University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Erforschung biologischer Ressourcen der Mongolei / Exploration into the Biological Resources of Mongolia, ISSN 0440-1298

Institut für Biologie der Martin-Luther-Universität Halle-Wittenberg

2007

Morphology, Reproduction and Mortality of *Equus hemionus hemionus* in Mongolia

Annegret Stubbe
Martin-Luther-Universität, annegret.stubbe@zoologie.uni-halle.de

Michael Stubbe
Martin-Luther-Universität

Nyamsuren Batsaikhan
National University of Mongolia, microtusb@yahoo.com

Follow this and additional works at: http://digitalcommons.unl.edu/biolmongol

Part of the Asian Studies Commons, Biodiversity Commons, Desert Ecology Commons, Environmental Sciences Commons, Nature and Society Relations Commons, Other Animal Sciences Commons, Population Biology Commons, Terrestrial and Aquatic Ecology Commons, and the Zoology Commons

Stubbe, Annegret; Stubbe, Michael; and Batsaikhan, Nyamsuren, "Morphology, Reproduction and Mortality of *Equus hemionus hemionus* in Mongolia" (2007). *Erforschung biologischer Ressourcen der Mongolei / Exploration into the Biological Resources of Mongolia, ISSN 0440-1298*. 79.
http://digitalcommons.unl.edu/biolmongol/79

This Article is brought to you for free and open access by the Institut für Biologie der Martin-Luther-Universität Halle-Wittenberg at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Erforschung biologischer Ressourcen der Mongolei / Exploration into the Biological Resources of Mongolia, ISSN 0440-1298 by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Copyright 2007, Martin-Luther-Universität Halle Wittenberg, Halle (Saale). Used by permission.

Erforsch. biol. Ress. Mongolei (Halle/Saale) 2007 (**10**): 117-132

Morphology, reproduction and mortality of *Equus hemionus hemionus* in Mongolia[1]

A. Stubbe, M. Stubbe, N. Batsajchan

Abstract

There are collected materials on morphology, reproduction rate and mortality of Dschiggetajs *Equus h. hemionus* between 2001 and 2006 in the South Gobi of Mongolia. It were found 794 skeletons of Wild Asses, 95 % of these were pouched, ⅔ of them in winter coat. Pouching was also located in the protected areas of this region. The main living resources of *Equus hemionus* are registered in the South eastern Gobi. For the first time statistical data on morphology measurements of body length, tail and tuft, ear length and hoofs are given. There are no significant differences between the sexes. The reproduction rate differed in the years 2003 to 2006 between 23 % and 7.5 % in dependence of weather and feeding conditions as well as the fitness of the mares. In two reference areas of Manlaj Sum and Bordzongijn Gobi we found in 4 years per 1 km^2 2.1 to 4.1 shot Wild Asses. All sources of population decrease are known. Now the politicians have to develop new strategies for better protection of this endangered species. The International Nature Conservation and the International community are waiting for progress in this unacceptable situation.

Keywords: *Equus hemionus*, Mongolia, morphology, reproduction, mortality, distribution, pouching, population decrease.

1. Introduction

The history of exploration and distribution of Central Asiatic Wild Ass were recently described by BANNIKOV (1954), ZEVEGMID & DAWAA (1973), DENZAU & DENZAU (1999), STUBBE et al. (2005, 2007) and SCHREIBER (2007). In the last 70 years the area of *E. hemionus* decreased about 50 %. We can evaluate that the quantity of this characteristic ungulate in the Mongolian territory is reduced up to about 25 % or less. This count down is going on.

The problems of exact census of this species are discussed in various articles (see STUBBE et al. 2005). It was also a main point of discussion at the International Asiatic Wild Ass Conference in August 2005 in Hustai Nuuru National Park/Mongolia. In the last decades the Wild Asses are more or less concentrated in the South eastern Gobi with the "Little Gobi Strictly Protected Areas A and B". We have a clear quantitative gradient of population density from the Dzungarian and Transaltai Gobi up to the Bordzongijn and Galbyn Gobi. This gradient is correlated also with the precipitation how v. WEHRDEN & WESCHE (submitted) have shown. The precipitation is determining the development of vegetation and the condition of pastures and last not least the migration of the Dschiggetajs. The different produced biomass is dominated by heavy local thundershowers. So we have a great mosaic of poor and rich pastures in the desert steppes.

The anthropogenic pressure on the Wild Ass with pouching and livestock competition on feeding and water resources and the change of landscape by mining and overgrazing are the main factors for lost in biodiversity. 2001 we began to study Wild Ass ecology in the South and Southeast Gobi. Some results we will present.

[1] Results of the Mongolian-German Biological Expeditions since 1962, No. 284.

Fig. 1: Expedition camp in the South Gobi and recording of morphological data of found Dschiggetai-skeletons, b: N. Batsajchan, M. Stubbe, B. Ench-Oršich; c: N. Batsajchan, B. Ench-Oršich, M. Görner; d: A. Stubbe, e: N. Batsajchan, M. Winter, A. Schonert; f: A. Schonert, M. Stubbe (photos: A. & M. STUBBE).

2. Morphological data

The material of measured/hunted Dschiggetais is very small because the scientists collected only single or few males/females. It was a problem of conservation and transport under field conditions. BANNIKOV (1954) is giving the following measurements: body length 220 - 260 cm, tail 40 - 54 cm (with tuft 80 - 105 cm), and ear 20 – 26.5 cm, shoulder height 110 - 128 cm, body mass 190 - 260 kg. HEPTNER & NAUMOV (1966) are mentioned for the body length 220 cm, tail 43 - 49 cm (with tuft 92 -99 cm), shoulder height 127 -137 cm. There are published also some data by SHAGDARSUREN (see STUBBE et al. 2007) in the range of called measurements.

