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NINA Report

Reintroduction of kulan into the central steppe of Kazakhstan: Field Report for 2018-2019

Petra Kaczensky, Albert R. Salemgareyev, Steffen Zuther, Mukhit Suttibayev, Fariza Adilbekova, and John D. C. Linnell

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Trondheim, February, 2020

ISSN: 1504-3312
ISBN: 978-82-426-4539-5

AVAILABILITY
Open

PUBLICATION TYPE
Digital document (pdf)

QUALITY CONTROLLED BY
Andrea Miller

SIGNATURE OF RESPONSIBLE PERSON
Research director Signe Nybø

COVER PICTURE
Mare and two foals of the first group of translocated kulan in the acclimatization enclosure in the winter 2017/2018 ©Albert Salemgareyev, ACBK

KEY WORDS
Asiatic wild ass
Kulan
Equus hemionus
Reintroduction
Kazakhstan

NØKKELORD
Asiatisk villesel
Kulan
Equus hemionus
Gjeninnføring
Kasakhstan

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Abstract

Kaczensky, P., A. R. Salemgareyev, S. Zuther, M. Suttibayev, F. Adilbekova, and J. D. C. Linnell. 2020. Reintroduction of kulan into the central steppe of Kazakhstan: Field Report for 2018-2019. NINA Report 1782. Norwegian Institute for Nature Research.

(1) 2018, saw the continuation of the monitoring of kulan in the acclimatization enclosure at the Alibi field station by two veterinarian interns and the local staff.

(2) In April 2018, the first group of nine translocated kulan were released from the acclimatization enclosure into the Torgai steppe. The animals first moved together, but subsequently split up. Although hormone analysis of faeces suggested that two mares were released pregnant, no newborn foals were seen during ground-checks in summer. December 2018, saw the loss of one collared mare due to poaching. The total area covered by all four collared kulan in 2018 was 55,000 km^2.

(3) Throughout the summer of 2018, field activities were directed at upgrading the Alibi field station, improving access, and preparing for the arrival of a new group of translocated kulan. In Altyn Emel National Park (NP) the capture infrastructure was upgraded based on last years' experience.

(4) A lot of preparation went into the planning and organization of the logistics for the new transport approach using a combination of an AN-12 transport plane and truck transport to and from the airports and the capture and release sites.

(5) In October 2018, the team failed to chase any kulan into the capture corral in Altyn Emel NP, due to the unfortunate combination of a scarcity of kulan around the capture corral due to poor pasture availability and technical / logistical problems.

(6) Outreach activities were organized on the Torgai steppe with the *Kulanmobil* in September and November 2018. In total, 1168 pupils and 629 adults from 20 different schools and/or villages participated in the activities games, plays) and/or attended presentations around steppe ecology and kulan conservation, and received kulan information material (the kulan comic from 2017, poster, booklet).

(7) 2019 saw the continued monitoring of the translocated, free-ranging kulan on the Torgai steppe. The remaining two collared kulan kept moving separately, one alone and the other with an uncollared kulan (likely one of the foals from the 2017 transport). Ground-checks in summer again did not document newborn foals and we have no records of the other uncollared kulan. December 2019, saw the loss of a second collared mare due to poaching. The total area covered by the two collared kulan in 2019 was 69,000 km^2.

(8) In 2019, the overall focus of the translocation shifted from the capture of kulan in Altyn Emel NP, to capture in Baraa Kelmes State Nature Reserve (SNR). The latter is closer to Alibi field station (450 km straight line distance as compared to 1,200 km to Altyn Emel NP) and allows for a truck-only transport, rather than necessitating the logistically very challenging combined airplane and truck approach that was planned for 2018. The new workplan was the result of the pevious years' experience and the original plan of aiming for kulan from Barsa Kelmes in the third year. Genetic analysis showed that Barsa Kelmes kulan were very similar to those in Altyn Emel NP and had a similar to slightly higher genetic diversity.

(9) Field activities were concentrated on understanding the kulan situation in Barsa Kelmes SNR, with three preparatory trips in February, April, and July to initiate and clarify cooperation, GPS-collar three kulan to get a first understanding of their movements, and to plan the capture infrastructure necessary for the anticipated capture and transport of up to 30 kulan in fall. In July, a feed-in capture corral on Kaskakulan was built at one of the three artesian springs.

(10) In August 2019 we held a two-day Animal Capture & Handling workshop for staff of the Okhozootprom Reintroduction Center and Almaty zoo staff in Almaty. The course was conducted

by the core capture team and two international veterinarians. Furthermore, construction of the chase-in corral at Barsa Kelmes SNR was initiated.

(11) In September/October 2019 the team successfully transported 2 kulan from Barsa Kelmes SNR to the acclimatization enclosure at the Alibi field station on the Torgai steppe. In addition, the team collared three more kulan in Barsa Kelmes SNR, initiated the first camera trapping survey at the three artesian springs on Kaskakulan and conducted a pilot drone survey. Although the number of translocated animals was well below the number originally hoped for, the team gained important experience on kulan capture at Barsa Kelmes and of truck-only transportation which will be the basis for future planning.

(12) In November, the *Kulanmobil* supported by 17 rangers from Barsa Kelmes SNR organize kulan events in the Aral region. Meetings were held in four villages and five schools and reached more than 300 children and 22 teachers. Updated information material included a new kulan comic (kulan comic 2019).

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Sammendrag

Kaczensky, P., A. R. Salemgareyev, S. Zuther, M. Suttibayev, F. Adilbekova, and J. D. C. Linnell. 2020. Reintroduction of kulan into the central steppe of Kazakhstan: Field Report for 2018-2019. NINA Report 1782. Norwegian Institute for Nature Research.

(1) I 2018 fortsatte overvåkningen av det asiatiske villeselet, kulan, i akklimatiseringsinnhegningene på Alibi feltstasjon, utført av to veterinærpraktikanter og de lokalt ansatte.

(2) I april 2018 ble den første gruppen, bestående av ni forflyttede dyr, sluppet ut på Torgai-steppen fra akklimatiseringsinnhegningen. I starten beveget dyrene seg sammen, men etter hvert delte gruppen seg opp. Selv om hormonanalyser av avføring tydet på at to av merrene som ble sluppet ut var drektige, ble ingen nyfødde føll sett da området ble undersøkt på sommeren. I desember 2018 døde en av merrene som var merket med klave, som en følge av snikskyting.

(3) Gjennom sommeren i 2018 fokuserte feltaktiviteten på å oppgradere Alibi feltstasjon, forbedre tilgangen til feltstasjonen og forberede ankomsten av en ny gruppe forflyttede villesel.

(4) Det gikk med mye tid på planleggingen og organiseringen av logistikken til den nye transportmetoden, som bruker en kombinasjon av et AN-12 transportfly og lastebiltransport til og fra flyplassene og stedene hvor dyrene fanges og slippes ut.

(5) I oktober 2018 klarte ikke teamet å jage noen villesel inn i fangstinnhegningen i Altyn Emel nasjonalpark på grunn av den uheldige kombinasjonen av få dyr rundt innhegningen på grunn av dårlig beite og tekniske og logistiske problemer.

(6) Formidlingsaktiviteter ble organisert på Torgai-steppen med *Kulanmobil* i september og november 2018. Totalt deltok 1168 elever og 629 voksne fra 20 ulike skoler og/eller landsbyer i aktivitetene (leker og spill) og/eller deltok på presentasjoner om steppeøkologi og bevaring av kulan, samt mottok informasjonsmateriell om kulan (kulantegneserien fra 2017, poster og hefte).

(7) I 2019 fortsatte overvåkningen av forflyttede frittgående kulan på Torgai-steppen. De gjenværende merkede dyrene fortsatte å bevege seg hver for seg, én alene og den andre sammen med en umerket kulan (sannsynligvis ett av føllene fra transporten i 2017). Det ble ikke dokumentert nyfødte føll da området ble undersøkt på sommeren, og de andre umerkede dyrene ble ikke observert. I desember 2017 mistet vi den andre merkede merra på grunn av snikskyting. Det totale området de to merkede dyrene dekket i 2019 var 69 000 km^2.

(8) I 2019 var hovedfokuset flyttet fra fangst av kulan i Altyn Emel nasjonalpark til fangst i Basra Kelmes naturreservat. Sistnevnte er nærmere Alibi feltstasjon (450 km i luftlinje sammenlignet med 1200 km til Altyn Emel nasjonalpark), noe som muliggjør transport med kun lastebil i stedet for den logistisk utfordrende kombinasjonen av fly- og lastebiltransport som var planlagt i 2018. Den nye arbeidsplanen var et resultat av erfaringen fra foregående år og den opprinnelige planen med mål om flytting av kulan fra Barsa Kelmes det tredje året. Genetiske analyser viser at kulan i Barsa Kelmes er veldig like de i Altyn Emel nasjonalpark, og at de har en lignende til noe høyere høyere genetisk diversitet.

(9) Feltaktivitetene konsentrerte seg om å forstå situasjonen til kulan i Barsa Kelmes naturreservat, med tre forberedende turer i februar, april og juli for å igangsette og avklare samarbeid, merke tre kulan med GPS-klaver for å få en forståelse av bevegelsene deres, og å planlegge den nødvendige infrastrukturen for den forestående fangsten og transporten av opp mot 30 kulan på høsten. I juli ble en fangstinnhegning på Kaskakulan bygget på en av de tre artesiske kildene.

(10) I august 2019 arrangerte vi en todagers workshop om fangst og håndtering av dyr for de ansatte ved Ohotzooprom reintroduksjonssenter og Almaty dyrepark i Almaty. Kurset ble ledet av kjernefangstteamet og to internasjonale veterinærer. Arbeidet med å bygge en innhegning for innjaging av dyr i Barsa Kelmes naturreservat ble også igangsatt.

(11) I september/oktober 2019 transporterte teamet to kulan fra Barsa Kelmes naturreservat til akklimatiseringsinnhegningen på Alibi feltstasjon på Torgai-steppen. I tillegg merket teamet tre

dyr i Barsa Kelmes naturreservat med klaver, de satte i gang den første kamerafelleundersøkelsen ved de tre artesiske kildene på Kaskakulan, og gjennomførte en pilotstudie med drone. Selv om antallet forflyttede dyr var godt under det antallet vi opprinnelig håpet på, fikk teamet viktig erfaring med fangst av kulan ved Barsa Kelmes og med lastebiltransport. Dette legger grunnlaget for framtidig planlegging.

(12) I november organiserte *Kulanmobil*, støttet av 17 nasjonalreservatansatte fra Barsa Kelmes nasjonalreservat, arrangementer i Aral-området. Møtene ble arrangert i fire landsbyer og på fem skoler, og mer enn 300 barn og 22 lærere deltok. Oppdatert informasjonsmateriell inkluderte en kulantegneserie.

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Summary in Russian

Каченски, П., Салемгареев, А. Р., Цутер Ш., Суттібай М., Адилбекова Ф. и Линнелл Ж. Д. С. 2020г. Реинтродукция кулана в степи центрального Казахстана: Отчет по полевой работе 2018-2019 гг. NINA Report 1782. Норвежский институт природных исследований.

(1) В 2018 году было продолжено наблюдение за куланами в акклиматизационном загоне на полевой станции Алиби, в котором приняли участия два стажера-ветеринара и техниками-смотрителями.

(2) В апреле первая группа из девяти перевезенных куланов была выпущена из акклиматизационного загона в Торгайскую степь. В первое время животные двигались вместе, но впоследствии разделились. Анализ взятых образцов гормонов показал, что две кобылы были выпущены беременными, во время летних наземных проверок не было обнаружено новорожденных жеребят. В декабре 2018 года из-за браконьерства погибла одна кобыла со спутниковым ошейником. Общая площадь перемещения четырех куланов с ошейниками в 2018 году составила 55 000 км^2.

(3) В течение лета полевые работы были направлены на модернизацию центра Алиби, улучшение доступа и подготовку к прибытию новой группы куланов. На территории нац. парка «Алтын-Эмель» была усовершенствована коралевая ловушка для отлова, основываясь на опыте прошлых лет.

(4) Проведена большая подготовка по планированию и организации материально-технического обеспечения для нового транспортного подхода с использованием транспортного самолета Ан-12 и автомобильного транспорта в / из аэропортов и мест вывоза и выпуска.

(5) В октябре команде не удалось загнать куланов в загон в нац. парке «Алтын-Эмель» из-за небольшого скопления куланов вокруг загона, причиной было плохое пастбище в районе загона, а также технические и логистические проблемы.

(6) С сентября по ноябрь в Торгайском регионе были проведены просветительские мероприятия «Куланмобиль». В общей сложности 1168 учеников и 629 взрослых из 20 различных школ и поселков. Участники приняли участие в играх, прослушали презентации, посвященных экологии степи и сохранению куланов, а также получили информационные материалы по куланам (комикс, постер, буклет).

(7) В 2019 году продолжился мониторинг ранее выпущенных куланов в торгайской степи. Оставшиеся два кулана со спутниковыми ошейниками продолжали двигаться раздельно, одна самка в одиночку, а другая с молодым куланом (один из жеребят которого перевезли в 2017 году). Наземные проверки вновь не фиксировали новорожденных жеребят и отсутствует записей о другом кулане без ошейника. В декабре 2019 года по причине браконьерства погибла вторая кобыла с ошейником. Общая площадь куланов с двумя ошейниками в 2019 году составила 69 000 км^2.

(8) Главный фокус по отлову куланов сместился с нац. парка «Алтын-Эмел»ь на отловы животных в Барсакельмесском заповеднике. Вторая точка располагается ближе к центру Алиби (напрямую 450 км по сравнению с 1200 км от нац. парка «Алтын-Эмель») и позволяет осуществлять перевозку грузовым автомобилям, вместо того, чтобы требовать сложного с точки зрения логистики комбинированного подхода самолета и грузового транспорта. Новый рабочий план был результатом прошлогоднего опыта и первоначального плана по перевозки куланов из барсакельмеского заповедника на третий год. Генетический анализ показал, что куланы из барсакельмесского заповедника были

очень похожи на куланов в нац. Парке «Алтын-Эмель» и имели чуть большее генетическое разнообразие.

(9) Полевые работы были сконцентрированы на понимании ситуации с куланами в заповеднике, с тремя подготовительными поездками: в феврале, апреле и июле, чтобы начать и прояснить сотрудничество, установкой ошейников на трех куланов, получить информацию о их передвижения и спланировать постройку загонов для отлова 30 куланов. В июле на одном из трех артезианских источников был построен подкормочный загон на территории Каскакулан.

(10) В августе состоялся двухдневный семинар по отлову и обращению с дикими животными для центра реинтродукции при РГКП «ПО «Охозоотпром» и сотрудников Алматинского зоопарка г. Алматы, проведенный группой по отлову и двумя международными ветеринарами из разных стран. Кроме того, началось строительство загонов в барсакельмесском заповеднике.

(11) В сентябре / октябре команда успешно перевезла 2 куланов из барсакельмесского заповедника в акклиматизационный загон на Алиби. Командой было установлено еще три спутниковых ошейника на куланов в заповеднике, кроме того инициировано первое исследование при помощи фотоловушек на трех артезианских источниках на территории Каскакулан и провели исследование по подсчету куланов с помощью беспилотного летательного аппарата. Несмотря на то, что количество перевезенных животных было намного ниже ожидаемого, команда получила важный опыт по отлову и транспортировке куланов в барсакельмесском заповеднике, которая станет основой для будущего планирования.

