María Camila Salazar-Pérez and Sergio Estrada-Villegas. 2025. Neotropical insectivorous bats adjust echolocation calls in response to vegetation structure. THERYA, Vol. 16(3):397-408

**Supplementary material**

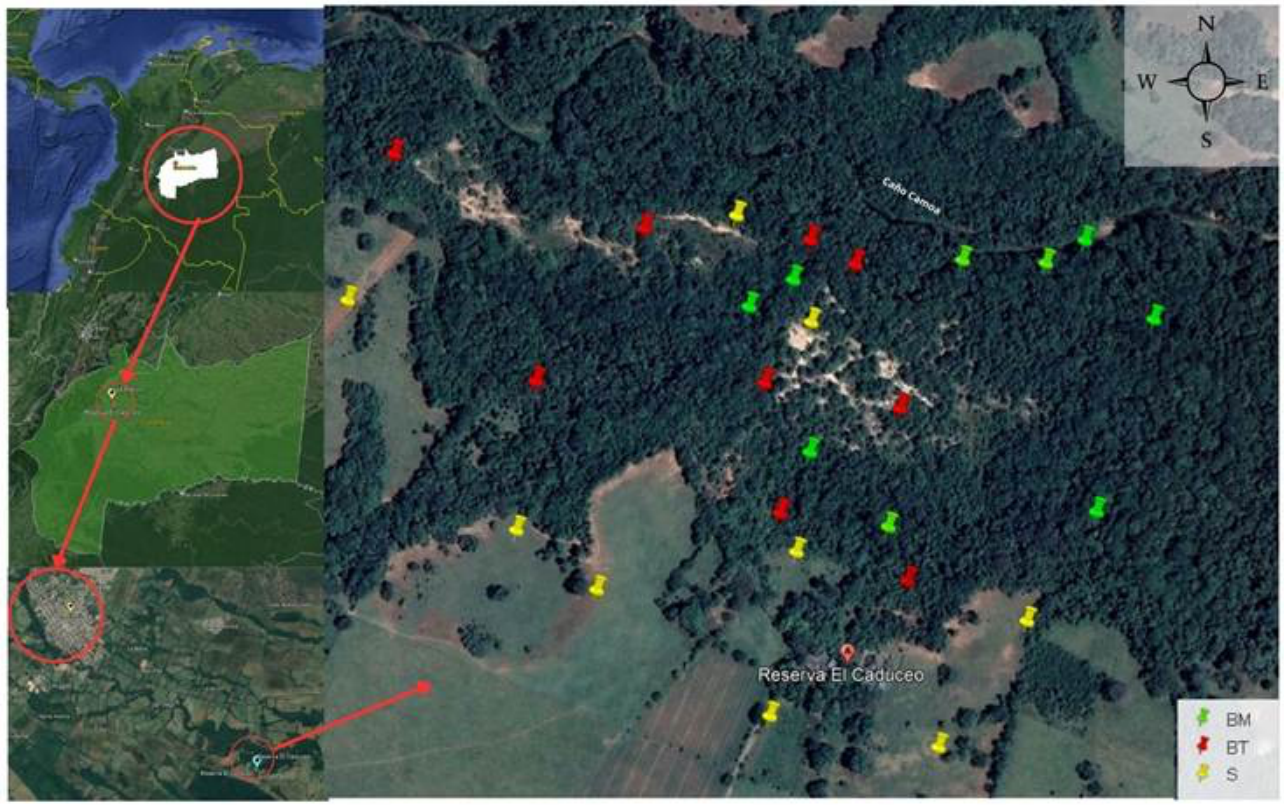


Figure S1. Geographical location of the El Caduceo Reserve, San Martin, Meta, Colombia and sampling points. Green for very complex vegetation structure (BM), red for complex vegetation structure (BT) and yellow for open spaces (S).

