**Kin relationships in cultural species of the marine realm: case study of a matrilineal social group of sperm whales off Mauritius Island, Indian Ocean.**

Francois Sarano&(1) et al.

Supplementary information



**Figure S1. Box plot comparing the relatedness estimates for pairs of simulated individuals using four estimators**

Hundred dyads of 4 kinship relations (parent offspring, full sibling, half sibling, unrelated individuals) were simulated from our dataset to estimate relatedness coefficients using 4 different estimators: L & L = Li et al. (1993), L & R = Lynch & Ritland (1999), Q & G = Queller & Goodnight (1989) and W = Wang (2002).

**Table S1: Correlation between *genetic individuals* (skin samples sharing a same microsatellite genotype) and field-identified individuals.**

An alphabetic name was given to all the individuals identified.

Skin samples represented in red and crossed out are the 4 skin samples attributed to incorrect individuals in the field. Their correct attributions appear in green.

AF: Adult female; YF, young female; YM, young male

|  |
| --- |
| **A. Sperm whales sampled in the Mauritius Island** |
| Individual | Age/sex | Subgroup | 2017 | 2018 | 2019 |
| ADELIE | AF | II | 2017\_2B | - |  |
| AIKO | AF | I | 2017\_03A, 2017\_03B, 2017\_04B, 2017\_05A, 2017\_05B, 2017\_06B, 2017\_07B, 2017\_32B | - | 2019\_01A |
| ALEXANDER | YM | II | - | - | 2019\_16A |
| ALI | YM | I | - | - | ~~2019\_09A~~, 2019\_11A |
| ARTHUR | YM | I | 2017\_10B | 2018\_10B, 2018\_15B, 2018\_14B, 2018\_36A |  |
| CAROLINE | AF | II | 2017\_29B | 2018\_18A, 2018\_27A |  |
| CLAIRE | AF | I | 2017\_25B | 2018\_35B |  |
| DAREN | YM | I | - | - | 2019\_10A, 2019\_09A |
| DELPHINE | AF | II | 2017\_01B, 2017\_14B, 2017\_20B, 2017\_20C, 2017\_21B | 2018\_08A, 2018\_19A, 2018\_39A |  |
| DOS CALLEUX | AF | I | 2017\_24B | 2018\_21A, 2018\_29A |  |
| ELIOT | YM | II | 2017\_13B | 2018-28A, ~~2018\_36A~~, 2018\_38A | 2019\_13A |
| EMY | AF | II | 2017\_28B, 2017\_33B | 2018\_53B, 2018\_32A |  |
| GERMINE | AF | I | 2017\_23B, 2017\_27B | 2018\_13B | 2019\_18A |
| IRENE | AF | I | 2017\_08A, 2017\_08B, 2017\_09B, 2017\_15B, 2017\_31B | 2018\_01B, 2018\_11B, 2018\_22A |  |
| ISSA | AF | I | - | 2018\_12B, 2018\_41A |  |
| LANA | YF | I | - | - | 2019\_08A, 2019\_14A, 2019\_15A |
| LUCY | AF | I | 2017\_26B | 2018\_17B, 2018\_42A |  |
| MINA | AF | I | 2017\_11A, 2017\_11B, 2017\_12B, 2017\_17B | 2018\_09B, 2018\_20A, ~~2018\_10B~~ |  |
| MYSTERE | AF | I | 2017\_16B, 2017\_16C | - |  |
| Unknown\_2017 | AF | - | 2017\_18B | - |  |
| ROMEO | YM | I | - | 2018\_30A, 2018\_40A | 2019\_02A, |
| Clan\_Reshna\_1 | AF | - | - | 2018\_03B, 2018\_04B, 2018\_05B, 2018\_06B |  |
| Clan\_Reshna\_2 | AF | - | - | 2018\_07B |  |
| TACHE BLANCHE | YM | II | - | 2018\_24A, 2018\_26A, 2018\_52B, 2018\_50B, 2018\_33A |  |
| YUKIMI | AF | I | - | 2018\_2B, ~~2018\_39A~~ |  |
| VANESSA | AF | II | 2017\_22B | 2018\_25A |  |
| ZOE | YF | II | - | 2018\_23A, 2018\_31A, 2018\_37A, 2018\_51B |  |

**Supplementary Table S2. PCR conditions, number of alleles and ranges of allele sizes for each locus.**

Excepted the PPHO loci, all microsatellite loci were amplified independently in 20µL reaction mixes containing 1x *HotStart Taq Mix* (Eurobio®), 10 pmole of each primer and 10ng of genomic DNA. PPHO loci were amplified using a three primer reaction as described in Alfonsi et al. PLoS ONE 7(9): e44425. https://doi.org/10.1371/journal.pone.0044425.

After an initial denaturing step of 10min at 94°C, N amplification cycles consisting each in three steps (denaturation, 30s at 94°C; annealing 30s at the specific temperature; and extension, 60s at 72°C) were conducted. A final extension step of 30min at 72°C ended the reaction.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Loci** | **nA** | **Range (bp)** | **Repeat type** | **Reference** | **Hybridization Temperature (°C)** | **Number of cycles (N)** | **Dye label** |
| Pp HO110 | 9 | 130-150 | Di | Rosel et al. (1999) | 50 | 40 | 6-Fam |
| Pp HO130 | 9 | 128-156 | Di | Rosel et al. (1999) | 55 | 40 | Hex |
| Pp HO102 | 12 | 173-197 | Di | Rosel et al. (1999) | 55 | 40 | Hex |
| Pp HO131 | 4 | 110-120 | Di | Rosel et al. (1999) | 55 | 40 | 6-Fam |
| PPHO133 | 6 | 190-200 | Di | Rosel et al. (1999) | 55 | 40 | 6-Fam |
| PPHO104 | 1 | 132 | Di | Rosel et al. (1999) | 57 | 40 | Hex |
| Ev37 | 14 | 209-243 | Di | Valsecchi & Amos (1996) | 55 | 35 | 6-Fam |
| GT211 | 7 | 192-212 | Di | Berube et al. (2000) | 55 | 35 | 6-Fam |
| GT023 | 5 | 80-90 | Di | Berube et al. (2000) | 55 | 35 | Hex |
| GT575 | 6 | 131-145 | Di | Berube et al. (2000) | 55 | 35 | Dragonfly |
| GATA417 | 3 | 175-191 | Tetra | Palsboll et al. (1997) | 55 | 35 | 6-Fam |
| GATA028 | 4 | 117-137 | Tetra | Palsboll et al. (1997) | 55 | 35 | Dragonfly |
| 199\_200 | 1 | 108 | Di | Schlötterer et al. (1991) | 55 | 35 | Hex |
| 417\_418 | 2 | 193-195 | Di | Schlötterer et al. (1991) | 55 | 35 | Hex |
| EV1 | 8 | 130-148 | Di | Valsecchi & Amos (1996) | 55 | 35 | Hex |
| EV94 | 9 | 205-225 | Di | Valsecchi & Amos (1996) | 55 | 35 | Hex |

References:

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Valsecchi, E. & Amos, W. Microsatellite markers for the study of cetacean populations. *Molecular Ecol*ogy **5**, 151-156 (1996).

