*Cibotium barometz*

**Country – VIET NAM**
**Original language – English**

***Non-detriment finding for Cibotium barometz in Viet Nam***

Nguyen Tap[1], Le Thanh Son[1], Ngo Duc Phuong[1], Nguyen Quynh Nga[1], Pham Thanh Huyen[1], Nguyen Tien Hiep[2]

[1] National Institute of Medicinal Materials, 3B Quang Trung Str., Hoan Kiem Dist., Ha Noi, Viet Nam – ptainguyen@yahoo.com

[2] Center for Plant Conservation (CPC) of the Viet Nam Union of Science & Technology Associations (VUSTA) – Ha Noi, Viet Nam – ntienhiep@hn.vnn.vn

## I. Background information on the taxa

### 1. Biological data

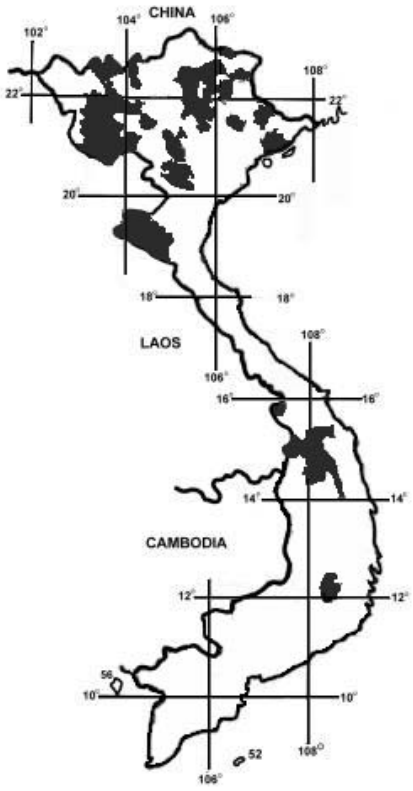
#### 1.1 Scientific and common names

Scientific names: ***Cibotium barometz*** (L.) J. Sm. It belongs to Cibotiaceae (Smith et al. 2006).

Comon names: Cau tich (Dog's spinal column - Vietnamese Chinese), Long cu ly (Culy hair), Long khi (Monkey hair), Kim mao (Golden hair - Vietnamese Chinese), Cu lan (Do Tat Loi, 1999; NIMM-WHO, 1990; NIMM, 1999), Cut bang (Tay Ethnic), Co cut pa (Thai Ethnic), Nhai cu vang (Dao Ethnic), Dang pam (K'Ho Ethnic), Golden moss (English), pitchawar, agneau de scythie, cibotie (French).

**Distribution**

*Cibotium barometz* is mainly distributed in the tropical and subtropical regions of Asia including North – East India, Myanma, Thailand, Laos, South China, Malaysia, the Philippines, Indonesia, Japan and Viet Nam. In Viet Nam, this plant is widely distributed unevenly in mountainous provinces in the North, including Cao Bang (Ha Quang, Nguyen Binh, Thach An districts); Lang Son (Huu Lung, Loc Binh dist.); Quang Ninh (Ba Che, Hoanh Bo, Van Don dist.); Lai Chau (Phong Tho, Than Uyen dist.); Lao Cai (Bat Xat, Muong Khuong, Bao Thang); Yen Bai (Mu Cang Chai, Tram Tau dist.); Dien Bien (Dien Bien Dong, Tua Chua, Tuan Giao dist.); Son La (Quynh Nhai, Song Ma, Thuan Chau, Mai Son dist.); Hoa Binh (Mai Chau, Da Bac, Tan Lac dist.), Tuyen Quang (Na Hang, Yen Son, Chiem Hoa dist.); Bac Can (Ba Be, Na Ri, Bach Thong dist.), Thai Nguyen (Phu Luong, Dai Tu, Dinh Hoa dist.); Phu Tho (Thanh Son, Tam Son dist.); Vinh Phuc (Tam Dao dist.); Thanh Hoa (Quan Hoa, Ba Thuoc, Cam Thuy dist.); Nghe An (Ky Son, Tuong Duong, Con Cuong dist.)... and some high mountainous areas in the South such as Ngoc linh (Dak Gley, Dak Ha, Tu Mo Rong, Kon Plong dist.) in Kon Tum province, Quang Nam province (Tra My, Tay Giang dist.); Chu Yang Sin in Dak Lak provine and Bi Dup in Lam Dong province (Do Tat Loi, 1999; NIMM & WHO, 1990; Nguyen Tien Ban et al., 1996; Nguyen Tap in NIMM, 1999; Nguyen Tap in Do Huy Bich et al., 2004). Based on survey results and information from literature data, we mapped all the regions where this species was found in Viet Nam (Map 1).




Map 1 – Schematic distribution of *Cibotium barometz* in Viet Nam
(Regions are occurrence of the species are indicated with dense shading)

**1.2 Biological characteristics**

**1.2.1 Provide a summary of general biological and life history characteristics of the species** (e.g. reproduction, recruitment, survival rate, migration, sex ratio, regeneration or reproductive strategies, tolerance toward humans)

*Cibotium barometz* is recognized as a tree fern and hygrophilous and slight shad enduring especially when young. Rhizome stout, prostrate, are densely covered with shining brown long hairs. Fronds close; stipes thick, up to 1 m long or more, triangular in transverse section at base, densely bearing caducous adpressed hairs, stipe and rachis green, turning purplish beneath with age; with a continuous or broken row of linear aerophores on each side of stipe, base of stipe with a mass of long (1-1.5 cm) hairs, upper part of stipe and rachis covered with small, appressed flaccid hairs becoming glabrescent; laminae 2-pinnate-pinnatifid, 1.5-3 m long; medial pinnae 40-80 x 15-30 cm, lower pinnae shortened, deflexed; pinnae many, alternate, stalked, pinnules short stalked, usually of about equal length on either side of rachilla; pinnule-segments slight falcate, apiculate, margins crenulate to serrulate-serrate; veins free, fertile ones simple, sterile simple or forked; laminae subcoriaceous, upper surface deep green, lower surface glaucous, glabrous on both sides, except the hairy midrib; venation visible on both surface, free, lateral veins simple or forked. Sori 1-5 pairs on pinnule-segments; indusia bivalvate, outer indusia round, inner ones more or less oblong; outer valve of indusium usually large; paraphyses dark reddish brown. Spores pale yellowish, with equatorial flange.

Reproduction of the plant normally occurs through spores in sexual propagation. Plants can produce large quantity of spores. Spore-bearing period lasts from August to December. It is observed that old rhizomes can spout some lateral buds, which grow into large rhizome. By spore propagation, the populations increase quickly and become large and dense in valleys and forest edges. However, it takes several years (over 4 years) for an individual grow into a mature spore-bearing plant. It also takes time to reach an exploitable plant of which rhizome is over 1.5 kg in weight.

### 1.2.2 Habitat types

*Cibotium barometz* is common in tropical and subtropical regions and in Viet Nam. The species can be found in valleys, forest edges, along stream-banks together with other plants or under canopy of the Pine forests (in Kon Tum, Dak Lak and Lam Dong provinces) ranging from 300 to 1.000 m (in the North) and 800 to 1.500 m (in the South). It adapts to warm and humid climatic conditions. Optimum average temperature varies between 20 and 23°C, the rainfall ranges from 1.800 to 2.600 mm every year. It prefers red-brown ferralitic and acid soils (Nguyen Tap in NIMM, 1999 and in Do Huy Bich et al., 2004).

### 1.2.3 Role of the species in its ecosystem

When *Cibotium barometz* forms a very dense population or dominates in community, it plays an important role in covering free land, preventing the erosion and keeping the humidity of the soil, especially when it grows under the canopy of Pine forests and along the stream-banks.

## 1.3 Population

**1.3.1 Global Population size** (Population size may be estimated by reference to population density, having due regard to habitat type and other methodological considerations, or simply inferred from anecdotic data)

In China, *Cibotium barometz* is distributed mainly in the South (Guangdong, Hainan, Guangxi and Yunnan), but there is no data about the population size of this species (Xian-Chun Zhang et al., 2008). In addition, there is no information on this species in India, Myanma, Thailand, Laos, the Philippines, and Indonesia.

### 1.3.2 Current global population trends

___increasing __√_decreasing ___stable ___unknown

## 1.4 Conservation status

**1.4.1 Global conservation status** (according to IUCN Red List)

| | |
|---|---|
| ___Critically endangered | ___Near Threatened |
| ___Endangered | ___Least concern |
| ___Vulnerable | _√__Data deficient |

### 1.4.2 National conservation status for the case study country

**1996:**

Status: Threatened (T) – (In Red Data Book of Viet Nam, 1996)
Main threats: - Habitat loss / Degradation

- Harvesting

**Present**: This species is curently not included in neither Red Data Book of Viet Nam (2007) nor the Red List of Medicinal Plant in Viet Nam (2001 & 2006). It can be understand because of *C. barometz* have been found in other locations in Son La, Dien Bien and Kon Tum with large quantity. It approximately thousands of tons. Especially, there is a 10.000 ha of forest where *C. barometz* is found will become reservoir for Son La hydroelectric project. Therefore, it is urgent to exploit *C. barometz* here before it turns into a riverbed.

#### 1.4.5 Main threats within the case study country

___No Threats
_√_Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
_√_Harvesting [hunting/gathering]
___Accidental mortality (e.g. By catch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other
___Unknown

## 2. Species management within the country for which case study is being presented

### 2.1 Management measures

#### 2.1.1 Management history

In 1996, *Cibotium barometz* was included in the Red Data Book of Viet Nam (Part II – Plant) as an officially protected plant. However, this species is currently not included in the Red Data Book of Viet Nam (2007) and in the Red list of Medicinal Plants in Viet Nam (2001 & 2006).

#### 2.1.2 Purpose of the management plan in place

To achieve sustainable use of the natural resources of this herb medicine, and to ensure that the export will not be detrimental to the survival of this species in Viet Nam.

#### 2.1.3 General elements of the management plan

Constrain the annual export from Viet Nam, as well as domestic use by medicinal factories.

#### 2.1.4 Restoration or alleviation measures

In National Park and Nature Reserve, collecting of *Cibotium barometz* is prohibited. In addition, collection permit must be obtained from Forestry branch in province prior to collecting plant from the wild.

### 2.1 Monitoring system

#### 2.1.1 Methods used to monitor harvest

*Cibotium barometz* is not included in any protected or threatened plan list regulations. However, as the same other non-timber forest product, It is prohibited to harvest from Protected areas. In out side of Protected area it is control by local forest rangers. By which, the collector required permit from commune people committee, then in turn the forest ranger in charge to examine the product and areas of exploitation.

**Confidence in the use of monitoring**

**2.2 Legal framework and law enforcement** (Provide details of national and international legislation relating to the conservation of the species)

Since 1996, *Cibotium barometz* had been listed in CITES Appendix II, this plant was restrictively exploited mainly for domestic use in traditional medicine. However in 2001, more data of natural resources have been collected as well as the urgent need to exploit this plant in the area belong to Son La hydroelectric project, Vietnamese CITES office set quota of 153 tones to export from Viet Nam. The export amount in following years is: 84 tones in 2002, 66 tones in 2003, 38,5 tones in 2004, 111 tones in 2005, 61 tones in 2006 and 55 tones in 2007.

