

## **Home ranges and habitat use of breeding Saker Falcons (*Falco cherrug*) in Mongolia.**

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### **Монгол орны идлэг шонхорын бодгалийн эзэмшил нутаг ба түүний ашиглалт**

1999-2000 оны V-VI сард Дундговь аймагт идлэг шонхорын бодгалийн эзэмшил нутаг ба түүнийг шувууд хэрхэн ашигладаг судалгааг радиотелеметрийн три-ангуляцийн аргаар бид хийсэн билээ. Бидний судалгаанд радиодолгион дамжуулагч бүхий 5 бие гүйцсэн идлэг (1 эр, 4 эм) 1999 онд, 6 бие гүйцсэн шувуу (2 эр, 4 эм) 2000 онд хамрагдсан юм. 1999 оны хээрийн судалгааны үед бие гүйцсэн шонхорт тавьдагаас өөр загварын бага оврын радиодолгион дамжуулагчийг 20 залуу шувууны хөлд бэхлэв. 1999 онд радиодолгион дамжуулагч бүхий 1 эм шувуу 1999 оны 8-р сард судалгааны талбайгаас олодохоо больсон ба мөн 1 эм шувуу сүүлийн удаа 2000 оны 3-р сард тэмдэглэгдээд дахин олодоогүй бөгөөд 2000 оны 6-р сард түүний үхсэн байхыг бид олсон юм. Түүний үхэхэд бүргэд эсвэл шар шувуу нөлөөлсөн байх талтай.

Судалгааны талбайд идлэг шонхорын үүрлэх нягтшил өндөр байсан ба заримдаа хосуудын үүрний хоорондох зай 1.2-5.3 км. Нэг үүрнээс 2-5 ангаахай бойжив. Бодгалийн эзэмшил нутгийн хэмжээ бүх эмд 78-103 км кв, харин нэг эрд 215 км кв байсан болно /1999 оны материал/.

Эзэмшил нутгийн ашиглалт нэг өдөрт эмүүдэд 13-27 км кв, эрд 60 км кв. Эм шувуудын эзэмшил нутаг ихээр давхцдаг. Эзэмшил нутгийн хэмжээ нисэж буй ангаахайнуудад бага 3.1-26 км кв байлаа. Нэг өдөр эм нь 40-60 км, харин эр нь 117 км нисдэг болохыг бид тогтоосон билээ.

Бодгалийн эзэмшил нутгийн давхцал нь доорх шалтгаантай. Үүнд: 1. Хосууд агнуурын нутгийг хамтран ашигладаг 2. Хэрвээ идэш тэжээлийн нөөц хязгаарлах нөлөөгүй бол үүрлэх нягтшил өндөр байдаг газарт хосууд хөршлөн амьдрах боломжтой.

## Индивидуальные участки и использование территории Монгольскими соколами-балобанами (*Falco cherrug*).

Использование территории исследовали методом триангуляционной радиотелеметрии в Дунговь аймаке, Монголия в мае-июне 1999 и 2000 полевых сезонов. Всего было помечено радиопередатчиками пять взрослых балобанов (4 самки и 1 самец) в 1999 году и 6 взрослых птиц (2 самца и 4 самки) в 2000 году. В 1999 полевом сезоне мы также проследили 20 молодых птиц снабженных миниатюрными радиопередатчиками прикрепляемыми к ноге. Две птицы (самец и самка) были прослежены в течение обоих полевых сезонов. Две самки помеченные в 2000 году появились в районе впервые и заняли гнездовые участки вместо самок помеченных в 1999 году. Одна из птиц помеченных в 1999 году исчезла из контрольной территории в августе этого же года. Другая самка была последний раз отмечена в марте 2000, и в июне 2000 года была найдена убитой предположительно орлом или совой. Контрольная территория располагалась в районе с высокой плотностью гнездования балобана: расстояния между ближайшими соседями составляло 1.2 – 5.3 км. Размер выводка варьировал от 2 до 5 птенцов. Индивидуальные территории вычисленные как минимально-выпуклый полигон (MCP) варьировали по площади от 78 до 103 кв. км. у самок и составили 215 кв. км. Площадь территории используемая за день составила 13-27 кв. км у самок и 60 кв км у самца. Индивидуальные территории самок значительно перерывались, хотя самки избегали посещения территорий в радиусе 300 м от гнезд соседей. Слетки имели меньшие индивидуальные территории площадь которых возрастала с возрастом птенцов и варьировала от 3.1 до 26 кв.км.

