

Supplementary Table S2. Echolocation call characteristics of bats with frequency modulated (FM) and FM/quasi-constant frequency (Q-CF) emitting calls recorded at Bidoup Nui Ba National Park, Vietnam, in comparison with calls of the same species as reported elsewhere in Asia

Species	n bats	n calls	Location	Start frequency (kHz)	End frequency (kHz)	FMAXE (kHz)	Midpoint frequency (kHz)	Duration (ms)	Bandwidth (kHz)	Reference
<i>Arielulus circumdatus</i>	4	48	Bidoup Nui Ba National Park	74.6 ± 3.2 CV 4.2% CI 73.7, 75.6 (69.6–81.7)	33.6 ± 2.4 CV 7.2% CI 32.9, 34.3 (29.0–38.4)	51.3 ± 4.3 CV 8.4% CI 50.1, 52.6 (39.5–67.3)	54.1 ± 2.0 CV 3.7% CI 53.5, 54.7 (50.8–59.0)	1.7 ± 0.4 CV 10.5% CI 1.6, 1.8 (1.0–2.7)	41.0 ± 4.0 CV 9.6% CI 37.4, 44.7 (33–48)	This study
<i>Arielulus circumdatus</i>	NS	NS	Vietnam (Bidoup Nui Ba National Park)	NS	NS	35–40	NS	NS	NS	Abramov et al. (2009)
<i>Arielulus circumdatus</i>	NS	NS	Vietnam (unspecified)	NS	NS	ca. 30 kHz	NS	NS	NS	Kruskop (2013)
<i>Arielulus circumdatus</i>	3		China (Guangdong)	(100.6–112.6) ¹	(36–37.3)	(52.1–67.6)	NS	(3.7–4.2)	74	Zhang et al. (2014)
<i>Eptesicus pachyomus</i>	1	12	Bidoup Nui Ba National Park	60.5 ± 3.8 CV 6.2% CI 58.1, 62.8 (55.7–66.7)	25.7 ± 0.8 CV 3.3% CI 25.2, 26.3 (24.3–27.4)	47.1 ± 1.0 CV 2.0% CI 46.5, 47.7 (44.8–48.3)	43.1 ± 2.0 CV 4.6% CI 41.8, 44.3 (40.0–46.4)	3.1 ± 0.9 CV 29.1% CI 2.5, 3.6 (1.7–4.2)	34.7 ± 3.8 CV 10.9% CI 32.3, 37.1 (30.1–40.7)	This study
<i>Kerivoula titania</i>	1	12	Bidoup Nui Ba National Park	189.6 ± 3.2 CV 1.7% CI 187.6, 191.6 (184–191.5)	74.4 ± 5.3 CV 7.2% CI 71.0, 77.8 (63.6–84.3)	131.2 ± 6.4 CV 4.9% CI 127.1, 135.2 (121–137.9)	132.0 ± 3.4 CV 2.6% CI 129.8, 134.2 (127–136.3)	3.5 ± 0.3 CV 9.8% CI 3.3, 3.7 (2.9–4.0)	115.2 ± 5.5 CV 4.8% CI 111.7, 118.7 (107.2–128)	This study
<i>Kerivoula titania</i>	2	15	Thailand	227.0 ± 7.4 (217.0–243.0)	82.6 ± 4.2 (74.8–90.0)	157.0 ± 7.6 (137.7–168.7)	133.1 ± 10.8 (113.1–148.4)	NS	NS	Douangboubpha et al. (2016)
<i>Murina cyclotis</i>	1	12	Bidoup Nui Ba National Park	160.1 ± 6.4 CV 4.0% CI 156.0, 164.2 (145–165.2)	61.1 ± 3.8 CV 6.1% CI 58.7, 63.5 (55.4–65.5)	114.7 ± 25.6 CV 22.3% CI 98.4, 131.0 (70.8–143.5)	110.6 ± 2.7 CV 2.4% CI 108.9, 112.3 (105–114)	2.6 ± 0.6 CV 24.7% CI 2.2, 3.0 (1.6–3.3)	99.0 ± 9.0 CV 9.1% CI 96.5, 101.5 (79.9–107.9)	This study
<i>Murina cyclotis</i>	3	23	Thailand	149.0 ± 6.1 (141–163)	60.0 ± 4.4 (56–72)	104.9 ± 6.7 (96.3–109)	NS	2.0 ± 0.3 (1.5–2.3)	NS	Soisook (2013), Soisook et al. (2013)
<i>Murina cyclotis</i>	4?	4?	Thailand	125.2 (113.5–134.0)	72 (60.9–90.0)	95 (86–103.4)	NS	1.4 (1.1–1.9)	NS	Phommexay (2009)
<i>Murina cyclotis</i> ²	3	15?	Malaysia (peninsular)	158.3 ± 7.1	69.1 ± 4.1	95.1 ± 5.3	NS	1.3 ± 0.1	89.2 ± 4.4	Schmieder et al. (2010)
<i>Murina cyclotis</i>	28	28	Thailand	121.4 ± 44.6	57.4 ± 25.9	93.8 ± 7.6	NS	1.78 ± 1.2	69.2 ± 28.1	Hughes et al. (2011)
<i>Murina cyclotis</i>	4	40	Malaysia (peninsular)	177.5 ± 7.1	57.1 ± 10.5	93.1 ± 5.2	NS	1.9 ± 0.2	115.4 ± 9.3	Schmieder et al. (2012)
<i>Murina cyclotis</i>	1	5	India (Karnataka)	135.5	49.5	89.2	NS	1.4	NS	Raghuram et al. (2014)
<i>Murina cyclotis</i>	22	131	Malaysia (peninsular)	165.2 ± 7.4 (143.2–180.0)	51.6 ± 7.0 (37.6–72.8)	77.2 ± 13.4 (54.4–136.8)	135.1 ± 12.7 (89.6–166.4)	2.0 ± 0.6 (1.2–4.1)	NS	Kingston et al. (1999)
<i>Murina cyclotis</i>	3	36	Vietnam (Quang Ngai)	>127.1 ± 5.8 (118.5–149.5)	56.9 ± 13.4 (35.0–111.9)	NS	>92.0 ± 7.1 (82–121)	2.3 ± 0.5 (1.0–3.4)	NS	Son et al. (2016)
<i>Murina harpioloides</i>	1	12	Bidoup Nui Ba National Park	163.8 ± 6.4 CV 3.9% CI 159.7, 167.9 (153–173)	65.7 ± 2.7 CV 4.1% CI 64.0, 67.4 (61.4–69.6)	122.5 ± 15.1 CV 12.3% CI 112.9, 132.1 (99.5–138.4)	114.8 ± 3.2 CV 2.8% CI 112.7, 116.8 (110–120.8)	1.6 ± 0.4 CV 25.5% CI 1.4, 1.9 (1.3–2.8)	98.2 ± 7.4 CV 7.6% CI 93.4, 105.7 (85.9–109.4)	This study