Besides that, from 2006 up to now, Forestry branches in Son La and Dien Bien provinces have issued permit of collecting populations in the area where will become a reservoir and some other areas outside NP. and NR. (in Thuan Chau dist., Son La prov. and Muong Lay dist., Dien Bien prov.). According to our survey (NIMM, 3-2009), the exploited amount in these areas ranged between 200 - 300 tones/year.

## 3. Utilization and trade for range State for which case study is being presented

**3.1 Type of use (origin) and destinations (purposes)** (e.g. commercial, medicinal, subsistence hunting, sport hunting, trophies, pet, food). Specify the types and extent of all known uses of the species. Indicate the extent to which utilization is from captive-bred, artificially propagated, or wild specimens.

*Cibotium barometz* is well valued as a medicinal herb. In traditional medicine, is is believed that the rhizome replenishes the liver and the kidney, strengthens the tendons and bones and relieves rheumatism conditions. Thus, it is widely used to cure rheumatism, limb-ache, lumbago, neuralgia and pollakiuria in aged humans and leucorrhoea. It also cures sciatica, micturition, enuresis and body-ache in pregnant women. The golden hair covering the rhizome is used for poulticing the wounds and cuts in the limbs to stop bleeding. According to literature, *C. barometz*'s rhizome is also employed as a tonic and vermifuge. The hair, in suitable application, can arrest capillary bleeding by mechanical action. Up to now, there is no artificial cultivation of *C. barometz* in Viet Nam; all the materials used are collected from wild populations.

**3.2 Harvest**

**3.2.1 Harvesting regime** (extractive versus non extractive harvesting, demographic segment harvested, harvesting effort, harvesting method, harvest season)

In Viet Nam, the rhizome of *Cibotium barometz* is usually collected in dry seasons (autumn or winter). During that time, the rhizome have a low water level and it will be easy to be dried and lose less weight compared to fresh materials. The evidence shows that the ratio between dried and fresh rhizome ranging from 67 to 70%. It means the fresh rhizome will lose 30 to 33% its dried weight.

**Harvesting method**:

Leaves are removed first, then rhizome is dug up, removed from the soil, hard fibrous roots, petioles, golden hairs and transported to the processing area (Picture 1).

Picture 1. Fresh rhizome before processing.

There are two ways in processing of fresh rizhome. The first way, rhizome is cut into slices by cutting machine or specialized knife (Picture 2).

Picture 2: Fresh rhizome are cutting by specialized knife

The second way is that rhizomes can be cleaned and steamed or boiled quickly in hot water before they are thinly sliced. In this way, raw materials turn to brown-yellow (Picture 3). After being cut, materials are dried in the sun or in the oven. Moisture content in dried materials must be below 13% (Vietnamese Pharmacopoeia III).

After preliminary processing, materials are packed in bag or sack (about 50 kg per bag or sack) and preserved in dry and cool place.

Picture 3. Dried materials

**3.2.2 Harvest management/control** (quotas, seasons, permits, etc.)

Since 2001, Vietnamese CITES office has officially set quota for exporting *Cibotium barometz*. Appropriate seasons for exploitation are autumn and winter. Forestry branch in province has responsibility for controlling localities and exploitation amount and issuing collection permits. Collecting the populations inside Nature reserves and National parks is prohibited.

**3.3 Legal and illegal trade levels** (To the possible extent, quantify the level of legal and illegal use nationally and export and describe its nature)

The dry sliced rhizomes of *Cibotium barometz* called "Cau tich". Approximately 200 tones of "Cau tich" is used widely in traditional medicine every year in Viet Nam. State-owned companies and private companies started to commercialize this medicinal material many years ago. In 1996, this plant was listed in CITES Appendix II; therefore, it was restrictively exploited mainly for domestic use in traditional medicine. So far, no illegal trade has been found in Viet Nam.

Since 2001, Vietnamese CITES officer has officially set export quotas about 30 – 150 tones of "Cau tich" and the main import country is China.

From October 2008 to Feburary 2009, Son La Pharmaceutical Joint-Stock Company has bought about 300 tons of fresh rhizome of *Cibotium barometz* that was collected in the areas will become reservoir in Quynh Nhai district, Son La province.

## II. Non-detrimental Finding procedure (NDFs)

Provide detailed information on the procedure used to make the non-detriment finding for the species evaluated.

### 1. Is the methodology used based on the IUCN checklist for NDFs?

_√__**yes** ___no

### 2. Criteria, parameters and/or indicators used

There are several ways to estimate the deposit of natural resources of the rhizomes of *Cibotium barometz* such as field plot-survey method, field observations, field descriptions of plant communities and kinds of vegetation. To complete our estimation, we also referred to collect other information and data from the State-owned companies or private companies and the collectors in Son La, Dien Bien, Lai Chau and Ha Noi.

### 3. Main sources of data, including field evaluation or sampling methodologies and analysis used

The distribution of *Cibotium baometz* in Viet Nam is uneven. Therefore, we selected sample plots from some provinces in which a few counties were selected. For example, local collector in Son La said that in richest areas (unexploited) has about 12 - 16 kg fresh rhizomes of *C. baometz* can be collected each field plot in 2 x 2 meter. In Kontum province, *C. baometz* densely distributed under shad of Pine and mixed forests belong to 4 districts: Dak Glei, Dak Ha, Tu Mo Rong and Kon Plong. According to our field plot survey carried out in areas belong to "Dak Glei Investment and Development of Agriculture, Forestry and Service Company", there are about 1.600 ha of forest where the species is found in here. The maximum fresh rhizomes can be collected in field plot (rich areas) are 20 - 25 kg in weight, and the minimum are 10 – 12 kg. The biggest rhizome reaches 13 kg in weight. These provinces are examples of the most abundant with this species. Based on all results of field plot-surveys and data gathered from other sources we can estimate the biomass of rhizomes of *Cibotium barometz* in provinces and districts, about 10.000 tones of deposits of "Cau tich" in Viet Nam.

### 4. Evaluation of data quantity and quality for the assessment

It is difficult to estimate the deposit of natural resources accurately because of the difficulty of field survey and the limitation of sampled populations in its vast distribution areas. The annual sustained yield should be estimated at about 400 – 500 tones making up 5% of the standing stocks. The export quota of 300 – 350 tones per year is reasonable within five years, from 2009.

### 5. Main problems, challenges or difficulties found on the elaboration of NDF

The plants are widely and unevenly distributed in mountainous areas from the North to the South of Viet Nam, thus, our field survey is still very limited.

### 6. Recommendations

To ensure the long-term survival of wild populations and their associated habitats, management plans for collection should provide a framework for setting sustainable harvest levels and describe appropriate collection practices that are suitable for *Cibotium barometz* through following actions:

i) Only the populations outside nature reserves can be collected under the permission and strict control of local governments and Provincial Forestry Branch. In addition, it should be focus on collecting in area of new reservoir belonging to Son La and Dien Bien provinces.

ii) Exportation of *Cibotium barometz* should be limited by strict quota at 300 – 350 tones per year within 5 years from 2009 for sustainable use;

iii) Develop guidelines on good collection practice for *Cibotium barometz*. The guidelines should be concerned to:

- Appropriate seasons or time period for collection (to ensure the best possible quality of materials).
- Standards of plants for collection: only plant of which rhizome weight is over 1,5 kg should be collected.
- Collection levels and collection practices to encourage the regeneration of source medicinal plant materials (Ex: leaving the nurslings, small plants and spore-bearing plants for reproduction and regeneration of maintaining their populations).
- Minimum frequency of collection: Duration time for the next collecting should be 10 years.

In future, export of final products rather than raw materials should be encouraged. It is hoped that researches on propagation through spore will be carried out for artificial cultivation and techniques for cultivating this plant in suitable areas. It will be help to reduce the pressure on wild resources of this much exploited species.

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MINISTRY OF NATURE, ENVIRONMENT
AND TOURISM OF MONGOLIA

14201 Zasgiin gazriin II bair, Negdsen undestnii gudamj 5/2,
Chingeltei duureg, Ulaanbaatar MONGOLIA
Tel: (976-51) 26-61-71, Fax: (976-11) 26-62-86,
E-mail: monenv@mail.mn, http://www.mne.mn

Date 2/06 - 2009
Ref.

To: CITES SECRETARIAT

**Subject: Notification to the Parties on Mongolia *Falco cherrug*, SC57, 03 February 2009**

On behalf of the Government of Mongolia and Ministry of Nature, Environment and Tourism, I would like to present the compliments for your kind support and cooperation in the environment protection and nature conservation of Mongolia through the international legal mechanism such as CITES.

I have acknowledged that Recommendations of the Standing Committee has been taken on the February 03 2009 regarding the trade suspension of several species including the *Falco cherrug* of Mongolia SC57.

Since my appointment as a Minister of Nature, Environment and Tourism, I have planned certain measure to conserve saker falcon such as promoting the sustainable management of falcon populations in their habitat, strongly enforcing the regulated trade under CITES, scaling-up the current management system in national legislation, and updating/facilitating the successful implementation of National Programme on Saker Falcons.

We do hope that such intervention would help to revise the decision of trade suspension of *Falco cherrug*. In further, CITES will forge our partnership among the range states and thus contributing to larger global efforts on conservation of *Falco cherrug*.

We do apologize the delay of responding the Animal Committee Recommendation due to staffs and Government changes in Mongolia.

Please accept, Sir, the assurances of my highest consideration to you.

Sincerely Yours,

MR.GANSUKH LUIMED
MEMBER OF THE PARLIAMENT OF MONGOLIA
AND MINISTER FOR NATURE, ENVIRONMENT AND TOURISM

FOR STANDING COMMITTEE CONSIDERATION

**Responses of Mongolia on the recommendation of Animal Committee**

a) Provide justification for and details of the scientific basis by which, it has been established that the quantities of *F. cherrug* exported were not detrimental to the survival of the species and in compliance with Article IV, paragraphs 2 (a) and 3;

*Mongolia is launched the artificial nest project since 2006 with financial contribution of the UAE. On the basis of the implementation of 250 artificial nest project (Please see. Attachment.1) in two different geographical areas of Mongolia, we have a plan to increase the number of artificial nests upto 5000 in their habitat from 2009 with the continued support of the UAE and Kuwait. Therefore, 5000 artificial nests produce 300 to 1000 young birds per year that can be used sustainably.The system of artificial nests has proved the successful result in the production of enough juvenile Saker Falcons that could provide a sustainable annual harvest within the range upto1000 juvenile females in every year for Mongolia. Herewith Mongolia requests trade quota of 300 Saker Falcons starting from this year (2009). Once the second phase of the project as installing 5000 artificial nests in the country, we would like to kindly ask the Standing Committee to increase the number of trade quota upto 1000 annually.*

b) Provide information on the distribution and conservation status of *F. cherrug* , explaining when the status was established and by what methodology the information was obtained; and

*There are some publications done by the researchers like .Gombobaatar, B.Odkhuu, B. Munkhzaya, Andrew Dixon, and others in 2007. Please see the attachment 2 and also Nyambayar and Tseveenmyadag, Key Sites for Conservation, which shows the species widely distributed throughout the country.*

c) Provide information on the number of captive breeding operations for *F. cherrug* in the country and the controls in place to differentiate between captive-bred and wild-caught specimens to ensure that the authorized exports of specimens of wild origin are not augmented by falsely declared 'captive-bred' specimens.