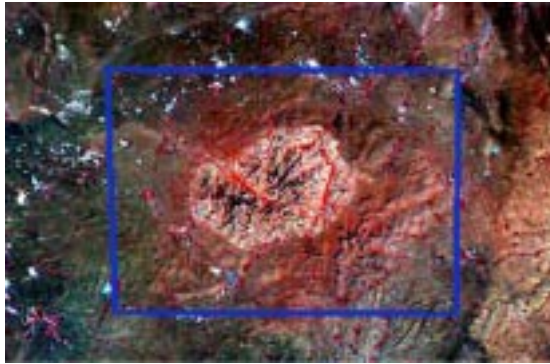
Home ranges were studied using triangulation radiotelemetry in the Dundgobi (Middle-Gobi) province of Mongolia in May-June of 1999 and 2000. A total of 5 (4 females and 1 male) and 6 (2 males and 4 females) adult birds fitted with backpack radiotransmitters were radiotracked in these years respectively. In addition in 1999 we placed leg-mount radio-tags on 20 fledglings. Two birds (one male and one female) have been radiotracked during both seasons, another 2 birds (both females) radiotracked in 2000 were females which replaced the females observed in 1999. One of the birds tagged in 1999 disappeared from the

study area in August 1999, another died (presumably killed by an eagle or an owl), and its transmitter and the bird remains were recovered in June 2000. This bird was last seen alive in March 2000. The study was in a place with a high breeding density of Sakers: the distances between the nests varied from 1.2 to 5.3 km. Brood sizes varied from 2 to 5. Home ranges of females measured by minimum convex polygons varied from 78 to 103 km<sup>2</sup>, and in the male was 215 km<sup>2</sup>. Daily Minimum Convex Polygon (DMCP) was 60 km<sup>2</sup> in male and 13-27 km<sup>2</sup> in females. The home ranges of females significantly overlapped, but nonetheless the females avoided areas within 300 m of the nests of their neighbours. Fledglings had smaller than adults home ranges which varied from 3.1 to 26 km<sup>2</sup>. Minimum distance moved in young varied from 0.2 to 2.1 km. Within the first three weeks after leaving the nest all home ranges of young remained within the home range on parents. The chicks remained in the region until at least November. Minimum Distance Moved (MDM) varied from 40 to 60 km per day in females and 117 km in male (data for 1999 only). The large home range overlaps indicate that the birds share hunting space and can co-exist in high density areas provided that food supply is not limiting.

## **Methods**

Radiotracking of Saker falcons has been carried out in 1999. This study investigated territory use patterns in breeding falcons and if there are any limits to the density set by territoriality. The study was carried out using conventional radiotelemetry methods using backpack transmitters with whip aerials (Biotrack Ltd., UK). The weight of the transmitters was 24 grams, and did not exceed 2.5% of the bird's body weight. The signals were picked up by several radiotracking receivers from 2, 3 or more triangulation points located on summits. Two AVM electronics radiotracking receivers (AVM Instruments, Livermore, California), 2 falconry receivers and 1 Mariner radiotracking receivers were employed. The fixes were taken for every tagged bird on 15 minutes intervals. Bearings were taken using Silva (Silva compass AB, Sweden) magnetic compasses with the accuracy 2°. The bearings were converted into coordinates using SAS programmes developed by G. Wife with some changes. Home range sizes were measured using MCP and were plotted for each day, as well as for the whole period of observations using the programme Home Range (Huber & Bradbury 1995-6) developed for Macintosh computers. Minimum Distances Moved and overlaps were calculated using Wildtrak software (Todd 1992).

Figure 1. Satellite photo of the Baga Gadzrin Choloo study area.



The MCP were merged together and georeferenced to UTM48/WGS84 aerial photos (Mongolian Geodetic and Cartographic Management GUGK) with blended quicklooks of SPOT 4 images of September 1998 georeferenced to UTM48/WGS84 SPOT using cubic convolution, so the colour boundaries are smooth. Pixel size for the used images is 145 m. Image processing was performed using ERDAS IMAGINE 8.3.1 for NT by O. Totubalina (Scott Polar Institute, Cambridge University).

