

**Final Report of**

## **BP Conservation Programme – OWL 2002**

**Project name:**

### **Conservation Action on the Endemic Owls at Lianhuashan Mountains**

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**Abstract:** During 2002-2004, 120 nest boxes were set up at Lianhuashan Mountains to help the endemic owls (the Sichuan Wood Owl and Boreal Owl). The Boreal Owl started to breed in our nest boxes in 2003, 4 and 6 nest boxes were used by Boreal Owl in 2003 and 2004. Although the Sichuan Wood Owl has not used our nest boxes, signs showing they have started to enter our nest boxes, we believe the Sichuan Wood Owl would use our nest boxes in following years. We made censuses of the Sichuan Wood Owl and the Boreal Owl, and found the Sichuan Wood Owl was in low density. However, the number of Boreal Owl in our study area was getting raised, possibly benefited by the nest boxes. During this project, we also monitored the breeding of the Boreal Owl in our nest boxes, and investigated the rodent population in our study area.

## **INTRODUCTION**

There are two endemic species/subspecies of owls involved in this project. The Sichuan Wood Owl (*Strix davidi*) and the boreal owl (*Aegolius funereus beickianus*). The Sichuan

Wood Owl was first described by Sharpe (1875) as *Syrnium davidi*, after a type from “Moupin” in Sichuan. It was named after the French missionary Pater Armand David, who discovered this large owl during his first expedition to China in 1866 and collected a male specimen. At all times, the Sichuan Wood Owl was classified as extremely rare and therefore rated internationally as a “vulnerable” bird. In China this owl is listed in category II of nationally important species, as all other owls (Zheng & Wang 1998), and, Sun (2001) suggested this endemic owl should be raised as category I nationally important species.

The Boreal Owl has a circumpolar distribution, inhabiting conifer forest in northern hemisphere. Three subspecies have been found in China (Cheng 1976, 1992); *A. f. pallens* in Tianshan Mountain in western Xinjiang, *A. f. sibiricus* in the Wulunbeier area of Inner-Mongolia and in the Daxinganling Mountains in northeast China. In Gansu, *A. f. beickianus* was first recorded at Tiantong Temple area in 1928 by Stresemann. After that the bird has not been reported for quite a long time (Wang 1991), except for a few records at Guinan in Qinghai and Jiuzhaigou in Sichuan (Cheng *et al.* 1991, Zheng and Wang 1998).

## STUDY AREA

Our study area is located at Lianhuashan Mountains (34°45'-35°06'N, 103°27'-103°51'), which including the Lianhuashan Natural Reserve, parts of Yangsha and Yeliguan forestry farms in Kangle, Lintan and Zhuoni County, Gansu Province, China. The altitude of forest around this area is between 2600 m to 3600m, with the highest peak of 3616 m. The yearly average temperature in the Lianhuashan Natural Reserve was 5.1-6.0°C, with a high of 34°C and a low of -27.1°C.

The forest occurred on northern slopes and some north-east or north-west slopes; it was too dry for forest on the southern slopes, there only grass and shrubs. The forest is

dominated by fir (*Abies fargesii*), spruce (*Picea asperata*), birch (*Betula* spp.), and many kinds of willow (*Salix* spp.).

The Tao River originating from the mountains in the south of Lanzhou is running from south to north, flowing into the Yellow River just before arriving the capital of Gansu province. About 120 km south of Lanzhou, where the Tao River valley is cutting the last mountain chain before reaching the plateau, the Lianhuashan is located on the right side of the Tao River, and its name was got from an impressive chain of white peaks partially covered with beautiful green mixed forests.

The mountain forests in our study area are fragmented in several ways – naturally by deep valleys and creek systems at lower altitude and by the timber line around 3,500 m, at the one hand and by heavy cutting of mature forests, at the other hand which has occurred recently and also in the past resulting in extended agricultural landscapes.

From Chinese Grouse (*Bonasa sewerzowi*) landscape works, we used satellite imagery of a 120,000 ha area covering the reserve and its surrounding with the aim to measure the dimension of patchiness. Within the reserve we identified about 1,200 ha of mature coniferous-dominated forest (excluding mixed forest with a low proportion of coniferous trees) in 11 patches. The patches were 12-320 ha in size, averaging 106 ha. The conifer patches were connected by extensive shrub land.

