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Do Nest Materials and Nest Substrates affect the Breeding of *Buteo hemilasius* in the Mongolian Steppe?

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Do nest materials and nest substrates affect the breeding of *Buteo hemilasius* in the Mongolian Steppe?

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Abstract

Upland Buzzards occur across Mongolia excluding lush taiga forest and breeds from the Mongolian Altai mountains to the western foothills of the Great Khyangan Mountains. Our field work was conducted during the breeding season of the species in Mongolia from 2001 to 2007. Nest materials of the studied nests contained natural (twigs of elm tree, shrubs, tail and mane of horse, hair of cows, fur of sheep, goats and camels) and artificial or man-made (cotton, plastic bags, wires, cables, and others) materials. Contents of the nesting materials of the species were differed by location, region and breeding pair's behaviour. A total of 24 different nest sites were selected by breeding pairs during the study periods. Most nests were placed on the ground (22.7 %), 19.7 % on artificial nest platforms (three-legged poles, single poles, car tire on poles, pylons), 16.8 % on rocky outcrops, 8.8 % on rocky columns or cliffs, 5.26 % on type 'A' wooden poles of high power electric lines and 26.74% others. Average clutch was comparatively high for breeding pairs that nested on rock columns 3.9, abandoned buildings 3.7, ground 3.6, cliffs 3.3, type "A" wooden poles of the high power electric lines 3.3, sandy precipice 3 and others less than three. Average number of nestlings on the ruins of buildings was 3, rock columns 2.8, ground, telegraph poles and concrete poles of the high power electric lines 2.5, wooden poles of the high power electric lines and pylons 2.4, well building and livestock shelter 2, cliffs 1.6 and sandy precipices 1.5. There was a significant difference between the number of nestlings on natural and artificial substrates, including artificial nest platforms. We documented a breeding pair that was incubating three of its own eggs and a Saker falcon egg on a cliff of a mountain outcrop. We also observed twice the number of second clutches on natural substrates, which we consider to be dependent on food abundance and accessibility.

Keywords: Mongolia, Upland buzzard, nest, nest substrate, clutch, chicks

1. Introduction

The breeding distribution of the Upland Buzzard *Buteo hemilasius* is limited in comparison to the other *Buteo* species of the World. Mongolia is the core region of all the countries in which the species is known to breed. In Mongolia, Upland Buzzards breed from the Mongolian Altai Mountains to the western foothills of the Great Khyangan Mountains (FLINT & BOLD 1991). The distribution, number, status, and diet, in Mongolia have been extensively studied previously (PRZEWALSKII 1876, PEVTSOV 1883, BIANKI 1915, KOZLOVA 1930, TUGARINOV 1932, SUSHKIN 1938, MINORANSII 1962, DEMENTIEV 1963, KOZLOVA 1975, MAUERSBERGER 1980, PIECHOCKI *et al*. 1981, FLINT & BOLD 1991, STEPHAN 1994, BOLD et al. 1996, SUMIYA & BATSAIKHAN 1999, BOLD and BOLDBAATAR 2001, POTAPOV *et al.* 2001, POTAPOV 2005, GOMBOBAATAR *et al*. 2006, MAINJARGAL 2006) and there are few studies concerning the breeding biology of the species (SHAGDARSUREN 1964, 1983; BOLD & BOLDBAATAR 1999, KARYAKIN 2005, KARYAKIN et al. 2005, GOMBOBAATAR 2006, KARYAKIN et al. 2006, KARYAKIN & NOVIKOVA 2006).

The aims of our study were to a) describe the nest site selection and nest substrate of the Upland Buzzard; b) understand the relationship between nest substrate and clutch size, number of nestlings; c) and elucidate the main factors that influence the number of eggs laid and, subsequently, the fledging success.

2. Study area and Methods

We conducted fieldwork during the breeding season (from May to August) in Mongolia. Nest measurements (nest bearing, height and diameter, height of nest substrate, nest height above the ground); clutch size and chicks were recorded. During the breeding season, we searched for new active nests and re-checked nests of previous years using the method of FOX *et al.* (1997). All nests were named, marked on a 1:500 000 map and GPS. Each active nest of the year was checked two or 3 times in each breeding season. During the years 2001-2007 we checked a total of 304 active nests monitored in different natural zones that included high mountains, forest, forest steppe, mountain steppe and desert steppe in Mongolia (Fig. 1).

