

Supplementary material for:

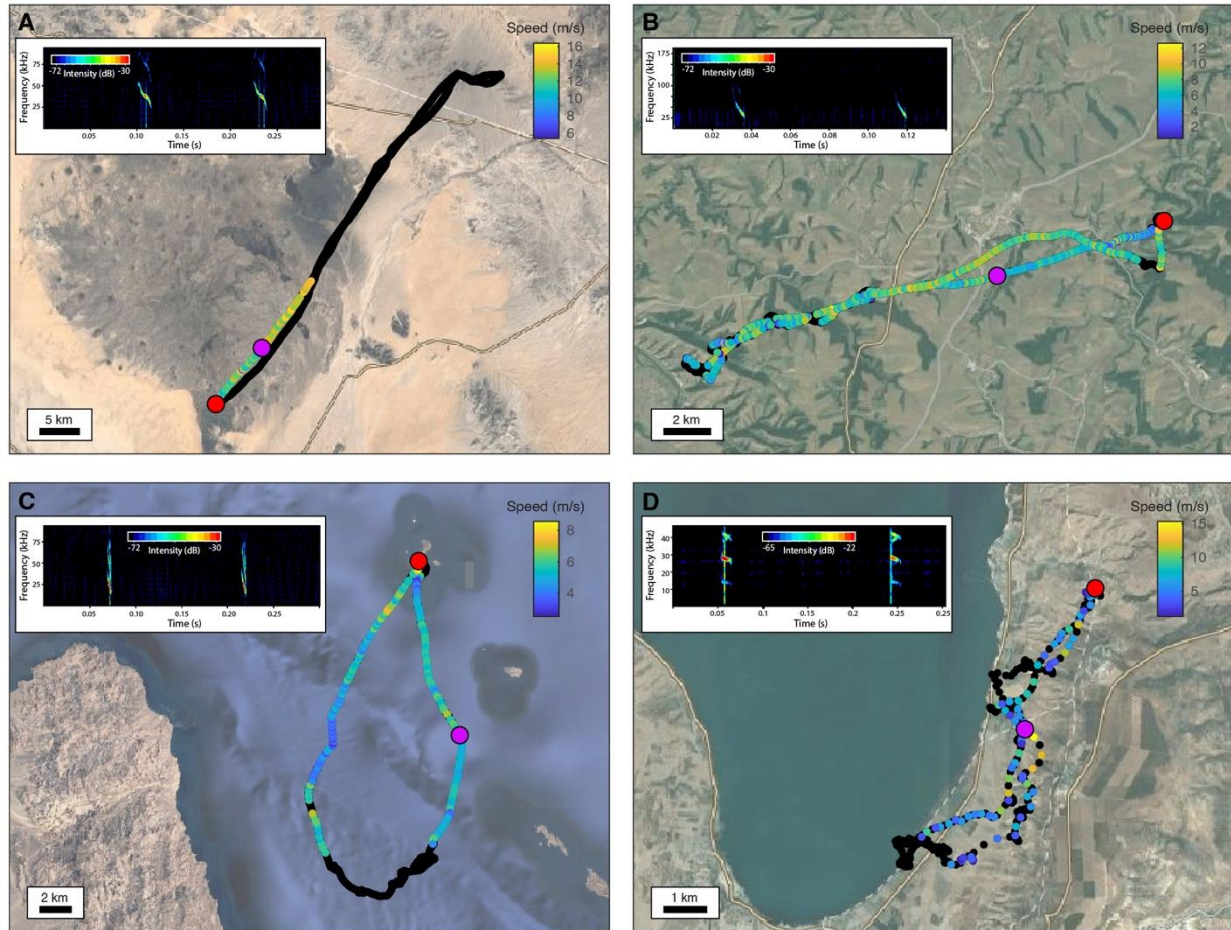
What determines the information update rate in echolocating bats