In the whole surrounding area of 120,000 ha studied, it became evident that mature conifer islands (4,100 ha in sum) were rare and very fragmented forming a fine-grained mosaic in the landscape with an average patch size of only 18 ha. About 60% of all conifer patches were smaller than 10 ha and only 3 % exceeded 100 ha. The mixed forest area (18,800 ha in sum) was fragmented into 480 islands having an average size of 40 ha. 64% of the mixed forest patches were smaller than 10 ha.

In our study area, the villages within and around the reserve were inhabited by Chinese, Hui, Tibetan nationalities people. In 1992, 7050 people lived in 13 villages within the

reserve, by 2000, this population had increased to about 10,000. They live mostly from agriculture and about 8,350 grazing animals (sheep, cattle and yaks) in 1992. These people are poor, and exert great pressure on the forest resources, regularly collecting dead wood, arrow bamboo, mushrooms and other edible plants, and occasionally even illegally cutting trees in the nature forest.

## **METHODS**

### *Nest box-design*

We designed the nest boxes according to the nest box styles for the European Ural Owl and Boreal Owl. We distributed the nest boxes according to the topography characters and spread them in different altitude from 2400 m to 3000 m. The nest boxes were set up at the trunk of the trees, with the height higher than 3 m, to avoid possible disturbance by local people. The openings the nest boxes are normally to the south, to get more sun shines (warm) into the nest boxes. In 2003, we started to make new type of nesting boxes with tree barks covering outside.

### *Investigation on the presence of the owls*

In 2002 and 2003, we surveyed the owls by line transects, without playback the calls of the owls. In 2004, we used the playback survey to investigate the presence of the Sichuan Wood Owl and the Boreal Owl. The surveys were taken in the evening-night during 8:00-10:00 pm along the paths around our study area, and we stopped to playback the calls every 0.5 km.

### *Nest boxes checking and breeding monitoring*

During breeding season from March to July, we checked the nest boxes every 20 days in 2002 - 2003 and every 10 days in 2004. When we found a next box was occupied, we

would monitor the whole breeding procedure of the bird. Video camera was used to monitor two nest boxes, and recorded all-night activities in the nest boxes.

### *Food of the Boreal Owl and the local rodent population*

In 2004, we studied the preys stored in the nest boxes. Night-capture method was used to analyze the local rodent species and density.

## **RESULTS**

In May 2000, I discovered a Boreal Owl nested in a trunk of 4 m when I was surveying on the landscape study of Chinese grouse at Duozang of Yeliguan Forestry Farm with the altitude of 3000m. The forest in that area was seriously destroyed, this Boreal owl bred in such single trunk gave me a shock and from that time I decided to help these owls.

As the forest in most of study area had been selectively logged, almost all big trees were cut. At least we knew the Boreal owl bred in the holes of the big trees, so they might meet difficulties of their breeding. In order to protect the Boreal owl, we started this project and our team started to set up nest boxes in this area. During 2002 to 2003, 120 nest boxes (50 for the Sichuan Wood Owl and 70 for the Boreal Owl) were set up in the Lianhuashan Mountains. Most boxes were in the Lianhuashan Natural Reserve and some were outside the reserve.

### *The Sichuan Wood Owl*

In spring 2004, we played the calls the Sichuan Wood Owl and Boreal Owl in our study area. We got answers from the Sichuan Wood Owls at four sites (every site the answers were more than three times), in an area of 4 km<sup>2</sup>. We thought there would be the territorial area for 2-3 males of the Sichuan Wood Owl, so the density of the Sichuan Wood Owl in our study area might be around 0.5-0.75 males/km<sup>2</sup>. From this

investigation, we got the knowledge that the Sichuan Wood Owl needed large areas for breeding and the density of the birds during breeding season was low.

No Sichuan Wood Owl has bred in our nest boxes during 2002 to 2004. In 2002 and 2003, we did not get any signs in our nest boxes for the Sichuan Wood Owl, however, in 2004, two nest boxes were found the feathers, possibly from the Sichuan Wood Owl, we thought the Sichuan Wood Owl have been in the boxes. We suspect that the Sichuan Wood Owl is getting used to our nest boxes.

