**Supplementary Text 1**

**Praat Settings**

Here, we provide a detailed description of the acoustic analysis performed in Praat software using a custom-made script (Briefer et al., 2019; Garcia et al., 2016; Reby & McComb, 2003) adjusted for little auk vocalisations (Osiecka et al. 2023). Settings used to extract the 16 acoustic parameters presented in Supplementary Table 1 are described below (Praat commands indicated in brackets; see Supplementary Table 1 for abbreviations of the parameters used).

1. **Duration**. The duration (Dur) was measured as the total duration of each wav file (s), corresponding to individual calls manually extracted from the recordings, based on the visualisation of both the oscillogram and spectrogram.

2. **Amplitude modulation**. AM Var and AM Rate were calculated from the intensity contour of each individual call, using the [Sound: To Intensity] command (minimum pitch = 500 Hz, time step = 0.005 s).

3. **Source-related acoustic features**. *f0* contour of each call was extracted using a cross-correlation method ([Sound: To pitch (cc)] command; time step = 0.005 s, pitch floor = 500 Hz, pitch ceiling = 2000 Hz). We included the following *f0* frequency values: *f0* Start, *f0* End, *f0* Mean, *f0* Min, *f0* Max, Time *f0* Max, *f0* Range. We also measured the *f0* Var and FM Rate.

4. **Spectrum-related parameters.** Q25%, Q50%, and Q75% were measured on a spectrum applied to the whole call, and *f*Peak was measured on a cepstral-smoothed spectrum (command [Create: Cepstral smoothing]; bandwidth = 100 Hz).

Praat spectrogram settings: view range max: 8000; window length: 0.008; dynamic range: 60.

**Supplementary Table 1.** Sample sizes of the two call types extracted per individual. Individuals are indicated by their unique ring numbers. Grey/white segments indicate nests, i.e. mating pairs.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Ring no.** | **nest** | **sex** | ***classic call*** | ***short call*** | **total calls** |
| 50161 | 101 | F | 3 | 20 | 23 |
| 48567 | 101 | M | 15 | 40 | 55 |
| 55405 | 11\_58 | F | 0 | 4 | 4 |
| 26937 | 11\_58 | M | 2 | 34 | 36 |
| 50135 | 113\_10 | M | 0 | 12 | 12 |
| 44892 | 113\_41 | F | 12 | 40 | 52 |
| 46155 | 113\_41 | M | 5 | 40 | 45 |
| 50259 | 12\_16 | F | 1 | 0 | 1 |
| 50138 | 12\_16 | M | 8 | 4 | 12 |
| 26555 | D15\_5 | F | 2 | 15 | 17 |
| 55401 | D15\_5 | M | 1 | 20 | 21 |
| 43087 | D15\_6 | F | 1 | 20 | 21 |
| 50172 | D17\_16 | M | 0 | 5 | 5 |
| 50496 | K17\_13 | M | 1 | 20 | 21 |
| 55404 | K8 | F | 0 | 20 | 20 |
| 44931 | K8 | M | 2 | 0 | 2 |
| 50152 | W39 | F | 2 | 7 | 9 |
| 46028 | W39 | M | 4 | 20 | 24 |
| 50167 | W39B | F | 1 | 8 | 9 |
| 50327 | W39B | M | 1 | 24 | 25 |
| 43817 | W40 | F | 18 | 40 | 58 |
| 41260 | W40 | M | 10 | 40 | 50 |
| 44955 | W41J | F | 7 | 40 | 47 |
| 26975 | W41J | M | 30 | 40 | 70 |
| 43858 | W49 | M | 3 | 1 | 4 |
| 50099 | W6 | F | 7 | 21 | 28 |
| 50088 | W6 | M | 3 | 20 | 23 |
|  |  | **total** | **139** | **555** | **694** |

**Supplementary Table 2.** Acoustic parameters extracted for each vocalisation (adapted from Briefer *et al.* 2017 and Osiecka *et al.* 2023).

|  |  |
| --- | --- |
| **Abbreviation** | **Description** |
| ***f*0 Mean (Hz)** | Mean fundamental frequency value across the vocalisation |
| ***f*0 Start (Hz)** | Fundamental frequency value at the start of the vocalisation |
| ***f*0 End (Hz)** | Fundamental frequency value at the end of the vocalisation |
| ***f*0 Max (Hz)** | Maximum value of the fundamental frequency across the vocalisation |
| ***f*0 Min (Hz)** | Minimum value of the fundamental frequency across the vocalisation |
| ***f*0 Range** | Difference between *f*0 Max and *f*0 Min |
| **Time *f*0 Max (%)** | Percentage of the total duration when the maximum F0 frequency occurs within the vocalisation |
| ***f*0 Var (Hz/s)** | Cumulative variation in f0 frequency divided by the total vocalisation duration |
| **FM Rate (s-1)** | Number of *f*0modulations divided by the total vocalisation duration |
| **Q25% (Hz)** | Frequency value at the upper limit of the first quartiles of energy |
| **Q50% (Hz)** | Frequency value at the upper limit of the second quartiles of energy |
| **Q75% (Hz)** | Frequency value at the upper limit of the third quartiles of energy |
| ***f*peak (Hz)** | Frequency of peak amplitude |
| **Dur (s)** | Duration of the vocalisation |
| **AM Var (dB/s)** | Cumulative variation in amplitude divided by the total vocalisation duration |
| **AM Rate (s-1)** | Number of amplitudemodulations divided by the total vocalisation duration |