(12) В ноябре при поддержке 17 инспекторов из барсакельмесского заповедника организовали мероприятия по «Куланмобилю» в Аральском регионе. Встречи были проведены в четырех поселках и пяти школах, которое охватило более 300 детей и 22 учителя. Обновленный информационный материал и включал новый комикс по кулану.

Summary in Kazakh

Каченски, П., Салемгареев, А. Р., Цутер Ш., Суттібай М., Адилбекова Ф. және Линнелл Ж. Д. С. 2020 ж. Орталық Қазақстан даласына құланды қайта жерсіндіру: 2018-2019 жылдардағы далалық жұмыстар туралы есеп. NINA есебі XXXX. Норвегия табиғи зерттеулер институты.

(1) 2018 жылы «Әліби» дала станциясындағы акклиматизациялану қорғанындағы құландарды бақылау жалғасып, оған екі тағылымгер-ветеринарлар мен техникалық бақылаушылар қатысты.

(2) Сәуірде тасымалданған тоғыз құланның бірінші тобы акклиматизация қорғанынан Торғай даласына шығарылды. Басында жануарлар бірге жайылып жүріп, бірақ кейіннен бөлінді. Алынған гормондық үлгілерді талдау жұмыстары көрсеткендей, екі бие буаз болып шыққан, жердегі жазғы зерттеулерде жаңа туған құлындар табылмады. 2018 жылдың желтоқсанында спутниктік қарғыбауы бар бір бие браконьерліктің салдарынан қаза болған. 2018 жылы қарғыбаулары бар төрт құланның қозғалыстарының жалпы ауданы 55 000 км2 құрады.

(3) Жаз бойы дала жұмыстары Әліби орталығын жаңғыртуға, мүмкіншіліктерді жақсартуға және құландардың жаңа тобын әкелуге дайындалуға бағытталған болатын. «Алтын Емел» табиғи паркінің аймағында өткен жылдардағы тәжірибеге сүйене отырып, аулап ұстау түсіру үшін тұзақтар жетілдірді.

(4) Ан-12 көліктік ұшақтары және әуежайларға барып қайту мақсатында автокөлік құралдарын қолдана отырып, жаңа көліктік тәсілдер мен логистиканы жоспарлау және ұйымдастыру бойынша көптеген дайындық жұмыстары жүргізілді.

(5) Қазан айында жұмысшылар тобы «Алтын Емел» ұлттық паркінде қорғанның айналасында құланның аз жиналуына байланысты, қорған аумағындағы жайылымның нашар болуы, сондай-ақ техникалық және материалдық-техникалық мәселелер болуына байланысты құландарды қорғанға айдап кіргізе алмады.

(6) Қыркүйектен қарашаға дейін Торғай ауданында «Құланмобиль» білім беру-ағарту іс-шаралары өткізілді. Әртүрлі ауылдар мен 20 шақты мектептерден барлық қатысушылар саны – 1 168 оқушы мен 629 ересек адам. Қатысушылар ойындарға қатысты, дала экологиясы және құландарды сақтау туралы презентацияларды тыңдады, сонымен бірге оларға құландар туралы ақпараттық материалдар (комикс, плакат, буклет) таратылды.

(7) 2019 жылы Торғай даласында бұрын шығарылған құландарға мониторинг жүргізу жалғасты. Қалған екі спутниктік қарғыбаулары бар құлан екі бөлек қозғалуды жалғастырды, аналық біреуі жалғыз, ал екіншісі жас құланмен (2017 жылы әкелінген құлынның біреуі). Жер бетіндегі тексерулер қайтадан жаңа туған құлындарды тіркемеді және қарғыбауы жоқ басқа құлан туралы дерек болған жоқ. 2019 жылдың желтоқсанында браконьерліктің салдарынан қарғыбауы бар екінші аналық құлан қаза болды. Екі қарғыбауы бар құландардың қозғалыстарының жалпы ауданы 2019 жылы 69000 км2 құрады.

(8) Құландарды аулау бойынша басты фокус «Алтын-Емел» ұлттық паркінен Барсакелмес қорығынан аулауға ауысты. Екінші нүкте Әліби орталығына жақынырақ орналасқан («Алтын-Емел» ұлттық паркінен 1200 км, Барсакелместен 450 км) және ұшақ пен жүк тасымалы үшін логистикалық тәсілдерді қолданбай-ақ, жүк көлігімен тасымалдауға мүмкіндік береді. Жаңа жұмыс жоспары өткен жылдың тәжірибесі мен үшінші жылы «Барсакелме» қорығынан құландарды тасымалдаудың алғашқы жоспары болды. Генетикалық талдаулар Барсакелмес қорығындағы құландар «Алтын Емел» ұлттық паркіндегі құландарға табиғи түрі өте ұқсастығын, және генетикалық біраз әртүрлілігін көрсетті.

(9) Дала жұмыстары қорықтағы құландардың жағдайын танып-білуге бағытталып, үш дайындық сапарымен: ақпанда, сәуірде және шілдеде ынтымақтастықты бастау және

нақтылау, үш құланға қарғыбаулар тағу, олардың қозғалысы туралы ақпарат алу және 30 құланды ұстауға арналған қорғанның құрылысын жоспарлау мақсатында жүргізілді. Шілдеде Қасқақұлан аумағында, үш артезиан бұлақтарының бірінде қоректендіргіш қорған салынды.

(10) Тамыз айында реинтродукция орталығы мен Алматыдағы хайуанаттар бағының қызметкерлері үшін «Охозоотпром» ҚБ РМК-де жабайы аңдарды ұстау және оларға қарау бойынша екі күндік семинар өткізілді, оны аулау тобы және шетелден келген екі халықаралық ветеринарлар өткізді. Сонымен қатар, Барсакелмес қорығында қорғанның құрылысы басталды.

(11) Қыркүйек / қазан айларында жұмыс тобы Барсакелмес қорығынан 2 құланды Әлібидегі акклиматизация қорғанына сәтті тасымалдап әкелді. Қорықта тағы үш құланға спутниктік, қарғыбау орнатылды, сонымен қатар, алғашқы зерттеу Қасқақұлан аумағындағы үш артезиан көздерінде фототұзақтарды қолдану арқылы алғашқы зерттеулер басталып, пилотсыз ұшу аппаратын қолдана отырып құландарды санау бойынша зерттеу жүргізілді. Тасымалданатын жануарлардың саны күтілгеннен әлдеқайда аз болғанына қарамастан, жұмыс тобы болашақта жоспарлау үшін негіз болатын Барсакелмес қорығында құландарды аулау және тасымалдау бойынша маңызды тәжірибеге ие болды.

(12) Қараша айында Барсакелмес табиғи қорығының 17 мемлекеттік инспекторларының қолдауымен Арал аймағында «Құланмобиль» іс-шаралары ұйымдастырылды. Кездесулер төрт ауылда және бес мектепте өтті, оған 300-ден астам балалар мен 22 мұғалім қатысты. Ақпараттық материал жаңартылды және құланға жаңа комикс енгізілді.

Contents

Foreword

The dramatic social, economic and political changes that have followed the collapse of the former Soviet Union have created both challenges and opportunities for wildlife conservation in Central Asia. In the context of central Kazakhstan these changes have created massive areas of potential habitat for the conservation of mobile species and the restoration of functional steppe ecosystems. Large herbivores are important species for the functioning of steppe ecosystems and require massive areas of space to accommodate their seasonal movements. While populations of saiga antelope are robust and roam the region, two species are absent, the kulan and the Przewalski's horse. This report covers the second and third year of a three year pilot project to explore the feasibility of reintroducing kulan to the central steppe of Kazakhstan. Reintroducing locally extinct species is widely recognized as being among the most challenging tasks within biodiversity conservation, and this report will reveal that this also applies to the case of returning kulan to Kazakhstan. Our goal with this report is to document this process in detail, showing all the success, failures and frustrations that occurred, so that future work can build on our experience.

The kulan reintroduction project KulanSteppe, or QulanDala in Kazakh language, is being coordinated by the Norwegian Institute for Nature Research and implemented by the Association for the Conservation of Biodiversity of Kazakhstan (ACBK) in partnership with the Committee of Forestry and Wildlife (CFW) Ministry of Ecology, Geology and Natural Resources of Kazakhstan, the Royal Society for Protection of Birds (RSPB), Frankfurt Zoological Society (FZS) and Nuremberg Zoo as a part of the wider Altyn Dala Conservation Initiative.

The project has been funded by a range of sources, with main contributions by Fondation Segré, Nürnberg Zoo & Verein der Tiergarten Freunde Nünberg e.V., Taipei Zoo, the Royal Society for the Protection of Birds, and the Frankfurt Zoological Society, with long term technical support provided by the Wildlife Conservation Society (WCS), the Research Institute of Wildlife Ecology (FIWI) at University of Veterinary Sciences Vienna (Vetmeduni Vienna), La Palmyr Zoo, and the Molecular Zoology Unit of the Technical University of Munich. In 2019 we had additional support from Zoo Budapest and Zoo Frankfurt. PK was funded by the Research Council of Norway (grant 251112). Additional financial support came from Wroclaw Zoo & Fundacja Zoo Wroclaw and La Passerelle Conservation.

We are grateful to the Committee of Forestry and Wildlife of the Ministry of Ecology, Geology and Natural Resources of Kazakhstan, Ohotzooprom's Centre for Translocation and rangers team, Barsa Kelmes State Nature Reserve and Altyn Emel National Park for supporting this project. Many people have committed so much time and effort to driving this project forward over the last two years:

ACBK: Baurzhan Iskakov, Sayat Mukhtarov, Mukhtar Axartov, Alexandr Putillin, Saltanat Kamiyeva, Renat Eskazyuly, Dias Kuralbek

Caretakers / monitoring: Kishkentay Ordabayev, Kairzhan Zhusupbekov, Gani Sadvakasov, Aidar Erzhanov; R. Salemgareyev, E. Moldakhmetov, N. Kuanyshbayev, K. Makhin, G. Sadvakasov, A. Erzhanov, Bolat Kempirov (Ohotzooprom)

Interns: Diana Gliga (VetMed Vienna) and Natalia Petrova (Moscow State Academy of Veterinary Medicine & Biotechnology, Russia)

Ohotzooprom: Kaisar Tushkenov, Aybol Razakov, Saken Ainabekov, Zhumadil Beyspaev, Sergey Olyarchuk, Zhumabil Beyspaev, Ernar Kalibay, Zhanibek Alimbayev, the late Zhanat Imankulov, Sasha Gridchin, Roman Golubinski, Fedor Zevako, Vasiliy Popov.

Altyn Emel: Kalyk Bayadilov, Daniyar Turgambayev, Galym Akhmetbekov, Murat Sydygaliev

Barsa Kelmes: Zauresh Alimbetova, Gaukharbek Satekeyev, Nurtugan Sakhiev, Ulagat Kozbayev, Almat Esenov, Galymzhan Bazarbayev, Sabyrzhan Toreniyazov, R. Tleuov, G. Umbetov, S. Tureniyazov, R. Tleuov, B. Satekeev, G. Satekeev, A. Kenesbayev, A. Zhylkaidarov, M. Kuatov

International vets: Chris Walzer (Vetmed Vienna & WCS), Thierry Petit (La Palmyre Zoo, France), Nikolaus Huber (Vetmed Vienna), Endre Sos (Zoo Budapest, Hungary), Christina Geiger (Zoo Frankfurt, Germany), Patricia Kay Walzer (Vetmed Vienna), Sanatana Soilemetzidou (Leibniz Institute for Zoo and Wildlife Research, Germany)

Other: Ralph Kuehn (Technical University Munich), Franz Schwarzenberger (Vetmed Vienna**)**

Steering committee: Vera Voronova, Sergey Sklyarenko (ACBK), Stephanie Ward, Mark Day (RSPB), Dag Enke (Zoo Nürnberg), Michael Brombacher (FZS)

…many more people that helped in one way or another: THANK YOU ALL!

Petra Kaczensky and John Linnell, Norwegian Institute for Nature Research

March 2020

Also see: https://www.nina.no/english/Research/KULANSTEP

1 Background

Asiatic wild ass, or kulan (*Equus hemionous*), were once a key species in the assemblage of large herbivores (along with saiga antelope, several gazelle species and wild horses) that ranged the Eurasian steppes, stretching from the eastern shores of the Mediterranean to Mongolia. Overhunting and habitat conversion decimated their populations and today they are only found on less than 3% of their historic global distribution range.

While it is still possible to see large herds of kulan in the Gobi Desert of Mongolia, the species only persist in tiny fragments in the rest of Central Asia. The end of the USSR resulted in dramatic socio-economic changes in the region. While some of these changes have been negative for species conservation, e.g. through the breakdown of management structures that prevented overhunting, others, such as large scale rural-urban migration of the human population, have created new opportunities for landscape-level biodiversity conservation and species recovery.

In Kazakhstan, large parts of the central steppe – an area equal to the size of France – have become almost devoid of people and livestock. This situation has created the rare opportunity for landscape-level biodiversity conservation and species recovery in a steppe ecosystem. In 2005, the Altyn Dala Conservation Initiative (ADCI) was initiated: A large-scale joint initiative of the Association for the Conservation of Biodiversity of Kazakhstan (ACBK), the Committee of Forestry and Wildlife (CFW) of Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan and international partners. The ADCI aims to conserve and recover nationally and internationally important flagship species and their habitats in the steppe and semi desert zones of Kazakhstan.

This project links into the ADCI vison and aims to 1) Re-establish kulan as part of the large herbivore assemblage on the Torgai steppe, 2) Double the range of kulan in Central Asia, 3) Significantly increase the global kulan population, 4) Provide a catalyst for kulan and Przewalski's horse conservation actions across the region. The project involves a cooperation between ACBK and several international partners (Norwegian Institute for Nature Research, Frankfurt Zoological Society, Nuremberg Zoo, and the Royal Society for the Protection of Birds). Veterinary support is provided by the Research Institute of Wildlife Ecology (FIWI), University of Veterinary Medicine, Vienna, Austria and the Wildlife Conservation Society (WCS), New York office. Population genetics support is provided by the Molecular Zoology Unit, Technical University of Munich (TUM), Germany.

In 2017, we successfully translocated 9 kulan (4 adult mares, 1 subadult stallion and 4 foals) from Altyn Emel National Park (NP) in southeastern Kazakhstan to the acclimatization enclosure at Alibi field station (field station) on the Torgai steppe. The kulan were captured in a newly designed capture corral and were airlifted over 1300 km with a large MI-26 helicopter directly from the capture to the release site. The kulan were held over the winter in a large acclimatization enclosures to familiarize them with the new environment and suppress excessive dispersal. During this time the kulan were monitored by two interns and the local staff until release in early April 2018 ("soft release"). The 4 adult mares had been equipped with GPS-Iridium collars to allow post-release monitoring (for a detailed report see Kaczensky at al. 2018 and the project website at: http://www.nina.no/english/Research/KULANSTEP).