We measured the bearing of every nest using Sylva (02^{o}) compass and nest measurements by measuring tape (see FOX et al. 1997). We applied descriptive statistics to analyze the measurements of the height, diameter of every nest, clutch size, brood size, hatching and fledging success in order to get average, standard deviation and range of the data.

Descriptive statistics were used to average the nest measurement; clutch size and number of chicks; number of eggs/chicks and diameter, depth, and height of the nest. Non-parametric tests (Wilcoxon Test) were used to determine the relationship between clutch and nestlings on natural and artificial substrates (KREBS 1989, SYSTAT 10.0).

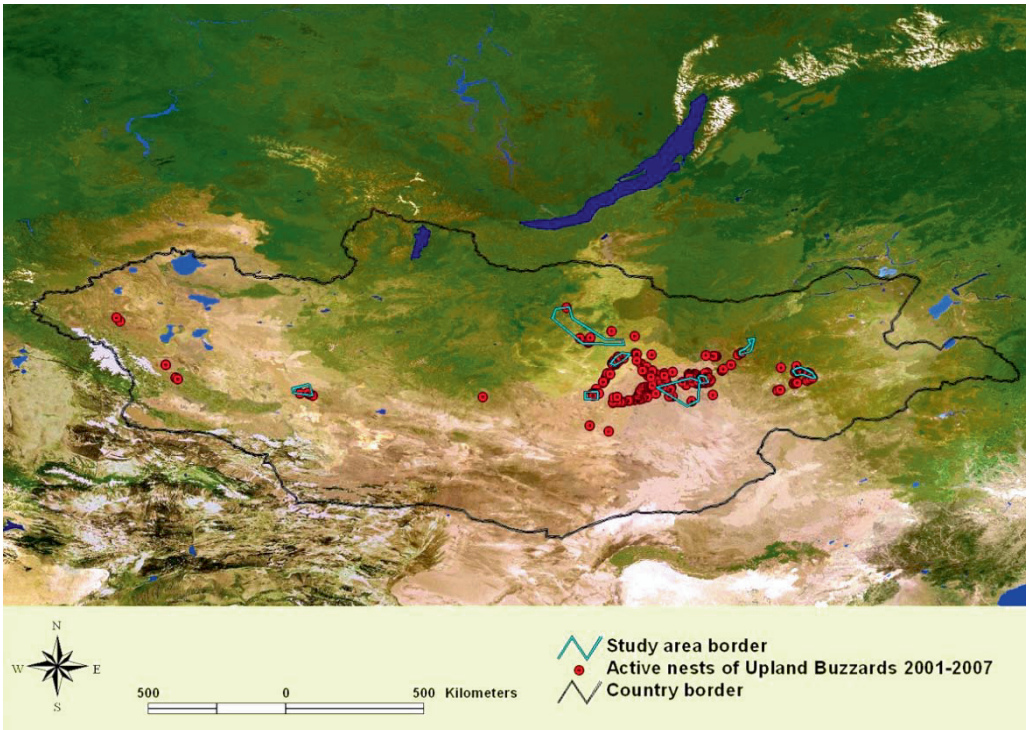

Fig. 1: Locations of the monitored nests of Upland Buzzards *Buteo hemilasius* in Mongolia (2001-2007).

3. Results and discussion

Nest and nest material

Nest materials of a total of 304 active nests were twigs of elm tree, shrubs (*Caragana* sp.), tail and mane of horse, hair of cows, fur of sheep, goat and camels, cotton, plastic bags, wires,

cables, and other man-made materials. Proportion of nest materials for each nest varied depending on habitat type, vegetation, distance from urban areas and availability of these materials. Nest materials of breeding pairs located in proximity of urban areas consisted of 80-90% of wires, cables, plastic bags, strings and twigs. Nest materials in the remote areas consisted only of components of natural origins such as twigs, branches, roots, dried grasses, etc. We found 15 nests located close to small towns in the steppe. Nest materials of two of these active nests were twigs of *Caragana*-shrub, dried grass, wool and fur of cattle. The rest of the nests contained several different artificial or man-made materials such as cables, wires, cotton, plastic bags, rope, string and paper. This can be explained by the opportunistic behaviour of nest building of the breeding pairs. Outer diameter of the nest of the buzzard on average was 90.8 cm (± 36.9 SD, min. 30, max. 200, n = 233), nest depth was 5.1 cm (± 3.99 SD, min. 0, max. 14, n = 214), and nest height was 31.7 cm (± 19.1 SD, min. 0, max. 180, n = 228).

