

SUPPLEMENTARY TABLES

Table S1. Individual sample information and associated voucher number from the Australian National Wildlife Collection, CSIRO, Canberra, Australia.

| Species | Sample | Population | Latitude | Longitude |
|-----------------------|--------|------------|-----------|-----------|
| Entomyzon cyanotis | B29845 | CYP | -12.4328 | 141.8511 |
| Entomyzon cyanotis | B42938 | CYP | -13.6194 | 143.5056 |
| Entomyzon cyanotis | B57229 | CYP | -11.90686 | 142.18051 |
| Entomyzon cyanotis | B51580 | CYP | -13.0681 | 141.975 |
| Entomyzon cyanotis | B32186 | CYP | -16.45 | 141.5833 |
| Entomyzon cyanotis | B33941 | NT | -15.7019 | 129.6381 |
| Entomyzon cyanotis | B54741 | NT | -14.172 | 133.741 |
| Entomyzon cyanotis | B29991 | NT | -12.3978 | 131.1908 |
| Entomyzon cyanotis | B54495 | NT | -16.503 | 136.447 |
| Entomyzon cyanotis | B54658 | NT | -14.686 | 134.374 |
| Entomyzon cyanotis | B56237 | PNG | -8.70793 | 141.65549 |
| Entomyzon cyanotis | B56130 | PNG | -8.85101 | 141.24799 |
| Entomyzon cyanotis | B56165 | PNG | -8.88643 | 141.25607 |
| Entomyzon cyanotis | B56277 | PNG | -8.77699 | 141.63367 |
| Entomyzon cyanotis | B56164 | PNG | -8.88643 | 141.25607 |
| Entomyzon cyanotis | B41504 | QLD | -19.5667 | 147.2333 |
| Entomyzon cyanotis | B43430 | QLD | -24.3583 | 150.9611 |
| Entomyzon cyanotis | B55999 | QLD | -18.61753 | 144.76453 |
| Entomyzon cyanotis | B31184 | QLD | -19.9322 | 147.8672 |
| Entomyzon cyanotis | B44248 | QLD | -22.4417 | 150.2972 |
| Gerygone magnirostris | B32144 | CYP | -14.1317 | 143.2733 |
| Gerygone magnirostris | B39712 | CYP | -13.7 | 143.35 |
| Gerygone magnirostris | B39969 | CYP | -15.15 | 143.8 |
| Gerygone magnirostris | B39983 | CYP | -14.25 | 143.4333 |
| Gerygone magnirostris | B51442 | CYP | -14.4769 | 144.2083 |
| Gerygone magnirostris | B54621 | NT | -14.713 | 135.284 |
| Gerygone magnirostris | B33683 | NT | -12.42 | 131.2242 |
| Gerygone magnirostris | B33742 | NT | -12.4167 | 131.2114 |
| Gerygone magnirostris | B54599 | NT | -14.742 | 135.292 |
| Gerygone magnirostris | B48650 | NT | -11.4061 | 130.93 |
| Gerygone magnirostris | B56004 | PNG | -9.06799 | 146.83009 |
| Gerygone magnirostris | B56086 | PNG | -8.69726 | 141.1261 |
| Gerygone magnirostris | B55973 | PNG | -8.71265 | 146.53625 |

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|--------------------------|--------|-----|-----------|-----------|
| Gerygone magnirostris | B56100 | PNG | -8.85101 | 141.24799 |
| Gerygone magnirostris | B56134 | PNG | -8.85101 | 141.24799 |
| Gerygone magnirostris | B56294 | PNG | -8.71246 | 141.64272 |
| Gerygone magnirostris | B31306 | QLD | -18.9269 | 146.3183 |
| Gerygone magnirostris | B31194 | QLD | -19.8203 | 147.6681 |
| Gerygone magnirostris | B31218 | QLD | -19.7361 | 147.5553 |
| Gerygone magnirostris | B31331 | QLD | -18.7342 | 146.1403 |
| Gerygone magnirostris | B31332 | QLD | -18.7342 | 146.1403 |
| Lichmera indistincta | B51483 | CYP | -14.6244 | 144.245 |
| Lichmera indistincta | B32243 | CYP | -14.9786 | 143.5978 |
| Lichmera indistincta | B51686 | CYP | -15.4367 | 141.7181 |
| Lichmera indistincta | B29599 | CYP | -17.4722 | 141.1922 |
| Lichmera indistincta | B41709 | CYP | -18.2167 | 139.8833 |
| Lichmera indistincta | B33483 | NT | -15.6017 | 130.0367 |
| Lichmera indistincta | B54818 | NT | -15.787 | 133.578 |
| Lichmera indistincta | B54566 | NT | -15.665 | 135.654 |
| Lichmera indistincta | B54594 | NT | -14.78 | 135.257 |
| Lichmera indistincta | B48750 | NT | -11.9056 | 130.9222 |
| Lichmera indistincta | B31254 | QLD | -19.3361 | 147.0975 |
| Lichmera indistincta | B32345 | QLD | -19.25 | 146.8 |
| Lichmera indistincta | B31143 | QLD | -20.9078 | 148.8422 |
| Lichmera indistincta | B43709 | QLD | -22.7614 | 150.6497 |
| Lichmera indistincta | B43518 | QLD | -22.4267 | 150.5819 |
| Melithreptus albogularis | B51510 | CYP | -13.0019 | 142.0583 |
| Melithreptus albogularis | B32720 | CYP | -12.1756 | 141.8964 |
| Melithreptus albogularis | B51423 | CYP | -14.305 | 144.2236 |
| Melithreptus albogularis | B29715 | CYP | -13.8464 | 143.1453 |
| Melithreptus albogularis | B32178 | CYP | -15.4203 | 144.1842 |
| Melithreptus albogularis | B54698 | NT | -14.696 | 134.3 |
| Melithreptus albogularis | B29984 | NT | -12.3978 | 131.1908 |
| Melithreptus albogularis | B33932 | NT | -15.7019 | 129.6381 |
| Melithreptus albogularis | B48618 | NT | -11.5136 | 130.8978 |
| Melithreptus albogularis | B54425 | NT | -15.947 | 136.313 |
| Melithreptus albogularis | B55950 | PNG | -9.02185 | 146.81592 |
| Melithreptus albogularis | B56038 | PNG | -8.99921 | 146.79308 |
| Melithreptus albogularis | B39410 | QLD | -22.1667 | 148.5 |
| Melithreptus albogularis | B31140 | QLD | -20.9078 | 148.8422 |
| Melithreptus albogularis | B31310 | QLD | -18.9269 | 146.3183 |
| Melithreptus albogularis | B43790 | QLD | -22.7294 | 150.2481 |
| Melithreptus albogularis | B56000 | QLD | -18.61753 | 144.76453 |