This reports summarizes the project activities of 2018 & 2019. The main activities in 2018 were centered around monitoring the 9 kulan in the acclimatization enclosure, their release & monitoring in the wild, and the 2nd, unsuccessful, capture attempt in Altyn Emel NP in October 2018. The main activities in 2019 saw a shift of kulan related activities from Altyn Emel NP to Barsa Kelmes State Nature Reserve (SNR) and focused on understanding the kulan situation in this new area, establishing a capture infrastructure, and conducting the 3rd partially successful capture and translocation of kulan to the Torgai Steppe in September 2019.

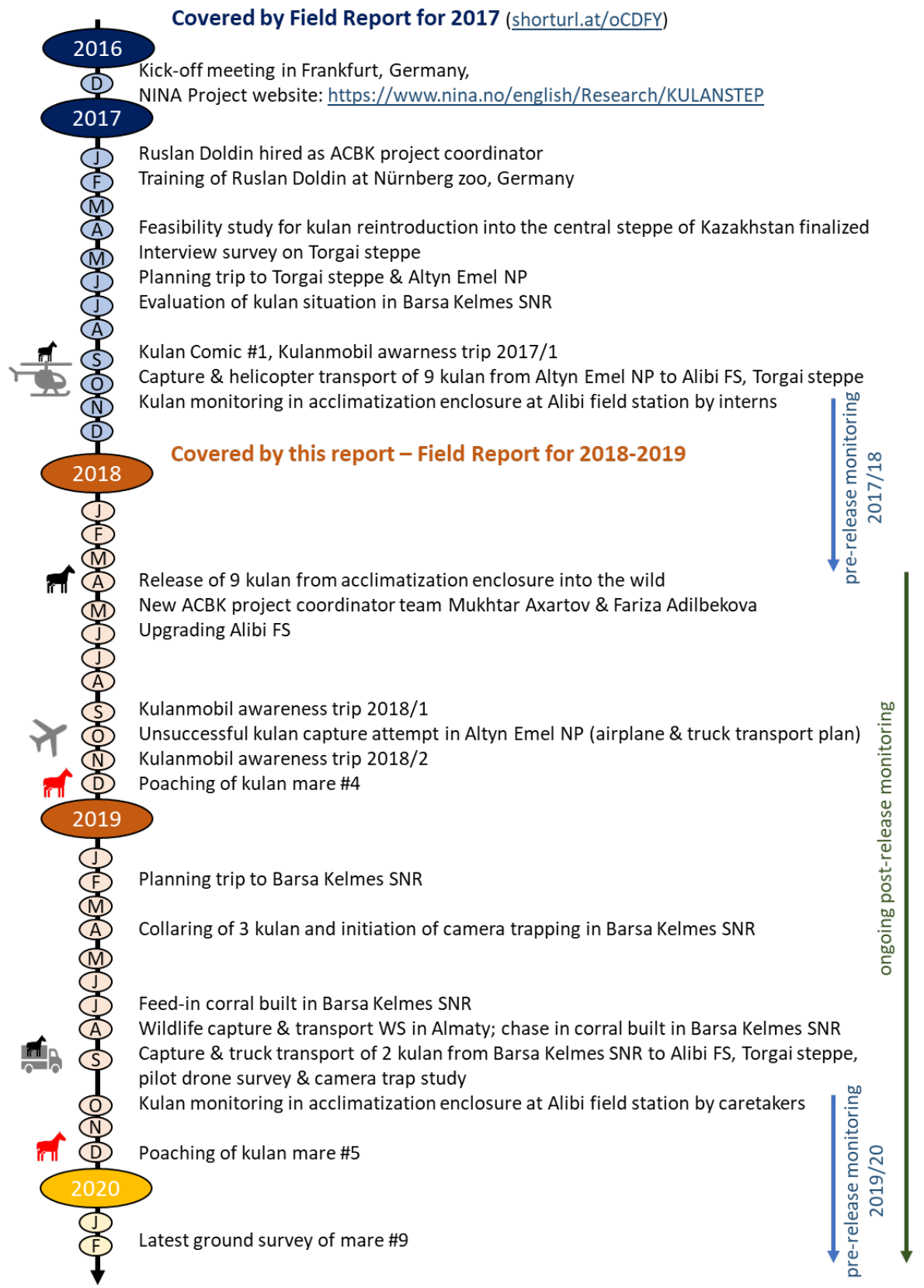


Fig. 1: Time line of the kulan reintroduction project and parts covered by past and current field reports.

2 List of abbreviations and technical terms

Organisations

ACBK = Association for the Conservation of Biodiversity of Kazakhstan

CADI = Central Asian Desert Initiative

CFW = Committee of Forestry and Wildlife of Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan

FIWI = Research Institute of Wildlife Ecology at University of Veterinary Sciences Vienna

FZS = Frankfurt Zoological Society

NINA = Norwegian Institute of Nature Research

Ohotzooprom = State ranger organization under the Ministry of Ecology, Geology and Natural Resources of Kazakhstan

Ohotzooprom Centre for Translocations = a newly created subgroup under Ohotzooprom created to assist with wildlife translocations for hunting or conservation goals

RSPB = Royal Society for the Protection of Birds

TUM = Technical University of Munich

Vetmeduni Vienna = University of Veterinary Sciences Vienna

WCS = Wildlife Conservation Society

Other

ADCI = Altyn Dala Conservation Initiative

Altyn Emel = National Park in SE Kazakhstan

AN-12 = Antanov 12, a four engine turboprop Russian transport plane, Nato name “Cub”

Barsa Kelmes = State Nature Reserve at the Aral Sea in SW Kazakhstan

EPG = (parasite) eggs per gram

FEC = fecal (parasite) egg count

GPS = Global Positioning Service

GSD = Ground Sample Distance or ground resolution (size 1 image pixel represents on the ground)

Kamaz truck = KAMAZ is the largest truck producer in Russia and the CIS

Kashkakulan = former island in the Aral sea, now part of Barsa Kelmes SNR

MCP = Minimum Convex Polygon

MI-26 = huge twin-engine heavy Russian transport helicopter, Nato name “Halo”

NP = National Park, equivalent to IUCN category II protected area

Reserve = protected area equivalent to IUCN category IV-VI

SNR = State Nature Reserve, highest level of protected area equivalent to IUCN category I protected area

UAV = Unmanned aviation vehicle

3 Kulan capture in Altyn Emel NP 2018

3.1 National “Kulan coordinator

Recruiting a kulan coordinator has been a continual challenge and it became increasingly clear that there is a very limited pool of suitable candidates available in Kazakhstan for such a complex project with its demands for a range of skillsets (English language, communication, ecological background, willingness to spend time away in the field under harsh conditions, organization ability, technical understanding, passion for the job). In the end the job was split between two new people with a complimentary skillset, Mukhtar Axartov (organization, technical understanding and field work) and Fariza Adilbekova (communication internationally and assistance with organization and communication within Kazakhstan). The new national coordination team did a very good job and smoothed 2018’s organisation and negotiations with the various parties involved. However, Mukhtar Axartov was forced to resign in September 2018 due to health issues and Albert Salemgareyev took over from him for the capture season and the reminder of the year.

3.2 Preparations and upgrading at Alibi field station

The construction work mainly concerned the improvement of the enclosures with consideration for the lessons learnt from the previous year. A storage barn to keep the hay dry was built. The fencing poles of the small and large enclosures were checked and replaced or stabilized. An additional shelter for kulan was built (for use mainly in winter) and was placed in the far part of the large enclosure, where the kulan stayed most of the time in the previous year.

Furthermore, fresh hay was cut (Fig. 2).

Fig. 2: Preparatory activities at the Alibi field station on the Torgai Steppe Photos: ACBK

Because the plan for transporting kulan in 2018 was changed to use a combination of airplane and trucks, the team worked out a short and safe route for the delivery of the animals. For this purpose, a crossing was built across the Uly-Zylanshyk river which now serves as quick access to the field station. It also provides better access to the field station in the winter period and supports the anti-poaching activities of state rangers (Fig. 3).

Fig. 3: New crossing of the Uly-Zylanshyk river, allowing for improved access of the Alibi field station. Photos: P. Kaczensky

Furthermore, the oxbow lake in the small enclosure was fenced out. The “shore” of the oxbow lake gets very muddy during rainy periods (as was the case in October 2017) and poses a considerable risk as kulan may get stuck in the mud. We decided, however, not to fence the oxbow in the large enclosure. The risk of getting stuck in the mud seems considerably lower, as there is a spring at the eastern end where the ground is more stable and there are more access points giving kulan the possibility to choose the safest approach.

To be prepared for possible periods of cold temperatures without snow - when the oxbow lake is frozen or temperatures are so cold that water provided in the concrete trough freezes quickly – we constructed solar-heated water troughs with a volume of 150 liters. These passive solar troughs heat up during the day by the warmth of the sunlight. They are well insulated so that they keep the warmth for a long time, keeping the water from freezing (also see www.ranchtanks.com).

The living conditions at the field station was upgraded and improved based on the experiences from 2017/18 and included: improved solar system for more stable power supply, telephone & internet connection, renovated steam bath (banja or Russian sauna), additional toilet, fencing of the field station, and other small improvements.

3.3 Capture and transport October 2018

3.3.1 Air and truck transport plan

A 5-fold increase in the charter price for the MI-26 transport helicopter forced us to plan and negotiate the 2018 transport with an Antanov AN-12 transport plane (owned by Jupiter Jet Airlines LLP) plus truck transport to and from the closest available airports, which in the original plan was Almaty at the capture site and Arkalyk as the arrival site. However, the beginning of the capture season in October 2018 saw the official closure of the airport in Arkalyk, which required us to plan for Kostanay airport and added another 400 km to the necessary ground transport (Fig. 4 & 5). The aim was to transport a total of 20 kulan from Altyn Emel NP, ideally composed of: 4 adult mares with 4 foals, 4 adult mares without foals, 2 adult stallions, and 6 subadult (2-3 years) mares or stallions (Fig. 5).

Fig. 4: Overview of the different routes for the kulan transport 2018 from Altyn Emel NP (requiring a truck-plane-truck approach). For actual distances of the planned truck transport for the 2018 transport see Table 1.

Final transport plan 2018: Dark purple line = final flight route, Orange lines = asphalt roads, White lines = gravel/dirt roads; Initial transport plan 2018: Light purple line = initial flight route before airport in Arkalyk was declared unsafe, Yellow line = part of the original truck transport from Arkalyk airport to Alibi field station (~100km)

The AN-12 was being used for several international transports and contrary to the arrangements with the MI-26 transport helicopter in 2017, the plane could not just be on standby. In contrast, we had to select two potential transfer slots of 3 days each, which we decided would be in week 42 and 43 (15-28 October 2018). In the end the specific dates of the availability of the plane changed due to an engine failure of the original plane and the need to negotiate for a potential replacement plane.

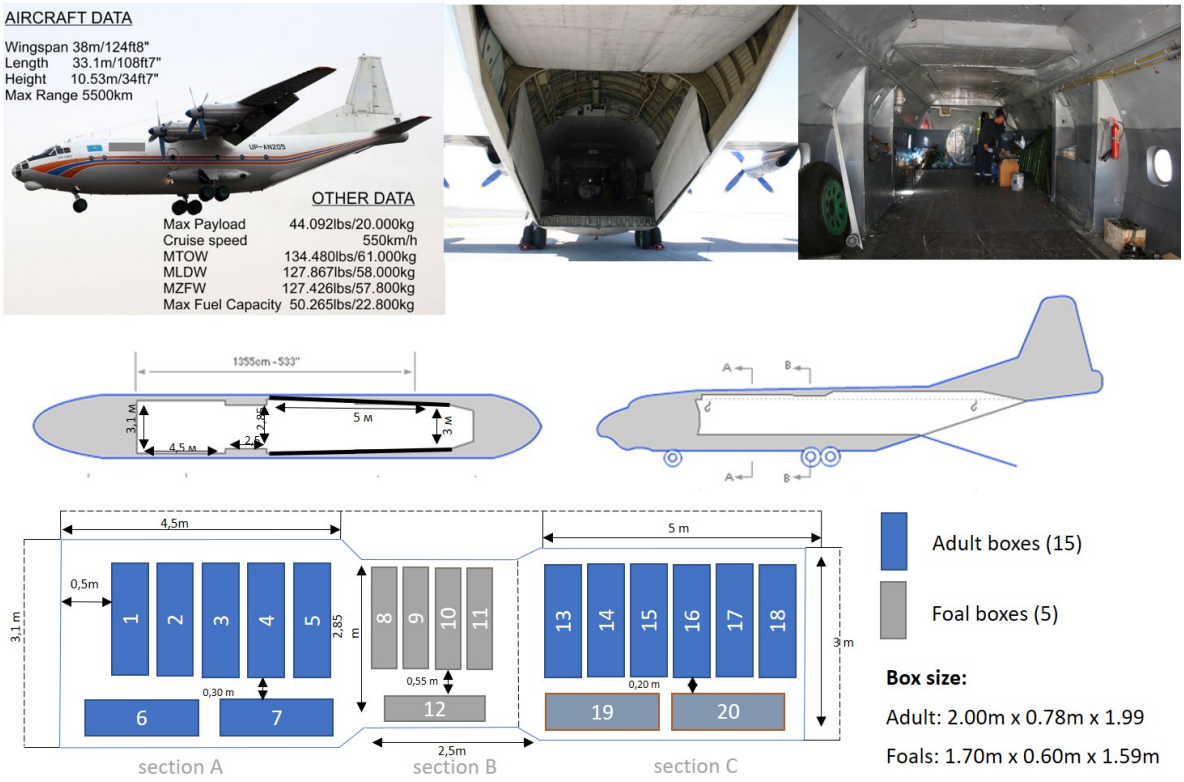


Fig. 5: AN-12 transport plane with anticipated box loading. Final discussions resulted in a final loading plan for 18 boxes.

The expected travel time was 28.5 hours, of which 3.5 hours would be spend flying, 16 hours driving (total of 680 km), and the reminder loading & unloading and conducting security checks (Table 1).

Table 1: Time table for the planned transport 2018 from Altyn Emel NP, involving a flight from Almaty to Kostanay airport and truck traffic to and from the respective airports to the Alibi field station.

Mode	Stage	Distance (km)	Type	Time (h)	Start hour
Loading	Loading at corral			2.0	05:00
Truck	Corral to main road (bad road)	50	Gravel road	2.0	07:00
Truck	Check point			0.5	09:00
Truck	Main road to airport (asphalt)	100	Asphalt road	2.0	09:30
Loading	Loading at airport & security			2.5	11:30
Plane	Flight	1,490	Air transport	3.5	14:00
Loading	Offloading at airport			2.0	17:30
Truck	Kostanay to Amangeldi	450	Asphalt road	7.0	19:30
Truck	Amangeldi to Alibi field station	180	Steppe dirt road	5.0	02:30(+1)
Loading	Unloading boxes Alibi field station			2.0	07:30(+1)
	Total	**2,270**		**28.5**	

3.3.2 Kulan capture in Altyn Emel NP

In October 2018, ACBK and international partners (led by the Norwegian Institute for Nature Research) together with the Centre for Translocations of the State Enterprise “Ohotzooprom” (state rangers) and Altyn Emel NP started another attempt to catch and translocate wild kulan from the Altyn Emel NP to the Altyn Dala reserve in the Torgai steppe (Fig. 6). Attempts to drive animals into the capture corral were made on seven consecutive nights (16-22 October 2018), but none were successful. In no attempt were animals even driven close to the corral opening. There were several major differences in the preconditions for 2018’s activities:

(1) There was a difference in the weather prior to the actual capture. Because of a dry summer there was very little vegetation and water within the zone where the capture corral was placed. Most kulan remained in the central region of the park – where we had not been permitted to construct our corral because it is the national park’s core zone – and to the extreme western end. The result was that there were only a few small groups of animals (single animals and a few groups of 10-30) within the 5-10 km radius of the corral that is considered a practical capture distance.

