STEPPE EAGLE BREEDING SUCCESS AND PREY SPECIES ABUNDANCE REPORT FOR ORIENTAL BIRD CLUB CONSERVATION GRANTS

SUMMARY

Steppe eagle (*Aquila nipalensis*) is an endangered species internationally and population declines have been confirmed in numerous distributed sites. The eagle is a migratory species in Mongolia that breeds mainly in steppe zone. Our survey is conducted in 4676 km square area of Halzan Soum, Sukhbaatar Province, Mongolia from May to August, 2018. We studied 25 breeding nest including 13 (52%) were placed on the ground of flat steppe, 12 (48%) were on boulders of rocky hill sides. However the nesting substrate did not affect hutching success, breeding success was higher in rock boulder habitat than flat steppe. Average clutch size was 2.4 (±0.13 SD, 1-3, n=25) and the number of young fledged per pair was 1.2 (±0.2 SD, 1-3, n=25). For most raptors, breeding success is limited by food supply and nesting site availability. When 98 Brandt' vole in a per hectar area, the steppe eagle clutch size was 2.4 and it is higher number than other study from which another part of Eastern Mongolia.

INTRODUCTION

The Eastern Mongolian Steppes are home to the largest remaining intact temperate grasslands on the Earth. This steppe ecosystem is characterized by treeless steppes on flat terrain and gently rolling hills, and wetlands. Sukhbaatar Aimag lies in the southern portion of Mongolia's steppe ecosystem. The eastern steppes are an exceptional ecoregion within the vast Eurasian Steppes that span from the European Pannonian Steppes in Hungary to the Mongolian-Manchurian grasslands. Within this system, the eastern steppe is unique due to their intactness, relatively high altitude, and northern latitude. The main, distinctive characteristic of the region compared to other steppe ecosystems is that it is dominated by grass spanning thousands of square kilometers, with several species of bushes and shrubs. Steppe eagle (*Aquila nipalensis*) is an endangered species internationally and population declines have been confirmed in numerous distributed sites. For most raptors, breeding success is limited by food supply and nesting site availability. Due to no study has examined the influence of prey abundance on the distribution and breeding success of this eagle, our planed survey will be used for conservation management.

However, few species of birds breed in the area such as steppe eagle, Saker falcon, buzzard and some species of Passeriformes.

PROJECT OBJECTIVES

The project aims to Quantify the breeding success, and prey species abundance of steppe eagle and answer the question do steppe eagle breeding success relate with prey species abundance? The result will be used to action plan of steppe eagle and recommendation to help wildlife managers organize pest control program.

METHODS

The project will survey the relationship between breeding density and breeding performance of the steppe eagle pairs with the availability of their main prey in territories. Nest sites will be mapped in GIS and abundance calculated using Distance methods which avoid stress in early breeding season. Habitat characteristics will also be recorded.

To evaluate breeding success, we will use the average productivity for each pair, defined as the number of fledglings raised per number of years mentioned (Sundev et al. 2005, 2012).

Reproduction parameters will evaluate clutch size, nestlings and fledgling for each nest. Productivity values will available for the 15-20 breeding pairs of this study for one year. Biodiversity and density of prey species will be surveyed and compared with biodiversity at random sites without colonies. The project will survey species richness and evenness of small mammals (box traps), and birds (point counts) in 3 randomly selected occupied territories and 3 unoccupied territories.

Data analysis will involve 1) identifying the habitat requirements of steppe eagle using model selection techniques to examine which characteristics best explain nest distribution, and 2) Regression analysis will use for evaluation and statistical differences between factors affecting nest substrate and hatching and fledging success; changes in number of egg laid and young fledged the year, egg and nestling mortality. 3) We will use descriptive analysis for the measurements of nest height, nest diameter, clutch size, number of chicks, hatching and fledgling success. 4) prey species density analysis will calculate in program Distance and Mark.

RESULTS

A total of 2 different types nest substrates were selected by the breeding pairs. Of the total of 25 nests evaluated, 13 (52%) were placed on the ground, 12 (48%) were on boulders. Breeding pairs preferred to place their nest in the midst of 5-15 cm rock boulders in rocky hill sides. The nests were placed on top of hilly slopes overlooking active colonies of rodents, mostly Brandt's vole (*Lasiopodomys brandti*). In contrast, steppe eagle built nests on the ground (47.8%, n=49), on rock columns and large boulders (32.6%, n=49) and on artificial substrates (8.7%, n=49; Sundev et al., 2012) from 1998 to 2007. In our observation of 2013 when Daurian Pika (*Ochotona dauurica*) population raised peak, we found 3 active nests in per 10 km^2 in Halzan soum of Sukhbaatar Province. Totally, we counted 15 active nests in the soum region (Unpublished data). Breeding nest density was 6.3 (2.1-17.2) km between pairs (Figure 1).

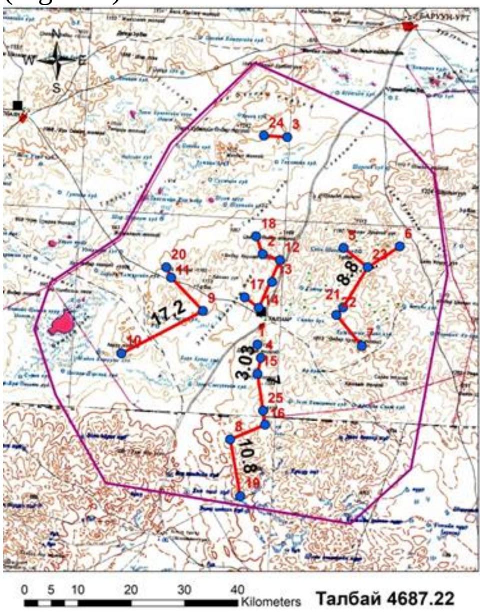

Figure 1. Steppe eagle nest disturbance and distance between pairs in Halzan Soum of Sukhbaatar Province, 2018.

