**Supporting Information**

**Table S1a**: Summary of the *Hyla arborea* data used in this study, extracted from Dufresnes et al. (2014b) for sex-linked markers and Dufresnes et al. (2013) for autosomal data (30 loci). ID: locality number used in the mentionned publications; $N_m$: number of male samples; $N_f$: number of female samples; X-Y dif.: X-Y differentiation estimated by Dufresnes et al. (2014b); N: number of samples.

| | | sex-linked loci | | | | | | autosomal loci | |
|---|---|---|---|---|---|---|---|---|---|
| ID | Country | $N_m$ | $N_f$ | ♂-♀ $F_{st}$ | ♂ $F_{is}$ | ♀ $F_{is}$ | X-Y dif. | N | $F_{is}$ |
| 1 | Greece | 25 | 27 | 0.09 | -0.24 | 0.02 | 0.39 | 52 | 0.01 |
| 2 | Greece | 6 | - | - | -0.08 | - | 0.33 | 6 | 0.02 |
| 3 | Greece | 25 | - | - | -0.03 | - | 0.27 | 25 | 0.09 |
| 5 | Greece | 20 | - | - | -0.21 | - | 0.39 | 22 | -0.02 |
| 8 | Greece | 18 | 7 | 0.13 | -0.35 | -0.06 | 0.53 | 25 | 0.09 |
| 9 | Greece | 18 | - | - | -0.36 | - | 0.48 | 18 | 0.09 |
| 11 | Greece | 14 | - | - | -0.39 | - | 0.49 | 16 | 0.06 |
| 24 | Serbia | 6 | - | - | -0.37 | - | 0.56 | 7 | 0.10 |
| 28 | Albania | 8 | 10 | 0.11 | -0.18 | -0.14 | 0.49 | 20 | -0.01 |
| 30 | Croatia | 18 | - | - | -0.59 | - | 0.62 | 18 | 0.06 |
| 31 | Croatia | 7 | 5 | 0.20 | -0.57 | 0.12 | 0.62 | 12 | -0.09 |
| 32 | Croatia | 20 | - | - | -0.58 | - | 0.51 | 22 | 0.03 |
| 33 | Croatia | 14 | 12 | 0.23 | -0.53 | 0.03 | 0.64 | 26 | 0.07 |
| 37 | Croatia | 18 | 18 | 0.22 | -0.40 | -0.01 | 0.55 | 36 | 0.02 |
| 38 | Croatia | 25 | 25 | 0.25 | -0.51 | 0.05 | 0.69 | 50 | 0.07 |
| 39 | Croatia | 19 | - | - | -0.48 | - | 0.69 | 19 | 0.06 |
| 40 | Serbia | 15 | 14 | 0.19 | -0.42 | -0.07 | 0.69 | 30 | 0.00 |
| 41 | Romania | 11 | - | - | -0.46 | - | 0.67 | 11 | 0.01 |
| 42 | Romania | 5 | 6 | 0.19 | -0.39 | -0.05 | 0.73 | 13 | 0.02 |
| 43 | Romania | 10 | 8 | 0.19 | -0.45 | 0.00 | 0.77 | 20 | 0.07 |
| 44 | Hungary | 15 | - | - | -0.39 | - | 0.71 | 16 | 0.00 |
| 45 | Austria | 18 | 8 | 0.20 | -0.47 | -0.20 | 0.69 | 26 | 0.03 |
| 48 | Poland | 9 | - | - | -0.69 | - | 0.87 | 9 | 0.08 |
| 49 | Switzerland | 18 | 15 | 0.27 | -0.62 | 0.06 | 0.83 | 33 | 0.05 |
| 55 | Netherlands | 19 | - | - | -0.72 | - | 0.89 | 23 | -0.05 |
| 56 | Switzerland | 15 | 15 | 0.38 | -0.75 | 0.16 | 0.88 | 30 | 0.07 |
| 57 | France | 22 | 7 | 0.27 | -0.64 | -0.23 | 0.78 | 29 | -0.02 |
| 66 | Sweden | 8 | - | - | -0.77 | - | 0.82 | - | - |

**Table S1b**: Summary of the *Rana temporaria* data used in this study, extracted from Rodrigues et al. (2013, 2014). $N_m$: number of male samples; $N_f$: number of female samples.

| | | sex-linked loci | | | | |
|---|---|---|---|---|---|---|
| Locality | Country | $N_m$ | $N_f$ | ♂-♀ $F_{st}$ | ♂ $F_{is}$ | ♀ $F_{is}$ |
| Esrange | Sweden | 24 | 28 | 0.02 | 0.02 | -0.03 |
| Ammarnäs | Sweden | 24 | 21 | 0.15 | -0.42 | 0.03 |
| Hampjärn-Grytan | Sweden | 27 | 20 | 0.13 | -0.24 | 0.03 |
| Häggedal | Sweden | 28 | 23 | 0.07 | -0.11 | 0.09 |
| Lindragen | Sweden | 16 | 9 | 0.06 | 0.18 | 0.40 |
| Tvedöra | Sweden | 22 | 23 | 0.01 | 0.11 | 0.06 |
| Lavigny | Switzerland | 18 | 18 | 0.00 | 0.09 | 0.05 |
| Cossonay | Switzerland | 6 | 6 | 0.00 | 0.14 | 0.10 |
| Bex | Switzerland | 31 | 31 | 0.01 | 0.06 | 0.02 |
| Retaud | Switzerland | 5 | 5 | 0.01 | 0.19 | 0.06 |