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| --- | --- | --- | --- | --- | --- |
| **Locus** | **nA** | **Range (bp)** | **Locus** | **nA** | **Range (bp)** |
| 417-418 | 2 | 193-195 | EV37 | 14 | 209-243 |
| GATA417 | 3 | 175-191 | GATA028 | 4 | 117-137 |
| GT23 | 5 | 80-90 | Pp HO110 | 9 | 130-150 |
| EV1 | 8 | 130-148 | Pp HO130 | 9 | 128-156 |
| EV94 | 9 | 205-225 | Pp HO102 | 12 | 173-197 |
| GT211 | 7 | 192-212 | Pp HO131 | 4 | 110-120 |
| GT575 | 6 | 131-145 | Pp HO133 | 6 | 190-200 |
| 199-200 | 1 | 108 | Pp H0104 | 1 | 132 |

**Table S3. Number of alleles and ranges of allele sizes for each locus**

**Table S4. Relatedness values calculated between all dyads.**

*rK*, *rW* and rL design respectively the Kalinowsky *et al*. (2006), the Wang (2002) and the Li *et al*. (1993) coefficients

|  |  |
| --- | --- |
| **Dyads** | **Relatedness** |
| **Individual 1** | **Individual 2** | **rK** | **rw** | **rl** |
| ADELIE | AIKO | 0.014 | -0.1106 | -0.0469 |
| ADELIE | ALEXANDER | 0.1919 | 0.1379 | 0.1974 |
| ADELIE | ALI | 0 | -0.1173 | -0.0469 |
| ADELIE | ARTHUR | 0 | 0.0623 | 0.0578 |
| ADELIE | CAROLINE | 0.0216 | -0.0611 | -0.012 |
| ADELIE | CLAIRE | 0 | 0.1236 | 0.0927 |
| ADELIE | DAREN | 0.2458 | 0.1756 | 0.2323 |
| ADELIE | DELPHINE | 0 | -0.0297 | 0.0578 |
| ADELIE | DOS CALLEUX | 0 | -0.0151 | 0.0578 |
| ADELIE | ELIOT | 0.5591 | 0.5725 | 0.6161 |
| ADELIE | EMY | 0.2302 | 0.2538 | 0.3719 |
| ADELIE | GERMINE | 0 | -0.1908 | -0.1865 |
| ADELIE | IRENE | 0 | -0.0352 | 0.0927 |
| ADELIE | ISSA | 0 | 0.0176 | -0.012 |
| ADELIE | LANA | 0 | 0.127 | 0.0927 |
| ADELIE | LUCY | 0.1069 | 0.1342 | 0.1625 |
| ADELIE | MINA | 0 | 0.1291 | 0.1974 |
| ADELIE | MYSTERE | 0.0343 | 0.1547 | 0.2672 |
| ADELIE | ROMEO | 0.003 | -0.0893 | -0.0469 |
| ADELIE | Unknown\_2017 | 0 | -0.0595 | -0.012 |
| ADELIE | TACHE BLANCHE | 0 | -0.0626 | 0.0229 |
| ADELIE | VANESSA | 0 | 0.0501 | 0.0927 |
| ADELIE | ZOE | 0.0817 | 0.0637 | 0.0927 |
| ADELIE | YUKIMI | 0 | -0.1221 | -0.0469 |
| AIKO | ALEXANDER | 0.2179 | 0.098 | 0.3021 |
| AIKO | ALI | 0.1301 | 0.2728 | 0.3021 |
| AIKO | ARTHUR | 0 | -0.2403 | -0.1865 |
| AIKO | CAROLINE | 0.1076 | 0.0849 | 0.1625 |
| AIKO | CLAIRE | 0 | -0.1177 | -0.0818 |
| AIKO | DAREN | 0.3228 | 0.3133 | 0.4417 |
| AIKO | DELPHINE | 0 | -0.3185 | -0.2912 |
| AIKO | DOS CALLEUX | 0 | -0.024 | -0.012 |
| AIKO | ELIOT | 0 | -0.1793 | -0.1167 |
| AIKO | EMY | 0.0266 | -0.0026 | -0.012 |
| AIKO | GERMINE | 0 | -0.2145 | -0.2214 |
| AIKO | IRENE | 0 | -0.1541 | -0.0469 |
| AIKO | ISSA | 0.1147 | 0.0454 | 0.1625 |
| AIKO | LANA | 0 | -0.2164 | -0.2563 |
| AIKO | LUCY | 0 | 0.0802 | 0.1276 |
| AIKO | MINA | 0.0433 | 0.1642 | 0.1974 |
| AIKO | MYSTERE | 0.1875 | 0.1383 | 0.337 |
| AIKO | ROMEO | 0 | -0.0484 | -0.1516 |
| AIKO | Unknown\_2017 | 0 | -0.1392 | -0.2214 |
| AIKO | TACHE BLANCHE | 0 | -0.2788 | -0.2563 |
| AIKO | VANESSA | 0 | -0.2065 | -0.2563 |
| AIKO | ZOE | 0.0546 | 0.2187 | 0.0927 |
| AIKO | YUKIMI | 0.1338 | 0.124 | 0.0229 |
| ALEXANDER | ALI | 0.1369 | 0.2962 | 0.337 |
| ALEXANDER | ARTHUR | 0 | -0.0427 | -0.0469 |
| ALEXANDER | CAROLINE | 0.5645 | 0.6052 | 0.5463 |
| ALEXANDER | CLAIRE | 0 | -0.13 | -0.1167 |
| ALEXANDER | DAREN | 0.2281 | 0.1247 | 0.2323 |
| ALEXANDER | DELPHINE | 0 | -0.0622 | 0.0229 |
| ALEXANDER | DOS CALLEUX | 0 | 0.017 | 0.1276 |
| ALEXANDER | ELIOT | 0.2161 | 0.2151 | 0.3021 |
| ALEXANDER | EMY | 0 | 0.0267 | 0.1276 |
| ALEXANDER | GERMINE | 0 | 0.0094 | 0.0578 |
| ALEXANDER | IRENE | 0 | 0.0493 | 0.1974 |
| ALEXANDER | ISSA | 0.2614 | 0.2467 | 0.3021 |
| ALEXANDER | LANA | 0 | 0.043 | -0.012 |
