**Table S1.** GenBank accession numbers of the sequences used to reconstruct the phylogeny of *Phestilla* spp. and their related genera/species

|  |  |  |  |
| --- | --- | --- | --- |
| Species | H3 | 16S | COI |
| *Phestilla fuscostriata* sp. nov. | MN065809 | MN065807 | MN065805 |
| *Phestilla fuscostriata* sp. nov. | MN065810 | MN065808 | MN065806 |
| *Abronica abronia* | KY128504.1 | KY128712.1 | KY128917.1 |
| *Abronica purpureoanulata* | KY128557.1 | KY128762.1 | KY128970.1 |
| *Abronica* sp. 6 | KY128575.1 | KY128780.1 | KY128988.1 |
| *Abronica* sp. 7 | KY128578.1 | KY128783.1 | KY128991.1 |
| *Aeolidia* sp. 2 | KY128561.1 | KY128766.1 | KY128974.1 |
| *Amphorina cf. farrani* | KY128614.1 | KY128819.1 | KY129028.1 |
| *Amphorina pallida* | KY128616.1 | KY128821.1 | KY129030.1 |
| *Apata pricei* | KY128645.1 | KY128851.1 | KY129060.1 |
| *Calma glaucoides* | - | KY128705.1 | KY128913.1 |
| *Catriona columbiana* | KY128493.1 | KY128698.1 | KY128906.1 |
| *Catriona gymnota* | KY128494.1 | KY128699.1 | KY128907.1 |
| *Coryhella verrucosa* | KY128650.1 | KY128856.1 | KY129065.1 |
| *Coryphellina arveloi* | KY128633.1 | KY128839.1 | KY129048.1 |
| *Coryphellina exoptata* | KY128638.1 | KY128844.1 | KY129053.1 |
| *Coryphellina rubrolineata* | KY128646.1 | KY128852.1 | KY129061.1 |
| *Cratena pilata* | KY128502.1 | KY128709.1 | - |
| *Cuthona nana* | KY128501.1 | KY128708.1 | KY128915.1 |
| *Cuthonella cocoachroma* | KY128513.1 | KY128720.1 | KY128925.1 |
| *Cuthonella concinna* | KY128512.1 | KY128719.1 | KY128924.1 |
| *Cuthonella hiemalis* | KY128595.1 | KY128799.1 | KY129007.1 |
| *Cuthonella soboli* | KY128605.1 | KY128811.1 | KY129020.1 |
| *Cuthonella* sp. A | KY128594.1 | KY128810.1 | KY129019.1 |
| *Diaphoreolis flavovulta* | KY128535.1 | KY128742.1 | KY128947.1 |
| *Diaphoreolis lagunae* | KY128542.1 | KY128748.1 | KY128955.1 |
| *Diaphoreolis viridis* | KY128613.1 | KY128818.1 | KY129027.1 |
| *Eubranchus alexei* | KY128487.1 | KY128692.1 | KY128900.1 |
| *Eubranchus exiguus* | KY128615.1 | KY128820.1 | KY129029.1 |
| *Eubranchus mandapamensis* | KY128621.1 | KY128826.1 | KY129035.1 |
| *Eubranchus odhneri* | KY128490.1 | KY128695.1 | KY128903.1 |
| *Eubranchus olivaceus* | KY128623.1 | KY128828.1 | KY129037.1 |
| *Eubranchus rupium* | KY128617.1 | KY128822.1 | KY129031.1 |
| *Eubranchus* sp. 3 | KY128626.1 | KY128831.1 | KY129040.1 |
| *Eubranchus* sp. A | KY128625.1 | KY128830.1 | KY129039.1 |
| *Eubranchus tricolor* | KY128618.1 | KY128823.1 | KY129032.1 |
| *Facelina bostoniensis* | KY128632.1 | KY128837.1 | KY129046.1 |
| *Fiona pinnata* | KY128486.1 | KY128838.1 | KY129047.1 |
| *Flabellina gracilis* | KY128640.1 | KY128846.1 | KY129055.1 |
| *Flabellina* sp. A | KY128637.1 | KY128843.1 | KY129052.1 |
| *Flabellinopsis iodinea* | KY128641.1 | KY128847.1 | KY129056.1 |
| *Murmania antiqua* | KY128651.1 | KY128857.1 | KY129066.1 |
| *Orienthella trilineata* | KY128649.1 | KY128855.1 | KY129064.1 |
| *Pacifia goddardi* | KY128648.1 | KY128854.1 | KY129063.1 |
| *Paraflabellina funeka* | KY128639.1 | KY128845.1 | KY129054.1 |
| *Phestilla chaetopterana* | MF458310 | MF458308 | MF458314 |
| *Phestilla lugubris* | KY128660.1 | KY128866.1 | KY129075.1 |
| *Phestilla melanobrachia* | KY128661.1 | KY128867.1 | KY129076.1 |
| *Phestilla minor* | DQ417304 | DQ417256 | - |
| *Phestilla poritophages* | KY128554.1 | KY128759.1 | KY128968.1 |
| *Phestilla sibogae* | KY128562.1 | KY128767.1 | KY128975.1 |
| *Phestilla subodiosa* | MN255477 | MN255475 | MN255482 |
| *Phestilla viei* | MN239112 | MN257606 | MN257608 |
| *Phyllodesmium parangatum* | - | KY128872.1 | KY129081.1 |
| *Phyllodesmium* sp. A | KY128666.1 | KY128873.1 | KY129082.1 |
| *Rubramoena amoena* | KY128491.1 | KY128696.1 | KY128904.1 |
| *Rubramoena rubescens* | KY128503.1 | KY128710.1 | KY128916.1 |
| *Salma bicolor* | KY128635.1 | KY128841.1 | KY129050.1 |
| *Salma bilas* | KY128636.1 | KY128842.1 | KY129051.1 |
| *Salma macassarana* | KY128644.1 | KY128850.1 | KY129059.1 |
| *Tenellia adspersa* | KY128668.1 | KY128876.1 | KY129085.1 |
| *Tenellia* sp. 10 | KY128563.1 | KY128768.1 | KY128976.1 |
| *Tenellia* sp. 12 | KY128565.1 | KY128770.1 | KY128978.1 |
| *Tenellia* sp. 15 | KY128567.1 | KY128772.1 | KY128980.1 |
| *Tenellia* sp. 17 | KY128568.1 | KY128773.1 | KY128981.1 |
| *Tenellia* sp. 19 | KY128569.1 | KY128774.1 | KY128982.1 |
| *Tenellia* sp. 2 | KY128572.1 | KY128777.1 | KY128985.1 |
| *Tenellia* sp. 29 | KY128571.1 | KY128776.1 | KY128984.1 |
| *Tenellia* sp. 3 | KY128665.1 | KY128871.1 | KY129080.1 |
| *Tenellia* sp. A | KY128579.1 | KY128784.1 | KY128992.1 |
| *Tenellia* sp. B | KY128580.1 | KY128785.1 | KY128993.1 |
| *Tenellia* sp. C | KY128511.1 | KY128718.1 | KY128923.1 |
| *Tenellia* sp. D | KY128496.1 | KY128701.1 | KY128909.1 |
| *Tenellia* sp. E | KY128586.1 | KY128791.1 | KY128999.1 |
| *Tenellia* sp. F | KY128589.1 | KY128794.1 | KY129002.1 |
| *Tenellia* sp. G | KY128566.1 | KY128771.1 | KY128979.1 |
| *Tenellia* sp. H | KY128498.1 | KY128703.1 | KY128911.1 |
| *Tenellia* sp. J | KY128684.1 | KY128892.1 | KY129101.1 |
| *Tenellia* sp. K | KY128570.1 | KY128775.1 | KY128983.1 |
| *Tenellia* sp. L | KY128659.1 | KY128865.1 | KY129074.1 |
| *Tenellia* sp. M | KY128582.1 | KY128787.1 | KY128995.1 |
| *Tergipes tergipes* | KY128670.1 | KY128878.1 | KY129087.1 |
| *Tergiposacca longicerata* | KY128669.1 | KY128877.1 | KY129086.1 |
| *Trinchesia albocrusta* | KY128509.1 | - | - |
| *Trinchesia* cf. *maua* | KY128492.1 | KY128697.1 | KY128905.1 |
| *Trinchesia foliata* | KY128499.1 | KY128704.1 | KY128912.1 |
| *Trinchesia lenkae* | KY128676.1 | KY128884.1 | KY129093.1 |
| *Trinchesia ornata* | KY128553.1 | KY128758.1 | KY128967.1 |
| *Trinchesia speciosa* | KY128583.1 | KY128788.1 | KY128996.1 |
| *Zelentia* cf. *pustulata* | KY128556.1 | KY128761.1 | - |
| *Zelentia fulgens* | KY128539.1 | KY128746.1 | KY128951.1 |
| *Ziminella salmonacea* | KY128647.1 | KY128853.1 | KY129062.1 |