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|------------------------|--------|-----|-----------|-----------|
| Myzomela obscura | B43004 | CYP | -13.7806 | 143.4861 |
| Myzomela obscura | B39800 | CYP | -13.9333 | 143.4917 |
| Myzomela obscura | B57192 | CYP | -11.64674 | 142.72982 |
| Myzomela obscura | B43018 | CYP | -13.7583 | 143.4722 |
| Myzomela obscura | B57101 | CYP | -10.73394 | 142.50963 |
| Myzomela obscura | B33563 | NT | -12.42 | 131.2242 |
| Myzomela obscura | B54715 | NT | -14.028 | 133.875 |
| Myzomela obscura | B34507 | NT | -12.8167 | 131.65 |
| Myzomela obscura | B48592 | NT | -11.7197 | 130.6733 |
| Myzomela obscura | B51120 | NT | -15.6169 | 129.6272 |
| Myzomela obscura | B56269 | PNG | -8.77699 | 141.63367 |
| Myzomela obscura | B56307 | PNG | -8.68756 | 141.47913 |
| Myzomela obscura | B55970 | PNG | -8.71265 | 146.53625 |
| Myzomela obscura | B56258 | PNG | -8.58917 | 141.74752 |
| Myzomela obscura | B56292 | PNG | -8.71246 | 141.64272 |
| Myzomela obscura | B31220 | QLD | -19.7361 | 147.5553 |
| Myzomela obscura | B31308 | QLD | -18.9269 | 146.3183 |
| Myzomela obscura | B31119 | QLD | -20.9078 | 148.8422 |
| Myzomela obscura | B43750 | QLD | -22.6022 | 150.6839 |
| Myzomela obscura | B41530 | QLD | -19.2833 | 147.0333 |
| Philemon buceroides | B32142 | CYP | -14.1316 | 143.2733 |
| Philemon buceroides | B32255 | CYP | -14.3953 | 143.3625 |
| Philemon buceroides | B42873 | CYP | -13.8972 | 143.5583 |
| Philemon buceroides | B42971 | CYP | -13.7 | 143.4528 |
| Philemon buceroides | B33751 | NT | -12.1783 | 131.1106 |
| Philemon buceroides | B33752 | NT | -12.1783 | 131.1106 |
| Philemon buceroides | B48720 | NT | -11.8506 | 130.8531 |
| Philemon buceroides | B55954 | PNG | -9.01521 | 146.80179 |
| Philemon buceroides | B55960 | PNG | -9.02185 | 146.81592 |
| Philemon buceroides | B56001 | PNG | -9.09222 | 146.84665 |
| Philemon buceroides | B55946 | PNG | -9.02211 | 146.77823 |
| Philemon buceroides | B56018 | PNG | -8.99887 | 146.80368 |
| Philemon buceroides | B31319 | QLD | -18.5997 | 146.2767 |
| Philemon buceroides | B31122 | QLD | -20.9078 | 148.8422 |
| Philemon buceroides | B31171 | QLD | -20.9078 | 148.8422 |
| Philemon buceroides | B31121 | QLD | -20.9078 | 148.8422 |
| Philemon buceroides | B31261 | QLD | -19.3361 | 147.0975 |
| Philemon citreogularis | B32711 | CYP | -12.5556 | 141.9222 |
| Philemon citreogularis | B29534 | CYP | -17.4722 | 141.1922 |
| Philemon citreogularis | B51537 | CYP | -13.0681 | 141.975 |
| Philemon citreogularis | B48618 | CYP | -11.5136 | 130.8978 |

