**Supplementary File 1A**

Table 1. Information about dogs used in the study.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Name** | **Breed** | **Owner** | **Age****(years)** | **Sex** | **NOUT** | **NIN** | **NT** | **NS** |
| 1 | Hennessy | Borzoi | PN | 2-3 | M | 53 | 54 | 15 | 39 |
| 2 | Amalka | Dachshund Zwerg Rauhhaar | KB | 2-4 | F | 25 | 27 | 24 | 3 |
| 3 | Hurvinek | Dachshund Zwerg Rauhhaar | KB | 4-7 | M | 46 | 49 | 27 | 22 |
| 4 | Kacka | Dachshund Zwerg Rauhhaar | KB | 2-4 | F | 30 | 31 | 22 | 9 |
| 5 | Pecka | Dachshund Zwerg Rauhhaar | KB | 1-2 | F | 14 | 16 | 11 | 5 |
| 6 | Punta | Dachshund Zwerg Rauhhaar | KB | 1-2 | M | 22 | 25 | 18 | 7 |
| 7 | Terezka | Dachshund Zwerg Rauhhaar | KB | 1-2 | F | 32 | 32 | 25 | 7 |
| 8 | Benda | Dachshund Zwerg Rauhhaar | KB | 1 | F | 16 | 18 | 15 | 3 |
| 9 | Vendulka | Dachshund Zwerg Rauhhaar | KB | 10 | F | 17 | 18 | 13 | 5 |
| 10 | Albi | Dachshund Zwerg Rauhhaar | HF | 9-11 | M | 67 | 71 | 23 | 48 |
| 11 | Hugo | Dachshund Zwerg Rauhhaar | HF | 2-4 | M | 47 | 50 | 34 | 16 |
| 12 | Demi | Dachshund Zwerg Rauhhaar | MJ | 4 | F | 24 | 30 | 20 | 10 |
| 13 | Cecil | Dachshund Zwerg Rauhhaar | AM | 4 | M | 43 | 47 | 41 | 6 |
| 14 | Upir | Dachshund Kaninchen Rauh. | HF | 1 | M | 18 | 20 | 18 | 2 |
| 15 | Figy | Dachshund Kaninchen Rauh. | KB | 2-3 | F | 16 | 17 | 13 | 4 |
| 16 | Kuky | Dachshund Kaninchen Rauh. | KB | 5-6 | M | 4 | 5 | 3 | 2 |
| 17 | Bay | Dachshund Standard Langh. | HS | 3 | M | 12 | 12 | 8 | 4 |
| 18 | Gina | Dachshund Standard Langh. | HS | 1 | F | 8 | 8 | 5 | 3 |
| 19 | Safira | Dachshund Standard Langh. | HS | 2 | F | 12 | 14 | 7 | 7 |
| 20 | Jeny | Dachshund Standard Rauh. | TB | 2 | F | 9 | 9 | 7 | 2 |
| 21 | Amala | Dachshund Standard Kurzhaar | HK | 6 | F | 5 | 5 | 0 | 5 |
| 22 | Kara | German Spaniel | TB | 3 | F | 28 | 31 | 20 | 11 |
| 23 | Bessy | Fox Terrier Smooth | JA | 6-7 | F | 9 | 12 | 8 | 4 |
| 24 | Gofi | Fox Terrier Smooth | JA | 2 | F | 32 | 34 | 24 | 10 |
| 25 | Hard | Fox Terrier Smooth | JA | 1 | M | 12 | 14 | 10 | 4 |
| 26 | Sara | Alpine Dachsbracke | MD | 3-4 | F | 4 | 4 | 2 | 2 |
| 27 | Dona | Welsh Terrier | TB | 4 | F | 17 | 19 | 8 | 11 |
|  | Total | 622 | 672 | 421 | 251 |

**Supplementary File 1B**

Table 2. Factors in the final GLMMs for the dependent variables (in bold).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Contributing Factors in final models* | *Num DF* | *Den DF* | *F Value* | *Probability / P value* |
| a) | **Probability for N-S compass run** |
|  | Return strategy | 1 | 644 | 51.70 | <0.0001 |
| b) | **Probability for scouting strategy** |
|  | Alignment behaviour | 1 | 643 | 46.54 | <0.0001 |
|  | Study site familiarity  | 1 | 643 | 15.23 | 0.0001 |
| c) | **Efficiency of return** |
|  | Alignment behaviour | 1 | 246 | 6.47 | 0.0116 |
| d) | **Speed of inbound trajectory** |
|  | Shoulder height | 1 | 12.5 | 72.48 | <0.0001 |
|  | Forest path used during inbound return | 1 | 666 | 4.91 | 0.0270 |
|  | Return strategy | 1 | 671 | 17.58 | <0.0001 |
| e) | **Inbound track length** |
|  | Shoulder height | 1 | 15.6 | 0.3 | 0.5924 |
|  | Forest path used during inbound return | 1 | 672 | 6.32 | 0.0122 |
|  | Beeline distance between dog and owner | 1 | 662 | 1080.88 | <0.0001 |

