Small Mammals

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Chapter 8

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Summary

We recorded a total of 33 small mammal species including seven shrew, two bat, 19 rodent and five lagomorph species. We obtained 16, 14 and 18 small mammal records from Danba, Kangding and Yajiang, respectively. In Danba County, 16 species of small mammals were found. Most species documented at this site are distributed only or mainly in China. Among species recorded were several species listed as threatened according to the 2007 IUCN Red List, most notably Salenski's shrew (*Chodsigoa salenskii*) listed as Critically Endangered and the Greater stripe-backed shrew (Sorex cylindricauda), listed as Endangered, both observed only in Danba County during this survey. In Kangding County, 14 small mammal species were documented, including eight species distributed uniquely or mainly in China. Fewer species of small mammals were documented at this site compared to the other sites, perhaps due to higher levels of human disturbance. In Yajiang County we captured 18 species, including the first record of the Shangdong small shrew (*Crocidura shantongensis*) for Ganzi Prefecture, a new subspecies of Qinghai vole (*Microtus fuscus*), and range extensions for the Greater brown vole (*Eothenomys miletus*) in Yajiang County. Prior to the RAP survey, we predicted that this site would have the lowest biodiversity of small mammals but the result show that this site had a diverse and interesting community of small mammals.

Introduction

Western Sichuan, located in the Himalaya-Hengduang Mountain Range, is situated within the Mountains of Southwest China, designated by Conservation International as one of 34 global Biodiversity Hotspots (Mittermeier et al. 2004). Ganzi Canton, which makes up a large part of western Sichuan Province, includes 18 counties. As few biodiversity surveys have been conducted in this area, few records exist for the small mammal fauna. In total, 58 species of small mammals have been recorded in Ganzi Canton prior to this RAP survey (Bainan S. 1982).

Small mammals play an important role in the ecosystem, particularly in their roles as prey for carnivorous animals and as seed dispersers. Reliable surveys enhancing our knowledge of the current small mammal distributions and their conservation status throughout Western Sichuan are urgently needed. Small mammal diversity of a given area cannot be exhaustively assessed within the short period of sampling per site typical for a Rapid Assessment Program (RAP) survey. Small mammal trapping results can nevertheless indicate how much of a forest community of small mammals still exists, or to what extent non-forest species have already invaded isolated forests or forest edges. In the areas surveyed, small mammals included insectivores (Order Insectivora), rodents (Rodentia), bats (Chiroptera) and pikas (Lagomorpha).

Methods

Collecting methods included pitfall and snap trapping, as well as mark-recapture techniques in Danba County only. We sampled at different elevations to investigate a broad range of habitats, placing traps at a variety of elevations and in different vegetation types to sample the diversity of small mammals present.

We collected small mammals in different habitats using the mousetrap-capture method. One mousetrap was placed every 5 m along a transect, and each transect was 15 m apart from one another. To increase the capture rate, mousetraps were placed in front of holes or along paths showing evidence of use by small mammals.

The pitfall trapping method captures insectivores, primarily. We buried buckets along paths showing evidence of use by small mammals or under rotten wood, and inspected the buckets the following day. If animals were present in a bucket, the bucket was removed and brought back to camp, then buried in another location. Buckets were buried for the purpose of collecting specimens, and so were not placed systematically. Between 10 and 15 buckets were buried daily.

The mark-recapture method was used to investigate the identity, population size, and home range of species. This method was put into practice in Danba County only. The first day we set capture boxes (sherman trap) baited with peanuts and melon seeds in selected habitats and recorded box serial numbers and locations. The following day we marked captured animals, using a sequence of serial numbers, before setting them free and replacing bait in each trap. We placed dry paper or hay in each trap to avoiding freezing captured small mammals. We followed this procedure on all consequent days spent sampling in Danba County, recording the species and number of individuals caught as well as the serial number of traps in which individuals were caught. Over four days, we set 36 traps in coniferous forest each day. In total, we set 144 traps. Due to cold weather and heavy rain, we captured only 10 individual small mammals among which only one individual was recaptured. The sample size was not large enough for us to calculate the population size.