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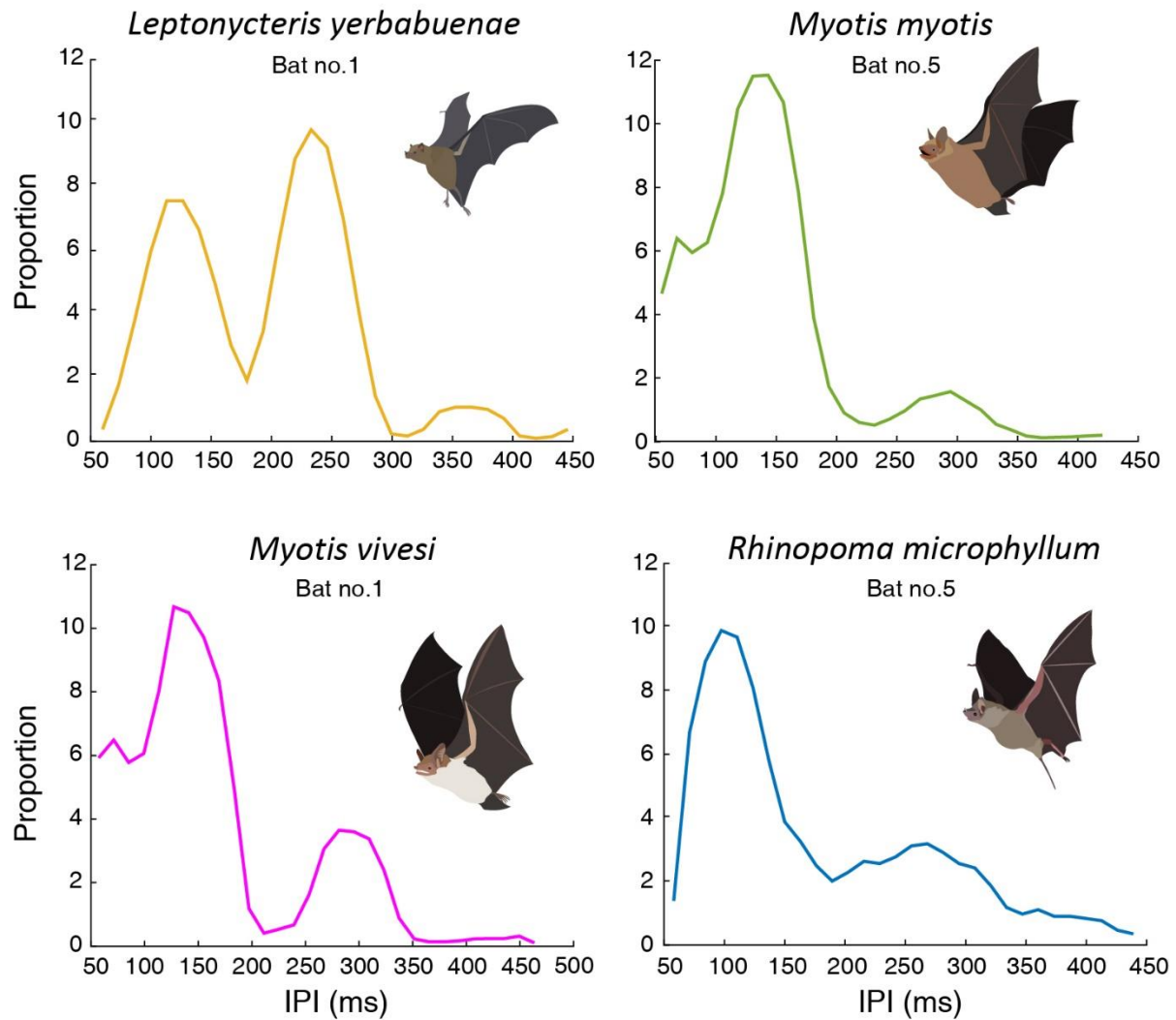
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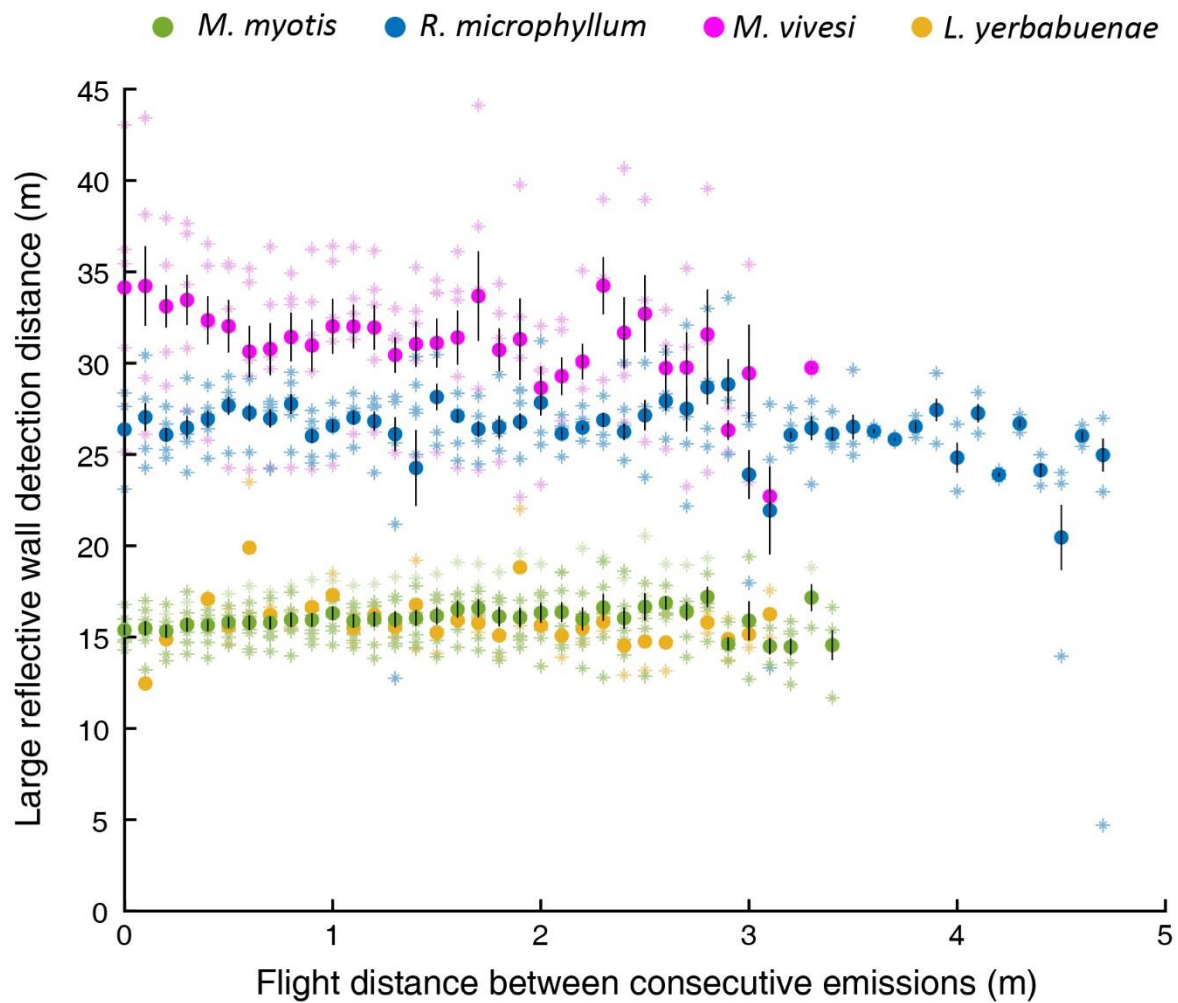
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Supplementary Figure 1: Examples of bats' flight trajectories and echolocation calls. Bats' flight trajectories of one individual of (A) *L. yerbabuena*, (B) *M. myotis*, (C) *M. vivesi*, and (D) *R. microphyllum* are color-coded according to their ground speed (blue to yellow scale). Black dots represent GPS positions without analyzed audio data. The colonies of the bats are presented by red circles. Inset panels show examples of bats' echolocation calls, with corresponding recording locations marked by purple circles.