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|-------------------------------|--------|-----|-----------|-----------|
| <i>Philemon citreogularis</i> | B54425 | CYP | -15.947 | 136.313 |
| <i>Philemon citreogularis</i> | B50037 | NT | -12.3189 | 131.245 |
| <i>Philemon citreogularis</i> | B51055 | NT | -15.7019 | 129.6381 |
| <i>Philemon citreogularis</i> | B54502 | NT | -16.503 | 136.447 |
| <i>Philemon citreogularis</i> | B54767 | NT | -14.023 | 133.827 |
| <i>Philemon citreogularis</i> | B54807 | NT | -15.767 | 133.624 |
| <i>Philemon citreogularis</i> | B56251 | PNG | -8.58917 | 141.74752 |
| <i>Philemon citreogularis</i> | B56253 | PNG | -8.58917 | 141.74752 |
| <i>Philemon citreogularis</i> | B56239 | PNG | -8.70793 | 141.65549 |
| <i>Philemon citreogularis</i> | B56242 | PNG | -8.70793 | 141.65549 |
| <i>Philemon citreogularis</i> | B43182 | QLD | -21.4667 | 146.7083 |
| <i>Philemon citreogularis</i> | B31266 | QLD | -19.3361 | 147.0975 |
| <i>Philemon citreogularis</i> | B41869 | QLD | -23.2667 | 150.4333 |
| <i>Philemon citreogularis</i> | B28941 | QLD | -20.4 | 148.5833 |
| <i>Philemon citreogularis</i> | B44304 | QLD | -22.7633 | 150.3392 |
| <i>Ptilotula flavescens</i> | B49041 | CYP | -15.5717 | 143.6025 |
| <i>Ptilotula flavescens</i> | B28551 | CYP | -15.5717 | 143.6025 |
| <i>Ptilotula flavescens</i> | B57536 | CYP | -16.34678 | 143.05797 |
| <i>Ptilotula flavescens</i> | B57526 | CYP | -16.34678 | 143.05797 |
| <i>Ptilotula flavescens</i> | B41710 | CYP | -18.2167 | 139.8833 |
| <i>Ptilotula flavescens</i> | B33513 | NT | -15.6306 | 130.0103 |
| <i>Ptilotula flavescens</i> | B54782 | NT | -15.856 | 133.609 |
| <i>Ptilotula flavescens</i> | B29423 | NT | -17.7272 | 139.39 |
| <i>Ptilotula flavescens</i> | B54583 | NT | -15.673 | 135.766 |
| <i>Ptilotula flavescens</i> | B54674 | NT | -14.755 | 134.379 |
| <i>Ptilotula flavescens</i> | B56009 | PNG | -9.00854 | 146.80333 |
| <i>Ptilotula flavescens</i> | B56007 | PNG | -9.00854 | 146.80333 |
| <i>Ptilotula flavescens</i> | B56008 | PNG | -9.00854 | 146.80333 |
| <i>Ptilotula fuscus</i> | B43568 | QLD | -22.6972 | 150.4222 |
| <i>Ptilotula fuscus</i> | B55862 | QLD | -21.08607 | 146.43651 |
| <i>Ptilotula fuscus</i> | B43569 | QLD | -22.7611 | 150.3111 |
| <i>Ptilotula fuscus</i> | B43789 | QLD | -22.7625 | 150.3119 |
| <i>Ptilotula fuscus</i> | B55861 | QLD | -21.08607 | 146.43651 |

Table S2. Outgroup species and samples used for both pyrad filtering and polarizing of the 2DSFS. All sample numbers correspond to vouchers in the Australian National Wildlife Collection.

| Ingroup | Outgroup | Samples |
|---------|----------|---------|
|---------|----------|---------|

| | | |
|--------------------------------------|---------------------------------|----------------|
| <i>Entomyzon cyanotis</i> | <i>Melithreptus albogularis</i> | B29715, B39410 |
| <i>Gerygone magnirostris</i> | <i>Gerygone levigaster</i> | B29636, B29732 |
| <i>Lichmera indistincta</i> | <i>Entomyzon cyanotis</i> | B43430, B44248 |
| <i>Melithreptus albogularis</i> | <i>Entomyzon cyanotis</i> | B43430, B44248 |
| <i>Myzomela obscura</i> | <i>Lichmera indistincta</i> | B41709, B51483 |
| <i>Philemon buceroides</i> | <i>Philemon citreogularis</i> | B31266, B32711 |
| <i>Philemon citreogularis</i> | <i>Philemon buceroides</i> | B56247, B56280 |
| <i>Ptilotula flavescens / fuscus</i> | <i>Entomyzon cyanotis</i> | B43430, B44248 |

Table S3. RAD locus numbers after various steps of filtering. Any step that requires unlinked SNPs or a single SNP per locus would have SNP numbers from the middle column.

| System | RAD loci / unlinked SNPs | Total SNPs |
|-------------------------------|--------------------------|------------|
| Entomyzon cyanotis | 22 428 | 55 234 |
| Gerygone magnirostris | 33 291 | 82 633 |
| Lichmera indistincta | 30 990 | 95 613 |
| Myzomela obscura | 14 332 | 36 194 |
| Philemon buceroides | 33 127 | 61 719 |
| Philemon citreogularis | 47 266 | 108 400 |
| Melithreptus albogularis | 31 127 | 72 092 |
| Ptilotula flavescens & fuscus | 16 588 | 58 730 |

