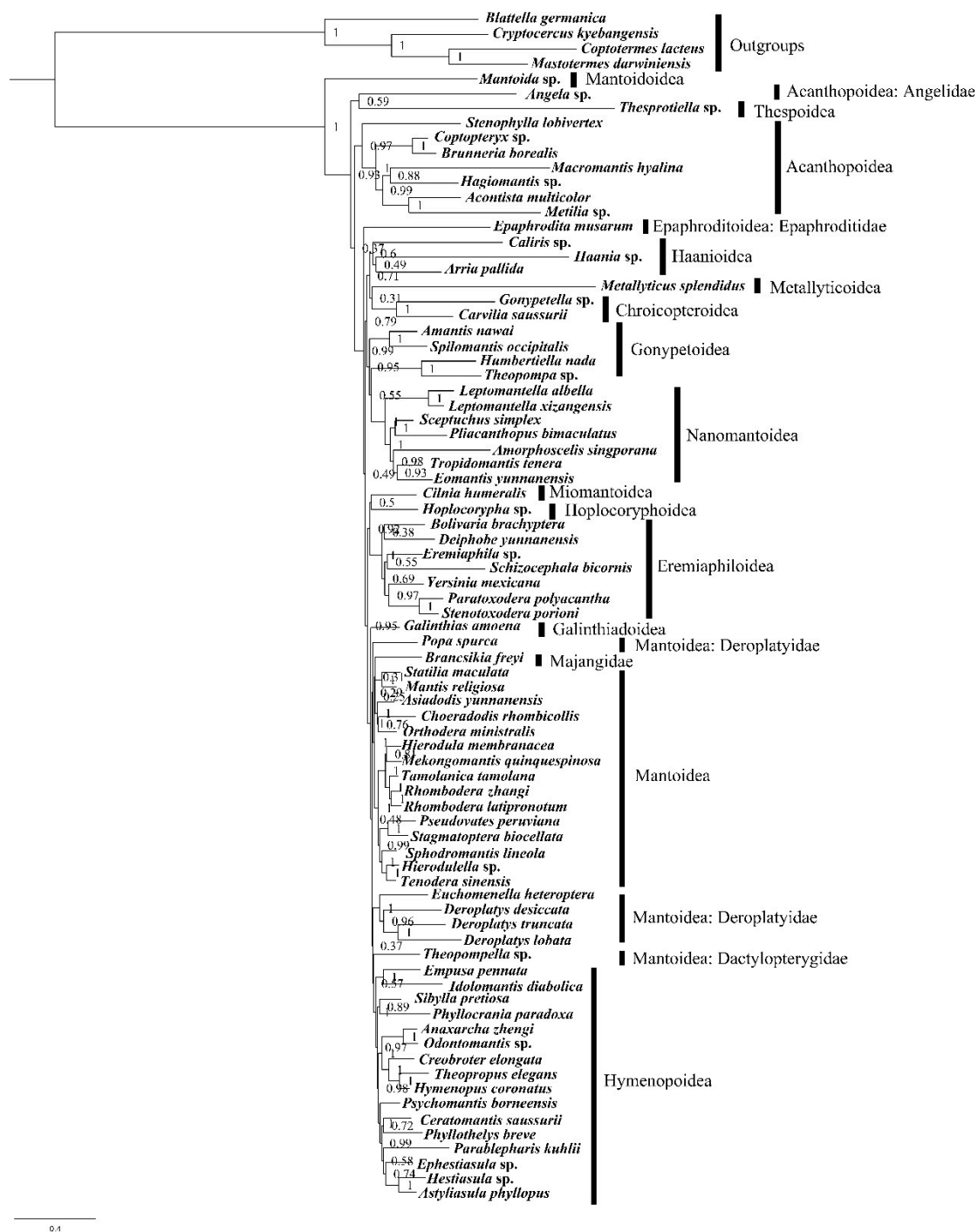


**Figures S19.** Phylogenetic tree inferred from BI analysis of NGPCGRNA using the site-heterogeneous model. Bayesian posterior probabilities (BPPs) of BI analyses were labeled at each node.