In 1999 the falcons were fitted with radiotransmitters in end of May beginning of June. A total of 4 females and 1 male have been radiotracked. In addition 20 young chicks were fitted with leg mount transmitters few days before fledging. The radiotracking took place from 30 May to 7 July. More than 300 fixes were obtained per every bird. In 2000 four new falcons (1 male and 3 females) were fitted with radiotransmitters. In addition 2 falcons (one male and one female) marked in 1999 still had active transmitters and were radiotracked in 2000. Out of the 1999 birds, one female was found dead (presumably killed by an eagle or eagle own) close to her nest. She was last recorded alive in April 2000. One bird (female) was shot dead by former Nature Protection Officer of the Baga Gadzrin Choloo study area. The latter female was replaced by a new female, which was also radiotracked in 1999. The male of this pair was caught in 2000 and radiotagged. One female and one male marked in 1999 did not change their nest locations and were radiotracked in 2000. In total we have radiotracked 5 adults and 20 young in 1999 and 6 adults in 2000.

Duration of hunting sortie has been recorded by direct observation from a hidden place more than 500 away from the nest. The duration of

the sortie was determined as a time before departure of an adult bird for a hunt and prey delivery time.

All radiotracking observations took place in the Baga Gadzrin Chuluu study (Figure 1).

### **Minimum Distance Moved.**

The adult birds showed a typical pattern of territory use of central place foragers: a marked centre of activity close to the nest and radial hunting sorties (Figure 2). When chicks grew up and fledged the single centre of activity split into multiple centres which were located at the dominating summits and slopes with good air lift. Interestingly, one female marked in 1999 and tracked in 1999 and 2000 years showed very similar multiple centre type of territory use.

Averaged for the whole period of observations, the Minimum Distance Moved (MDM) in one male was 115 km per day, whereas in females it was 42 km per day (figure 3). Despite significant variations in the MDM between females, females all moved less than males. However due to the small sample size no statistical test was possible.

The duration of hunting sortie was not statistically different between the sexes and was  $58 \pm 27.1$  min in males and  $49 \pm 30.7$  min in females (Figure 4). Most hunting sorties were c. 35-60 min, however

Figure 2. Territory use of female F21 in 1999.

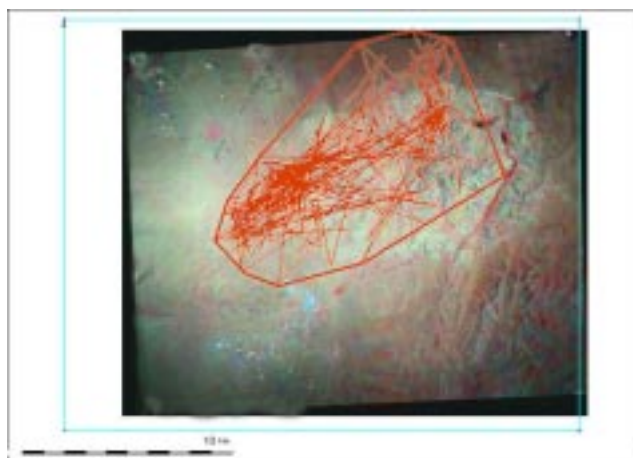


Figure 3. Minimum Distance Moved in adults. Data for all period of observations.

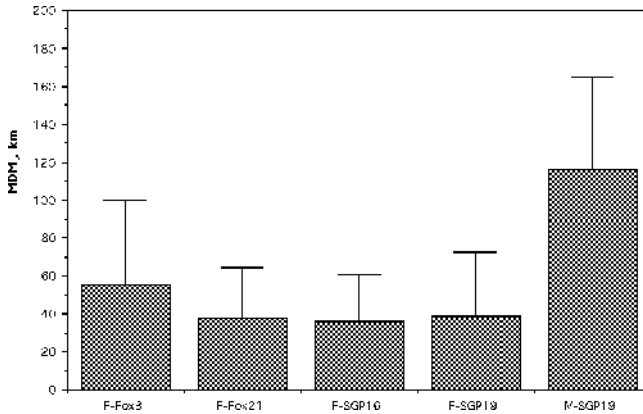
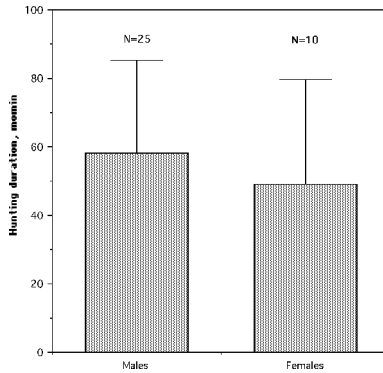


Figure 4. Duration of hunting sortie in males and females.



once or twice a day the duration of the sortie was twice as much - c. 120 min. This resulted in distortion of hunting sortie distribution which becomes skewed; the latter is especially visible in females (Figure 5).