**Table S2.** Uncorrected *COI*/16S rRNA/H3 *p*-distances (%) among all species of described *Phestilla* with available sequences

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 *Phestilla fuscostriata* sp. nov. |  |  |  |  |  |  |  |  |  |  |
| 2 *Phestilla fuscostriata* sp. nov. | 0.5/1.5/0.6 |  |  |  |  |  |  |  |  |  |
| 3 *P. viei* | 12.5/4.8/3.8 | 12.5/7.0/3.2 |  |  |  |  |  |  |  |  |
| 4 *P. subodiosa* | 14.7/10.8/8.2 | 15.0/9.7/7.5 | 15.9/11.7/5.0 |  |  |  |  |  |  |  |
| 5 *P. sibogae* | 20.4/14.7/11.5 | 20.8/15.8/11.5 | 19.9/13.7/8.5 | 21.9/12.4/9.1 |  |  |  |  |  |  |
| 6 *P. chaetopterana* | 16.8/12.6/10.0 | 16.8/13.7/9.7 | 19.0/14.6/6.2 | 16.3/11.6/9.5 | 22.0/14.3/8.5 |  |  |  |  |  |
| 7 *P. lugubris* | 22.4/12.2/8.6 | 22.8/12.2/8.6 | 22.8/14.4/5.1 | 19.4/8.7/8.4 | 24.2/14.0/8.4 | 20.4/11.9/8.2 |  |  |  |  |
| 8 *P. melanobranchia* | 18.7/11.5/9.6 | 19.1/11.5/8.9 | 17.4/11.9/5.4 | 17.3/7.2/8.4 | 22.0/13.4/11.7 | 22.4/12.3/9.2 | 22.8/6.8/4.4 |  |  |  |
| 9 *P. poritophages* | 18.4/10.9/10.7 | 18.8/11.2/10.7 | 19.0/11.3/7.4 | 16.3/8.0/10.5 | 19.6/13.2/8.8 | 17.2/12.3/10.5 | 21.4/9.4/4.1 | 20.9/8.6/7.8 |  |  |
| 10 *P. minor* | 14.2/12.1/- | 14.2/10.9/- | 15.7/13.6/- | 15.0/8.4/- | 21.9/13.9/- | 17.2/12.1/- | 19.610.0/- | 18.3/9.4/- | 16.5/10.0/- |  |