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Recent surveys of bats (Mammalia: Chiroptera) from China. I. Rhinolophidae and Hipposideridae

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We conducted surveys of bats in China between 1999 and 2007, resulting in the identification of at least 62 species. In this paper we present data on 19 species, comprising 12 species from the family Rhinolophidae and seven from the Hipposideridae. Rhinolophids captured were *Rhinolophus affinis*, *R. ferrumequinum*, *R. lepidus*, *R. luctus*, *R. macrotis*, *R. siamensis*, *R. marshalli*, *R. rex*, *R. pearsonii*, *R. pusillus*, *R. sinicus* and *R. stheno*. Because of extensive morphological similarities we question the species distinctiveness of *R. osgoodi* (may be conspecific with *R. lepidus*), *R. paradoxolophus* (which may best be treated as a subspecies of *R. rex*), *R. huananus* (probably synonymous with *R. siamensis*), and we are skeptical as to whether *R. sinicus* is distinct from *R. thomasi*. Hipposiderids captured were *Hipposideros armiger*, *H. cineraceus*, *H. larvatus*, *H. pomona*, *H. pratti*, *Aselliscus stoliczkanus* and *Coelops frithii*. Of these species, two rhinolophids (*Rhinolophus marshalli* and *R. stheno*) and one hipposiderid (*Hipposideros cineraceus*) represent new species records for China. We present data on species' ranges, morphology and echolocation call frequencies, as well as some notes on ecology and conservation status. China hosts a considerable diversity of rhinolophid and hipposiderid bats, yet threats to their habitats and populations are substantial.

Key words: Chiroptera, distribution, ecology, echolocation, morphology, China, new records

INTRODUCTION

The bat fauna of China is poorly documented. Allen (1938) listed 81 bat species in China and Mongolia, though this was recently increased to 120 species for China alone, following an extensive review of survey work and systematic research (Wang, 2003). However, the literature on bat species found in China is riddled with misidentifications and taxonomic confusion. For example, Wang's (2003) list includes several species names that are now considered as synonyms in the most recent assessment of bat taxonomy (Simmons, 2005). Moreover, recent syntheses of the Chinese literature include isolated records of several species that are far from the known current centres of distribution, such as *Pteropus giganteus* and *P. vampyrus* in central China (Smith and Xie, 2008), and such records must be of a highly questionable nature.

To resolve some of these taxonomic and geographic anomalies, and to obtain data on current distribution patterns, a series of field surveys focusing on bat research was initiated in China between 1999 and 2007 by the Bat Research Group (BRG) at the Institute of Zoology, Chinese Academy of Sciences, Beijing, the Molecular Ecology and Evolution Group (MEEG) at East China Normal University, and the Wild Animal Research and Monitoring Group (WARMG) at Guangdong Entomological Institute. To date, more than 50 surveys have been conducted, involving researchers from the University of Bristol (UK), Queen Mary, University of London (UK), York University (Canada), University of California, Los Angeles (US) and University of Auckland (New Zealand). These surveys have resulted in the documentation of at least 62 species of bats captured in China, comprising five from the family Pteropodidae, two from the Megadermatidae,

12 from the Rhinolophidae, seven from the Hipposideridae, one from the Emballonuridae, two from the Molossidae and more than 33 from the Vespertilionidae. In many cases we have documented echolocation calls and have used phylogenetic analyses of gene sequence data to help resolve taxonomic uncertainties (e.g., Jones *et al*., 2006; Li *et al*., 2006, 2007; Thabah *et al*., 2006; 2007; Zhang *et al*., 2007). In this paper, we present the results of our surveys for two families, Rhinolophidae and Hipposideridae, while others will be presented in future papers.

We recorded 12 species from the Rhinolophidae. Two of our records are new for China, namely *Rhinolophus marshalli* and *R. stheno*. Records of these species have been published in Chinese journals with English abstracts (Zhang J. S. *et al*., 2005; Zhang L. B. *et al*., 2005), but have hitherto been unavailable to a wider audience. We also recorded seven species from the Hipposideridae, one of which (*Hipposideros cineraceus*) is a new record for China. Here we review all of our records, and present information on distribution, echolocation call frequencies, and some ecological notes.

Materials and Methods

Study Areas

The country of China in East Asia stretches from the Pacific in the east to the Tibetan Plateau and arid plains in the west (73°E to 135°E). The north of the country includes the Gobi Desert, while the south borders Indo-China (18°N to 55°N). The vast size of China is reflected in its diverse range of climates, altitudes and associated biogeographical zones. Major habitat types include grassland, desert and temperate broadleaf forest in the north and west, and alluvial flood plains and tropical monsoonal rainforests in the southern latitudes. For a more thorough treatment of biogeographical divisions in China, see Wang and Xie (2004). In our bat surveys, we focused on the southwestern, southern and eastern provinces (Fig. 1), which encompass the interface between Palaearctic and Indo-Malayan biota (Hoffmann, 2001). Large areas of the west, including the remote Tibetan plateau and arid northern plains were not covered, but will be the focus of future work.

Fieldwork was conducted from 1999 to 2007 in the provinces of Anhui, Beijing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Jiangxi, Shandong, Shanxi, Sichuan, Tianjin and Yunnan (Fig. 1). A joint project funded by the Chinese Academy of Sciences and Royal Society (UK) was carried out by BRG and the team led by SYZ and GJ from 2001 to 2003. Additional data were subsequently collected by individuals and groups working as part of the MEEG, BRG and

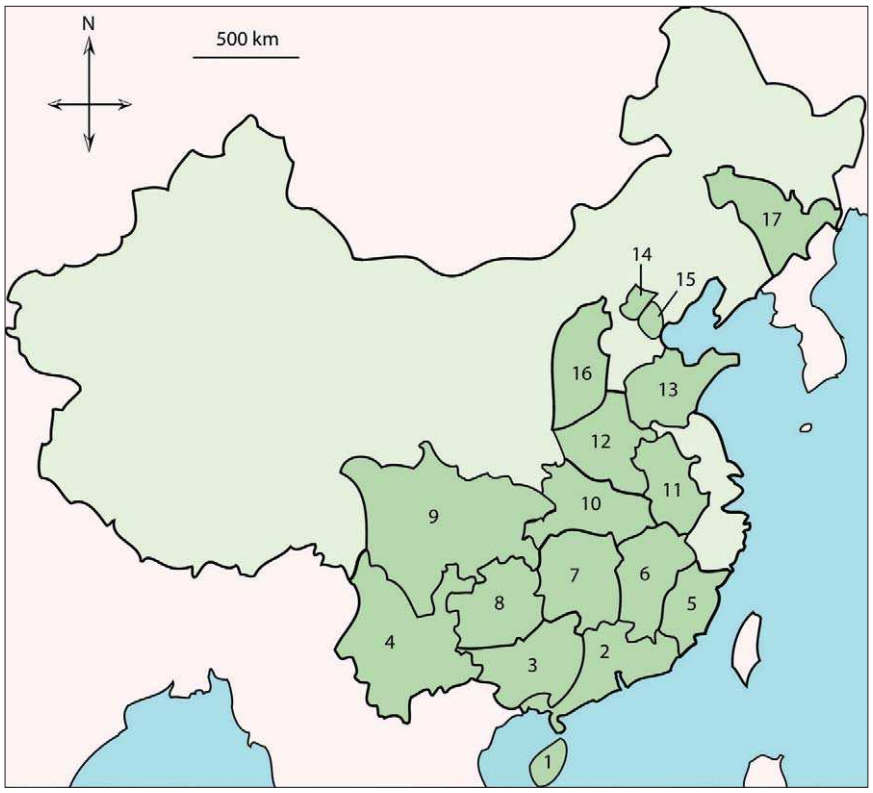

Fig. 1. Map of China showing the collecting sites during our fieldwork, from 1999 to 2007. Pink is not part of the Peoples' Republic of China. Light green are areas of China that were not surveyed for bats. All provinces that were included in the survey are showed in dark green, including 1-Hainan, 2-Guangdong, 3-Guangxi, 4-Yunnan, 5-Fujian, 6-Jiangxi, 7-Hunan, 8-Guizhou, 9-Sichuan, 10-Hubei, 11-Anhui, 12-Henan, 13-Shandong, 14-Beijing, 15-Tianjin, 16-Shanxi, and 17-Jilin

TABLE 1. Species recorded in surveys, sampling sites (provinces), number of bats (N), forearm (FA, mm), body mass (BM, g), frequency of most energy of echolocation calls (FMAXE, kHz), and status in China. The province symbols are as in Fig. 1. C_1 — China Red Data Book of Endangered Animals (six categories are included in this book: Extinct — Ex, Extirpated — Et, Endangered — E, Vulnerable — V, Rare — R and Indeterminate — I (Wang, 1998)], C_2 — China Species Red List [eleven categories are included in this book: Extinct — EX, Extinct in the Wild — EW, Regionally Extinct — RE, Critically Endangered — CR, Endangered — EN, Vulnerable — VU, Near Threatened — NT, Least Concern — LC, Data Deficient — DD, Not Applicable — NA, Not Evaluated — NE (Wang and Xie, 2004)], I — IUCN RL [nine categories are included in this list: EX — Extinct, EW — Extinct in the Wild, CR — Critically Endangered, EN — Endangered, VU — Vulnerable, LR/cd — Lower Risk: Conservation Dependent, LR/nt or NT — Near Threatened, DD — Data Deficient, LR/lc or LC — Least Concern — IUCN, 2007)

Species	Sites	N	FA	BM	FMAXE	Status
			Rhinolophidae			
Rhinolophus affinis	1, 2, 3, 4, 5, 9	102	48.8–54.8	9.0–15.3	70.0–88.5	C_2: NT; I: LR/lc
R. ferrumequinum	3, 4, 9, 10, 12, 13, 14, 15, 16, 17	Common	56.5–62.0	16.5–32.6	72.0–83.5	C_2: LC; I: LR/nt
R. lepidus/osgoodi	4	3	43.0–45.4	No data	92.0–95.2	I: LR/lc
R. luctus	1, 5, 6, 7	10	66.3–72.8	26.5–49.5	32.6–34.9	C_1: V; C_2: NT; I: LR/lc
R. macrotis	3, 9, 14	6	46.9–49.9	8.7–9.4	47.2–53.9	C_2: LC; I: LR/lc
R. marshalli	3, 4	6	38.9–47.1	5.8–7.0	41.8–44.5	I: LR/nt
R. pearsonii	2, 3, 4, 5, 6, 7, 8, 9, 11	89	51.0–56.0	11.0–17.1	57.6–70.0	C_2: LC; I: LR/lc
R. pusillus	1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 14	Common	34.3–41.6	3.3–7.8	100.3–111.2	C_2: NT; I: LR/lc
R. rex	3, 4, 8	14	51.6–57.3	10.8–14.0	23.7–26.4	C_2: NA; I: VU B1+2c
R. siamensis	3, 4, 5, 6, 8	37	39.2–45.4	5.5–6.4	60.0–69.3	No data
R. sinicus	1, 2, 3, 4, 5, 6, 8, 9, 10	117	44.1–54.4	8.5–14.3	78.9–88.5	C_2: LC; I: LR/lc
R. stheno	4	6	41.8–47.1	10.3 ± 1.40	87.2 ± 0.56	I: LR/lc
			Hipposideridae			
Hipposideros armiger	1, 2, 3, 4, 5, 8, 9, 11, 12	Common	86.0–96.8	41.0–63.0	65.1–72.7	C_2: LC; I: LR/lc
H. cineraceus	3, 4	34	31.7–36.0	3.1–4.6	155.5–163.5	I: LR/lc
H. larvatus	1, 2, 3, 4	Common	55.5–64.1	12.1–24.5	79.2–88.0	C_2: VU; I: LR/lc
H. pomona	1, 2, 3, 4	89	40.5–44.2	5.2–7.0	120.8–129	C_2: NT; I: LR/lc
H. pratti	3, 4, 5, 9, 12	22	79.3–90.8	48.0–57.3	58.2–61.9	C_2: NT; I: LR/nt
Aselliscus stoliczkanus	3, 4, 8	30	39.8–47.3	5.0–7.5	118.4–130	C_2: NT; I: LR/lc
Coelops frithii	1, 5	21	35.0–39.1	5.0–5.5	141	C_2: VU; I: LR/lc

WARMG. More recently (2004–2008), surveys have been conducted under an award from the Darwin Initiative headed by GJ and SYZ.