Nest substrates

We studied a total of 24 different nest sites selected by breeding pairs of Upland buzzards. Most nests were placed on the ground 22.7 % (n = 69), 19.7 % (n = 60) on artificial nest platforms (three-legged poles, single poles, car tire on poles, pylons), 16.8 % (n = 51) on rocky outcrops, 8.8 % (n = 27) on rocky columns or cliffs, 5.26 % (n = 16) on type 'A' wooden poles of high power electric lines and others (26.74%) (Fig. 2).

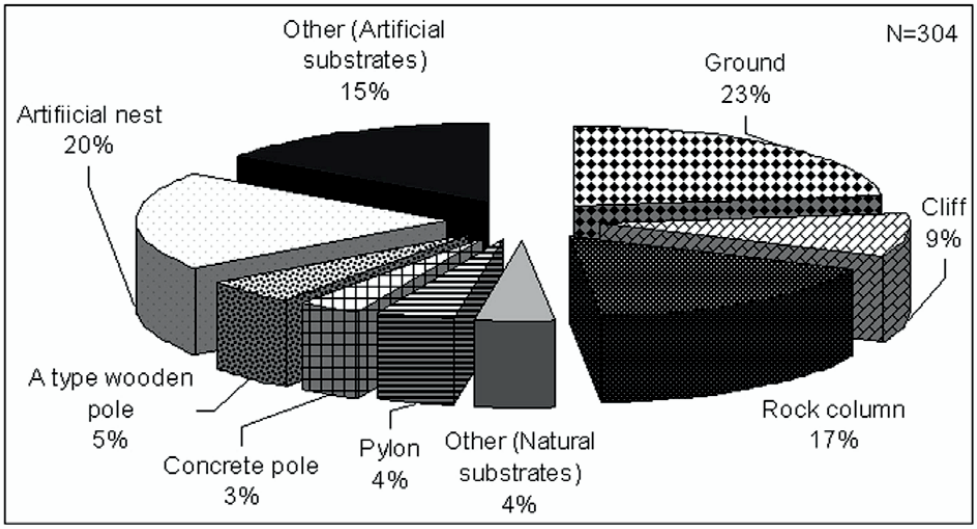

Fig.2: Type of nest substrates selected by Upland Buzzard *Buteo hemilasius* in Mongolia.

We categorized all nest substrates as natural or artificial based on their origin. Of the total occupied nest substrates, 52.6 % were natural (ground (22.7 %, n = 69), rock column (16.8 %, n = 51), cliff (8.9 %, n = 27), tree (2.6 %, n = 8), sandy precipice (1.3 %, n = 4), and bones/carcasses of dead cow (0.33 %, n = 1)) and 47.4 % artificial (artificial nest platform (19.7 %, n = 60), type 'A' wooden pole of the high power electric line (5.3 %, n = 16), pylon (3.9 %, n = 12), concrete pole (3.3 %, n = 10), telegraph pole (2.6 %, n = 8), ruins of building (2.3 %, n = 7), livestock shelter (1.9 %, n = 6), railway bridge (1.6 %, n = 5), wooden building of ground well (1.3 %, n = 4), wooden single pole (0.9 %, n = 3), abandoned car cabin (0.9 %, n = 3), car tires on the ground (0.7 %, n = 2), wooden house of local (0.7 %, n = 2), concrete bank of ground well (0.7 %, n = 2), car tire on the ground (0.7 %,n = 2), petrol containers (0.3 %, n = 1), gravel wall of busy railway (0.3 %, n = 1), and old Russian military target (0.3 %, n = 1).