| ALEXANDER | LUCY | 0 | 0.0131 | 0.0927 |
| ALEXANDER | MINA | 0.0926 | 0.1767 | 0.3021 |
| ALEXANDER | MYSTERE | 0 | 0.1083 | 0.3021 |
| ALEXANDER | ROMEO | 0 | -0.0631 | -0.1167 |
| ALEXANDER | Unknown\_2017 | 0.156 | 0.2352 | 0.1974 |
| ALEXANDER | TACHE BLANCHE | 0 | -0.0225 | 0.0578 |
| ALEXANDER | VANESSA | 0.0903 | 0.0462 | 0.1276 |
| ALEXANDER | ZOE | 0.131 | 0.3192 | 0.2672 |
| ALEXANDER | YUKIMI | 0 | -0.1429 | -0.0469 |
| ALI | ARTHUR | 0 | -0.1443 | -0.1516 |
| ALI | CAROLINE | 0.1394 | 0.2335 | 0.2323 |
| ALI | CLAIRE | 0 | -0.0846 | -0.1516 |
| ALI | DAREN | 0.2385 | 0.3703 | 0.337 |
| ALI | DELPHINE | 0 | 0.0555 | -0.0469 |
| ALI | DOS CALLEUX | 0.496 | 0.4286 | 0.337 |
| ALI | ELIOT | 0 | 7,00E-04 | 0.0578 |
| ALI | EMY | 0 | 0.2517 | 0.1625 |
| ALI | GERMINE | 0 | -0.1374 | -0.1167 |
| ALI | IRENE | 0 | 0.1235 | 0.2323 |
| ALI | ISSA | 0 | 0.1019 | 0.0927 |
| ALI | LANA | 0.0586 | -0.0089 | -0.012 |
| ALI | LUCY | 0.1069 | 0.2688 | 0.2323 |
| ALI | MINA | 0.5 | 0.4671 | 0.4766 |
| ALI | MYSTERE | 0.1495 | 0.2057 | 0.337 |
| ALI | ROMEO | 0.1774 | 0.1777 | 0.2323 |
| ALI | Unknown\_2017 | 0.0767 | 0.2169 | 0.1974 |
| ALI | TACHE BLANCHE | 0 | -0.1114 | -0.0818 |
| ALI | VANESSA | 0.0617 | 0.213 | 0.0927 |
| ALI | ZOE | 0.0373 | 0.1769 | 0.1625 |
| ALI | YUKIMI | 0.0964 | 0.1752 | 0.1974 |
| ARTHUR | CAROLINE | 0 | -0.3442 | -0.3261 |
| ARTHUR | CLAIRE | 0 | -0.1333 | -0.1167 |
| ARTHUR | DAREN | 0.086 | 0.2165 | 0.0927 |
| ARTHUR | DELPHINE | 0.2588 | 0.2712 | 0.1974 |
| ARTHUR | DOS CALLEUX | 0.0415 | -0.0867 | -0.0818 |
| ARTHUR | ELIOT | 0 | -0.0037 | -0.012 |
| ARTHUR | EMY | 0.2389 | 0.2317 | 0.1625 |
| ARTHUR | GERMINE | 0 | -0.1369 | -0.1167 |
| ARTHUR | IRENE | 0.5 | 0.5225 | 0.4766 |
| ARTHUR | ISSA | 0 | -0.0885 | -0.0818 |
| ARTHUR | LANA | 0 | 0.1867 | 0.0927 |
| ARTHUR | LUCY | 0 | -0.0308 | -0.1865 |
| ARTHUR | MINA | 0.0415 | -0.226 | -0.2214 |
| ARTHUR | MYSTERE | 0.2093 | 0.2667 | 0.3021 |
| ARTHUR | ROMEO | 0 | -0.2217 | -0.2214 |
| ARTHUR | Unknown\_2017 | 0 | -0.1294 | -0.1516 |
| ARTHUR | TACHE BLANCHE | 0.0264 | 0.0084 | -0.0818 |
| ARTHUR | VANESSA | 0 | -0.2378 | -0.3261 |
| ARTHUR | ZOE | 0 | -0.0981 | -0.0818 |
| ARTHUR | YUKIMI | 0 | -0.1102 | -0.0818 |
| CAROLINE | CLAIRE | 0 | -0.2187 | -0.1865 |
| CAROLINE | DAREN | 0 | 0.061 | 0.0229 |
| CAROLINE | DELPHINE | 0 | -0.2691 | -0.1516 |
| CAROLINE | DOS CALLEUX | 0 | -0.2141 | -0.1865 |
| CAROLINE | ELIOT | 0.0312 | 0.0011 | 0.1276 |
| CAROLINE | EMY | 0 | -0.1718 | -0.0818 |
| CAROLINE | GERMINE | 0 | -0.3429 | -0.2563 |
| CAROLINE | IRENE | 0 | -0.2141 | -0.0469 |
| CAROLINE | ISSA | 0 | -0.1416 | -0.1167 |
| CAROLINE | LANA | 0 | -0.3152 | -0.2563 |
| CAROLINE | LUCY | 0 | -0.2205 | -0.1865 |
| CAROLINE | MINA | 0 | -0.1502 | -0.0469 |
| CAROLINE | MYSTERE | 0 | -0.1027 | 0.0578 |
| CAROLINE | ROMEO | 0 | -0.1254 | -0.2563 |
| CAROLINE | Unknown\_2017 | 0.1635 | 0.246 | 0.1625 |
| CAROLINE | TACHE BLANCHE | 0 | -0.1901 | -0.0469 |
| CAROLINE | VANESSA | 0.0462 | 0.1699 | 0.0927 |
| CAROLINE | ZOE | 0.5101 | 0.5165 | 0.4417 |
| CAROLINE | YUKIMI | 0 | -0.1395 | -0.0818 |
| CLAIRE | DAREN | 0 | -0.0733 | -0.0818 |
| CLAIRE | DELPHINE | 0.1386 | 0.0205 | 0.0578 |
| CLAIRE | DOS CALLEUX | 0 | 0.0415 | -0.0469 |
| CLAIRE | ELIOT | 0.1126 | 0.2721 | 0.1625 |
| CLAIRE | EMY | 0 | 0.0913 | 0.0229 |
| CLAIRE | GERMINE | 0 | -0.1177 | -0.1865 |
| CLAIRE | IRENE | 0 | -0.0709 | -0.0469 |
| CLAIRE | ISSA | 0 | -0.0708 | -0.1167 |
| CLAIRE | LANA | 0.1349 | -0.12 | -0.1167 |
| CLAIRE | LUCY | 0.0597 | 0.1415 | 0.0578 |
| CLAIRE | MINA | 0.0518 | -0.0566 | -0.0818 |
