

**Table S2. List of errors detected in the dataset of Dunn et al. [2].**

Gene names are those of the original study. ‘Contamination’ includes both biological and *in silico* contaminations, as we cannot determine the origin of reported errors. However, we suspect that the biological material was contaminated as contaminating sequences exclusively belong to parasites. Cases of paralogy are often detected for species not used in the original study, especially for Bilateria, and therefore did not affect the original analysis. Misassignment of paralogs as orthologs is extremely rare and constitutes a negligible issue for this dataset.

| gene      | frameshift   | point mutations                         | paralogy  | contamination/alignment   |
|-----------|--|---|---|---|
| tribe1006 |  | Branchiostoma(5)                        |   |   |
| tribe1007 | Acanthosciura(5), Crassostrea (~50)  |   |   |   |
| tribe1009 | Homo(20), Macrostomum(40), Echinococcus(10), Trichinella(10), Ocarella(30) |   |   |   |
| tribe1012 |  |   |   |   |
| tribe1013 | Echinoderes(4, perhaps more)   | Branchiostoma(1)                        |   |   |
| tribe1015 | Macrostomum(90), Euprymna(5)   | Boophilus(2)                            | Heterodera+Meloidogyne(divergent copies, in-paralog)  |   |
| tribe1020 |  |   | Daphnia (out-paralog)   |   |
| tribe1026 | Crassostrea(50), Euprymna(20)  |   | Myzus (in-paralog)  | Scutigera (~50 misaligned), Euprymna (~50 misaligned)                             |
| tribe1041 | Cristatella(2), Euperipatoides(2), Gallus(20), Paraplanocera(3)            |   |   |   |
| tribe1046 | Euprymna(6?)   | Hydra(~5)                               | Daphnia(3, in-paralog?), Locusta(2, in-paralog)   |   |
| tribe1047 | Trichinella(20), Carcinus(6), Acanthosciura (10)                           |   |   |   |
| tribe1050 |  | Ptychodera(3)                           |   |   |
| tribe1051 | Acanthoscurria(3), Gallus(3), Lumbricus(3)                                 | Xiphinema(1)                            |   |   |
| tribe1054 |  |   | Onychiurus(2, in-paralog)   |   |
| tribe1077 |  | Turbanella(2)                           | Drosophila(2, divergent, in-paralog)  |   |
| tribe1081 | Acanthosciura(25)  |   |   |   |
| tribe1099 | Platynereis(6)   |   |   |   |
| tribe1118 | Carcinus(7), Biomphalaria(50)  | Trichinella(6)                          |   |   |
| tribe1121 | Nematostella (10)  | Hydra(1), Carinoma(2), Gnathostomula(2) |   |   |
| tribe1129 | Trichinella(5)   |   |   |   |
| tribe1132 |  |   |   |   |
| tribe1136 | Trichinella(20)  | Amoebidium (1)                          |   |   |
| tribe1162 | Biomphalaria(6), Macrostomum(50)   |   |   |   |
| tribe1165 | Brachionus(5)  | Anoplodactylus(3), Asterina(1)          |   |   |
| tribe1169 | Ptychodera(20), Trichinella(60), Xiphinema(3)                              |   |   |   |
| tribe1170 | Biomphalaria(10), Acanthosciura(10)  | Branchiostoma(1), Brachionus(1)         |   |   |
| tribe1181 | Crassostrea(10)  |   |   |   |
| tribe1187 |  | Branchiostoma(~10), Hydra(7)            |   |   |
| tribe1190 |  | Trichinella(2), Carinoma(1)             |   |   |
| tribe1200 |  |   |   |   |
| tribe1204 |  |   |   |   |
| tribe1244 | Trichinella(intron), Fenneropenaeus(20), Ciona(40)                         |   |   |   |
| tribe1245 |  |   | Hirudo, within Lepidoptera (in-paralog) + 3 divergent sequences (Nematostella, Strongylocentrotus, Laupala, likely, in-paralog) |   |