By communicating with the researchers working on the Ural Owl (*Strix uralensis*) in Europe, they told us the Ural Owl were getting used to the nest boxes after the boxes were set up for five years. We still believe that the Sichuan Wood Owl will use our nest boxes in following years and wish to continue this project.

If the Sichuan Wood Owl could be getting used to our nest boxes, our action would raise the density of this rare bird.

### ***The Boreal Owl***

#### *Census of the Boreal Owl at Lianhuashan*

In 2002, we made censuses of the owls by line transects, however, not using the playback method. There were only three sites we got the calls of the Boreal Owl.

During the early breeding period, the male Boreal Owl made territorial calls (primary song) in the evening and night, sometimes also in daytime. In 2004, we made playback surveys of the Boreal Owl from mid March to early May. We got answers from 10 calling stops, in which 3 stops we got three times of answers. For the 10 calling stops, we found one nest box (#4) had been used and two boxes were used after we got calling for 1-2 weeks the calling (nest box #2 and #6), see Table 2. Altogether we defined 5 breeding territories in our main study areas.

We had an impression that Boreal Owl population rose in 2004 compared with 2002, however, as we did not use playback method in 2002. We need to continue the surveys in following years to see the population trend of the Boreal Owl.

*Breeding status of the Boreal Owl in 2003 and 2004*

There was no owl using our nest boxes in 2002, the first owl using our nest boxes was found on 29 May 2003. This is an old style nest box. In 2003, altogether 4 nest boxes were used by the Boreal Owls, see Table 1.

Table 1. The breeding status of the Boreal Owl at next boxes at Lianhuashan in 2003

	#8	#9	#81	#50
Date female found at the nest box	31 May	29 May	20 June	23 June
Status when finding	Incubating	Incubating	Incubating	Egg laying
Clutch size	3	3	4	3
Young owls hatched	2	3	4	0
Number of nestlings leaving the nest boxes	2	2	4	
Reproductive success rate**** □ % □	67	67	100	0
Notes	One egg was broken	The female died at nest		Nest was destroyed by predators

After the experience we got in 2003, we decided to pay more attention on the breeding of Boreal Owl in 2004. We monitored the breeding of the birds by wireless video camera-

recorder system and got more detailed information of their breeding. In 2004, 6 nest boxes were occupied by the Boreal Owl, see Table 2.

Table 2. The breeding status of the Boreal Owl at nest boxes at Lianuashan in 2004

	#3	#6	#5	#1	#2	#4
Date female at nest box	before 13 May	—	—		8 May	
Egg laying	18 May	before June 6	—	24-25 April	17-22 May	before 26 April
Clutch size	2	2		3	3	4
Egg size (mm <sup>3</sup> )*	13.41	13.11		11.58	10.10	—
Incubation period (days)	—	>30	—	—	27	>31
Young owls hatched	—	2	3	—	3	4
Nestling period 1 ** (days)	—	17	—	—	23	16
Date female leaving	—	18 July	1 July		6 July	12 June
Nestling period 2 *** (days)	—	21	9		15	28
Date and number of nestlings leaving	—	9 August 2	10 July 1		21-22 July 2	9 July 3
Reproductive success	—	100	>33	—	66	75



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rate****					
□%□					
Notes	Nest was	2	Nest was	1	2
	abandoned	nestlings	abandoned	nestling	nestlings
	around 5	died	around	died	died
	June		13-15		
			May		

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\* Egg size showed by the volume index= $\pi \times \text{egg length} \times \text{egg width}^2 / 6000$

\*\* Nestling period with the female Boreal Owl at nest

\*\*\* Nestling period when the female not at nest

\*\*\*\* Reproductive success rate is calculated as the percent of nestlings leaving the nest boxes of eggs laid.

Some breeding notes of the Boreal Owl at our nest boxes: Only female incubated in the nest boxes, the male sent food to the female in the night, and some of the preys were stored in the next boxes. After hatching, the female stayed in the nest boxes for about 16-23 days, and then left the breeding territories. Then the males would continue feed the nestlings until their age around 38-44 days.

