

Supplementary Table S3. Echolocation call characteristics of constant frequency (CF), frequency modulated (FM)/CF, and FM/CF/FM emitting bats recorded at Bidoup Nui Ba National Park, Vietnam, in comparison with calls of the same species as reported elsewhere in Asia

Species	Location	<i>n</i> Bats	<i>n</i> Calls	CF component FMAXE (kHz)	FM rise (kHz)	FM tail (kHz)	Duration	Reference
<i>Hipposideros galeritus</i>	Bidoup Nui Ba National Park	9	108	106.9 ± 1.4 CV 1.4% CI 106.7, 107.2 (102.4–109.0)	0	11.8 ± 2.4 CV 20.7% CI 6.3, 6.9 (4.1–16.8)	6.6 ± 1.6 CV 24.1% CI 6.3, 6.9 (4.6–14.3)	This study
<i>Hipposideros galeritus</i>	Lao PDR	NS	NS	107–110	NS	NS	NS	Francis (2019)
<i>Hipposideros galeritus</i>	Vietnam (Cat Tien NP)	2	NS	110.1; 112.1	NS	NS	NS	Thong (2015)
<i>Hipposideros galeritus</i>	Malaysia (Sabah)	NS	NS	109–117	NS	NS	NS	Francis (2019)
<i>Hipposideros galeritus</i>	Malaysia (Sabah)	NS	NS	110	NS	NS	NS	Francis and Habersetzer (1998)
<i>Hipposideros galeritus</i>	India (Telangana and Karnataka)	NS	10	112.5 ± 3.6 CV 3.1% (102.6–114.3)	NS	NS	4.8 ± 0.5 CV 9% (3.86–5.27)	Srinivasulu et al. (2015)
<i>Hipposideros galeritus</i>	Cambodia	23	23	100.7 ± 1 (98.5–102.5)	ca. 1.2	ca. 10.6	5.9 ± 1 (3.9–8.7)	Phauk et al. (2013)
<i>Hipposideros galeritus</i>	Thailand	NS	NS	82.5	NS	NS	NS	Hughes et al. (2010)
<i>Hipposideros galeritus</i>	Peninsular Malaysia	NS	NS	85–93	NS	NS	NS	Francis (2019)
<i>Hipposideros galeritus</i>	Peninsular Malaysia	NS	NS	89.2	NS	NS	NS	Francis and Habersetzer (1998)

<i>Hipposideros galeritus</i>	India (Karnataka)	6	30	126.7 ± 2.1 (123.2–128.5)	NS	NS	6.5 ± 1.4 (4.9–9.0)	Raghuram et al. (2014)
<i>Hipposideros gentilis</i>	Bidoup Nui Ba National Park	1	12	114.5 ± 0.4 CV 0.3% CI 114.2, 114.7 (113.5–114.8)	0	17.7 ± 1.1 CV 6.2% CI 17.0, 18.4 (16.6–19.8)	6.5 ± 0.6 CV 9.7% CI 6.1, 6.9 (5.5–7.4)	This study
<i>Hipposideros pomona</i>	Peninsular Malaysia	NS	3	136.4–139.4	NS	NS	NS	Murray et al. (2018)
<i>Hipposideros pomona</i> males	Thailand	23	230	133.3 ± 3.9 (127.3–139.3)	NS	NS	NS	Douangboubpha et al. (2010)
<i>Hipposideros pomona</i> females	Thailand	15	150	133.9 ± 3.7 (127.7–140.2)	NS	NS	NS	Douangboubpha et al. (2010)
<i>Hipposideros pomona</i>	Thailand	NS	NS	125.6–128.2	NS	NS	NS	Puechmaille [personal communication in Douangboubpha et al. (2010)]
<i>Hipposideros pomona</i>	China (Hainan, Guangdong, Guangxi, Yunnan)	NS	NS	120.8–129.0	NS	NS	NS	Zhang et al. (2009)
<i>Hipposideros pomona</i>	Hong Kong	30	NS	129.6 (125.7–132.5)	NS	NS	6.3 (5.4–7.8)	Shek and Lau (2006)
<i>Hipposideros pomona</i>	Myanmar	22	22	134.9 ± 1.4 (132.1–137.2)	NS	NS	NS	Struebig et al. (2005)
<i>Hipposideros pomona</i>	Myanmar	NS	NS	131.8–135.4	NS	NS	NS	Puechmaille [personal communication in Douangboubpha et al. (2010)]
<i>Hipposideros pomona</i>	Lao PDR	NS	NS	125.0	NS	NS	NS	Francis and Habersetzer (1998)
<i>Hipposideros pomona</i>	Lao PDR	NS	NS	120–126	NS	NS	NS	Francis (2019)