(2) Furthermore, the weather during the middle part of the capture season was poor, with rain, snow and fog reducing visibility to a level where chasing had to be stopped for several of the most important hours after sunset, as the animals were simply not visible and driving became too dangerous. Strong wind also influenced kulan movements, pushing them further into the mountains and away from the corral.

(3) The distribution and behavior of the animals required chasing in very challenging terrain in a well-coordinated manner. However, following the request of the Committee for Forestry and Wildlife (MoA), we had to use a combination of staff from Altyn Emel NP and the new Centre for Translocations of Ohotzooprom to drive the cars and capture the kulan. The consequence of the required changes in the capture team meant that we were faced with two institutional groups, one of which had no experience of kulan capture. The lack of experience with the animal, lack of detailed knowledge of the local terrain, the lack of previous cooperation between the two institutions, and particularly a lack of coordination in the first few days of the capture were reasons for inefficiency and contributed to the failure of the whole activity.

(4) Unfortunately, the quality of the vehicles provided was low. While they were principally the right type of vehicle, they were in poor condition, not allowing them to maintain chase speed and becoming damaged in important moments of the capture process, allowing the animals to escape.

(5) Another factor, making the whole operation more complicated was that the AN-12 transport plane only had limited availability due to other contracts which forced us to plan capture windows many months in advance around the plane’s availability rather than around the animal’s distribution. In addition to this, the plane had an engine failure just when the capture was about to start.

The first attempts to drive animals were frustrated by the distribution of the animals and the new capture team’s inexperience at working together. We then had several days of poor weather (rain and snow which gave poor visibility) – although attempts were made anyway. By the end of the week the team had begun to work better together. However, at this stage the few animals (1-3 groups of 10-20 animals each night) that were in the capture zone had already been so frequently chased that it was not possible to drive them into the corral. The result was that despite 7 consecutive nights of chase attempts we had not captured any animals, and indeed had not even come close. As there were still no more animals in the zone, the airplane’s availability was coming to an end, and the weather conditions at the release site were forecasted to deteriorate making access challenging, we decided to abandon the attempt for 2018.

Fig. 6: Impressions from the 2018 capture attempt in Altyn Emel NP. Photos: P. Kaczensky

3.3.3 Lessons learned

(1) The consequence of the non-availability of the Mi-26 helicopter implied that we could not simply load the boxes from the capture corral in Altyn Emel NP directly into the helicopter and then directly offload them into the enclosures at the release site in Torgai after 9 hours like we did in 2017. Instead, we had to plan to drive the animals by truck to Almaty airport (approximately 4 hours), reload them into a cargo plane (an An-12) to fly 3-4 hours, and then reload them again and drive them by truck to Alibi field station on the Torgai steppe. The original plan for this was based on being able to use the airport at Arkalyk, but this possibility was removed a few days before the capture season started when the civil aviation authority declared the airport to be unusable. This meant a quick change of our plans to instead use the airport at Kostanay (see Map 1 for location of place names and Table 1 for transport time). This would have added 1 hour of flying and implied a 12-hour drive by truck (5-6 hours longer than if we had the Arkalyk option). Because the An-12 had other work, we were also only able to have the plane for two 3.5-day windows. As it happened, the plane had to undergo emergency repairs (an engine replacement) during the first window, although a Ukrainian alternative plane became available after receiving special permission to fly domestically within Kazakhstan. This exposed how vulnerable the whole operation was to externalities.

Without access to the helicopter which was so instrumental for the 2017 translocation, Altyn Emel NP is a much less viable source of kulan for reintroduction to the central steppes. The very long distance (1200 km straight line, resulting in 2000 km by road) makes using road transport impossible because it would require about 50 hours of non-stop driving (Fig. 7). It is very likely that most animals would not survive, and survivors would face reduced fitness upon arrival due to long-term stress, and the approach would not meet any international animal welfare standards that precondition international funding and approval. For example, EU rules do not allow more than 24 hours of truck transport for captive wild equids. The only potential viable route is the combined truck-airplane-truck method that we had planned. However, our experience with organizing the logistics in 2018 has shown us how complex this approach is, with many bottlenecks in the system where problems could arise.

(2) If another capture is to be attempted in Altyn Emel NP, there is a need for a number of changes to the approach. Firstly, a second capture corral constructed further east in the park's core area would increase the chances of success, as it would allow us to respond to between-year changes in animal distribution (Fig. 8). This would require considerable extra funds as kulan require a solidly built corral. Secondly, there needs to be a better planning of the capture approach and a better coordination of the institutions / drivers / cars involved in the capture-drive to ensure that no time is lost and that animals are not disturbed unnecessarily. Thirdly, we would need to plan for a longer capture window, with plans made to have rotating veterinary teams on standby and to potentially maintain kulan in the corral for multiple days until transport windows align.

3.3.4 Future plans

The kulan translocation project was going to continue at least until 2019 with good chances of further activities even in following years. Because of the points above we proposed to prioritize the capture of animals from Barsa Kelmes SNR in 2019 (Fig. 7). Using this different source population would have the following advantages:

(1) It is much closer to the Torgai steppe (450 km straight line or 700-750 km by truck) so that a truck-only transport would be feasible – which is considerably less logistically challenging and would allow for more flexibility (no need to maximize the number of animals to fill an airplane at a predefined date) and would also be cheaper.

(2) Capture in Barsa Kelmes SNR could also avail of a trap-enclosure at a water-point – which would likely lead to the use of multiple capture events with smaller numbers of kulan – so that multiple small transports of 6-10 animals would be feasible. This would also ease the logistical organisation. This form of capture would not necessitate a large team of rangers and multiple vehicles driving at night in challenging terrain and would be much safer for the capture team and result in less disturbance for the kulan.

(3) It was thought likely that the animals in Barsa Kelmes SNR would have a higher genetic diversity than those in Altyn Emel NP, as they were the original source for Altyn Emel NP.

(4) When looking at the distances moved by animals already released in the Torgai steppe from the 2017 translocation it would be quite possible that animals from Barsa Kelmes SNR might learn to establish functional movement connectivity between this existing population and the reintroduced population on the Torgai steppe.

An additional element that was raised would be to investigate the potential of supplementing the newly established kulan group on the Torgai steppe with a transport of animals from European zoos. Experiences with the release of captive bred Przewalski's horses suggests that captive bred wild equids can quickly re-adapt to the harsh conditions of Central Asia. Several zoos have offered animals, but there is a need to clarify their genetic structure, and potential additional sources of funding. Logistically, this should be practical via the Kostanay airport, and would be a good test for the future plans to bring captive-bred Przewalski's horses from international zoos by the same route.

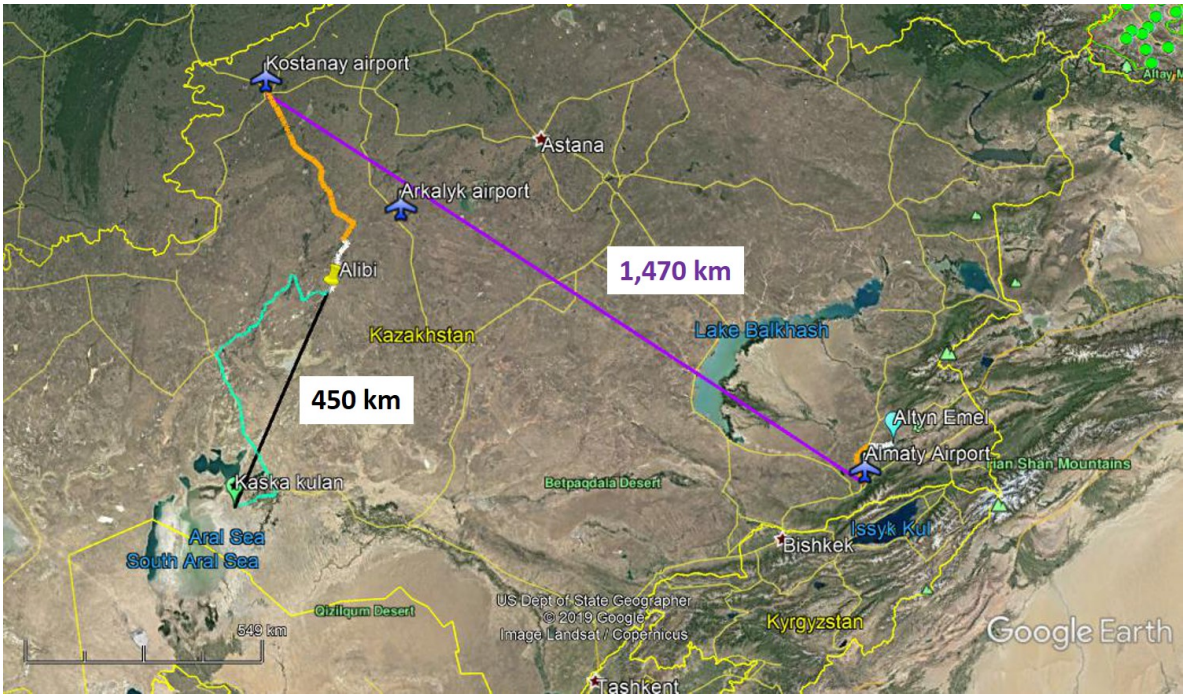


Fig. 7: Straight line distance (black) and available roads and dirt tracks (turquois) between Kaskakulan, Barsa Kelmes SNR and Alibi field station as compared to the airplane & truck transport from Altyn Emel NP planned in 2018.

Final transport plan 2018: Dark purple line = final flight route, Orange lines = asphalt roads, White lines = gravel/dirt roads (total roads ca. 680 km); Potential transport plan 2019: Black line = straight line distance from Barsa Kelmes to Alibi field station, Torquois line = most likely ground transport route (ca. 800 km).

The experiences from the October 2018 capture attempt and the new reality of needing to fly to Kostanay, made transports from Altyn Emel NP increasingly unattractive (without a sufficient budget for that helicopter that was so successful in 2017). Hence, we decided to pursue an alternative plan foreseeing the capture and transport from Kaskakulan in Barsa Kelmes SNR at the Aral Sea for the 2019 season.

Fig. 8: Single kulan in Altyn Emel NP, October 2018. Photo: J. Linnell

4 Kulan capture in Barsa Kelmes SNR 2019

4.1 National "Kulan coordinator"

A new replacement plan foresaw to build up a "species recovery and conservation team", rather than a project specific "kulan coordinator" within ACBK. In 2019, this involved splitting the role of the former "kulan coordinator" among existing and experienced ACBK personnel and freeing more time of existing staff – namely Albert Salemgareev, who has become the backbone of the project on the Kazakh side – for kulan related work. and supplemented by other staff involved in technical and logistical work.

4.2 Kulan reintroduction with animals from Barsa Kelmes SNR

Between 1953 and 1963 a total of 19 kulan were transported from Turkmenistan to Barsa Kelmes SNR, which at the time was an island in the Aral Sea (Pavlov 1996, Pavlov 1999; Fig. 9). This transport was the first wild equid transport globally! The population grew and animals from Barsa Kelmes SNR were subsequently transported to other regions in Kazakhstan, including Altyn Emel NP (Kaczensky et al. 2018b).

By the 1990s when Barsa Kelmes island ceased to be an island, the last kulan had left due to the lack of drinking water. However, kulan remained in the region making particular use of the former island of Kaskakulan and its artesian springs and still visiting the former island Barsa Kelmes in winter. In 2017, the kulan population was estimated to number around 500.

A field trip to Barsa Kelmes SNR in summer 2017 confirmed the presence of a sufficiently large kulan population as an alternative source for reintroductions (Kaczensky et al. 2017 & 2018a). Furthermore, the director of the protected area, Zauresh Alimbetova, was extremely supportive and expressed a huge interest in cooperation to promote science, conservation, built capacity, improve communication, and develop nature-based tourism. Additional cooperation between ACBK and Barsa Kelmes SNR was established in 2018 within the context of the Central Asian Desert Initiative (CADI) project (http://cadi.uni-greifswald.de/en/home/).

4.3 Capture preparations

Capture preparations built on the experiences from the first visit in summer 2017 (Kaczensky et al. 2017) with follow-up trips in February/March (23.02.-03.03.2019), April (21-28.04.2019), and July (12-18.07.2019) to prepare for the actual capture in September 2019. Preparatory trips were to Aralsk, where the Barsa Kelmes SNR administration is located and to the former island of Kaskakulan, which is at the core of the kulan population due its three artesian springs (Fig. 9, Fig 10).

The trip in February aimed to discuss details of the necessary preparatory field work with Barsa Kelmes staff and to familiarize the capture team with the area. The team consisted of Zauresh Alimbetova, Gaukharbek Satekeyev, Nurtugan Sakhiev, Ulagat Kozbayev (Barsa Kelmes SNR), Albert Salemgareyev, Baurzhan Iskakov, Sayat Mukhtarov (ACBK), Kaisar Tushkenov, Aybol Ryzakov (Ohotzooprom's Centre for Translocation), and Petra Kaczensky (NINA).

In order to learn more about kulan on Kaskakulan, a first camera trap was installed at one of the artesian springs ("Tree spring"; Fig. 10) and it was agreed to return in April to capture and collar three kulan to learn more about kulan movements to facilitate capture planning.

