

Diet studies of Saker Falcon (*Falco cherrug*) in Mongolia

S.Gombobaatar¹, D.Sumiya,¹O.Shagdarsuren¹ E.Potapov², N.Fox²

¹ Zoology Department, Faculty of Biology, National University of Mongolia, Ulaanbaatar 210646A P.O.Box 537 MONGOLIA. E-mail: gomboo@www.com ² Falcon Facility, National Avian Research Centre, Penllynin, College Road, Carmarthen SA33 5EH, UK, office@falcons.co.uk

Монгол орны идлэг шонхор (*Falco cherrug*) - ын идэш тэжээлийн судалгаа

1998-1999 онуудад Монгол орны идлэг шонхорын идэш тэжээлийн судалгааг бид хийсэн ба судалгааны үндсэн зорилго нь а/ Монголын идлэг шонхорын идэш тэжээлийн бүрэлдхүүнийг тодорхойлох, в/ түүний үндсэн идэш тэжээл бологч амьтдыг тогтоох, с/ идэш тэжээлийн бүрэлдхүүнийг хавар-зун, намар - өвөл зэрэг улирлаар харьцуулан гаргах, d/ энэ зүйл шонхорын идэш тэжээлд ямар амьтад голлох байр суурь эзэлдэгийг илэрхийлэхэд оршино.

Дундговь, Дорноговь, Өмнөговь, Булган, Баянхонгор, Говь-Алтай, Ховд, Хэнтий, Дорнод, Төв аймаг ба Улаанбаатар хот орчим зэрэг идлэг шонхорын үржиж, өвөлждөг нутгуудын 64 үүрнээс 765 гулгидас, 2239 идэш тэжээлийн үлдэгдэл цуглуулж, эдгээрээс ялгасан нийт 6321 ширхэг үлдэгдлийг тодорхойлсон болно. Идлэгийн идэш тэжээлийн үлдэгдэл дэх амьтдыг зүйл, төрөл, овгийн төвшинд тодорхойлж, бодгалийн минимум тоог гаргалаа.

Монгол орны идлэг шонхорын идэш тэжээл бүрэлдхүүнд 7 овгийн хатуу далавчтан буюу цох (COELOPTERA), 1 зүйл мөлхөгч, 15 овгийн 29 зүйл шувуу, 6 овгийн 14 зүйл хөхтөн амьтад ордогийг тогтоов.

Манай орны энэ зүйл шонхорын үржлийн популяцийн идэш тэжээлд шавьжаас SCARABAEIDAE овгийн цох (22%), TENEBRIONIDAE (21%), CURCULINOIDAE (22%), CARABIDAE (14%) ба бусад цох (21%); шувуунаас шоорон алаг болжмор *Eremophila alpestris* (23%), ногтруу *Syrhaptus paradoxus* (9%), давид бужирга *Pyrgilauda davidiana* (6%), ухаа дунхай *Lanius cristatus* (6%), алаг хөөндэй *Zoothera dauma* (5%), хадны бор шувуу

Petronia petronia (2%), монгол болжмор *Melanocorypha mongolica* (1%) ба бусад (38%); хөхтнөөс үлийн цагаан оготно *Microtus brandtii* (72%), шар чичүүл *Meriones meridianus* (9%), монгол тарвага *Marmota sibirica* (6%), монгол чичүүл *Meriones unguiculatus* (5%), монгол оготно *Microtus mongolicus* (4%) ба бусад хөхтөн (4%) тус тус эзлэж байна.

1998-1999 оны манай орны идлэгийн намар-өвлийн идэш тэжээлийн бүрэлдхүүнд шоорон алаг болжмор (*Eremophila alpestris*), ногтруу (*Syrhaptes paradoxus*), давид бужирга (*Pyrgilauda davidiana*), алаг хөөндэй (*Zoothera dauma*), хадны бор шувуу (*Petronia petronia*), монгол болжмор (*Melanocorypha mongolica*) зэрэг шувууд; үлийн цагаан оготно, монгол тарвага, монгол чичүүл, шар чичүүл ба монгол оготно хөхтөн голлох байр суурьтай байлаа.