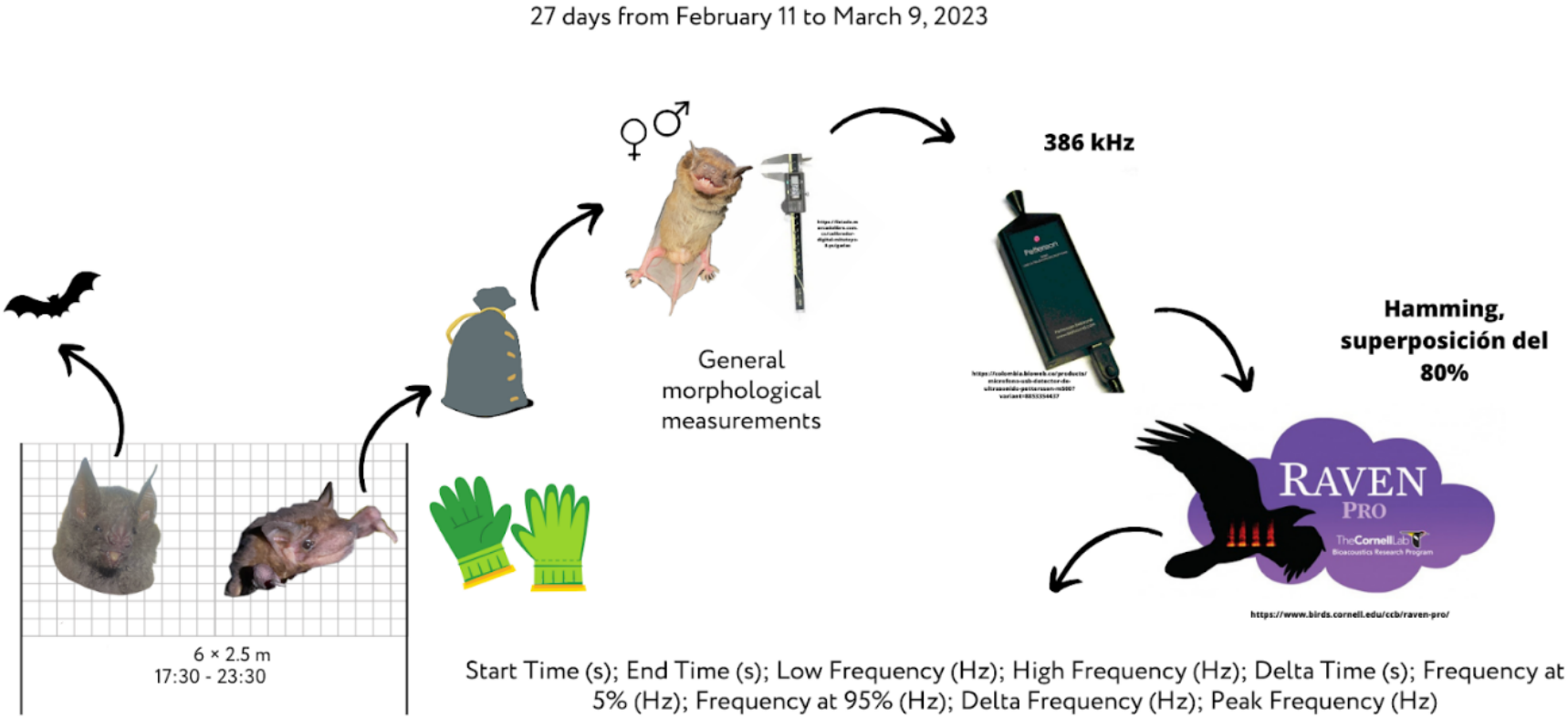


Figure S2. Bat capture methodology and reference calls.

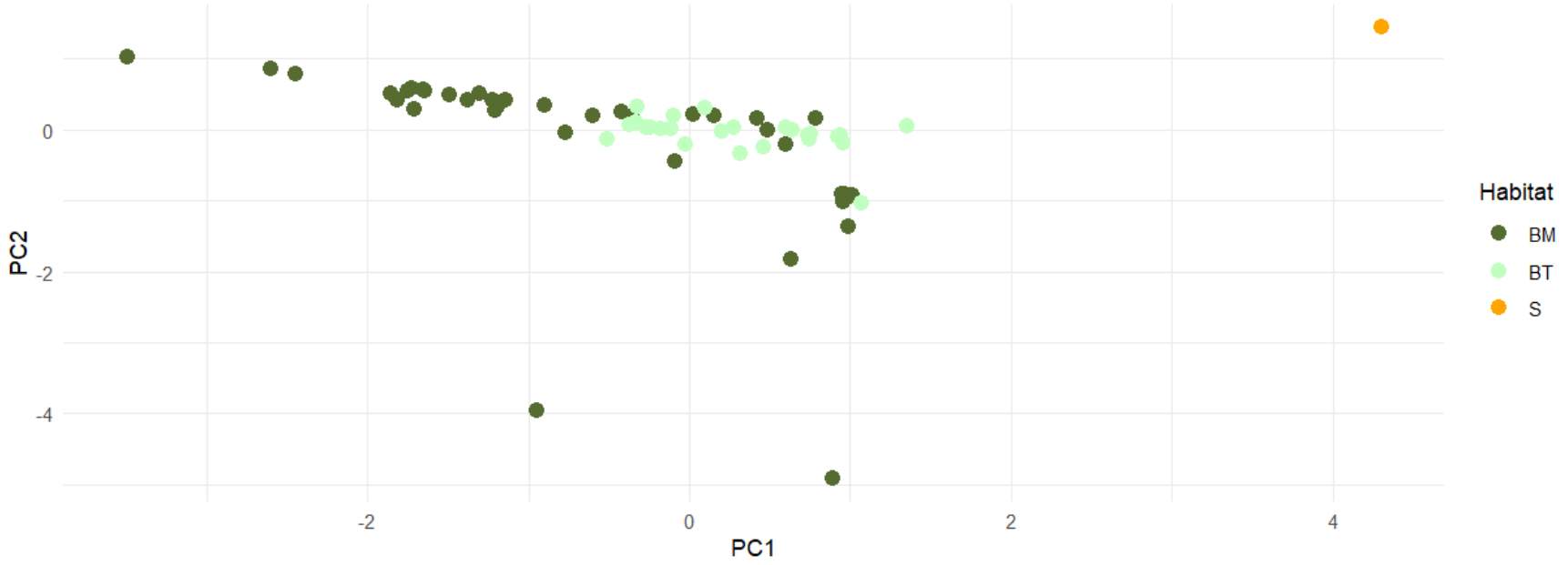


Figure S3. Principal Component Analysis (PCA) by Transect for the Three Sampled Habitats (BM, BT, and S).