*Since Mongolia has greater potential for farming the wild Falco cherrug in their natural habitat. Mongolia has no intention to introduce the captive breeding in the country.*

Within 24 months (by September 2007) for range States wishing to resume the exportation of *F. cherrug*

a) Conduct a survey of the status of *F. cherrug* in the country, including an assessment of distribution and abundance, population trends, threats to populations and other relevant factors to provide the basis for the making of non-detriment findings as required under the provisions of Article IV, paragraphs 2 (a); and

*Mongolia has conducted the annual survey. In September 2008, the survey was done by the researchers. Please see the attachment 3. By the survey, we found that distribution, abundance and resource of Falco cherrug are stable.*

b) Develop a science-based population monitoring system, and establish adaptive management programmes for harvesting of and trade in *F. cherrug*, taking into consideration the results of the survey referred to in the previous paragraph.

*In last we emphasize the significance of sustainable harvesting is key conservation method in Mongolia. The Ministry of Nature, Environment and Tourism of Mongolia will introduce the monitoring system for harvesting and trade in 2010. In further, MNET will conduct the training on custom officials and local rangers on Falco cherrug conservation in 2009. Please see the attachment 5. Additional information is provided in the attachments.*

**ATTACHMENT 1**

## SUSTAINABLE HARVEST OF SAKER FALCONS FOR CITES REGULATED INTERNATIONAL TRADE

## EXECUTIVE SUMMARY


1. This document has been prepared by International Wildlife Consultants (UK) Ltd (IWC) as part of the conservation and research programme conducted by IWC on behalf of the Environment Agency - Abu Dhabi (EAD), in collaboration with the Wildlife Science and Conservation Centre (WSCC), under a research agreement signed between EAD and the Ministry of Nature and Environment of Mongolia (MNE) on 25th November 2007 in Abu Dhabi.

2. The project was based on the premise that the number of Saker Falcons trapped and exported from Mongolia will be compensated by increased productivity of the wild population through active management.

3. The management consists of providing artificial nesting sites in regions where these were in short supply and limit the size of the Saker Falcon breeding population.

4. In nest-site limited regions there was an existing non-breeding population of adult Saker Falcons. These non-breeders can be encouraged to breed by providing artificial nests, and so increase the size of the breeding population in these areas.

5. The number of juvenile Saker Falcons produced from these artificial nest sites can thus be harvested without impacting on the pre-existing Saker Falcon population.

6. The number of juvenile Sakers produced at artificial nests each year will depend on (i) level of occupancy at artificial nests, (ii) breeding success at occupied nests and (iii) survival of young birds to independence. These biological measures are variable and will need to be independently assessed each year in order to determine a sustainable harvest quota.

7. Experimental studies indicate that annual harvestable quotas of between 300 to 1000 juvenile female Saker Falcons are achievable under the proposed system.

8. The proposed system would have significant financial benefits for local communities as a key part of the sustainability of the project. The project is to be funded by the Arabic end-users of the falcons through a permit payment system.

9. The scheme is implemented for initial harvesting autumn 2010 and the scheme presented to the CITES CoP meeting in Qatar in January 2010 as an example of a sustainable wildlife trade system.


### Calculation to predict productivity of a network of artificial nests

- Saker Falcons were reportedly being trapped across 12 aimags of Mongolia (see press report in Appendix 1). We suggest that each of these aimags has a network of ten grids containing 36 artificial nests spaced at 2 km intervals.

- Thus, each aimag will have 360 artificial nest sites spread over ten areas where natural nest sites are in limited supply.

- Breeding densities in experimental trials ranged from 3.7 to 11.5 breeding pairs per 100 $km^2$. Thus, 10 artificial nesting grids are predicted to support 37-115 breeding pairs of Saker Falcons, depending on local availability of small mammalian prey.

- Nesting Success at the artificial grids was estimated as 91%. Thus, we have predicted that 34-105 of the nests would be successful.

- The average brood size in our experimental trials was 4.1 chicks per successful nest. Thus, we have 118-366 chicks fledged from the artificial nesting grids.

- The survival rate of chicks from fledging until dispersal from the nest area was estimated as 68%. Thus, we foudn that 80-248 fledglings would survive until dispersal. Given an equal sex ratio this would result in an estimated 40 to 124 female chicks available for trapping at the time of dispersal from their breeding area.

- An allowable harvest of 70% of productivity would mean that a trapping quota for each aimag is predicted to be set somewhere between 27 and 87 juvenile females per annum. The exact quota will depend on actual levels of occupancy, breeding success and post-fledging survival each year.

- At a national level, annual harvest quotas over 12 aimags (provinces), each utilising grids of 360 artificial nest sites are predicted to range from 335 to 1040 juvenile females per annum. The quotas will vary from aimag to aimag depending on local productivity and we suggest imposing a maximum quota of 1000 juvenile females.

- Juvenile male Saker falcons can be harvested at the same rate as females.

**Implementation of a programme to ensure sustainable harvesting of Saker Falcons in Mongolia for falconry**

- The underlying principle of conservation through sustainable use of wildlife resources is that there is no detrimental impact on the population being harvested. Furthermore, the concept also requires that the harvest benefits the local community so that there is a local incentive to conserve the species through sustainable use.

- In this model for sustainable Saker Falcon trade there are both end-users (Arab falconers) and producers (local Mongolian communities). This trade is facilitated and regulated by the Mongolian government using permits and is governed by international law through the implementation of CITES.

**Artificial nesting sites for breeding Saker Falcons**

PROJECT OBJECTIVE:

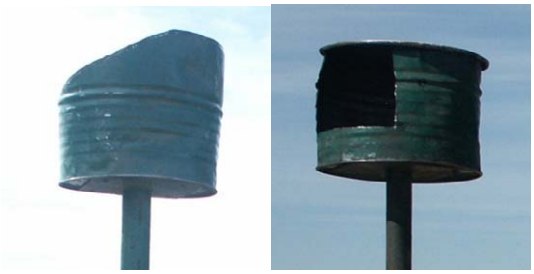
Artificially increasing the breeding population of Saker Falcons can be used to develop a sustainable system for the harvesting of wild Sakers for the falconry trade.

AIM:

To increase the breeding population of Saker Falcons in nest-site limited steppe habitats.

RESULTS:

We have established grids of artificial nests in two areas: Darhan and Bayan. The first grid of 100 nests, spaced 2 km apart over an area of 324 $km^2$, was established in autumn 2005 near Darhan. We experimented with four different designs of nesting trays in order to determine if Saker Falcon occupancy and/or breeding success was influenced by nest box design.



Four different designs of artificial nesting trays. Clockwise from top left: Open Shallow; Open Deep; Open Sheltered and Closed Box.

| **DARHAN** (18 x 18 km grid) | 2006 | 2007 | 2008 |
|---|---|---|---|
| Open Tray – shallow wall | 0/24 = **0%** | 1/24 = **4%** | 1/22 = **5%** |
| Open Tray – Deep wall | 0/25 = **0%** | 1/25 = **4%** | 1/24 = **4%** |
| Open Tray – Sheltered wall | 1/25 = **4%** | 1/24 = **4%** | 1/23 = **4%** |
| Closed Box | 2/25 = **8%** | 7/25 = **28%** | 9/25 = **36%** |

Table 1. Occupancy of the four different designs of nesting box in 2006-08

Occupancy rates increased annually from 3 pairs in 2006, 10 in 2007 to 12 in 2008 despite the fact that small mammal densities were low in the area throughout this period. Sakers showed a marked preference for the Closed Box design of artificial nest site, with 75% of pairs using such sites.

The second area selected for placement of artificial nests was Bayan. This area was chosen after satellite telemetry revealed juvenile Sakers settled here after dispersing from their nests in 2006. An autumn visit confirmed very high densities of Brandt's Vole across the region and four 16 $km^2$ grids, each with 25 artificial nests placed 1 km apart, were established in November 2006. All artificial nests were of the Open Tray – Sheltered Wall design; at this time it was not known that Sakers preferred the Closed Box design. In March 2008 a further 50 artificial nests were erected across two 16 $km^2$ grids using the Closed Box design of artificial nest.

| **BAYAN** (4 x 4 km grids) | 2007 | 2008 |
|---|---|---|
| Open Tray – Sheltered Wall | 5/100 = **5%** | 9/96 = **9%** |
| Closed Box | na | 2/43 = **5%** |

Table 2. Occupancy of the artificial nests at Bayan in 2007 and 2008

Occupancy rates increased from 5 pairs in 2007 to 9 pairs in 2008 in four artificial nesting grids, whilst in two further grids established in March 2008 the initial occupancy level was 5%. In 2008 small mammal densities were variable across the grids but higher than that found in the Darhan region.

In 2008 the breeding density of Saker Falcons at the Darhan artificial nesting grid area was 3.7 bp/100 $km^2$ (a total area of 324 $km^2$), compared with a much higher breeding density of 11.5 bp/100 $km^2$ in the Bayan area (total area of 96 $km^2$). This higher breeding density at Bayan can be at least partly explained by the greater abundance of mammalian prey available here. Preliminary analysis of pellets and prey remains from Saker Falcon nests at Darhan and Bayan indicate a clear difference in diet, with Brandt's Voles and Gerbils predominating in the diet of Sakers at Bayan and birds predominating in the diet of Sakers in Darhan.

**CONCLUSIONS**:

- **Artificial nests can increase the breeding population of Sakers in nest-limited steppe habitats.**
- **Occupancy levels increase annually, at least in the first few years after establishing an artificial nesting area.**
- **Occupancy can be maximised by using the Closed Box design of artificial nests.**

**Breeding Success and post-fledging survival of Saker Falcons at artificial nests and natural nest sites in central Mongolia in 2008**

Introduction

We compared breeding success at artificial nests and natural nest sites at our study areas in central Mongolia.

Study area and methods

The artificial nest sites were located in flat and undulating steppe near Bayan and natural nests were monitored in a 240 $km^2$ area of the Eej Khad mountain block (Map 1).

Nests were monitored at 10-day intervals during the nesting period. Individually marked fledglings, using a combination of wing-tags and tail-mounted radio transmitters, were tracked at approximately 5-day intervals.

Flat steppe habitat at the Bayan artificial nest area

Hill habitat with scattered rock tors at Eej Khad

Definitions of terms used:

Nesting Success = the percentage of nesting attempts that result in at least one chick surviving to fledge.