Питание сокола балобана (*Falco cherrug*) в Монголии

В 1998-99 годах мы исследовали питание сокола балобана в Монголии. Целью исследования было: описать питание сокола балобана в Монголии, определить наиболее важные виды в питании сокола, сравнить питание сокола по сезонам, и определить наиболее важные объекты питания по биомассе. В течение указанных полевых сезонов мы собирали погадки и остатки добычи из гнезд сокола в провинциях Дундговь, Дорноговь, Умнуговь, Булган, Баянхонгор, Говь-Алтай, Ховд, Хентей, Дорнод и Тув, а также в некоторых местах близ Улаабаатара. Сборы велись в репродуктивный и зимний сезоны.

В общей сложности 6321 идентифицируемых остатков было собрано из 765 погадок и 2239 остатков добычи подобранных у 64 гнезд и из-под зимних и летних присад соколов. Мы регистрировали минимальное количество жертв и определяли виды жертв до таксонов минимально возможного ранга.

Питание балобана включает насекомых (Coleoptera) из 7 семейств, 1 вид рептилий, 29 видов птиц из 15 семейств и 14 видов млекопитающих из 6 семейств.

Во время сезона размножения следующие таксоны были отмечены в питании балобана: SCARABAEIDAE (22%), TENEBRIONIDAE (21%), CURCULINOIDAE (22%), CARABIDAE (14%); Рогатый жаворонок *Eremophila alpestris* (23%), саджа *Syrrhaptes paradoxus* (9%), снежный выюрок *Pyrgilauda davidiana* (6%), серый сорокопуд *Lanius cristatus* (6%), пестрый каменный дрозд *Zoothera dauma* (5%), каменный воробей *Petronia petronia* (2%), монгольский жаворонок *Melanocorypha mongolica* (1%) и другие птицы (38%); полевка Брандта *Microtus brandtii* (72%), полуденная песчанка *Meriones meridianus* (9%), сибирский сурок *Marmota sibirica* (6%), монгольская песчанка *Meriones unguiculatus* (5%), монгольская полевка *Microtus mongolicus* (4%) и другие млекопитающие (4%).

Осенью и зимой балобаны питались фоновыми видами такими как рогатый жаворонок, саджа, снежный выюрок, пестрый каменный дрозд, каменный воробей, монгольский жаворонок; полевка Брандта, полуденная песчанка, монгольская песчанка и монгольская полевка.

Abstract

Pellets and prey remains were collected in 1998-99 in Dundgobi, Dornogobi, Umnugobi, Bulgan, Bayankhongor, Gobi-Altai, Khovd, Khentii, Dornod, Tuv provinces and some areas of Ulaanbaatar city during the breeding and winter seasons. A total of 6321 prey items were identified from 765 pellets and 2239 prey remains collected from 64 nests and also both summer and winter roost sites. The minimum number of individuals of animal species, genera, and families from the pellet and prey remains of Saker were recorded.

Introduction and methods

The diet of breeding and wintering saker falcons in Mongolia is poorly studied there are only a few (Przevalskii 1876, Kozlova 1930, Tugarinov 1932, Sushkin, 1938, Shagdarsuren 1983). Diet was also studied in Kazakhstan (Watson and Clarke 2000), Slovakia (Chavko 1995) and in Hungary (Bagyura et al 1994) and there is a summary in the review by Baumgart (1991). Biodiversity of birds and mammals in

Mongolia is high (Bannikov 1954, Fomin and Bold 1991, Batjargal and Enkhbat 1998), in addition some of the mammals, most notably Brand's vole are cyclical which has a big impact on raptor population.

In 1998-1999, we studied the diet of the Saker in Mongolia.