Concerning the substrates mentioned above, the most interesting and unusual were bones/carcasses of dead cows, abandoned car cabins, the gravel wall of a busy railway and on

the ground close to a busy and dirt road. After the disastrous winter of 2002, during which many cows and horses of local nomads died due to starvation and extreme cold in Central Mongolia before the breeding period of the Buzzard, the families removed the dead cows from their cattle shelters and piled them up near their ger camps. One breeding pair of Upland Buzzard was found incubating 4 eggs in a nest placed on top of such a pile made up of seventeen cow carcasses. This nest was located in an area with a high vole density. The height of the nest substrate was 0.7 cm from the ground and three young were successfully fledged from the nest (Fig. 3).

An abandoned Russian lorry cabin in the middle of the steppe was one of the nest sites during the peak of Brandt's Vole and Mongolian Gerbil *Meriones unguiculatus* populations. Breeding pairs built nest in and on top of these cabins. Well sheltered car cabins on the open steppe are suitable not only for Upland Buzzard but also Steppe Eagles and Saker Falcons. A pair of Upland Buzzards built its nest on a gravel wall at a distance of 0.5 meters from the busy Trans Baikal railroad. A dark individual was observed incubating 3 eggs in the nest. Owing to the disturbance by the trains and railway workers, no young were fledged from the nest. On another occasion, two nests with 3 young each were located 0.3 meters away from a busy countryside dirt road. We counted 2 cars that passed on the road for every 3 hours. Clutch size and fledging success for these nests was similar to the other nesting substrates. Trees were a predominant location selected for nest placement, especially in the Buryat region. Of 48 nests found, 95.9% were on trees (KARYAKIN et al. 2006). From the comparison of this study and our results, we assume that Upland buzzards prefer to select nesting substrates depending on suitability, stability of nesting substrates and abundance and availability of prey species in the breeding area.

Fig.3: An adult buzzard in the nest placed on the carcasses of dead cows.

Unusual nest sites, artificial nest platforms and comparatively high occupancy of nests on poles and pylons of the high power electric lines, telegraph poles, livestock shelters, and building ruins appears to be related to the high density of Brandt's vole on the Mongolian steppe. KARYAKIN (2005) found that the Upland Buzzard prefers to nest on poles and pylons of high power electric lines, artificial nest platforms in neighbouring countries such as Tuva. The average number of clutch in the country was comparatively higher than Buryat (2.33 ± 1.12, n = 41) (KARYAKIN et al. 2006).

Clutch and chicks

Average clutch was comparatively high for breeding pairs that nested on rock columns 3.9 (± 1.15 SD, min. 2, max. 4, n = 36), on the ground 3.6 (± 0.87 SD, min. 2, max. 7, n = 46), in cliffs 3.3 (± 0.67 SD, min. 2, max. 8, n = 10) or sandy precipices 3 (± 1.4 SD, min. 2, max. 5, n = 2), in pylons 2.8 (± 0.64 SD, min. 3, max. 3, n = 2), concrete poles of the high power electric lines 3 (± 0 SD, min. 3, max. 3, n = 2), type 'A' wooden poles of the high power electric lines 3.3 (± 1.2 SD, min. 2, max. 6, n = 9), telegraph poles 3 (± 0.89 SD, min. 2, max. 4, n = 6), artificial nest platforms (tripod, single pole with tire, geodetic triangulation post, tires on concrete pole and wooden pole of the high power electric lines 2.9 (± 0.69 SD, min. 2, max. 4, n = 46) and abandoned buildings 3.7 (± 0.87 SD, min. 3, max. 4, n = 4). Clutch size was statistically different between natural and artificial nest substrates (Wilcoxon Test, Z = -5.3, p = 0.0001). The most frequent clutch size was 3 eggs for artificial nest substrate and 4 for natural substrates during our study (Fig.4).