<i>Murina huttoni</i>	9	108	Bidoup Nui Ba National Park	151.5 ± 5.3 CV 3.5% CI 150.5, 152.6 (149.5–161.1)	56.4 ± 3.4 CV 6.0% CI 55.7, 57.0 (50.0–64.3)	108.9 ± 15.7 CV 14.4% CI 105.9, 111.9 (75.2–141.5)	104.0 ± 3.0 CV 2.9% CI 103.4–104.5 (96.5–110.5)	2.5 ± 1.2 CV 45.9% CI 2.3, 2.7 (1.3–6.0)	95.2 ± 6.5 CV 6.9% CI 93.9, 96.4 (74.9–106.2)	This study
<i>Murina huttoni</i>	NS	NS	China (Guangdong)	108.2 ± 12.5	54.9 ± 7.8	NS	NS	1.3 ± 0.6	NS	Zhou et al. (2011)
<i>Myotis ater</i>	2	24	Bidoup Nui Ba National Park	97.6 ± 11.3 CV 11.6% CI 92.8, 102.4 (83.7–117.4)	48.5 ± 7.3 CV 15.1% CI 45.4, 51.6 (39.2–56.5)	57.6 ± 2.3 CV 4.0% CI 56.6, 58.6 (53.5–62.8)	73.1 ± 7.6 CV 10.4% CI 69.9, 76.3 (62.7–86)	5.6 ± 3.7 CV 66.0% CI 4.0, 7.2 (1.7–14.3)	49.1 ± 11.4 CV 23.2% CI 44.3, 53.9 (28.4–77.9)	This study
<i>Myotis ater</i>	2	24	Vietnam (Quang Ngai)	105.0 ± 7.0 (95.8–117.7)	53.4 ± 4.9 (44.8–60.4)	NS	79.2 ± 4.2 (73.4–87.3)	2.3 ± 0.7 (1.4–3.9)	NS	Son et al. (2016)
<i>Myotis ater</i>	2	24	Vietnam (Bac Kan)	104.7 (95.4–110)	57.5 (53.7–60.1)	66.7 (64.3–71.3)	62.5 (60.4–64.1)	1.4 (1.0–1.7)	NS	Furey et al. (2009)
<i>Myotis horsfieldii</i>	6	72	Bidoup Nui Ba National Park	103.9 ± 9.9 CV 9.5% CI 101.6, 106.2 (78.5–122.9)	43.2 ± 3.8 CV 8.8% CI 42.3, 44.1 (36.3–51.7)	64 ± 7.0 CV 10.9% CI 62.4, 65.6 (51.4–101.8)	73.5 ± 5.5 CV 7.5% CI 72.2, 74.8 (60.6–80.9)	3.3 ± 0.7 CV 20.5% CI 3.1, 3.5 (1.7–4.9)	60.7 ± 10.3 CV 17.0% CI 58.3, 63.1 (35.9–85.2)	This study
<i>Myotis horsfieldii</i>	4	34	India (Andaman Islands)	104.3 ± 5.1 (94.1–113.5)	42.3 ± 4.3 (37.2–52.1)	64.8 ± 3.9 (58.8–72.4)	NS	3.3 ± 0.5 (2.4–4.1)	62.0 ± 7.5 (42.1–71.0)	Srinivasulu et al. (2017)
<i>Myotis horsfieldii</i>	8	8	Thailand	87.2 ± 13.6	39.6 ± 5.9	56.9 ± 8.0	NS	3.2 ± 2.6	95.9 ± 6.3	Hughes et al. (2011)
<i>Myotis horsfieldii</i>	59	NS	India (Tamil Nadu)	91.2 ± 15.3 (50.7–126.8)	41.6 ± 2.7 (33.5–57.5)	53.8 ± 5.1 (37.9–101)		2.6 ± 0.6 (1.5–6.7)	23.9 ± 8.6 (6.8–83.9)	Wordley et al. (2014)