The aims were to:

Describe the diet of Saker falcons in Mongolia,

Identify the most important prey species,

Compare the diet of Saker falcons in Spring- Summer and Autumn-winter,

Identify which are of most significant in terms of biomass.

During breeding and wintering seasons a total of 765 pellets and 2239 prey remains were collected from 64 saker nests, roosting sites and hunting territories in Dundgobi, Dornogobi, Umnugobi, Bulgan, Bayankhongor, Gobi-Altai., Khovd, Khentii, Dornod, Tuv and some areas of Ulaanbaatar. The width, length and weight of every pellet and prey remain was measured. Each pellet was put into cold water to separate the prey items. Remains of bones, feathers, insects, stones, hair and skin were extracted from each pellet for identification. Feathers of every pellet were glued to the paper for feather identification. The minimum number of individuals of animal species, genera, and families from a total of 6321 prey items of saker were registered (table 1).

Feather remains from the nest were identified by comparing the remains with the skins from bird collections at the Mongolian National University and Naumann Museum of Germany. We also used feather identification guides such as Ivanov and Shtegman (1978), Svensson (1984), Fomin and Bold (1991), Jonsson (1992) and Dawaa *et al.* (1994).

Mammal remains (maxilla, mandible, crania, hair, tail and paws) were easier to identify. The mammal identification guides by Gromov and Polyakov (1977), Sokolov and Orlov (1977, 1980), Sokolov (1979) and mammal collections from study areas and several territories in Mongolia were used. Samples are kept in the National University of Mongolia.

Most of the insect remains from pellets belonged to the order Coleoptera and were identified using identification keys (A. Tsendsuren and K. Ulykpan 1979, A. Tsendsuren 1979, and B. Namkhaidorj 1988).

Reptile species were identified by as skin and bone remains, and by comparing them with the reptile collection from Saker breeding territories.

Results

During 1998-1999 the Mongolian saker diet consisted of 29 species of birds from 15 families, 14 species of mammals from 6 families, 7 families of insects (Coleoptera), 1 species of reptile (Figure 1) were identified. The majority of prey items belonged to mammals followed by birds, insects and reptiles.

Amongst mammals (figures 2b and tables 2a) the majority of prey items were Brandt's Vole (72%), Midday Gerbil (9%), Mongolian Gerbil (5%) and other mammals (14%). The dominant bird was Horned Lark (23%) followed by Pallas' Sandgrouse (10%) and David's Snow Finch (6%). Many other species were represented by few individuals and the total for these individuals was 61% (figure 2a and table 2b). Predominant birds and mammals are those living in Mongolia all year round and are the most abundant and widely distributed across the country. Reptiles were represented by one identified individual, a Toad-headed Agama (*Phrynocephalus versicolor*).

Diet of the breeding period (table 3) included 28 species of birds of 15 families and 14 species of mammals belongs of 6. Winter pellet and prey remains (table 4) consisted of 9 species of birds (6 families) and 5 species of mammals (2 families).

Figure 1. Proportion of large taxa in the diet of Sakers in Mongolia

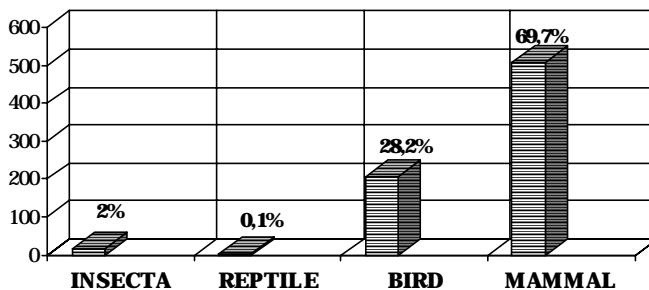


Figure 2a. The percentage of identified species of birds from all pellet and prey remains of breeding and wintering sakers in Mongolia (1998-1999)