| CLAIRE | MYSTERE | 0 | -0.0369 | -0.012 |
| CLAIRE | ROMEO | 0 | -0.1037 | -0.1167 |
| CLAIRE | Unknown\_2017 | 0 | -0.13 | -0.2214 |
| CLAIRE | TACHE BLANCHE | 0.099 | 0.1891 | 0.0927 |
| CLAIRE | VANESSA | 0.118 | 0.0208 | -0.0818 |
| CLAIRE | ZOE | 0 | -0.066 | -0.0818 |
| CLAIRE | YUKIMI | 0 | -0.0831 | -0.0469 |
| DAREN | DELPHINE | 0 | -0.1973 | -0.1865 |
| DAREN | DOS CALLEUX | 0.0996 | 0.1947 | 0.2323 |
| DAREN | ELIOT | 0 | 0.1597 | 0.0927 |
| DAREN | EMY | 0.2142 | 0.3414 | 0.3021 |
| DAREN | GERMINE | 0 | -0.2556 | -0.2563 |
| DAREN | IRENE | 0.0286 | 0.2251 | 0.1974 |
| DAREN | ISSA | 0.1565 | 0.1384 | 0.1974 |
| DAREN | LANA | 0 | -0.0089 | -0.1516 |
| DAREN | LUCY | 0.5089 | 0.508 | 0.4766 |
| DAREN | MINA | 0 | 0.1675 | 0.1974 |
| DAREN | MYSTERE | 0.282 | 0.3906 | 0.4417 |
| DAREN | ROMEO | 0.0254 | 0.0836 | 0.0578 |
| DAREN | Unknown\_2017 | 0 | 0.0958 | 0.0229 |
| DAREN | TACHE BLANCHE | 0 | -0.1945 | -0.1516 |
| DAREN | VANESSA | 0 | -0.1665 | -0.2214 |
| DAREN | ZOE | 0.0263 | 0.1401 | 0.0578 |
| DAREN | YUKIMI | 0 | 0.0802 | 0.0578 |
| DELPHINE | DOS CALLEUX | 0 | 0.1218 | -0.012 |
| DELPHINE | ELIOT | 0.0419 | -0.0584 | 0.1276 |
| DELPHINE | EMY | 0 | 0.1314 | 0.0578 |
| DELPHINE | GERMINE | 0 | -0.066 | -0.0818 |
| DELPHINE | IRENE | 0.0009 | 0.2418 | 0.1625 |
| DELPHINE | ISSA | 0 | -0.1148 | -0.1516 |
| DELPHINE | LANA | 0.0146 | 0.2789 | 0.1625 |
| DELPHINE | LUCY | 0 | -0.152 | -0.1516 |
| DELPHINE | MINA | 0 | -0.0203 | -0.1167 |
| DELPHINE | MYSTERE | 0 | 0.0832 | 0.0229 |
| DELPHINE | ROMEO | 0 | -0.2434 | -0.2912 |
| DELPHINE | Unknown\_2017 | 0.0541 | 0.192 | 0.1276 |
| DELPHINE | TACHE BLANCHE | 0.587 | 0.5616 | 0.5463 |
| DELPHINE | VANESSA | 0.1146 | 0.1679 | 0.1276 |
| DELPHINE | ZOE | 0 | -0.0759 | -0.0818 |
| DELPHINE | YUKIMI | 0.0821 | 0.1566 | 0.0578 |
| DOS CALLEUX | ELIOT | 0 | -0.0759 | 0.0229 |
| DOS CALLEUX | EMY | 0 | 0.2354 | 0.1974 |
| DOS CALLEUX | GERMINE | 0 | 0.0913 | 0.0578 |
| DOS CALLEUX | IRENE | 0.0776 | 0.0427 | 0.1974 |
| DOS CALLEUX | ISSA | 0.0606 | 0.0803 | 0.1974 |
| DOS CALLEUX | LANA | 0 | -0.0716 | -0.0469 |
| DOS CALLEUX | LUCY | 0.5179 | 0.5343 | 0.4766 |
| DOS CALLEUX | MINA | 0.6262 | 0.6319 | 0.651 |
| DOS CALLEUX | MYSTERE | 0 | 0.0514 | 0.1625 |
| DOS CALLEUX | ROMEO | 0.2538 | 0.3758 | 0.2672 |
| DOS CALLEUX | Unknown\_2017 | 0 | 0.0976 | 0.0927 |
| DOS CALLEUX | TACHE BLANCHE | 0 | -0.2186 | -0.1865 |
| DOS CALLEUX | VANESSA | 0 | 0.09 | 0.0229 |
| DOS CALLEUX | ZOE | 0 | -0.0379 | 0.0578 |
| DOS CALLEUX | YUKIMI | 0 | -0.1358 | -0.1167 |
| ELIOT | EMY | 0 | 0.1044 | 0.1974 |
| ELIOT | GERMINE | 0 | -0.0605 | -0.012 |
| ELIOT | IRENE | 0 | 0.0268 | 0.1974 |
| ELIOT | ISSA | 0 | -0.0211 | -0.012 |
| ELIOT | LANA | 0 | 0.1168 | 0.1625 |
| ELIOT | LUCY | 0 | 0.1349 | 0.0578 |
| ELIOT | MINA | 0 | 0.0323 | 0.0578 |
| ELIOT | MYSTERE | 0 | 0.2113 | 0.2672 |
| ELIOT | ROMEO | 0 | -0.1819 | -0.1516 |
| ELIOT | Unknown\_2017 | 0.2041 | 0.1662 | 0.2323 |
| ELIOT | TACHE BLANCHE | 0.5 | 0.5324 | 0.5114 |
| ELIOT | VANESSA | 0 | 0.0745 | 0.0927 |
| ELIOT | ZOE | 0 | -0.0116 | 0.0578 |
| ELIOT | YUKIMI | 0 | -0.0227 | 0.0229 |
| EMY | GERMINE | 0 | -0.2093 | -0.2214 |
| EMY | IRENE | 0.1155 | 0.2538 | 0.2672 |
| EMY | ISSA | 0 | -0.0076 | -0.0469 |
| EMY | LANA | 0.0121 | 0.1853 | 0.0927 |
| EMY | LUCY | 0.0646 | 0.0513 | 0.0578 |
| EMY | MINA | 0 | 0.2451 | 0.2323 |
| EMY | MYSTERE | 0 | 0.1052 | 0.1974 |
| EMY | ROMEO | 0.0122 | -0.1184 | -0.1167 |
| EMY | Unknown\_2017 | 0 | 0.085 | 0.0229 |
| EMY | TACHE BLANCHE | 0 | -0.0777 | -0.012 |
| EMY | VANESSA | 0 | 0.1599 | 0.0578 |