The duration of hunting sortie in males does not show any correlation with the brood size, whereas the females tend to shorten the hunting sortie if they have large broods (Figure 6).

Figure 5. Distribution of duration of the hunting sortie in males and females.

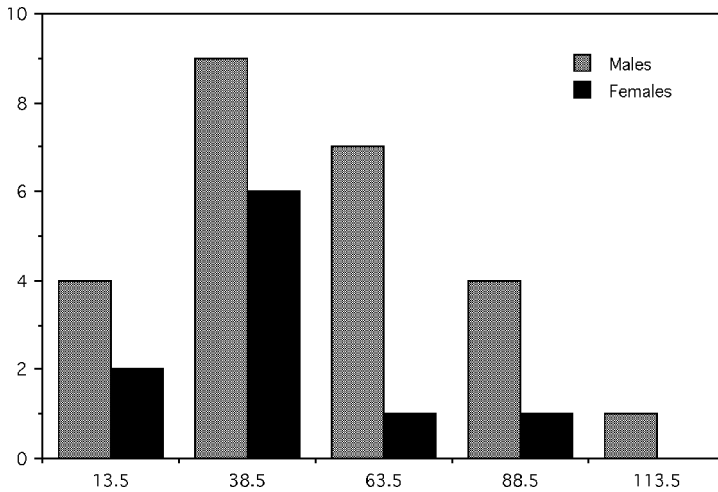
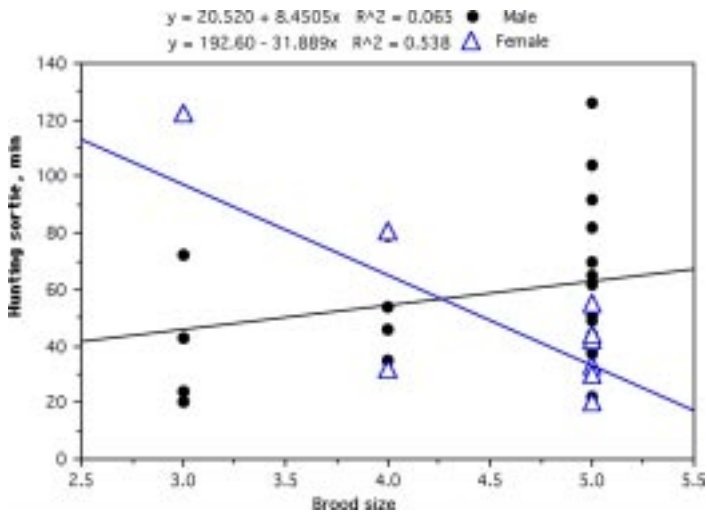


Figure 6. Duration of hunting sortie in males and females in relation to their brood size.



### Home range size.

The data for home range size are given for 1999 only. The results of 2000 radiotracking effort will be supplied later.

The home ranges of the observed falcons showed a significant (70-98%) overlap between each other (Figure 7). Home ranges of all females did not go out the mountain massif, whereas the male roamed in the opened steppe as well.

Figure 7. Home ranges on radiotracked birds in 1999.



Figure 8. Daily MCP and total MCP for all period of observations.

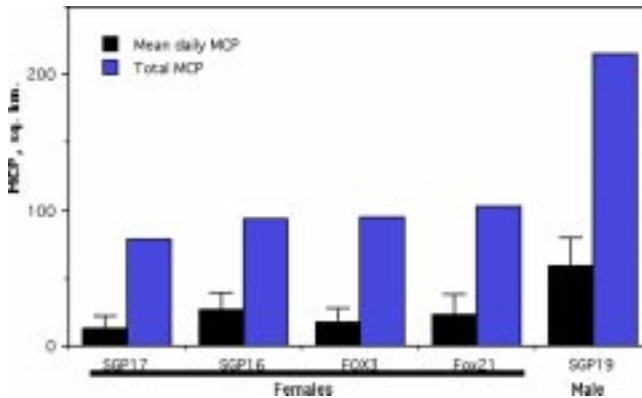




Figure 9. Daily MCP in two different pairs of Sakers.