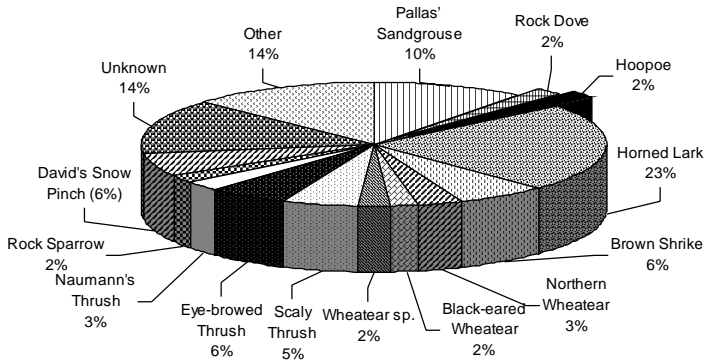


Figure 2b. Percentage of identified species of mammals from all pellet and prey remains of breeding and wintering saker in Mongolia (1998-1999)

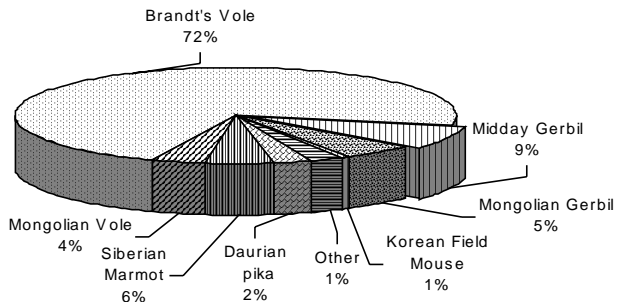


Table 1. Number of pellets and prey remains.

	<i>Nests /sites</i>	<i>Pellets /remains</i>	<i>Identified Remains</i>	<i>Number of bones</i>	<i>Number of feathers</i>	<i>Number of insects</i>	<i>all remains</i>
All data	56	765	487	4036	37	9	4082
	58		1588	754	1480	5	2239
	64	765	2075	4790	1517	14	6321
Summer		586	400	3220	37	9	3266
			1330	744	1224	5	1973
	55	586	1710	3964	1261	14	5239
Winter		179	87	852	0	0	852
			223	10	220	0	230
	10	179	310	862	220	0	1082

Table 2a. Identified species, genera and families of mammals from pellet and prey remains in both breeding and wintering seasons

Species	N
<i>Ochotona daurica</i> (Daurian Pika)	19
<i>Lepus tolai</i> (Tolai Hare)	1
<i>Citellus dauricus</i> (Daurian Souslik)	1
<i>Citellus undulatus</i> (Long-tailed Souslik)	2
<i>Citellus erythrognus</i> (Red-cheeked Souslik)	2
<i>Marmota sibirica</i> (Siberian Marmot)	25
<i>Microtus mongolicus</i> (Mongolian Vole)	16
<i>Microtus gregalis</i> (Narrow-skulled Vole)	2
<i>Microtus brandtii</i> (Brandt's Vole)	370
<i>Microtus</i> sp. (Vole)	1
<i>Meriones meridianus</i> (Midday Gerbil)	40
<i>Meriones unguiculatus</i> (Mongolian Gerbil)	26
<i>Meriones</i> sp. (Gerbil)	1
<i>Rhombomys opimus</i> (Great Gerbil)	2
<i>Apodemus peninsulae</i> (Korean Field mouse)	3
<i>Alactaga sibirica</i> (Siberian Jerboa)	1
Sum	512

Table 2b. Identified species, genera and families of birds from pellet and prey remains in both breeding and wintering seasons

