

RECENT RESEARCH ON THE ECOLOGY AND CONSERVATION OF THE GREAT BUSTARD *OTIS TARDA* IN ASIA

*Современные исследования по экологии и сохранению дрофы (*Otis tarda*) в Азии*

M.E. Kessler
М.Е. Кесслер

*Альянс по изучению и сохранению дрофиных птиц Евразии, г. Сент-Луис, США,
e-mail: mimi@asiangreatbustard.org*

The Great Bustard (Otididae: *Otis tarda*) is an iconic bird of the Eurasian steppe. Though currently listed as “Vulnerable” globally by IUCN, the species is under higher conservation concern in the Asian portion of its range. [9,17]. In this paper I summarize research published since 2010 on the ecology and status of the Great Bustard in Asia on its breeding grounds, migratory pathway, and wintering grounds. I also make recommendations for future research and action to improve the species’ conservation status in Asia.

Breeding Grounds

Recent research on the breeding grounds of Great Bustards in Asia has concentrated on habitat selection. A study in northern Mongolia found that sites used by Great Bustards have greater Carabidae and Acrididae abundance than sites without Great Bustards, and fewer Formicidae [6]. Additionally, sites used by female bustards exhibited greater vegetation biomass and height. In the same region, a study found Great Bustards to use both wheat agriculture (sown and fallow fields) and pasture as nesting habitat [23]. Further, female Great Bustards frequently selected nest sites within 100 m of forest edges, which may be behavior specific to the eastern subspecies. However, reproduction of all females monitored in this study failed, regardless of nest site choice [23]. In some cases, this was due to crushing of clutches by agricultural machinery, which continues to lower Great Bustard reproduction across the Asian breeding grounds [5,10].

News about the status of breeding populations is mixed. A small increase in breeding populations was been noted in Buryatia [7] and breeding individuals appeared in Omsk after nearly a half-century absence [12]. However, these and other populations remain vulnerable [23]. The population in Omsk later again shrank, likely due to poaching and free-ranging dogs, which have also been noted as a problem in Zabaikalia [5,12]. The breeding Great Bustard population in northwestern Iran has further shrunk to 43-48 individuals [15].

Migratory Ecology

Research on migratory staging grounds and stopovers has focused on migratory routes and cues, as well as vigilance and threats on the migratory journey. The first satellite telemetry of Great Bustards in Asia found that individuals breeding in Khövsgöl Aimag migrate 2000 km one-way to overwinter near Xi’an, China [24]. These individuals, of the eastern subspecies, accomplish the journey in approximately two months on average, and use multiple and variable stopover sites. Dates of departure and arrival were highly variable between individuals and years. The timing of migratory movements showed significant correlation with weather conditions, particularly temperature and wind [23]. This migratory flexibility may help the species to accommodate climate change.

A study of the vigilance behavior of flocks of the western subspecies of Great Bustard staging for migration in Tacheng, Xinjiang, China found that a lower percentage of individuals in large flocks scanned for threats, thus allowing them to spend increased time feeding before migration [32]. Larger flocks also exhibited a higher percentage of time during which at least one individual was vigilant for threats, implying that smaller flocks such as are typical in much of the

Asian range may be more vulnerable to dangers. Great Bustards were also more vigilant within 100 m of a road.

Fatal collisions with power lines have been a common occurrence for Great Bustards in their European range. They are now also noted at a new mining development in the Mongolian Gobi Desert [16], which is located in an area which the birds cross during migration [24].

Regarding the frequency of observations of Great Bustards on migratory stopovers, an exciting report was made in December 2016 of a single male Great Bustard migrating into South Korea [30]. This is only the second observation of the species in South Korea since the 1970s.

Wintering Grounds

Research of the ecology of the Great Bustard on wintering grounds in Asia has focused on habitat use patterns. Satellite telemetry data from Great Bustards of the eastern subspecies on wintering grounds near the confluence of the Wei and Yellow Rivers in Shaanxi, China, found that females move itinerantly across large home ranges, with the largest minimum convex polygon described slightly less than 2000 km² [24]. The habitat used by these individuals consists primarily of agricultural fields. This study also found that individuals breeding at the same location (lek) did not migrate together nor inhabit the same winter home ranges.

Great Bustards overwintering in both China and Kazakhstan have been noted in soybean fields, where they pull up plants for consumption even from under snow cover [2,3,26]. Regular monitoring of Great Bustards at wintering grounds in eastern and southeastern Kazakhstan has revealed that the species gathers in larger flocks during times of snow cover, and in soybean fields [1]. These larger flocks attract hunters from the provincial capital. Overwintering flocks near the Yellow River in Henan Province of China are overwhelmingly found in winter wheat. Preferred habitat allows a wide field of vision and has lower levels of disturbance (i.e. located more than 2 km from villages and more than 0.5 km from roads) [21]. A study of habitat preferences of Great Bustards in Cangzhou, Hebei, China found that the species prefers to winter in locations that are more than 400 m distant from areas inhabited by humans, less than 1 km from standing water, and on smaller parcels of farmland [29].