Sampling Sites

At Site 1 (Danba), we surveyed Dongma village, including Dongma valley, Dingguoshan mountain and Kuiyong valley. The elevation of the region surveyed is 2800-5300 m. The habitats studied in Danba County provided fairly good conditions for small mammals and had low levels of human influence. The area included many different vegetation types, including grassland, high mountain shrub, conifer forest, conifer and broad-leaf forest, shrub-grass, meadow, plantations, abandoned buildings, residential areas and hardwood and broad-leaf forest. In Danba, we selected 15 sites to survey small mammals. In total, we set 783 snap-traps (of which 773 were recovered) while also setting 144 box-traps for mark-recapture studies.

At Site 2 (Kangding), we surveyed Tongling village with an elevation of 2400-5000 m. The habitats of the Tongling village area were in poorer condition than those in Danba County. The vegetation is mostly secondary forest regenerating after being logged, but the resulting forest is in a fairly good state. Types of vegetation included grassland, high mountain shrub, conifer forest, conifer and broad-leaf forest, hardwood and broad-leaf forest, residential areas and plantations. In Kangding County we selected eight sites for sampling small mammals and set 364 snap-traps (of which 361 were recovered) and 72 pitfall traps.

At Site 3 (Yajiang), we surveyed Decha village with an elevation of 3500-5000 m. Compared with the other two survey sites, the Yajiang site was located at a much higher altitude and contained different vegetation types. The lowest altitude sampled was 3500 m. The vegetation consisted mainly of plateau meadow and conifer forest. Surveyed habitats included snow-covered mountains, grassland, high mountain shrubs, conifer forest, evergreen shrubs, plantations and residential areas. In Yajiang County we selected 10 sites for small mammals samples. We set 410 snap-traps and recovered 403 of these. Forty-five pitfall traps were set at this site.

Results

Danba. In Danba County, we captured more than 120 small mammal specimens belonging to 16 species, including two species of insectivore, 11 species of rodent and three species of pikas (Appendix 5). Seven species collected belong to the Oriental realm, with the remaining 10 belonging to the Palearctic realm, according to Rongzhu Z. (1999). The 16 recorded species can be divided into five distribution types: the Oriental type is represented by three species, *Tamiops swinhoei, Niviventer excelsior* and *Niviventer confucian*; the South China type is represented by three species, *Dremomys pernyi, Apodemus draco* and *Apodemus chevrieri*; the Highland type is represented by five species, *Marmota himalayan, Neodon irene, Eozapus setchuanus, Ochotona gloveri* and *Ochotona thomasi*; the Himalayan-Hengduan Mountains type is represented by five species, *Sorex cylindricauda, Soriculus salenskii, Apodemus latronum*, and *Ochotona thibetana*; and the Palaearctic type is represented by one species, *Micromys minutus*. The most common genera collected were *Apodemus* and *Niviventers. Apodemus* spp. made up 43.5% of the captures and *Niviventers* spp. comprised 40.9% of the captures. Appendix 5 contains the species list of small mammals captured in Danba County. Among the 16 species, 13 species are endemic to China, or found mainly in China, including *Sorex cylindricauda, Soriculus salenskii, Apodemus chevrieri, Apodemus latronum, Niviventer excelsior, Eozapus setchuanus, Ochotona thibetana* among others.

Three species recorded during our survey of Danba County are listed as threatened on the current IUCN Red List (IUCN 2007). The two species of highest threat status recorded during our survey were both found only in Danba County: *Soriculus salenskii*, listed as Critically Endangered and *Sorex cylindricauda*, listed as Endangered. In addition, *Eozapus setchuanus*, listed as Vulnerable listed as Data Deficient, were also recorded at this site during our survey.

Kangding. In Kangding County, we captured 56 small mammal specimens and recorded a total of 14 species (Appendix 5). Among these, the Greater Horseshoe bat (*Rhinolophus ferrumequinum*) and Water mouse-eared bat (*Myotis daubentoni*) were also documented in the Sichuan Jintang-Kongyu Nature Reserve baseline survey conducted in June 2004. The Himalayan marmot (*Marmota himalayana*) were identified using tracks while the Rock squirrel (*Sciurotamias davidianus*) was seen in the forest. Specimens were not collected of these three species.