<i>Rhinolophus affinis</i>	Bidoup Nui Ba National Park	13	156	74.2 ± 1.0 CV 1.3% CI 74.1, 74.4 (72.6–75.5)	10.6 ± 4.3 CV 40.8% CI 9.9, 11.2 (1.9–20.0)	18.9 ± 2.4 CV 12.9% CI 18.5, 19.3 (9.8–24)	35.6 ± 7.5 CV 21.1% CI 34.4, 36.8 (17.5–54.4)	This study
<i>Rhinolophus affinis</i>	Sumatra	5	5	74.2 ± 0.5 (73.2–74.6)				Ith et al. (2015), Ith et al. (2016)
<i>Rhinolophus affinis</i>	Vietnam (Tam Do NP)	5	NS	73.5 (72.9–73.8)	NS	NS	NS	Thong (2014)
<i>Rhinolophus affinis</i>	Vietnam (Cat Ba NP)	NS	NS	73.0–73.8	NS	NS	NS	Thong (2014)
<i>Rhinolophus affinis</i>	Lao PDR	NS	NS	(73–78)	NS	NS	NS	Francis (2019), Francis and Habersetzer (1998)
<i>Rhinolophus affinis</i>	Malaysia (Taman Negara Pulau Pinang island)	2	2	(72.6–73.1)	NS	NS	NS	Ith et al. (2015), Ith et al. (2016)
<i>Rhinolophus affinis</i>	China (Hong Kong)	40	NS	72.0 (70.1–73.9)	NS	NS	38.3 (12.3–61.3)	Shek and Lau (2006)
<i>Rhinolophus affinis</i>	Vietnam (Bac Kan)	18	18	71.1 ± 0.9 (69.3–73.4)	Ca. 14.2	Ca. 14.5	43.2 ± 10.4 (17.6–55.4)	Furey et al. (2009)
<i>Rhinolophus affinis</i>	Thailand	2	NS	71.3 (66.8–73.9)	NS	NS	29.2 (26.8–31.6)	Phommexay (2009)
<i>Rhinolophus affinis</i>	Vietnam (Bidoup Nui Ba National Park)	NS	NS	76	NS	NS	NS	Abramov et al. (2009)
<i>Rhinolophus affinis</i>	Cambodia	15	15	77.1 ± 0.5 (76.5–78.3)	ca. 6.6	ca. 15.6	26.6 ± 5.9 (17.9–36.7)	Phauk et al. (2013)
<i>Rhinolophus affinis</i>	Cambodia	11 Males 1 Female	≥55 Males ≥ 5 Female	Males 77.2 ± 1 (76.1– 79.0) Female 79.9	NS	NS	NS	Kingsada et al. (2011)
<i>Rhinolophus affinis</i>	Peninsular Malaysia	NS	NS	77–78	NS	NS	NS	Francis (2019), Francis and Habersetzer (1998)