Table S4. Mathematical models of parapatric speciation as described by Yamaguchi & Iwasa (2017)

| Model | Function | Parameters |
|------------------|--|-------------|
| (1) Threshold | $I(Z) = \begin{cases} 0 & \text{for } Z < Z_c \\ 1 & \text{for } Z \geq Z_c \end{cases}$ | |
| (2) Constant | | $a = 1$ |
| (3) Decelerating | $I(Z) = \begin{cases} (\frac{Z}{Z_c})^a & \text{for } Z < Z_c \\ 1 & \text{for } Z \geq Z_c \end{cases}$ | $0 < a < 1$ |
| (4) Accelerating | | $a > 1$ |

(5) Sigmoid

$$I(Z) = \begin{cases} D \left(\frac{Z^b}{Z_0^b + Z^b} \right) & \text{for } Z < Z_c \\ 1 & \text{for } Z \geq Z_c \end{cases} \quad D = \frac{z_0^b + z_c}{z_c^b}, z_0 < z_c, 1 < b$$

Table S5. Mean posterior probabilities of 200 simulated data sets under competing speciation trajectories. The rows correspond to the model under which the data was simulated and the columns correspond to the model for which the simulation had highest support.

| | Accelerate | Constant | Decelerate | Sigmoid | Threshold |
|------------|------------|----------|------------|---------|-----------|
| Accelerate | 0.9228 | 0.0080 | 0 | 0.0692 | 0 |
| Constant | 0.0002 | 0.9978 | 0.0020 | 0 | 0 |
| Decelerate | 0 | 0.0279 | 0.9720 | 0.0001 | 0 |
| Sigmoid | 0.1349 | 0.0046 | 0.0371 | 0.8184 | 0 |
| Threshold | 0 | 0 | 0 | 0 | 1 |

Table S6. Table describing which climate layers were used for which species in the species distribution modeling (<http://www.worldclim.org/bioclim>). For each occurrence point of each species, we measured correlations of the different climate layers using a Spearman rank correlation test. Climate layers correlated with a $\rho > 0.7$ were removed. The remaining layers have are not correlated with each other and serves as an independent predictor for the species distribution models.

| Climate Layer | <i>G. magirostris</i> | <i>E. cyanotis</i> | <i>L. indistincta</i> | <i>M. albogularis</i> | <i>M. obscura</i> | <i>P. buceroides</i> | <i>P. citreogularis</i> | <i>P. flavescens x fuscus</i> |
|---------------------------------------|-----------------------|--------------------|-----------------------|-----------------------|-------------------|----------------------|-------------------------|-------------------------------|
| BIO1: Annual mean temp | X | | | | | | | X |
| BIO2: Mean diurnal range | X | X | X | | X | X | X | X |
| BIO3: Isothermality | | | X | X | | | X | |
| BIO4: Temperature seasonality | X | | | | | X | | X |
| BIO5: Max temp of warmest month | | X | X | X | X | | | |
| BIO6: Min temp of coldest month | | | | | X | X | | |
| BIO8: Mean temp of wettest quarter | | | | | | X | X | |
| BIO9: Mean temp of driest quarter | | X | X | | | | X | |
| BIO12: Annual precipitation | | | | | | | | |
| BIO13: Precipitation of wettest month | X | | | X | X | X | | X |
| BIO14: Precipitation of driest month | | | | | | X | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| BIO15: Precipitation seasonality | X | X | X | X | | | | X |
| BIO18: Precipitation of warmest quarter | | X | X | X | X | X | X | |

Table S7. Resistance values between populations through time. Infinity symbols denote having to cross an oceanic barrier.

| Population pair | Resistance (present) | Resistance (mid Holocene ~6kya) | Resistance (LGM ~21kya) |
|---------------------------------|----------------------|---------------------------------|-------------------------|
| <i>Entomyzon cyanotis</i> | | | |
| CYP vs. NT | 742.1002 | 851.1351 | 995.2401 |
| CYP vs. PNG | ∞ | ∞ | 189.1555 |
| CYP vs. QLD | 230.2103 | 255.7627 | 197.0822 |
| NT vs. PNG | ∞ | ∞ | 881.0137 |
| NT vs. QLD | 862.3774 | 1039.316 | 1061.6734 |
| PNG vs. QLD | ∞ | ∞ | 384.5885 |
| <i>Gerygone magnirostris</i> | | | |
| CYP vs. NT | 1510.0651 | 1816.8913 | 1215.1146 |
| CYP vs. PNG | ∞ | ∞ | 385.3652 |
| CYP vs. QLD | 282.7111 | 300.9629 | 1525.7326 |
| NT vs. PNG | ∞ | ∞ | 1240.1005 |
| NT vs. QLD | 1777.8343 | 2107.9084 | 2670.3581 |
| PNG vs. QLD | ∞ | ∞ | 1804.532 |
| <i>Lichmera indistincta</i> | | | |
| CYP vs. NT | 711.0416 | 601.2957 | 848.4618 |
| CYP vs. QLD | 263.3853 | 245.1646 | 307.7274 |
| NT vs. QLD | 816.3009 | 718.2799 | 1001.021 |
| <i>Melithreptus albogularis</i> | | | |
| CYP vs. NT | 682.5893 | 712.6771 | 403.6569 |
| CYP vs. QLD | 269.3641 | 261.9011 | 258.2616 |
| NT vs. QLD | 843.2562 | 876.0704 | 629.6025 |