Included in the list of recorded species are three species of insectivore, two species of bat, and nine species of rodent. Of the recorded species, nine belong to the Oriental realm, three belong to the Palaearctic realm and two are widely distributed. The 14 recorded species can be divided into five distribution types. The Oriental type is represented by three species, *Rattus tanezunmi, Niviventer excelsior* and *Niviventer confucian*; the South China type is represented by two species, *Apodemus draco* and *Apodemus chevrieri*; the Himalayan-Hengduan Mountains type is represented by four species, *Uropsilus gracilis, Episoriculus caudatus,Blarinella quadraticauda* and *Apodemus latronum*; the Highland type is represented by two species, *Marmota himalayan* and *Eospalax fontanierii*; the Palaearctic type is represented by only one species, *Myotis daubentonii*; and two species, *Rhinolophus ferrumequinum* and *Sciurotamias davidanus*, are widely distributed.

The *Apodemus* spp. and the insectivore *Uropsilus gracilis* are the most common species found in this area. Among the 14 small

mammal species documented, eight species are endemic to China or found mainly in China including *Sciurotamias davidanus, Apodemus chevrieri, Apodemus latronum, Niviventer excelsior*, and *Eospalax fontanierii*. Fewer species of small mammals were documented at this site compared to the other sites and all species we recorded here are common in China.

One species recorded during our survey of Kangding County is listed as threatened on the current IUCN Red List (IUCN 2007): *Eospalax fontanierii*, listed as Vulnerable, was recorded only at this site during the RAP survey.

Yajiang. In Yajiang County, we collected 97 small mammal specimens and recorded a total of 18 species (Appendix 5). We recorded two species of insectivore, 12 species of rodent and four species of pika. Of these, nine species belong to Oriental realm and nine species belong to the Palaearctic realm. The species can de divided into six distribution types: the Oriental type represented by four species, *Crocidura shantongensis, Niviventer excelsior, Niviventer confucian* and *Hystrix brachyura*; the South China type represented by one species, *Apodemus draco*; the Himalayan-Hengduan Mountains type represented by three species, *Apodemus latronum, Eothenomys miletus* and *Ochotona thibetana*; the Palaearctic type represented by one species, *Tamias sibiricus*; the Northeast-north China type represented by one species, Apodemus peninsulae; and the Highland type represented by eight species, *Sorex excelsus, Marmota himalayan, Microtus fuscus, Neodon irene, Eozapus setchuanus, Lepus oiostolus, Ochotona gloveri* and *Ochotona cansus*.

Among the species collected are a number of interesting records. The Shangdong small shrew (*Crocidura shantongensis*) was recorded for the first time in Ganzi Prefecture during this survey. A new subspecies of Qinghai vole (*Microtus fuscus*) was collected. Range extensions were documented for the Greater brown vole (*Eothenomys miletus*) in Yajiang County. Prior to the RAP survey, we predicted that this site would have the lowest biodiversity of small mammals but our results show that this site contains a diverse and interesting community of small mammals, perhaps due to the low level of human disturbance here.

Species of note

Shangdong small shrew (*Crocidura shantongensis*)

We recorded one individual in shrubby forest at 3680 m in Xiadecha town at Site 3 (Yajiang). We indentified it as *Crocidura horsfieldii* in the beginning, which has not been recorded in China (Wilson 2005). To confirm its taxonomic status, we did further studies on the sequence analysis of mitochondrial cytochrome b gene and found that it is was consistent with that of the Shangdong small shrew (*Crocidura shantongensis*). In China, this species has previously been recorded in the provinces of Yunnan, Guizhou, Hainan, and Taiwan (Rongzu Z. 1997; Yingxiang W. 2003). Ours is the first record of this species in Ganzi Prefecture. Measurement data are: weight 4 g, head and body length 57 mm, tail length 46 mm, hindfoot length 11 mm, ear length 8 mm, greatest length of skull 18.4 mm, mandibular length 7.3 mm, breadth of skull 8.35 mm (measurement of interorbital breadth), breadth of molar tooth row 5.6 mm, length of upper tooth row (molar teeth) 8 mm, length of lower tooth row (all teeth) 7.4 mm. The ratio of tail length to head and body length is about 80.7%. Some long and sparse white hairs are found between the back of the body and the middle part of tail. The formula of teeth is 1.1.2.4/1.1.1.3.