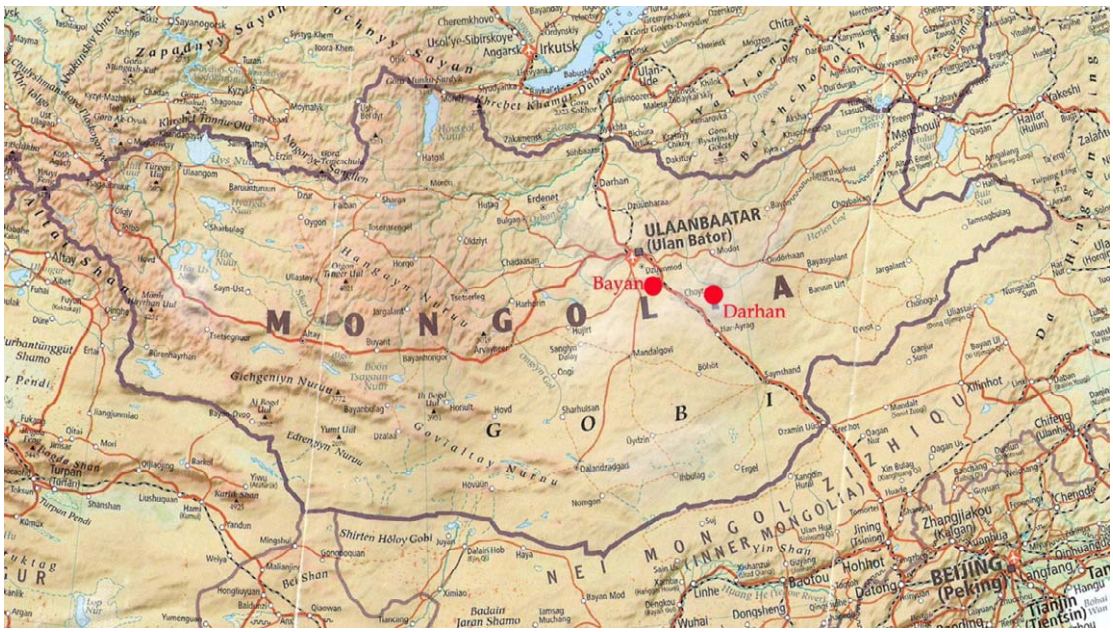
Mayfield Method = a method to calculate nesting success based on daily survival rates of nests; the daily survival of nests during the egg and nestling stages were calculated separately.

Egg-Fledging Rate = the percentage of eggs laid that resulted in fledged young.

Hatch-Fledging Rate = the percentage of eggs hatched that resulted in fledged young.

Calculating First Egg Dates: Assumed that one egg was laid every two days and incubation lasted 33 days from the laying of the last egg. When nests were not inspected during the laying period we estimated the first-egg date by back-dating from a calculated hatch date.

Calculating Hatch Date: Age of chicks estimated by comparison with a 14 stage growth chart.




**Map 1**: locations of artificial nest grids at Bayan and Darhan

Results and Discussion

*Breeding Success*:

At the artificial nest grids in Bayan, 11 pairs of Saker Falcons settled to breed in 2008. The estimated mean *First Egg Date* was 1st April (range 7th March to 23rd April). The mean *Clutch Size* was 4.7 eggs (range 3 to 5 eggs), whilst the mean *Brood Size at Hatching* was 4.4 chicks (range 2 to 5 chicks) and the mean *Fledged Brood Size* was 3.5 fledglings (range 0 to 5 fledglings; mean 3.9, range 2-5 fledglings for successful nests only). At these 11 nests a total of 52 eggs were laid, 48 hatched and 39 chicks fledged, thus the *Egg-Fledging* rate was 75.0% and the *Hatch-Fledging* rate was 81.3%.

At the artificial nest grids in Bayan we monitored nesting success at 11 nests, all of which successfully survived the incubation period to hatch at least on chick. At least one chick was fledged from 10 nests, the single nest failure occurring when the whole brood disappeared at approximately three weeks old. Nesting success over a notional 82-day egg-laying to fledging period was calculated as 90.9% using a daily survival estimate calculated separately for the egg and nestling periods (i.e., Mayfield analysis; Table 1).

At the natural nest sites in Eej Khad, 15 Saker Falcon nests were found in 2008. The estimated mean *First Egg Date* was 3rd April (range 16th March to 2nd May). The mean *Clutch Size* was 4.7 eggs (range 2 to 5 eggs), whilst the mean *Brood Size at Hatching* was 4.1 chicks (range 1 to 5 chicks) and the mean *Fledged Brood Size* was 3.5 fledglings (range 1 to 5 fledglings). At these 15 nests a total of 56 eggs were laid, 41 hatched and 35 chicks fledged. The *Egg-Fledging* rate was 50.0% and the *Hatch-Fledging* rate was 85.4%.

At the natural nest sites in Eej Khad we monitored 15 nests, 12 of which successfully survived the incubation period to hatch at least on chick. Of the three nest failures, two occurred during egg-laying and the females were found dead on the nest with eggs still inside their oviducts (probably cause of death was egg peritonitis due to cold weather), whilst the third nest was a late clutch of only two eggs that disappeared early in incubation. At least one chick was fledged from all 12 of these nests that successfully survived to hatching. Nesting success over a notional 82-day egg-laying to fledging period was calculated as 60.2% using a daily survival estimate calculated separately for the egg and nestling periods (i.e., Mayfield analysis; Table 1).

| | **Nests** | **Successful Nests (%)** | **Nesting Success (Mayfield analysis)** |
|---|---|---|---|
| **Bayan (artificial)** | 11 | 10 (90.9) | 90.9% |
| **Eej Khad (natural)** | 15 | 12 (80.0) | 60.2% |

**Table 1**. Nesting success of Saker Falcons at artificial and natural nest sites

Nesting success was higher at artificial nests than natural nests in the adjacent mountain block at Eej Khad. This difference was due to the higher failure rate of nests with eggs at Eej Khad. A proportion of these nest failures, particularly during the egg-laying period, were probably a direct result of exposure to cold, strong winds, which resulted in egg peritonitis. No such deaths were recorded at artificial nests, presumably because they afford greater protection against the wind. This difference was also reflected in the number of unhatched eggs found in nests that survived to hatching (Table 2), suggesting that the egg hatching rate was also linked to nest exposure.

| | **Eggs Laid** | **Hatched** | **Unhatched** |
|---|---|---|---|
| **Bayan** | 52 (N = 11 nests) | 48 (N = 11 nests) | 4 (7.7%) (N = 4 nests) |
| **Eej Khad** | 49 (N = 10 nests) | 41 (N = 10 nests) | 8 (16.3%) (N = 5 nests) |

**Table 2**. Nests that survived to hatch

Of the four nestlings that died in four different nests at Bayan, three disappeared within the first 10-days after hatching and one had to be killed at fledging age because its leg was broken after becoming

entangled in nest material. Of the six nestlings that died in four different nests at Eej Khad, three disappeared within the first 10-days at three nests and in one of these nests a further two chicks disappeared 30-38 days after hatching leaving only one chick to fledge, whilst a single chick was found dead 9-19 days after hatching at a fourth nest.

We assume that all chicks that disappeared within 10-days after hatching simply died and were subsequently eaten or removed, whilst the two older nestlings that disappeared when they were *ca*. five-weeks old may have been taken by a predator or a person.

Young Saker Falcon caught in nest material; the bird had a badly damaged leg and had to be killed.

*Post-fledging Survival:*

Individual fledglings were tracked at 5-day intervals after leaving their nests. Previous satellite telemetry of four fledglings in central Mongolia revealed that they can disperse from the natal area 21 to 31 days after leaving their nest (mean = 28 days). The survival rate of young Saker Falcons from fledging to dispersal was calculated under three scenarios:

(i) all chicks that disappeared after 21 days dispersed; all chicks that disappeared before 21 days died

(ii) all chicks that disappeared after 28 days dispersed; all chicks that disappeared before 28 days died

(iii) all chicks that disappeared after 35 days dispersed; all chicks that disappeared before 35 days died

At Bayan a total of 35 fledglings from 10 nests were tracked for up to 50 days after fledging. Of these five were known to have died and their corpses were recovered, giving an absolute maximum post-fledging to dispersal survival rate of 85.7%. Of the five chicks that were found dead, one had died from unknown causes whilst four had been killed and eaten by Steppe Eagles *Aquila nipalensis*. Steppe Eagle predation in open steppe habitats is clearly an important mortality factor for fledglings and they are vulnerable to this type of predation whilst standing on flat, open ground.

The fate of the remaining 31 fledglings could not be determined; some disappeared from the natal area within the first week, whilst others were seen alive for up to 46 days after fledging. These fledglings may have either dispersed from their natal area or died. These can be regarded as maximum, average and minimum survival estimates for a notional 28-day fledging to dispersal period. For the Bayan area calculated fledging-dispersal survival, based on daily survival estimates, was 67.7% (Min. 57.5%; Max. 78.0%).

We are taking steps to improve the following parameters in 2009:

*Occupancy Levels*

The level of occupancy at Bayan is likely to increase year on year until an upper limit is reached, presumably determined by available food supply and its influence on territoriality. At Darhan, an area with a substantially lower availability of rodent prey than Bayan, Sakers occupied 12 of 96 available artificial nests in 2008 (i.e., 12.5%). At Darhan the number of breeding pairs has increased year on year with 2, 10 and 12 breeding pairs in 2006, 2007 and 2008 respectively. Our trials of different designs of artificial nest at Darhan have indicated that Saker Falcons show a significant preference for closed-box design artificial nests. However, we do not know if this preference (exhibited when the birds are given a choice of different designs) is also reflected in increased attractiveness of artificial nests for prospective breeding birds. Nevertheless, we will modify all 150 nests at Bayan prior to the 2009 breeding season so that all nests are of the closed box design in an attempt to improve their attractiveness for breeding Saker Falcons. We predict that such a modification, and continued settlement in the area, will increase the number of Saker Falcons to at least 20 breeding pairs in 2009 (i.e., an occupancy level of 13.3%).

*Breeding Success*

The use of closed-box design nests may improve breeding success as we have some evidence that open nests, exposed to strong winds hatch fewer eggs and fledge fewer young. However, the level of breeding success at open artificial nests at Bayan in 2008 was high and any improvements through changing nest box design may be minimal or only noticeable under circumstances of extreme weather events.

As a step for further management we shall remove all nest materials put into the artificial nest boxes by Ravens and Upland Buzzards once the Saker Falcon eggs have hatched. In this way we can reduce the risk of nestlings becoming entangled in nest material.

Finally, we will attach a removable exercising ledge to all occupied boxes with nestlings. At the moment chicks inside closed-box design nests have no opportunity to exercise their wings before leaving the nest and consequently they leave the safety of the nest without the ability to fly strongly. An exercising ledge will enable nestlings to stand outside the confines of the nesting box and exercise their wings before fledging. It will also provide a safe refuge from the ground after the birds have fledged.

*Post-fledging Survival*

Of the 13 birds that went missing during the first 28-days after fledging, three were known to have been killed and eaten by Steppe Eagles (i.e., 23%) and a further fledgling was killed and eaten five-weeks after leaving its nest. It is likely that all these fledglings were killed whilst perched on open ground and it may be possible to minimise the risk of this type of predation by erecting suitable, sheltered perching sites around successful nests in order to minimise the exposure of fledglings to eagle attacks and attacks by other ground-predators such as foxes, dogs and wolves.

Another factor that may have affected our survival analysis was the trapping of falcons by Arab trappers. A large team of trappers from Kuwait arrived in the Bayan and Eej Khad area in mid July 2008 and caught fledglings in the region from this date onwards. We approached the trapping teams, who were operating with the permission of the Mongolian government under their wild-harvest quota system, and explained that we were undertaking research on Sakers in the area. We informed them that we had marked young Saker Falcons with wing-tags and asked them to report any marked birds that they captured. However, no marked birds were reported to us by the trappers nor were any marked birds reported to us from by Mongolian Ministry of Nature and Environment.