Sampling and Measurements

Bats were captured either by hand net while roosting in caves, or on emergence by mist nets and harp traps set at roost entrances. On occasion we also erected harp trap and mist nets in forests and foraging areas. Bats were identified to species level, sexed and standard measurements were taken (FA: forearm length in mm — measured to the nearest 0.1 mm with dial calipers; body mass in g, measured with a spring balance). Processing was typically completed within two hours, and the bats were then released at their site of capture. Capture and collection methods followed standard methodologies described in Kunz (1988). For all bats, a wing membrane biopsy was taken using a dermatological punch (Stiefel Laboratories, Wooburn Green, UK) for DNA analysis. A small number of individuals of taxonomic interest were taken as voucher specimens, preserved in 70% ethanol and deposited at the Institute of Zoology, Chinese Academy of Sciences, Beijing. For species that were newly recorded from China, we took additional external measurements in the field and cranial measurements in the laboratory. We provide GPS co-ordinates of study sites where these were taken. Droppings were analysed following methods described in Jones (1990).

Echolocation calls were recorded from hand-held individuals using a Pettersson D-980 bat detector (Pettersson Elektronik AB, Uppsala, Sweden). Time-expanded (10×) calls were downloaded to either a Sony WMD6C cassette recorder (Sony, Tokyo, Japan) or a Sony TCD-D8 DAT recorder. No measurable differences in call frequency occurred depending on which recording method was used. Calls were digitized using BatSound Pro, v3.0 (Pettersson Elektronik AB). The frequency of most energy (FMAXE) in the second harmonic in the power spectrum was measured (the resting frequency) for rhinolophids and hipposiderids held in the hand. A 1024-point fast Fourier transform (FFT) and a Hanning window were used to generate each power spectrum, giving a frequency resolution of 300 Hz. Nomenclature follows Simmons (2005). Our identifications were based on a number of works concerning bats in Asia (especially Corbet and Hill, 1992; Koopman, 1994; Lekagul and McNeely, 1998; Bates *et al*., 2000, 2004; Hendrichsen *et al*., 2001; Francis, 2008).

Species Review

Rhinolophidae

During our surveys, 12 species of horseshoe bats were captured (for capture sites, measurements and status, see Table 1; for representative echolocation calls, see Fig. 2; see also Appendix), of which two represent new records for China: *R. marshalli* and *R. stheno.* We also captured bats that fit descriptions of *R. siamensis*, recognised as a distinct species in Smith and Xie (2008). Among these 12 species, *R. ferrumequinum* and *R. pusillus* are common and widespread in China.

Rhinolophus affinis Horsfield, 1823
Intermediate horseshoe bat

FA — 48.8–54.8 mm, mass — 9.0–15.3 g. Forty-seven males and 55 females were captured from Fujian, Guangdong, Guangxi, Hainan, Henan,

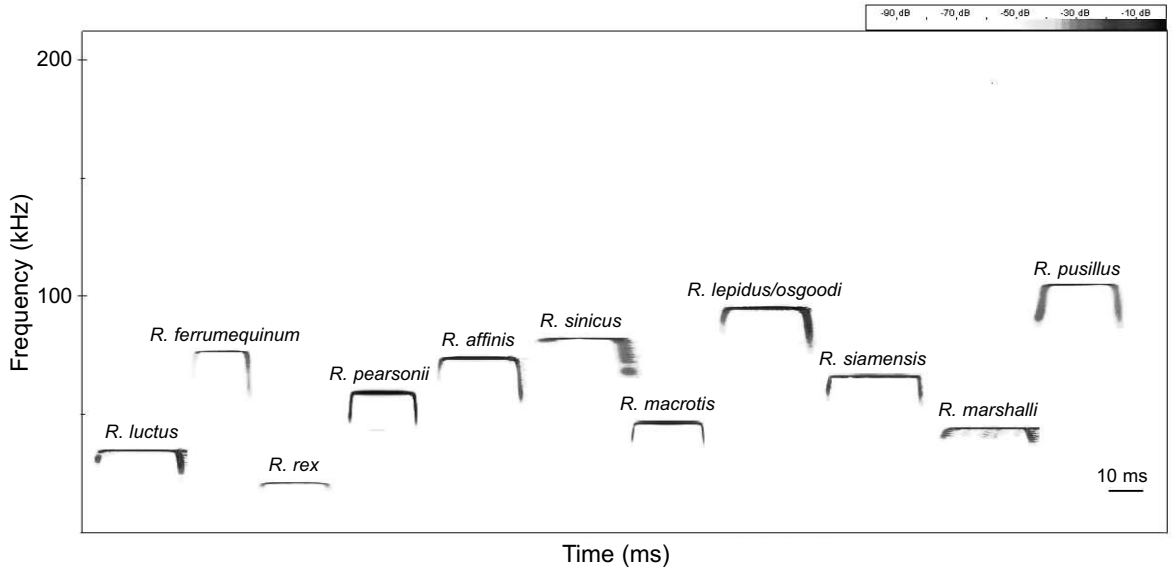

FIG. 2. Representative echolocation calls of bats in the family Rhinolophidae captured from China during our surveys (except *Rhinolophus stheno* for which sound files were unavailable). See text for data on intraspecific variation. Recordings are from time expanded sequences of handheld bats with FFT size 1024 Hz, Hanning window. The species are arranged according to body size from large species (left) to small (right)

Sichuan and Yunnan. The FMAXE values for echolocation calls are very variable, ranging between 70.0 to 88.5 kHz at different sites. Individuals from Hainan, Guangdong and Guangxi called at relatively low frequencies (70.0 to 74.3 kHz), those from Yunnan called at 82.6 to 83.7 kHz, while those from Jiangxi called at higher frequencies, 88.1 to 88.5 kHz. In Fujian, bats called at 71.9 to 86.1 kHz. Even in the same cave bats called at very different frequencies. For example, in Jinkuang Cave (Fujian), 10 bats were captured, of which seven called at 71.9 to 73.2 kHz, while another three bats called at 85.7 to 86.1 kHz. This raises the possibility that cryptic species may be present, and this is currently under investigation using molecular phylogenetic methods. Call frequencies for this species in Malaysia were previously reported as 77.6 kHz (FA 49.3 mm) (Kingston *et al*., 2000) and 76 kHz (FA 51 mm) (Heller and Helversen, 1989).

In China *R. affinis* is most easily confused with *R. sinicus*, from which it is best distinguished by its straight-sided lancet and the long second phalanx of the third digit (66.3–80.4% of the length of the metacarpal: Csorba *et al*., 2003). *Rhinolophus affinis* is also typically a larger species, though overlap occurs with *R. sinicus* at forearm lengths between 50–53 mm. There is extensive overlap in call frequency, but only a small overlap in forearm length between *R. affinis* and *R. sinicus* (Fig. 3). The bats calling at < 75 kHz were *R. affinis* from Guangdong, although one *R. sinicus* called at 73.4 kHz. Our molecular studies suggest that unequivocal separation can be achieved by sequencing the control region of mtDNA (authors' unpublished data), though this assumes an absence of introgression.

Previous records from China: Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hunan, Hubei, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan and Zhejiang (Zhang, 1997; Wang, 2003; Yu *et al*., 2006).

Ecological Notes

All roosts were found in caves except for one tree roost where a single individual was located. Numbers were typically in single figures, although up to 21 bats were recorded at one site. Although widespread, this species was not abundant.

Rhinolophus ferrumequinum (Schreber, 1774)
Greater horseshoe bat

FA — 56.5–62.0 mm, mass — 16.5–32.6 g. A widespread bat in China: we captured bats in Beijing, Guangxi, Henan, Hubei, Jiangxi, Jilin, Shandong, Shanxi, Sichuan, Tianjin and Yunnan. Bats assigned to *R. ferrumequinum* in China have lower call frequencies and longer forearms (72.0–83.5 kHz, 56.5–62.0 mm, respectively) than those sampled in continental Europe and the UK (81–84 kHz, 50.6–59.0 mm FA in UK — Heller and Helversen, 1989; Jones and Rayner, 1990; Park *et al*., 2000; Andrews and Andrews, 2003; Ransome 2008). Genetic analyses of microsatellite loci and mitochondrial DNA reveal deep divisions among populations within China, and also between the Chinese populations and those from the Middle East and

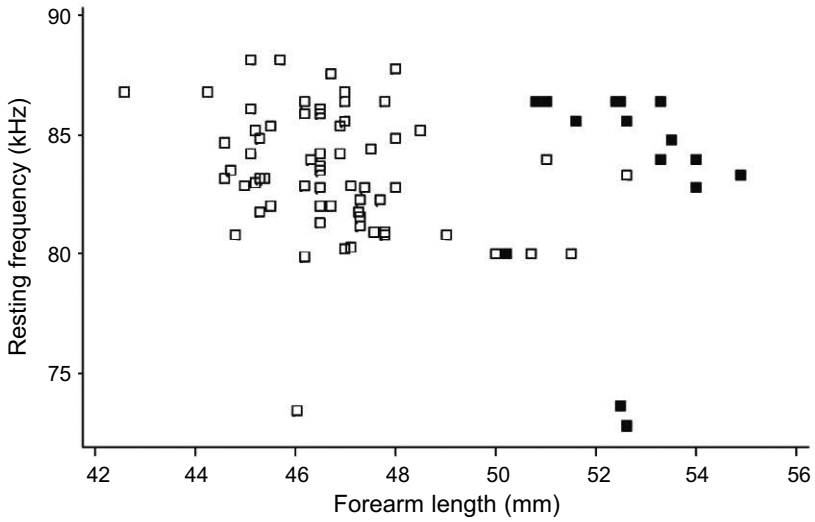

FIG. 3. Relationship between frequency of echolocation calls from handheld bats (resting frequency) and forearm length for *Rhinolophus sinicus* (□) and *R. affinis* (■)

Europe (Rossiter *et al*., 2007; Flanders *et al.* 2009). Bats from southwest China typically emitted echolocation calls with FMAXE at 72.0 kHz to 73.9 kHz (Yunnan and Sichuan, respectively), while those from east China are higher again (♂♂ 74.8–76.8 kHz; ♀♀ 76.4–77.1 kHz). Moreover, bats from Japan that are usually considered a discrete subspecies (*R. f. nippon*) show a further decrease in call frequency (ca. 65 kHz — Taniguchi, 1985; Fukui *et al.*, 2004) and are typically larger than most bats on the Chinese mainland. In conflict with this general trend was one bat from Jilin that emitted echolocation calls at 65 kHz and also appeared to show greater mtDNA sequence affiliation to the bats from Japan. Hence it is likely that the *nippon* lineage has recolonised China from Japan (Flanders *et al*., 2009). Such large differences in call frequency and corresponding genetic distinctiveness suggest that populations of this species in China might warrant taxonomic revision.