2005 and 2006 we began to collect morphological data on the skeletons of pouched Wild Asses in the Gobi region (fig. 1, 3). Of course the accuracy will have a greater variation than to realize the measurements on living or fresh shut animals. The values for the body length have an accuracy of ± 5-10 cm, of the tail ± 1 cm, of the ear ± 0.5 cm (or more?). Very exact we could measure length and width of the hoofs with ± 0.5 mm. That's the first field material for a statistical evaluation (table 1). For the body length we measured about 50 stallions and 57 mares, all older than 4 years. Also the data for hoofs from 102 males and 108 females were taken from individuals with full permanent dentition. For the body length we have recorded values between 186 and 245 cm, for the tail 32 -54 cm, for the tuft 30 - 53 cm and the ear 14 -18 cm (only few data with the danger of shrunken skin). The hoofs of the forelegs are significantly longer and broader than those of the hind legs. But we have no statistical significant differences between the hoofs and the other body measurements of different sexes. Some pictures show the hoofs, their prints and some peculiarities on it (fig. 4).

Table 1: Morphological data (in mm) of *Equus hemionus hemionus* from found skeletons between 2005 and 2006

sex	measure-ments	head-body	tail	tuft	ear	fore hoof		hind hoof	
						width	length	width	length
♂♂	N	50	52	51	11	102	102	102	102
	$\overline{x}$	2248.3	420.3	452.0	161.0	79.4	109.6	70.8	103.6
	s	119.86	40.67	51.96	7.48	5.84	5.40	5.58	6.17
	min	1860	320	330	146	66.1	99	60	83
	max	2450	540	530	170	100	123	90,5	122
♀♀	N	57	56	56	6	108	108	113	113
	$\overline{x}$	2238.1	419.4	427.0	162.7	78.8	107.4	71.7	102.1
	s	96.04	36.45	47.63	16.15	6.16	6.09	5.96	5.87
	min	2050	340	300	140	65	93	58	86
	max	2450	510	510	180	94	122	90.5	122

We have also a lot of data from younger animals which can be used later for investigations on body stature. Remarkable is the change of colour and hair density/length in winter and summer coat. The moulting from winter to summer pelts will be finished in the end of June. Only younger or ill individuals can have patches of old hairs until middle of July (fig. 2). RADDE (1862) noticed the hair length of winter coat with 25 -28 cm. The summer hair is short (about 1 cm), firm attached and shiny (HEPTNER & NAUMOV). We couldn't see remarkable differences in the moulting of stallions and mares like BANNIKOV (1954) and HEPTNER & NAUMOV (1966) it has described. Morphology and anatomy of hairs should be investigated in future. It's to advise on the publication of MAZAK (1962) about spring moult of *Equus hemionus kiang* with contributions to the phylogenesis of moulting in the subfamily Equinae.

Fig. 2a: Group of yearlings with rests of winter coat in the Bordzongijn-gobi, 24th of July 2002.

Fig. 2b: A bachelor with spring moult in the Galbyn-gobi, 12th of July 2005.

Fig. 2c: A mare with foal, followed by yearlings with partly spring moult on 23rd of July 2005 (photos: M. STUBBE).

Fig. 3: *Equus hemionus hemionus* in the South Gobi (a, b); c-h: recording and measuring of found death Wild Asses: c & f: M. Stubbe, N. Batsajchan; d: N. Sajna, driver, R.Driechciarz; M. Stubbe, N. Batsajchan; g: M. Stubbe, h: M. Stubbe, R. Driechciarz, N. Batsajchan (photos: M. & A. STUBBE, E. DRIECHCIARZ).