Species	N
Tadorna tadorna (Common Shelduck)	1
Chlamydotis undulata (Houbara Bustard)	1
Tringa sp. (Sandpiper)	1
Syrrhaptes paradoxus (Pallas' Sandgrouse)	21
Columba livia (Rock Dove)	4
Columba rupestris (Blue Hill Pigeon)	2
Columba sp. (Pigeon)	1
Cuculus canorus (Common Cuckoo)	3
Apus pacificus (White-rumped Swift)	1
Upupa epops (Hoopoe)	4
Melanocorypha mongolica (Mongolian Lark)	3
Alauda arvensis (Common Skylark)	1
Eremophila alpestris (Horned Lark)	46
Anthus campestris (Tawny Pipit)	1
Anthus hodgsoni (Indian Tree Pipit)	1
Lanius cristatus (Brown Shrike)	13
Lanius isabellinus (Isabelline Shrike)	3
Lanius excubitor (Great Gray Shrike)	1
Oenanthe oenanthe (Northern Wheatear)	6
Oenanthe pleschanka (Black-eared Wheatear)	4
Oenanthe isabellina (Isabelline Wheatear)	4
Oenanthe sp. (Wheatear)	4
Zoothera dauma (Scaly Thrush)	11
Turdus obscurus (Eye-browed Thrush)	11
Turdus naumanni (Naumann's Thrush)	5
Turdus ruficollis (Red-troated Thrush)	2
Turdus sp. (Thrush)	1
Ficedula parva (Red-troated Flycatcher)	1
Passer montanus (Tree Sparrow)	1
Petronia petronia (Rock Sparrow)	4
Pyrgilauda davidiana (David's Snow Finch)	12
Pica pica (Black-billed Magpie)	1
Corvus dauricus (Daurian Jakkaw)	1
Corvus sp.	2
Unidentified	29
Total	207

Table 3. Diet by the season. Birds only.

Autumn-winter Species	Spring-summer			
	N	%	N	%
<i>Eremophila alpestris</i> (Horned Lark)	43	23.0	3	15
<i>Syrhaptes paradoxus</i> (Pallas' Sandgrouse)	17	9.0	4	21
<i>Pyrgilauda davidiana</i> (David's Snow Finch)	12	6.0	-	
<i>Lanius cristatus</i> (Brown Shrike)	11	6.0	2	11
<i>Zoothera dauma</i> (Scaly Thrush)	9	5.0	2	11
<i>Turdus obscurus</i> (Eye-browed Thrush)	9	5.0	2	11
<i>Oenanthe oenanthe</i> (Northern Wheatear)	6	3.2		
<i>Turdus naumanni</i> (Naumann's Thrush)	5	3.0		
<i>Columba livia</i> (Rock Dove)	4	2.1		
<i>Oenanthe pleschanka</i> (Black-eared Wheatear)	4	2.1		
<i>Oenanthe</i> sp. (Wheatear)	4	2.1		
<i>Cuculus canorus</i> (Common Cuckoo)	3	1.6		
<i>Melanocorypha mongolica</i> (Mongolian Lark)	3	1.6		
<i>Upupa epops</i> (Hoopoe)	3	1.6	1	5
<i>Oenanthe isabellina</i> (Isabelline Wheatear)	3	1.6	1	5
<i>Petronia petronia</i> (Rock Sparrow)	3	1.6	1	5
<i>Lanius isabellinus</i> (Isabelline Shrike)	3	1.6		
<i>Turdus ruficollis</i> (Red-troated Thrush)	2	1.0		
<i>Columba rupestris</i> (Blue Hill Pigeon)	2	1.0		
<i>Corvus</i> sp.	2	1.0		
<i>Tadorna tadorna</i> (Common Shelduck)	1	0.5		
<i>Chlamydotis undulata</i> (Houbara Bustard)	1	0.5		
<i>Tringa</i> sp. (Sandpiper)	1	0.5		
<i>Columba</i> sp. (Pigeon)	1	0.5		
<i>Apus pacificus</i> (White-rumped Swift)	1	0.5		
<i>Alauda arvensis</i> (Common Skylark)	1	0.5		
<i>Anthus campestris</i> (Tawny Pipit)	1	0.5		
<i>Anthus hodgsoni</i> (Indian Tree Pipit)	1	0.5		
<i>Turdus</i> sp. (Thrush)	1	0.5		
<i>Ficedula parva</i> (Red-troated Flycatcher)	1	0.5		
<i>Passer montanus</i> (Tree Sparrow)	1	0.5		
<i>Pica pica</i> (Black-billed Magpie)	1	0.5		
<i>Corvus dauricus</i> (Daurian Jakkaw)	1	0.5		
<i>Lanius excubitor</i> (Great Gray Shrike)	-		1	5
Unknown	27	14.4	2	11
Total	188	100	19	100

Table 4. Diet by the season. Mammals only.