| tribe1292 | Gallus(10), Macrostomum(20)  |   | Monosiga (~60 misaligned)   |   |
| tribe1294 | Richtersius(30), Branchiostoma(10)   |   |   |   |
| tribe1335 |  |   |   | Capitella (~20 misaligned), Lumbricus (~40 misaligned), Euprymna (~30 misaligned) |
| tribe1374 | Biomphalaria(10)   |   |   |   |
| tribe1378 |  | Trichinella(2)                          |   |   |
| tribe1381 | Gnathostomula(10)  | Hydra(2)                                |   |   |

| gene      | frameshift   | point mutations   | paralogy | contamination/alignment                                  |
|-----------|--|---|----------|--|
| tribe1409 | Biomphalaria(10)   |   |          |  |
| tribe143  | Schmidtea(5)   | Acropora(1),<br>Argopecten(2),<br>Crassostrea(2),<br>Hypsibius(1)   |          | Symsagitiferra<br>(Chlorophyta)                          |
| tribe1489 |  | Philodina(1)  |          |  |
| tribe156  | Bugula(10), Carcinoscorpius(4),<br>Monosiga(70), Saccoglossus(55)  | Brachionus(2),<br>Cristatella(1),<br>Hydractinia(12),<br>Oscarella(6),<br>Paraplanocera(4),<br>Platynereis(1) |          |  |
| tribe1646 | Macrostomum(10)  |   |          |  |
| tribe169  | Brachionus(30), Branchiostoma(8),<br>Chaetopleura(10),<br>Echinococcus(50), Euprymna(30),<br>Hydractinia(7), Mnemiopsis(6),<br>Monosiga(20)  |   |          | Biomphalaria (~50<br>misaligned)                         |
| tribe174  | Asterina(30), Carcinoscorpius(15),<br>Euperipatoides(10), Phoronis(80)   | Acanthoscurria (20),<br>Biomphalaria(4),<br>Cristatella(2),<br>Echinoderes(2)                                 |          |  |
| tribe179  | Monosiga(8), Oscarella(10),<br>Trichinella(10), Macrostomum(80),<br>Strongylocentrotus(6),<br>Scutigera(10)  | Trichinella(3), Spadella(1),<br>Crassostrea(1),<br>Carinoma(1),<br>Hypsibius(2),<br>Hydractinia(5)            |          | Neochildia (Microsporidia)                               |
| tribe184  | Acropora(12),Biomphalaria(40),<br>Carcinoscorpius(3),<br>Chaetopleura(3), Echinococcus(5),<br>Euprymna(30), Hydractinia(30),<br>Macrostomum(20), Mytilus(60),<br>Oscarella(10), Symsagitifera(7),<br>Trichinella(75) | Brachionus(2),<br>Xiphinema(10)   |          |  |
| tribe186  | Amoebidium(30), Capsaspora(40),<br>Oscarella(47)   | Anoplodactylus(2),<br>Hydractinia(1),<br>Mnemiopsis(2),<br>Monosiga(3),<br>Turbanella(5)                      |          | Carcinoscorpius (~20<br>misaligned)                      |
| tribe193  | Spadella(8)  | Argopecten(1),<br>Echinococcus(5), Homo(3)  |          |  |
| tribe199  | Dugesia(20)  | Boophilus(2),<br>Chaetopterus(1),<br>Euprymna(2)  |          | Neochildia (Microsporidia)                               |
| tribe200  | Acanthoscurria(5), Acropora(10),<br>Capitella(60),<br>Fenneropenaeus(5),<br>Macrostomum(~10)   | Chaetopleura(3),<br>Hydractinia(1),<br>Monosiga(5)  |          | Cristatella (~70<br>misaligned)                          |
| tribe211  | Biomphalaria(30)   | Chaetopleura(2),<br>Ptychodera(2), Spadella(2)  |          | Symsagitiferra<br>(Chlorophyta)                          |
| tribe213  |  | Euprymna(1),<br>Monosiga(3),Sphaeroform<br>a(2), Trichinella(13)  |          | Symsagitiferra<br>(Chlorophyta, ~40<br>misaligned)       |
| tribe225  | Biomphalaria(30),<br>Branchiostoma(10),<br>Echinococcus(10),<br>Sphaeroforma(10)   | Spadella(1), Trichinella(1)   |          |  |