| EMY | ZOE | 0.0067 | 0.1281 | 0.1625 |
| EMY | YUKIMI | 0 | -0.1479 | -0.1516 |
| GERMINE | IRENE | 0 | -0.0594 | 0.0229 |
| GERMINE | ISSA | 0.5 | 0.4359 | 0.3719 |
| GERMINE | LANA | 0.1045 | 0.0837 | 0.1276 |
| GERMINE | LUCY | 0 | -0.0251 | -0.1167 |
| GERMINE | MINA | 0 | -0.0045 | 0.0229 |
| GERMINE | MYSTERE | 0 | -0.1707 | -0.0818 |
| GERMINE | ROMEO | 0 | -0.0782 | -0.1516 |
| GERMINE | Unknown\_2017 | 0 | -0.1017 | -0.0469 |
| GERMINE | TACHE BLANCHE | 0.0845 | -0.0219 | -0.012 |
| GERMINE | VANESSA | 0 | -0.2595 | -0.2563 |
| GERMINE | ZOE | 0 | -0.1479 | -0.012 |
| GERMINE | YUKIMI | 0.067 | -0.0435 | 0.0578 |
| IRENE | ISSA | 0 | 0.0815 | 0.0578 |
| IRENE | LANA | 0.4281 | 0.5328 | 0.4068 |
| IRENE | LUCY | 0 | -0.0518 | -0.0469 |
| IRENE | MINA | 0.0775 | -0.0255 | 0.1276 |
| IRENE | MYSTERE | 0.5751 | 0.5715 | 0.651 |
| IRENE | ROMEO | 0 | -0.2189 | -0.1516 |
| IRENE | Unknown\_2017 | 0 | -0.0195 | 0.0578 |
| IRENE | TACHE BLANCHE | 0.0817 | 0.0599 | 0.0229 |
| IRENE | VANESSA | 0.036 | -0.1122 | -0.0818 |
| IRENE | ZOE | 0 | 0.0379 | 0.1276 |
| IRENE | YUKIMI | 0.0434 | 0.1788 | 0.1625 |
| ISSA | LANA | 0.0484 | 0.2052 | 0.0578 |
| ISSA | LUCY | 0 | 0.0176 | 0.0229 |
| ISSA | MINA | 0.1749 | 0.2582 | 0.337 |
| ISSA | MYSTERE | 0.1031 | 0.2118 | 0.3021 |
| ISSA | ROMEO | 0 | 0.012 | 0.0578 |
| ISSA | Unknown\_2017 | 0 | 0.034 | -0.012 |
| ISSA | TACHE BLANCHE | 0.0636 | -0.0735 | -0.0469 |
| ISSA | VANESSA | 0.0078 | -0.2666 | -0.1865 |
| ISSA | ZOE | 0 | -0.0064 | 0.0229 |
| ISSA | YUKIMI | 0 | -0.137 | -0.1167 |
| LANA | LUCY | 0 | -0.1686 | -0.2563 |
| LANA | MINA | 0 | 0.006 | -0.012 |
| LANA | MYSTERE | 0.0985 | 0.2771 | 0.2323 |
| LANA | ROMEO | 0 | -0.1557 | -0.1865 |
| LANA | Unknown\_2017 | 0.0383 | 0.0942 | 0.0927 |
| LANA | TACHE BLANCHE | 0 | 0.108 | 0.0578 |
| LANA | VANESSA | 0.0154 | -0.1526 | -0.1167 |
| LANA | ZOE | 0.0659 | 0.0895 | 0.1276 |
| LANA | YUKIMI | 0.154 | 0.0214 | -0.012 |
| LUCY | MINA | 0.2116 | 0.2601 | 0.3021 |
| LUCY | MYSTERE | 0 | 0.216 | 0.1276 |
| LUCY | ROMEO | 0.5 | 0.4505 | 0.3719 |
| LUCY | Unknown\_2017 | 0 | -0.1201 | -0.1167 |
| LUCY | TACHE BLANCHE | 0 | -0.2367 | -0.1865 |
| LUCY | VANESSA | 0 | -0.1865 | -0.2214 |
| LUCY | ZOE | 0 | -0.1328 | -0.1516 |
| LUCY | YUKIMI | 0 | -0.155 | -0.1167 |
| MINA | MYSTERE | 0 | 0.0611 | 0.1974 |
| MINA | ROMEO | 0.2541 | 0.1974 | 0.2323 |
| MINA | Unknown\_2017 | 0 | -0.0021 | -0.012 |
| MINA | TACHE BLANCHE | 0 | -0.2365 | -0.2214 |
| MINA | VANESSA | 0.1134 | 0.1963 | 0.1625 |
| MINA | ZOE | 0 | 0.0536 | 0.1625 |
| MINA | YUKIMI | 0.043 | -0.1492 | -0.1167 |
| MYSTERE | ROMEO | 0 | -0.0181 | 0.0229 |
| MYSTERE | Unknown\_2017 | 0 | -0.0463 | 0.0229 |
| MYSTERE | TACHE BLANCHE | 0 | 0.0159 | -0.012 |
| MYSTERE | VANESSA | 0.0133 | -0.2226 | -0.1865 |
| MYSTERE | ZOE | 0 | 0.0094 | 0.0927 |
| MYSTERE | YUKIMI | 0.0857 | 0.266 | 0.2323 |
| ROMEO | Unknown\_2017 | 0 | -0.0373 | -0.0818 |
| ROMEO | TACHE BLANCHE | 0 | -0.2462 | -0.2563 |
| ROMEO | VANESSA | 0 | -0.3384 | -0.4308 |
| ROMEO | ZOE | 0 | 0.0474 | -0.0469 |
| ROMEO | YUKIMI | 0 | -0.0518 | -0.012 |
| Unknown\_2017 | TACHE BLANCHE | 0.0046 | 0.0447 | 0.0927 |
| Unknown\_2017 | VANESSA | 0.1634 | 0.2885 | 0.1625 |
| Unknown\_2017 | ZOE | 0.1634 | 0.2488 | 0.1974 |
| Unknown\_2017 | YUKIMI | 0 | -0.0184 | 0.0229 |
| TACHE BLANCHE | VANESSA | 0 | 0.0036 | 0.0229 |
| TACHE BLANCHE | ZOE | 0 | -0.1649 | -0.1167 |
| TACHE BLANCHE | YUKIMI | 0 | 0.1037 | -0.012 |
| VANESSA | ZOE | 0 | -0.0541 | -0.0818 |
| VANESSA | YUKIMI | 0 | -0.1738 | -0.2214 |
| ZOE | YUKIMI | 0.0561 | 0.166 | 0.1276 |
|  |  |  |  |  |  |