<i>Myotis horsfieldii</i>	NS	NS	Vietnam (unspecified)	ca. 100	ca. 45	ca. 50	NS	NS	NS	Kruskop (2013)
<i>Nyctalus cf. plancyi</i>	1	12	Bidoup Nui Ba National Park	52.6 ± 0.9 CV 1.8% CI 52.0, 53.2 (51.4–54.0)	24.1 ± 1.1 CV 4.8% CI 23.4, 24.8 (22.3–26.4)	45.4 ± 0.6 CV 1.3% CI 45.0, 45.8 (44.1–45.9)	38.4 ± 0.9 CV 2.3% CI 37.8, 38.9 (36.9–40.2)	1.6 ± 0.1 CV 8.7% CI 1.5, 1.6 (1.4–1.8)	28.5 ± 1.1 CV 3.8% CI 27.8, 29.2 (27.2–30.4)	This study
<i>Phoniscus jagorii</i>	1	12	Bidoup Nui Ba National Park	158.9 ± 13.7 CV 8.6% CI 150.2, 167.6 (147.6–185.3)	83.0 ± 2.4 CV 2.8% CI 81.5, 84.5 (79.3–88.2)	100.0 ± 2.0 CV 2.0% CI 98.8, 101.3 (97.6–103.6)	121.0 ± 6.5 CV 5.3% CI 116.8, 125.1 (116.0–132.3)	2.5 ± 0.3 CV 11.6% CI 2.3, 2.7 (2.1–3.1)	75.9 ± 14.9 CV 19.6% CI 63.5, 88.4 (59.6–106.0)	This study
<i>Phoniscus jagorii</i>	1	10	Malaysia (peninsular)	178.9	74.7	102.6	NS	3.5	96.2	Schmieder et al. (2012)
<i>Phoniscus jagorii</i>	3	18	Malaysia (peninsular)	169.3 ± 8.7 (154.4–184.8)	70.4 ± 4.7 (61.6–76.0)	94.4 ± 11.8 (79.2–117.6)	127.1 ± 6.6 (120–140.8)	2.2 ± 0.5 (1.6–3.2)	NS	Kingston et al. (1999)
<i>Phoniscus jagorii</i>			Thailand	137.6 ± 1.7 (137–140)	82.9 ± 3.4 (77.0–85.7)	88 (87.5–88.2)	NS	(1.4–1.6)	NS	Thong et al. (2006)
<i>Phoniscus jagorii</i> ²	1	10	Malaysia (peninsular)	192.9 ± 6.9	90.2 ± 3.3	124.1 ± 24.0	NS	2.3 ± 0.4	102.7 ± 10.2	Schmieder et al. (2010)
<i>Phoniscus jagorii</i>	1?	1?	Thailand	86.9	85.7	86.2	NS	2.1	NS	Phommexay (2009)
<i>Pipistrellus coromandra</i>	7	84	Bidoup Nui Ba National Park	88.3 ± 7.1 CV 8.0% CI 86.8, 89.8 (76.3–105.5)	36.8 ± 2.4 CV 6.5% CI 36.3, 37.3 (32.4–43.3)	48.8 ± 5.8 CV 11.9% CI 47.5, 50.1 (40.4–69.7)	62.5 ± 4.3 CV 6.9% CI 61.6, 63.4 (55.8–73.9)	2.4 ± 0.6 CV 25.0% CI 2.3, 2.5 (1.3–4.4)	51.5 ± 6.2 CV 12% CI 50.1, 52.9 (40.4–63.3)	This study