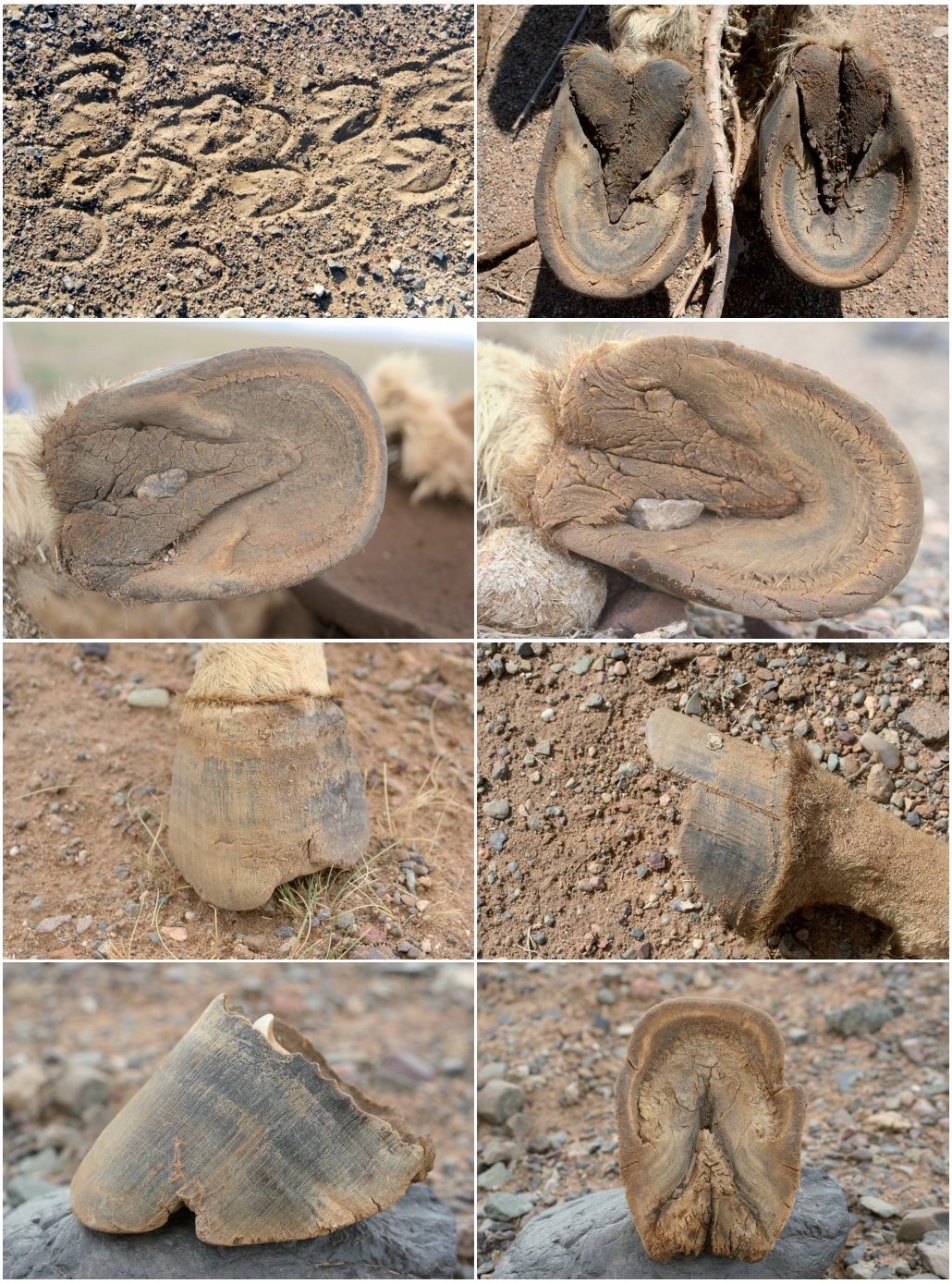

Fig. 4: Foot prints and hoofs with peculiarities of *Equus hemionus hemionus* (photos: M. STUBBE, E. DRIECHCIARZ).

3. Reproduction

The reproduction of Wild Asses in Mongolia is less investigated. The time from the middle of May up to the end of June can be clearly described as the foal time. Only a few foals were born also still in July. SHAGDARSUREN observed in the western Gobi between 25th and 28th of May mares with newborn foals. ANDREWS (1933) recorded on a hunted mare still pregnant at 28th of June. STUBBE & CHOTOLCHU (1968) registered a new born foal at 16th of June 1962. PRZEWALSKI (1875) and RADDE (1862) reported on a rutting time in September (see DENZAU & DENZAU 1999). Contrary notifications have given BANNIKOV (1954) who registered sexual activities especially in July. After information of herdsmen the rutting time is in the second half of July and August. In the second half of July 2004 we observed high sexual activities of stallions (STUBBE et al. 2005).

Data on sexual maturity of *Equus hemionus* based in first line on observations in enclosures (see summarized results by SCHREIBER & ZIMMERMANN 2002). Mares will pair with two and stallions with three years. The reproduction rates of *Equus hemionus hemionus* in the wilderness differ in greater variations as we recorded beside our monitoring routes through the South and South east Gobi. In one year it's possible to notice enormous regional differences in the structure of Wild Ass populations, in the number of adult asses and newborn foals (TSENDJAV & PUREVSUREN 2007).

In table 2 is shown that the reproduction rate between 2003 and 2006 has had an important gradient. In autumn 2003 we found an optimal increase of 23 % whereas in 2006 it decreased up to 7.5 % (table 2). Important is always the seasonal aspect of recording because the mortality after birth is a normal phenomenon and will reduce from month to month the relationship of young to old. Comparison of censuses in different intervals after birth has to reflect it. The record of population rate between 2004 and 2006 was done comparable in July of each year but 2003 in the end of September/October. All the more it's surprising that we found in autumn 2003 the highest value of increase. The summer 2003 was very rainy and influenced an extraordinary development of vegetation. It was a great impression to see a golden desert autumn with plants in rich colouring. The pastures for Wild Asses and their fitness were optimal. A bad condition of mares can be accompanied by abort of foetuses or reduced milk production and increase of postnatal mortality. Hypothetical we can believe that the pressure of enemies especially by wolves was in all years the same. Sudden fall in temperature can be decisive for the postnatal surviving of few days old foals. So we have had at 17th of July 2006 the strange experience of a sensitive onset of cold weather on the territory of Manlaj Sum. The temperature fall dawn to 12.9 °C. Herdsmen and authorities of the region found some dead Dschiggetaj foals and noticed mortality in young animals of their goat and sheep livestock.