Species	Spring-summer		Autumn-winter	
	N	%	N	%
<i>Microtus brandtii</i> (Brandt's Vole)	318	71.6	52	80
<i>Meriones meridianus</i> (Midday Gerbil)	38	8.5	2	3
<i>Marmota sibirica</i> (Siberian Marmot)	25	5.6	-	-
<i>Meriones unguiculatus</i> (Mongolian Gerbil)	22	4.9	4	6
<i>Microtus mongolicus</i> (Mongolian Vole)	15	3.5	1	2
<i>Ochotona daurica</i> (Daurian Pika)	13	2.7	6	9
<i>Apodemus peninsulae</i> (Korean Field mouse)	3	0.6	-	-
<i>Rhombomys opimus</i> (Great Gerbil)	2	0.4	-	-
<i>Citellus undulatus</i> (Long-tailed Souslik)	2	0.4	-	-
<i>Microtus gregalis</i> (Narrow-skulled Vole)	2	0.4	-	-
<i>Citellus erythrogeus</i> (Red-cheeked Souslik)	2	0.4	-	-
<i>Microtus</i> sp. (Vole)	1	0.2	-	-
<i>Meriones</i> sp. (Gerbil)	1	0.2	-	-
<i>Alactaga sibirica</i> (Siberian Jerboa)	1	0.2	-	-
<i>Lepus tolai</i> (Tolai Hare)	1	0.2	-	-
<i>Citellus dauricus</i> (Daurian Souslik)	1	0.2	-	-
Total	447	100	65	100

Discussion.

The data on the Saker's diet available from the literature (Przevalskii 1876, Kozlova 1930, Tugarinov 1932 and Sushkin 1938) show that the Sakers dominant prey were Pikas (*Ochotona* spp.), Pallas' Sandgrouse, Steppe Hare (*Lepus tolai*) and in Eastern Mongolia - Brandt's Vole (*Microtus brandtii*).

According to O.Shagdarsuren (1983), the main prey for sakers in Mongolia in the breeding season are Pika (*Ochotona* spp.), Souslik (*Citellus* spp.), Brandt's Vole, Horned Lark, Pipits, Pallas' Sandgrouse, Chukar, Daurian Partridge, Willow Grouse and Henderson's Ground Jay. The dominant species in the diet of wintering sakers are Pikas and Pallas' Sandgrouse. P.Tsengeg, A.Bold and O.Shagdarsuren (1996) identified 11 species of mammals and several species of birds from 2000 pellets of saker. In Hungary (Bogyura et al. 1994) the Sakers prey mainly on Rock Dove (*Columbia livia*) and European Sousliks (*Citellus (Spermophilus) citellus*): the authors even divided the population into souslik and pigeon specialists. No such division would be possible in our study: even if the pair would have Brand's vole as a dominant prey, the rest of the species composition in the diet would be entirely different from the neighboring pair. In Kazakhstan the diet dominated by the Red-Cheeked Sousliks (*Spermophilus erythrogeus*) and Long-tailed Sousliks (*S. undulatus*) (Watson and Clarke 2000). The authors even found a positive regression between the abundance of the

sousliks and productivity of the Sakers. In the Naursum Nature Reserve, Kazakhstan (see paper by Bragin, this volume) Sakers preferred the Little Sousliks (*S. pygmaeus*) and the abundance of the latter predetermined the breeding rate of the Sakers there. It appears that in Mongolia the Sakers do well in the years and places where the Brandt's vole are in superabundance. Nevertheless there are successful pairs in the places where the Brandt's vole is absent or at low numbers: the Sakers do feed on a variety of birds. In latter cases it is quite difficult to find out the dominant species.