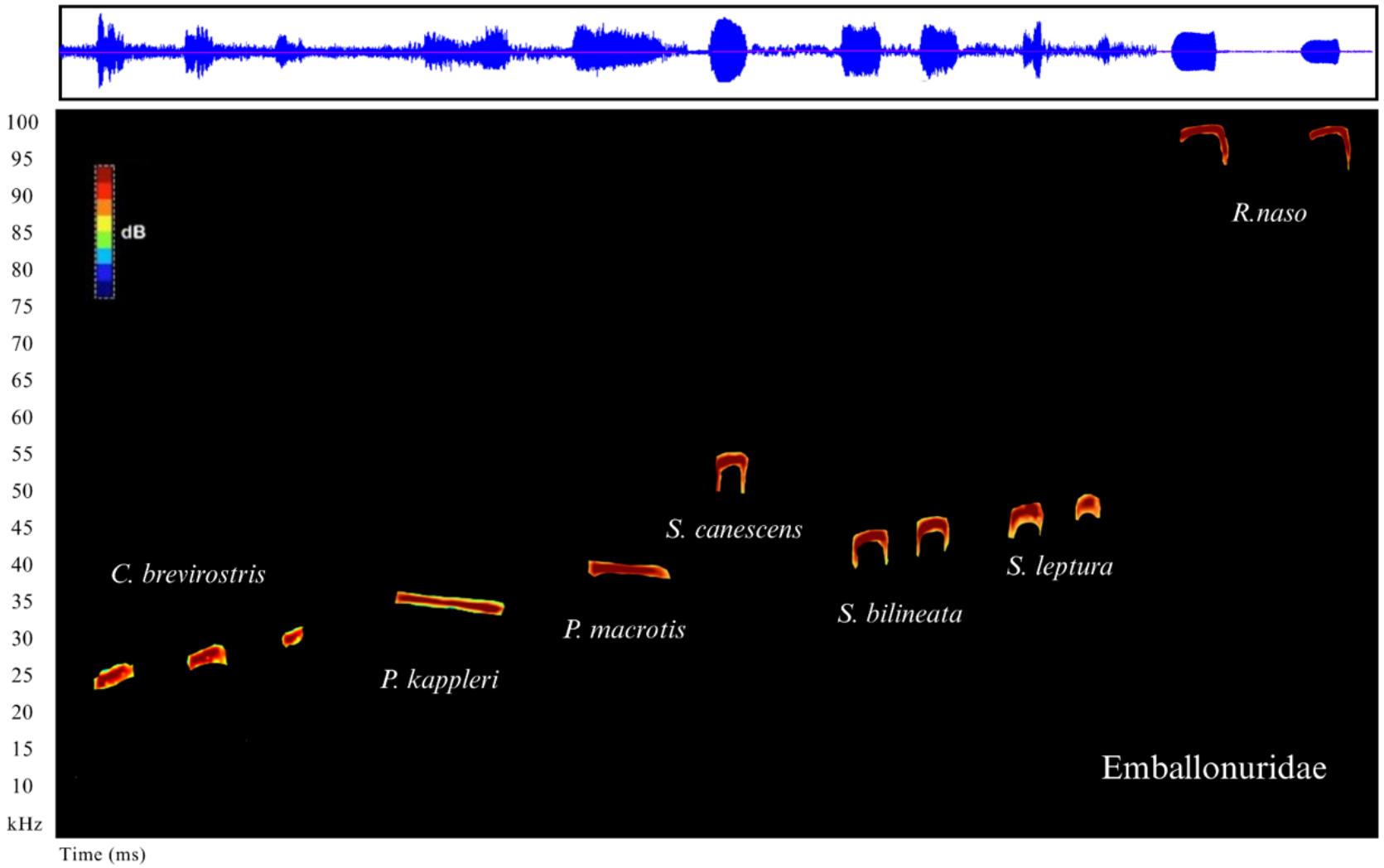


Figure S4. Sonotypes of the family Emballonuridae recorded in the present study.