Previous records from China: Anhui, Beijing, Fujian, Gansu, Guangxi, Guizhou, Hebei, Henan, Hunan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Ningxia, Shaanxi, Shanxi, Shandong, Shanghai, Sichuan, Yunnan and Zhejiang (Zhang, 1997; Wang, 2003).

Ecological Notes

Although widespread, the species was rarely encountered in large numbers. It was always found in caves. Breeding was confirmed in Du Cave, Tianjin where young were noted during late June. The species appears to eat mainly moths and beetles, as in Britain (Jones, 1990). Analysis of 60 droppings from Beijing collected in August 2003 revealed average percentage volumes of 96.9% moths, 2.7% beetles, 0.4% dipterans.

Rhinolophus lepidus Blyth, 1844
Blyth's horseshoe bat
Rhinolophus osgoodi Sanborn, 1939
Osgood's horseshoe bat

We consider these taxa together because it is not clear whether or not they are in fact conspecific (Corbet and Hill, 1992; Simmons, 2005). Csorba *et al.* (2003) consider *R. osgoodi* as a distinct species on the basis of lancet shape, its short upper canine and long palatal bridge, but recognise that specific distinctness of this taxon has not been accepted widely in the past. *Rhinolophus osgoodi* has only previously been recorded from one site (Nguluku, north of Likiang) in Yunnan. Osgood (1932) initially considered this taxon to be a subspecies of *R. lepidus*, and its specific status was introduced by Sanborn (1939) on the basis of its relatively long forearm and small cranial measurements.

One male was captured in Fumin County, Yunnan on 4 November 2005, FA 43 mm, FMAXE 92 kHz. One female (FA 45.4 mm, FMAXE 95.2 kHz) was netted in Dali County, Yunnan Province on 4 September 2003. The Dali bat had a relatively long upper canine more typical of *R. lepidus* than *R. osgoodi* (Csorba *et al*., 2003), despite being captured close to the type locality for *R. osgoodi*.

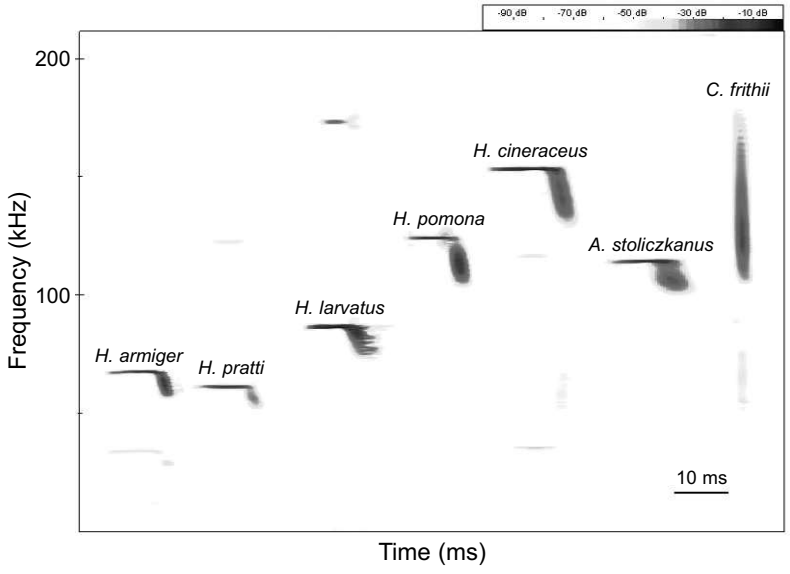

FIG. 4. Representative echolocation calls of bats in the family Hipposideridae captured from China during our surveys. See text for data on intraspecific variation. Calls are from time expanded sequences of handheld bats with FFT size 1024 Hz, Hanning window. The species are arranged according to body size from large species (left) to small (right)

The similarities in forearm length and call frequencies of these bats suggest they may belong to the same taxon. Pottie *et al*. (2005) reported that *R. lepidus* in Singapore calls at 97.8 kHz, and had a FA of 39.9 mm, whereas this species in Malaysia calls at around 100 kHz and has a FA that ranges from 37.0– 43.9 mm (Kingston *et al*., 2000). More work is warranted to determine if *R. osgoodi* is distinct from *R. lepidus*.

Previous records from China (*R. lepidus*): Anhui, Fujian, Guangxi, Guangdong, Guizhou, Hainan, Hunan, Hubei, Jiangxi, Sichuan, Yunnan and Zhejiang (Zhang, 1997; Wang, 2003). *Rhinolophus osgoodi*: Yunnan.

Ecological Notes

Seldom encountered and appeared to be rare and not widespread. Records were from caves.

Rhinolophus luctus Temminck, 1834
Woolly horseshoe bat

FA 66.3–72.8 mm, mass 26.5–49.5 g. Six males and four females were captured in Fujian, Hainan, Hunan and Jiangxi provinces. The call frequency of *R. luctus* in China (32.6–34.9 kHz) is lower than that in Malaysia (FMAXE 42 kHz), while the forearm length shorter is in Malaysia (63.4 mm — Kingston *et al*., 2000). Pottie *et al*. (2005) reported that *R. luctus* called at 42.6 kHz in Singapore, but these authors did not collect individuals of this species, identifying them from their echolocation calls. Given the geographic variation in call frequency and forearm length, cryptic species may therefore be present in this taxon, although more work is needed to confirm this.

Previous records from China: Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Sichuan, Yunnan and Zhejiang (Zhang, 1997; Wang, 2003).

Ecological Notes

This species was seldom encountered and was always found in small groups. All records were from caves.

Rhinolophus macrotis Blyth, 1844
Big-eared horseshoe bat
Rhinolophus siamensis Glydenstolpe, 1917
Thai horseshoe bat

We consider these taxa together because their distinctiveness from each other has long been questioned. *Rhinolophus siamensis* was formerly included in *R. macrotis*, but was recently considered as a distinct taxon on the basis of its smaller size and higher echolocation call frequency (Francis *et al*., 1999; Hendrichsen *et al*., 2001). Indeed, Simmons (2005) treats *R. siamensis* as a distinct species. It was first described (as a subspecies of *R. macrotis*) from north-west Thailand (Gyldenstolpe, 1917), and is sympatric with the larger *R. macrotis* in Vietnam and Lao PDR (Csorba *et al.*, 2003). A paratype specimen of *R. siamensis* has a forearm length of 37.1 mm, whereas *R. macrotis* can reach 48 mm (Csorba *et al*., 2003). Heller and Helversen (1989) and Kingston *et al*. (2000) reported that *R. macrotis* in Malaysia calls at 48 kHz (FA 46.5 mm and 45.5 mm, respectively), which is close to values from the large bats typical of this species in China. We have found typical *R. macrotis* and a smaller form (that fits with descriptions of *R. siamensis*) in sympatry (even in the same cave) in Guangxi, supporting their status as separate species. Detailed analyses of genetic and call frequency variation of these taxa are currently underway (authors' unpublished data) to clarify their taxonomic status, and to determine whether one does indeed correspond to *R. siamensis* and whether additional cryptic species may be present. Sun *et al.* (2008) identified a 'new' cryptic species of *R. macrotis* from Jianxi, though on the basis of body size and call frequency we believe that their 'new' small species is probably *R. siamensis*. Wu *et al.* (2008) described a new, small cryptic species in the *R. macrotis* group from Guangdong, Guangxi and Jiangxi, which they named *R. huananus*. The forearm length of this bat was 39.3–43.1 mm, and hence overlapped with that found by Sun *et al.* (2008). Although Wu *et al.* (2008) argued that the body size of *R. huananus* was intermediate between that of *R. siamensis* and *R. macrotis*, they were not able to examine any specimens of the former. Francis (2008) gives the forearm length of *R. siamensis* in Thailand as 38–42 mm. We therefore believe that *R. huananus* may be a synonym of *R. siamensis*, and until further evidence is forthcoming we consider the large and small bats in the *R. macrotis* group in China as *R. macrotis* and *R. siamensis*, respectively.

Our criteria for separation of *R. macrotis* and *R. siamensis* are conservative because they are based on individuals where both call frequency and forearm length were recorded — we have found no overlap in either parameter between the taxa. Bats with FA > 46 mm and FMAXE < 55 kHz were assigned to *R. macrotis*. If FA < 46 mm and

FMAXE > 58 kHz then bats were assigned to *R. siamensis*.

Rhinolophus macrotis

FA — 46.9–49.9 mm (*n* = 5), mass — 8.7–9.4 g (*n* = 4). Two males and four females typical of *R. macrotis* were caught from Beijing, Guangxi and Sichuan. The echolocation calls ranged in FMAXE from 47.2–53.9 kHz.

Previous records from China (for all bats identified as *R. macrotis* — may include records of *R. siamensis* because this species was not previously considered distinct): Fujian, Guangdong, Guangxi, Guizhou, Jiangxi, Sichuan, Shaanxi, Yunnan and Zhejiang (Zhang, 1997; Wang, 2003).

Ecological Notes

The species is relatively uncommon, and always found in small numbers. Records are widespread, extending north to Beijing from subtropical regions of China. All bats were captured in caves.

Rhinolophus siamensis

FA — 39.2–45.4 mm (*n* = 22), mass — 5.5–6.4 g (*n* = 10). Thirty-seven bats (14 ♂♂ and 23 ♀♀) could be readily assigned to this taxon, and there was no overlap with either forearm length or FMAXE of the larger *R. macrotis*. Echolocation calls had FMAXE ranging from 60.0–69.3 kHz (*n* = 22). Recorded from Fujian, Guangxi, Guizhou, Jiangxi, and Yunnan

Ecological Notes

Rhinolophus siamensis appears to be widespread in southern China, and was recorded more frequently than *R. macrotis,* which may extend further northwards given the new record from Beijing. The two species were sympatric (even found in the same cave) in Guangxi. *Rhinolophus siamensis* was previously recorded from Yunnan according to Smith and Xie (2008). All records were from caves.