# ИЗУЧЕНИЕ ПЕРНАТЫХ ХИЩНИКОВ

## БИОЛОГИЯ РАЗМНОЖЕНИЯ СОКОЛА БАЛОБАНА В МОНГОЛИИ

*Гомбобаатар С. (Монгольское орнитологическое общество)*
*Сумъяа Д. (Монгольский национальный университет)*
*Потапов Е. (Исследование природы, Великобритания)*
*Мунхзаяа Б., Одхуу Б. (Монгольское орнитологическое общество)*

**Контакт:**
С. Гомбобаатар
Б. Одхуу
Б. Мунхзаяа
Монгольское орнитологическое общество
Монголия
Улаанбаатар
210646А
а/я 537
тел.: 976 11 323 970
976 99 180 148
факс: 976 11 320 159
gomboo@num.edu.mn
mongolianbirds@mail.com
http://num.edu.mn/ornithology

Д. Сумъяа
Монгольский Национальный Университет
Монголия
Улаанбаатар
210646А а/я 537
тел.: 976 11 323 970
monbird_mos@yahoo.com

### Введение

В Монголии обитает азиатский балобан *Falco cherrug milvipes* Jerdon, 1871. Он широко распространён в степной, лесостепной, пустынно-степной зонах и малочислен в пустыни (Shagdarsuren 1983). Питается балобан широко распространёнными в местах его обитания, активными, в том числе и в зимний период, и легко добываемыми видами животных, такими как полёвка Брандта *(Lasiopodomys brandtii)*, монгольская песчанка *(Meriones unguiculatus)*, рогатый *(Eremophila alpestris)* и монгольский жаворонки *(Melanocorypha mongolica)* (Shagdarsuren, 1983, Bold, Boldbaatar, 2001, Gombobaatar et al., 1999a,b, 2000, 2001a,b, 2002, 2006). К двум годам балобан достигает половой зрелости. Гнездится на естественных или искусственных субстратах в гнёздах ворона *(Corvus corax)*, мохноногого курганника *(Buteo hemilasius)*, беркута *(Aquila chrysaetos)* и степного орла *(Aquila nipalensis)* (Ellis et al., 1995, 1997, Potapov et al., 2000, 2002, Gombobaatar, 2006). Откладывает до 6 яиц и выращивает примерно столько же птенцов. Обычно самка заботится о птенцах, а самец добывает для них пищу (Potapov et al., 2002b, Gombobaatar, 2006). Зимует в Китае и Внутренней Монголии. В зависимости от толщины снежного покрова и наличия кормовой базы некоторые взрослые балобаны зимуют в пределах Монголии, совершая небольшие кочёвки (Potapov, 2003, Gombobaatar, 2006).

### Introduction

Subspecies *Falco cherrug milvipes* Jerdon, 1871 of Saker falcon widely distributes in steppe, forest steppe, desert steppe and occurs rarely in Gobi desert in the Mongolia. Saker preys Brandt's Vole *(Lasiopodomys brandtii)*, Mongolian Gerbil *(Meriones unguiculatus)*, Horned Lark *(Eremophila alpestris)*, Mongolian Lark *(Melanocorypha mongolica)* which are abundant species in number, occur all year around in Mongolia (Shagdarsuren, 1983, Bold, Boldbaatar, 2001, Shagdarsuren et al., 2001, Gombobaatar et al., 1999a,b, 2000, 2001a,b, 2002, 2006). This species of falcon prefer to nest in old and newly built nests by Raven *(Corvus corax)*, Upland Buzzard *(Buteo hemilasius)*, Steppe *(Aquila nipalensis)* and Golden Eagles *(Aquila chrysaetos)* located on natural and artificial substrates (Ellis et al. 1995, 1997, Potapov et al., 2000, 2002, Gombobaatar, 2006). Clutch size is max. 6, average in 3.7±1.02 (1 – 6, n=330). Female broods and males spend much time in hunting during breeding season (Potapov et al., 2002b, Gombobaatar, 2006). Sakers of Mongolia winter in China and Inner Mongolia and also in the country depending on snow coverage and food supply. All fledglings are migratory and seasonal movement is recorded for few adult individuals (Potapov, 2003, Gombobaatar, 2006). Scientific collaboration is urgent in order to conserve and sustainable use of the species in regional and International levels (Fox, 2001, 2002, Gombobaatar, 2006).

**Contact:**
S. Gombobaatar
B. Odkhuu
B. Munkhzaya
Mongolian Ornithological Society
P.O. Box 537, 210646A
Ulaanbaatar
Mongolia
tel.: 976 11 323 970
976 99 180 148
fax: 976 11 320 159
gomboo@num.edu.mn
mongolianbirds@mail.com
http://num.edu.mn/ornithology

D. Sumiya
National University of Mongolia
P.O. Box 537, 210646A
Ulaanbaatar
Mongolia
tel.: 976 11 323 970
monbird_mos@yahoo.com

Требуется принятие мер по охране балобана и его рациональному использованию (Fox, 2001, 2002, Gombobaatar, 2006).

## Расположение учётных площадей

Для простоты и ясности все учётные площади условно отмечены знаками: ALT, BH, BGC, EK, UB, DA, CH (рис. 1). Хотя балобан изредка встречается в тайге, высокогорных лесах на высоте 3000–4000 м над уровнем моря, а также в пустыне, сведения о гнездовании на этих территориях отсутствуют. В Монголии балобаны распространены в степной, лесостепной и опустыненной зонах, а также в горах на высотах не более 3000–4000 м н.у.м. Общая площадь территории распространения и гнездования балобана составляет 1085400 км². Площадь всех обследованных территорий – 15986,9 км², что составляет 1,1% от территории Монголии и 1,4% всех гнездопригодных мест.

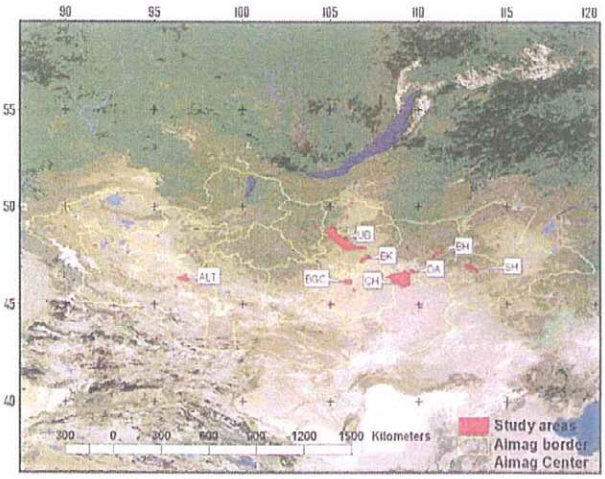



***Рис. 1.*** *Название и расположение учётных площадей*

***Fig. 1.*** *Name and location of study areas*

## Материал и методика исследований

Обработка собранных материалов производилась на Кафедре зоологии Монгольского госуниверситета, в институте Зоологии университета Халле-Виттенберга, Германия (2000–2002 гг.) и в музее Науманна города Кетэн, Германия (2000–2001 гг.), в Институте орнитологических исследований Ямашина Японии (2000–2001 гг.) и в национальном орнитологическом центре Англии (2005 г.). Там же, а также в Университете Геттингена (Германия), в трёх центрах по кольцеванию птиц, были собраны литературные данные по соколу балобану.

## Location of Study Areas

We marked all study areas by letters in order to understand easy and simply (fig. 1). Sakers are rarely registered in taiga, high mountains, elevated in 3000–4000 m above sea level, and desert. But there is no record of breeding in these areas. Suitable breeding territories of the species are steppe, forest steppe, desert steppe, mountain steppe and mountains elevated less than 3000–4000 m above sea level. Size of suitable breeding and distribution territories for Sakers in Mongolia is 1085400 sq. km. The size of our study areas represents 1.1% of whole Mongolian territory and 1.4% of suitable breeding territories of Sakers.

## Materials and Methods

We analyzed all data in the Zoology Department of the National University of Mongolia, Institute of Zoology, Halle-Wittenberg University, Germany in 2000–2002, Naumann Museum in Kothen, Germany in 2000–2001, and Yamashina Institute for Ornithology, Japan in 2000 and 2001). In the result of field works, we recorded and rechecked in total of 498 breeding pairs in order to study the taxonomy, nest site selection, age group of nestlings, estimate number and density, clutch and brood size of breeding pairs, and calculate the breeding success of Sakers depending on food supply. Long term monitoring studies of breeding Sakers in study areas were conducted by following the International standard methods of Fox et al. (1997). Anova-Single factor, Anova-two tail, Kruskal-Wallis Test Statistic, correlation and discritive analyzes of the Ms. Excel, Systat 10.0 software's were used for statistic analyze. We used ArcView 3.2, OZI-Explorer 4.0. software for mapping and estimation of breeding pairs.

## Results and Discussions

### Role of female and male to select nest sites and nesting period

Most successful breeding pairs of Sakers, Ravens, and Upland Buzzards prefer to nest on cliffs, rocks, trees and artificial substrates where are located in outside of blocks of high cliffs and rocks middle of flat steppe in our study areas. The reason for selection of nest site for those breeding pairs was to save energy during hunting (close by food resources) and to reduce of predator threats (Eagle Owl *Bubo bubo*). Nest site selection

В результате экспедиционных маршрутов учтено 498 пар балобанов и проведены исследования по систематике, окраске, численности и плотности гнездящихся пар, выбору мест гнездования, размерам кладки и выводков, возрастным группам птенцов, зависимости успеха размножения от стабильности кормовой базы. Исследования по мониторингу гнездящихся пар проводились ежегодно по общепринятой международными исследователями методике (Fox et al., 1997). Статистическую обработку данных проводили с помощью программ Ms. Excel, Systat 10.0, Anova-Single factor, Anova-two tail, Kruskal-Wallis Test Statistic, проведены корреляционный и дискритивный анализы и картирование с применением ArcView 3.2, OZI-Explorer 4.0.

*Пара балобанов (Falco cherrug) на гнезде в Центральной Монголии. Март 2004 г. Фото С. Гомбобаатар*

*A pair of the Saker Falcon (Falco cherrug) in the nest in Central Mongolia. March 2004. Photo by S. Gombobaatar*

## Результаты исследований и обсуждение

### Роль самки и самца в выборе гнездовых территорий, гнёзд и времени гнездования

Балобаны, вороны и мохноногие курганники в большей части гнездятся в пограничной между степью и скалистыми горами зоне. Такое расположение гнёзд выгодно по двум причинам: во-первых, близость основных объектов питания позволяет уменьшить затраты энергии на поиск пищи, во-вторых, оно обеспечивает защищённость гнёзд от филинов *(Bubo bubo)*. Выбор мест гнездования балобанами, а также смертность птенцов и взрослых особей зависят от целого ряда факторов, таких как численность и плотность филина, достаточность кормовой базы, особенности местности, антропогенный фактор, наличие гнездовых построек, плотность других гнездящихся птиц (мохноногий курганник, ворон и др.). Сроки выбора гнезда и его освоения парой различны. По данным 1998–2005 гг. выбор гнезда начинается со второй-третьей недели марта ($n$=13), и некоторые птицы в это время уже спариваются ($n$=1). В первую неделю апреля этот процесс идёт интенсивнее: пары выбирают гнёзда и активно защищают их ($n$=21), спариваются ($n$=3). Бо-

was directly and highly depended on series factors such as number and density of Eagle Owl, food supply, location of nest substrates, and human disturbance. According to data of 1998–2005, nest selection of breeding pairs started from second half of the March ($n$=13) and was very intensive in a first week of the April. Breeding pairs actively defended nest sites ($n$=21) and copulated ($n$=3) at this time. Rising of air temperature and thinning of snow coverage were the main factors to early nesting and copulating in 1998–2005. 66.7% of observed old or newly built nests ($n$=21) were selected by males.