**Table S5. List of all the first- (n=13) and second-degree (n=34) relationships detected between all the dyads.**

First (Parent-offspring, PO, and Full siblings, FS) and second (Half siblings, avuncular, grand parents-grandchildrens; all noted HS here) have been deduced

(1) from the calculation of the relatedness coefficient ***r*** using the Kalinowsky *et al*. (2006), the Wang (2002) and the Li *et al*. (1993) estimators (respectively *rK*, *rW* and rL),

(2) from the maximum likelihood relationship (*P.*) estimated by ML relate (Kalinowsky et al. 2006) and

(3) from the parentage analysis performed by CERVUS (*S*: **\*** confidence level 95%, **+**: confidence level 80%, **-:** parent offspring link undetected by CERVUS).

Thirteen first degree relationships (PO, n=12 and FS, n=1; all represented in bold) have been detected.

In addition three other first degree relationships proposed by ML relate have been modified to HS (all underlined in the table):

* A PO relation between Alexander and Clan Reshna 2: impossible, as Caroline has already been identified as the mother of Alexander and Clan Reshna 2 is a female.
* A PO relation between Ali and Dos Calleux: Dos Calleux is in fact the grandmother of Ali, whose mother is Mina, daughter of Dos Calleux.
* A PO relation between Eliot and Tâche Blanche, impossible as Eliot and Tâche Blanche are two juveniles born the same year, in 2011, and have different mothers, respectively Adélie and Delphine. They most likely share only the same father.

|  |  |  |
| --- | --- | --- |
| **Dyads** | **Relatedness** |  |
| **Individual 1** | **Individual 2** | **rk** | **rw** | **rl** | **p** | **S** | **∆p** |
| **ADELIE** | **ELIOT** | **0.5591** | **0.5725** | **0.6161** | **PO** |  |  |
| ADELIE | EMY | 0.2302 | 0.2538 | 0.3719 | HS |  |  |
| AIKO | ALI | 0.1301 | 0.2728 | 0.3021 | HS |  |  |
| AIKO | DAREN | 0.3228 | 0.3133 | 0.4417 | HS |  |  |
| AIKO | MYSTERE | 0.1875 | 0.1383 | 0.337 | HS |  |  |
| AIKO | YUKIMI | 0.1338 | 0.2962 | 0.337 | HS |  | -0.062 |
| ALEXANDER | ALI | 0.1369 | 0.2962 | 0.337 | HS |  |  |
| **ALEXANDER** | **CAROLINE** | **0.5645** | **0.6052** | **0.5463** | **PO** | **\*** |  |
| ALEXANDER | ISSA | 0.2614 | 0.2467 | 0.3021 | U |  | 0.025 |
| ALEXANDER | Clan\_Reshna\_2 | 0.4064 | 0.3872 | 0.3021 | HS |  |  |
| ALEXANDER | ZOE | 0.131 | 0.3192 | 0.2672 | HS |  |  |
| ALI | CAROLINE | 0.1394 | 0.2335 | 0.2323 | HS |  |  |
| ALI | DAREN | 0.2385 | 0.3703 | 0.337 | U |  | 0.012 |
| ALI | DOS CALLEUX | 0.496 | 0.4286 | 0.337 | HS |  |  |
| ALI | LUCY | 0.1069 | 0.2688 | 0.2323 | U |  | 0.012 |
| **ALI** | **MINA** | **0.5** | **0.4671** | **0.4766** | **PO** | **+** |  |
| ALI | ROMEO | 0.1774 | 0.1777 | 0.2323 | HS\* |  | -0.2 |
| ARTHUR | DELPHINE | 0.2588 | 0.2712 | 0.1974 | HS |  |  |
| ARTHUR | EMY | 0.2389 | 0.2317 | 0.1625 | HS |  |  |
| **ARTHUR** | **IRENE** | **0.5** | **0.5225** | **0.4766** | **PO** | **\*** |  |
| ARTHUR | MYSTERE | 0.2093 | 0.2667 | 0.3021 | HS |  |  |
| ARTHUR | Clan\_Reshna\_1 | 0.1893 | 0.1725 | 0.2323 | HS |  |  |
| ARTHUR | Clan\_Reshna\_2 | 0.2478 | 0.2193 | 0.2323 | HS |  |  |
| CAROLINE | Unknown\_2017 | 0.1635 | 0.246 | 0.1625 | HS\* |  | -0.073 |
| **CAROLINE** | **ZOE** | **0.5101** | **0.5165** | **0.4417** | **PO** | **\*** |  |
| CLAIRE | Clan\_Reshna\_1 | 0.33 | 0.2478 | 0.3021 | HS |  |  |
| DAREN | DOS CALLEUX | 0.0996 | 0.1947 | 0.2323 | U |  | 0.017 |
| DAREN | EMY | 0.2142 | 0.3414 | 0.3021 | HS |  |  |
| **DAREN** | **LUCY** | **0.5089** | **0.508** | **0.4766** | **PO** | **\*** |  |
| DAREN | MYSTERE | 0.282 | 0.3906 | 0.4417 | HS |  |  |
| **DELPHINE** | **TACHE BLANCHE** | **0.587** | **0.5616** | **0.5463** | **PO** | **\*** |  |
| **DOS CALLEUX** | **LUCY** | **0.5179** | **0.5343** | **0.4766** | **PO** |  |  |
| **DOS CALLEUX** | **MINA** | **0.6262** | **0.6319** | **0.651** | **PO** | **\*** |  |
| DOS CALLEUX | ROMEO | 0.2538 | 0.3758 | 0.2672 | HS |  |  |
| ELIOT | TACHE BLANCHE | 0.5 | 0.5324 | 0.5114 | HS |  |  |
| EMY | IRENE | 0.1155 | 0.2538 | 0.2672 | U |  | -0.006 |
| **GERMINE** | **ISSA** | **0.5** | **0.4359** | **0.3719** | **PO** | **\*** |  |
| **IRENE** | **LANA** | **0.4281** | **0.5328** | **0.4068** | **PO** | **+** |  |
| **IRENE** | **MYSTERE** | **0.5751** | **0.5715** | **0.651** | **PO** |  |  |
| ISSA | MINA | 0.1749 | 0.2582 | 0.337 | HS |  |  |
| ISSA | MYSTERE | 0.1031 | 0.2118 | 0.3021 | U |  | 0.014 |
| LANA | MYSTERE | 0.0985 | 0.2771 | 0.2323 | U |  | 0.023 |
| LUCY | MINA | 0.2116 | 0.2601 | 0.3021 | HS |  |  |
| **LUCY** | **ROMEO** | **0.5** | **0.4505** | **0.3719** | **PO** | **\*** |  |
| MINA | ROMEO | 0.2541 | 0.1974 | 0.2323 | U |  | 0.012 |
| Unknown\_2017 | VANESSA | 0.1634 | 0.2885 | 0.1625 | HS |  | -0.119 |
| Unknown\_2017 | ZOE | 0.1634 | 0.2488 | 0.1974 | HS |  |  |