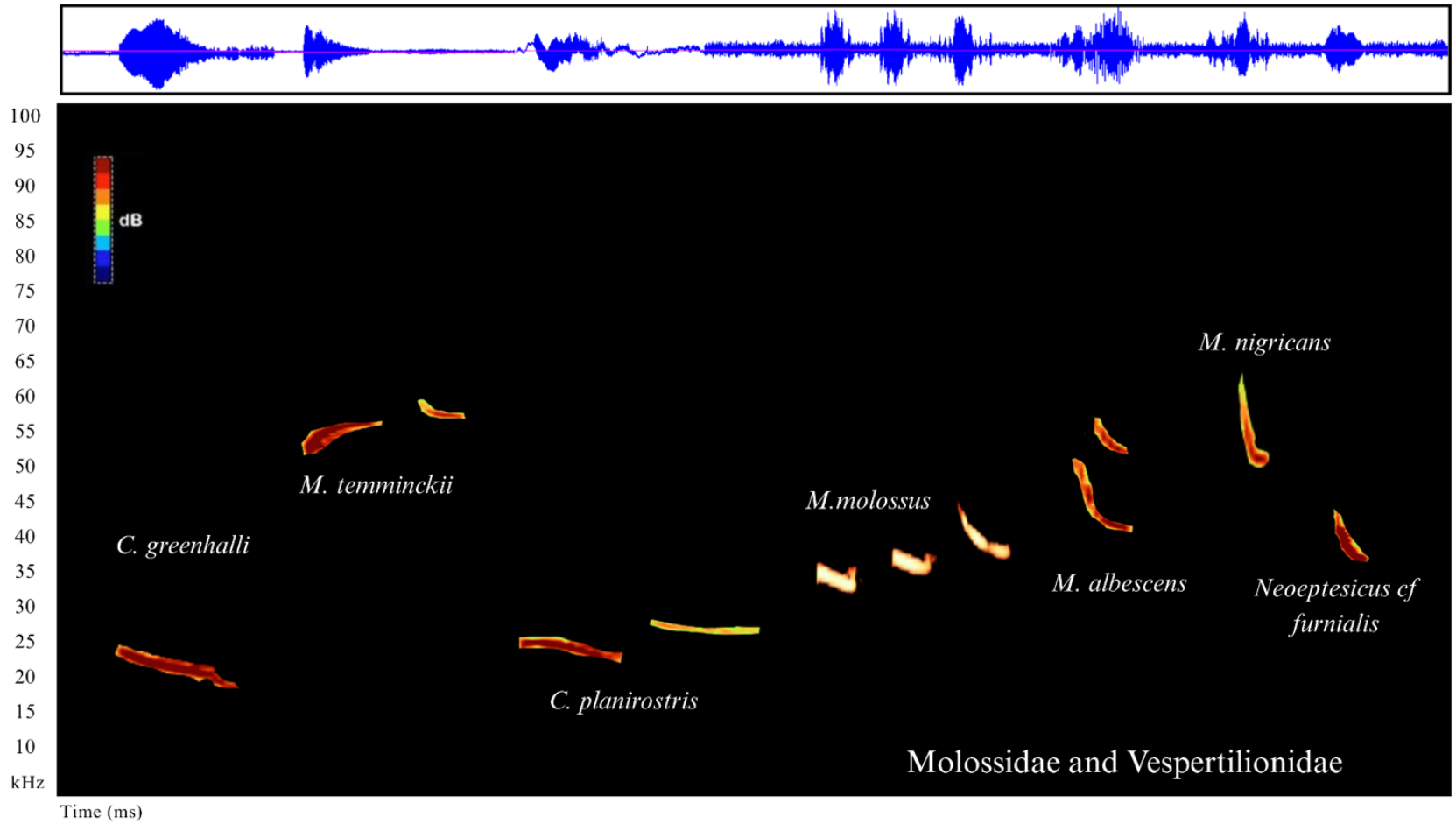


Figure S5. Sonotypes of the family Molossidae and Vespertilionidae recorded in the present study.