<i>Pipistrellus coromandra</i>	6	30	India (Karnataka)	122.8 ± 3.9 (116.7–127.6)	38.8 ± 3.0 (35.9–43.1)	50.2 ± 3.6 (47.3–56.5)	NS	1.6 ± 0.4 (1.2–2.1)	NS	Raghuram et al. (2014)
<i>Pipistrellus coromandra</i>	2	12	India (Andaman Islands)	57.8 ± 1.8 (54.0–61.0)	40.7 ± 1.0 (39.0–42.0)	42.4 ± 0.9 (41.4–44.2)	NS	5.9 ± 0.3 (5.3–6.4)	17.8 ± 1.9 (14.8–22)	Srinivasulu et al. (2017)
<i>Pipistrellus coromandra</i>	NS	NS	Vietnam (unspecified)	NS	NS	40–42	NS	NS	NS	Kruskop (2013)
<i>Scotomanes ornatus</i> ³	2	24	Bidoup Nui Ba National Park	87.0 ± 9.4 <i>CV</i> 10.8% <i>CI</i> 82.4, 91.5 (73.4–103.5)	38.3 ± 5.2 <i>CV</i> 13.7% <i>CI</i> 36.1, 40.6 (30.8–46.9)	58.5 ± 8.2 <i>CV</i> 14.0% <i>CI</i> 55.1, 62.0 (43.5–68.3)	62.7 ± 6.8 <i>CV</i> 10.9% <i>CI</i> 59.8, 65.5 (53.9–74.5)	2.1 ± 0.4 <i>CV</i> 20.7% <i>CI</i> 1.9, 2.3 (1.4–3.0)	48.6 ± 6.7 <i>CV</i> 13.8% <i>CI</i> 45.8, 51.4 (38.6–65.1)	This study
<i>Scotomanes ornatus</i>	NA	NA	China (Mianyang, Sichuan)	73.9 ± 11.5	22.9 ± 2.6	57.9 ± 1.4	NS	NS		Liu et al. (2011)
<i>Scotomanes ornatus</i>	2	24	Vietnam (Quang Ngai)	104.6 ± 6.3 (98–122.6)	20.1 ± 0.7 (19.2–21.4)	63.8 ± 3.0 (56.2–67.1)	62.4 ± 3.2 59.1–71.3	3.3 ± 0.9 (2–4.8)	NS	Son et al. (2016)
<i>Scotomanes ornatus</i>	6	6	Vietnam (Bac Kan)	54.1 ± 7.0 (43–62)	21.0 ± 1.9 (18.6–23.1)	31.7 ± 2.5 (29.7–35.9)	28.8 ± 1.8 (26.6–31.3)	3.4 ± 0.8 (2.2–4.4)		Furey et al. (2009)
<i>Scotomanes ornatus</i>	NS	NS	Vietnam	ca. 80	ca. 25	ca. 30	NS	NS	NS	Kruskop (2013)

¹Start frequency may include second harmonic. ²Initial phases of approach call sequences ³For *S. ornatus* in this study the maximum energy was in the second harmonic, including individuals hand-held and in flight within our enclosure. Therefore we provide call frequency and duration measurements for the second harmonic. Measurements of the first harmonic (not given) are consisted with those presented by Furey et al. (2009) and Kruskop (2013) for *S. ornatus* from northern Vietnam.

Abbreviations: *CI* = 95% confidence interval for the mean; *CV* = coefficient of variation; NS = not specified.

[See list of references for Supplementary Table S2 on next page below]

Supplementary Table 2 References

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