Rhinolophus marshalli Thonglongya, 1973
Marshall's horseshoe bat

FA — 38.9–47.1 mm, mass — 5.8–7.0 g. Three males and four females were netted in Yunnan Province on 8 September 2003, representing a new species record for China. Morphological and cranial measurements were described by Zhang L. B. *et al*. (2005). These bats called at 39.2–41.6 kHz (FA 43.8–47.1 mm). On 13 October 2007, three males (FA 44.0–46.4 mm, mass 5.8–7.0 g, FMAXE 41.8–42.3 kHz) were also netted in Yunnan Province and on 21 June 2007, we netted 6 males and 5 females (FA — 38.9–44.1 mm, FMAX — 43.0–44.5 kHz) in Guangxi.

Ecological Notes

Our data represent new records for China in subtropical areas, always involving small numbers of individuals. The species is found in neighboring Vietnam (Hendichsen *et al*., 2001).

Rhinolophus rex G. M. Allen, 1923
King horseshoe bat
Rhinolophus paradoxolophus (Bourret, 1951)
Bourret's horseshoe bat

These taxa appear to be very closely related and there has been some disagreement in the literature regarding whether or not they represent discrete species. For these reasons they are considered together here. *Rhinolophus rex* has previously been separated from *R. paradoxolophus* on the basis of small differences in external, cranial and dental measurements with the former considered to be the fractionally larger species. For example, *R. paradoxolophus* has a forearm length of 50.5–57 mm, *R. rex* 56.5–63 mm (Csorba *et al.*, 2003). In our surveys, several bats captured in Guangxi had forearm lengths that would classify them as *R. paradoxolophus*, while our Yunnan bat had a forearm length that fits the measurements for *R. rex*. Despite these size differences, these bats called at similar call frequencies. Francis (in Eger and Fenton 2003) recorded *R. paradoxolophus* at 22–25 kHz in Lao PDR, and hence it appears that the call frequencies used by *R. paradoxolophus* and *R. rex* are identical. Eger and Fenton (2003) recorded *R. paradoxolophus* at 43 kHz in China, but presumably measured the third harmonic of a signal with a fundamental at about 14 kHz. We consider that the small differences in body size are inadequate descriptors of taxonomic distinctiveness between *R. paradoxolophus* and *R. rex*, and given that their echolocation calls are very similar we suggest they are probably the same taxon. *Rhinolophus paradoxolophus* occurs at more southerly locations than *R. rex*, and the forms are probably best recognized as geographical races (subspecies). Because *R. rex* (1923) was named before *R. paradoxolophus* (1951) we suggest that the taxa are synonymised under the name *R. rex* and considered as one species. An account of the biology of *R. paradoxolophus* is given by Eger and Fenton (2003).

Rhinolophus rex

FA — 51.6–57.3 mm, mass — 10.8–14 g. Four males and 10 females were captured in Guangxi, Guizhou and Yunnan. *Rhinolophus rex* calls at a very low frequency, FMAXE 23.7–26.4 kHz, with calls dominated by the second harmonic.

Previous records from China (for *R. rex*): Chongqing, Guangdong, Guangxi, Guizhou, Sichuan and Yunnan (Zhang, 1997; Wang, 2003).

Ecological Notes

This species is restricted to southern provinces where it is only encountered in small numbers in caves. Echolocation calls are audible at close range to the unaided ear.

Rhinolophus pearsonii Horsfield, 1851
Pearson's horseshoe bat
Rhinolophus yunanensis Dobson, 1872
Dobson's horseshoe bat

Rhinolophus yunanensis (found in NE India, north Myanmar, SE China and Thailand) is normally recognised as a species distinct from *R. pearsoni* (see Csorba *et al.*, 2003). The main reason for this distinction appears to be that *R. yunanensis* is slightly larger (e.g., forearm lengths 51.5–64.0 mm versus 47.0–56.0 mm in *R. pearsoni* — Csorba *et al.*, 2003). However, the overlap in forearm lengths between the two species is substantial; we have found consistency in echolocation call frequencies (suggesting all bats belong to one species) of bats that would be described as *R. pearsoni* and *R. yunanensis* on the basis of forearm lengths (i.e., bats with forearm length < 51.5 mm can have a similar call frequency to bats with forearm length > 56 mm). Forearm length is therefore a weak indicator of species distinctiveness, and better diagnostic features are needed to adequately separate these taxa. Echolocation call frequency may prove useful in this respect. *R. pearsonii* from Anhui, Jiangxi, and Fujian call at 64.2–70 kHz, while those from Guangxi call at 57.6–61.6 kHz. Females call at higher frequencies than males, by about 2 kHz. Robinson (1996) reported that *R. pearsonii* in Malaysia emits echolocation calls with FMAXE at 65.0 kHz. *Rhinolophus yunanensis* in Thailand calls at considerably lower frequencies, typically around 51–52 kHz (P. Soisook, personal communication). One bat captured in Sichuan emitted calls that were considerably lower in FMAXE (48 kHz), and was probably therefore *R. yunanensis*. Otherwise, on the basis of echolocation call frequencies, most of the records below probably refer to *R. pearsonii*. In other parts of S Asia, differences between *R. yunanensis* and *R. pearsoni* may be more apparent. Moreover, an intermediate species — *R. chiewkweeae* — has recently been described from peninsular Malaysia (Yoshiyuki and Lim, 2005).

Rhinolophus pearsonii

FA — 51–56 mm, mass — 11.0–17.1 g. Fifty males and 39 females were captured from Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan and Yunnan.

Previous records from China (*R. pearsonii*): Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Hubei, Jiangxi, Tibet, Shaanxi, Sichuan, Yunnan and Zhejiang (Zhang, 1997; Wang, 2003). *Rhinolophus yunanensis* previously reported from Yunnan (Wang, 2003).

Ecological Notes

Rhinolophus pearsonii was often found in quite cool conditions in montane areas of high elevation, as was our likely record of *R. yunanensis*. All records were of small numbers of bats in caves.

Rhinolophus pusillus Temminck, 1834
Least horseshoe bat

This is a common bat species in China. FA — 34.3–41.6 mm, mass — 3.3–7.8 g, FMAXE — 100.3–111.2 kHz. Capture sites included Beijing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Jiangxi, Shandong, Sichuan and Yunnan. Among these sites, bats from Beijing were larger than others (FA 40.2–41.6 mm) and had a lower call frequency, ranging 105.2–109.7 kHz. For example, some *R. pusillus* from Guangxi called at a higher frequency (111.2 kHz) and are smaller (FA 35.2–37.9 mm). Robinson (1996) reported that *R. pusillus* in Malaysia calls at 92.5 kHz (FA 38.3 mm), and so it appears likely that cryptic species divisions are likely in this taxon across its range. Li *et al*. (2006) suggested that bat taxa *R. pusillus* (sampled across China), *R. monoceros* (Taiwan), *R. cornutus* (main islands of Japan) and *R. c. pumilus* (Okinawa, Japan) are better considered as geographical subspecies rather than distinct species. Simmons (2005) considers that *R. cornutus* is confined to Japan and, therefore, bats from China that were previously assigned to this taxon are now considered to belong to *R. pusillus*.

Previous records from China: Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Hunan,

Jiangsu, Jiangxi, Shaanxi, Sichuan, Tibet, Yunnan and Zhejiang (Zhang, 1997; Wang, 2003).

Ecological Notes

This is the most widespread and frequently encountered rhinolophid in China. It is rarely found in large numbers, and all records were from caves or once from a rock crevice. Five droppings collected in July 2002 from Beijing were analysed and found to contain (average percentage volume) 45% dipterans, 42% lepidopterans and 14% coleopterans. The diet is therefore similar to that of *R. hipposideros* in Europe (Vaughan, 1997), which it resembles closely in morphology seemingly as a consequence of convergent evolution (Li *et al*., 2006). Pregnant females were captured on 17 May, lactating females on 12 June 2005, in Guangxi.

Rhinolophus sinicus K. Andersen, 1905
Chinese rufous horseshoe bat

The species is most easily confused with *R. affinis*, from which it is best distinguished by its straight-sided lancet and the relatively short second phalanx of the third digit (< 66% of the length of the metacarpal — Csorba *et al*., 2003). Unequivocal separation can seemingly be performed by sequencing the control region of mtDNA (authors' unpublished data). Echolocation call frequencies overlap with those emitted by *R. affinis*. *Rhinolophus affinis* is also typically a larger species, though overlap occurs with *R. sinicus* at forearm lengths between 50–53 mm (Fig. 4). *Rhinolophus sinicus* is very similar to *R. thomasi* from Myanmar, Vietnam, Lao PDR and Thailand, to which it is closely related and possibly conspecific. Call frequency for *R. thomasi* in Lao PDR is reported as 76–86 kHz (Francis and Habersetzer 1998), and so the two taxa overlap considerably in call frequency. *Rhinolophus thomasi* is reported to have smaller upper canines than *R. sinicus* (Francis 2008).

FA — 42.6–52.6 mm, mass — 8.5–14.3 g. Seventy-four males and 43 females were captured from Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Jiangxi, Sichuan, and Yunnan. The echolocation calls vary over the geographic range, from 73.4–88.5 kHz. The call frequencies ($\bar{x}$ ± SD) of a sample of males (82.0 ± 2.0 kHz, n = 38) were lower than females (85.4 ± 1.9, n = 29 — Mann-Whitney W = 839, $P < 0.001$), but the forearm lengths were not significantly different between sexes (♂♂: 46.9 ± 1.5, n = 37; ♀♀: 46.6 ± 2.0, n = 29; Mann-Whitney W = 1325, $P > 0.05$).

Previous records from China:, Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hubei Jiangsu, Jiangxi, Shaanxi, Sichuan, Tibet, Yunnan, Zhejiang (Zhang, 1997; Wang, 2003).

Ecological Notes

Widespread in caves in southern China, but never abundant. Maximum count was 24 bats in one cave in Jiangxi. An abandoned brick kiln was used by a solitary male in Xinyi County.

Rhinolophus stheno K. Andersen, 1905
Lesser brown horseshoe bat

FA — 41.8–47.1 mm, mass — 10.3 ± 1.4 g (n = 6). Four males and three females were captured in Yunnan Province. These were the first records of *R. stheno* from China, and a detailed description was given in Zhang J. S. *et al*. (2005). The echolocation calls indicated that the FMAXE of *R. stheno* was about 87.2 kHz, while Robinson (1996) reported 85–90 kHz (FA 46 mm), and Kingston *et al.* (2000) documented 86.1 kHz (FA 48.8 mm), both in Malaysia.