Table 2: Monitoring of reproduction of Wild Ass in Mongolia between 2003 and 2006 in the South and Southeast Gobi

observation time	total	1+ / adult		foals		reproduction rate (%)
	n	n	%	n	%	
21.09. - 07.10.2003	1830	1488	81.3	342	18.7	**23.0**
03.07. - 23.07.2004	3387	2776	82.0	611	18.0	**22.0**
07.07. - 27.07.2005	1399	1274	91.1	125	8.9	**9.8**
24.07. - 02.08.2006	1539	1431	93.0	108	7.0	**7.5**

A peculiarity we registered in July 2005 beside the control of more than 20 eyries of Black Vulture *Aegypius monachus*. In two nests the controlled big young birds have at one's leg or toe a hard ring like horn shoe (hoof) of young Dschiggetaj foal or embryo (fig. 5). With difficulty we could rescue the birds from these shackles. It's unclear if the adult vultures cached by itself the prey or take the foal legs from carcasses? The ejected prey brought the young bird accidental into contact with this foot bond. But these cases show that foals should be a regular prey of vultures.

Fig. 5: Legs of *Aegypius monachus* nestlings with “horn shoes” (hoofs) of Dschiggetaj foals (photos: M. STUBBE, 2005).

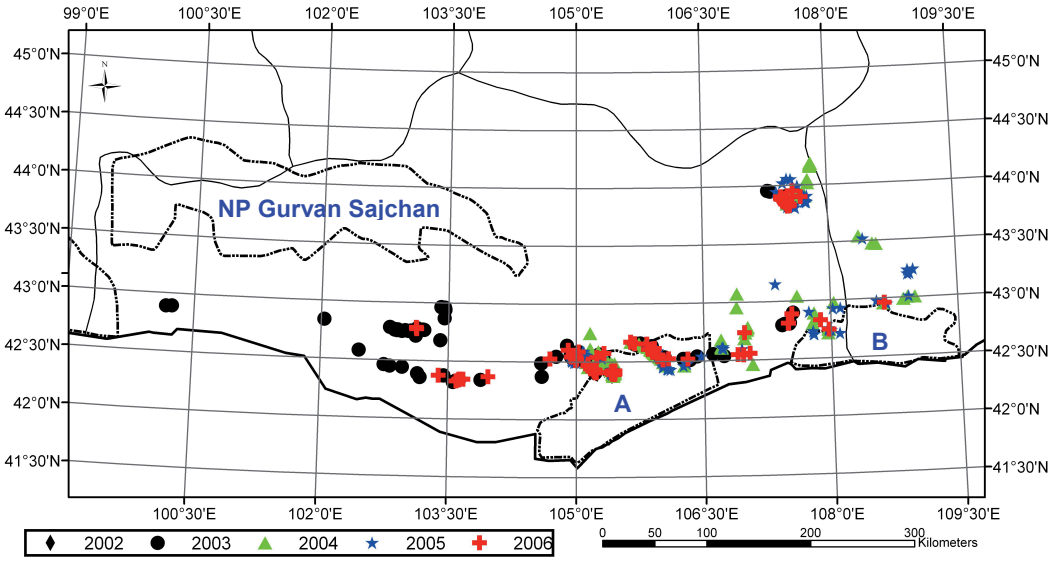

Fig. 6: The South Gobi Aimag with all localities of dead found Dschiggetajs between 2002 and 2006 and the protected areas of this region.

