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EXAMINATION OF THE FORAGE BASIS OF SAIGA IN THE URAL POPULATION ON THE BACKGROUND OF THE MASS DEATH IN MAY 2010 AND 2011

ИЗУЧЕНИЕ КОРМОВОЙ БАЗЫ САЙГАКОВ В УРАЛЬСКОЙ ПОПУЛЯЦИИ НА ФОНЕ МАССОВОЙ ГИБЕЛИ В МАЕ 2010, 2011 ГГ.

Dieterich, T.[1], Sarsenova, B.[2]

[1]ACBK (Association for the Conservation of Biodiversity of Kazakhstan, Astana, Kazakhstan, til.dieterich@web.de

[2]ACBK (Association for the Conservation of Biodiversity of Kazakhstan), Uralsk, Kazakhstan, sarsenovab@mail.ru

Summary

Mass death of Saiga antelopes took place from 18 to 21 May 2010 in the north west of West Kazakhstan province north-east and south-east of Borsy (about 12.000 dead animals found). In August and September the forage basis of Saiga antelope in the mass death area was investigated. Mass growth of potentially poisonous Brassicacea species for ruminants could be found on abandoned fields in the area (*Lepidium perfoliatum*, *Lepidium ruderale*, *Descurainia sophia* and

Thlaspi arvense). Due to favourable warm and wet weather conditions in spring 2010 the mass growth of these annual Brassicacea species occurred on a big scale. Even though Saiga is capable to eat large amount of this plants, they are poisonous to ruminants when consumed in large amounts. In addition lush growth of Brassicacea and Poacea species (*Poa bulbosa*, *Eremophyrum triticeum*, *Leymus ramosus, Elytrigia repens*) providing high protein forage, can cause the observed symptoms of foamy fermentation, diarrhoea and bloating. The animals thus could have been killed by extreme bloating and/or acute pulmonary edema ("fog fever") after foraging on wet and highly nutritious "fog pastures". Qualitative investigations in the field confirmed that the animals ate most above mentioned species.

The clinically confirmed pasteurellosis, diarrhea and foamy fermentation are only symptoms, but not the cause of the mass death. Due to the investigations and analysis of secondary data the following stress factors are likely to play a role to cause the clinically confirmed symptoms, which led consequently to the mass death of Saiga antelope in the Ural population:

1) High chlorine (salt) content in plants and soil

2) High density of potentially poisonous plants from the Brassicacea family (D*escurainia sophia*, *Lepidium perfoliatum*, *Lepidium ruderalis* and *Thlaspi arvense) and Liliacea family (Ornithogalum fischerianum)* especially on abandoned fields.

3) High density of fresh, highly nutritious Brassicacea (see 2) and Poacea species such as *Poa bulbosa*, *Leymus ramosus* and *Eremophyrum triticeum* on abandoned fields and Elytrigia repens in depressions.

4) Warm temperatures and wet weather conditions before and especially during the death event, did enhance the development of highly dangerous "fog pastures".

In addition the animals have been congregation for calving, which does contribute to a higher background stress.

The results of the investigation suggest that a combination of at least some of the above listed factors is responsible for the tragic events.

Background

Two recent mass death events of Saiga antelopes (Saiga tatarica subsp. tatarica) took place from 18 to 21 May 2010 and 26.–27. May 2010 with respectively about 12.000 and 450 dead animals in the Ural Oblast near the village Borsy (compare map).

The events have been a serious blow to the population which is actually coming down from about 39.000 animals before the death event in 2010 to only about 17.000 in 2011 (56% drop within 12 months, compare table). In both cases investigations run by the Kazakh government revealed Pasteurellosis as the main cause of death (Grachev, Bekenov 2010, Duisekeev 2011). Under normal conditions, Pasteurella inhabits the mucus of the upper air passages and has no adverse effect to the animals (Lushchekina 2010). Thus Pasteurella becomes dangerous if the animals get under serious stress. A definite causal connection what triggered mass death of Saiga could not be confirmed up to these days, but we found strong evidence that the pastures and weather conditions did play a crucial role (compare also Kock et. al 2012).

Generally mass death events are regularly repeating as shown in the table below. It has to be stated, that it seems a natural phenomenon in Saiga populations, possibly important to keep the populations fit. With about 1/3 population loss in 2010 the event was of much lower magnitude than other recorded events with up to 2/3 animals dying within one event.

There have been more death events in recent history (1955, 1956, 1958, 1967, 1969 and 1974) but many of them are not properly documented (Kock et. al 2012).