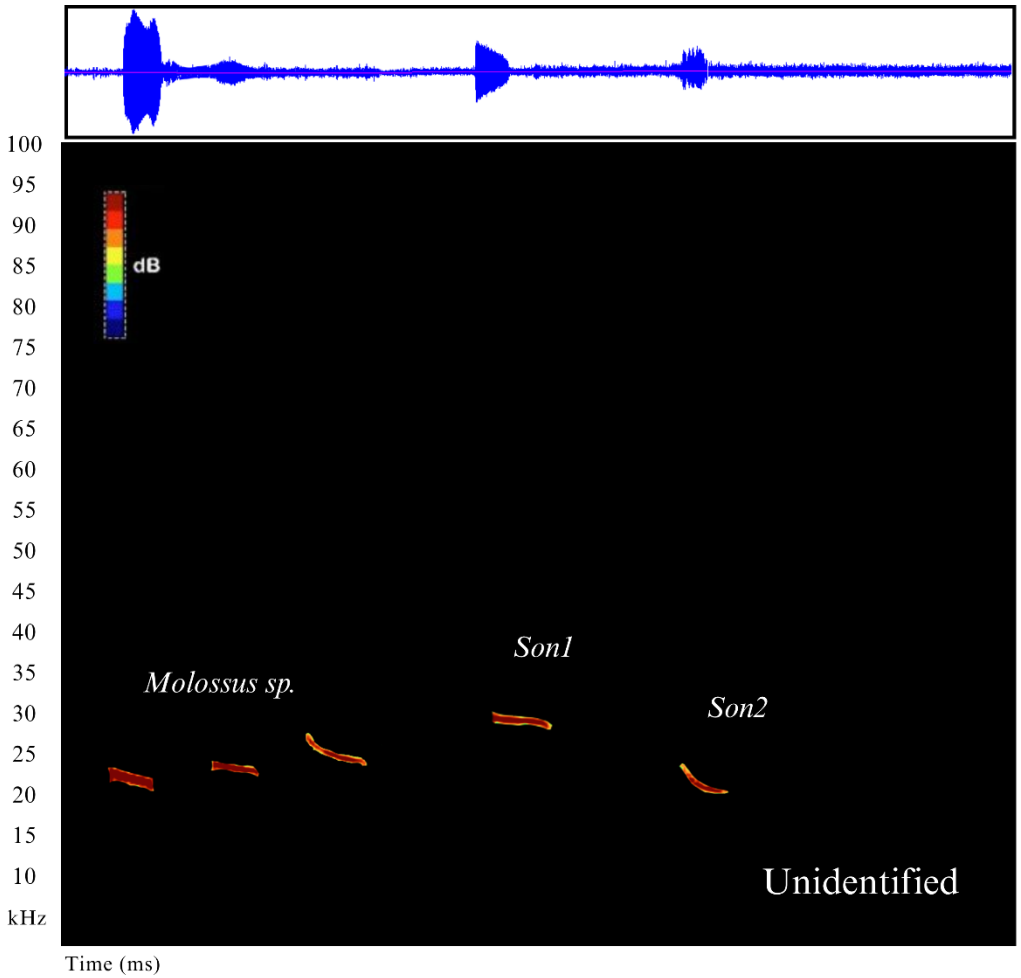


Figure S6. Unidentified sonotypes recorded in the present study.

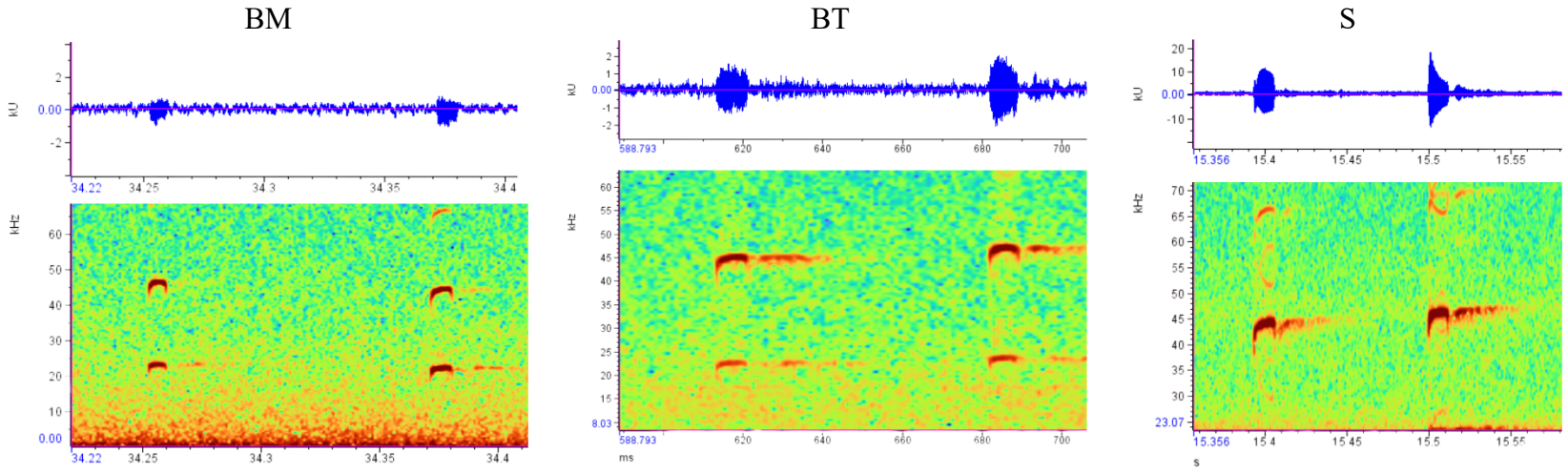


Figure S7. Spectrograms of *Saccopteryx bilineata* across the three vegetation structures.