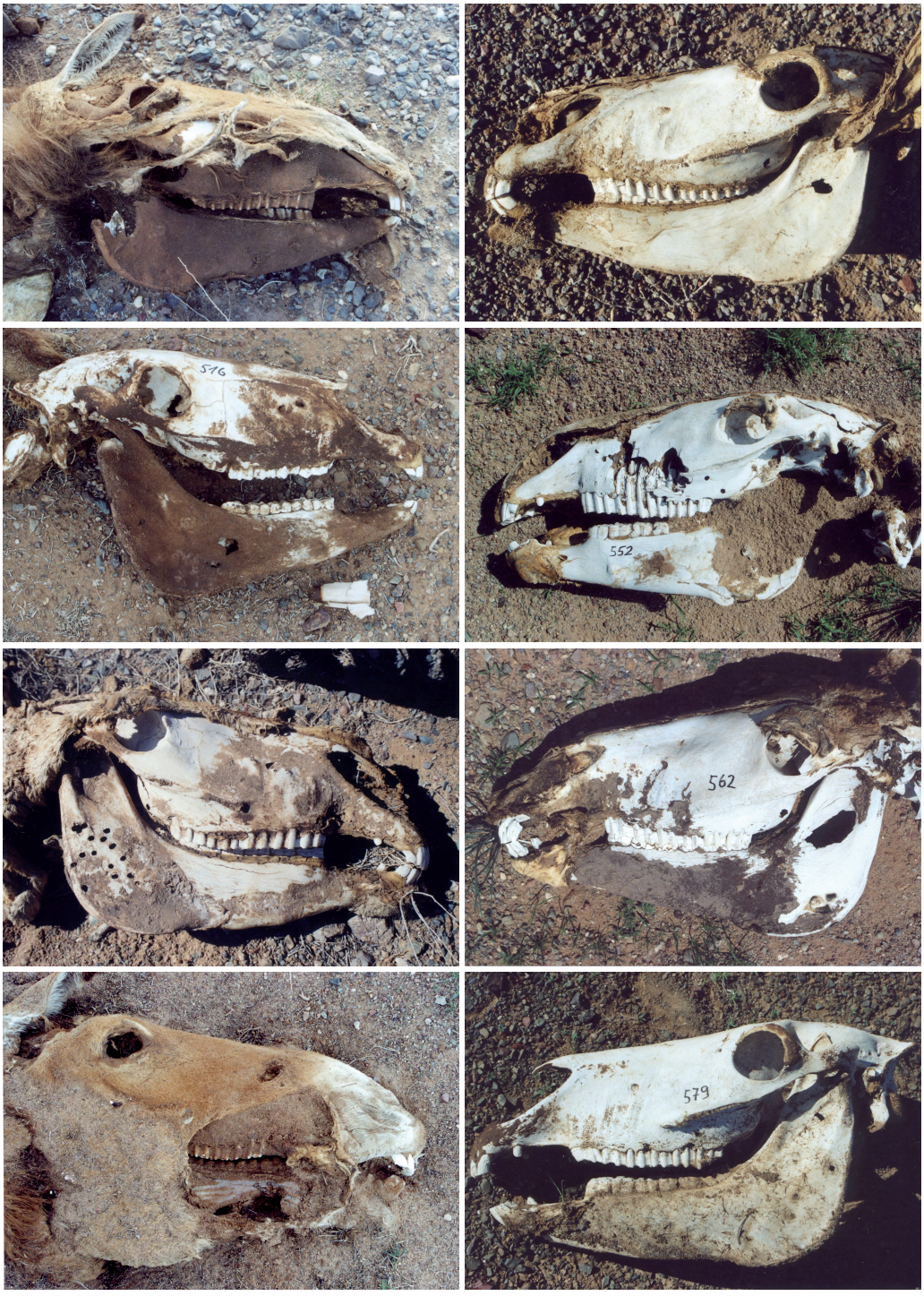

Fig. 7: Skulls of poached Dschiggetajs with bullet wounds (photos: A. & M. STUBBE).

4. Mortality

Between 2001and 2006 we analysed in the Gobi region 794 skeletons of Wild Asses, about 95 % were pouched (fig. 7). The bigger part of the animals was killed in these years, a relative small part (about 25 %) was older, and in the Gobi sun the bones were bleached and porous. A. STUBBE et al. (2005) have documented the located skeletons for the years 2003 and 2004. That we will do here for the following years (fig. 8) and in an overview for the whole period (fig. 6).

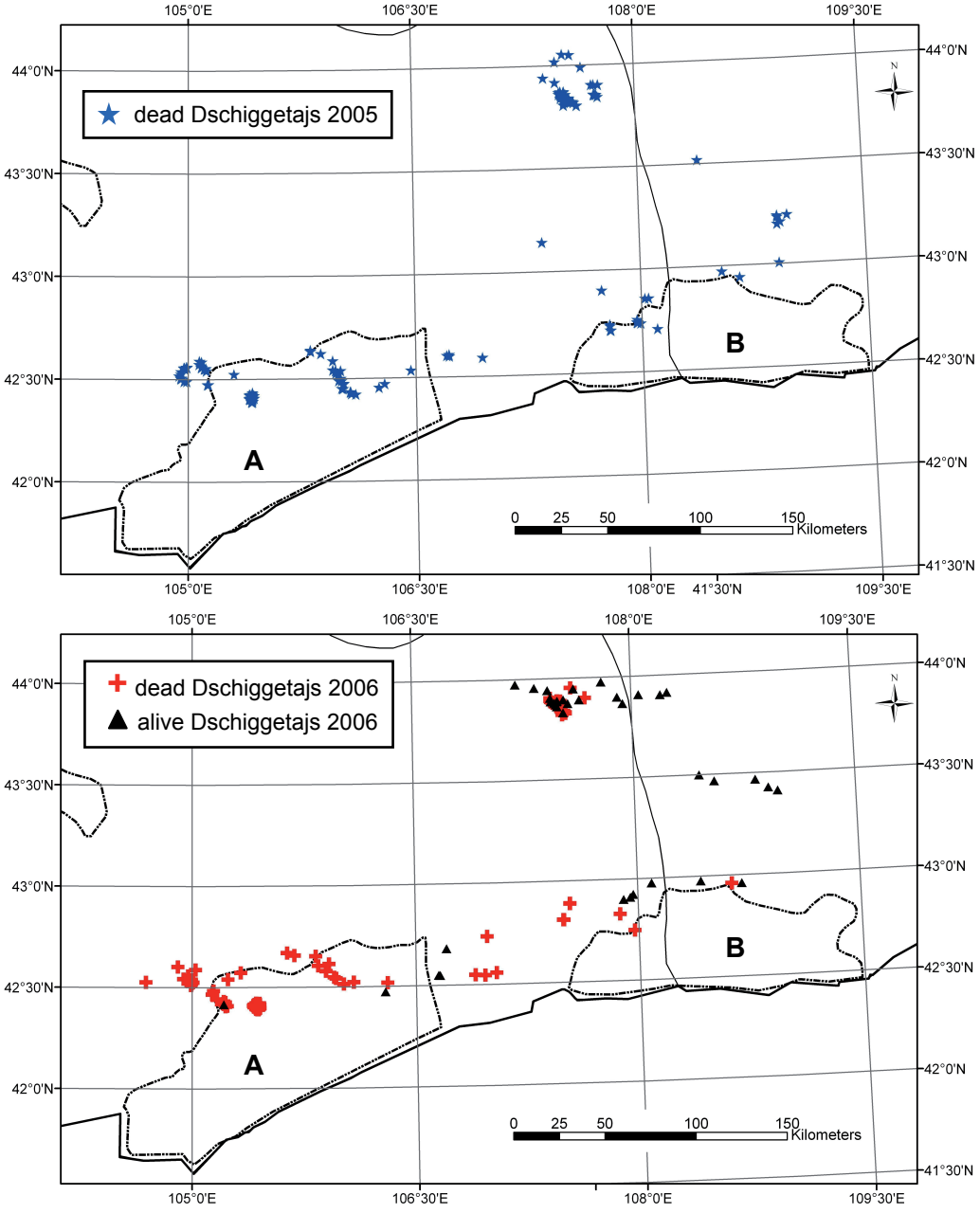

Fig. 8: Localities of dead found Dschiggetajs 2005 (above) and 2006 (below) as well as observed alive individuals or animal groups.