The breeding success of the Boreal Owl in our nest boxes is averaged 68.2% (n=7 nests, 22 eggs) (nest abandon not included), indicating that our nest boxes are effective for helping the breeding of the owls. When video-monitoring the breeding of one nest boxes, we found that one predator (a wild cat) was trying to enter the nest box, and at last failed.

By comparing the clutch size and nestlings survived with the work in Europe and North America (see Table 3), we found our owls have little egg, less clutch size and produce less nestlings, and we suggest that more conservation actions should be done and our efforts should also be continued.

Table 3. Reproductive characters of the Boreal Owls at Lianhuashan compared with other areas in the world

	Location	Date of egg laying	Egg size*	Clutch size	Nestlings survived
Lianhuashan	N34-35	24 April-6	11.81±1.16	2.8	2
	E103	June			
North	N64 E20	Early	12-13	4-8	2-6
Sweden		March – mid June			
Western	N63 E23	23 Feb.-1	12.13±0.9	5-6	3.9
Finland		July			
Germany		—	—	3.8	3.4
Idaho, USA		12 April - 24 May	12.18	3.25	2.3

\* Egg size showed by the volume index= $\pi \times \text{egg length} \times \text{egg width}^2 / 6000$

Besides the owls, some passerine birds also used the nest-boxes, including one pair of the black-crested tit (*Parus rubidiventris*), one pair of the common tree-creeper (*Certhia familiaris*), two pairs the white-cheeked nuthatch (*Sitta leucopsis*). All the birds bred successfully in the nest-boxes.

At least 3 cases, the nest-boxes which were used by the owls had been formerly used by the nuthatches, and the nuthatches had put lot of mosses in the boxes. The owls then robbed the boxes from the nuthatches. So we thought the owls might need mosses in the nest-boxes, and in 2004 we put grasses and mosses in the nest boxes.

#### *Food analysis and survey of the small mammals*

A preliminary study on species composition, diversity and biomass of small mammal community in coniferous forest at Lianhuashan Natural Reserve was conducted in autumn 2003. Seven species of small mammals were captured, among which *Apodemus peninsulae*, *Caryomys eva* and *Sorex sinalis* were dominant species of the community.

The result of biomass also showed that *Apodemus peninsulae* and *Caryomys eva* were two predominant species. The moisture might be a major factor influencing the biomass of the community.

### *Landscape and local bird fauna*

From different views the forest reserve “Lian Hua Shan” is quite unusual, and its goal to preserve undisturbed forests of the mountain region together with its fauna is of high importance in a supra-regional, partly even global level.

For the first all the tree-species, which are typical for the high mountains, could maintain in this rather isolated woodlands, whereas they clearly are from autochthonous origin, with a healthy potential for rejuvenation, - regardless of human utilizations and former logging. On the other hand a great number of animal species found a refuge in mountain forests during the glacial time, like in the area around “Lian Hua Shan”, where they could survive up to now – in absolute isolation: This group is represented especially by famous bird-species as the Chinese Grouse, the Blue Eared Pheasant, the Sichuan Wood Owl, the local subspecies of the Blood Pheasant and Boreal Owl– as the richness of the songbirds.

During our work at Lianhuashan, we also studied the breeding of some endemic birds, such as the Snowy-cheeked Laughingthrush (*Garrulax sukatschewi*) and the Chinese Thrush (*Turdus mupinensis*) and published the papers.

### **Conservation status of the population of Sichuan Wood Owl**

---- From Dr. W. Scherzinger’s paper: Encounter with the Sichuan Wood Owl (*Strix uralensis davidi*) in western China.

The distributional isolation, as well as the evident rarity of the Sichuan Wood Owl, may suffice to cause this population to become endangered. In addition, the natural availability of suitable habitats is strictly limited infact of a high degree of fragmentation of old growth coniferous forests, caused by a diverse morphology of the high mountains. But on top of this, human impact decrease the owl’s chance of survival by extensive

clear-cutting and grazing in the natural mountain forests in large parts of Sichuan, especially in eastern Tibet in the 1970-s. Therefore it is out of doubt, that the degree of endangering of this poorly known owl should get rated much higher (Duncan 2003). Nowadays there is hope, because the new politics in China to maintain the woodland areas and encourage reforestation (as an answer to the increasing risks by erosion and flooding) may succeed in time and could undo the aggravating fragmentation of the forests in the mountains! Regarding to the reserve “Lian Hua Shan”, first results of mapping the actual distribution of forest stands exist, based on satellite-data, which can be used to plan reforestation, to create stepping stones and corridors between the remnant forest patches (Klaus et al. 2001). Supported by a “BP-Conservation Programme” a sample of suitable nest boxes were placed in the reserve in 2002-03, to offer adequate nesting sites for the Sichuan Wood Owl even in younger forest stands, and also to provide possibilities for observations of incubation and rearing its offspring.