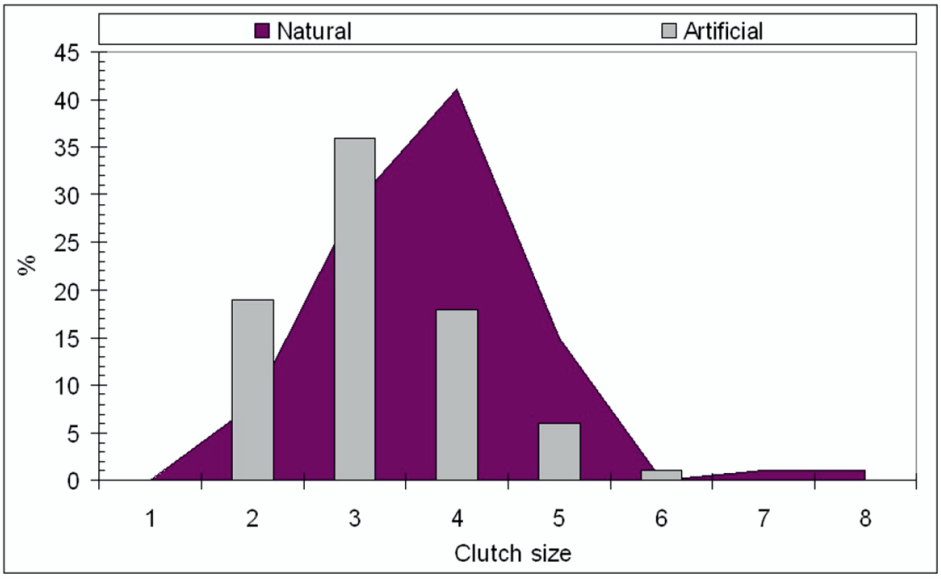

Fig.4: Frequency of clutch size on natural and artificial substrates of Upland Buzzard *Buteo hemilasius* in Mongolia (2001-2007).

The average number of nestlings on the ruins of buildings was 3 (± 1.4 SD, min. 2, max. 4, n = 2), rock columns 2.8 (± 1.7 SD, min. 0, max. 5, n = 37), ground 2.5 (± 1.3 SD, min. 0, max. 5, n = 54), concrete poles of the high power electric lines 2.5 (± 1.3 SD, min. 0, max. 5, n = 54), telegraph poles 2.5 (± 1.37 SD, min. 1, max. 4, n = 6), wooden poles of the high power electric lines 2.4 (± 2.5 SD, min. 0, max. 6, n = 5), pylons 2.4 (± 1.1 SD, min. 0, max. 3, n = 10), well buildings 2 (± 1.4 SD, min. 0, max. 3, n = 4), livestock shelters 2 (± 1.6 SD, min. 0, max. 4, n = 4), cliffs 1.6 (± 1.2 SD, min. 0, max. 3, n = 14) and on sandy precipices 1.5 (± 0.7 SD, min. 1, max. 2, n = 2).

The average number of nestlings on natural substrates was 2.4 (± 1.5 SD, min. 0, max. 5, n = 107), on artificial substrates 2.3 (± 1.4 SD, min. 0, max. 6, n = 34) and on artificial nest platforms 1.1 (± 1.2 SD, min. 0, max. 4, n = 74). Low numbers of nestlings on average on artificial nest platforms were caused by the size of the platform which was placed either on a tripod, on a single pole, on a pole, or inside electrical pylons which required them to be comparatively small (60 x 60 cm) to build big enough nests to rear all chicks in the nest. The high number of frozen eggs found in artificial nest platforms was caused by sparse nest material and thin nest bottom.

There was another interesting recording that a breeding pair incubated three of its own eggs and a Saker falcon egg on a cliff of a mountain outcrop. It was most likely that this Saker falcon hosted the nest after it was rebuilt by a Buzzard pair at the beginning of the breeding season. Then, the nest

was re-occupied by Buzzards after the first clutch of the falcon in the result of competition of two species with the same ecological niche on the Mongolian steppe. Three Buzzard chicks and a Saker chick successfully hatched in the nest. After 2 weeks, the Saker chick disappeared for an unknown reason. We assume that the larger and more aggressive Buzzard chicks ate the Saker chick.

MAINJARGAL (2006) mentioned that Upland buzzards can lay up to 6 eggs. We documented for the first time for the species clutches with 6 eggs. We also observed twice the number of second clutches on natural substrates, which we consider to be dependent on food abundance and accessibility (Fig.5 and 6).

Fig. 5: Six clutches of Upland Buzzard in Central Mongolia in May 2004.

Fig.6: Double clutches of Upland Buzzard in Central Mongolia in June 2007.

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