Soisook *et al*. (2008) recently elevated *R. microglobosus* to species status and consider it distinct from *R. stheno* in Southeast Asia. Whereas *R. stheno* typically echolocates with FMAXE of 85–88 kHz, *R. microglobosus* calls at 92–101 kHz. *Rhinolophus stheno* had forearm lengths between 43.2–48.1 mm, whereas *R. microglobosus* was smaller on average (FA — 41.4–46.3 mm). *Rhinolophus stheno* was found in the Thai-Malaysian peninsular and central Vietnam, with *R. microglobosus* distributed further north, also in Myanmar, Cambodia, Vietnam, and Lao PDR and hence closer to the border with China (Soisook *et al.*, 2008). Nonetheless, our echolocation call frequency measurements are consistent with the Chinese bats being *R. stheno* rather than *R. microglobosus*.

Ecological Notes

These records were the first for China: the bats were roosting in caves.

Hipposideridae

Seven species from the family Hipposideridae, including two common species (*H. armiger* and *H. larvatus*) were discovered during nine years of survey (for capture sites, measurements and status, see Table 1; for representative echolocation calls,

see Fig. 4). One species (*H. cineraceus*) represents a new record for China.

Hipposideros armiger (Hodgson, 1835)
Great leaf-nosed bat

FA — 86.0–96.8 mm, mass — 41.0–63.0 g. A common species in China, captured in Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Sichuan, and Yunnan. Call frequencies vary with FMAXE values from 65.1–72.7 kHz recorded. *Hipposideros armiger* in the most southern area, Hainan, calls at the highest frequencies, 72.0–72.7 kHz (FA — 90.2–92.0 mm). FMAXE was 68 kHz in Guangdong, 68.0–68.8 kHz Guangxi, 64.8 kHz at three sites in Yunnan, 67.4–69.4 kHz in Sichuan. Gould (1979) reported that the call frequency of *H. armiger* is 66 kHz (FA — 91 mm) in Malaysia.

Previous records from China: Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan, and Zhejiang (Zhang, 1997; Wang, 2003).

Ecological Notes

A common and widespread bat in southern China. Once observed feeding around streetlights. Typically found in caves, including some of the largest aggregations of bats noted. Young were already flying by mid-July in Sichuan.

Hipposideros cineraceus Blyth, 1853
Ashy leaf-nosed bat

FA — 31.7–36.0 mm, mass — 3.1–4.6 g. Fifteen males and 19 females were captured in Guangxi and Yunnan. This is a very small species in the Hipposideridae that calls at a high frequency (FMAXE — 155.5–163.5 kHz). The small size, echolocation call frequency, and shape of the internarial septum (in comparison with bats from Myanmar) fits descriptions of this species in Myanmar, Thailand and elsewhere in south-east Asia (Francis, 2008; S. Puechmaille, personal communication). There are apparently two forms (probably cryptic species) of *H. cineraceus* in south-east Asia, and the bats from China fit the description of the widespread, smaller form (Francis, 2008). In Ningming County, Guangxi, about 60 bats of this species were found roosting alone in a cave near some villages. The bats in this cave called with FMAXE values close to 156 kHz. In Yuanjiang and Baoshan counties, Yunnan, this species roosts with *H. pomona*, and calls at higher FMAXE values of about 162 kHz.

Ecological Notes

These are the first records for China. All of these captured bats were found in small populations. The bats were captured in caves, and in a shelter (Fangkong Cave 1) around an abandoned airport.

Hipposideros larvatus (Horsfield, 1823)
Intermediate leaf-nosed bat

FA — 55.5–64.1 mm, mass — 12.1–24.5 g. A common bat species in south China that was captured in Guangdong, Guangxi, Hainan and Yunnan. Echolocation call frequencies differ according to site. The bats in Hainan on average emitted higher call frequencies (FMAXE — 86.5–87.8 kHz) and had longer forearms (61–64 mm) than those in Guangxi (84.8–88 kHz, FA — 55.5–61.6 mm), and Guangdong (FMAXE — 83.2–85.6 kHz, FA — 67.8–62.2 mm). Bats in Yunnan emitted even lower call frequencies (79.2–84 kHz) and had forearm lengths measuring between 57.5–64.1 mm. Kingston *et al*. (2000) reported that *H. larvatus* in Malaysia calls at 100.0 kHz (FA — 58.5 mm), and Thabah *et al*. (2006) claimed that in one cave on north-east India, bats identified as *H. larvatus* emitted calls with FMAXE values at either 85 kHz or 98 kHz, leading the authors to propose the name *Hipposideros khasiana* for bats of the 85-kHz phonic type. Chinese *H. larvatus* was phylogenetically closest to Malaysian bats (100–102 kHz), but might deserve raising to specific status given the considerable difference in call frequency (Thabah *et al*., 2006).

Previous records from China: Guangdong, Guangxi, Guizhou, Hainan, Yunnan (Zhang, 1997; Wang, 2003).

Ecological Notes

Found in subtropical areas of southern China where it can occur in large numbers (roosts of several hundred individuals) in caves. They were also found in the shelter (Fangkong Cave 2) around the abandoned airport, Ningming County.

Hipposideros pomona K. Andersen, 1918
Pomona leaf-nosed bat

FA — 40.5–44.2 mm, mass — 5.2–7.0 g. Forty males and 49 females were captured from Guangdong, Guangxi, Hainan and Yunnan. *Hipposideros pomona* emitted different call frequencies at different sites. The bats in Yunnan called between 120.8–125.6 kHz and had FA values of 41.5–44.2 mm. Bats in Guangdong called between 125–129 kHz, with

FA values of 40.6–43.0 mm. In Hainan calls were recorded at 121 kHz (FA 38–42 mm). Shek and Lau (2006) reported that *H. pomona* in Hong Kong emitted echolocation calls at 129.6 (range 125.7–132.5) kHz.

Previous records from China: Fujian, Guangdong, Guangxi, Hainan, Hunan, Sichuan, Yunnan, (Wang, 2003).

Ecological Notes

Most records were from caves in the south of China, but small population was found under the bed in an abandoned house in Hainan. One large roost was found.

Hipposideros pratti Thomas, 1891
Pratt's leaf-nosed bat

FA — 79.3–90.8 mm, mass — 48–57.3 g. Nine males and 13 females were captured in Fujian, Guangxi, Henan, Sichuan and Yunnan. The bats in Fujian called with FMAXE values 58.2 kHz; bats from Guangxi called at 59.2–61.6 kHz, and those from Henan at 61.0–61.9 kHz.

Previous records from China: Anhui, Fujian, Guangxi, Guizhou, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan and Zhejiang (Zhang, 1997; Wang, 2003).

Ecological Notes

Females with pups were captured in early July in Sichuan. Maternity colonies in caves may contain hundreds of bats.

Aselliscus stoliczkanus (Dobson, 1871)
Stoliczka's Asian trident bat

FA — 39.8–47.3 mm, mass — 5.0–7.5 g. Fourteen males and 16 females were captured in Guangxi, Guizhou and Yunnan. Bats called with FMAXE values between 118.4–130 kHz (n = 5). On 2 September 2003, one juvenile female was netted in Yunnan, which called at 118.4 kHz (FA — 44.4 mm), while adult male in this cave called at 119.3 kHz (FA — 45.6 mm). One adult female was netted in Yunnan on 26 November 2006, calling at 130 kHz (FA — 39.8 mm). Another juvenile male was captured in Guizhou on 1 November 2005, which had a dominant call frequency at 120.3 kHz (FA — 44.0 mm). On 5 September 2006, two males and one female were captured in Guangxi, that female called at 125.4 kHz dominant frequency (FA — 44.7 mm, mass — 7.0 g), two males both called at 122.9 kHz (FA — 42.7 and 43.9 mm, mass both — 5.0 g). Echolocation calls are described further in Li *et al.* (2007).

Previous records from China: Guizhou, Guangxi, Jiangxi and Yunnan (Zhang, 1997; Wang, 2003).

Ecological Notes

Only small numbers were found and all records were from caves in southern provinces.

Coelops frithii Blyth, 1848
East Asian tailless leaf-nosed bat

FA — 35.0–39.1 mm, mass — 5.0–5.5 g. Four males and 17 females were captured in Hainan and Fujian. The Hainan *C. frithi* (FA — 35.0–37.0 mm) were slightly smaller than bats from Fujian (FA — 36.0–39.1 mm). The bats emitted echolocation calls dominated by a broadband component with FMAXE 141 kHz (start frequency 199 kHz, end frequency 117 kHz), although a higher constant frequency component may have been missed because of sampling rate restrictions of the recording equipment.

Previous records from China: Fujian, Guangdong, Guangxi, Hainan, Sichuan and Yunnan, (Zhang, 1997; Wang, 2003).

Ecological Notes

Appears to have a very restricted distribution in southern China. Found only in small numbers in three caves.

Discussion

The diversity of rhinolophid and hipposiderid bats in China is considerable. According to Wang (2003), there are 18 (including *R. paradoxolophus*) species of Rhinolophidae in China. *Rhinolophus monoceros* and *R. formosae* are distributed only in Taiwan, and the former was suggested to be an island subspecies of *R. pusillus* by Li *et al*. (2006). In addition to the species that we recorded, Smith and Xie (2008) and Wang (2003) list the following additional rhinolophid species as occurring in the Peoples' Republic of China (excluding Taiwan): *R. cornutus*, *R. rouxi*, *R. subadius*, *R. shortridgei*, and *R. trifoliatus.* We considered *R. cornutus* and *R. pusillus* as one species (*R. pusillus*) based on Li *et al*. (2006), and we used the name *R. sinicus* to replace *R. rouxii* based on Simmons (2005). We consider *R. lepidus* and *R. osgoodi* to be potentially synonymous, as are *R. paradoxolophus* and *R. rex*.

We consider that previous records of *R. thomasi* refer to *R. sinicus*, and also suggest that further research needs to be performed to determine whether these are indeed separate taxa. *Rhinolophus shortridgei* is considered distinct from *R. lepidus* by Csorba *et al.* (2003), but the reliability of Chinese records is questionable given the difficulties inherent in separating this species from *R. lepidus* (Csorba *et al*., 2003). The identification of *R. subadius* must also be questioned given similarities and taxonomic confusion with *R. pusillus*, and only one Chinese record exists (Smith and Xie 2008). *Rhinolophus trifoliatus* is a distinctive species, and there is only the one Chinese record from Guizhou (Wang, 2003). We also suggest that *R. ferrumequium* in China may be taxonomically distinct from the European species as that at least two forms exist in China. The large, low frequency bats similar to *R. ferrumequinum* in Japan may also be taxonomically distinct. Overall we therefore believe that we recorded all of the Chinese rhinolophid species with the exception of *R. trifoliatus*, and we recorded two species new to China (*R. marshalli* and *R. stheno*).