### Types of nest substrates

All nest substrates of successful breeding pairs were categorized as natural (cliff, rock column, ground, tree, sandy precipice) and artificial (rest of substrates). A total of 21 types of natural and artificial nest substrates were selected by 303 breeding pairs of Sakers in 1998–2005. High percentages of nest site selected by Sakers were cliffs 78 (25.7%), rock columns 48 (15.8%) from natural and pylons 56 (18.5%), wooden poles 36 (11.9%) of high power electric line from artificial substrates (table 1). 43.2% ($n$=131)

*Пара балобанов в гнезде на деревянной опоре ЛЭП (вверху) и самка в гнезде на земле (внизу). 2004 г. Фото С. Гомбобаатар*

*A pair of the Saker Falcon in the nest on the wooden electric pole (upper) and female in the nest on the ground (bottom). 2004. Photos by S. Gombobaatar*

*Балобаны в гнёздах на скале (вверху) и на дне старого колодца на земле (внизу). 2004 – 2005 г. Фото С. Гомбобаатар*

*Sakers in the nests on the rock (upper) and on the ground in the pit (bottom). 2004 – 2005. Photos by S. Gombobaatar*

лее ранние сроки гнездования и спаривания некоторых пар связаны с увеличением температуры воздуха и уменьшением снежного покрова в январе-марте.

По наблюдениям за 21 парой балобанов, которые занимали свежепостроенные гнёзда или впервые поселялись на старых гнёздах, выявлено, что в 14 случаях (66,7%) главную роль играли самцы.

of 303 breeding pairs successfully nested on natural substrates and 56.8% on artificial substrates (fig. 2).

Nest site selection of Saker was heavily depended on number of suitable nest substrates and nests of other raptors. Average height of nest substrates was 15.8±0.7 m (min. 0, max. 120, *n*=303) and height of nest location – 10.2±0.4 m (min. 0, max. 60, *n*=303). "0" means ground nesting sakers.

**Nest and nest site selection**

Sometimes female lays eggs into shallow scrapes of the sandy and gravel ground, and dusty remains of pellets in concrete banks of abandoned well without nest materials. There was significant difference between nests of raptor species selected by Sakers ($ANOVA_{0.05}$:$F_{10,55}$=2.0; p=0.0001). Upland Buzzard, a dominant species in numbers, was a pioneering nest builder for Saker. Size, nest materials, and location of the Buzzard nests are suitable for laying eggs, brooding and feeding chicks, and easily occupying for Sakers in the steppe zone. Northern Raven was a second important nest provider species. Adult falcons attack to host of the nest, kill them and occupy freshly built theirs nests. Sakers are always keeping a distance from powerful raptors comparing own body size such as Black Vulture, Steppe and Golden Eagles.

***Табл. 1.*** *Число пар и характеристика гнездовых построек, занимаемых балобаном* (Falco cherrug)

***Table 1.*** *Number of breeding pairs and nest substrates occupied by Sakers* (Falco cherrug)

| No | Субстрат / Substrates | Всего / Total | |
|---|---|---|---|
| | | N | % |
| 1 | Скалы, утесы / Cliff | 78 | 25.7 |
| 2 | Одиночные вертикальные камни / Rock column | 48 | 15.8 |
| 3 | Земля / Ground | 3 | 0.99 |
| 4 | Деревья / Trees | 2 | 0.66 |
| 5 | Речной обрыв / Sandy precipiece | 1 | 0.33 |
| 6 | Металлическая опора ЛЭП / анкер / Pylon | 56 | 18.5 |
| 7 | Бетонная опора ЛЭП / Concrete single pole of HPEL | 30 | 9.9 |
| 8 | Деревянная опора ЛЭП / Wooden pole of HPEL | 36 | 11.9 |
| 9 | Кошары / Cattle shelter | 4 | 1.32 |
| 10 | Деревянные постройки колодцев, буровых скважин / Abandoned building of well | 5 | 1.65 |
| 11 | Бетонные ванны буровых колодцев / Concrete bank of well | 5 | 1.65 |
| 12 | Автомобильные кабины / Car cabin | 1 | 0.33 |
| 13 | Обзорные вышки / Observation tower | 1 | 0.33 |
| 14 | Старые армейские цели для стрельбищ / Abandoned military poles and buildings | 2 | 0.66 |
| 15 | Искусственное гнездо / Artificial nest platforms | 12 | 3.96 |
| 16 | Опоры железнодорожных мостов / Railway bridge | 1 | 0.33 |
| 17 | Столбы железнодорожных светофоров / Railway light pole | 1 | 0.33 |
| 18 | Заброшенные железнодорожные будки / Railway cabin | 1 | 0.33 |
| 19 | Заброшенные постройки / Abandoned old buildings | 2 | 0.66 |
| 20 | Геодезические вышки / Geodetic triangulation poles | 1 | 0.33 |
| 21 | Телеграфные столбы / Telegraph wooden pole | 13 | 4.29 |
| **Всего / Total** | | **303** | **100** |

### Гнездовые субстраты

Различают естественные и искусственные гнездовые субстраты (табл. 1). По данным наблюдения за 303 парами балобанов в 1998–2005 гг., птицы использовали для постройки гнёзд 21 тип естественных и искусственных субстратов. На естественных субстратах гнездились 131 или 43,2% пар ($n$=131). На искусственных – 172 пары, что составляет 56,8% (рис. 2).

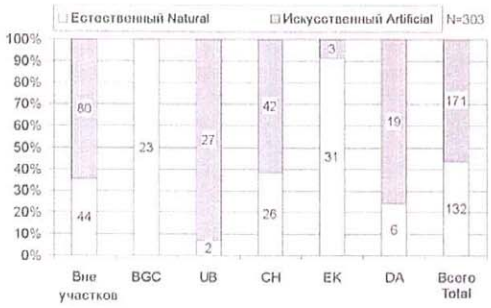



*Рис. 2. Число и процентное соотношение пар, гнездящихся на естественных и искусственных субстратах на контрольных участках*

*Fig. 2. Number and percentage of breeding pairs nested on natural and artificial or man made substrates in control territories of study*

Выбор гнездовых субстратов находится в прямой зависимости от их наличия, а также от наличия на них построек других хищных птиц – поставщиков гнёзд для балобанов. Средняя высота субстратов, выбираемых для гнездования – 15,8±0,7 м (0–120, n=303), гнёзда располагались на высоте 10,2±0,4 м (0–60, n=303). Высота расположения гнезда, равная нулю, подразумевает его устройство на земле.

### Выбор гнёзд и их особенности

Балобаны не строят собственных гнёзд, а занимают гнёзда других птиц. Иногда они откладывают яйца и выращивают птенцов на песчаных и каменистых россыпях, на земле или на скоплении погадок в ваннах заброшенных колодцев. На основании исследований 466 гнёзд выявлено, что выбор построек других птиц различается по видам ($ANOVA_{0.05}$:$F_{10,55}$=2,0; $p$=0,0001). В большинстве случаев балобаны выбирают гнёзда господствующего по численности мохноногого курганника – они подходят по размеру для откладки яиц и выращивания птенцов, а также их легче отбить у хозяев. Другим не менее важным "поставщиком" гнёзд является ворон. Убив ворона, пара балобанов занимает построенное им новое гнездо. Как правило, балобаны уклоняются от борьбы за гнездо с крупными птицами, такими как степной орёл, беркут и чёрный гриф *(Aegypius monachus)*.

### Repeating and shifting of nest sites

Sakers are a very conservative for nesting. Few breeding pairs nested from 2 to 7 times at the same nests. Sakers prefer to nest mostly in Upland Buzzard nets. There was significant difference between nests of raptors selected by Sakers ($ANOVA_{0.05}$: $F_{4,50}$=2.5, $p$=0.00001). The reason for this was caused by size, location, and nest materials of the Buzzard nests were more suitable for Sakers and also prey species of Sakers and Upland Buzzards were almost same in Mongolia. Eggs of Sakers nested on nests of Black Vulture, Black Stork *(Ciconia nigra)*, Steppe and Golden Eagles easily overcooled because of size of these nests was big, nest materials were unsuitable for egg laying. After 2–3 times repeat nesting, most nests were unsuitable for laying eggs and brooding chicks in these nests. 42 (52.5%) of repeated nesting pairs was on natural and 38 (47.5%) on artificial substrates. 52 (10.4%) breeding pairs from a total of 498, was shifted to neighboring nests due to destroyed nests caused by wind, failure of first attempt of nesting, disturbance of Eagle Owls and possibly ectoparasites in the nests. Distance between shifted nests was 1.02±0.3 km in average, the furthest was 5 km and the nearest was 10 sm.

### Copulation

Each breeding pair has individual breeding behavior. While female was eating food passed by male, theirs copulation started on the nest, poles, cliffs and ground. Duration of copulation was 4.1±0.9 sec. (min. 1, max. 12, $n$=11). Pose of female in eating food was similar to pre-copulation pose of female for males. Therefore, it might be one of the simulative factors to males for successful copulating.

### Number and Density of breeding pairs

According to our studies of 1998–2005, there was no significant decline of numbers of breeding pairs in Central Mongolian study areas. Positive and medium correlation was occurred between number of breeding pairs and density of Brandt's Vole, average air temperature. Our data show that influence from wind speed and snow depth to number of breeding pairs was not significant. Number of breeding pairs changed and fluctuated across years due to complex various factors including number of Brandt's Vole, snow depth, air temperature in February-March, and human activities and disturbance. High density of breeding pairs in average was recorded in BGC and EK study

### Повторное гнездование и смена гнёзд

Балобаны гнездятся в одном гнезде в течение 2–7 лет. Они предпочитают повторно гнездиться в постройках курганника ($ANOVA_{0.05}$: $F_{4,50}$=2,5, $p$=0,00001). Кроме того, что гнёзда курганника больше подходят по форме и размерам, этот вид имеет тот же состав питания. Гнёзда чёрного грифа, чёрного аиста *(Ciconia nigra)*, беркута и степного орла крупнее, поэтому в ненастную погоду велика опасность переохлаждения яиц. После 2–3-х летнего повторного гнездования некоторые гнёзда становятся непригодными для откладки и насиживания яиц. Из повторно гнездящихся пар на естественных объектах отмечено 42 (52,5%), на искусственных 38 (47,5%) пар. Для некоторых пар отмечена смена гнёзд. Из 498 пар сменили гнёзда 52 пары, что составляет 10,4%. При этом среднее расстояние между гнёздами составило 1,02±0,3 км, наибольшее расстояние – 5 км, наименьшее – 10 см. Главными причинами смены гнёзд являются их разрушение от сильных ветров, безуспешность первого гнездования, присутствие в постройке эктопаразитов или гнездование филинов на данной территории.