| tribe226  | Euprymna(7)  | Cerebratulus(2)   |          |  |
| tribe232  | Acropora(8), Amoebidium(2),<br>Aplysia(14), Capitella(10),<br>Capsaspora(6),<br>Fenneropenaeus(13), Gallus(5),<br>Myzostoma(15),<br>Strongylocentrotus(6)  | Cyanea(3),<br>Macrostomum(5)  |          | Trichinella (Ascaris)                                    |
| tribe233  | Anoplodactylus(intron), Capitella(7)   |   |          |  |
| tribe235  | Boophilus(10), Ciona(intron),<br>Gallus(20), Strongylocentrotus(10)  |   |          | Neochildia (Microsporidia)                               |
| tribe236  | Fenneropenaeus(25)   | Biomphalaria(1)   |          |  |
| tribe241  | Aplysia(5), Capsaspora(4),<br>Mytilus(18)  |   |          |  |
| tribe242  | Argopecten(12), Biomphalaria(4),<br>Crassostrea(20)  |   |          |  |
| tribe243  | Cyanea(5), Scutigera(3)  | Anoplodactylus(2),<br>Echinoderes(2)  |          | Macrostomum(choano?),<br>Symsagitiferra<br>(Chlorophyta) |

| gene     | frameshift   | point mutations  | paralogy  | contamination/alignment   |
|----------|--|--|---|---|
| tribe260 | Acropora(3), Haementeria(4),<br>Phoronis(7), Trichinella(30),<br>Schmidtea(12),<br>Strongylocentrotus(5) | Branchiostoma(3)   |   |   |
| tribe263 | Crassostrea(120),<br>Fenneropenaeus(8), Euprymna(15),<br>Capitella(6)                                    | Saccoglossus(10, bad<br>genetic code),<br>Echinococcus(6),<br>Paraplanocera(12),<br>Dugesia(5), Asterina(11) |   | Hydra(Artemia)  |
| tribe268 |  |  |   |   |
| tribe271 |  |  |   |   |
| tribe272 |  | Acropora(2), Capitella(20),<br>Echinococcus(1),<br>Pedicellina(1),<br>Platynereis(4)                         |   |   |
| tribe273 | Monosiga(10)   | Trichinella(1),<br>Turbanella(2)   |   | Priapulid (Phoronis)  |
| tribe279 |  | Acanthoscurria(10),<br>Cryptococcus(6)   |   | Neochilidia (Microsporidia)   |
| tribe281 | Asterina(5), Trichinella(5)  | Oscarella(2),<br>Schmidtea(1)  | Tribolium (2)   |   |
| tribe287 | Argopecten(17), Ciona(5)   | Monosiga(1),<br>Paraplanocera(1)   |   | Symsagittifera (Ciliates)   |
| tribe288 | Dugesia(3), Strongylocentrotus(25),<br>Themiste(intron)  | Capsaspora(52)   |   | Symsagittifera<br>(Ancyromonas)   |
| tribe299 | Chaetopleura(7)  | Anoplodactylus(1),<br>Biomphalaria(1),<br>Euperipatoides(1),<br>Gnathostomula(2),<br>Xiphinema(3)            |   | Symsagittifera<br>(Chlorophyta?)  |
| tribe305 | Daphnia(20)  | Brachionus(2),<br>Chaetopleura(2),<br>Cyanea(1),<br>Echinococcus(1),<br>Scutigera(3)                         |   | Symsagittifera (Ciliates)   |
| tribe319 | Anoplodactylus(6)  | Euperipatoides(1),<br>Hydractinia(5)   |   |   |
| tribe320 | Anoplodactylus(2)  | Crassostrea(1)   |   | Symsagittifera (Cnidaria?)  |
| tribe321 |  | Chaetopleura(2)  |   | Acanthoscurria (Triticum)   |
| tribe325 | Biomphalaria(13), Haementeria(50),<br>Macrostomum(10)  | Aplysia(4)   |   | Branchiostoma (not clear<br>donor)  |
| tribe330 | Argopecten(4), Crassostrea(40),<br>Fenneropenaeus(4)   | Strongylocentrotus (24),<br>Ptychodera(3), Cyanea(7),<br>Daphnia(2),<br>Paraplanocera(5),<br>Schmidtea(6)    |   | Dugesia (Gallus),<br>Xiphinema (Lumbricus),<br>Asterina (~60<br>misaligned), Cyanea (~60<br>misaligned), Nematostella<br>(~40 misaligned) |
| tribe333 | Flaccisagitta(30), Capsaspora(10),<br>Euprymna(10)   | Biomphalaria(2)  | Paracentrotus+Strongylocentro<br>tus (3, in-paralog),<br>Saccoglossus(3) and several<br>others (drosophila, etc.) |   |