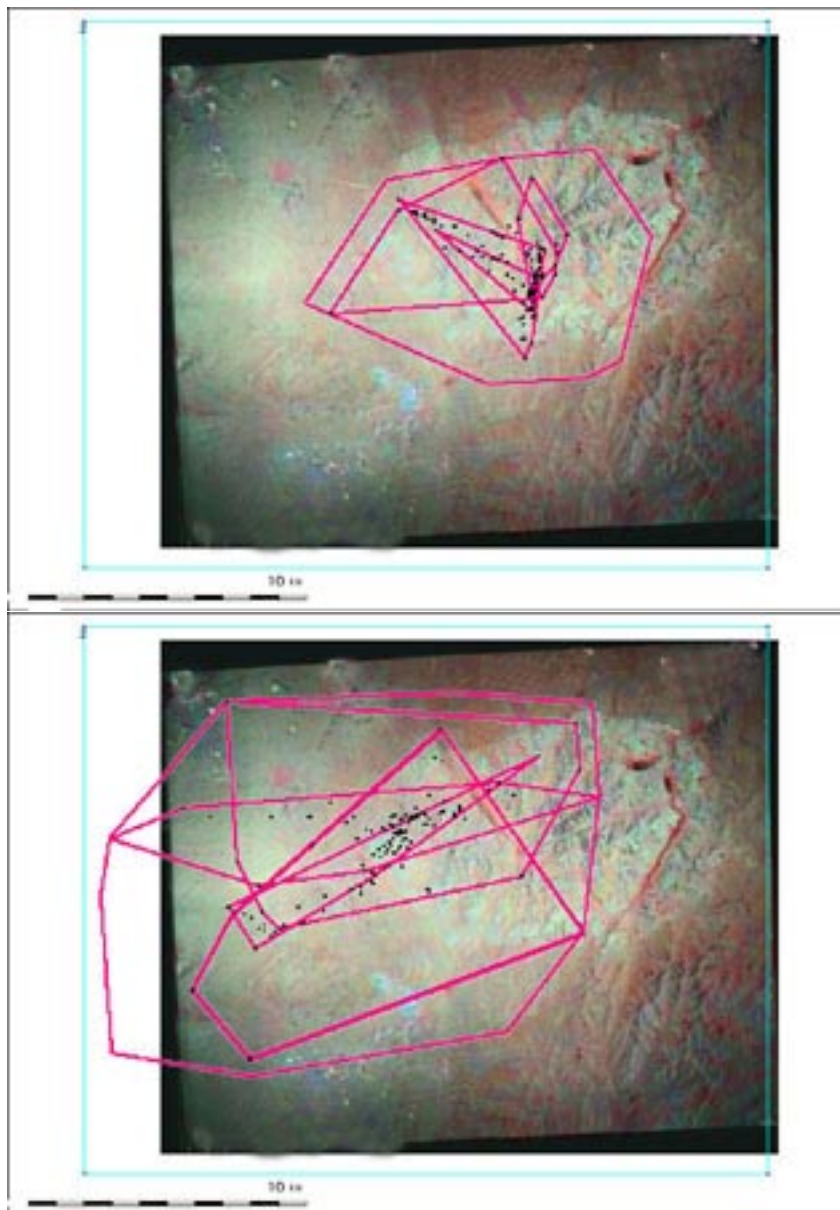


Figure 10. A. Home ranges of chicks at different age of pair SGP18. B. Home range of chicks of different age of pair SGP19a.



The minimum convex polygon in the male was 214.7 km<sup>2</sup>, and fluctuated from 78.2 to 103.9 km<sup>2</sup> in four observed females (Figure 8). However the birds did not use these areas evenly. In one day the male on average covered 59.5±20.7 km<sup>2</sup>, and females from 13±9.27 to 27±12.9 km<sup>2</sup>. The birds occupied different parts of their home ranges each day. Normally the daily polygons showed a considerable overlap, however the latter is much smaller than the overlaps between the neighbours (Figure 9).

Fledged chicks had significantly smaller home ranges (Figure 10). Their home ranges varied from 3.1 to 25.5 km<sup>2</sup>. Minimum distance moved varied between 0.2 to 2.1 km. Within 3 weeks after fledging all home ranges of chicks still remained within the home ranges of their parents. The chicks remained in the region of the nest for at least until August.

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