### Спаривание

Каждая пара имеет свои индивидуальные особенности брачного поведения. Некоторые самцы приносят пищу самкам и в момент кормежки или после неё вступают в спаривание. Продолжительность спаривания составляет 4,1±0,9 сек. (1–12, n=11). Позы, которые самки принимают во время кормежки и перед спариванием

*Копулирующая пара балобанов. Центральная Монголия. Март 2004 г. Фото С. Гомбобаатар*

*Sakers copulating. Central Mongolia. March 2004. Photo by S. Gombobaatar*

areas (fig. 1), which consisted of only natural substrates. No sharp difference of density of breeding pairs per 100 km² across years and study areas was occurred.

We estimated density of breeding pairs in average using observed breeding pairs, non-breeding birds and successful fledged chicks in study areas per 100 km² each year (table 2).

### Egg laying and incubation

Period of egg laying of Sakers in the country varied across years depending on average air temperature, food supply and snow coverage. Interval of egg laying was 1–2 days. In 2000, egg laying started early due to thin snow cover and rising of air temperature. In 1998–2005, intensive mass egg laying was observed at the end of the March. Full or 4–5 clutches were recorded at the end of the April.

### Color, size and influencing factors to number of egg

**Color.** Eggshell is from red brown to yellowish brown with informal dark brown and pinkish brown spots and dots with 0.05–10 mm diameter. Under the influence of sunrays and wind, spots and dots of eggs becoming dull (depigmentation) and color of eggs changed from red brown to yellowish brown and complete white.

**Size.** Egg length was 56.5±2.0 ($M$±$SD$) mm (min 50.86, max 66.2, $n$=220), width 46.69±1.6 mm (min 32.5, max 47.24, $n$=90), and weight 50.64±5.9 gr. (min 36, max 65, $n$=90) in average. Egg size was bigger than other subspecies of Sakers in European countries and similar to Chinese population.

**Number.** Average clutch size was 3.7±1.02 (min 1, max 6, $N$=330). Clutch size significantly varied with years and control territories ($ANOVA_{0.05}$: $F_{7,322}$=2.03, $p$=0.0001). Old breeding pairs naturally lay eggs less than 2–5 years (Ilichiev et al. 1982). For Mongolian Sakers, clutch size was 4 (3–5) shows that age of breeding population of Mongolia is consisted of comparatively younger females. G.P. Dementiev (1951), D.W. Snow et al. (1989) mentioned about 6 eggs for Saker, but there was not any proffer documentation before our surveys (Potapov et al. 2002a). Laying of six eggs depends on individual behavioral hereditary of breeding female, air temperature, snow coverage, and sufficient of food supply. No negative affects of height of nest substrates and height of nest location on substrates, type of nest substrates, nest di-

*Табл. 2. Средняя плотность особей на 100 км² всех учётных площадок*
*Table 2. Average density of the Saker Falcon in study areas by 100 km²*

| Показатели на 100 км² учётных площадок/год<br>Indices for 100 km² in study areas/years | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Средние<br>Average |
|---|---|---|---|---|---|---|---|---|---|
| Средняя плотность пар<br>Average density of breeding pairs | 0.29 | 0.56 | 0.45 | 0.3 | 0.97 | 0.13 | 0.56 | 0.49 | 0.47 |
| Число размножающихся особей<br>Number of breeding individuals | 0.58 | 1.12 | 0.9 | 0.6 | 1.94 | 0.26 | 1.12 | 0.98 | 0.94 |
| Число взрослых одиночных особей*<br>Number of non breeding single birds recorded | 0.02 | 0.08 | 0.06 | 0.02 | 1.4 | 0.04 | 0.08 | 0.06 | 0.22 |
| Число взрослых особей<br>Number of adult Sakers | 0.6 | 0.68 | 0.96 | 0.62 | 2.34 | 0.3 | 1.2 | 1.04 | 0.97 |
| Среднее число птенцов<br>Average number of chicks/fledglings | 3.2 | 3.7 | 2.9 | 3.1 | 2.9 | 1.4 | 2.8 | 2.2 | 2.78 |
| Средняя плотность всех особей<br>Average density of total | 3.8 | 4.38 | 3.86 | 3.72 | 5.24 | 1.7 | 4 | 3.6 | 3.79 |

* рассчитано по численности одиночных взрослых особей с площадок
* number calculated on adult birds from study areas

одинаковы, что действует как возбуждающий фактор и влияет на успешное спаривание самца.

### Численность и плотность гнездящихся пар

По данным 1998–2005 гг., несмотря на тенденцию сокращения, численность гнездящихся пар на учётных площадках оставалась сравнительно стабильной. Результаты исследований показывают на существование небольших положительных корреляций между численностью гнездящихся пар, плотностью полёвки и средней температурой воздуха. Скорость ветра почти не влияет на численность гнездящихся пар, отмечена незначительная корреляция с высотой снежного покрова. Таким образом, изменение численности гнездящихся пар балобанов зависит от целого ряда факторов, включая антропогенный. Высокая плотность наблюдалась на участках BGC и EK (рис. 1), состоящих только из естественных гнездовых субстратов. Сравнительный анализ плотности особей на площади в 100 км² не выявил резких различий по участкам и годам (табл. 2).

### Откладка яиц и насиживание

Сроки откладывания яиц в условиях Монголии зависят от среднегодовой температуры воздуха и толщины снежного покрова, поэтому они немного варьируют по годам. Откладка яиц происходит с интервалом в 1–2 дня. В 2000 г. из-за потепления и небольшого снежного покрова кладка началась раньше. В 1998–2005 гг. наблюдалось массовое появление кладок на 3–4 неделе марта. Кладки с 4 и 5 яйцами обычно наблюдаются в 3–4-ю недели апреля, но иногда, в зависимости от по-

ameter, depth, wind speed, snow coverage, and air temperature to clutch size was recorded in study areas. High and positive correlation was appeared between clutch size and density of Brandt's Vole.

### Incubation and hatching

Females and males do not incubate first and second eggs but shelter eggs from cold wind. Intensive incubation started from third eggs in the nest. According to our observation of incubation of females and males, 73.9% (51) out of 69 occasions was female and 26.1% male. After 26.5 – 33.5 days (28 days in average) of first incubation, chicks pip inside of eggshell. This result was confirmed by L. Brown, D. Amadon (1968). Late hatching of eggs was caused by nest location close by busy car route, disturbance of lifestock, dropping of air temperature, lack of nest materials for stick nests on artificial substrates, and less sheltered nests from wind and rain. After 31.5 – 38.5 days of first incubation or after 2 – 3 days of first piping, eggs hatch asynchrony. Therefore, age difference of chicks was 1 – 4 days for the same nest.

### Number of chicks and influencing factors to them

Eggs 3.79 and 3.31 (min 1, max 6, *n*=401) hatchlings, and 2.8±0,7 (min 1, max 6, *n*=401) fledglings in average from 401 breeding records were for successful breeding pairs. There was no difference between number of chicks across years and study areas. 3.34 chicks hatched from 3.79 eggs, so hatching success was 88.1% in average. Breeding success was 73.8% based on calculation of 2.8 hatchlings from 3.79 eggs. Number of successful fledged chicks depends on nest selection of raptors (North-

годных условий, могут быть сдвинуты к первой неделе апреля.

### Число, размеры, окраска яиц и факторы, влияющие на них

***Окраска.*** Яйца бледно-буроватые, охристые, с рыжевато-бурыми, бурыми пятнами неопределённой формы размером в 0,05–10 мм. Окраска скорлупы зависит от окраски фона и пятен. Поскольку цвет пятен резко отличается от фоновой окраски яйца, они определяют общую окраску яиц. При воздействии солнца и ветра происходит депигментация скорлупы, вследствие чего пятна исчезают, и проявляется фоновая охристая, бледно-буроватая окраска.

**Размеры.** Длина яйца составляет 56,5±2,0 (*M*±*SD*) мм (50,86–66,2, *n*=220), ширина 46,69±1,6 мм (32,5–47,24, *n*=90), вес 50,64±5,9 г. (36–65, *n*=90). Яйца балобанов, живущих в Монголии, не отличаются от яиц балобанов, живущих в Китае, и крупнее, чем у птиц из других мест.

**Количество.** В среднем кладка состоит из 3,7±1,02 яиц (1–6, *n*=330). Число яиц в кладке различается по годам и учётным площадкам ($ANOVA_{0.05}$: $F_{7,322}$=2,03, *p*=0,0001). Старые пары откладывают обычно меньше яиц (Ильичев и др., 1982). Для монгольских балобанов обычным является 4 яйца в кладке (3–5) и, по-видимому, самки в популяции размножающихся пар в основном молодые. Хотя в работах Г.П. Дементьева (1951) и D.W. Snow et al. (1989) упоминается о том, что кладка балобанов содержит 6 яиц, доказательства

*Кладка балобана из 6 яиц (вверху) и выводок из 6 птенцов (внизу). 2002 г. Фото С. Гомбобаатар*

*Clutch of the Saker Falcon from 6 eggs (upper) and brood from 6 nestlings (bottom). 2002. Photos by S. Gombobaatar*

ern Raven, Upland Buzzard, Black Vulture, Black Kite, Steppe and Golden Eagles). Most chicks of Sakers in control territories successfully fledged in nests of Upland Buzzards. Negative and positive, low correlation was appeared between number of fledglings and height of nest substrates (*r*=–0.01), nest diameter (*r*=0.1), nest depth (*r*=0.08), height of nest location on substrates (*r*=–0.1), and number of perches surrounded nest sites. The main limiting factors to number of fledgling were density of Brandt's Vole and weather conditions (air temperature, wind speed, snow coverage) (correlation between number of fledglings and the factors: *r*=0.5 – 0.7).

### Age group of chicks and color variation

Due to limited data of chicks, we could not describe all features and plumages which identify age and sex of chicks. But we have written group of ages in general as follows:

Nestlings with first down (15 –17 days old).

Nestlings with first vascular of primaries (wing length 187 mm for male, 204.5 мм for females, ~17 – 30 days old).

Nestlings with second vasculars of primaries (wing length more than 187 mm for male, more than 204.5 mm for females, more than 30 days old).

Fledglings (Dispersed but depends on parent birds).

Young birds (left breeding sites and independent from parents, more than 75 days).

Upper part of fledglings is a dark or chocolate brown with yellowish brown or buffish edges. There are distinct 3 color morphs (brown (normal), dark brown, reddish brown) and also transit colors in plumage.

Portion 1% from recorded 498 breeding pairs was symmetrically developed the narrow and whitish gray stripe of feathers along third and fourth toes. This might be appearance of atavism. According to biogenetic principles, this is facts of that ancestor of Sakers was feathered tarsus and lived in cold habitats and zones. 0.6% (3 nearly fledged chicks) from total recorded pairs was asymmetrically grown 13 tail feathers.

### Literature

*Bold A. & Boldbaatar S.* Range and seasonal distribution, peak and decline of the Saker Falcon in Mongolia. – Proc. of the II International Conference on the Saker Falcon and Houbara Bustard. Mongolia. Ulaanbaatar. 2001. P. 155–159.