**Table S6: List of the second-degree (n=8) relationships detected after specific dyad testing in ML relate.**

When ML relate and relatedness indices were in opposition between half siblings (HS) and unrelated (U), the two putative hypotheses were tested and their p-values calculated and compared (see text for details).

In bold, the relationships retained as half siblings after testing.

|  |  |  |
| --- | --- | --- |
| **Dyads** | **Relatedness** | **Test** |
| **Individual 1** | **Individual 2** | **p** | **HS/U** | **U/HS** | **∆p** |
| ADELIE | ALEXANDER | U | 0.423 | 0.036 | 0.387 |
| ADELIE | DAREN | U | 0.253 | 0.11 | 0.143 |
| AIKO | ALEXANDER | U | 0.178 | 0.144 | 0.034 |
| **AIKO** | **YUKIMI** | **HS** | **0.131** | **0.193** | **-0.062** |
| ALEXANDER | DAREN | U | 0.411 | 0.064 | 0.347 |
| ALEXANDER | ELIOT | U | 0.288 | 0.09 | 0.198 |
| **ALEXANDER** | **ISSA** | **U** | **0.185** | **0.16** | **0.025** |
| ALEXANDER | Unknown\_2017 | U | 0.23 | 0.096 | 0.134 |
| **ALI** | **DAREN** | **U** | **0.181** | **0.169** | **0.012** |
| **ALI** | **LUCY** | **U** | **0.162** | **0.15** | **0.012** |
| ALI | MYSTERE | U | 0.218 | 0.108 | 0.11 |
| **ALI** | **ROMEO** | **HS** | **0.085** | **0.285** | **-0.2** |
| ALI | Unknown\_2017 | U | 0.253 | 0.12 | 0.133 |
| **CAROLINE** | **Unknown\_2017** | **HS** | **0.142** | **0.215** | **-0.073** |
| **DAREN** | **DOS CALLEUX** | **U** | **0.179** | **0.162** | **0.017** |
| DAREN | IRENE | U | 0.234 | 0.11 | 0.124 |
| ELIOT | Unknown\_2017 | U | 0.261 | 0.09 | 0.171 |
| **EMY** | **IRENE** | **U** | **0.153** | **0.159** | **-0.006** |
| EMY | MINA | U | 0.35 | 0.065 | 0.285 |
| IRENE | Clan\_Reshna\_2 | U | 0.224 | 0.13 | 0.094 |
| **ISSA** | **MYSTERE** | **U** | **0.16** | **0.146** | **0.014** |
| **LANA** | **MYSTERE** | **U** | **0.182** | **0.159** | **0.023** |
| **MINA** | **ROMEO** | **U** | **0.17** | **0.158** | **0.012** |
| MYSTERE | Clan\_Reshna\_2 | U | 0.263 | 0.103 | 0.16 |
| MYSTERE | YUKIMI | U | 0.209 | 0.144 | 0.065 |
| **Unknown\_2017** | **VANESSA** | **HS** | **0.109** | **0.228** | **-0.119** |
| Clan\_Reshna\_1 | Clan\_Reshna\_2 | U | 0.238 | 0.109 | 0.129 |

**Table S7: Average relatedness coefficients in groups and subgroups**

Relatedness coefficients are calculated as described in Kalinowsky *et al*. (2006), Wang (2002) and Li *et al*. (1993) (respectively *rK*, *rW* and rL)

|  |  |
| --- | --- |
|  | **Average relatedness** |
|  | **rK** | **rW** | **rL** | **Global** |
| Irene's social group (Adult females and juveniles) | 0.064 | 0.035 | 0.046 | 0.048 |
| Irene's social group (Females only) | 0.051 | 0.02 | 0.033 | 0.035 |
| Subgroup I (Adult females and juveniles) | 0.094 | 0.07 | 0.75 | 0.08 |
| Subgroup I (Females only) | 0.084 | 0.058 | 0.73 | 0.072 |
| Subgroup II (Adult females and juveniles) | 0.11 | 0.098 | 0.14 | 0.11 |
| Subgroup II (Females only) | 0.067 | 0.065 | 0.076 | 0.07 |
| All the individuals | 0.06 | 0.039 | 0.049 | 0.049 |