For two great "battlegrounds" in the Bordzongijn-gobi and the pastures of the Manlaj Sum detailed analysis are showing the whole dimensions of the anthropogenic input. In the Bordzongijn we have mapped at an area of 31 km^2 a minimum of 136 skeletons and in the Sum Manlaj on 39 km^2 a minimum of 82 carcasses (fig. 9, 10).

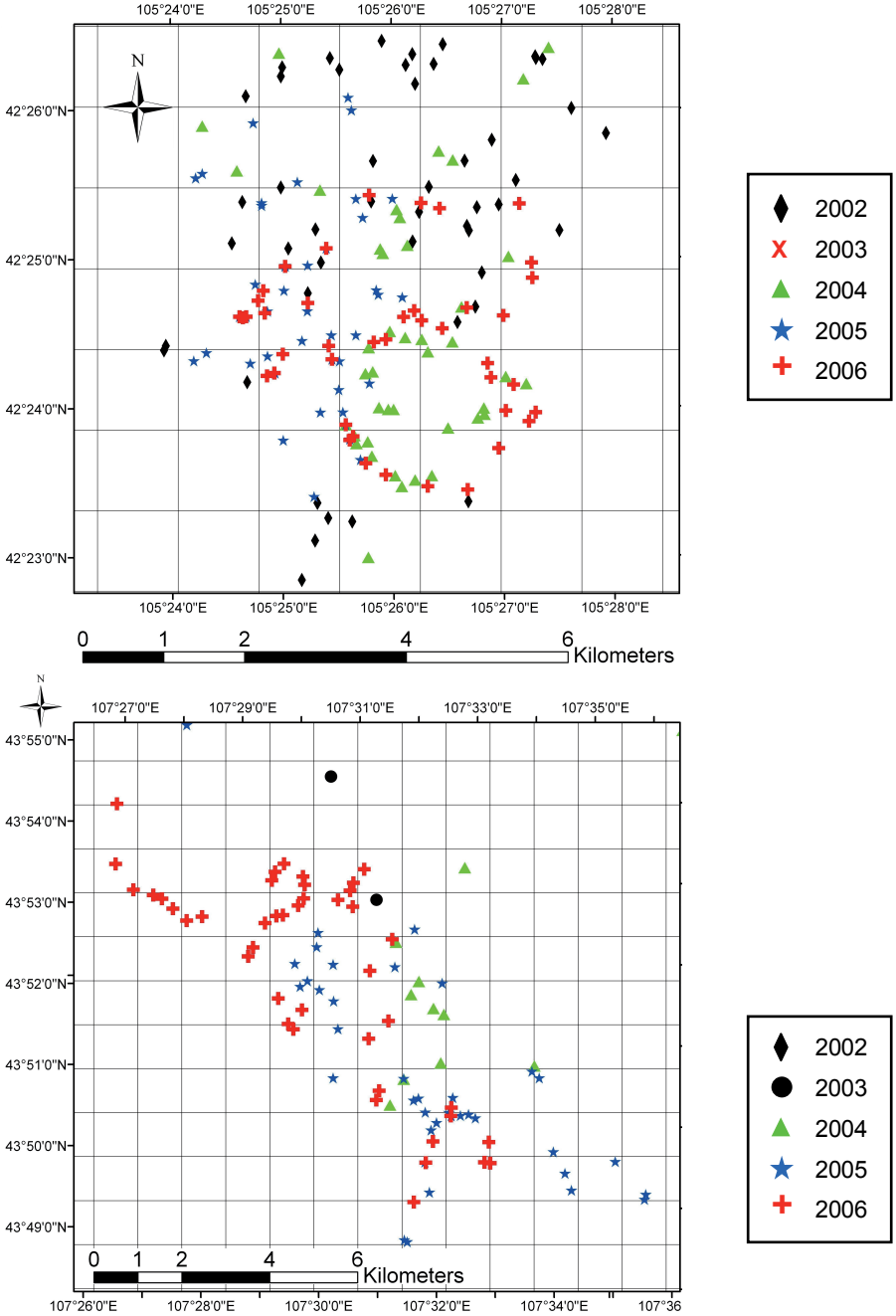

Fig. 9: Detailed grid maps (1 x 1 km) of Bordzongijn-gobi (above) and a part of Manlaj Sum with GPS-positions of poached Dschiggetajs between 2002 and 2006.