этому были получены лишь нами. Откладывание 6 яиц является наследственным признаком взрослых самок и зависит от суммарного воздействия среднегодовой температуры воздуха, толщины снежного покрова и обилия пищи. Показатели высоты местности, расположения гнезда, объекта гнездования, наружного и внутреннего диаметра, глубины гнезда, скорости ветра не оказывают заметного отрицательного воздействия на число яиц в кладке. Но, между тем, была выявлена положительная корреляция между числом яиц в кладке и плотностью полёвки, что лишний раз доказывает связь между числом яиц и обилием кормовой базы.

**Насиживание и вылупление птенцов**

В дневные часы кладку из 1–2 яиц птицы активно не насиживают, а лишь прикрывают их, зашишая от переохлаждения. Начиная с 3-го яйца начинается активное насиживание. По нашим наблюдениям, из 69 случаев в 73,9% (51) кладку насиживала самка, а в 26,1% самцы. Следовательно, самки играют главную роль в этом процессе. Через 26,5–33,5 дня, в среднем 28 дней после насиживания в яйцах слышны звуки, издаваемые птенцами. Эти сроки совпадают с данными L. Brown, D. Amadon (1968). Сроки вылупления птенцов неодинаковы. Близкое расположение дорог, выпасов скота, понижение температуры воздуха, недостаточная подстилка на бетонных, железных субстратах гнёзд, плохая зашишённость от ветра приводят к переохлаждению яиц, следствием чего и являются поздние сроки вылупления птенцов. Через 31,5–38,5 дня после насиживания или через 2–3 дня после первых звуков в яйцах из скорлупы поочередно вылупляются птенцы. Поэтому птенцы из одной кладки различаются в возрасте в 1–4 дня.

**Число птенцов и факторы, влияющие на них**

Кладки 401 пары балобанов содержали в среднем 3,79 яиц, выводки – 3,31 птенцов (1–6, *n*=401), летные выводки – 2,8±0,7 слётков (1–6, *n*=401) на успешное гнездо. Если сравнить число слётков на всей гнездовой территории по годам и учётным площадкам, то видимых различий не выявлено. Из 3,79 яиц вылупилось 3,34 птенца, следовательно, успешность кладки составляет в среднем 88,1%. Из 3,34 выводков 2,8 встали на крыло, т.е. вылетело 83,8% слётков на успешное гнездо. На 3,79 яиц балобана приходится 2,8 слётка, а обший успех размножения составляет 73,8%.

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Число успешно развивающихся птенцов сильно зависит от вида гнездовых построек, то есть гнёзда каких видов птиц были заняты балобанами. Больше всех птенцов отмечено в постройках мохноногого курганника. Выявлена слабая отрицательная корреляция между числом птенцов и высотой местности ($r$=–0,01), незначительная положительная корреляция – между числом птенцов, диаметром ($r$=0,1) и глубиной ($r$=0,08) гнезда, высотой расположения гнезда ($r$=–0,1) и числом присад ($r$=0,3) – что говорит о том, что влияние этих показателей на число птенцов не существенно. Главными лимитирующими факторами являются численность полёвки и погодные условия (температура воздуха, скорость ветра, толщина снежного покрова) ($r$=0,5–0,7).

### Возрастные группы птенцов, внешние признаки и их изменчивость

Собранный нами материал недостаточен для полного описания возрастных групп птенцов, поэтому здесь мы ограничимся лишь общими соображениями:

– Взрослые пуховики (15–17 дневные).

– С первичными сосудистыми маховыми (у самца длина крыла–187 мм, у самки–204.5 мм, ~17–30 дневные).

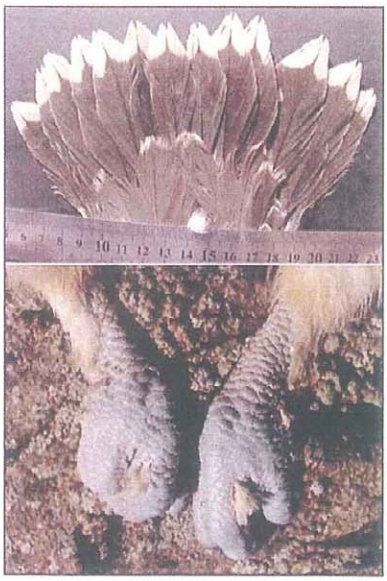
– Развиты вторичнососудистые маховые перья (у самца длина крыла–187 мм, у самки-более 204.5 мм, больше 30 дней).

– Слётки или птенцы с полным оперением (покидают гнезда, зависят от родителей).

– Молодая птица (не зависит от родителей и живёт самостоятельно, 75 дней и больше).

**Окраска.** Фоновая окраска перьев спины в основном бурая, но в зависимости от пигментации может иметь 3 цветовые вариации: бурую, тёмно-бурую, бледно-бурую. Существуют также различные переходные формы расцветки.

**Случайные признаки.** У 1% самок (n=498) на 3, 4 пальцах и внутренней стороне 1 пальца, образуя узкие полосы, выросли симметрично расположенные пучки бледно-серых перьев. Такое оперение пальцев и цевки является проявлением "атавизма". По биогенетическому закону это служит доказательством тому, что предками балобанов были птицы холодных поясов с оперенной цевкой. В норме у балобана 12 симметрично расположенных рулевых перьев. У 0,6% птиц наблюдается увеличение числа рулевых перьев, в частности, у 3-х самок отмечено 13 рулевых перьев.



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**ATTACHMENT 3**

**REPORT ON RANDOM SURVEY ON *FALCO CHERRUG* IN 2008**

Ministry of Nature, Environment, and Tourism has done the random survey in the field of *Falco cherrug* harvesting areas in Mongolia. The field survey has conducted for 15 days from September 20th to October 4, 2008 in 3 different groups that consisted of raptor researchers, biologist and graduate students.

**The objective** of the field survey was to identify the current status of *Falco cherrug* population size where in the harvesting sites and their abundance, and distribution.

The three teams have provided the vehicle and necessary equipments by the MNET allocated budget and financial contribution of Kuwait.

**Participants** were taken the lead of H.Tseveenmyadag, Head, Laboratory for Bird Research of the Institute of Biology, National Academy of Sciences of Mongolia, Dr. Sh. Boldbaatar, Researcher, Dr. S.Gombobaatar, Professor, National University of Mongolia (NUM), and members of G.Mainjargal, Assistant Researcher and PhD Candidate, D.Damdindorj, Graduate Student, and T.Javkhlantsetseg, Assistant Researcher, B.Gantulga, Assistant to the NUM, and drivers like Ts.Nergui, N.Choidog, and N.Luvsanbaldan.

**Destinations** of the field survey were in the following:

The first destination of the team has covered from Ulaanbaatar - Bayannuur – Dashinchilen – Gurvanbulag – Khashaat – Kharkhorin – Khujirt – Bayankhongor – Bombogur – Galuut – Jargalant (Baidrag) – Gurvanbulag – Khureemaral – Arbaikheer – Nariintal – Arvaikheer – Olziit – Yesunzuil – Ulaanbaatar in total of 4698 km.

The second team has covered that from Ulaanbaatar to Tov Province and Dundgobi Provinces including Argalant soum.

The last team has covered the remaining part of the areas in Bayankhongor, Ovorkhangai, and Bulgan Provinces.

During this time, the field survey teams were not faced the difficulty of weather, vehicles, and technical problems. Average temperature of the days was (+ 15) and (+ 4) to (+5 ) in the nights.

**Result:**

The teams found that distribution of *Falco cherrug* population were wide in the habitat ranges, population size was large as same as before, numbers was stable comparing to the previous field surveys. At first, we noted that the field survey was done in the appropriate time of the year. Secondly, the migration of the of *Falco cherrug* was active during the field survey.

In last, while the summer of 2008 was relatively good comparing to the previous years, there was a significant increase of rodents and small wild mice that caused the major soil erosion in the steppes.

It is important that to note the significance of regular field survey.

**ATTACHMENT 4**

**STATUS OF THE SAKER FALCON (*FALCO CHERRUG*) IN MONGOLIA IN RELATION TO CITES TRADE**

Accurate measures of the population size of the Saker Falcon (*Falco cherrug*) in Mongolia do not exist. The Saker Falcon occurs throughout the whole country as a breeding species, whilst migrants from more northerly breeding populations in southern Siberia occur in the country during autumn and spring passage, whilst some may overwinter along with a proportion of the Mongolian breeding birds.

The most recent assessment of the Mongolian Saker Falcon population estimates that there are 2000-5000 breeding pairs in the country (Dixon, 2009). The species is a widespread breeding bird of prey, which is found in 33 of 70 Important Bird Areas in Mongolia (Batbayar & Natsagdorj, 2009). Breeding densities vary spatially across different habitat types (the highest densities being found in steppe habitats) and temporally in relation to fluctuating food supplies (especially population cycles of small rodents). Average breeding density across eight study areas over the period 1998-2005 was 0.47 pairs per 100 $km^2$ (Gombobaatar *et al*., 2007). Over this eight year period measured breeding densities fluctuated from 0.13 to 0.97 pairs per 100 $km^2$ but showed no overall increasing or decreasing trend. In a central Mongolian study area (Eej Khad IBA MN051) the Saker Falcon breeding population has remained stable over an 11-year period 1998-2008 (Dixon, 2009).

Productivity of breeding Saker Falcons in Mongolia is high, with an average of 2.8 chicks per breeding pair being produced over the period 1998-2005 (Gombobaatar, 2007). Consequently, annual productivity of fledgling Saker Falcons in Mongolia is likely to be in the region 6000-15,000 individuals. Post-fledging mortality of these juveniles will mean that this number gradually declines from July onwards and many juveniles migrate from Mongolia to China from September-October (though at this time wintering immigrants and passage birds from the Russian breeding will enter the country). There is no evidence that harvest levels of Saker Falcons for CITES regulated export trade has had any detrimental impact on the Mongolian breeding population.

The limited trend data available (Gombobaatar et al., 2007; Dixon 2009) does not indicate a declining breeding population of Saker Falcons, at least in the steppe zone of central Mongolia. Furthermore, there is evidence that a large non-breeding population of Saker Falcons exists in the central Mongolian steppe zone. A surplus non-breeding population would not exist if the breeding population was in decline. Non-breeding Saker Falcons occur across large areas of flat, nest-site limited steppe habitats of central Mongolia and they can be encouraged to breed in these areas by the provision of artificial nesting sites (Dixon et al., 2008).

The Ministry for Nature and Environment of Mongolia has an agreement with the Environment Agency Abu Dhabi (UAE) to undertake research and conservation work on Saker Falcons in Mongolia. This work is being carried out by the Wildlife Science & Conservation Center (Mongolia) and International Wildlife Consultants Ltd (UK). Part of this work has involved the experimentally testing whether artificial nests can be used to increase the breeding population of Saker Falcons in nest-site limited habitats and to develop a system whereby the productivity of these nests can be used to set a sustainable harvest quota. This work has shown that the principle can work and the intention is to extend this system over a wider area in order to establish a sustainable harvesting system for Saker Falcons. The scheme is to be funded by the Arabic end-users, independently monitored by respected Mongolian NGO's and administered by the Ministry for Nature and Environment of Mongolia within the framework of CITES.

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