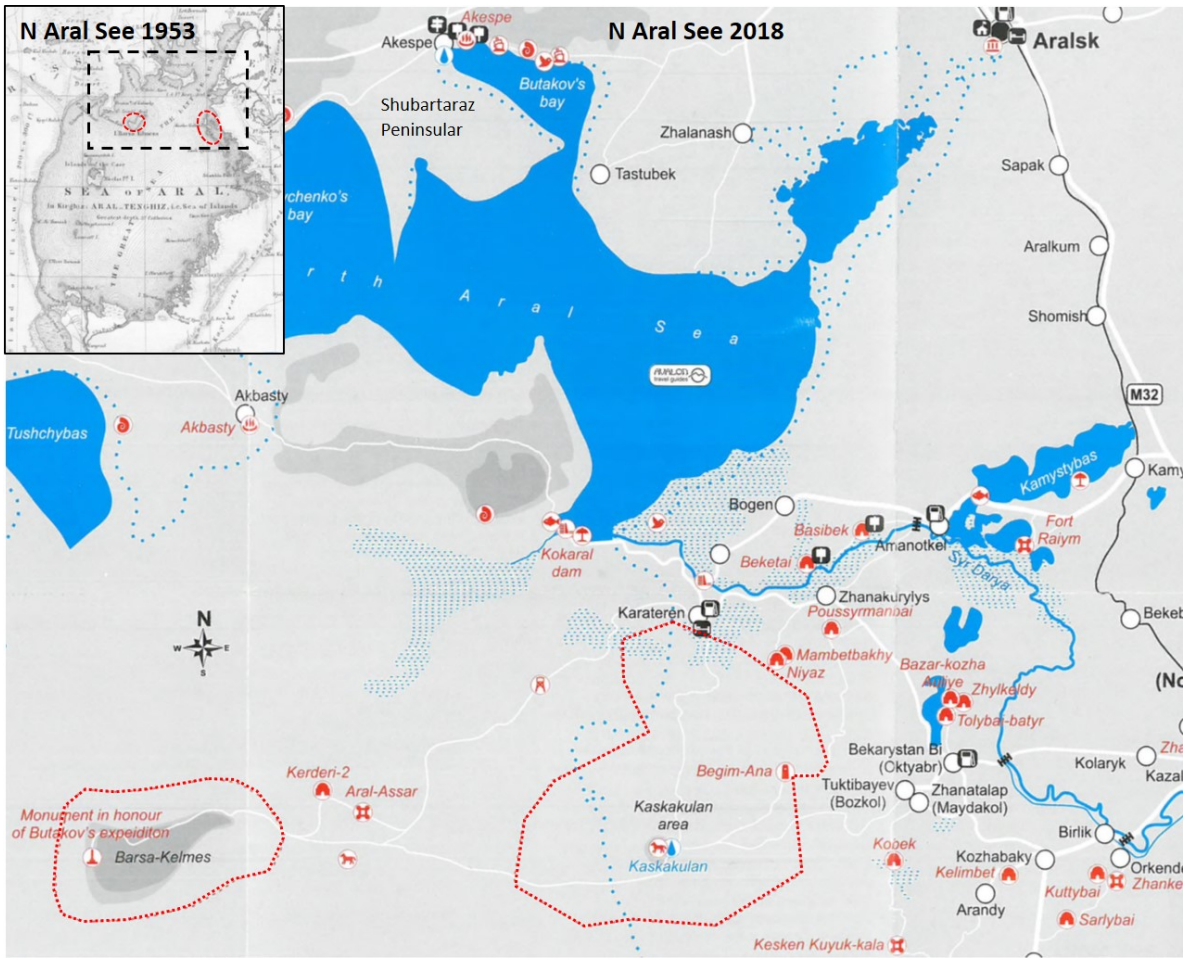


Fig. 9: Location of Kaskakulan and Barsa Kelmes part of Barsa Kelmes SNR in the former bed of the large southern basin of the Aral Sea. *Source: Small map - Butakoff, A. 1853; Large map – Avalon Historico-Geographical Society 2018*

Fig. 10: First camera trap installed at an artesian spring referred to as "Tree spring" on Kaskakulan on 28 February 2019. *Photo: P. Kaczensky*

4.3.1 Kulan collaring

4.3.1.1 Team

The field team varied over time but included Zauresh Alimbetova, Gaukharbek Satekeyev, Almat Esenov, Galymzhan Bazarbayev, Sabyrzhan Toreniyazov (Barsa Kelmes SNR), Albert Salemgareyev, Baurzhan Iskakov, Sayat Mukhtarov (ACBK), Saken Ainabekov, Sergey Olyarchuk, Zhumabil Beyspaev, Ernar Kalibay, Zhanibek Alimbayev, Zhanat Imankulov

(Ohotzooprom Centre for Translocation), Nikolaus Huber (FIWI, Vetmed Vienna), and Petra Kaczensky (NINA) arrived in Barsa Kelmes SNR in April.

4.3.1.2 Training

The trip was used as an opportunity for the Ohotzooprom Centre for Translocation team to receive some first-hand experience training for kulan capture. Half a day was dedicated to explain and train with the CO_2 powered dart gun (filling of darts, target practice, safety instruction; Fig. 11).

Fig. 11: Practical training with the dart gun. Photos: P. Kaczensky

4.3.1.3 Original capture plan

The initial plan was to free-range dart kulan at the artesian springs with the most kulan activity. To assess the latter, we had installed one camera trap in February. This camera had been operational at the artesian *Tree spring* for 26 days from 9 March – 14 April 2019 and recorded 26 visits by kulan (all at night), of which 24 visits were by single animals, 1 visit by 3 animals, and one visit by at least 6 animals (Fig. 12). The only other mammals recorded were red fox (*Vulpes Vulpes;* 4 visits) and wild boar (*Sus scrofa;* 6 visits).

Tracks and dung also suggested that only a few kulan were visiting the *Tree spring*, likely as a result of recent snow cover and rain which reduced their dependence on springs. Images revealed that kulan had not visited this particular spring at all between 24 March and 6 April and that on the dates they visited, they only did so at night (Fig. 12).

Based on dung and tracks, the artesian spring located in a sandy area surrounded by some shrubs (“Shrub spring”) seemed the most frequented and hence the most promising. We installed a hide 30m from the water’s edge (Fig. 13). A nearby hill (300m) allowed for a good overview of both the spring and the wider area, which is crucial in order to be able to see where a darted kulan is running to before the drug takes effect.

Fig. 12: Kulan images from a camera trap at one of the three artesian springs on Kaskakulan which was operational from 9 March until 14 April 2019. The camera recorded 26 visits of kulan, 6 of wild boar, and 4 of red fox. Note that times on the images are in UTC+1, so that 4 hours need to be added to obtain local Eastern Kazakhstan time (UTC+5). Photo: Rykonex camera trap, J. Linnell, NINA

We spent one morning waiting for kulan from 4:00-9:00 with Nikolaus Huber sitting in the hide, Petra Kaczensky and Zhumabil Beyspaev on the hill, and Albert Salemgareyev in the car 700m away (positioned to catch up with any kulan moving far and to allow communication with the rest of the team in the basecamp 4 km away). Unfortunately, only 4 kulan were visible from the hill and all were ≥1km away and showed no indication of coming to drink.

Fig. 13: Setting up the hide on 24 April 2019. Photo: P. Kaczensky

Meanwhile Barsa Kelmes staff had been looking for kulan presence in other parts of the reserve and had discovered several groups of 10-15 animals in the west, where they thought they should be able to dart them from the car. Given the low presence of kulan around the three artesian springs and the camera trap data suggesting only nighttime visits, we decided to investigate in the afternoon.

4.3.1.4 Capture by darting from a jeep

In an approximately 20 km straight line from the artesian springs on Kaskakulan, we encountered the first group of kulan. The terrain was reasonably flat and after a short chase we were able to dart an adult female (following methods described in Walzer et al. 2007 & Gerritsmann et al. 2016). It was the very first kulan ever equipped with a GPS-satellite collar in the Aral region! We subsequently captured and collared a second adult female 2.5 hours later and a third adult female the next morning (Table 2, Fig. 14).

All collars were programmed to take 1 GPS location per hour. All were equipped with pre-programmed drop-offs; the first two mares received regular GPS-Iridium collars expected to last for 2.5 years, and the third mare received a GPS-Iridium collar with integrated camera which was expected to last for 1 year (hence the different drop dates in Table 2). The camera collar was programmed to collect 1 image ever 30 min between 8:00 and 20:00.

Table 2: Kulan captured and collared in Barsa Kelmes SNR in April 2019. [Time in UTC+5]

Date	Time	Kulan ID	Sex	Age	Collar #	Collar ID [drop date]	Eartag #	Comment
25.04.2019	15:00	BK1	f	adult	2	26863 [20.10.2021]	1	with yearling, in group of 10
25.04.2019	17:30	BK2	f	adult	3	26861 [20.10.2021]	2	no foal, in group of 10
26.04.2019	10:00	BK3	f	adult	18	26177 [20.04.2020]	none	foal?, in group of 5

Fig. 14: Top left: Collared kulan shortly before reversal of the anaesthesia. Photo: P. Kaczensky. *Top right: A happy team after the successful capture and collaring of the 3rd khulan. From left to right: Zhumadil Beyspaev, Zhanibek Alimbayev, Nikolaus Huber, Zauresh Alimbetova, Petra Kaczensky, Zhanat Imankulov, Ernar Kalibay, Albert Salemgareyev. Bottom: First kulan ever collared in the Aral region.* Photos: A. Salemgareyev, ACBK

4.3.2 Kulan genetics

In summer 2017, we had collected 30 fresh dung samples (see Kaczensky et al. 2018a). Analyses were conducted at the Molecular Zoology lab of Ralph Kuehn at the Technical University Munich (http://zoologie.wzw.tum.de/index.php?id=18&L=0) and showed that the kulan in Barsa Kelmes SNR are very similar to those in Altyn Emel NP (which derive from Barsa Kelmes) and the original source population in Badhyz SNR in Turkmenistan. They also show a relative high degree of heterozygosity, allelic richness and low inbreeding – overall values are very similar to those of animals from Altyn Emel NP with slightly higher values for diversity and lower values for inbreeding (Table 3, Fig. 15). In summary, from a genetic point of view the kulan from Barsa Kelmes SNR were equally suitable as a source for reintroduction as kulan from Altyn Emel NP.

Table 3: Population statistics for the reintroduced kulan populations in Barsa Kelmes SNR and Altyn Emel NP as compared to their source population in Badhyz SNR, and the large, diverse population in Mongolia's South Gobi Region.

Population	N samples[1]	Loci typed[2]	Unbiased Hz[3]	Observed Hz[4]	Ratio	N Alleles[5]	Allelic richness	FIS	Individual inbreeding
Badhyz (source)	32	9	0.7610	0.3890	0.5	8.56	4.8	0.493	0.49
Altyn Emel	67	9	0.7303	0.3903	0.5	8.89	4.3	0.468	0.48
Barsa Kelmes	30	9	0.7482	0.5778	0.8	8.44	4.6	0.231	0.31
South Gobi Region	43	9	0.8229	0.7400	0.9	10.67	5.3	0.102	0.23

[1]Number of individuals in sample, [2]Number of loci typed in sample, [3]Unbiased heterozygosity (Nei 1987), [4]Observed heterozygosity, [5]Mean number of alleles/locus

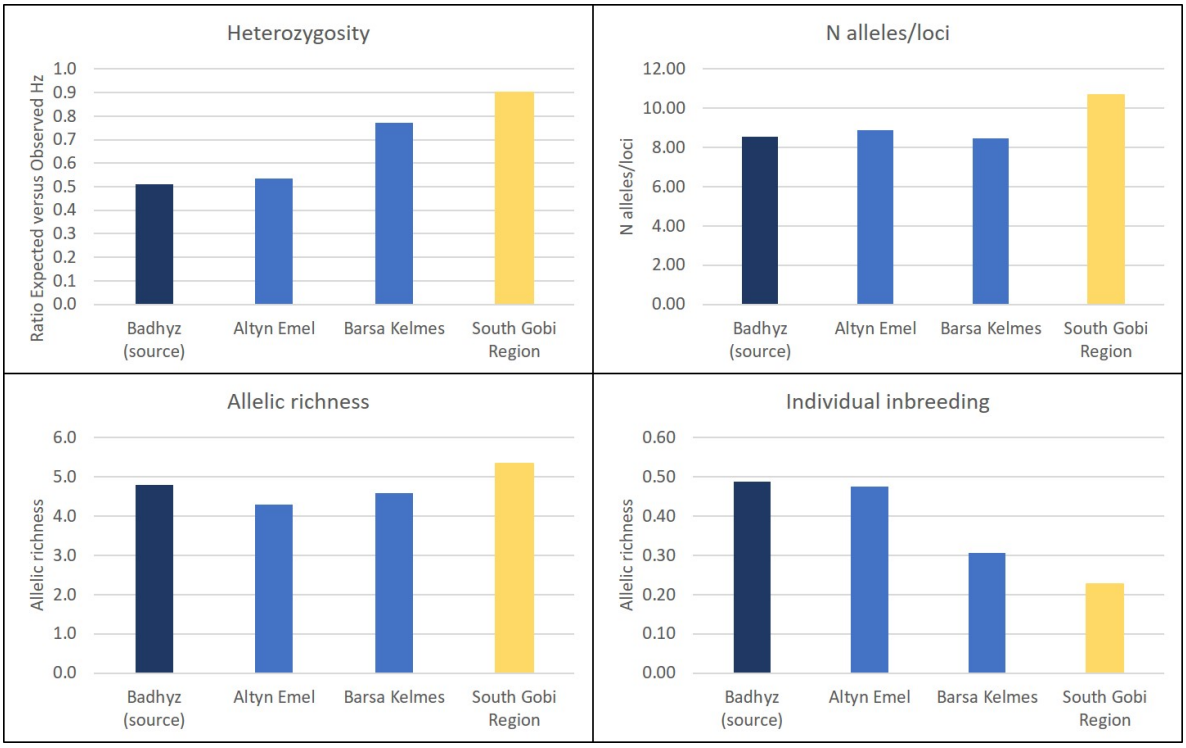


Fig. 15: Genetic constitution of the Altyn Emel NP and Barsa Kelmes SNR kulan population compared to the source in Badhyz SNR, Turkmenistan and the large and genetically diverse population in the South Gobi Region of Mongolia (also see Kaczensky et al. 2018b for details on genetic analysis).

4.3.3 Capture corrals

Building material for the capture corral was transported to Barsa Kelmes SNR on 25 June 2019, by Kairat Mereke from a private company based in Kyzylorda. However, construction was delayed until July, due to a delay in receiving the capture and construction permits from the Committee of Forestry and Wildlife (CFW) of the Ministry of Ecology, Geology and Natural Resources of Kazakhstan.

4.3.3.1 Feed-in corral

In July, Albert Salemgareyev, Baurzhan Iskakov, Sayat Mukhtarov (ACBK), Petra Kaczensky, and John Linnell (NINA) went to Kaskakulan to start the construction of the feed-in corral (a corral where kulan were meant to be lured in by food and water) and to decide on the final location of the chase-in corral (for applying the method previously used for capture in Altyn Emel NP, see Kaczensky et al. 2018a).

Upon arrival, temperatures were in the high 40s (°C), reaching almost 50°C during the day. Construction of the feed-in corral on Kaskakulan proceeded rapidly due to material (poles, fencing, reed) stored nearby and gates already welded in June. Sayat Mukhtarov, Baurzhan Iskakov, and Albert Salemgareyev were helped by SNR staff S. Tureniyazov, R. Tleuov, and G. Umbetov. Basic construction followed the design shown in Fig. 16. For this corral, we used reeds to provide a visual barrier. This natural material takes much longer to fix along the fence, but blends in nicely with the surrounding environment. It is also more durable than canvas, as it allows the wind to go through during storms, rather than tear on a large surface (Fig. 17). To monitor whether kulan went into the feed-in corral, we mounted a camera inside the feed-in corral. Hay and oats were placed inside the corral, and the majority of the spring's outflow was redirected through a pipe to enter a trough in the corral.