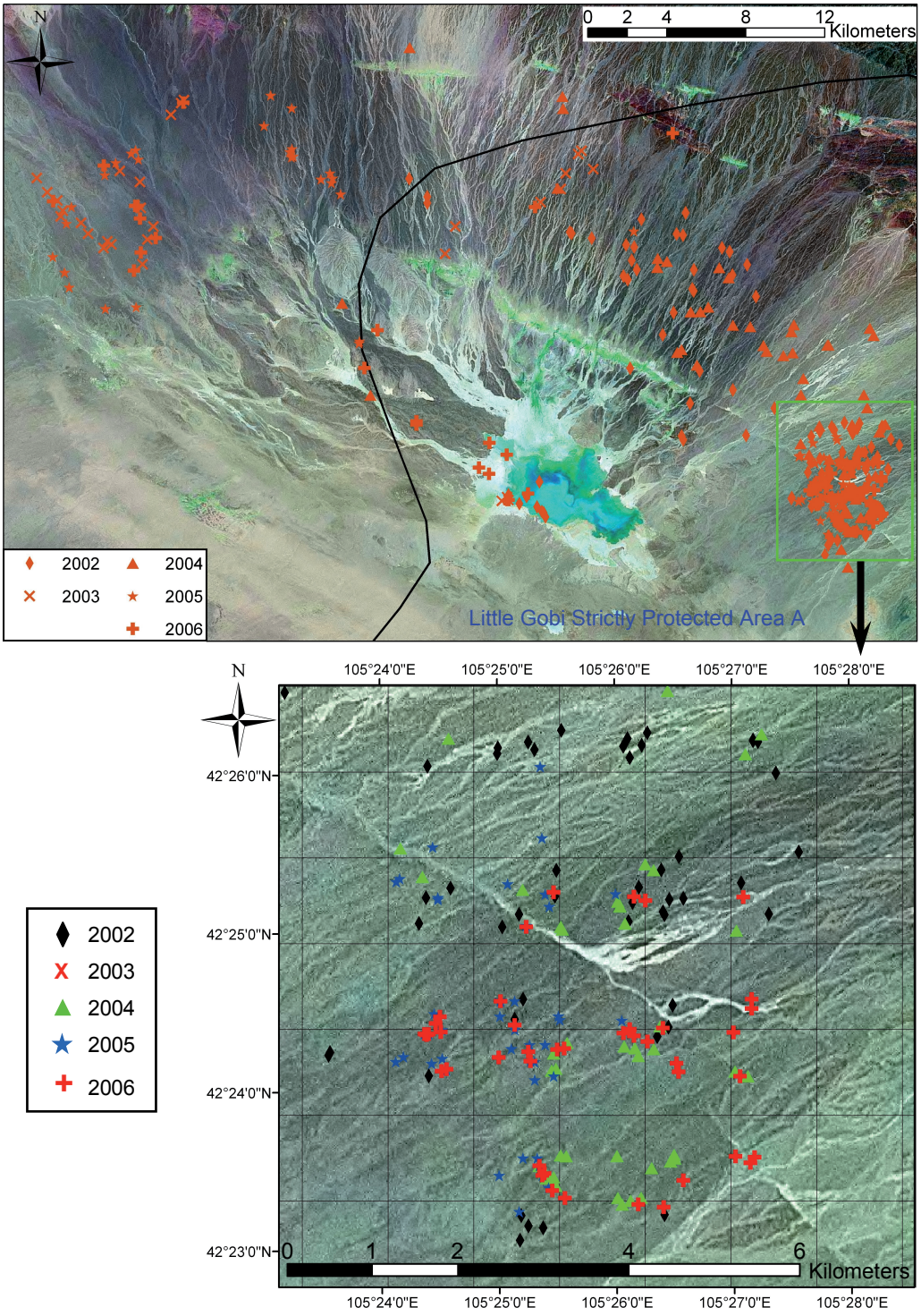

Fig 10: Satellite photos of the Bordzongijn-gobi depression with the border of the Little Gobi Strictly Protected Area A (above) and the detailed battleground of poached Dschiggetajs.

Especially distressing is the pouching in the strictly protected areas (fig. 9, 10). Fresh carcasses can be skeletonized by Black Vultures in a few hours (fig. 11). Bullet wounds (fig. 7), cartridge cases of various calibres, found knifes as well as missing parts of skeleton and the method of skinning were sure indicators of illegal killing. The motorization of the herdsman and city gangs was the decisive progress for pouching on flat runways in the dessert. At the topography of the landscape we could prognosticate the significance of illegal hunting and finding of skeletons. Two third of the pouched animals were shut in winter coat (table 3).

Fig 11:
Poached Dschiggetaj found in the depression of the Bordzongijn-gobi at 09.09.2005 (above), and the same carcass 1 hour and 40 minutes later nearly skeletonized by Black vultures (below); photos: H. von WEHRDEN und H. ZIMMERMANN).

Fig. 12: Competition between Wild Asses and domestic camels on water resources (Galbyn-gobi, 2004).

Fig. 13: Fleeing Dschiggetajs in the Bordzongijn-gobi (2003).

Fig. 14: Rolling place of a Dschiggetaj in the Galbyn-gobi, 2004 (photos: A. & M. STUBBE).

In the Red Books of Mongolia (SHAGDARSUREN et al. 1987, SHIREVDAMBA et al. 1997, DULAMTSEREN et al. 2006) as well as by STUBBE et al. (2005) and further passages in the Conclusions/Recommendations of the Asiatic Wild Ass Conference and in the Conservation Action Plans for Mongolian Mammals (CLARK et al. 2006) all sources for endanger of the splendid Wild Ass are listed.

Table 3: Registration of Wild Ass skeletons in the South Gobi

year	winter coat			summer coat			season unclear		total
	♂	♀	?	♂	♀	?	♂	♀	
2001	-	-	-	-	-	-	17	20	**37**
2002	27	50	-	7	3	-	2	3	**92**
2003	37	73	-	14	8	1	8	15	**156**
2004	39	115	2	21	14	3	1	2	**197**
2005	49	97	1	25	19	1	4	4	**200**
2006	27	54	13	10	6	1	-	1	**112**
total	**179**	**389**	**16**	**77**	**50**	**6**	**32**	**45**	**794**

Fig. 15: Advertising for the protection of wild great ungulates in the Trans-altai Gobi National Park (B) (photo: M. STUBBE, 1991).