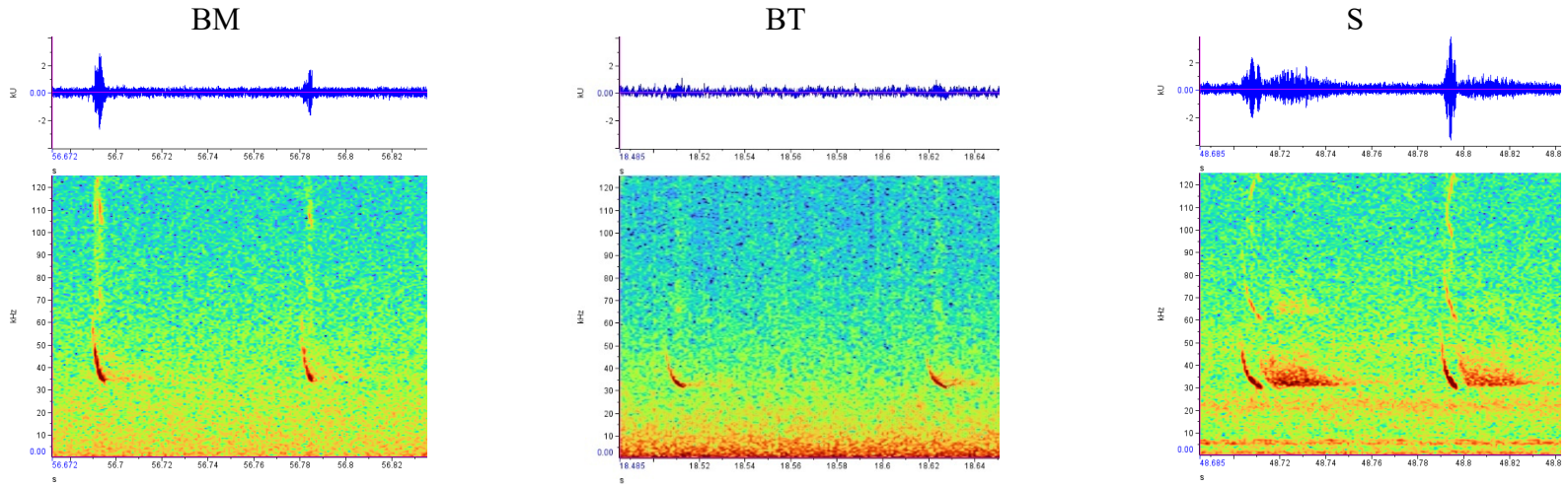


Figure S8. Spectrograms of *Neoeptesicus cf furinalis* across the three vegetation structures.

Table S1. Kruskal-Wallis Test Results for Spectral and Temporal Parameters of Acoustic Signals

| Species | | Spectral and temporal parameters | | |
|---|---|---|---|---|
| | | Delta frequency | Delta Time | Peak Frequency |
| *Saccopteryx bilineata* | High pulse | 0,0001 | 1,72E-05 | 4,89E-12 |
| | Low pulse | 1,99E-05 | 2,20E-16 | 4,89E-12 |
| *Neoptesicus cf furinalis* | Unique pulse | 0,004 | 2,20E-16 | 1,39E-05 |

Table S2. Results of the Bonferroni Post Hoc Test for Both Species Across Sampled Land Cover Types

| **Species** | | **Delta frequency** | | | **Delta time** | | **Peak frequency** | |
|---|---|---|---|---|---|---|---|---|
| | | **Comparison** | **Z** | **P adj** | **Z** | **P adj** | **Z** | **P adj** |
| *Saccopteryx bilineata* | High pulse | **BM-BT** | 0,14 | 1 | -4,08 | 1,32E-04 | -2,08 | 0,11 |
| | | **BM-S** | -3,37 | 0,002 | -13,27 | 9,34E-40 | -3,4 | 0,00 |
| | | **BT-S** | -3,18 | 0,004 | -7,43 | 3,23E-13 | -0,76 | 1,00 |
| | Low pulse | **BM-BT** | 2 | 0,11 | -3,49 | 1,40E-03 | -1,3 | 0,54 |
| | | **BM-S** | -1,88 | 0,17 | -12,31 | 2,36E-34 | -2,55 | 0,03 |
| | | **BT-S** | -4,03 | 0,0001 | -7,5 | 1,84E-13 | -0,88 | 1,00 |
| *Neoptesicus cf furinalis* | Unique pulse | **BM-BT** | -2,41 | 4,70E-02 | -1,2 | 6,80E-01 | -0,1 | 1,00 |
| | | **BM-S** | 2,32 | 5,99E-02 | -11,6 | 1,13E-30 | 2,18 | 0,09 |
| | | **BT-S** | 4,93 | 2,44E-06 | -8,53 | 4,15E-17 | 2,01 | 0,13 |

Table S3. Relative Abundance of Insectivorous Bat Species Acoustically Detected in El Caduceo Reserve (BM, BT, and S).