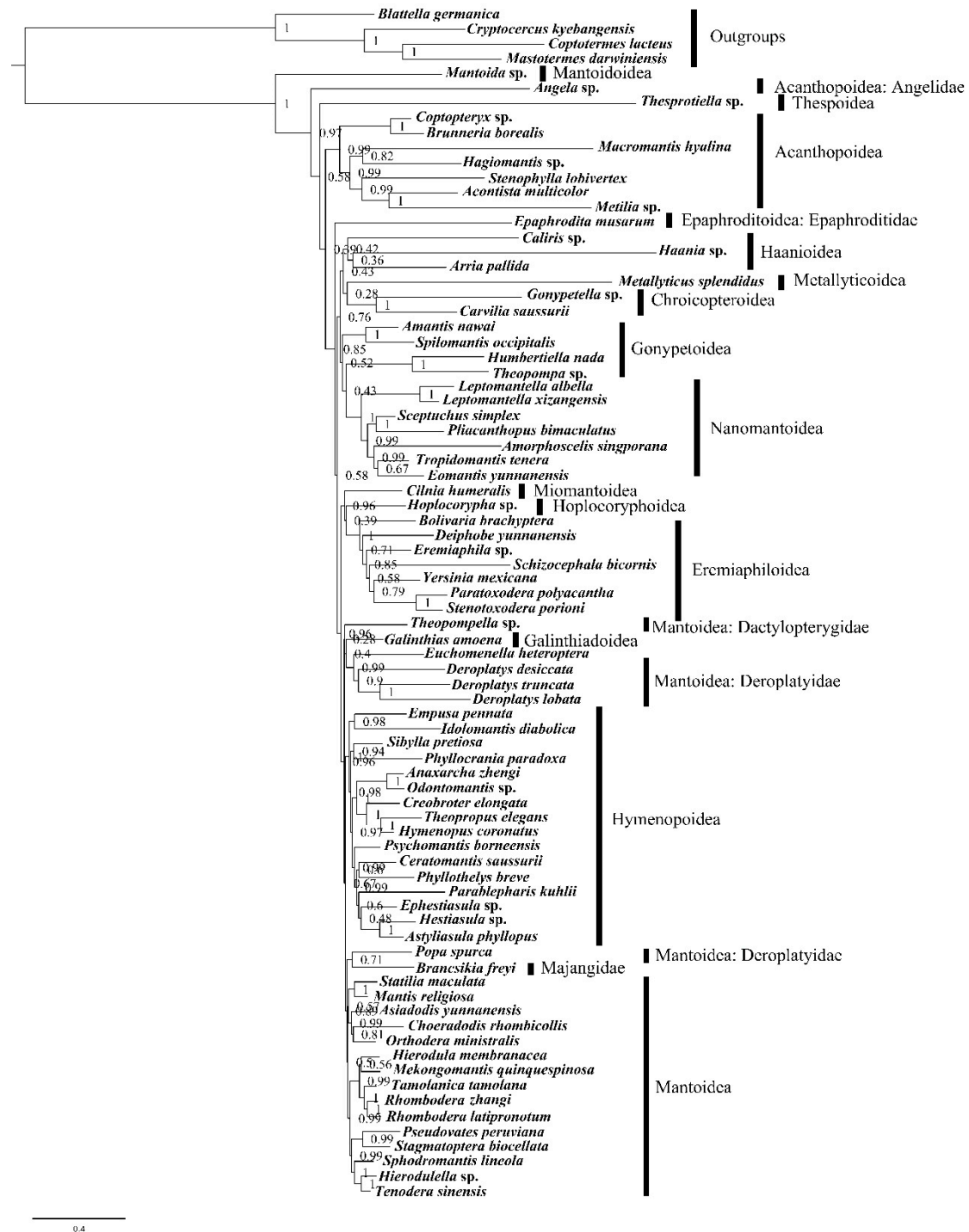




**Figures S20.** Phylogenetic tree inferred from BI analysis of PCGRNA using the site-heterogeneous model. BPPs of BI analyses were labeled at each node.



**Figures S21.** Phylogenetic tree inferred from BI analysis of NGPCG12RNA using the site-heterogeneous model. BPPs of BI analyses were labeled at each node.



**Figures S22.** Phylogenetic tree inferred from BI analysis of PCG12RNA using the site-heterogeneous model. BPPs of BI analyses were labeled at each node.