<i>Rhinolophus affinis</i>	Peninsular Malaysia	4	24	77.6	NS	NS	NS	Kingston et al. (2000)
<i>Rhinolophus affinis</i>	Peninsular Malaysia (southern)	16	16	77.8 ± 1.3 (75.4–79.3)				Ith et al. (2015), Ith et al. (2016)
<i>Rhinolophus affinis</i>	Thailand	6	NS	75–80	NS	NS	NS	Robinson (1996)
<i>Rhinolophus affinis</i>	Vietnam (Quang Ngai)	18	216	80.6 ± 0.77 (79.3–82.5)	11.0 ± 6.1 (0–58.9)	19.2 ± 4.9 (2.2–59.9)	30.6 ± 7.0 (13.9–52)	Son et al. (2016)
<i>Rhinolophus affinis</i>	Java (central)	6	6	81.8 ± 0.4 (81.2–82.3)				Ith et al. (2015), Ith et al. (2016)
<i>Rhinolophus</i> cf. <i>affinis</i>	Vietnam (Cat Tien NP)	2	NS	83.1; 83.5	NS	NS	NS	Thong (2015), Thong (2011)
<i>Rhinolophus affinis</i>	China (unspecified)	6	6	86.6 ± 0.4	NS	NS	NS	Wu et al. (2015)
<i>Rhinolophus affinis</i>	China (Jiangxi)	28?	28?	85.9 ± 0.6	NS	17.3 ± 1.8	46.5 ± 3.8	Jiang et al. (2008)
<i>Rhinolophus affinis</i>	Peninsular Malaysia (northern)	31	31	70.8 ± 0.7 (69.5–72.6)	NS	NS	NS	Ith et al. (2015), Ith et al. (2016)
<i>Rhinolophus affinis</i>	Lombok Island, Indonesia	3	NS	69.4–71.6	NS	NS	14.8–48.5	McKenzie et al (1995)
<i>Rhinolophus affinis</i>	China (multiple locations)	102?	NS	70.0–88.5	NS	NS	NS	Zhang et al. (2009)
<i>Rhinolophus affinis</i>	Thailand	NS	NS	69.7	NS	NS	NS	Hughes et al. (2010)
<i>Rhinolophus affinis</i>	Borneo	1	1	68.9				Ith et al. (2015), Ith et al. (2016)
<i>Rhinolophus affinis</i>	Thailand (Tarutao islands)	10	10	65.1 ± 1.3 (63.6–66.6)				Ith et al. (2015), Ith et al. (2016)

<i>Rhinolophus affinis</i>	Thailand (Koh Surin, Phang Nga)	1	1	62.3				Ith et al. (2015), Ith et al. (2016)
<i>Rhinolophus lepidus</i>	Bidoup Nui Ba National Park	6	72	93.7 ± 1.3 CV 1.4% CI 93.4, 94.0 (91.5–96.8)	9.8 ± 4.8 CV 49.4% CI 8.7, 10.9 (0–16.2)	15.4 ± 3.6 CV 23.3% CI 14.5, 16.2 (4.2–22.0)	34.3 ± 10.1 CV 9.5% CI 31.9, 36.7 (14.3–51.3)	This study
<i>Rhinolophus lepidus</i>	China (Yunnan)	24?	24?	90.7 ± 0.3	NS	NS	35.8 ± 11.0	Shi et al. (2009)
<i>Rhinolophus lepidus</i>	China (Yunnan)	NS	NS	91.8 ± 0.9	NS	NS	NS	Li et al. (2014)
<i>Rhinolophus lepidus</i> (as <i>R. lepidus/osgoodi</i>)	China (Yunnan)	3?	NS	92.0–95.2	NS	NS	NS	Zhang et al. (2009)
<i>Rhinolophus lepidus</i>	India (Karnataka)	5	25	95.2 ± 1.4 (93.2–96.8)	NS	NS	32.2 ± 9.4 (16.8–42.4)	Raghuram et al. (2014)
<i>Rhinolophus lepidus</i>	Singapore	24	240	97.8 ± 0.1	NS	NS	28.30 ± 1.4	Pottie et al. (2005)
<i>Rhinolophus lepidus</i>	Peninsular Malaysia	NS	NS	98–100	NS	NS	NS	Francis (2019), Francis and Habersetzer (1998)
<i>Rhinolophus lepidus</i>	Thailand	NS	NS	100.1	NS	NS	NS	Hughes et al. (2010)
<i>Rhinolophus lepidus</i> (<i>R. refulgens</i>)	Thailand	NS	NS	103	NS	NS	NS	Francis (2019)
<i>Rhinolophus lepidus</i>	Malaysia (Tioman Island)	NS	NS	101	NS	NS	NS	Chua and Asiz (2019)
<i>Rhinolophus lepidus</i>	Thailand	7	NS	101.8 (75.3–105.6)	NS	NS	36.0 (24.5–48.6)	Phommexay (2009)