| tribe340 | Aplysia(10)  |  |   |   |
| tribe345 | Acropora(12), Ciona(5),<br>Dugesia(21)   |  |   |   |
| tribe351 | Euperipatoides(5), Hydractinia(10)   | Turbanella(1)  |   | Priapulid (Alveolata)   |
| tribe352 | Biomphalaria(25), Crassostrea(4),<br>Daphnia(5), Echinococcus(7)   | Sphaeroforma(20),<br>Spinichordodes(10)  |   |   |
| tribe355 |  | Argopecten(2),<br>Branchiostoma(2),<br>Euperipatoides(2)   |   |   |
| tribe356 | Brachionus(15),<br>Chaetoderma(15), Mytilus(4)   | Chaetopleura(2),<br>Echinoderes(1),<br>Gnathostomula(1),<br>Trichinella(3),<br>Turbanella(1)                 |   | Symsagittifera<br>(Amoebozoa?)  |

| gene     | frameshift  | point mutations  | paralogy   | contamination/alignment  |
|----------|---|--|--|--|
| tribe368 | Aplysia(10), Mytilus(60), Saccoglossus(5)   | Saccoglossus(17, bad genetic code), Ciona(82), Schmidtea(7), Euperipatoides(7)     |  | Ptychodera (~200 misaligned)   |
| tribe369 |   | Fenneropenaeus(3), Asterina(21)  |  | Hydra (Artemia), Saccoglossus (Mus)  |
| tribe380 | Lumbricus(10), Chaetopterus(5)  | Saccoglossus(10, bad genetic code), Ciona(62), Paraplanocera(16)                   |  |  |
| tribe400 | Flaccisagitta (25), Schmidtea(110)  | Fenneropenaeus(4), Asterina(34, bad code), Ptychodera(5), Dugesia(9), Boophilus(3) |  | Saccoglossus (Mus), Dugesia (Gallus)   |
| tribe435 | Scutigera(3), Xiphinema(30)   | Anoplodactylus(1), Xiphinema(~5)   |  |  |
| tribe460 | Eupryma(40)   | Chaetopterus(1), Eupryma(30), Trichinella(2), Richtersius(3)                       |  | Strongylocentrotus (chimerical gene, the first 40 amino acids are from Rho guanine nucleotide exchange factor 3) |
| tribe495 | Carcinus(5), Trichinella(20), Biomphalaria(3)   | Euprymna(1), Monosiga(3), Schmidtea(1), Amoebidium(5)                              |  |  |
| tribe507 | Biomphalaria(10), Mytilus(6)  | Daphnia(1), Turbanella(2)  |  |  |
| tribe508 |   | Trichinella(3), Xiphinema(1), Richtersius(1)                                       |  |  |
| tribe532 | Oscarella(4)  |  |  |  |
| tribe542 | Cerebratulus (~10)  | Bugula(1)  | Schmidtea(divergent, in-paralog)   |  |
| tribe550 |   |  | several paralogs (without clear structure)   |  |
| tribe572 | Capsaspora(8), Branchiostoma (6), Aplysia(10), M. ovata(10)   | Branchiostoma(2)   | Rhodnius, Hymenoptera(divergent, in-paralog?), Brugia (in-paralog), Tribolium (divergent, in-paralog?) |  |
| tribe585 | Macrostomum(5), Gallus (~30)  | Hypsibius(7)   | duplication at the base of Hexapoda  |  |
| tribe586 |   |  | Caenorhabditis (divergent, in-paralog?)  |  |
| tribe593 | Capitella(10), Chaetopterus(intron)   |  |  |  |
| tribe613 | Ferrenopenaeus(3)   |  | Apis   |  |
| tribe619 | Ferrenopenaeus(10)  | Acropora(1)  |  |  |
| tribe622 | Biomphalaria(20)  |  |  | Trichinella (Pseudomonas)  |
| tribe629 | Echinococcus(3), Strongylocentrotus(3), Mytilus(3)  | Gnathostomula(1), Branchiostoma(10)  |  |  |
| tribe632 |   |  | numerous divergent copies in Hexapoda and Nematoda   |  |
| tribe646 | Spinochordodes(6), Biomphalaria(3)  | Acanthoscurria(1)  |  |  |
| tribe647 | Macrostomum(2)  | Branchiostoma(10)  |  |  |
| tribe683 | Turbanella(10)  | Mnemioopsis(3)   | Ixodes (3, in-paralog), Saccoglossus(3), Folsomia(2), Lumbricus(2), several hexapoda, many others      | Symsagittifera (Cyanobacteria)   |