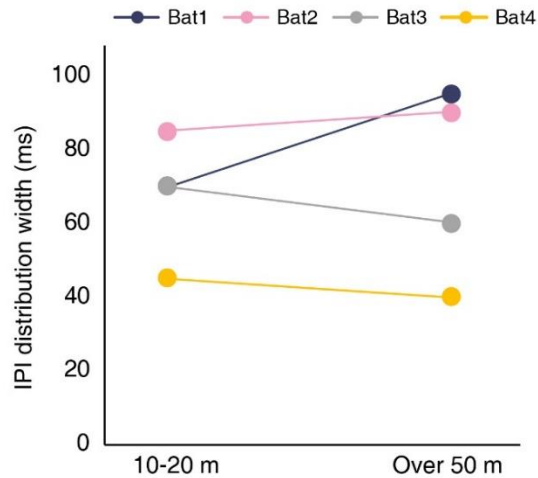


Supplementary Figure 2: IPI distribution of individual bats. An example of one individual is shown for each species.

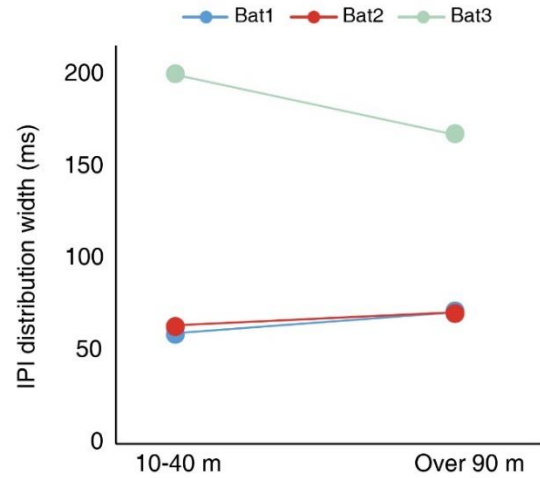


Supplementary Figure 3: Large reflective wall detection range. Large reflective wall detection distance compared to flight distance of the four bat species. Circles represent the average detection distance estimated for different flight distances based on the actual signal parameters and the flight speed. Asterisks represent the individual data points for each species. Error bars depict the SE. N=22 bats from all four species in total.