<i>Rhinolophus lepidus</i>	India (Tamil Nadu)	NS	35	102.31 ± 1.81 (97–106.3)	NS	NS	25.23 ± 11.38 (1.4–51.5)	Wordley et al. (2014)
<i>Rhinolophus lepidus</i>	India (unspecified)	2	NS	104.0, 105.0	NS	NS	NS	Soisook et al. (2016)
<i>Rhinolophus lepidus</i>	India (Delhi)	NS	9	108	NS	NS	25	Mishra et al. (2018)
<i>Rhinolophus lepidus</i>	China (unspecified)	7	7	88.71 ± 3.56	NS	NS	NS	Wu et al. (2015)
<i>Rhinolophus</i> cf. <i>marshalli</i>	Bidoup Nui Ba National Park	1	12	34.1 ± 0.2 CV 0.6% CI 33.9, 34.2 (33.7–34.6)	4.1 ± 1.4 CV 33.8% CI 32, 5.0 (2.6–6.1)	7.0 ± 2.2 CV 31.3% CI 5.6, 8.4 (4.7–10.1)	29.7 ± 1.4 CV 4.6% CI 28.9, 30.6 (27.5–31.4)	This study
<i>Rhinolophus marshalli</i>	Lao PDR	NS	NS	40–41	NS	NS	NS	Francis (2019)
<i>Rhinolophus marshalli</i>	China (Guangxi, Yunnan)	6?	NS	41.8–44.5	NS	NS	NS	Zhang et al. (2009)
<i>Rhinolophus marshalli</i>	China (Guangxi)	17	1,020	43.1–44.6	NS	NS	Means ca. 52.8 ± 8.8 to 54.1 ± 6.5	Liu et al. (2009)
<i>Rhinolophus marshalli</i>	China (unspecified)	6	6	44.00 ± 0.10	NS	NS	NS	Wu et al. (2015)
<i>Rhinolophus marshalli</i>	Vietnam (multiple locations)			44	Ca. 1	Ca. 2	49.9	Thong et al. (2007)
<i>Rhinolophus marshalli</i>	Vietnam (unspecified)	NS	NS	45	NS	NS	NS	Kruskop (2013)
<i>Rhinolophus pusillus</i>	Bidoup Nui Ba National Park	6	72	100.1 ± 0.9 CV 0.9% CI 99.9, 100.3 (98.9–103.5)	11.0 ± 4.1 CV 37.1% CI 10.0, 12.0 (2.0–21.5)	17.6 ± 5.6 CV 31.5% CI 16.3, 19.0 (5.0–37.3)	35.4 ± 7.2 CV 20.3% CI 33.7, 37.1 (18.6–48.8)	This study

<i>Rhinolophus pusillus</i>	Lao PDR	NS	NS	100.0	NS	NS	NS	Francis and Habersetzer (1998)
<i>Rhinolophus pusillus</i>	Vietnam (Quang Ngai)	8	96	99.7 ± 0.7 (97.9–101)	14.9 ± 4.8 (2–22.5)	17.5 ± 4.8 (5–26.7)	35.8 ± 9.8 (13.5–52.3)	Son et al. (2016)
<i>Rhinolophus pusillus</i>	China (multiple locations)	NS	NS	100.3–111.2	NS	NS	NS	Zhang et al. (2009)
<i>Rhinolophus pusillus</i>	China (Yunnan)	NS	NS	102	NS	NS	NS	Shi et al. (2009)
<i>Rhinolophus pusillus</i>	China (Hong Kong)	31	NS	105.4 (100.5–107.8)	NS	NS	32.3 (12.4–55)	Shek and Lau (2006)
<i>Rhinolophus pusillus</i>	China (Yunnan)	26	multiple	104				Jiang et al. (2010)
<i>Rhinolophus pusillus</i>	China (Ahui, Chongqin, Fujian, Guangdong, Guangxi, Guizhou, Henan, Jiangsu, Zhejiang)	173	multiple	Means 104.4 ± 0.1 to 113.8 ± 0.1	NS	NS	NS	Zhang et al. (2009)
<i>Rhinolophus pusillus</i>	Vietnam (Cat Ba NP)	NS	NS	104.7–109.1	NS	NS	NS	Thong (2014)
<i>Rhinolophus pusillus</i>	Vietnam (Bac Kan)	10	10	105.0 ± 1.2 (102.3–106.1)	ca. 14.8	ca. 18.2	31.6 ± 8.9 (20.5–47.6)	Furey et al. (2009)
<i>Rhinolophus pusillus</i>	Vietnam (Tam Do NP)	21?	NS	105.9 (103.9–110.7)	NS	NS	NS	Thong (2014)
<i>Rhinolophus pusillus</i>	Lombok Island, Indonesia	4	NS	105.2–105.6	NS	NS	9.9–28.4	McKenzie et al. (1995)
<i>Rhinolophus pusillus</i>	China (unspecified)	6	6	107.52 ± 1.63	NS	NS	NS	Wu et al. (2015)
<i>Rhinolophus pusillus</i>	Lao PDR, Thailand	NS	NS	108–115	NS	NS	NS	Francis (2019)