At the time of revising this manuscript, a new species of *Rhinolophus* aligned to the *landeri* group was described from Yunnan, with additional records from Guizhou (Zhou *et al*., 2009). The species — *R. xinanzhongguoensis* — has a forearm length of 58–61 mm and hence is similar in body size to *R. ferrumequinum*, from which it can be distinguished by its pointed and hornlike connecting process (Zhou *et al*., 2009).

Seven species of Hipposideridae were captured, while Wang (2003) suggested 10 species of this family occur in China. There is no *Hipposideros bicolor* in China based on Simmons (2005), which is difficult to discriminate from *H. pomona*. *Hipposideros terasensis* from Taiwan is considered a synonym of *H. armiger* (Simmons, 2005). Another two species, *H. fulvus* and *H. lylei*, reported to be distributed in China by Wang (2003), were not found during our surveys. Smith and Xie (2008) also reported *H. turpis*, listed under *H. larvatus* by Wang (2003), and so the nature of those records seems debatable. Smith and Xie (2008) also split *H. grandis* from *H. larvatus* in Yunnan, on the basis of its longer ears. Our records of *H. cineraceus* represent a new species for China.

Overall, our survey has provided considerable new information on the distribution of rhinolophoid bats in China, has identified three new species for the country, and has helped to clarifying the taxonomy of bats in a country where most of the earlier literature has been inaccessible to English readers.

Despite the tremendous diversity of rhinolophid and hipposiderid bats in China, they were rarely found in large numbers (except for some colonies of *H. armiger*, *H. larvatus* and *R. pusillus*), and their conservation is of concern. Several sites were subject to extreme disturbance, and local people reported eating these small bats (*H. pratti* and *R. pusillus*). Programmes to promote bat conservation, and protection of important roosting and foraging sites are of paramount importance if this tremendous diversity is to be maintained under challenging conditions associated with rapid economic growth.

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APPENDIX

List of locality records of bats in the family Rhinolophidae and Hipposideridae. When the locality was presented in the first time, its longitude, latitude and altitude were provided if possible. Within the province, information is sorted by time

Rhinolophidae

Rhinolophus affinis

FUJIAN — 28 February 2006: Longkong Cave, Yanshi County, 25°12'N, 117°15'E, 1 ♀. 1 May 2006: Zhuxi Cave, Shanghang County, 25°10'N, 116°45'E, 440 m a.s.l., 1 ♂. 2 March 2006: Jinkuang Cave, Liancheng County, 25°39'N, 116°53'E, 796 m a.s.l., 5 ♂♂ and 5 ♀♀. 4 March 2006: Qixian Cave, Sha County, 26°25'N, 117°39'E, 336 m a.s.l., 4 ♂♂ and 2 ♀♀. 4 March 2006: Guixian Cave, Mingxi County, 26°24'N, 117°11'E, 1 ♂. 9 March 2006: Huanghuacong Cave, Yanzijiao Town, Wuyi Mountain, 27°49'N, 117°43'E, 1,100 m a.s.l., 1 ♀; GUANGDONG — 2 September 2002: Shui Cave, Longmen County, 1 ♂. 2 September 2002: Dongbian Cave, Longmen County, 1 ♂. 4 September 2002: Penglai Cave, Yunfu Mount, Bolo County, 1 ♂. 24 October 2005: Fangkong Cave, Luofu Mountain, Huizhou City, 23°16'N, 114°04'E, 2 ♂♂; GUANGXI — 9 September 2002: Seven Star Cave, Guilin City, 25°17'N, 110°18'E, 154 m a.s.l., 1 ♂ and 1 ♀. 16 May 2005: Fenkeng Cave, Guilin City, 25°17'N, 110°21'E, 126 m a.s.l., 1 ♂. 13 July 2005: Seven Star Cave, Guilin City, 2 ♂♂; HAINAN — 6 September 2005: Bianfu Cave, Lingshui County, 18°42'N, 109°53'E, 210 m a.s.l., 1 ♂ and 2 ♀♀. 7 September 2005: Xiashui Cave, Qiongzhong County, 19°04'N, 109°46'E, 369 m a.s.l., 1 ♂ and 1 ♀. 8 September 2005: Qianlong Cave, Baoting County, 18°34'N, 109°26'E, 761 m a.s.l., 7 ♂♂ and 5 ♀♀. 10 September 2005: Fangkong Cave, Yingge Mountain, 19°04'N, 109°33'E, 697 m a.s.l., 8 ♂♂ and 13 ♀♀. 11 September 2005: Qishier Cave, Huoshan Mountain, Haikou City, 19°57'N, 110°12'E, 59 m a.s.l., 4 ♂♂ and 4 ♀♀; HENAN — 20 August 2002: Bianfu Cave, Xixia countryside, 2 juvenile ♀♀; JIANGXI — 27 December 2005: Longhushan Park, Yingtan City, 28°04'N, 116°58'E, 8 ♂♂ and 8 ♀♀; YUNNAN — 22 November 2002: Jinuo Town, Xishuangbanna, 21°58'N, 100°49'E, 1 ♂ (roosting in tree hole). 24 November 2002: Manfa Village, Xishuangbanna, 3 ♀♀. 25 November 2002: Dashu Cave, Xishuangbanna, 1 ♀. 7 September 2003: Jiuxiang Cave, Yiliang County, 5 ♂♂ and 1 ♀. 9 September 2003: Shaft Cave, near Bailong Cave, Mile County, 24°11'N, 103°21'E, 1,400 m a.s.l., 5 ♀♀.

Rhinolophus ferrumequinum

BEIJING — 11 August 2001: Bianfu Cave, SW of Beijing, 39°43'N, 115°43'E, 722 m a.s.l., under 10 seen, 4 captured (1 juvenile ♂, 1 ♂, and 2 ♀♀). 14 August 2001: Caves at Shidu, Fangshan Town, 39°25'N, 115°17'E, 682 m a.s.l., 1 ♂♂ and 3 ♀♀. 4 January 2003: Bianfu Cave, SW of Beijing, 1 juvenile ♂. 3 April 2004: Bianfu Cave, Beijing, three ♀♀. 4 January 2005: Guanyin Cave, Jietai Temple, Fangshan Town, 39°48'N, 115°48'E, 538 m a.s.l., Beijing, 9 ♀♀; GUANGXI — 4 September 2006: Seven Star Cave, Guilin City, 4 ♂♂ and 6 ♀♀; HENAN — 1 January 2006: Shenxian Cave, Huancuigu, Rongyang County, 34°38'N, 113°15'E, six ♂♂; HUBEI — 7 November 2004: Shennongjia, 31°30'N, 110°23'E, 1,470 m a.s.l., 2 ♂♂. 10 November 2004: Sihe Village, Langhe Town, Wudang Mountain, 1 ♂ and 2 ♀♀. 16 November 2004: Tongmu Village, Muyu Town, Tanjiawan County, 31°28'N, 110°25'E, 1,270 m a.s.l., 2 ♂♂ and 1 ♀♀; JIANGXI — 28 December 2005: Wanfu Cave, Jingdezhen City, 28°37'N, 116°28'E, 1 ♂ and 1 ♀; JILIN — 3 October 2006: Juda Lizi Cave, Zian Village, Jian City, 41°04'N, 125°50'E, 1 ♂ and 2 ♀♀; SHANDONG — 2 January 2006: Xiaya Cave, Yiyuan

Appendix. Continued

County, 4 ♂♂ and 1 ♀; SHANXI — 21 September 2001: Lingqiu, 1 ♂; SICHUAN — 9 July 2005: Nantou Village, Luding County, 29°48'N, 102°14'E, 1 ♂. 12 July 2005: Dahu Cave, Emeishan, 29°35'N, 103°17'E, 1,280 m a.s.l., 1 ♂; TIANJIN — 28 June 2005: Du Cave, Panshan Mountain, Tianjin City, 7 ♂♂ and 18 ♀♀, 5 pups present. New provincial record; YUNNAN — 2 September 2003: Heshang Cave, NW of Kunming, 25°12'N, 102°28'E, 1 ♂. 3 October 2006: Xiaogou Cave, Kunming City, 25°04'N, 103°23'E, one ♂. 8 October 2006: Xiao Cave, Yiliang County, 1 ♂.

Rhinolophus lepidus and *R. osgoodi*

YUNNAN — 4 September 2003. Tianlong Cave, Dali County, 25°55'N, 100°05'E, 1 ♀. 4 November 2005: Xiyou Cave, Fumin County, 25°09'N, 102°39'E, 1 ♂.

Rhinolophus luctus

FUJIAN — 5 March 2006: Jiuba Cave, Jiangle County, 26°43'N, 117°29'E, 173 m a.s.l., 1 ♂; Kangtou Cave, 26°40'N, 117°36'E, 487 m a.s.l., 1 ♀; HAINAN — 9 August 2007: Xianren Cave, Shishan Town, Haikou City, 19°44'N, 109°37'E, 277 m a.s.l., 4 ♂♂ and 2 ♀♀; HUNAN — 11 January 2007: Tangle Cave, Jishou, 28°18'N, 109°39'E, 1 torpid ♀. New provincial record; JIANGXI — 27 December 2005: Longhushan Park, 1 ♂.

Rhinolophus macrotis

BEIJING — 14 August 2001: Caves at Shidu, 1 ♂. New provincial record; GUANGXI — 10 September 2002: Closed Cave, Ziyuan County, 3 ♀♀; SICHUAN — 7 July 2005: Yuanfeng Cave, Qilai County, 30°29'N, 103°24'E, 596 m a.s.l., 1 ♂ and 1 juvenile ♀.

Rhinolophus siamensis

FUJIAN — 25 December 2005: Yinhua Cave, Jiangle County, 26°39'N, 117°34'E, 481 m a.s.l., 2 ♂♂ and 1 ♀. 1 March 2006: Zhuxi Cave, Shanghang County, 2 ♀♀. 2 March 2006: Ganru Cave, Liancheng County, 5 ♂♂ and 8 ♀♀. 5 March 2006: Yinhua Cave, Jiangle County, 1 ♂ and 1 ♀; GUANGXI — 9 September 2002: Seven Star Cave, Guilin City, 1 ♀. 10 September 2002: Closed Cave, Ziyuan County, 2 ♂♂ and 2 ♀♀; GUIZHOU — 20 June 2000: Wolong Cave, Xingyi County, 24°9'N, 104°53'E, two ♂♂ and 3 ♀♀. 1 November 2005: Shanjia Cave, Anlong County, 25°19'N, 105°05'E, 1 ♂; JIANGXI — 28 December 2005: Wanfu Cave, Jingdezhen County, 5 ♂♂ and 3 ♀♀; YUNNAN — 24 November 2002: Manfa Village, Xishuangbanna, 2 ♀♀. 2 September 2003: Heshang Cave, Fumin County, 1 ♂.