References

- Badgyura, J., L.Haraszthy and T.Szitta. 1994. Feeding biology of the Saker Falcon *Falco cherrug* in Hungary. In: Meyburg, B and Chancellor, R. eds. Raptor conservation today: 397-401.
- Bannikov, A.G. 1954. Mammals of Mongolian Peoples Republic. Academy of Sciences Publishers, Moscow.
- Batjargal, Z. and Enkhbat, A. and eds. 1998. Biological Diversity in Mongolia. MNE&UNDP Publishers, Ulanbataar.
- Chavko, J. 1995. Nesting of Saker *Falco cherrug* in Slovakia in 1993-94. *Buteo* 7: 175-181.
- Davaa, N., W.- D, Busching, D.Sumijaa, A.Bold and R. Samijaa. 1994. Kommenteerte Checkliste der Vogel und Sauger der Mongolei. Teil I. Kotten: Naumann Museum.
- Dulamtseren, S. 1987. Mammals of Mongolia. Ulaanbaatar.
- Fomin, A. V. and A.Bold 1991. Catalog of birds of Mongolia. Moscow, Nauka Publishers.
- Gombobaatar, S., D.Sumiya, O. Shagdarsuren, Ch.Uuganbayar, D.Erdembileg, Potapov E. and N.Fox. 1999. On diet studies of saker falcon (*Falco cherrug* GRAY, 1834) in Mongolia. Scientific journal of Mongolian National University. N 9(146):156-173
- Gombobaatar, S., D.Sumiya, O.Shagdarsuren, E.Potapov, and N.Fox 1999. On saker falcon diet studies in Mongolia. In: Proc. of 3rd International Conference of Raptor research Foundation. Milkulov, Czech Republic 21-26 September 1999. *Buteo* supplement.:51.
- Gombobaatar, S., D.Sumiya, E.Potapov, N.Fox, R.Samiya and M.Stubbe. 2000. On diet studies of breeding saker falcons in Mongolia. In: Proc. of 150 International Conference of German Ornithological Society. Leipzig, Germany 19-25 September 2000.:82.

- Gromov, I. and Polyakov I.Ya. 1977. Fauna of USSR- Mammals. Part III. Proceedings of the Zoological Institute. Leningrad.
- Harrison, C. and A.Greensmith 1993. Birds of the World. London.
- Ivanov, A.I. and B.K.Shtegman 1978. Bird identification guide of USSR. Nauka Publishers, Leningrad.
- Jonsson, L 1992. Die Vogel Europas. Germany.
- Massey, J. Matsui S., Suzuki T.eds. 1982. Birds of Japan. Japan.
- Namkhaidorj, N. 1988. Insect Identification Guide of Mongolia. Part I and II. Ulaanbaatar.
- Reading, R.F., D.Sumiya, R.Samiya, and N.Batsaikhan. 1994. Dictionary of the vertebrate species of Mongolia. Ulaanbaatar: 3-57
- Shagdarsuren, O. 1983. Birds of Prey in Mongolia. Ulaanbaatar. p.
- Sokolov, V.A. and V.N. Orlov. 1980. Mammal identification guide of Mongolia. Moskow.
- Sokolov, V.A. 1979. Systematics of Mammals. Moscow.
- Tsengeg, P. , Bold A., and O.Shagdarsuren. 1996. Biology-ecology of saker in Mongolia. Bach. Thesis.
- Svensson, L. 1984. Identification Guide to European Passerines. Stockolm.
- Tsendsuren, A. 1979. Fauna of Mongolia: Part I. Class of Insects. Ulaanbaatar.
- Tsendsuren, A.and K.Ulykpan. 1979.Mongolian Insects. Ulaanbaatar.
- Watson, M. and R.Clarke. 2000. Saker falcon diet: the implications of habitat change. British Birds 93: 136-143.