| tribe686 |   |  | many species   |  |
| tribe696 | Trichinella(5)  | Strongylocentrotus(1)  |  |  |
| tribe700 | Oscarella(40)   |  | bombyx (2, divergent, in-paralog?)   |  |
| tribe703 | Crassostrea(50), Echinococcus(10), Gallus(~10), Lumbricus(4), Macrostomum(~25), Symsagittifera(11), Trichinella(10) | Hydra(1), Shaeroforma(2)   |  |  |
| tribe716 | Hydra(10), Euprymna(10)   |  |  | Acanthoscurria (angiosperm, + frameshift of 68 aa)   |
| tribe717 | Daphnia(7)  | Hydractinia(4)   | Drosophila(2)  |  |
| tribe726 |   |  | Brugia(2), Mammalia(2), mosquitoes(2)  |  |
| tribe739 | Ferrenopenaeus(4)   | Euperipatoides(1)  | Myzus(2), Drosophila(2)  |  |
| tribe740 | Euprymna(5)   | Mytilus(1)   |  |  |
| tribe742 |   | Asterina(1), Crassostrea(2)  | Tribolium(2), Vertebrata(2), Platyhelminthes(2), Symsagittifera(2)                                     |  |
| tribe756 |   | Monosiga(3)  | Helobdella(2), Drosophila(2)   |  |
| tribe764 | Aplysia(6)  |  | Coleoptera(2)  |  |
| tribe765 | Trichinella(6)  |  | Capitella(2)   |  |
| tribe766 |   |  |  | Carcinoscorpius (~10 misaligned), Carcinus (~10 misaligned)  |

| gene     | frameshift   | point mutations  | paralogy  | contamination/alignment                          |
|----------|--|--|---|--|
| tribe768 | Homo(5)  | Branchiostoma(2)   |   |  |
| tribe782 | Gallus(5), Biomphalaria(10), Euperipatoides(4)                                   |  |   |  |
| tribe783 | Chaetopleura(3)  | Anoplodactylus(2)  |   |  |
| tribe793 | Crassostrea(2), Biomphalaria(40)   | Mnemiopsis(1)  |   |  |
| tribe801 | Argopecten(10)   |  | Nematostella(2, divergent), Insecta(several)                    |  |
| tribe805 | Drosophila(2), Echinococcus(5)   | Crassostrea(2), Daphnia(1), Oscarella(3)                     |   |  |
| tribe831 |  |  |   |  |
| tribe832 | Macrostomum(20), Xenoturbella(4), Euprymna(20), Fenneropenaeus(20)               | Themiste(2), Mytilus(2)                                      | Drosophila(2, divergent)  |  |
| tribe833 | Branchiostoma(15), Cryptococcus(8), Hypsibius(30), Mnemiopsis(3), Trichinella(5) | Acanthoscurria(1)  |   |  |
| tribe850 | Dugesia(2), Boophilus(20)  | Amoebidium (7)   |   |  |
| tribe852 | Symsagittifera(4)  | Branchiostoma(1)   |   |  |
| tribe858 |  | Branchiostoma(2), Schmidtea(1)                               | many many paralogs  | Asterina (Bacteria)                              |
| tribe861 | Cristatella(4), Schmidtea(2)   |  |   |  |
| tribe868 |  |  |   |  |
| tribe893 |  |  | Monosiga(2)   |  |
| tribe895 | Branchiostoma(3), Biomphalaria(70)   |  |   |  |
| tribe896 | Xiphinema(10), Lumbricus(3)  |  |   | Symsagittifera (Chlorophyta)                     |
| tribe905 |  | Echinococcus(1)  | Caenorhabditis(2,in), Pristionchus(2,in), Drosophila(divergent) |  |
| tribe906 |  | Crassostrea(5)   | Drosophila(2, divergent), Mammalia(2)                           |  |
| tribe916 |  | Echinococcus(1)  |   | Symsagittifera (Prokaryota), Monosiga (Rhizopus) |
| tribe927 | Aplysia(3)   | Branchiostoma(2)   | Lepidoptera(2)  |  |
| tribe930 | Euprymna(3)  | Biomphalaria(1)  | Myzus(2)  |  |
| tribe942 |  | Boophilus(50), Branchiostoma(1)                              | Drosophila(2, divergent)  | Oscarella (Pseudomonas)                          |
| tribe961 | Hydractinia(6)   | Cristatella(2), Crassostrea(1), Aplysia(5), Gnathostomula(2) | Helobdella(2, divergent)  |  |
| tribe965 |  |  |   |  |