Betbak Dala Population				
Turgay Oblast (Amangeldi and Dzhangildi Raion)	24.–26.05.1981	470.000	20%	95.000
Turgay Oblast (Amangeldi Raion)	14.–22.05.1988	634.000	68%	434.000
Ural Population				
Ural Oblast (Dzhangaldinsk, Urlinsk, Taipak Raion)	End Feb. – Mid March 1984	150.000	67%	100.000

Ural Oblast (North-Eeast, South-East Borsy village)	18.–21.05.2010	39.000	31%	11.920
Ural Oblast (South-East Borsy village)	26.–27.05.2011	17.900	2%	441

Sources: Duisekeev, 2011; Grachev, 2011; Grachev, Bekenov; 2010 (also direct communication); Aikimbaev, 1985.

The reason for the here described investigations was the hypothesis that the mass death at Ural in 2010 and 2011 is connected with the forage basis of the animals. The observed symptoms of discharges of bloody foam from the nose and mouth cavity, as well as bloody diarrhea and flatulence (the stomach of the animals was blown up heavily before death) (Salemgareev et al. 2010, Grachev, Bekenov 2010) are known symptoms of consumption of Poacea, Fabacea and Cruciferacea species with a high protein and moistures content in the wet spring weather of 2010 and 2011. The forage basis was only investigated 3–4 month after the event 2010 event, but in 2011 three days after the death incident a team of botanist was on site. Some results of both investigations are presented here.

Forage basis and weather conditions

Saiga are selective feeders and can consume large amounts of plants poisonous to other ruminants (Abaturov et. al. 2005). We could confirm that the animals have been feeding on at least 14 taxa (Lepidium perfoliatum, Lepidium ruderalis, Descurainia sophia, Bassia sedoides, Kochia prostrata, Galium rutenicum, Veronica spicata, Verbascum phoeniceum, Tanacetum achilleifolium, Spirea sp., Ornithogalum fischerianum, Leymus ramosus, Festuca sulcata, Poa bulbosa, Agropyrum cristatum/pectinatum). The observation are founded on observations of utilized species in the field, rumen and general stomach content. No quantitative investigations could been made up to date, but are in process. Nevertheless in the death areas of 2010 and 2011 a mass growth of Brassicacea species (Lepidium perfoliatum, L. ruderalis, Descuarainia sophia) could be observed. The species are potentially poisonous to ruminants and can cause digestion problems namely foamy fermentation, diarrhoea and bloating. Mass growth of these species was observed mainly on fallow fields which are frequent south of the village Borsy. This is a result of the so called new land champagne conducted during Soviet times for enlarging the area for wheat production. Fodder experiments on Saiga in captivity showed that they can eat large amounts of Brassicacea species without being harmed. Namely Lepidium perfoliatum was consumed with up to 28% and Descurainia sophia with up to 10% (Abadurov et. al. 2005). Nevertheless not only the poisonous mustard oils of the plants can cause digestion problems, but eaten in a lush stage is dangerous, too.

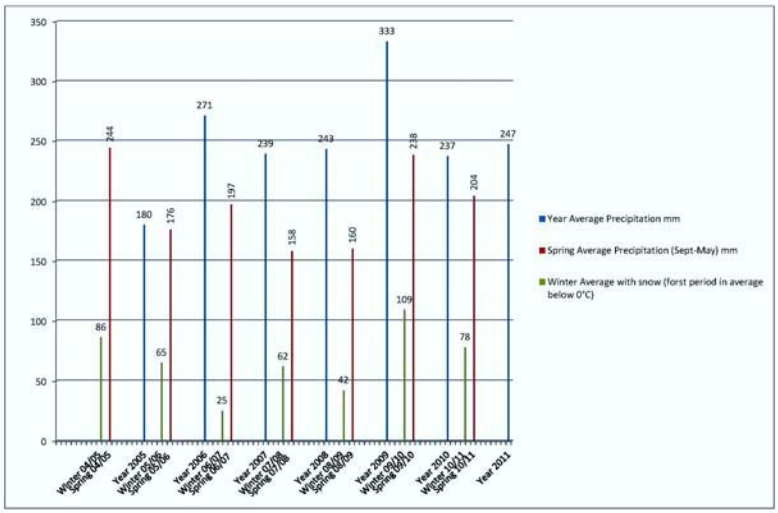
One species which flowers have been foraged selectively by Saiga is Ornithogalum fischerianum. The whole genus is reported to be poisonous to ungulates (Kellerman et. all. 1988). No data is available for the specific species, which has been very abundant on fallow fields grazed in both years. In the center of the death area 2011 literally all flower and fruit stands have been foraged by Saiga.