**Supplementary Table 3.** Principal Components Analysis: results for the *short* and *classic* call types

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | ***short call*** | | | ***classic call*** | | |
|  | **Eigenvalue** | **Proportion of variance** | **Cumulative proportion** | **Eigenvalue** | **Proportion of variance** | **Cumulative proportion** |
| **PC1** | 2.42 | 0.39 | 0.39 | 1.82 | 0.22 | 0.22 |
| **PC2** | 1.45 | 0.14 | 0.53 | 1.73 | 0.20 | 0.42 |
| **PC3** | 1.36 | 0.12 | 0.65 | 1.49 | 0.15 | 0.57 |
| **PC4** | 1.10 | 0.08 | 0.74 | 1.11 | 0.08 | 0.65 |
| **PC5** | 1.03 | 0.07 | 0.81 | 1.06 | 0.08 | 0.72 |
| **PC6** | 0.95 | 0.06 | 0.87 | 0.99 | 0.07 | 0.79 |
| **PC7** | 0.84 | 0.05 | 0.91 | 0.95 | 0.06 | 0.85 |
| **PC8** | 0.68 | 0.03 | 0.94 | 0.76 | 0.04 | 0.89 |
| **PC9** | 0.57 | 0.02 | 0.97 | 0.71 | 0.03 | 0.92 |
| **PC10** | 0.51 | 0.02 | 0.98 | 0.61 | 0.03 | 0.95 |
| **PC11** | 0.47 | 0.02 | 1.00 | 0.57 | 0.02 | 0.97 |
| **PC12** | 0.18 | 0.00 | 1.00 | 0.52 | 0.02 | 0.99 |
| **PC13** | 0.12 | 0.00 | 1.00 | 0.36 | 0.01 | 0.99 |
| **PC14** | 0.06 | 0.00 | 1.000 | 0.29 | 0.01 | 1.00 |
| **PC15** | 0.00 | 0.00 | 1.000 | 0.00 | 0.00 | 1.00 |

**Supplementary Table 4.** Principal Components Analysis: contributions of raw acoustic parameters to the first five principal components

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ***short call*** | | | | | ***classic call*** | | | | |
| **Raw variable** | **PC1** | **PC2** | **PC3** | **PC4** | **PC5** | **PC1** | **PC2** | **PC3** | **PC4** | **PC5** |
| Mean *f0* | -0.95 | 0.16 | 0.16 | 0.07 | -0.09 | 0.29 | 0.80 | -0.30 | 0.07 | -0.22 |
| Start *f0* | -0.71 | 0.53 | 0.32 | 0.05 | -0.19 | -0.50 | 0.35 | -0.16 | -0.44 | 0.34 |
| End *f0* | -0.96 | -0.19 | 0.04 | 0.08 | -0.00 | -0.17 | 0.49 | -0.52 | -0.03 | -0.37 |
| Max *f0* | -0.96 | -0.18 | 0.03 | 0.01 | -0.07 | 0.52 | 0.78 | -0.06 | 0.07 | 0.12 |
| Min *f0* | -0.76 | 0.51 | 0.32 | 0.15 | -0.08 | -0.40 | 0.50 | -0.56 | -0.35 | -0.06 |
| Range *f0* | -0.63 | -0.68 | -0.24 | -0.12 | -0.03 | 0.72 | 0.48 | 0.24 | 0.26 | 0.15 |
| Time max *f0* | -0.57 | -0.34 | -0.04 | 0.47 | 0.29 | 0.16 | -0.28 | 0.21 | -0.00 | -0.76 |
| *f0* var | -0.44 | -0.59 | -0.25 | -0.24 | -0.44 | 0.77 | 0.28 | 0.12 | 0.14 | 0.01 |
| FM rate | 0.29 | 0.23 | 0.12 | 0.36 | -0.11 | 0.23 | -0.03 | 0.16 | 0.03 | 0.39 |
| Q25% | -0.56 | 0.33 | -0.11 | -0.47 | 0.11 | -0.03 | 0.49 | 0.54 | -0.37 | -0.14 |
| Q50% | -0.16 | 0.40 | -0.81 | -0.04 | 0.05 | -0.35 | 0.50 | 0.72 | -0.15 | -0.03 |
| Q75% | -0.15 | 0.43 | -0.79 | -0.04 | 0.06 | -0.66 | 0.37 | 0.46 | 0.22 | 0.02 |
| Fpeak | -0.66 | 0.17 | 0.10 | -0.36 | 0.10 | -0.32 | 0.12 | 0.54 | 0.08 | -0.17 |
| AM var | 0.04 | -0.09 | 0.35 | -045 | 0.67 | 0.44 | -0.26 | 0.27 | -0.60 | 0.03 |
| AM rate | -0.50 | -0.09 | -0.27 | 0.44 | 0.49 | -0.70 | 0.16 | -0.02 | 0.49 | 0.09 |