Rhinolophus marshalli

GUANGXI — 21 June 2007: Baisha Cave, Guiping County, 23°14'N, 109°54'E, 27 m a.s.l., 3 ♂♂ and 2 ♀♀; Shepo Cave, Guiping County, 23°25'N, 110°15'E, 1,480 m a.s.l., 3 ♂♂ and 3 ♀♀; YUNNAN — 8 September 2003: Bailong Cave, Mile County, 24°12'N, 103°14'E, 1,480 m a.s.l., 3 ♂♂ and 4 ♀♀. 13 October 2007: Gulong Cave, Yuanjiang County, 23°35'N, 101°58'E, 413 m a.s.l., 3 ♂♂.

Rhinolophus rex and *R. paradoxolophus*

GUANGXI — 7 November 1999: Dongmen Cave, Fushui County, 1 ♀. 8 September 2002: White Dragon Cave, Guilin City, 3 ♂♂. 6 May 2005: Fenkeng Cave, Guilin City, 2 ♀♀. 16 May 2005: Fenkeng Cave, Guilin City, two ♀♀; GUIZHOU — 6 October 2003: Xipo Cave, Wuchuang County, 1 ♀; YUNNAN — 5 September 2003: Qingxuan Cave, near Lijiang airport, 26°40'N, 100°12'E, 2,270 m a.s.l., 1 ♀. 5 September 2003: Tianlong Cave, Dali County, 1 ♀. 3 November 2005: Bianfu Cave, Yiliang County, 25°04'N, 103°23'E, 1 ♂. 4 November 2005: Xiyou Cave, Fumin County, 1 ♀. 3 October 2006: Xiaogou Cave, Yiliang County, 1 ♀.

Rhinolophus pearsonii and *R. yunanensis*

ANHUI — 29 December 2005: Yulong Cave, Qingyang County, 30°21'N, 117°50'E, 2 ♂♂; FUJIAN — 24 December 2005: Longkong Cave, Yanshi County, 1 ♂ and 1 ♀. 25 December 2005: Yuhua Cave, Jiangle County, 26°39'N, 117°35'E, 2 ♀♀. 26 December 2005: Bianfu Cave, Taining City, 26°42'N, 117°30'E, 4 ♂♂ and 3 ♀♀. 2 March 2006: Ganru Cave, Liancheng County, 1 ♂. 8 March 2006: Guwang Cave, Wuyi City, 27°42'N, 117°42'E, H: 792 m, 4 ♂♂ and 3 ♀♀. 9 March 2006: Huanghuacong Cave, Yanzijiao Town, Wuyi Mountain, 1 ♂ and 5 ♀♀; GUANGDONG — 16 September 2006: Shang Cave, Dafu Village, Meihua Town, Lechang County, 25°09'N, 113°04'E, 550 m a.s.l., 1 ♂; GUANGXI — 9 September 2002: Seven Star Cave, Guilin City, 1 ♂. 10 September 2002: Closed Cave, Ziyuan County, 1 ♂ and 3 ♀♀. 10 December 2004: Liangjiang Town, Wuming County, 2 ♂♂; GUIZHOU — 5 October 2003: Xipo Cave, Wuchuan County, 4 ♂♂; JIANGXI — 28 December 2005: Wanfu Cave, Jingdezhen City, 16 ♂♂ and 11 ♀♀; SICHUAN — 8 July 2005: Bao Zi Cave, Tian Quan County 30°10'N, 102°52'E, 839 m a.s.l., 2 juvenile ♂♂ and 1 ♀. 12 July 2005: Fufeng Cave, Emeishan, 29°34'N, 103°25'E, 538 m a.s.l., 1 ♂. 13 July 2005: Jiulao Cave, Emeishan, 29°33'N, 109°47'E, 1,750 m a.s.l., 6 ♂♂ and 2 ♀♀; YUNNAN — 18 November 2002: Mingjiu Cave, Mongzi County, 2 ♂♂ and 4 ♀♀. 17 December 2002: Pingbian Village, Mongzi County, 1 ♀. 18 December 2002: Wangzhangya Cave, Dawei County, 3 ♀♀. 26 November 2006: Bianfu Cave, Mengla County, 21°53'N, 101°18'E, 683 m a.s.l., 1 ♂.

Rhinolophus pusillus

BEIJING — 14 August 2001: Caves at Shidu, Fangshan District, first cave, 1 ♂; second cave, 1 ♂. 10 July 2002: Sanqing Cave, Wanglaopu, Fangshan District, 39°45'N, 115°45'E, 2 ♀♀. New provincial record; FUJIAN — 24 December 2005: Longkong Cave, Yanshi County, 1 ♂. 25 December 2005: Yinhua Cave, Jiangle County, 26°39'N, 117°34'E, 4 ♂♂ and 9 ♀♀. 2 March 2006: Jinkuang Cave, Liancheng County, 9 ♂♂ and 2 ♀♀. 2 March 2006: Ganru Cave, Liancheng County, 5 ♂♂ and 2 ♀♀. 3 March 2006: Niutongguan Cave, Liancheng County, 25°33'N, 116°59'E, 3 ♀♀. 3 March 2006: Chuqi Cave, Liancheng County, 25°33'N, 116°60'E, 5 ♂♂. 3 March 2006: Liuhuang Cave, Liancheng County, 25°52'N, 117°17'E, 468 m a.s.l., 4 ♂♂ and 1 ♀. 4 March 2006: Qixian Cave, Sha County, 4 ♂♂ and 1 ♀. 5 March 2006: Yinhua Cave, Jiangle County, 2 ♂♂. 5 March 2006: Jiuba Cave, Jiangle County, 2 ♀♀; GUANGDONG — 5 September 2002: Dingushan Forest Ecosystem, Cave of the Buddha, cluster of ca. 20 bats, captured 4 ♂♂ and 7 ♀♀. Butterfly Cave, Yunfu Mount, Bolo County, large roost (100s), captured 7 ♀♀. 24 October 2005: Fangkong Cave, Luofu Mountain, Huizhou City, 8 ♂♂ and 4 ♀♀. 9 August 2006: Dianxian Cave, Xinyi County, 22°20'N, 110°57'E, 94 m a.s.l., 6 ♀♀.12 August 2006: Shuili Cave, Xinyi County, 22°20'N,

APPENDIX. Continued

110°58'E, 134 m a.s.l., 10 ♂♂ and 1 ♀. 15 August 2006: rock crevice, Xinyi County, 22°15'N, 111°00'E, 214 m a.s.l., 3 ♂♂. 14 August 2006: Tongtian Cave, Xinyi County, 22°23'N, 110°72'E, 317 m a.s.l., 1 ♂. 16 August 2006: Chang Cave, Xinyi County, 22°17'N, 111°02'E, 489 m a.s.l., 9 ♀♀; GUANGXI — 7 September 2002: Jishui Cave, Guilin City, 25°17'N, 110°21'E, 1 ♂. 8 September 2002: White Dragon Cave, Guilin City, 1 ♂. 9 September 2002: Seven Star Cave, Guilin City, 3 ♀♀. 10 September 2002: Closed Cave, Ziyuan County, 2 ♂♂. 10 December 2004: Liangjiang Town, Wuming County, 6 ♂ and six ♀♀. 25 March 2005: Shui Cave, near Jishui Cave, about 100 m, Guilin City, 16 ♂♂. 17 May 2005: Shui Cave, Guilin City, 14 ♀♀. 12 June 2005: Jishui Cave, Guilin City, 20 ♀♀. 30 October 2005: Seven Star Cave, Guilin City, 1 ♂ and 1 ♀. 5 September 2006: Wulong Cave, Mashan County, 2 ♂♂; GUIZHOU — 1 November 2005: Shanjia Cave, Anlong County, 1 ♂ and 1 ♀. 31 May 2005: Leigong Mountain, three ♂; HAINAN — 9 September 2005: Fangkong Cave, Jianfeng Mountain, 18°54'N, 109°42'E, 1 ♂; HUBEI — 5 November 2004: Yichang City, 31°09'N, 111°08'E, 636 m a.s.l., 1 ♀. 6 November 2004: Shenlong Cave, Yichang, 31°21'N, 110°30'E, 869 m a.s.l., 1 ♀. 8 November 2004: Yeren Cave, Shennongjia, 31°55'N, 110°44'E, 821 m a.s.l., 5 ♂♂ and 3 ♀♀. 10 November 2004: Sihe Village, Langhe Town, Wudang Mountain, 3 ♂♂ and 3 ♀♀. 16 May 2005: Xianren Cave, Wuhan City, 25°53'N, 114°30'E, 16 ♂♂ and 9 ♀♀. New provincial records; JIANGXI — 27 December 2005: Longhushan Park, Yingtan City, 1 ♂ and 4 ♀♀. 28 December 2005: Wanfu Cave, Jingdezhen City, 7 ♂♂ and 4 ♀♀; SHANDONG — 2 January 2006: Xiaya Cave, Yiyuan County, 1 ♂. 1 March 2006: A mine near the road, Buyun Town, Shanghang County, 25°15'N, 116°50'E, 793 m a.s.l., 2 ♀♀. New provincial records; SICHUAN — 7 July 2005: Yilai Mountain, 30°29'N, 103°24'E, 596 m a.s.l., 4 ♂♂. 8 July 2005: Luding County, 29°48'N, 102°14'E, 1,080 m a.s.l., 1 ♀. 8 July 2005: Qilai County, 2 ♂♂ and 2 ♀♀; YUNNAN — 22 November 2002: Ahei Cae, Xishuangbanna, 3 ♀♀. 6 December 2002: Heshang Cave, Fumin County, 4 ♀♀. 7 December 2002: Xiangshui Village, Fumin County, 1 ♂. 18 December 2002: Wangzhangya Cave, Dawei County, 2 ♀♀. 7 September 2003: Fengjing Cave, Jiuxiang County, 1 ♂. 7 September 2003: Jiuxiang Cave, Yiliang County, 1 ♂ and 1 ♀. 8 September 2003: Bailong Cave, Mile County, 1 ♂. 9 September 2003: Shaft Cave, near Bailong Cave, Mile County, 1 ♂.