The location of Great Bustard wintering sites appears to have shifted to the north in Central Asia, and a spatial models predicts a similar trend in China. Great Bustards have begun to regularly overwinter in East Kazakhstan and Almatinskii regions of Kazakhstan [1,4]. The total number of Great Bustards estimated to now overwinter in Kazakhstan has been estimated at approximately 1000-1500, which is heartening for a species which has been close to extirpation in many parts of Central Asia [1,4]. The numbers of Great Bustards remaining in Kazakhstan to overwinter may be related to the degree of snow cover, though the birds are also able to withstand quite severe winter conditions if food resources are available [2,3]. In contrast, areas of northeastern Iran which once hosted overwintering Great Bustard populations have not noted the species in two decades [15]. Thus, Great Bustards in Central Asia may be shifting their movement patterns to overwinter in more northern regions when conditions are suitable. A spatial model was produced for wintering habitat of the eastern subspecies of Great Bustard in China, which predicted that the Manchurian plains will become increasingly important as a wintering ground for the species, while some southern sites will decrease in suitability [28]. The authors found that most Great Bustard wintering sites in China are not currently in the protected area system, nor will be sites predicted to be suitable under climate change.

Anthropogenic threats continue to be a major problem for Great Bustards on wintering grounds. Hunting parties in Kazakhstan are reported to remove up to 25-30% of overwintering flocks, using high-clearance vehicles and snowmobiles [1-3]. In China, self-organized citizen groups have begun to combat indiscriminate poisoning and netting of migratory and overwintering birds, including the Great Bustard [25]. The meat of these birds is illegally sold to “wild food” restaurants. Summaries of Great Bustard injuries reported to authorities at wintering grounds in Shaanxi, China, find collision with power lines to be a major cause of injury [18,27].

These authors also observe cases of poisoning and gunshot wound. A study of the level of heavy metals in Great Bustard feces on wintering grounds in Shaanxi found levels of lead, nickel, and arsenic similar to those noted in previous studies to be correlated with weakened reproductive outcomes [19,33]. Elevated levels of heavy metals are noteworthy not only for the health of the birds, but given the illegal consumption of bustard meat across the Asian range of the Great Bustard. These authors attribute the accumulation of heavy metals to the mechanization of agriculture in the fields the bustards inhabit.

Conservation Advances and Recommendations

In many areas across the Great Bustard's Asian range there is evidence of re-establishment of the species after catastrophic declines in the second half of the 20th century [9]. However, these gains are fragile and strong efforts must still be made to conserve the species. The long-distance migratory movements of the Great Bustard in Asia make international cooperation imperative. For this reason, the Government of Mongolia advanced a proposal to increase protection for the Great Bustard under the Convention on Migratory Species [22]. This proposal to list global populations of the Great Bustard on Appendix I of the Convention was unanimously passed at the 11th Conference of Parties in 2014. We are now preparing a proposal to which would list the Great Bustard as a species requiring Concerted and Cooperative Action under the Convention.

Literature reviewed here documents illegal hunting and poisoning as a continued major threat to Great Bustards across their migratory range. Increased anti-poaching enforcement, particularly on established wintering grounds [3], should be a priority. Notably, the Great Bustard was recently sighted in two National Parks of Kazakhstan where it had not been noted for half a century [8,14]. This may speak to the positive impact of increased patrolling. To this end, the proposal to create "Kurumbel'skaya Steppe" protected area on the international border between Omsk and Novosibirsk Regions of Russia and Pavlodar Region of Kazakhstan may play an important role in protecting the Great Bustard population in that region, which is on the brink of extirpation [13]. In the absence of increased government action, the emerging model of citizen groups combatting poaching in China may be transferable to other areas of the Great Bustard's range [25].

Logs of injuries to Great Bustards, such as those published in Shaanxi, China [18,27], are important to prioritize methods to reduce mortality. These reports have elucidated collisions with power lines as a major concern in Shaanxi. Burial of particularly problematic powerlines should be considered, with marking of cables with diverter types determined to be effective with Great Bustards as an alternative [31]. New developments along the migratory pathway such as mines should consider the migratory routes of Great Bustards when routing overhead cabling. Additional satellite telemetry studies will assist in describing the most important migratory paths. However, due to the very small size of many remnant breeding populations in Asia, research should be carried out only on relatively larger populations and with the greatest precautions for the safety of these birds, which are susceptible to death due to capture myopathy.