In addition a lush growth of highly abundant grass species such as *Poa bulbosa*, *Leymus ramosus* and *Eremophyrum triticeum* on abandoned fields and Elytrigia repens in depressions could be found. The local population did report several years of drought with little hay harvest, before the 2010 event. But in 2010 and 2011 a lot of water could be found standing in the depressions of the area causing so called "fog pastures". The consumption of wet high protein fodder can lead to acute pulmonary edema ("fog fever") which does kill the animals due to hypoxia. This happens when the rumen flora did not have enough time to adapt to the new fodder conditions occurring often in spring.

Therefore special attention has to be given to extraordinary rain events during both years which is reported for the Dzhanibek scientific station (ca 90 km south-west of the site). In 2010 a staggering 42,6 mm pour down happened at the 14.05. and additionally a sum of 12,9 mm rained down the day before and during the mass death event. This sums up to 55,5 mm, which is twice the norm for the whole month of May (27 mm). In 2011 the situation was not that extreme, but never

the less there was sufficient rain (about 12 mm) in the weeks before the event and over 9 mm rained down during the death event on 26th and 27th of May (Sapanov 2011 and personal communication).

In addition the long term precipitation data of Alexandrov Gay about 70 km east of the death event was reviewed and high winter and spring precipitation could be observed in both years.



The precipitation diagram shows different average seasonal precipitation for the past 6 years. The years 2005–2006 show well below average precipitation (330 mm). The Winters 2009/10 and 2010/2011 were rich in snow, which lead together with high precipitation over the most relevant months for soil moisture (Sept. – May) to high ephemeral and annual plant growth. In addition after a series of bad hay years 2010 was extraordinarily good. The spring 2005 has been similarly moist, but snow cover was not that extensive.

On this background it is not surprising that the overall water content of the foraged species 3 days after the death event was with an average with over 60% relatively high.

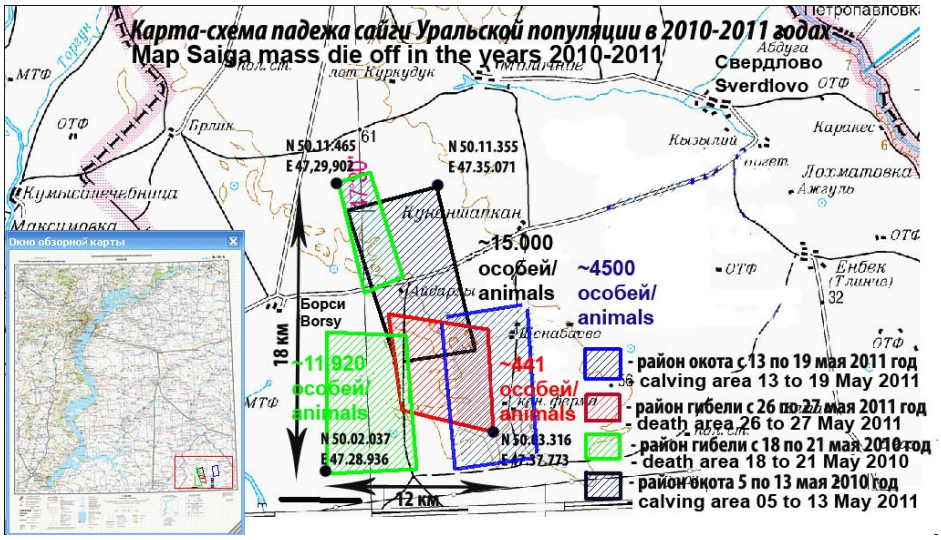
Conclusions

In both years the Saiga death events started just after the females and their 1–2 week old young started to move again. During the first 10 days of the calving time the females did not leave their young and not even move to the nearby water places for drinking. In both cases the calving sites where some meters higher and covered either by mainly steppe vegetation (2010, Stipa-Festuca Steppe) or Leymus ramosus grassland on fallow fields. Thus the moist pastures where presumably more intensively used during the death event. Nevertheless the heavy rain events just before or during the death event, did certainly lead to very moist fodder especially in the morning hours. In 2010 even fog was reported by the locals just before the dying started. The local people also reported, that Lepidium species do cause diarrhea in cattle and after heavy rain events herders do not let their livestock out to the pastures before noon. Wet and warm weather conditions have also be reported for the Betbak Dala Population during the spring death events in 1981 and 1988. The animals have also been calving for the first time in the Borsy area usually using pastures further south in the semi desert region. Part of the Saiga population did actually calve further south in the semi-desert area 2011 and no deaths were reported here. Wet weather conditions in spring combined with lush pastures are thus obviously problematic to Saiga.