Greater brown vole (*Eothenomys miletus*)

During this investigation we recorded four individuals of Divid's vole (*Eothenomys miletus*) in plantations at 3650 m near Decha town at Site 3 (Yajiang). This species, endemic to China, is mainly distributed in the provinces of Yunnan, Guizhou and Sichuan. In Sichuan Province, it has been reported in Dukou City, Nanchuan County and Qianjiang County (Zhang Rongzu Z. 1997; Zexun L. et al. 2000). Moreover, according to *Sichuan Fauna Economics* (Volume 2) (Jinchu H et al. 1984), it is usually found in shrubby forest and farmland habitats along Jinshajiang Valley at elevations between 800 and 2000 m. According to Youzhi W. and Jinchu H. (1999), it is distributed in the southwest mountainous regions (Liangshan Prefecture, Dukou City) and the eastern mountainous regions of Sichuan. According to our investigations over the last few years, *E. miletus* is not found in Litang, Daocheng, or Kangding Counties, all bordering on Yajiang County. Nor is the species found in Daofu, Jiulong or Xinlong Counties. Thus, in Sichuan Province, Yajiang is the only county for which a record exists for this species.

Its distribution in Yajiang Country is an interesting phenomenon for several reasons. First, the elevation at which we recorded this species is higher than its normal range. Secondly, its distribution in this area seems isolated. Perhaps individuals travel upstream along the Jinshajiang River and live near the Jinshajiang Valley. There is no high mountain between Yajiang and Muli counties and the areas of investigation in Yajiang link to the Jinshajiang River. It is therefore reasonable to believe that *E. miletus* may disperse from this area to Muli County.

Qinghai vole (*Microtus fuscus*)

We recorded two Chinese Qinghai voles in evergreen forest (elevation 3950 m) and shrubby forest (elevation 3990 m) at Lahagou, Xiadecha village of Decha town at Site 3 (Yajiang). According to Rongzhu (1997), this species is only found in parts of Qinghai Province, while Youzi and Jinchu (1999) also show the species in Shiqu County in Sichuan Province. It is said that this species has spread from Qinghai to Sichuan since the 1960's, only spreading about 60 km into Sichuan. In a baseline survey of Changshagongma Nature Reserve in Shiqu County from August to September 2005, we recorded several Qinghai voles. However, in a survey of Haizishan Nature Reserve in Litang and Daocheng Counties, we did not observe this species. In July and August 2005, we carried out a small mammal survey in the Dongyi district in Daocheng County again, and again no *M. fuscus* were recorded. From this, we conclude that the Chinese Qinghai vole is not found in Litang or Daocheng counties, both located between Shiqu County and Yajiang County. We conclude that the Yajiang specimens should represent a new subspecies of Qinghai vole for the following reasons: (1) different body size: the specimens of Qinghai vole found in Yajiang are much smaller than the species found in Shiqu County, and the measurement of these two are significantly different; (2) different color: the speciemens found in Yajiang are darker than those found in Shiqu; and (3) different habitat: the Qinghai vole was found in the forest instead of alpine grassland where Qinghai vole in Shiqu live.

Sichuan jumping mouse (*Eozapus setchuanus*)

The Sichuan jumping mouse is found mainly in the provinces of Shanxi, Gansu, Qinghai, Ningxia, Yunnan, and Sichuan (Rongzu Z. 1997; Yingxiang W. 2003). This species is divided into two subspecies, one of which, *Eozapus setchuanus setchuanus*, has only been recorded in Kangding County. The key characteristic of this subspecies is a "Y" strip on the chest and belly. The other subspecies is *Eozapus setchuanus vicinius* which is found in Gansu, Qinghai, Shanxi, Ningxia and Northern Sichuan provinces. This subspecies is characterized by a white belly lacking the "Y" strip. During this survey, we captured the Sichuan jumping mouse at Site 1 (Danba) and Site 3 (Yajiang). Before this RAP survey (in 2003 and 2004), we also captured several specimens that belong to the Kangding subspecies in Litang and Daocheng counties. This subspecies is very rare now and its distribution is greatly discontinuous. We have now documented this species in Kangding, Yajiang, Danba, Litang and Daocheng counties. This species is endemic to China, and has been listed in the China Red Book of Endangered Animals (Rarely seen) and by IUCN (Vulnerable).

Discussion

Our general impression is that the habitats of the surveyed area in Yajiang were in the best condition of the three sites surveyed despite the fact that the Yajiang survey site is found at a higher altitude and has fewer vegetation types. During this RAP survey, moresmall mammal species were recorded at Site 3 (Yajiang) than at the other sites, including a new subspecies and several rare species. Moreover, the valley people seem to be more conscientious of protecting the forest and animals. The forest is well preserved and the richness of biodiversity is higher in Yajiang than in the other two counties. Our results show that this area's conservation value is very high.