The research reviewed here also suggests agri-environmental approaches for improving the status of the Great Bustard. Observations and studies of winter habitat suggest that Great Bustards may be retained on wintering grounds through the planting of soybeans. It has been suggested that farmers be incentivized to plant soybeans for Great Bustards overwintering in Kazakhstan [1]. Given the tendency of Great Bustards to form larger flocks on soy fields, such initiatives must be accompanied by anti-poaching patrols. As Great Bustards prefer breeding habitat with higher abundance of Carabid beetles and grasshoppers [6], agri-environmental programs should be developed to discourage farmers from the use of pesticides which would destroy the protein-rich food base important to growing chicks. Such programs should also consider mechanisms to reduce clutch loss through crushing by farm machinery. In particular, changes in the timing of plowing of fallow fields would be beneficial. In regions where Great Bustards nest on unplowed steppe, protection from steppe fires is a priority [5,11].

Research on gene flow between breeding populations, and on the future suitability of current breeding grounds under conditions of climate change, are needed to prioritize regions for conservation action. Studies predicting habitat suitable for breeding under climate change should consider the species' strong philopatry [20].

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О ВОЗМОЖНОСТИ ВОЗРОДИТЬ СТЕПНОГО ТАРПАНА В КАЗАХСТАНЕ

About a opportunity to revive steppe Tarpan in Kazakhstan

**Нурушев М.Ж., Байтанаев О.А.
Nurushev M. Zh., Baytanayev O. A.**

*Евразийский национальный университет им. Л.Н.Гумилева, г. Астана, Казахстан
nuryshhev@mail.ru, ozat1948@gmail.com*

Тарпан на древнем казахском языке означает «лошадь, несущаяся вскачь во весь опор». И в последнее время не утихает полемика о том, что какое государство может с научной достоверностью отнести себя к родине домостикации домашней лошади. Причем дискуссия протекает с участием ученых самого разного профиля – от археологов и специалистов по древней истории до зоологов и палеонтологов. На евразийском пространстве за право называть себя родиной домашней лошади дискутируют Украина, Российская Федерация и Казахстан. Важно подчеркнуть, что, к примеру, палеозоологам по костным остаткам, как правило, для ранних этапов не удается однозначно определить к домашней или дикой лошади они принадлежат. Ответ дается уклончивый: возможно, могла быть одомашненной, если неодомашненная [1,2].

В эпоху энеолита, когда уже сформировалась современная фауна млекопитающих, на территории современной Украины большой интерес представляет археологические раскопки степной зоны поселений скотоводов IV тысячелетия до н.э. Несколько поселений открыты на правом берегу р. Днепра, южнее г. Кременчуга Полтавской области, получившие название местонахождения Дериевка. По данным археологов здесь жили наиболее ранние коневоды, содержавшие и разводившие лошадей. Около половины обнаруженных костей животных отнесены к лошадям [3]. Использование лошадей в

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ БІЛІМ ЖӘНЕ ҒЫЛЫМ МИНИСТРЛІГІ
МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН

ҚОСТАНАЙ МЕМЛЕКЕТТІК ПЕДАГОГИКАЛЫҚ ИНСТИТУТЫ
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БИОЛОГИЧЕСКОЕ РАЗНООБРАЗИЕ АЗИАТСКИХ СТЕПЕЙ

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**РЕДАКЦИЯ АЛҚАСЫ
РЕДАКЦИОННАЯ КОЛЛЕГИЯ**

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Ахметов Т.А., педагогика ғылымдарының кандидаты, профессор

Редакция алқасының мүшелері

Брагин Е.А., биология ғылымдарының кандидаты, профессор; *Божекенова Ж.Т.*, биология магистрі; *Ильяшенко М.А.*, биология магистрі; *Рулёва М.М.*, биология магистрі; *Сухов М.В.*, техникалық ғылымдарының кандидаты, доцент; *Суюндикова Ж.Т.*, биология ғылымдарының кандидаты, доцент

В сборнике опубликованы материалы III Международной научной конференции «Биологическое разнообразие азиатских степей». В докладах рассмотрены итоги исследований и перспективы сохранения биологического разнообразия степных экосистем, островных и ленточных лесов и водного-болотных угодий степной зоны Евразии, охраны природных территорий и популяций видов особого природоохранного значения, формирования экологической сети и вклада вузов в изучение биоразнообразия. Книга предназначена для ученых и практиков, работающих в области изучения и сохранения биологического разнообразия, преподавателей вузов, аспирантов, студентов, работников природоохранных учреждений.

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