### *Conservation suggestions*

Without doubt the importance of the nature reserve “Lianhuashan” can and will increase in future, concerning to its ecological, faunistic, conservational - and also touristical value, if the unification of the forest stands, as far as could remain in the reserve, with further stands in the western neighbourhood finally will succeed. The adjacent Yuliguan Forest Farm has a high potential because its size for the protection of forest birds and mammals requiring large scale territories and large space for movements and migration. To form an extended forest bridge by planting autochthones trees is one of the most vulnerable activities started some years ago. This should be continued on large scale.

More nest boxes should be set up in the forest, especially in the Yeliguan Forestry Farm areas.

### ***Team members working for this project during 2002-2004***

All together 16 people worked for the project during 2002 -2004, they are from Institute of Zoology, universities from local Gansu province, and local Lianhuashan Natural Reserve. We think the attendance of activities of this project, will help to educate the local people of their conservation ideas. Of all the members, Gu Yuan has been studying for her M.S. degree on the study of the Boreal Owls.

Researchers and students from Institute of Zoology, Chinese Academy of Sciences:  
Fang Yun, Gu Yuan, Bi Zhonglin, Ji Ting, Jiang Yingxin, Sun Yue-Hua

Staffs and workers from Lianhuashan Natural Reserve:  
Liu Xiusheng, Luo Peipeng, Song Jiangning, Li Yongsheng, Liu Hanguo, Li Chengrong

Students from Gansu Agricultural University:  
Ai Jiyun, Dai Ningcheng

Students from Gansu Forestry College, Tianshui  
Li Jinlin, Zhao Shiqing

### ***Papers published and accepted with BP Conservation Programme cited in acknowledgements***

Some preliminary results have been published or accepted for publishing in the national and international journals, however, main results from our project have not been published, we will publish those results and BP Conservation Programme will be cited. We will continue to report those papers to BP Conservation Programme managers after this summary been submitted.

1. Bi, Zh.L., Y. Gu, Ch.X. Jia, Y.X. Jiang & Y.H. Sun\* 2003 Nests, eggs, and nestling behavior of the Snowy-cheeked Laughingthrush (*Garrulax sukatschewi*) at Lianhuashan Natural Reserve, Gansu, China. The Wilson Bulletin 115 (4): 118-121.
2. Liu, X. Sh., Y.H. Sun, J.N. Song, Ch.X. Jia & Y. Fang 2003 Breeding notes of the Chinese Thrush at Lianhuashan, Gansu. Sichuan J. of Zoology 22(4): 235-237.
3. Sun, Y.H., Y. Fang, Scherzinger W. & Klaus S. 2004 Breeding notes of the Boreal Owl (*Aegolius funereus beickianus*) at Lianhuashan in Gansu, China. Chinese J. of Zoology 39(6): 99-100.
4. Scherzinger, W., Y. Fang et al. 2005 (accepted) Encounter with the Sichuan Wood Owl (*Strix uralensis davidi*) in western China. Newsletter of British Ornithologists' Club.
5. Gu, Y., Y. Ma & Y.H. Sun 2005 (accepted) A Rediscussion on the Taxonomic Status of *Cansumys canus*. Chinese J. of Zoology 40.

## Photos from BP Conservation Programme OWL 2002



In May 2000, we found one Boreal owl breeding at a trunk of fir in the Lianhuashan Mountains (outside the Lianhuashan Natural Reserve), the forest had been heavily cut and you might not find one big tree in that area.

From this finding, we thought the bird might have difficulties for their breeding. So we applied for this BP Conservation Programme. We thank BP Conservation Programme approved our project in 2002. After 3 year of work, we did help the endemic owls in the Lianhuashan Mountains.