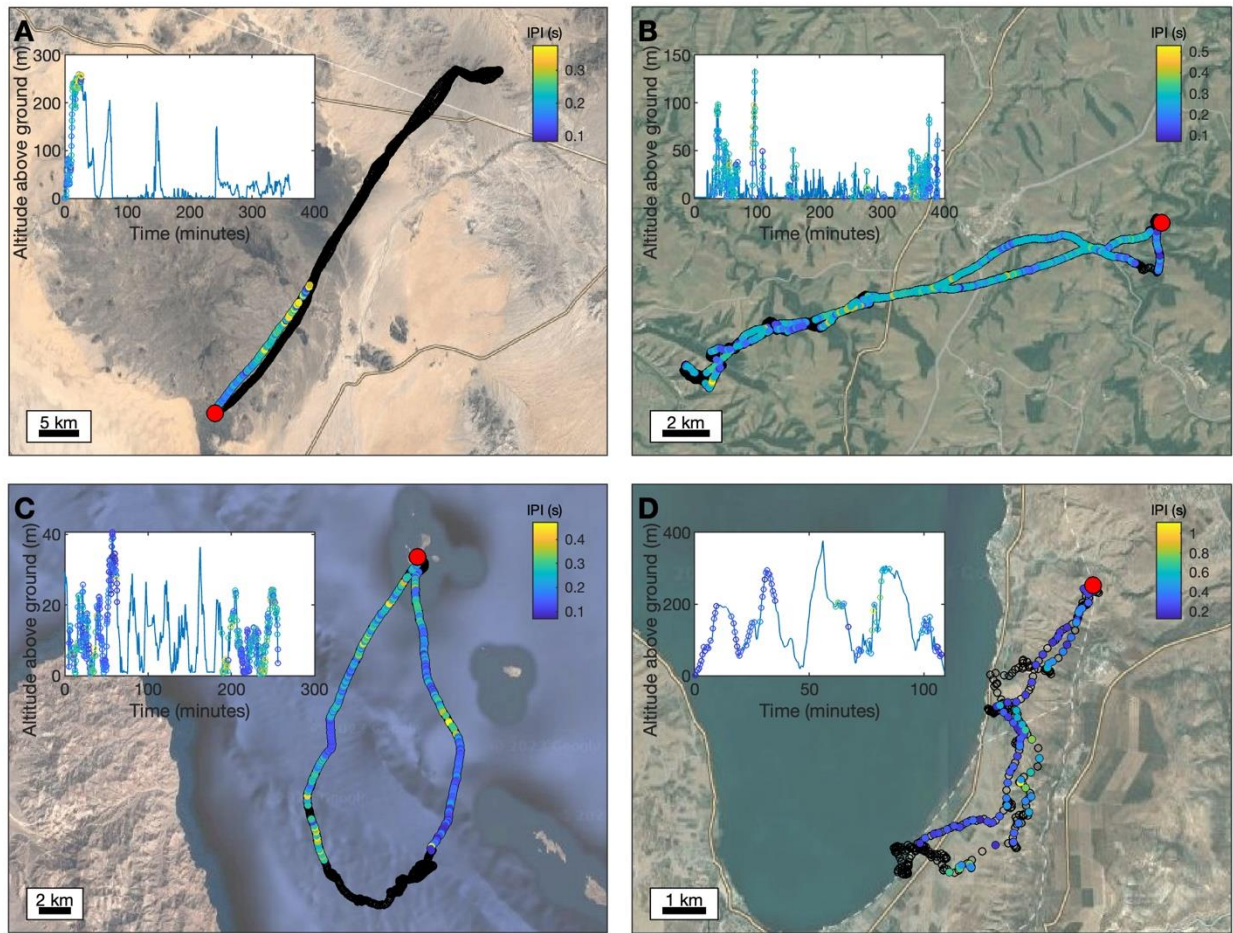
A *M. myotis*



B *R. microphyllum*



Supplementary Figure 4: IPI distribution width in different altitude ranges. (A) IPI distribution width of individual *M. myotis* bats at commute flights of 10-20 m and over 50 m. **(B)** IPI distribution width of individual *R. microphyllum* bats at commute flights of 10-40 m and over 90 m.



Supplementary Figure 5: Examples of bats' IPI by altitude along the flight trajectories. Bats' flight trajectories and flight altitude above ground (insert panels) of one individual of (A) *L. yerbabuenae*, (B) *M. myotis*, (C) *M. vivesi*, and (D) *R. microphyllum* are color-coded according to their IPI (blue to yellow scale). Black dots represent GPS positions without analyzed audio data. The colonies of the bats are presented by red circles.

Supplementary Table 1. Direction of influence of the different parameters on the IPI by species.

Parameter	<i>Leptonycteris yerbabuena</i>	<i>Myotis myotis</i>	<i>Myotis vivesi</i>	<i>Rhinopoma microphyllum</i>
Peak-energy frequency (kHz)	-	-	-	-
Intensity (dB)	NA	-	-	-
Speed ($\text{m} \cdot \text{s}^{-1}$)	NA	+	+	+
Altitude (m)	+	+	-	NA