Rhinolophus sinicus

FUJIAN — 25 December 2005: Yinhua Cave, Jiangle County, 1 ♀. 26 December 2005: Bianfu Cave, Taining City, 5 ♂♂ and 6 ♀♀. 28 February 2006: Longkong Cave, Yanshi County, 3 ♂♂. 1 March 2006: a mine near the road, Buyun Town, Shanghang County, 25°15'N, 116°50'E, 793 m a.s.l., 5 ♀♀. 2 March 2006: Jinkuang Cave, Liancheng County, 1 ♂. 3 March 2006: Liuhuang Cave, Liancheng County, 25°52'N, 117°17'E, 468 m a.s.l., 1 ♂. 4 March 2006: Yuxi Cave, Mingxi County, 26°21'N, 117°11'E, 468 m a.s.l., 1 ♂ and 1 ♀. 5 March 2006: Yinhua Cave, Jiangle County, 1 ♀. 7 March 2006: Xing Cave, Qiliqiao Bridge, Wuyi Mountain, 27°45'N, 117°30'E, 1 ♂ and 1 ♀. 8 March 2006: a mine near the Changganzhou Road, Xincun Town, Wuyi City, 27°37'N, 117°50'E, 243 m, a.s.l., 1 ♂. 9 March 2006: Huanghuacong Cave, Yanzijiao Town, Wuyi Mountain, 2 ♂♂; GUANGDONG — 4 September 2002: Penglai Cave, Bolo County, 1 ♂ and 1 ♀. 24 October 2005: Fangkong Cave, Luofu Mountain, Huizhou City, 1 ♂ and 7 ♀♀. 9 August 2006: Ni Cave, Xinyi County, 22°20'N, 110°57'E, 105 m a.s.l., 1 ♂. 12 August 2006: Shuili Cave, Xinyi County, 13 ♂♂ and 12 ♀♀. 15 August 2006: an abandoned brick kiln, Xinyi County, 22°15'N, 110°60'E, 185 m a.s.l., one ♂ roosting alone; GUANGXI — 10 September 2002: Closed Cave, Ziyuan County, 8 ♂♂. 26 April 2005: Fenkeng Cave, Guilin City, 2 ♂♂. 6 May 2005: Fenkeng Cave, Guilin City, 1 ♂. 17 May 2005: Shui Cave, Guilin City, 2 ♂♂; GUIZHOU — 3 October, 2003: Jiang Cave, Jiangkou County, 23°25'N, 110°15'E, 2 ♂♂; HAINAN — 7 September 2005: Xiashui Cave, Qiongzhong County, 2 ♂♂. 7 September 2005: Hela Village, Hongmao Town, Qiongzhong County, 2 ♀♀. 8 September 2005: Diyi Village, Five Finger Mountain, 2 ♂♂ and 1 ♀. 9 September 2005: Fangkong Cave, Jianfeng Mountain, 1 ♂; HUBEI — 6 November 2004: Shenlong Cave, Yichang City, 1 ♂; JIANGXI — 27 December 2005: Longhushan Park, Yingtan City, 3 ♂♂ and 1 ♀. 28 December 2005: Wanfu Cave, Jingdezhen City, 14 ♂♂ and 10 ♀♀; SICHUAN — 12 July 2005: Fufeng Cave, Emeishan, 1 ♂ and 1 ♀. 13 July 2005: Jiulao Cave, Emeishan, 1 ♂; YUNNAN — 8 September 2003: Bailong Cave, Mile County, 2 ♂♂.

Rhinolophus stheno

YUNNAN — 22 November 2002: Ahei Cave, Xishuangbanna, 1 ♂. 24 November 2002: Jinuo Cave, Xishuangbanna, 21°58'N, 100°49'E, 3 ♂♂ and 3 ♀♀.

Hipposideridae

Hipposideros armiger

ANHUI — 29 December 2005: Yulong Cave, Qingyang County, 8 ♂♂ and 6 ♀♀; FUJIAN — 1 March 2006: Zhuxi Cave, Shanghang County, 1 ♂ and 7 ♀♀. 3 March 2006: Chuqi Cave, Liancheng County, 1 ♀. 4 March 2006: Qixian Cave, Sha County, 6 ♂♂ and 2 ♀♀; GUANGDONG — 2 September 2002: Cemetery Cave, 1 ♂. 4 September 2002: Yunfu Mount, Bolo County, 1 ♀; GUANGXI — 8 September 2002: White Dragon Cave, Guilin City, 7 ♀♀. 9 September 2002: Seven Star Cave, Guilin City, 1 ♀. 15 July 2004: Fenkeng Cave, Guilin City, 2 ♀♀. 26 April 2005: Fenkeng Cave, Guilin City, 1 ♀. 30 October 2005: Seven Star Cave, Guilin City, 1 ♀. 5 September 2006: Huru Cave, Mashan County, 1 ♂ and 3 ♀♀; GUIZHOU — 1 November 2005: Shanjia Cave, Anlong County, 1 ♂; HAINAN — 10 September 2005: Fangkong Cave, Yingge Mountain, 5 ♂♂ and 3 ♀♀; HENAN — 5 January 2004: Bianfu Cave, Xixia County, 1 ♀. New provincial record; SICHUAN — 7 July 2007: Xiusi Cave, Qiong Lai County, 30°29'N, 103°24'E, 596 m a.s.l., ca. 20 adults with pups in a cave, male, post-lactating female and non-breeding female captured. 8 July 2005: Bao Zi Cave, Tian Quan County, at least 40 bats with advanced young. 12 July 2005: Dahu Cave, Emeishan, some bats roosting in a maternity colony with *H. pratti*. 14 July 2005: Emeishan, 29°50'N, 103°17'E, 570 m a.s.l., a large maternity colony containing hundreds, possibly thousands of bats found at in a tunnel over a stream; YUNNAN — 22 November 2002: Ahei Cave, Xishuangbanna, one bat. 24 December 2002: Manfa Village, Xishuangbanna, 1 ♂. 2 September 2003: Heshang Cave, NW of Kunming, 25°12', 102°28', 1 ♂. 5 September 2003: Qingxuan Cave, near Lijiang airport, 1 ♀. 8 September 2003: Bailong Cave, Mile County, 1 ♀. 4 November 2005: Xiyou Cave, Fumin County, 1 ♂ and 1 ♀.

APPENDIX. Continued

5 November 2005: Bailong Cave, Mile County, 25°09'N, 102°38'E, 2 ♂♂. 5 November 2005: Puerhei Cave, Qiubei County, 24°12'N, 103°21'E, 3 ♂♂ and 1 ♀. 26 November 2006: Bianfu Cave, Mengla County, 2 ♂♂.

Hipposideros cineraceus

GUANGXI — 7 September 2006: Fangkong Cave 1, shelter around the abandoned airport, Ningming County, 22°07'N, 107°07'E, H: 120 m a.s.l., 8 ♂♂ and 13 ♀♀; YUNNAN —3 July 2007: Baihualing Cave, 4 ♂♂ and 4 ♀♀. 13 October 2007: Gulong Cave, Yuanjian County, 3 ♂♂ and 2 ♀♀.

Hipposideros larvatus

GUANGDONG — 2 September 2002: Yunfu Mountain, 1 ♂. 2 September 2002: Shishan Cave, Lishui Town, Nanhai County, 4 ♂♂ and 8 ♀♀; GUANGXI — 9 September 2002: Seven Star Cave, Guilin City, 1 ♂ and 1 ♀. 25 March 2005: Shui Cave, Guilin City, 1 ♂ and 3 ♀♀ captured in the cave as they hibernated. 15 July 2004: Fenkeng Cave, Guilin City, 17 ♂♂ and 7 ♀♀. 20 April 2005: Dashuang Cave, Guiping County, 23°13'N, 110°14'E, 135 m a.s.l., 1 ♂. 6 May 2005: Fenkeng Cave, Guilin City, 4 ♂♂. 16 May 2005: Fenkeng Cave, Guilin City, 3 ♂♂ and 1 ♀. 17 May 2005: Fenkeng Cave, Guilin City, 3 ♂♂ and 1 pregnant ♀. 17 May 2005: Shui Cave, Guilin City, 4 ♂♂ and 5 pregnant ♀♀. 13 June 2005: Fenkeng Cave, Guilin City, 2 ♂♂ and 7 lactating ♀♀. 13 July 2005: Seven Star Cave, Guilin City, 2 juvenile ♂♂. 13 July 2005: Seven Star Cave, Guilin City, 1 juvenile ♂. 7 September 2006: Fangkong Cave 2, a shelter around the abandoned airport, near Fangkong Cave 1, Ningming County, about 100 bats. 5 September 2006: Huru Cave, Mashan County, 1 ♀; HAINAN — 8 September 2005: Qianlong Cave, Baoting County, 3 ♀♀; YUNNAN — 8 September 2003: Bailong Cave, Mile County, one bat. 9 September 2003: Shaft cave, near Bailong Cave, Mile County, large roost (100s) captured 22 bats. 10 September 2003: Xi Long Xi Cave, Dali County, 23°50'N, 103°11'E, large roost (several hundred) captured 2 ♂♂, 3 ♀♀, including juveniles.

Hipposideros pomona

GUANGDONG — 4 September 2002: Penglai Cave, Yunfu Mount, Bolo County, 1 ♀. 24 October 2005: Fangkong Cave, Luofu Mountain, Huizhou City, 1 ♀. 9 August 2006: Ni Cave, Xinyi County, 13 ♂♂ and 19 ♀♀; GUANGXI — 12 June 2005: Jishui Cave, Guilin City, 1 ♀; HAINAN — 28 July 2007: Huangdi Cave, Bawang Mountain, Changjiang County, 8°58'E, 109°08'N, 9 ♂♂ and 14 ♀♀. 4 August 2007: Ling House, Baoting County, 12 ♂♂ and 5 ♀♀; YUNNAN — 3 September 2003: Laojun Cave, Midu County, 25°21'N, 100°22'E, 1,770 m a.s.l., 6 ♂♂ and 5 ♀♀ captured from a large roost possibly containing hundreds of bats. 8 September 2003: Bailong Cave, Mile County, 3 ♀♀.

Hipposideros pratti

Fujian — 5 March 2006: Jiuba Cave, Jiangle County, 1 ♂; GUANGXI — 7 September 2002: Moon Cave, Yangsuo County, 1 ♀. 9 September 2003: Seven Star Cave, Guilin City, 2 ♂♂. 10 September 2003: Closed Cave, Ziyuan County, 3 ♀♀. 13 July 2005: Seven Star Cave, Guilin City, 2 ♀♀; HENAN — 20 August 2001: Bianfu Cave, Xixia Countryside, large colony (100s), captured 5 ♂♂ and 4 ♀♀. New provincial record; SICHUAN — 8 July 2005: Baozi Cave, Tianquan County, 1 ♂ and 3 ♀♀ with 3 pups (2 ♂♂ and 1 ♀), at least 100 bats estimated in this cave. 12 July 2005: Dahu Cave, Emeishan, large (100's) maternity colony, mixed with smaller numbers of *H. armiger*.

Aselliscus stoliczkanus

GUANGXI — 5 September 2006: Huru Cave, Mashan County, 2 ♂♂ and 1 ♀; GUIZHOU — 1 November 2005: Shanjia Cave, Anlong County, 1 juvenile ♂; YUNNAN — 2 September 2003: Heshang Cave, Fumin County, 1 ♂ and 1 juvenile ♀. 26 November 2006: Bianfu Cave, Mengla County, 1 ♀.

Coelops frithii

FUJIAN — 2 March 2006: Jinkuang Cave, Liancheng County, 1 ♂ and 2 ♀♀. 8 March 2006: Changganzhou Cave, Wuyi City, 27°37'N, 117°50'E, 243 m a.s.l., 1 ♂ and 2 ♀♀; HAINAN — 22 July 2007: Xianren Cave, Shishan Town, Haikou City, 2 ♂♂ and 13 ♀♀.