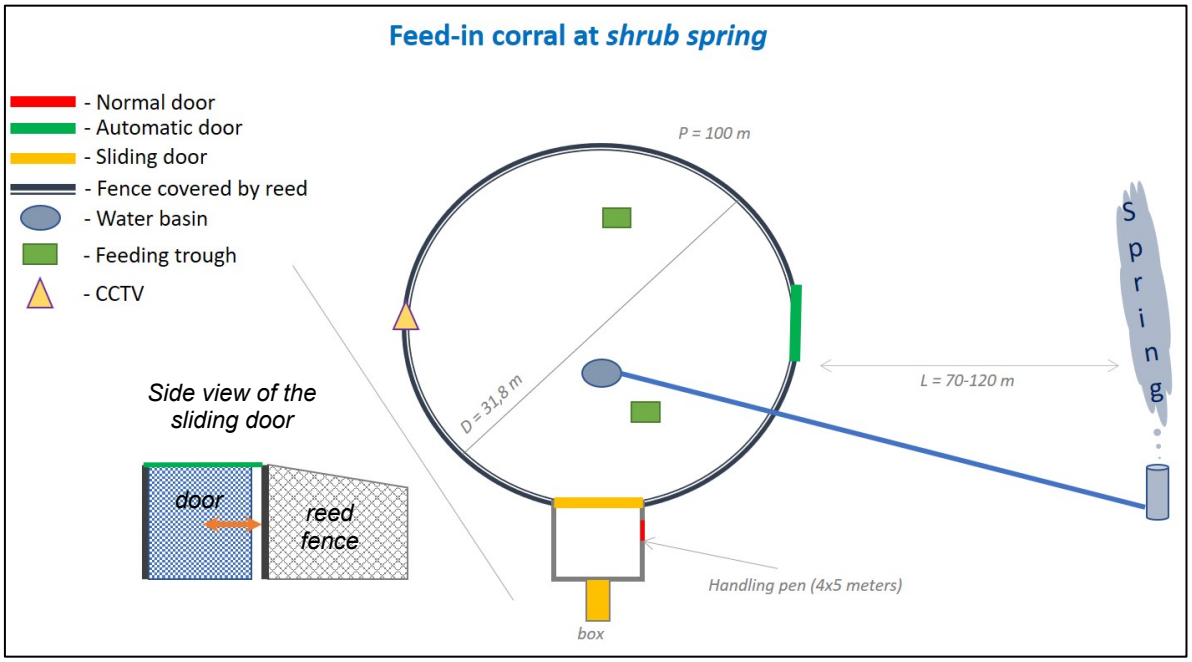


Fig. 16: Schematic view of the feed-in corral at the Shrub spring. Drawing: A Salemgareyev

Fig. 17: Real life view of the feed-in corral. Photos: P. Kaczensky

During the construction time, groups of kulan were observed visiting the large spring in the evening (Fig. 21). The largest group observed numbered around 200 individuals, including mares with foals.

4.3.3.2 Chase-in corral

A location for the chase-in corral was selected close to the ranger tower, in an area where rangers regularly observe kulan in late summer and fall. The chase-in corral was located in an approximately 20 km straight line distance from the feed-in corral (Fig. 18-20). Construction started on 26 August under the supervision of Sayat Mukhtarov, Baurzhan Iskakov (ACBK) with the help of SNR staff S. Tureniyazov, R. Tleuov, G. Umbetov, B. Satekeev, G. Satekeev, A. Kenesbayev, A. Zhylkaidarov, M. Kuatov. The design was based on the 2017 capture corral in Altyn Emel NP but was modified to allow for more flexibility in capture options. Rather than having one funnel entrance, which necessitates turning a group of kulan approaching from the wrong direction, the new corral had two funnel entrances pointing in opposite directions (Fig. 18 & 19).

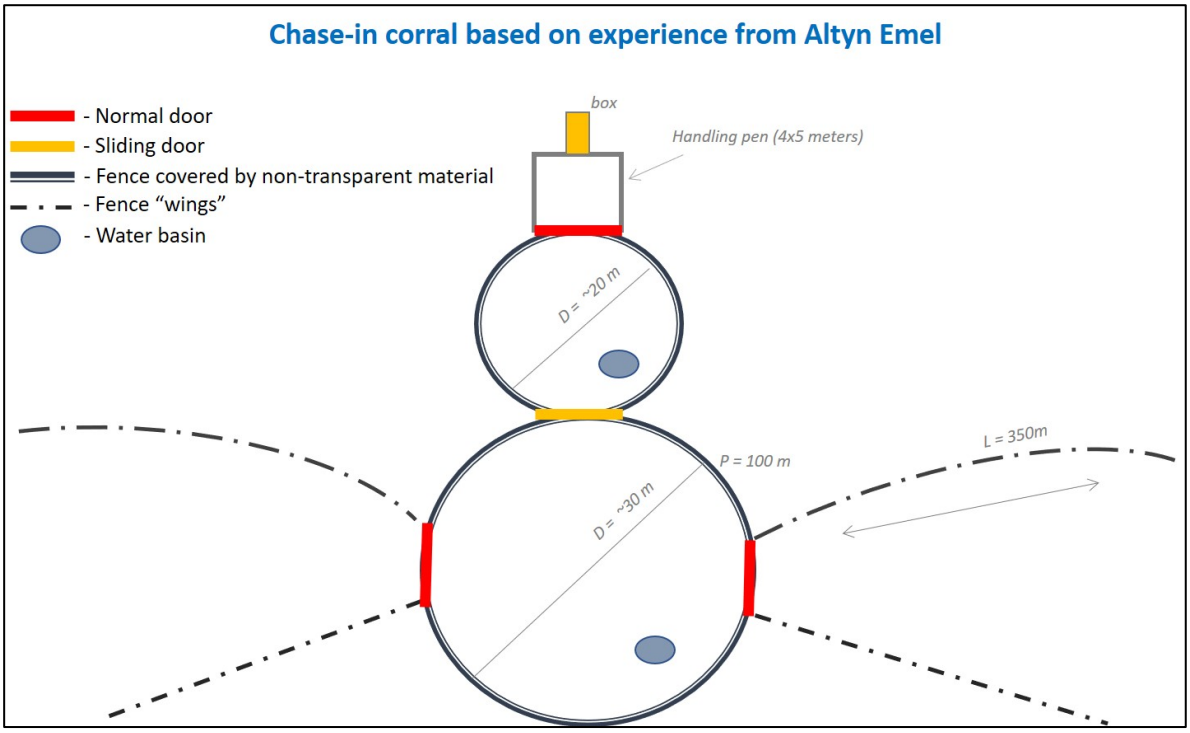


Fig. 18: Schematic view of the chase-in corral at the ranger tower. Drawing: A Salemgareyev

Fig. 19: Real life view of the chase-in corral. Photo: P. Kaczensky

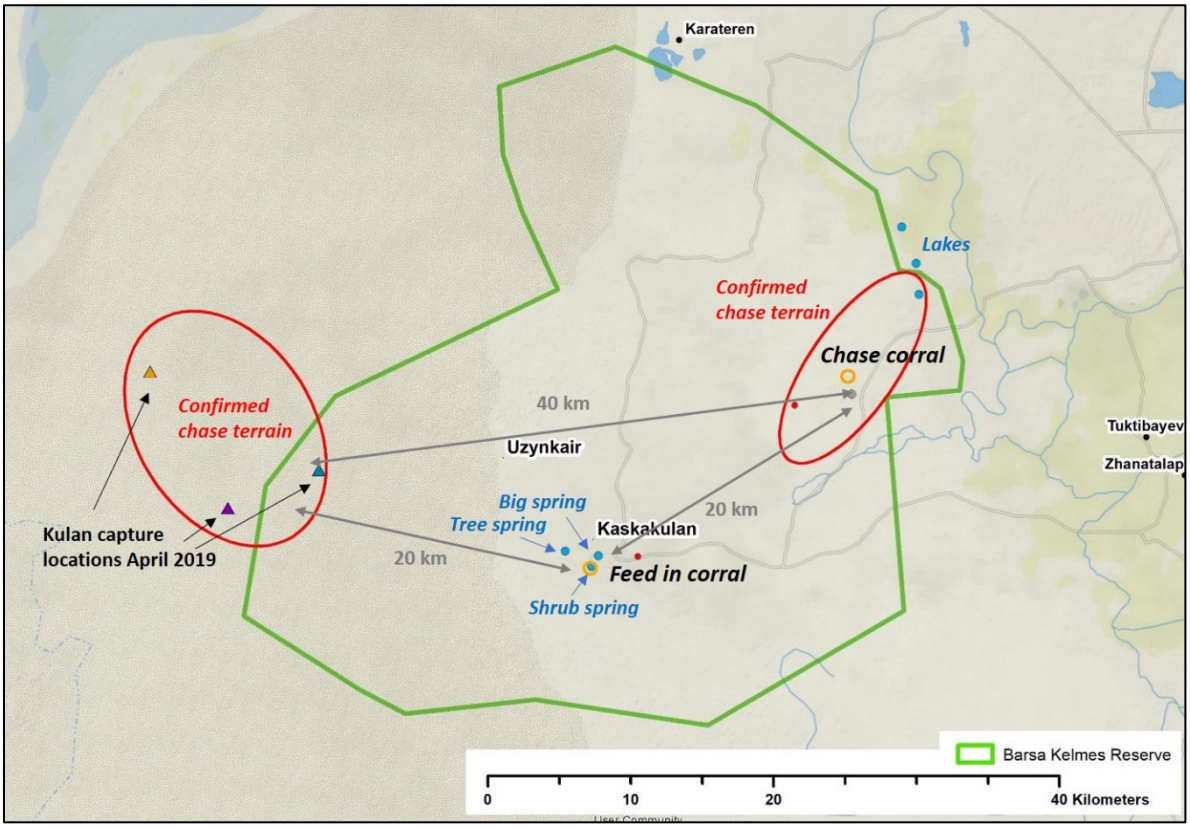


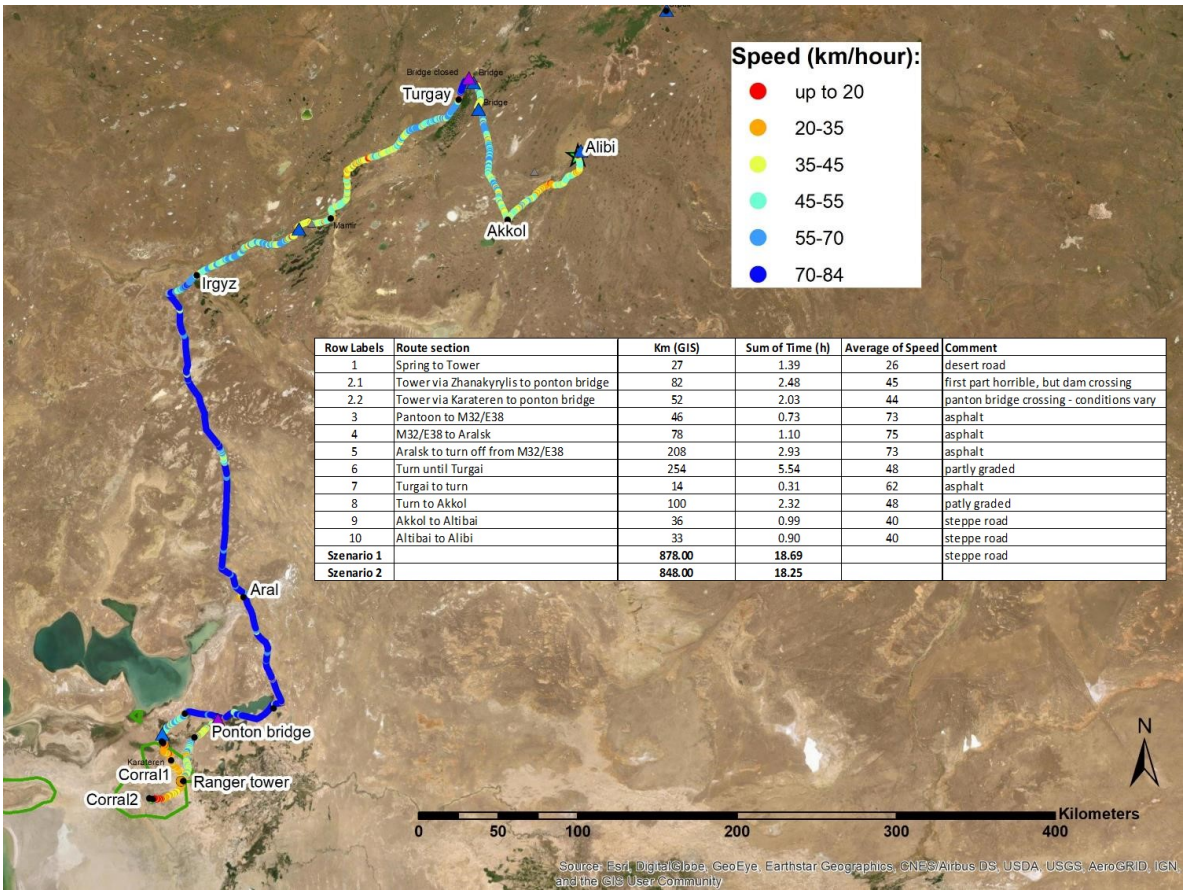
Fig. 20: Schematic map of the corral locations in Barsa Kelmes SNR.

Although the ground is flat around the ranger tower and bushes are mainly low, the ground is in places quite treacherous due to soft ground with small gerbil colonies which tend to collapse under a vehicles weight (Fig. 22).

Fig. 21: Group of stallions going to water on Kaskakulan. Photo: P. Kaczensky

Fig. 22: Chase terrain near the ranger tower, where, according to Barsa Kelmes rangers, kulan are frequently seen in late summer and fall. The area is part of the former bottom of the Aral Sea and the substrate is very fine and once the surface crust is broken the underlying layers are very soft. Photos: P. Kaczensky

As part of the preparations, we drove the entire transport route from the capture site in Barsa Kelmes to the Alibi field station to test and map the planned transport route for September 2019. The total distance was 850-880 km and took us 18-19 hours in a Toyota Landcruiser (the final time, however, depended on whether the ponton bridge near Karateren would be available or not). We did not encounter any obstacles for a truck transport on the way and all bridges were in good condition. Our average speed averaged 26-45 km/h on desert or steppe roads, 48 km/h on a partly graded road, and 62-75 km/h on the asphalt roads (Fig. 23). We were confident that it would be possible to do the kulan transport in ≤36 hours.



Row Labels	Route section	Km (GIS)	Sum of Time (h)	Average of Speed	Comment
1	Spring to Tower	27	1.39	26	desert road
2.1	Tower via Zhanakyrylis to ponton bridge	82	2.48	45	first part horrible, but dam crossing
2.2	Tower via Karateren to ponton bridge	52	2.03	44	panton bridge crossing - conditions vary
3	Pantoon to M32/E38	46	0.73	73	asphalt
4	M32/E38 to Aralsk	78	1.10	75	asphalt
5	Aralsk to turn off from M32/E38	208	2.93	73	asphalt
6	Turn until Turgai	254	5.54	48	partly graded
7	Turgai to turn	14	0.31	62	asphalt
8	Turn to Akkol	100	2.32	48	patly graded
9	Akkol to Altibai	36	0.99	40	steppe road
10	Altibai to Alibi	33	0.90	40	steppe road
Szenario 1		**878.00**	**18.69**		steppe road
Szenario 2		**848.00**	**18.25**		

Fig. 23: Test drive from Barsa Kelmes SNR to Alibi field station in July 2019.