The eagle nests contained twigs of shrub (*Caragana* sp.), elm tree (*Ulmus sp.*), sheep, goat wool, plastics, other garbage materials of human. The outer diameter of the nest was 113.9 cm (±4.1 cm SD, 90-130, n=12), cup size was 48.4 cm (±2.9 cm SD, 35-65, n=12). Nest diameter ($F_{1,2,3}$=0.058; R^2= -0.05, p=0.4) did not affect clutch size.

Average clutch size was 2.4 (±0.13 SD, 1-3, n=25) per breeding attempt. A total of 13 (48.0%, n=25) pairs laid 3 eggs, 11 (44.0%) laid 2 eggs, and 1 (4.0%) laid 1 egg clutches. The average number of young successfully fledged per breeding attempt was 1.2 (±0.2 SD, 1-3, n=25). A total of 11 pairs fledged 11 (44.0%) pairs fledged no young in this study; 1 (6.2%) pairs fledged one young, 10 (41.6) pairs two young and 3 (12.5%) pairs fledged three young. Our result are similar to Shagdarsuren (1983), Bold & Boldbaatar (1999) and Sundev et al (2012) who found that clutch size varied from 1 to 3 eggs in Mongolia.
Average hatching success was 62.5% (±9.4 SD, 0-100, n=25) and fledging success was 52.8% (±9.6 SD, 0-100, n=25). Nesting habitat occupied mainly in rocky boulders of hill sides. However hatching success (64.1% ± 12.7 SD, 0-100, n=25) for ground nester in flat steppe was higher and fledging success (61.1% ± 13.5 SD) was decreasing. It might be associated with human and livestock influence. In contrast, hatching success and fledging success (46.1% ± 12.8 SD) for boulder nesters were same and higher than ground nesters.

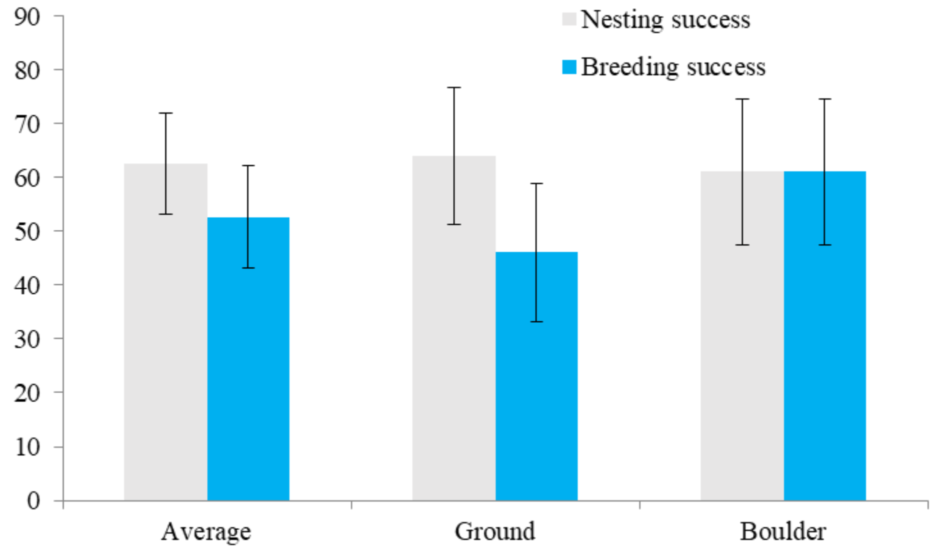

Figure 2. Nesting and breeding success of steppe eagle (*Aquila nippalensis*) ± standard error, Halzan Soum, Sukhbaatar Province in 2018

For the prey species density, we recorded 3 species of rodent including Brandt's vole (*Lasiopodomys brandti*), Daurian ground squirrel (*Spermophilus dauricus*) and Mongolian gerbil (*Meriones meridianus*). From the prey species, Brandt's vole population peak is occurred in the region 2017 and 2018. We found that species of vole density was 98 individuals per hectare (ind/ha). We recorded prey species remains such as Brandt's vole, Daurian ground squirrel, Daurian Pika (*Ochotona dauurica*), Daurian hedgehog (*Mesechinus dauuricus*), steppe polecat (*Mustela eversmanni*), least weasel (*Mustela nivalis*) in the eagle nest.
We guess that vole density affect higher clutch size (2.4±0.13) in this year. In contrast, clutch size was 1.9 in Eastern Mongolian in 10 years from when population 144-0 ind/ha of Brandt's vole survey result. We have to continue our breeding success and prey abundance survey next years when declining phase of prey vole.

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Figure 3. Steppe eagle checks with their prey (least weasel, Daurian ground squirrel, steppe polecat and) in Halzan Soum, Sukhbaatar Province, Mongolia in 2018.

Figure 4. Steppe eagle from egg stage to 60-70 days old, Halzan Soum, Sukhbaatar Province, Mongolia

Egg Day 1 Day 3 Day 9-12

Day 12-16 Day 16-22 Day 22-27 Day 27-32

Day 33-37 Day 45-50 Day 60-70