| **Familia** | **Especie** | **BT** | **BM** | **S** |
|---|---|---|---|---|
| **Vespertilionidae** | *Neoptesicus cf furinalis* (D´Orbiny&Gervais, 1847) | 152 | 31 | 9 |
| | *Myotis cf nigricans* (Schinz, 1821) | 51 | 0 | 58 |
| | *Myotis cf riparius* (Handley, 1960) | 20 | 46 | 13 |
| **Molossidae** | *Cynomops greenhalli* (Goodwin, 1958) | 30 | 431 | 217 |
| | *Cynomops planirostris* (Peters, 1866) | 10 | 0 | 9 |
| | *Molossus molossus* (Pallas, 1766) | 30 | 138 | 80 |
| | *Molossops temminckii* (Burmeister, 1854) | 20 | 0 | 9 |
| **Emballonuridae** | *Saccopteryx bilineata* (Temminck, 1838) | 333 | 154 | 217 |
| | *Saccopteryx leptura* (Schreber, 1774) | 121 | 15 | 35 |
| | *Saccopteryx canescens* (Thomas, 1901) | 10 | 92 | 35 |
| | *Cormura brevirostris* (Wagner, 1843) | 20 | 15 | 199 |
| | *Peropteryx macrotis* (Wagner, 1843) | 40 | 0 | 31 |
| | *Peropteryx kappleri* (Peters, 1867) | 0 | 0 | 13 |
| **Unidentified** | *Molosssus*1 (Geoffroy, 1805) | 101 | 15 | 44 |
| | *Molosssus2* (Geoffroy, 1805) | 61 | 0 | 4 |
| | Sonotipo 1 | 0 | 0 | 9 |
| | Sonotipo 2 | 0 | 62 | 18 |

Authors´note: To determine the relative abundances of bat species in the acoustic dataset, we considered the presence of each species per recorder during the three weeks of sampling. This allowed us to estimate the total number of acoustic records per species. We then standardized the data by dividing the number of acoustic records of each species by the total number of records per habitat and subsequently multiplied this value by 1000 to obtain decimal numbers greater than zero. Finally, the values were rounded to the nearest integer.

Table S4. Results of the Principal Component Analysis for Each Sampled Habitat

| | PC1 | PC2 | PC3 | PC4 | PC5 |
|---|---|---|---|---|---|
| **Standard deviation** | 15.662 | 10.552 | 0.7644 | 0.7162 | 0.57987 |
| **Proportion of Variance** | 0.4906 | 0.2227 | 0.1169 | 0.1026 | 0.06725 |
| **Cumulative Proportion** | 0.4906 | 0.7133 | 0.8302 | 0.9327 | 100.000 |

Table S5. Spectro and Temporal Parameters of Acoustically Recorded Insectivorous Bats

| Family | *Species* | Pulse | LF(kHz) | HF(kHz) | ΔTs) | F5% (kHz) | F95% (kHz) | ΔF(kHz) | PF(kHz) |
|---|---|---|---|---|---|---|---|---|---|
| Emballonuridae | *Saccopteryx bilineata (Temminck, 1838)* | Low | 39.44 ±1.02 | 42.64 ±1.42 | 0.008 ±0.002 | 40.59 ±1.34 | 42.16 ±1.44 | 3.1 ±1.09 | 41.50 ±1.49 |
| | | High | 44.02 ±1.89 | 47.25 ±2.05 | 0.008 ±0.002 | 45.17 ±1.86 | 46.81 ±1.99 | 3.23 ±1.13 | 46.10 ±1.85 |
| | *Saccopteryx leptura (Schreber, 1774)* | Low | 46.03±0.82 | 49.58±1.32 | 0.009±0.002 | 47.36±1.02 | 49±1.18 | 3.54±1.13 | 48.48±1.11 |
| | | High | 48.2±0.90 | 50.95±1.14 | 0.008±0.002 | 48.93±0.91 | 50.55±1.07 | 2.75±0.85 | 49.87±1.09 |
| | *Saccopteryx canescens (Thomas, 1901)* | Mono | 50.68±1.30 | 54.47±1.32 | 0.006±0.002 | 52.15±1.13 | 53.99±1.28 | 3.76±1.283 | 53.23±1.22 |
| | *Cormura brevirostris (Wagner, 1843)* | Low | 23.91±0.62 | 26.44±0.41 | 0.014±0.011 | 24.44±0.41 | 26.11±0.37 | 2.53±0.76 | 25.49±0.38 |
| | | Middle | 26.92±0.74 | 30.11±0.86 | 0.015±0.005 | 27.98±0.92 | 29.49±0.86 | 3.19±0.64 | 28.76±0.93 |
| | | High | 30.68±0.56 | 34.26±0.71 | 0.014±0.004 | 31.61±0.62 | 33.63±0.80 | 3.57±0.70 | 32.95±0.69 |
| | *Peropteryx macrotis (Wagner, 1843)* | Mono | 38.51±1.83 | 42.14±1.91 | 0.009±0.002 | 39.89±1.82 | 41.26±1.66 | 3.63±2.10 | 40.71±1.76 |
| | *Peropteryx cf kappleri (Peters, 1867)* | Mono | 31.35±1.03 | 35.68±1.09 | 0.013±0.001 | 32.49±1.14 | 34.84±1.161 | 4.33±0.43 | 33.82±1.62 |
| | *Rhynchonycteris naso (Wied-Neuwied, 1820)* | Mono | 69.60±2.32 | 97.86±1.41 | 0.055±0.007 | 80.89±5.07 | 96.68±0.61 | 28.25±2.62 | 88.05±7.37 |