4.4 Animal capture and handling workshop

A workshop was organized from 17-19 August 2019 in Almaty for personnel of Ohotzooprom's Centre for Translocation and staff of Almaty Zoo (Table 4, Fig. 24). The program focussed on capture, anaesthesia, handling, and transport of wild animals. Training was provided by wildlife veterinarian Chris Walzer (Vetmed Vienna & WCS), zoo veterinarian Thierry Petit (La Palmyre Zoo, France), Petra Kaczensky (NINA), and Albert Salemgareyev (ACBK). Everything was translated into Russian language by Makatova Karlygash. The training was focussed on practical aspects and borrowed from a large pool of experience working with and handling wildlife over the last 20-30 years. The practical part, including the anaesthesia and short transport of a Przewalski's horse hybrid, in Almaty Zoo.

Table 4: Program of the Animal capture and handling workshop in Almaty at the Saraichi hotel.

17th of August 2019

Time	Activities	Responsible
14:00 – 14:30	**Welcome and Introduction** *- Saken Ainabekov* *- Albert Salemgareev* *- Petra Kaczensky* *- Chris Walzer* *- Thierry Petit*	
14:30 – 14:45	Overview of the training	*Albert*
14:45 – 16:30	***Basics*** Basics on capture & transport (societal changes, ethics, the 3 S, international standards, importance for funding)	Chris, Thierry

18th of August 2019

Time	Activities	Responsible
8:30 – 11:00	***Capture – mechanics*** Methods for capturing wild large carnivores and large ungulates.	Petra, Chris, Albert
	Capturing large carnivores and large ungulates - what can go wrong and how to avoid it.	
	Equipment	
11:00 – 11:20	Coffee-break	
11:20 – 11:40	***Trap placement and monitoring in season, time, and space***	Chris, Petra
11:40 –12:30	***Species specific considerations*** (red deer, roe deer, saiga, goitered gazelle, kulan, P-horse, wild boar, bear, leopard, wolf)	Petra, Chris, Albert (KZ: saiga, goitered gazelles, wolf)
12:30 – 14:00	Lunch	
14:00 – 17:00	***Practical exercise in Almaty Zoo*** – Moving Przewalski's horses – Health assessment of selected animals	Chris & Thierry

19th of August 2019

Time	Activities	Responsible
9:00-11:00	***Capture – veterinary*** Animal health	Chris & Thierry
	Anesthesia	Chris
11:00 – 11:20	Coffee-break	
11:20-12:30	***Transport*** Mechanics	Thierry & Chris
	Monitoring and care during transport	Thierry & Chris
	Health and administrational requirements	Thierry, Chris, Albert
12:30 – 14:00	Lunch	
14:00-16:00	*Release* Soft versus hard release	Petra
	Post-release monitoring	Petra, Albert
16:00 – 17:00	Questions / Summary / Feedback	All

Fig. 24: Animal capture and handling workshop in Almaty, 17-19 August 2019. Photos: P. Kaczensky

4.5 Capture and transport September 2019

4.5.1 Truck transport plan

The plan was to transport kulan ideally in one trip or alternatively in multiple trips once a minimum of 6 animals had been captured. We planned to use two Kamaz trucks with cranes to have maximal flexibility in case of problems with one of the trucks or the need for emergency release before arriving at the Alibi field station.

The aim was to transport up to 30 adult kulan from Barsa Kelmes SNR, ideally composed of 70% adult and subadult mares and 30% adult (ideally 2) and subadult stallions. Given the expected long travel time overland we decided not to transport foals as we felt that this would be too stressful for such young animals. We expected to capture females with foals during the corral chases but planned to release all foals together with at least one adult mare back into the wild.

4.5.2 Team

ACBK [14.9.-12.10.2019]**:** Albert Salemgareyev, Alexandr Putillin, Baurzhan Iskakov, Sajat Mukhtarov, Saltanat Kamiyeva.

NINA [14.9.-12.10.2019]**:** Petra Kaczensky, John Linnell

Ohotzooprom's Centre for Translocation [18.9.-7.10.2019]**:** Aybol Razakov, Zhumadil Beyspaev, Sasha Gridchin, Roman Golubinski, Fedor Zevako, Vasiliy Popov

Vet team A [21.9.-4.10.2019]**:** Chris Walzer (Vetmed Vienna, Austria & WCS NY, USA), Thierry Petit (La Palmyr Zoo, France), Nikolaus Huber (Vetmed Vienna, Austria) & Patricia Kay Walzer (Vetmed Vienna, Austria)

Vet team B [5-12.10.2019]**:** Endre Sos (Zoo Budapest, Hungary), Christina Geiger (Zoo Frankfurt, Germany), Nikolaus Huber & Katharina Mahr (Vetmed Vienna, Austria)

4.5.3 Last preparations

Upon arrival, time was need to finalize the capture corrals and the transport boxes including: covering the chase-in corral with non-transparent green canvas, marking the funnel (wings) of the chase-in corral with police tape, organizing water and hay supplies for the kulan, finalizing the remotely triggered closure mechanism of the feed-in corral, installing VCR surveillance at the feed-in corral, finishing 3 newly constructed boxes and repairing and upgrading the existing boxes (mainly small improvements to the head compartment).

Checking the camera trap inside the feed-in corral showed no kulan visits since construction in July. This was also in line with a lack of kulan tracks and dung around the *Shrub spring* and the corral. We mounted four new camera traps at the artesian springs on Kaskakulan and kept one to monitor kulan in the capture corral.

Multiple kulan groups could be observed from the camp at the ranger tower or were encountered while driving to Kaskakulan. Groups seen numbered between 1-35 animals and including females with foals.

4.5.4 Kulan capture

Seeing the lack of kulan activity at and around the S*hrub spring*, we abandoned efforts to capture there and focused on a capture using the chase-in corral. The capture period had been carefully selected around the dark moon, as experience from Altyn Emel NP had shown that chasing kulan into a corral works best in total darkness (Levanov et al. 2013). However, seeing the difficulty of the terrain in Barsa Kelmes SNR with its cover of hard-wood saxaul (*Haloxylon ammodendrum*) shrubs (Fig. 28), soft ground, and old irrigation channels, the capture team wanted to try a day-time chase.

On 20 September, a group of 17 kulan was seen near the chase-in corral and a first day-time chase was initiated but failed because of cars getting stuck or having flat tires (Fig. 25 & 28). In the morning of 21 September, a second day-time chase was initiated. The team managed to drive 5 out of 8 kulan towards the corral, but the animals turned sharply away once they got close to the funnel fence. In the afternoon of 21 September, a third day-time chase was initiated by

Barsa Kelmes staff who had spotted three groups of 50, 60, and 20 kulan at a distance of 15-20 km from the chase-in corral. The team of motorbikes and cars managed to get a larger group of 60-70 animals close to the corral, but on the final approach the animals were spooked by the fence and corral and dispersed in all directions. After these three day-time chase attempts, it was clear to everybody that kulan cannot be pushed into the highly visible structure of a corral during daylight.

On 23 September, the first night time chase was attempted, but the animals spotted in the later afternoon, could not be found again in the dark. After searching in the dark for 2 hours, the chase team returned. The lack of roads and the high saxaul bushes made keeping track of kulan without disturbing them challenging. Once lost, finding animals again in the dark was almost impossible due to the dust stirred up by the vehicles and the bush cover, both of which reflected the light beams from the spotlights. An additional challenge was the hard wood of the saxaul trees, which if snapped became like daggers, puncturing the tires. A first successful chase occurred on 27 September, when 3 kulan (an adult mare and 2 foals) were chased into the corral out of a group of 15. Between 23 September and 5 October, we conducted a total of 7 attempts at chasing animals into the chase-in corral at night, of which only 3 were successful (Table 5).

Fig. 25: Heading out for a kulan night chase and subsequent car repairs the next morning. *Photos: P. Kaczensky*

Given the difficulties encountered, we attempted to supplement the animals in the chase-in corral with single kulan darted from a pursuing Toyota Landcruiser (the method used in April for collaring) in the vicinity of the corral and transported back under anesthesia on the flatbed of a following Toyota Hilux (Fig. 26). This method proved successful, but darting had to occur within 10 km of the capture corral in order to minimize transport time under anesthesia ≤30 minutes. Furthermore, darting a kulan close to the chase-in corral creates significant disturbance and likely reduces the chance for a night drive capture. As a consequence, both methods could not be applied on the same day. Between 28 September and 8 October, we captured 4 additional kulan by darting from the jeep, following methods and recommendations described previously (Walzer 2014, Walzer et al. 2007, 2018). One was unsuitable for transport and collaring due to old age, small size and poor body condition, but three were brought back to the capture corral (Table 5).

Fig. 26: Kulan darted from the jeep and transported back into the capture corral under anaesthesia on the flatbed of a Toyota Hilux. Photos: P. Kaczensky

Table 5: Kulan captured and collared in Barsa Kelmes SNR between 27 September and 8 October 2019.

Date	Description
By nighttime chasing	
27 Sep 2019	3 kulan captured: Adult female (5-6 years) and her foal plus another foal. All released on 3.10.2019 – adult female was ear-tagged & GPS-collared [collar 26851 with #1] before release. Female and 2 foals seen on camera trap at Kaskakulan on 5.10.2019.
2 Oct 2019	5 kulan captured: 3 jumped corral wall within 5 min of capture, 1 jumped at night, and 1 young stallion was left in the morning. The young stallion (3-4 years) was ear-tagged & GPS-collared [collar 26857 with #15] before release on 3.10.2019.
4 Oct 2019	1 kulan captured: The young stallion (2-3 years) was kept in the corral until 10.10.2019, when he was transported to Alibi field station. He did not receive a collar due to his small size.
By jeep darting & transport to corral during daytime	
28 Sep 2019	1 young female (2-3 years) without foal, ear-tagged & GPS-collared [collar 26854 with #6] in the field, returned to corral but escaped immediately by jumping the fence.
29 Sep 2019	1 small, adult female (15 years) not suitable for collaring or transport.
7 Oct 2019	1 adult female (>10 years) with foal, ear-tagged & GPS-collared [collar 32671 with #19] in the field, returned to corral. Kept in corral until 10.10.2019, when she was transported to Alibi field station.
8 Oct 2019	1 adult stallion (>10 years), ear-tagged & GPS-collared [collar 26862 with #13] in the field, returned to corral. Kept in corral until 10.10.2019, when he was transported to Alibi field station.

One unexpected problem arose when we reversed anesthesia of the first kulan darted from the jeep. The kulan stood up within minutes and started pacing in the big compartment of the chase-in corral. After 15 min we opened the sliding door to the smaller compartment of the corral to unite her with the female and the 2 foals. She walked into the small corral and immediately jumped the 2 m high fence (covered with opaque green canvas) without effort (Fig. 27). We named her “Jolly Jumper” and assumed that this unusual behavior was caused by a combination of stress and the recent wake-up from anesthesia. However, the successful night drive on 2 October, also saw 3 out of 5 adult kulan simultaneously jump over the 2 m high opaque fence of the big corral. Overnight a 4th kulan had also jumped so that in the morning, only one young stallion was left.

It became now clear that kulan in Barsa Kelmes SNR have no problem to jump a 2 m fence and that “Jolly Jumper’s” escape was not related to the post-anesthesia state. It was concluded that there was no point to put new animals into this corral, as they would most likely escape. The female with the foal (from the night capture on 27.09.2019) most likely did not jump because her foal would not be able to follow her. We decided to release the female (after putting a GPS collar on her), the 2 foals, and the young stallion (after putting a GPS collar on him) and then increase the height of the corral by 0.7 m (Fig. 27). The height of 2.70m proved sufficient and we were able to chase one subadult stallion into the elevated corral at night and dart an additional 2 kulan (an adult mare and an adult stallion) by jeep. This left us with 3 kulan suitable for transport at the end of the capture season.

Fig. 27: Top left: Tracks of a kulan that jumped out of the 2m corral. Top right and bottom: Corral elevated to 2.7m. All kulan had to be released to allow for the 2 days necessary to implement the changes which among other work involved welding and drilling. Photos: P. Kaczensky

By the end of the capture season, vehicles and tires were in such bad condition, that chasing was not an option anymore, especially given that the vehicles were also still needed to accompany the transport or return home. Furthermore, weather conditions were predicted to deteriorate both in the capture and release area, thus threatening a successful transport. The continued disturbance in the area also seemed to have an effect with kulan sightings becoming rarer and further away. Last but not least, the moon was increasing and nights were becoming too bright for a successful nigh chasing.

In summary, the capture team had to work in an area which was new to most and with people they had not worked with previously. As a consequence:

- It took time to get to know how animals used the landscape.
- Chasing kulan was challenging due to:
    - Deep irrigation channels which could only be crossed at certain locations by vehicles;
    - Dust stirred up by the vehicles and kulan, which greatly reduced visibility while chasing;
    - Areas of soft sand and collapsing gerbil colonies created areas where vehicles easily got stuck;
    - Saxaul bushes with very hard wood which when snapped easily punctured even solid off-road tires (Fig. 28);
    - Stands of high saxaul bushes and sand dunes made it easy for kulan to shake off pursuing vehicles, particularly in the dark;
- It took time to get the team to work together well and to accept constraints and procedures, such as the following:
    - Daytime chases into the corral are not possible, even if animals are close;
    - Searching for kulan at night once a group is lost is not efficient and just results in disturbance of the area and is hard on the vehicles;
    - The irrigation ditches and saxaul patches make it necessary to plan the night chase carefully, necessitating detours around known obstacles or pre-placing of vehicles ahead of the chase start;
    - Night chases only make sense if groups of around 10 kulan could be spotted in the afternoon at distances of ≤20 km from the chase corral;
- We needed to construct a totally new capture infrastructure (corrals) – and unexpectedly needed to modify the height to 2.7 m after we experienced kulan jumping out of the 2 m high corral (Fig. 27).

Fig. 28: Continual saxaul punctures eventually destroyed the tires to a point when driving was not safe anymore. *Photos: P. Kaczensky*

4.5.5 Keeping kulan in the corral

Kulan captured by night drive, entered the corral as a group and were kept as a group. In 2017, no aggression between animals were noted in Altyn Emel NP. In 2019, only small numbers of kulan were captured in a single drive (3, 5, and 1 see Table 5). The first group captured on 27

September consisted of a mare with her foal and another unrelated foal. To monitor social interactions we installed a camera trap at the corral.

The mare was very calm and so were both foals. Although the mare did not allow the unrelated foal to suckle, there was no indication of aggressive behavior and all three animals stayed close to each other. All three animals were feeding on hay and used the artificial pond for drinking (Fig. 29). No panic (running around or jumping) occurred when the group of 5 adult kulan was chased in the adjoining large compartment of the corral.

Due to the problems with a young mare (collars ID 26854, collar #6) and 4 out of the 5 kulan from the 2nd night drive on 2 October jumping the fence, we decided to release the mare and the two foals and the remaining young stallion to be able to modify the corral. Hence so up to this point there was no need to combine animals from different capture events.