In addition we had a very high mortality of over 95% of the females in a few days in both years. Interestingly the group of calving females in 2011 was about 4500 animals in the first 10 days and only the small group which was wandering off to the eastern pastures being problematic already in 2010 did die off almost completely (reported by rangers of Okhotzooprom, compare map). Thus in both years we observed the same mortality on similar pasture grounds. If a pathogen would have been the major cause, we would expect a significant lower death rate in the second year due to developed resistances (Kock et. al. 2012).

Unfortunately no conclusive tissue samples have been taken in order to understand conclusively the mass-death events. Nevertheless the presence of potentially poisonous plants (Brassicacea and Ornithogalum) and the presence of moist "fog pastures" with fodder plants containing high protein content are highly dangerous fodder conditions for ruminants.

It is likely that the animals have been killed by extreme bloating and/or acute pulmonary edema ("fog fever") after foraging on wet and highly nutritious "fog pastures" and/or potentially poisonous plant species.



With this evidence on hand we recommend in similar wet years to keep Saiga off such dangerous pastures and train the responsible rangers in identifying the described dangerous conditions. If it turns out difficult or dangerous for the Saiga population to keep them off dangerous pastures, the relevant areas should just be cut during the time when the animals are immobile during the first 10 days of calving. Cutting the dangerous pastures will prevent excessive development of toxins and protein in the plants. Even if the plants are eaten dry the risk of negative effects is minimized. By no means other agricultural activities should be taken into account i.e. ploughing or using of herbicides. This would lead to an additional mass growth of annual Brassicacea plants, as we could observe on young fallow fields in the north of Borsy in 2010. This will enlarge the risk of pasture problems even more.

Map showing the approximate calving and death areas of the years 2010 and 2011. The extension of the calving area 2011 deeds further refinement (Source: Okhotzooprom 2011, adapted 2012 by authors).

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НОВЫЕ ДАННЫЕ О РАСПРОСТРАНЕНИИ ЛЕТУЧИХ МЫШЕЙ (*MICROCHIROPTERA*) НА ТЕРРИТОРИИ КОСТАНАЙСКОЙ ОБЛАСТИ

THE NEW DATA ON BATS DISPERSAL IN THE TERRITORY OF KOSTANAY REGION

Ильяшенко М.А.
Костанайский государственный педагогический институт, г. Костанай, Казахстан, marinaxfiles@mail.ru

В настоящей работе представлены данные о находке нового для Костанайской области вида, представленного подотрядом *летучие мыши* (*Microchiroptera*) семейством *гладконосые летучие мыши (Vespertilionidae).*

Рукокрылые (*Chiroptera*) остаются одной из наименее изученных групп млекопитающих на территории Костанайской области.

По литературным данным (Гвоздев, Страутман, 1985), летучие мыши Костанайской области представлены шестью видами семейства *гладконосые летучие мыши* (*Vespertilionidae*). Достоверно известны два – *Vespertilio murinus и Eptesicus serotinus* (Брагина, Ильяшенко, 2008).

В конце августа 2010 года в здании Костанайского государственного педагогического института отловлена летучая мышь *рыжая вечерница Nyctalus noctula* из семейства *гладконосые летучие мыши Vespertilionidae,* род Вечерницы *Nyctalus*.

Определение вида проводилось по определителям (Кузякин, 1950; Мазунин, 1982; Гвоздев, Страутман, 1985) с проведением необходимых измерений *(Табл. 1)*.

Таблица 1.

Морфометрические показатели Рыжей вечерницы *Nyctalus noctula (♂)* г. Костанай. 31.08.2010.

№	Объекты измерения	мм
1	Длина тела	74
2	Длина хвоста	44
3	Высота уха	16
4	Ширина уха	15
5	Длина козелка	7
6	Кондилобазальная длина черепа	20
7	Высота черепа	9
8	Длина предплечья	52
9	Метакарпальная кость III пальца	50
10	Метакарпальная кость IV пальца	49
11	Метакарпальная кость V пальца	39