Myzomela obscura

| | | | |
|----------------|-----------|-----------|----------|
| CYP vs. NT | 883.9665 | 1610.5476 | 586.9946 |
| CYP vs. PNG | ∞ | ∞ | 191.9053 |
| CYP vs. QLD | 257.8238 | 235.5788 | 265.2507 |
| NT vs. PNG | ∞ | ∞ | 656.8568 |
| NT vs. QLD | 1134.5692 | 1845.4776 | 846.7071 |
| PNG vs. QLD | ∞ | ∞ | 452.2978 |

Philemon buceroides

| | | | |
|----------------|-----------|-----------|-----------|
| CYP vs. NT | 2013.1151 | 1700.6599 | 643.9916 |
| CYP vs. PNG | ∞ | ∞ | 215.058 |
| CYP vs. QLD | 241.3088 | 245.6542 | 396.3104 |
| NT vs. PNG | ∞ | ∞ | 1035.7023 |
| NT vs. QLD | 2234.4709 | 1922.1084 | 1035.7023 |
| PNG vs. QLD | ∞ | ∞ | 609.8001 |

Philemon citreogularis

| | | | |
|----------------|----------|----------|----------|
| CYP vs. NT | 608.7709 | 596.7824 | 715.6097 |
| CYP vs. PNG | ∞ | ∞ | 210.4877 |
| CYP vs. QLD | 241.0794 | 239.4819 | 295.3669 |
| NT vs. PNG | ∞ | ∞ | 807.1738 |
| NT vs. QLD | 693.2003 | 707.879 | 807.1738 |
| PNG vs. QLD | ∞ | ∞ | 474.8338 |

Ptilotula flavescens x fuscus

| | | | |
|----------------|----------|----------|-----------|
| CYP vs. NT | 745.2205 | 778.1429 | 846.6817 |
| CYP vs. PNG | ∞ | ∞ | 269.3989 |
| CYP vs. QLD | 335.3035 | 310.1177 | 324.2302 |
| NT vs. PNG | ∞ | ∞ | 1094.2727 |
| NT vs. QLD | 802.449 | 822.2543 | 857.5811 |
| PNG vs. QLD | ∞ | ∞ | 590.4697 |

Table S8. Various population genetic divergence estimates for ND2, the autosomal ddRAD loci, and the Z chromosome ddRAD loci.

| Population pair | ND2 p-dist | Fst autosomal | Fst Z chrom | D _{xy} autosomal | D _{xy} Z chrom | D _a autosomal | D _a Z chrom |
|---------------------------------|------------|---------------|-------------|---------------------------|-------------------------|--------------------------|------------------------|
| <i>Gerygone magnirostris</i> | | | | | | | |
| CYP x NT | 0.0144 | 0.376 | 0.541 | 0.0046 | 0.00348 | 0.00141 | 0.00139 |
| CYP x PNG | 0.0040 | 0.147 | 0.186 | 0.0042 | 0.00286 | 0.00025 | 0.00011 |
| CYP x QLD | 0.0013 | 0.175 | 0.184 | 0.0039 | 0.0024 | 0.00032 | 1.92E-05 |
| NT x PNG | 0.0151 | 0.331 | 0.48 | 0.00458 | 0.00351 | 0.00120 | 0.00119 |
| NT x QLD | 0.0150 | 0.42 | 0.602 | 0.00465 | 0.00362 | 0.00164 | 0.00166 |
| PNG x QLD | 0.0044 | 0.196 | 0.289 | 0.00432 | 0.00308 | 0.00047 | 0.00046 |
| <i>Entomyzon cyanotis</i> | | | | | | | |
| CYP x NT | 0.0194 | 0.363 | 0.674 | 0.00463 | 0.00411 | 0.00116 | 0.00188 |
| CYP x PNG | 0.0014 | 0.197 | 0.269 | 0.00351 | 0.00156 | 0.00028 | 0 |
| CYP x QLD | 0.0041 | 0.294 | 0.5 | 0.00391 | 0.00264 | 0.00069 | 0.00056 |
| NT x PNG | 0.0221 | 0.393 | 0.694 | 0.00459 | 0.00394 | 0.00134 | 0.00192 |
| NT x QLD | 0.0218 | 0.428 | 0.677 | 0.00485 | 0.00438 | 0.00161 | 0.00220 |
| PNG x QLD | 0.0052 | 0.357 | 0.551 | 0.004 | 0.00274 | 0.00100 | 0.00087 |
| <i>Lichmera indistincta</i> | | | | | | | |
| CYP x NT | 0.0022 | 0.117 | 0.137 | 0.00623 | 0.0041 | 0 | 0 |
| CYP x QLD | 0.0027 | 0.11 | 0.136 | 0.00615 | 0.00394 | 0 | 0 |
| NT x QLD | 0.0016 | 0.113 | 0.13 | 0.00615 | 0.00397 | 0 | 0 |
| <i>Melithreptus albogularis</i> | | | | | | | |
| CYP x NT | 0.0358 | 0.453 | 0.591 | 0.00554 | 0.00472 | 0.00199 | 0.00181 |
| CYP x QLD | 0.0346 | 0.189 | 0.277 | 0.00363 | 0.00282 | 0.00021 | 0 |
| NT x QLD | 0.0352 | 0.494 | 0.62 | 0.00553 | 0.00459 | 0.00228 | 0.00201 |
| <i>Myzomela obscura</i> | | | | | | | |
| CYP x NT | 0.02268 | 0.433 | 0.53 | 0.00447 | 0.00264 | 0.00125 | 3.18E-05 |