The landscape of the Lianhuashan Mountains.



The nest boxes were checked every 10-20 days, in this photo, Mr. Li Jinlin, our team member from Gansu Forestry College, was checking the nest box of the Boreal Owl.





This is the first owl using our nest boxes, the photo was taken on 29 May 2003. This is an old style nest box. In 2002, no owl used our nest boxes, so we were afraid the boxes we set up in 2002 might be too obvious and the owls might dare not to use them. This owl told us that they could use this type of nest-boxes, however, they needed some time to getting used to the “new homes”.





In 2003, we set up new type of nest boxes and they were looked more natural. This one was used by a boreal owl at the same year. (Nest box #81, 2003)



The eggs of the Boreal Owl. The owls stored food in their nests, from analyzing the stored food, we could learn the diet and reproduction status of the bird.





The habitat of the Boreal Owl at Lianhuashan. From this photo, you might see that most spruce and fir trees are young and the owls could not use them for breeding. Our action of setting up the nest boxes should help the birds much. In this photo, Fang Yun was capturing the female boreal owl from our nest-box #8. He would measure and mark her and her young. (nest box #8, 2003)





Fang Yun was measuring the eggs of the Boreal Owl from our nest boxes.



Four lovely young Boreal Owls from our nest-box 81. On 18 July 2003, they were marked with numbered aluminum foot rings, and we wish we could see them if they would use our nest-boxes in the future years.





Up to now, the bigger nest-boxes for the Sichuan Wood Owl have not been used. In 2004, we found the signs of the Sichuan Wood Owl entering our nest boxes. We think the bird is getting used to our nest boxes, and believe we will have success in following years.





This nest box was occupied by a pair of white-cheeked nuthatch (*Sitta leucopsis*). In this project, the black-crested tit (*Parus rubidiventris*) and common tree-creeper (*Certhia familiaris*) also used our nest boxes.



The satellite picture of our study area, shown by the blue square, in this project, our work was mainly in the Lianhuashan Natural Reserve, we wish to set more nest boxes in the future, in the Yeliquan Forestry Farm and Zhuoni (Jone) county (shown by the pink words).





In 2002, Mr. Jiang Yingxin, our team member from Institute of Zoology, was carrying the nest boxes to the forest for setting up.

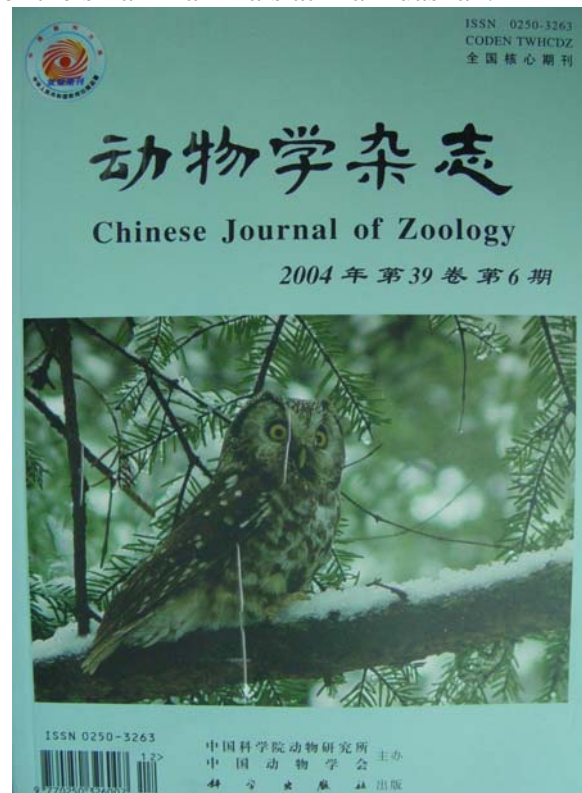


In 2003, new type of nest boxes were transported to the station and set in the forest.





Mr. Li Jinlin, our team member from Gansu Forestry College, was making the survey of community structure of the small mammals at Lianhuashan.



Altogether five papers were published or accepted in 2003 and 2004, with BP Conservation Programme cited in the acknowledgments. In the new issue of Chinese Journal of Zoology, the Boreal Owl was served as a cover photo.