This knowledge is to use urgently for a new politic-strategic management of comprehensive conservation of the last characteristic great ungulate of Mongolian wilderness. It's also a great challenge for the International Species and Nature Protection!

Acknowledgement

We have to thank our contributers in the field René and Ellen Driechciarz (Magdeburg), Axel Schonert, Marten Winter, Tobias Stenzel (Halle), S. Dorždorem, B. Ench-Oršich, S. Sanžmjatav, N. Sajnanemech (Ulan-Bator); Martin Görner (Jena). Henrik von Wehrden (Halle) gives his know how for the maps and we have to thank for financial help in transport of skeletons Dr. Waltraud Zimmermann, Prof. Dr. Nogge (Köln) and PD Dr. A. Schreiber (Heidelberg) as well as for the care of preparation Dr. Joachim Wussow and Roland Müller (Halle), Prof. Dr. Hermann Ansorge and Margit Ansorge (Görlitz).

References

ANDREWS; R.C. (1993): The Mongolian wild ass. - Natural History **38**: 3-16.

BANNIKOV, A.G. (1954): Mammals of the Mongolian Peoples' Republic. - Moscow (in Russian).

CLARK, E.; MUNKHBAT, J.; DULAMTSEREN, S.; BAILLIE, J.E.M.; BATSAIKHAN, N.; KING, S.R.B.; SAMIYA; R.; STUBBE, M. (2006): Summary conservation Action Plans for Mongolian Mammals. - Regional Red List Series, Zool. Soc. London.

DULAMTSEREN, S.; BAILLIE, J.E.M.; BATSAIKHAN, N.; SAMIYA, R.; STUBBE, M. (2006): Mongolian Red List of Mammals. - Regional Red List Series, Zool. Soc. London.

HEPTNER, V.G.; NAUMOV, N.P. (Hrsg.) (1966): Die Säugetiere der Sowjetunion. - Bd. **1**, Jena.

MAZAK, V. (1962): Spring Moult in *Equus hemionus kiang* Moorcroft (1841) and a Contribution to the Phylogensis of Moulting in the Subfamily Equinae (Perissodactyla, Mammalia). - Zool. Anzeiger **168**: 164-170.

POCOCK, R.I. (1994): Zum Lebensalter von Halbeseln. - Milu **8**: 106-109.

RADDE, G. (1861): Berichte über Reisen im Süden von Ost-Sibirien.- Beiträge zur Kenntnis des Russischen Reiches, Bd. **23** (Reprint Osnabrück 1970).

SCHREIBER, A.; ZIMMERMANN, W. (2002): Reproductive Seasonality in Hemiones, *Equus hemionus*: A heritable Character for Systematics? - Proc. 9th ICAZ Conference, Durham 2002, MASHKOUR, M. (ed.): Equids in time and Space, 132-145.

SCHREIBER, A. (2007): The emerging dziggetai (Equidae: *Equus hemionus* PALLAS): An illustrated history of taxonomic concepts for the identification, classification, and distribution of hemi-ones from Central Asia. - Erforsch. biol. Ress. Mongolei (Halle/Saale) **10**: 267-346.

SHAGDARSUREN, O. et al (Eds.) (1987): Red Book of Mongolia. - Ulaanbaatar (In Mongolian).

SHIIREVDAMBA, Ts.; SHAGDARSUREN, O.; ERDENJAV, G.; AMGALAN, Ts.; TSETSEGMA, Ts. (1997, Editors): Mongolian red book.- Ulaanbaatar (In Mongolian with English summary).

STUBBE, A.; STUBBE, M.; BATSAJCHAN, N.; SAMJAA, R.; DORŽDEREM, S. (2005): First results of Wild Ass research in the South Gobi Aymag/Mongolia in 2003 and 2004. - Erforsch. biol. Ress. Mongolei (Halle/Saale) **9**: 107-120.

STUBBE, A.; STUBBE, M.; SHAGDARSUREN, O.; SAMJAA, R.; BATSAJCHAN, N. (2007): Quo vadis Wild Ass *Equus hemionus hemionus* in Mongolia? - Erforsch. biol. Ress. Mongolei (Halle/Saale) **10**: 9-28.

STUBBE, M.; CHOTOLCHU, N. (1968): Zur Säugetierfauna der Mongolei. - Mitt. zool. Mus. Berlin **44**: 5-121.

TSENDJAV, D.; PUREVSUREN, S. (2007): Some information on the ecology of Khulan (*Equus hemionus* Pallas, 1775) in the western part of the South Gobi province, Mongolia. - Erforsch. biol. Ress. Mongolei **10**: 61-67.

WEHRDEN, H. von; WESCHE, K.: Relationships between climate, productivity and vegetation in southern Mongolian drylands. - Basic and Applied Dryland Research (submitted).

ZEVEGMID, D.; DAWAA, N. (1973): Die seltenen Großsäuger der Mongolischen Volksrepublik und ihr Schutz. - Arch. Naturschutz u. Landschaftsforsch. **13**: 87-106.

Addresses: Dr. Annegret Stubbe
Prof. Dr. Michael Stubbe
Institute for Biology
Martin-Luther-University Halle-Wittenberg
Domplatz 4
D-06099 Halle/Saale
stubbe@zoologie.uni-halle.de

N. Batsajchan
Biological Faculty,
National University of Mongolia
PO-Box 537
Ulaanbaatar 210646A
microtusb@yahoo.com