| | | | | | | | |
|--------------------------------------|---------|-------|-------|---------|---------|----------|----------|
| CYP x PNG | 0.0234 | 0.16 | 0.191 | 0.00412 | 0.00238 | 0 | 0 |
| CYP x QLD | 0.0228 | 0.174 | 0.22 | 0.00361 | 0.00209 | 0 | 0 |
| NT x PNG | 0.0141 | 0.387 | 0.478 | 0.00452 | 0.00269 | 0.00101 | 0 |
| NT x QLD | 0.0288 | 0.487 | 0.589 | 0.00447 | 0.00272 | 0.00161 | 0.00039 |
| PNG x QLD | 0.0295 | 0.222 | 0.287 | 0.00408 | 0.00249 | 0.00017 | 0 |
| <i>Philemon buceroides</i> | | | | | | | |
| CYP x NT | 0.0209 | 0.588 | 0.753 | 0.00534 | 0.00437 | 0.00278 | 0.00258 |
| CYP x PNG | 0.0123 | 0.373 | 0.543 | 0.00511 | 0.00476 | 0.00124 | 0.00166 |
| CYP x QLD | 0.0026 | 0.237 | 0.354 | 0.00351 | 0.00203 | 0.00026 | 0 |
| NT x PNG | 0.0209 | 0.472 | 0.598 | 0.00517 | 0.00491 | 0.00210 | 0.00246 |
| NT x QLD | 0.0186 | 0.598 | 0.749 | 0.0054 | 0.00461 | 0.00295 | 0.00290 |
| PNG x QLD | 0.0113 | 0.4 | 0.571 | 0.00521 | 0.00497 | 0.00145 | 0.00194 |
| <i>Philemon citreogularis</i> | | | | | | | |
| CYP x NT | NA | 0.167 | 0.295 | 0.00557 | 0.00447 | 0.00012 | 0.00021 |
| CYP x PNG | 0.0084 | 0.134 | 0.161 | 0.00501 | 0.00302 | 0 | 0 |
| CYP x QLD | 0.00558 | 0.109 | 0.122 | 0.00522 | 0.00316 | 0 | 0 |
| NT x PNG | NA | 0.187 | 0.305 | 0.00535 | 0.00438 | 0.00034 | 0.00030 |
| NT x QLD | NA | 0.174 | 0.277 | 0.00557 | 0.00455 | 0.00021 | 0.00029 |
| PNG x QLD | 0.0054 | 0.135 | 0.147 | 0.00497 | 0.00331 | 2.11E-05 | 0.00E+00 |
| <i>Ptilotula flavescens x fuscus</i> | | | | | | | |
| CYP x NT | 0.0061 | 0.143 | 0.179 | 0.00595 | 0.0034 | 0 | 0 |
| CYP x PNG | 0.0118 | 0.317 | 0.407 | 0.0059 | 0.00299 | 0.00101 | 0.00020 |
| CYP x QLD | 0.0211 | 0.315 | 0.419 | 0.00784 | 0.00533 | 0.00127 | 0.00087 |
| NT x PNG | 0.0092 | 0.329 | 0.395 | 0.00594 | 0.00316 | 0.00108 | 0.00032 |
| NT x QLD | 0.0199 | 0.328 | 0.428 | 0.00787 | 0.00535 | 0.00133 | 0.00084 |
| PNG x QLD | 0.0181 | 0.438 | 0.54 | 0.00785 | 0.00489 | 0.00253 | 0.00152 |