| Family | *Species* | Pulse | LF(kHz) | HF(kHz) | ΔTs) | F5% (kHz) | F95% (kHz) | ΔF(kHz) | PF(kHz) |
|---|---|---|---|---|---|---|---|---|---|
| Vespertilionidae | *Neoeptesicus cf. furinalis (D'Orbigny & Gervais, 1847)* | Mono | 32.41±1.80 | 49.91±6.52 | 0.009±0.002 | 33.50±1.81 | 43.28±4.24 | 17.49±6.13 | 35.15±2.73 |
| | *Myotis cf nigricans (Schinz, 1821)* | Mono | 48.05±4.75 | 67.05±11.77 | 0.006±0.002 | 49.31±4.81 | 55.36±4.56 | 19±10.75 | 50.79±4.95 |
| | *Myotis cf riparius (Handley, 1960)* | Mono | 58.22±4.96 | 80.89±14.67 | 0.005±0.002 | 59.42±5.24 | 70.88±10.62 | 22.66±11.44 | 60.84±5.60 |
| | *Myotis albescens (É. Geoffroy Saint-Hilaire, 1806)* | Mono | 38.71±1.18 | 61.82±16.05 | 0.008±0.001 | 41.19±6.11 | 53.57±15 | 23.10±14.96 | 43.99±9.38 |
| Molossidae | *Molossops temminckii (Burmeister, 1854)* | Low | 41.79±2.69 | 54.36±1.74 | 0.008±0.002 | 45.81±1.59 | 52.40±2.03 | 12.57±3.51 | 48.57±2062 |
| | | High | 54.29±1.83 | 64.83±5.31 | 0.008±0.001 | 54.98±1.78 | 59.66±1.78 | 10.54±4.83 | 56.05±1.13 |
| | *Molossus molossus (Pallas, 1766)* | Low | 30±1.6 | 34.93±2.19 | 0.015±0.004 | 31.02±1.57 | 34±1.9 | 4.97±1.56 | 32.56±1.44 |
| | | Middle | 33.98±2.05 | 39.08±2.26 | 0.013±0.003 | 35.20±1.64 | 38.22±2.03 | 5.1±2.77 | 36.90±1.24 |
| | | High | 37.35±1.96 | 44.95±4.35 | 0.013±0.005 | 38.85±1.35 | 43.17±3.04 | 7.59±5.26 | 41.17±1.27 |
| | *Cynomops planirostris (Peters, 1866)* | Low | 21±1.73 | 27.64±2 | 0.014±0.003 | 21.95±1.69 | 25.7±1.4 | 6.63±2.1 | 23.34±1.7 |
| | | High | 25.5±3.01 | 30.92±1.73 | 0.015±0.003 | 27.18±2.28 | 30.056±1.85 | 5.42±2 | 28.64±1.96 |

| Family | *Species* | Pulse | LF(kHz) | HF(kHz) | ΔTs) | F5% (kHz) | F95% (kHz) | ΔF(kHz) | PF(kHz) |
|---|---|---|---|---|---|---|---|---|---|
| | *Cynomops greenhalli (Goodwin, 1958)* | Mono | 19±2.68 | 25.47±2.1 | 0.016±0.003 | 20.08±2.39 | 23.55±2.21 | 6.47±2.36 | 21.56±2.33 |
| Unidentified | *Molossus sp.* | Low | 23.35 ±2.4 | 29.35 ±1.83 | 0.017 ±0.003 | 25.34 ±1.94 | 28.40 ±1.80 | 5.56 ±1.45 | 26.76 ±1.85 |
| | | High | 31.48±3.66 | 35.96±4.2 | 0.015±0.004 | 32.45±3.49 | 35.16±3.92 | 4.48±1.71 | 33.95±3.53 |
| | *Son1* | Mono | 24.69 ±2.09 | 28.86 ±1.86 | 0.02±0.02 | 26.4±1.86 | 27.9±1.84 | 4.17±0.85 | 27.18±1.92 |
| | *Son2* | Mono | 21.62±1.69 | 24.04±2.57 | 0.011±0.002 | 22.25±2.04 | 23.64±2.22 | 2.41±1.10 | 22.87±2.24 |

Table S6. Captured species and number of individuals with a single reference recording.

| Family | Species | Individuals |
|---|---|---|
| Emballonuridae | *Saccopteryx bilineata (Temminck, 1838)* | 1 |
| | *Rhynchonycteris naso (Wied-Neuwied, 1820)* | 1 |
| Vespertilionidae | *Myotis cf nigricans (Schinz, 1821* | 1 |
| | *Myotis albescens (É. Geoffroy Saint-Hilaire, 1806)* | 1 |
| | *Neoeptesicus cf. furinalis (D'Orbigny & Gervais, 1847)* | 4 |
| Molossidae | *Molossus molossus (Pallas, 1766)* | 1 |
| | *Molossops temminckii (Burmeister, 1854)* | 1 |