**Supplementary File 1C**

Table 3. Effects used in General Linear Mixed Models.

|  |  |  |
| --- | --- | --- |
| **Variable** | **Mean** | **Standard error** |
| Inbound speed (km per hour) | 8.4 | 0.1 |
| Inbound track length (m) | 351.4 | 11.2 |
| Beeline distance between the dog and his owner (m) | 246.3 | 12.1 |
| Dog age (years) | 4.0 | 0.1 |
| Shoulder height (cm) | 30.1 | 0.7 |
| Homing efficiency index (%) | 159.8 | 2.8 |
| **Categorical effects (classes)**  |
| Return strategy | Tracking or Scouting |
| Alignment behaviour | Yes or No |
| Unfamiliar area | Yes or No |
| Forest path used during inbound return  | Yes or No |
| Sex of the dog | Male or Female |
| Breed | 10 levels |

**Supplementary File 1D**

Table 4. Length parameters during different phases of the excursion (data from combined strategies are excluded).

|  |  |  |  |
| --- | --- | --- | --- |
| **Return strategy** | **Part of the excursion** | **Mean** | **Standard error** |
| **Tracking****N=399** | Outbound trajectory (m) | 384.2 | 16.2 |
| Turning trajectory (m) | 76.9 | 3.1 |
| Inbound trajectory (m) | 312.2 | 13.3 |
| Total (m) | 773.8 | 30. 9 |
| Straight distance (m) | 231.1 | 8.4 |
| Compass run (azimuth C) (m)  | 19.8 | 1.4 |
| **Scouting****N=223** | Outbound trajectory (m) | 622.0 | 36.4 |
| Turning trajectory (m) | 111.4 | 5.6 |
| Inbound trajectory (m) | 384.5 | 20.2 |
| Total (m) | 1118.1 | 55. 8 |
| Straight distance (m) | 278.2 | 12.9 |
| Compass run (azimuth C) (m)  | 18.1 | 1.4 |

**Supplementary File 1E**

Table 5. Circular analyses of individual (‘raw’) and grouped means for azimuth A, B and C during scouting and tracking strategies, and when a scouting strategy was used as the second return strategy (tracking used as a second return strategy not shown).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Return strategies** | **Azimuth** | **n** | **Mean vector****(µ) ± 95% CI** | **Length of mv (r)** | **Circular SD** | **Rayleigh test (Z)** | **Rayleigh test (p)** | **Data type** |
| **Scouting** | A (raw data) | 251 | 143° | 0.026 | 155° | 0.163 | 0.849 | Angles |
| A (means) | 27 | 207° | 0.209 | 101° | 1.179 | 0.310 | Angles |
| B (raw data) | 251 | 56° | 0.097 | 124° | 2.383 | 0.092 | Angles |
| B (means) | 27 | 30° | 0.123 | 117° | 0.407 | 0.670 | Angles |
| C (raw data) | 251 | 175°/355° ± 5° | 0.437 | 37° | 47.824 | < 10-12 | Axial |
| C (means) | 27 | 176°/356° ± 7° | 0.824 | 18° | 18.330 | 1.15x10-8 | Axial |
| **Scouting** **as second return** | B (raw data) | 28 | 21° | 0.102 | 122° | 0.291 | 0.751 | Angles |
| C (raw data) | 28 | 172°/352° ± 19° | 0.381 | 40° | 4.058 | 0.016 | Axial |
| **Tracking** | A (means) | 26 | 232° | 0.160 | 110° | 0.663 | 0.520 | Angles |
| B (means) | 26 | 64° | 0.153 | 111° | 0.612 | 0.547 | Angles |
| C (raw data) | 421 | 96°/276° | 0.042 | 72° | 0.748 | 0.473 | Axial |
| C (means) | 26 | 92°/272° | 0.227 | 49° | 1.342 | 0.263 | Axial |

**Supplementary File 1F**

Table 6. Axial analyses of azimuth C (= orientation of the compass run) partitioned into four groups to test for an influence of the owner on the orientation of the compass run during scouting strategy returns.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Magnetic direction of owner relative turning point (± 45°):** | **n** | **Azimuth C mean vector (µ) ± 95% CI** | **Length of m.v. (r)** | **Circular SD** | **Rayleigh test (Z)** | **Rayleigh test (p)** |
| **North** | 71 | 179°/359° ± 12° | 0.370 | 40° | 9.738 | 5.90x10-5 |
| **East** | 68 | 173°/353° ± 7° | 0.642 | 27° | 28.014 | < 10-12 |
| **South** | 59 | 171°/351° ± 12° | 0.392 | 39° | 9.087 | 1.13x10-4 |
| **West** | 53 | 177°/357° ± 16° | 0.322 | 43° | 5.508 | 0.004 |