In general, small mammal diversity is greater in higher quality habitats, when compared to diversity in lower quality habitats. In appearance, the vegetation in Kangding is of high quality. The lowest altitude surveyed here was much lower than the other two survey sites. The habitat is appropriate for small mammals and should support a diverse and abundant fauna, based on our knowledge and experience, but we captured very few species of small mammals. This may due to the high impact of grazing on the vegetation and wildlife. Our results suggest that the intensity of grazing has an impact on the local diversity of small mammals. The habitat here is adequate to support the presence of several species of Divid's voles (*Eothenomys*), but we did not record any of these species, even though we set a number of traps in different habitats and at elevations ranging from 2400 to 3420 m. The absence of Eothenomys in our collections is noteworthy. Human disturbance may be a factor but further research is warranted as we could not determine the impact of such disturbance during this study.

The altitudinal range covered in Danba County was a little higher than that covered in Kangding. Although heavily logged before 1998, vegetation here has recovered well as a result of little human disturbance since the logging ban. The prolonged rain may have reduced the small mammal diversity we surveyed at this site as it's much lower than that we expected.

According to the animal geographical fauna, ten of 16 small mammal species in Danba County belong to the Oriental realm (62.5 % of captures) and six belong to the Palearctic realm (37.5 % of captures). In Kangding County, nine species belong to the Oriental realm (64.3 % of captures), three belong to the Palearctic realm (21.4 % of captures), and the remaining two species (14.3 % of captures) are widely distributed. In Yajiang County, nine species belong to the Oriental realm (50% of captures) and nine species belong to the Palearctic realm (50% of captures). Comparing the three sites, the proportion of Palearctic realm species is highest at Yajiang, followed by Danba and lastly Kangding. It is consistent with the mammal fauna in Sichuan Province in that Yajiang has a higher percent Palearctic species due to its location at the boundary of the Paleactic and Oriental realms while Danba and Kangding belong to the Oriental realms.

The mammals of Sites 1 (Danba) and 2 (Kangding) were divided into five distribution types, while Site 3 (Yajiang) mammals were divided into six distribution types. In Danba, we recorded three species each of Oriental and South China types, five species of Highland and four species of Himalayan-Hengduan Mountains types, one species of Palearctic type and two widely distributed species. In Kangding, we recorded three species Oriental type, two species each of South China and Highland types, five species of Himalayan-Hengduan Mountains type, and one species of Palearctic type. In Yajiang County, we recorded four species of Oriental type , eight species of Highland type, three species of Himalayan-Hengduan Mountains type, and one species each of south China, Palearctic, and Northeast-north China types. Comparing the three sites, Site 3 (Yajiang) has more highland types due to its higher elevation.

Conservation Recommendations

Site 1 (Danba). In this area there is a valuable mushroom species, *Tricholoma matsutake*, collected for sale by local people. Collecting mushrooms has effects on the wildlife. Although we found evidence of this action only at lower elevations and it appeared to have little effect on wildlife, we still suggest that this action be regulated properly to reduce impacts to wildlife.

Parts of this survey site are regenerating after previous logging. In this area, there were few species of small mammals and larger populations of a few species. This indicates that logging may have had a serious impact on the small mammal population and should be carefully regulated and monitored in the future.

Grazing has some moderate impacts on small mammal fauna. Although the local residents own their grazing fields and the cattle don't often enter the woods to graze, we still suggest that people put efforts in place to protect the environment from damage resulting from grazing. Furthermore, we should be cognizant of the positive effects of Buddhism and the local monastery on wildlife protection.

Site 2 (Kangding). Forsts here are recovering from logging in the past. Intensive grazing largely affected the habitats of small mammals. We suggest that the local forestry bureau take measures to control this situation and put some efforts to reduce the impacts on wildlife that result from grazing. As Giant pandas were found in this area during the third Giant Panda Survey, this area should be protected to preserve Panda habitat.

Site 3 (Yajiang). The local people generally do not hunt the wildlife, especially those animals living in the secret mountains. We should encourage the positive effects of the local Buddhist religion on wildlife protection.

As grazing results in impacts to local wildlife, we suggest that the local forestry bureau put forth efforts to regulate and monitor this activity. At the Yajiang survey site, we documented many interesting species of small mammals. We recommend further studies in this region.

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