<i>Rhinolophus pusillus</i>	Thailand	40	NS	111.1 ± 2.0 (108.4–115.2) [22 males] 110.4 ± 1.8 (107.3–113.1) [18 Females]	NS	NS	NS	Soisook et al. (2016)
<i>Rhinolophus pusillus</i>	Cambodia	17	17	112.2 ± 1.3 (108.9–114.1)	Ca. 10.8	Ca. 15.4	22.8 ± 5.3 (14.7–34.1)	Phauk et al. (2013)
<i>Rhinolophus pusillus</i>	Thailand	NS	NS	112.5	NS	NS	NS	Hughes et al. (2010)
<i>Rhinolophus pusillus</i>	Vietnam (Cat Tien NP)	4	NS	117.5 ± 1.9 (114.6–119.0)	NS	NS	NS	Thong (2015)
<i>Rhinolophus pusillus</i>	Thailand	9	NS	90–95	NS	NS	NS	Robinson (1996)
<i>Rhinolophus stheno</i>	Bidoup Nui Ba National Park	5	60	84.7 ± 0.6 <i>CV</i> 0.7% <i>CI</i> 84.5, 84.8 (83.6–85.4)	11.1 ± 3.8 <i>CV</i> 34.2% <i>CI</i> 10.1, 12.1 (2.1–20.2)	17.7 ± 4.4 <i>CV</i> 25.0% <i>CI</i> 16.6, 18.9 (5.2–26.0)	33.9 ± 8.6 <i>CV</i> 25.3% <i>CI</i> 31.7, 36.1 (15.5–48.6)	This study
<i>Rhinolophus stheno</i>	Peninsular Malaysia, Thailand	NS	NS	85–88	NS	NS	NS	Francis (2019), Francis and Habersetzer (1998)
<i>Rhinolophus stheno</i>	Thailand	30	300	85.3–88.2	NS	NS	NS	Soisook et al. (2008)
<i>Rhinolophus stheno</i>	Peninsular Malaysia	NS	NS	86	NS	NS	NS	Heller and von Helversen (1989)
<i>Rhinolophus stheno</i>	Thailand	10	NS	86.1 (74.4–88.1)	NS	NS	38.8 (25.4–6.4)	Phommexay (2009)
<i>Rhinolophus stheno</i>	Peninsular Malaysia	59	354?	86.1	NS	NS	NS	Kingston et al. (2000)

<i>Rhinolophus stheno</i>	Thailand	NS	NS	86.6	NS	NS	NS	Hughes et al. (2010)
<i>Rhinolophus stheno</i>	Vietnam (Cat Tien NP)	3	NS	87.0 ± 0.2 (86.8–87.1)	NS	NS	NS	Thong (2015)
<i>Rhinolophus stheno</i>	China (Yunnan)	6?	NS	87.2 ± 0.56	NS	NS	NS	Zhang et al. (2009)
<i>Rhinolophus stheno</i>	Vietnam (Bac Kan)	6	12	91.1 ± 1.0 (89.8–92.0)	ca. 18.9	ca. 21.2	30.5 ± 11.5 (14.9–50.6)	Furey et al. (2009)
<i>Rhinolophus stheno</i>	Lao PDR (as <i>R. microglobosus</i>)	NS	NS	94.5–96.5	NS	NS	NS	Francis (2019)
<i>Rhinolophus stheno</i>	Thailand (as <i>R. microglobosus</i>)	NS	NS	95.4	NS	NS	NS	Hughes et al. (2010)
<i>Rhinolophus stheno</i>	Cambodia (as <i>R. microglobosus</i>)	15	15	98.3 ± 0.6 (96.4–98.9)	ca. 4.3	ca. 4.4	26.2 ± 7.1 (14.4–39)	Phauk et al. (2013)
<i>Rhinolophus stheno</i>	Thailand	5	NS	85–95	NS	NS	NS	Robinson (1996)

Abbreviations: *CI* = 95% confidence interval for mean; *CV* = coefficient of variation; NP=National Park; NS=not specified in original source

[References on pages below]

Supplementary Table S3 References

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