Table S9. Population diversity estimates using the genotype likelihoods

| Population | Autosome θ | Autosome π | Z chrom θ | Z chrom π |
|---------------------------------|-------------------|----------------|------------------|---------------|
| <i>Gerygone magnirostris</i> | | | | |
| QLD | 0.003277952 | 0.003471107 | 0.002135617 | 0.002257031 |
| CYP | 0.003779394 | 0.003818522 | 0.002607181 | 0.002504605 |
| NT | 0.002509809 | 0.002542577 | 0.001653728 | 0.001657289 |
| PNG | 0.004580752 | 0.004210669 | 0.003370646 | 0.002980327 |
| <i>Entomyzon cyanotis</i> | | | | |
| QLD | 0.002980094 | 0.002982851 | 0.002006108 | 0.002024454 |
| CYP | 0.003297949 | 0.003439777 | 0.002085779 | 0.002127208 |
| NT | 0.003322739 | 0.003486444 | 0.002244548 | 0.002319431 |
| PNG | 0.00275415 | 0.003004633 | 0.001684991 | 0.001713824 |
| <i>Lichmera indistincta</i> | | | | |
| QLD | 0.006261535 | 0.006173212 | 0.004934905 | 0.004754241 |
| CYP | 0.006709101 | 0.006522674 | 0.005240394 | 0.005083222 |
| NT | 0.006630884 | 0.006480875 | 0.005244635 | 0.004983413 |
| <i>Melithreptus albogularis</i> | | | | |
| QLD | 0.00315719 | 0.003107307 | 0.002623327 | 0.002542166 |
| CYP | 0.003823935 | 0.003718332 | 0.003183195 | 0.00319773 |
| NT | 0.003581574 | 0.003378084 | 0.002829646 | 0.002608657 |
| <i>Myzomela obscura</i> | | | | |
| QLD | 0.003152044 | 0.003259338 | 0.002627346 | 0.002641308 |
| CYP | 0.004061045 | 0.00399263 | 0.003158196 | 0.003198763 |
| NT | 0.002152452 | 0.002446523 | 0.001746233 | 0.002017711 |
| PNG | 0.004936094 | 0.004560164 | 0.003753177 | 0.003409752 |
| <i>Philemon buceroides</i> | | | | |
| QLD | 0.002910696 | 0.003130851 | 0.002138609 | 0.002287512 |
| CYP | 0.003200427 | 0.003355011 | 0.00235018 | 0.002434613 |
| NT | 0.001662568 | 0.001749557 | 0.001096852 | 0.001125887 |
| PNG | 0.004561044 | 0.004381696 | 0.003774143 | 0.003761706 |

Philemon citreogularis

| | | | | |
|-----|-------------|-------------|-------------|-------------|
| QLD | 0.00584692 | 0.005292435 | 0.004559265 | 0.004075835 |
| CYP | 0.006099616 | 0.005472283 | 0.004465513 | 0.004061899 |
| NT | 0.006152109 | 0.005412771 | 0.005223821 | 0.004439731 |
| PNG | 0.004700834 | 0.0046053 | 0.003802249 | 0.003704582 |

Ptilotula flavescens x fuscus

| | | | | |
|-----|-------------|-------------|-------------|-------------|
| QLD | 0.007301275 | 0.006987879 | 0.005368356 | 0.005039279 |
| CYP | 0.005924051 | 0.006139365 | 0.003903004 | 0.00387129 |
| NT | 0.005908877 | 0.006080792 | 0.003977746 | 0.003967045 |
| PNG | 0.003359922 | 0.003632582 | 0.001629726 | 0.001699717 |

S10. Individual demographic model support for all population pair comparisons

| Population Pair | IM | IM+hetM | IM+hetN | IM+hetNhetM | SI | SI+hetN | Sum (IM) | Sum (SI) |
|------------------------------|---------|---------|---------|-------------|---------|---------|----------|----------|
| <i>Entomyzon cyanotis</i> | | | | | | | | |
| CYP vs. NT | 0.00000 | 0.00201 | 0.00000 | 0.00134 | 0.82932 | 0.16734 | 0.00335 | 0.99665 |
| CYP vs. PNG | 0.02717 | 0.14286 | 0.61247 | 0.17442 | 0.01721 | 0.02587 | 0.95692 | 0.04308 |
| CYP vs. QLD | 0.83851 | 0.03267 | 0.11371 | 0.00805 | 0.00605 | 0.00100 | 0.99294 | 0.00706 |
| NT vs. PNG | 0.00000 | 0.00134 | 0.00000 | 0.00067 | 0.85542 | 0.14257 | 0.00201 | 0.99799 |
| NT vs. QLD | 0.48552 | 0.09771 | 0.16053 | 0.04691 | 0.13729 | 0.07204 | 0.79067 | 0.20933 |
| PNG vs. QLD | 0.59172 | 0.16629 | 0.20426 | 0.02937 | 0.00507 | 0.00328 | 0.99164 | 0.00836 |
| <i>Gerygone magnirostris</i> | | | | | | | | |
| CYP vs. NT | 0.11469 | 0.05976 | 0.31301 | 0.02958 | 0.40736 | 0.07559 | 0.51705 | 0.48295 |
| CYP vs. PNG | 0.77715 | 0.00829 | 0.20601 | 0.00147 | 0.00687 | 0.00021 | 0.99292 | 0.00708 |
| CYP vs. QLD | 0.59355 | 0.02234 | 0.11815 | 0.01467 | 0.21770 | 0.03361 | 0.74870 | 0.25130 |
| NT vs. PNG | 0.02245 | 0.36561 | 0.28765 | 0.26460 | 0.02477 | 0.03493 | 0.94030 | 0.05970 |
| NT vs. QLD | 0.07517 | 0.22647 | 0.27303 | 0.05241 | 0.16561 | 0.20731 | 0.62708 | 0.37292 |
| QLD vs. PNG | 0.75213 | 0.02566 | 0.19753 | 0.00328 | 0.02060 | 0.00081 | 0.97860 | 0.02140 |
| <i>Lichmera indistincta</i> | | | | | | | | |
| CYP vs. NT | 0.10509 | 0.31191 | 0.05489 | 0.52544 | 0.00268 | 0.00000 | 0.99732 | 0.00268 |