|  |  |  |
| --- | --- | --- |
| **Dyads** | **Relatedness** |  |
| **Individual 1** | **Individual 2** | **rK** | **rw** | **rl** | **p**  | **∆p** |
| Clan\_Reshna\_1 | ADELIE | 0 | -0,0253 | 0,1276 | U |  |
| Clan\_Reshna\_2 | ADELIE | 0 | 0,0776 | 0,1276 | U |  |
| Clan\_Reshna\_1 | AIKO | 0 | -0,0753 | -0,012 | U |  |
| Clan\_Reshna\_2 | AIKO | 0 | -0,0361 | 0,0927 | U |  |
| Clan\_Reshna\_1 | ALEXANDER | 0 | 0,1686 | 0,2323 | U |  |
| Clan\_Reshna\_2 | ALEXANDER | 0,4064 | 0,3872 | 0,3021 | PO |  |
| Clan\_Reshna\_1 | ALI | 0 | 0,038 | 0,1276 | U |  |
| Clan\_Reshna\_2 | ALI | 0 | -0,0743 | -0,0818 | U |  |
| Clan\_Reshna\_1 | ARTHUR | 0,1893 | 0,1725 | 0,2323 | HS | -0,127 |
| Clan\_Reshna\_2 | ARTHUR | 0,2478 | 0,2193 | 0,2323 | HS |  |
| Clan\_Reshna\_1 | CAROLINE | 0,0281 | 0,0453 | 0,0927 | U |  |
| Clan\_Reshna\_2 | CAROLINE | 0 | -0,0261 | -0,0818 | U |  |
| Clan\_Reshna\_1 | CLAIRE | 0,33 | 0,2478 | 0,3021 | HS |  |
| Clan\_Reshna\_2 | CLAIRE | 0 | -0,0866 | -0,0469 | U |  |
| Clan\_Reshna\_1 | DAREN | 0,0257 | -0,0055 | 0,0578 | U |  |
| Clan\_Reshna\_2 | DAREN | 0 | -0,0015 | 0,0229 | U |  |
| Clan\_Reshna\_1 | DELPHINE | 0 | 0,0821 | 0,0927 | U |  |
| Clan\_Reshna\_2 | DELPHINE | 0,1139 | 0,0402 | 0,0578 | U |  |
| Clan\_Reshna\_1 | DOS CALLEUX | 0 | -0,0123 | 0,0578 | U |  |
| Clan\_Reshna\_2 | DOS CALLEUX | 0 | -0,1643 | -0,1516 | U |  |
| Clan\_Reshna\_1 | ELIOT | 0 | 0,0583 | 0,2323 | U |  |
| Clan\_Reshna\_2 | ELIOT | 0 | 0,0904 | 0,1625 | U |  |
| Clan\_Reshna\_1 | EMY | 0,0675 | 0,0168 | 0,0578 | U |  |
| Clan\_Reshna\_2 | EMY | 0 | -0,048 | -0,0469 | U |  |
| Clan\_Reshna\_1 | GERMINE | 0 | -0,1577 | -0,1167 | U |  |
| Clan\_Reshna\_2 | GERMINE | 0,0524 | 0,0488 | 0,0578 | U |  |
| Clan\_Reshna\_1 | IRENE | 0,1223 | 0,1178 | 0,2672 | U |  |
| Clan\_Reshna\_2 | IRENE | 0,1545 | 0,209 | 0,2323 | U | 0,094 |
| Clan\_Reshna\_1 | ISSA | 0 | -0,1615 | -0,1516 | U |  |
| Clan\_Reshna\_2 | ISSA | 0 | 0,1898 | 0,1276 | U |  |
| Clan\_Reshna\_1 | LANA | 0 | -0,1288 | -0,0469 | U |  |
| Clan\_Reshna\_2 | LANA | 0,1435 | 0,1823 | 0,1625 | U |  |
| Clan\_Reshna\_1 | LUCY | 0 | 0,1534 | 0,0578 | U |  |
| Clan\_Reshna\_2 | LUCY | 0 | -0,1538 | -0,1865 | U |  |
| Clan\_Reshna\_1 | MINA | 0,0015 | 0,1466 | 0,1276 | U |  |
| Clan\_Reshna\_2 | MINA | 0,0185 | 0,2347 | 0,0927 | U |  |
| Clan\_Reshna\_1 | MYSTERE | 0,0197 | 0,0692 | 0,3021 | U |  |
| Clan\_Reshna\_2 | MYSTERE | 0,2114 | 0,1412 | 0,3021 | U | 0,16 |
| Clan\_Reshna\_1 | ROMEO | 0 | 0,0058 | -0,0818 | U |  |
| Clan\_Reshna\_2 | ROMEO | 0,0938 | 0,0649 | -0,012 | U |  |
| Clan\_Reshna\_1 | Unknown\_2017 | 0,0428 | 0,2214 | 0,1625 | U |  |
| Clan\_Reshna\_2 | Unknown\_2017 | 0 | 0,0248 | -0,0469 | U |  |
| Clan\_Reshna\_1 | TACHE BLANCHE | 0 | 0,0014 | 0,0229 | U |  |
| Clan\_Reshna\_1 | Clan\_Reshna\_2 | 0,2237 | 0,2874 | 0,2672 | U | 0,129 |
| Clan\_Reshna\_1 | VANESSA | 0 | -0,1021 | -0,1167 | U |  |
| Clan\_Reshna\_1 | ZOE | 0,0999 | 0,0742 | 0,0927 | U |  |
| Clan\_Reshna\_1 | YUKIMI | 0 | -0,0098 | 0,0927 | U |  |
| TACHE BLANCHE | Clan\_Reshna\_2 | 0 | 0,0124 | 0,0229 | U |  |
| Clan\_Reshna\_2 | VANESSA | 0 | -0,1407 | -0,1865 | U |  |
| Clan\_Reshna\_2 | ZOE | 0 | 0,1256 | 0,0578 | U |  |
| Clan\_Reshna\_2 | YUKIMI | 0,038 | 0,0419 | 0,0927 | U |  |

**Table S8. Relatedness values calculated between the 2 adult females members of another social group and Irene’s group members.**

First (Parent-offspring, PO, and Full siblings, FS) and second (Half siblings, avuncular, grand parents-grandchildrens; all noted HS here) have been deduced

(1) from the calculation of the relatedness coefficient ***r*** using the Kalinowsky *et al*. (2006), the Wang (2002) and the Li *et al*. (1993) estimators (respectively *rK*, *rW* and rL),

(2) from the maximum likelihood relationship (*P.*) estimated by ML relate (Kalinowsky et al. 2006) and

(3) from the parentage analysis performed by CERVUS