| | | | | | | | | |
|--|---------|---------|---------|---------|---------|---------|---------|---------|
| CYP vs. QLD | 0.02860 | 0.74521 | 0.00311 | 0.21911 | 0.00017 | 0.00381 | 0.99602 | 0.00398 |
| NT vs. QLD | 0.21281 | 0.39227 | 0.06154 | 0.31306 | 0.01993 | 0.00039 | 0.97968 | 0.02032 |
| <i>Melithreptus albogularis</i> | | | | | | | | |
| CYP vs. NT | 0.00000 | 0.01138 | 0.00000 | 0.01874 | 0.32597 | 0.64391 | 0.03012 | 0.96988 |
| CYP vs. QLD | 0.01860 | 0.50718 | 0.28994 | 0.17289 | 0.00063 | 0.01077 | 0.98860 | 0.01140 |
| NT vs. QLD | 0.00000 | 0.00201 | 0.00000 | 0.00402 | 0.35341 | 0.64056 | 0.00602 | 0.99398 |
| <i>Myzomela obscura</i> | | | | | | | | |
| CYP vs. NT | 0.00000 | 0.00067 | 0.00000 | 0.00067 | 0.76707 | 0.23159 | 0.00134 | 0.99866 |
| CYP vs. PNG | 0.46452 | 0.23226 | 0.21017 | 0.09304 | 0.00000 | 0.00000 | 1.00000 | 0.00000 |
| CYP vs. QLD | 0.34605 | 0.15663 | 0.32195 | 0.17537 | 0.00000 | 0.00000 | 1.00000 | 0.00000 |
| NT vs. PNG | 0.01452 | 0.03478 | 0.01628 | 0.04084 | 0.35306 | 0.54053 | 0.10641 | 0.89359 |
| NT vs. QLD | 0.00000 | 0.00000 | 0.00000 | 0.00134 | 0.54418 | 0.45448 | 0.00134 | 0.99866 |
| PNG vs. QLD | 0.15127 | 0.08969 | 0.57564 | 0.18340 | 0.00000 | 0.00000 | 1.00000 | 0.00000 |
| <i>Philemon buceroides</i> | | | | | | | | |
| CYP vs. NT | 0.00000 | 0.00335 | 0.00134 | 0.00535 | 0.31928 | 0.67068 | 0.01004 | 0.98996 |
| PNG vs. CYP | 0.00000 | 0.00669 | 0.00469 | 0.00535 | 0.68340 | 0.29987 | 0.01673 | 0.98327 |
| QLD vs. CYP | 0.02583 | 0.05999 | 0.41901 | 0.45185 | 0.00618 | 0.03715 | 0.95667 | 0.04333 |
| PNG vs. NT | 0.00000 | 0.00134 | 0.00602 | 0.00134 | 0.67001 | 0.32129 | 0.00870 | 0.99130 |
| QLD vs. NT | 0.00000 | 0.00535 | 0.00335 | 0.00937 | 0.28581 | 0.69612 | 0.01807 | 0.98193 |
| PNG vs. QLD | 0.08535 | 0.10510 | 0.32505 | 0.06353 | 0.35212 | 0.06885 | 0.57903 | 0.42097 |
| <i>Philemon citreogularis</i> | | | | | | | | |
| CYP vs. NT | 0.00000 | 0.10977 | 0.04685 | 0.73829 | 0.00000 | 0.10509 | 0.89491 | 0.10509 |
| CYP vs. PNG | 0.29050 | 0.05689 | 0.53548 | 0.11714 | 0.00000 | 0.00000 | 1.00000 | 0.00000 |
| CYP vs. QLD | 0.41633 | 0.17738 | 0.19143 | 0.21486 | 0.00000 | 0.00000 | 1.00000 | 0.00000 |
| NT vs. PNG | 0.00000 | 0.06894 | 0.08099 | 0.67269 | 0.00000 | 0.17738 | 0.82262 | 0.17738 |
| NT vs. QLD | 0.00000 | 0.11379 | 0.12985 | 0.63722 | 0.00201 | 0.11714 | 0.88086 | 0.11914 |
| QLD vs. PNG | 0.61306 | 0.04022 | 0.28952 | 0.03317 | 0.01849 | 0.00554 | 0.97597 | 0.02403 |
| <i>Ptilotula flavescens & fuscus</i> | | | | | | | | |
| CYP vs. NT | 0.02878 | 0.21419 | 0.23427 | 0.52142 | 0.00000 | 0.00134 | 0.99866 | 0.00134 |

| | | | | | | | | |
|-------------|---------|---------|---------|---------|---------|---------|---------|---------|
| CYP vs. PNG | 0.11232 | 0.06250 | 0.30104 | 0.17249 | 0.21740 | 0.13424 | 0.64835 | 0.35165 |
| CYP vs. QLD | 0.00000 | 0.02209 | 0.00000 | 0.03882 | 0.50134 | 0.43775 | 0.06091 | 0.93909 |
| NT vs. PNG | 0.05885 | 0.18866 | 0.07433 | 0.09175 | 0.37301 | 0.21340 | 0.41359 | 0.58641 |
| NT vs. QLD | 0.00000 | 0.00335 | 0.00134 | 0.00067 | 0.81258 | 0.18206 | 0.00535 | 0.99465 |
| QLD vs. PNG | 0.00000 | 0.00870 | 0.01272 | 0.03882 | 0.28514 | 0.65462 | 0.06024 | 0.93976 |