Fig. 29: The adult mare and the 2 foals from the first successful night drive capture event from 27.9.2019. The animals were released on 3.10.2019. *Photos: Seelock camera trap, ACBK*

Prior to release on 3 October, the young stallion was darted in the corral and equipped with a GPS collar (collar ID 26857, collar #15). Anesthesia was reversed outside the corral. The adult female was also darted inside the corral and equipped with a GPS collar (collar ID 26851, collar #1), but anesthesia was reversed inside the corral in order to release her together with the two foals (which were not handled). Once the mare was fully recovered, we opened the gates and slowly pushed all three animals out. The three animals left together and were observed still together two days later on the camera trap at the big spring on 5 October (Fig. 30).

Fig. 30: Camera trap images of left: Release of newly collared mare (collar ID 26851, collar #1) and the two foals on 3 October and right: Zoomed-in view of the mare with both foals at the "Big spring" on Kaskakulan two days later on 5 October. *Photos: Seelock camera trap, ACBK*

However, the need for combining kulan from different capture events and likely different groups arose when the 3rd successful night chase resulted in the capture of only a subadult stallion. Day time jeep capture resulted in an adult female and in order to have the big compartment of the corral available for additional capture attempts necessitated uniting the adult female with the subadult stallion. We pushed the mare over to the stallion and watched both animals closely for the first hour. The young stallion was immediately seeking contact without showing any form of aggression. The adult mare initially largely ignored him. The installed camera did not record any aggressive interactions and when we checked again after one hour, both kulan were standing close to each other and seemed calm (Fig. 31).

On 8 October, we darted a big adult stallion travelling alone from the jeep. We transported him back to the corral and reversed anesthesia in the big corral compartment. The animal was very agitated and we did not dare to unite him with the young stallion and adult mare. Experience from captive facilities has shown a high potential for aggression in adult stallions, which has in many cases resulted in serious injuries and even death. Given the confined space of the corral and the fact that the animals had not travelled together, we decided to keep the stallion separate.

For a detailed summary of the capture activities in 2019 also see 12 Appendix – Summary of kulan capture 2019.

Fig. 31: Subadult stallion and adult mare (collar ID32671, collar #19) in the small compartment of the capture corral. Top row left: minutes after being united (7 Oct), top right: the next day (8 Oct), Bottom row: the day before the transport (9 Oct). *Photos: Seelock camera trap, ACBK*

4.5.6 Kulan transport

On 11 October, the three kulan in the chase-in corral were anaesthetized with a mixture of Captivon, Butorphanol, and Detomidine (for details see 13 Appendix - Protocol of kulan transport 2019) and loaded into the transport boxes. We started with the adult stallion, who seemed the most agitated, followed by the adult mare, and the young stallion (Table 6). All three kulan received the long acting neuroleptics (LANs; a mixture of Haloperidol & Perphenazine-decanoate) to calm them down for the transport and release into the acclimatization enclosure (for details see 13 Appendix - Protocol of kulan transport 2019).

During the boxing procedure we analysed clinical blood parameters giving information regarding the health status of the animals using a field laboratory (VETSCAN; equid settings). None of the boxed animals showed signs of disease or weakness, although Leucocyte Copying Capacity (LCC) values suggested elevated stress levels for the two adult kulan transported in 2019 when compared to values of kulan captured and transported in 2017 (Fig. 32; for further details on methods see Kaczensky et al. 2018a and Huber et al. 2019). The values of the adult stallion were similar to the values of the two adult females which had to be released prior to the transport in 2017 because of behavioral issues in the box. The stallion, on the other hand, did not show these behavioral problems and appeared calm. Loading on the Kamaz truck with the integrated crane went smoothly and without problems.

We should note that we are still at the beginning of understanding the significance of LCC values in kulan and hence absolute results have to be viewed with some caution, as there may also differences in the baseline values between kulan from different areas. For instance, physically,

compared to animals in Altyn Emel NP, kulan in Barsa Kelmes SNR appeared “skinnier”, which may also have enabled them to jump more easily.

Table 6: Kulan transported from Barsa Kelmes SNR to Alibi field station.

Date	Kulan #	Age	Sex	Collar ID	Time			Released	Describtion
					Darted	Boxed	Standing		
10.10.2019	BK_10_5	adult	m	32671	09:30	08:50	10:03	euthanized	serious injury to tongue
10.10.2019	BK_10_6	adult	f	26862	10:31	10:56	10:58	11.10.2019 12:17	in big enclosure
10.10.2019	BK_10_7	subadult	m	none	10:38	10:41	10:44	11.10.2019 12:17	in big enclosure

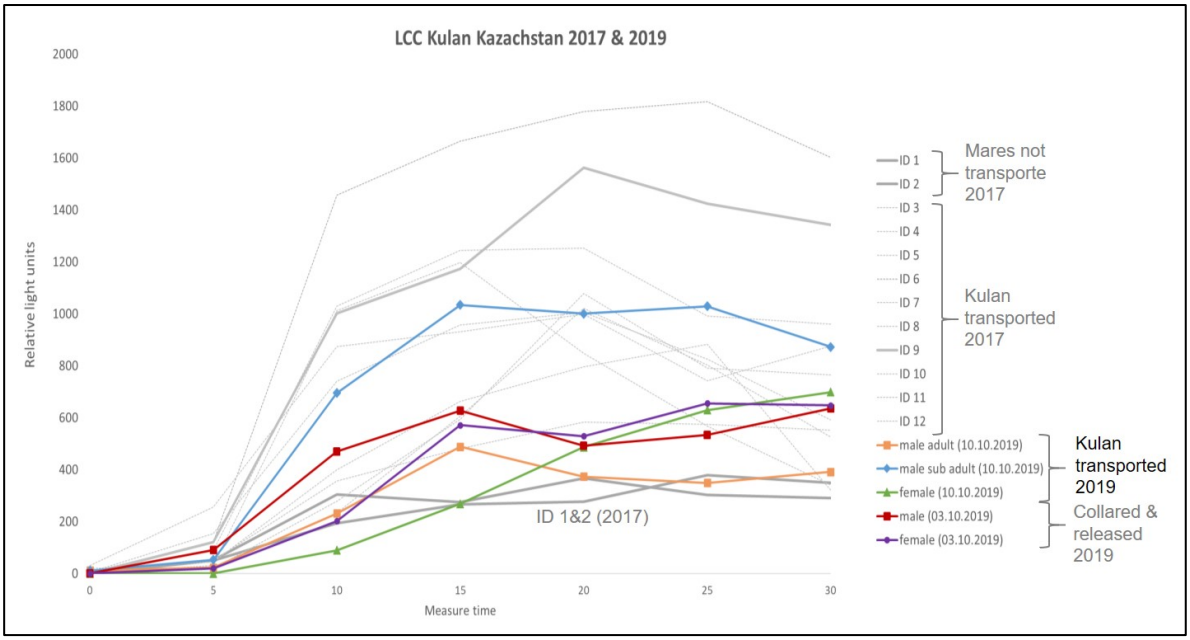


Fig. 32: Leucocyte Copying Capacity (LCC) values of kulan captured in fall 2017 in Altyn Emel NP and 2019 in Barsa Kelmes SNR. For further details on methods see Kaczensky et al. 2018a and Huber et al. 2019.

Loading the boxes on the Kamaz truck started on 11:59 and was finished by 12:16 and the transport started at 13:13 (UTC+4) and arrived at the Alibi field station at 13:04 (UTC+5), 23 hours later. During the transport, we conducted short checks every hour and additional checks whenever we needed to stop for other reasons (refueling, toilet stops). We minimized all stops to not stress the animals by our presence. We attempted to provide the kulan with water, but none of the animals accepted water so we felt these attempts created more stress than benefits. We did not stop or rest other than for checking on the animals, refueling and toilet stops.

Unloading started at 13:07 and the release from the box at 13:17 (Fig. 33). The adult mare and the subadult stallion left their boxes calmly and in good condition, moving without problems and starting to feed within minutes. A check up around 15:30 showed both animals feeding at the far end of the enclosure, but in separate locations. None of the two animals made any attempt to jump the 1.80m high fence of the 55 ha acclimatization enclosure (this had been a concern after the experience with the kulan jumping the 2m fence of the capture corral; Fig. 33).

Fig. 33: Release from the transport boxes into the big acclimatization enclosure at Alibi field station after the 23 hour drive on 11 October 2019. Photos: J. Linnell

However, the adult stallion was in bad shape. At the check at 02:17 it became obvious that the stallion was facing problems; he was half down in the box, there was more blood (there was some initially from facial abrasions), and he did not respond to being touched. However, in the darkness and the limited vision afforded by the crate, we were unable to see the tongue injury which only became obvious after unloading from the crate upon arrival in Alibi field station. The severity of the injury led to a decision to euthanize the animal. A subsequent post mortem did not reveal any other health issues apart from the tongue injury and pointed to injury related shock and age related alterations (deviations) and a body condition normal for an animal of this age (see detailed protocol on the transport in 13 Appendix - Protocol of kulan transport 2019).

Every capture and transport of wild animals is associated with a certain risk of injury or death. Using the best available practices and veterinary procedures can minimize these risks, but never exclude them totally. In this case we cannot see any aspects of the handling procedures which could have been done differently to prevent the stallion's injuries, because it appears to have been due to an unfortunate accident (the biting of the tongue) of the type that cannot be prevented or treated. The bite to the tongue was so severe that it would have been impossible to feed and survive such that it would have had a painful death within a short period of time so that humane euthanasia was the only viable option to minimize suffering.

As of March 2020, the two kulan are still in the acclimatization enclosure and appear in good health. They are checked daily by the 4-man caretaker team, Kishkentay Ordabayev, Kairzhan Zhusupbekov, Gani Sadvakasov and Aidar Erzhanov, working in 10 day shifts at Alibi field station. Current plans call for a release in spring / early summer 2020.

Fig. 34: Subadult stallion and adult mare (collared in the background) in the acclimatization enclosure on 12 October, the day after the transport. Photo: P. Kaczensky

5 Pre-release monitoring 2018

Monitoring of the 9 kulan (Table 7; Fig. 35) at Alibi field station by the two veterinary interns, Diana Gliga (Vetmed Vienna, Austria) and Natalia Petrova (Moscow State Academy of Veterinary Medicine and Biotechnology, Russia), focused on animal time budgets, body condition, and the collecting of individual dung samples for i) on-site parasite identification and counts and ii) on-site extraction of steroid metabolites. Analysis of steroid metabolites and genetic samples was delayed due to the lengthy process of obtaining various export permits (samples were finally exported at the end of October 2018).

Table 7: Kulan monitored at the Alibi field station from 24 March 2017. AF=Adult female, SM=Subadult male, FF= Foal female, FM= Foal male

Khulan #[1]	Kulan ID[2]	Sex	Age group	Age	With foal	Eartag left	Collar #[3]	Collar ID[4]
3	AF5	f	adult	7	FM8	3	5	26860
4	AF17	f	adult	7	FF7	4	17	26176
5	AF4	f	adult	6	FM11	5	4	26855
6	AF9	f	adult	5	no foal[5]	6	9	26859
7	FF7	f	foal	0.5		7		
8	FM8	m	foal	0.5		8		
10	FF0[6]	f	foal	0.5		none		
11	FM11	m	foal	0.5		11		
12	SM12	m	subadult	3		12		

[1]Based on capture sequence; [2]ID bases on sex and collar/eartag ID; [3]Number written on collar; [4]Iridium number; [5]No milk in the udder and the absence of a foal suggests that mare was without a foal at the time of capture; [6]This foal got separated from its mother during capture

Fig. 35: Translocated kulan in the acclimatisation enclosure at Alibi field station in the winter 2017/2018. Note: Collar #9 is upside down and thus reads #6; collar #17 is the larger camera collar. Photo: D. Gliga and N. Petrova

5.1 Weather

A weather station (Davis Vantage pro 2 Basic with the Davis Weatherlink 6510 PC-connection and datalogger) was installed on 29 October 2019, about 100m from the field station. The data is stored in a built-in datalogger but has to be manually downloaded to a PC at regular intervals. Either due to technical problems or human error, data download resulted in major gaps in the data, with continuous weather data at 30min intervals for the periods: 29.10.2017-23.04.2018, 25.10.2018-16.12.2018, 15.02.2019-03.07.2019, and 20.08.2019-10.10.2019 (Fig. 36). Given the gaps, little can be said about monthly averages or annual differences. Average monthly temperature in the winter 2017/18 (Dec-Feb) ranged between -12.6 and -18.6.

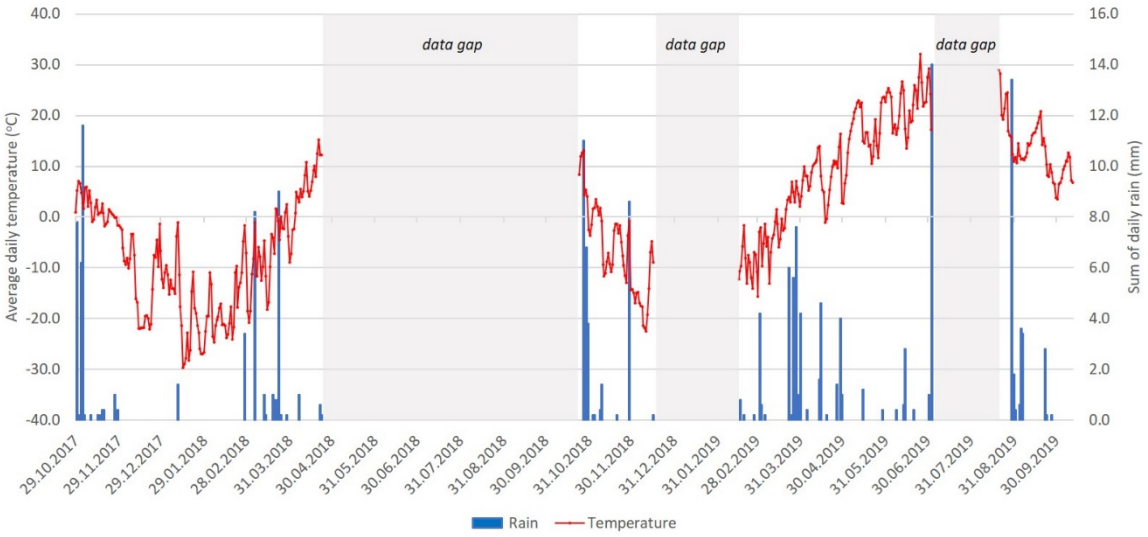


Fig. 36: Weather data from the Alibi field station 10/2017 to 10/2019.

5.2 Behavioral monitoring

We used instantaneous scan sampling (Altmann 1974) with binoculars during one to four 1-hour long observation periods each day. Behavioral scans for main behavioral categories were initially performed at 15 min intervals (from 30th Oct 2017 to 13th Feb 2018) and later at 5 min intervals (from 14th Feb to 26th March 2018). In total, we conducted 271 sessions of behavioral observations of one hour each. After removal of incomplete observations, 244 observation sessions remained for analyses.

We focused on four main behaviors to obtain individual time budgets: feeding, moving (subsequently re-named to walking as running was very rare and was considered separately), standing, laying down, and other. We additionally recorded all events of mutualistic (play, grooming, suckling) and antagonist (chasing away, biting, kicking, fighting) interactions during the entire observation hour.

Behavioral observations did not reveal any major differences in the overall time budget of the nine kulan. All kulan were primarily feeding (72-80%) and standing (17-25%), whereas behaviors such as walking (2-2.4%), alert (0.1-0.8%), and laying down (0.1-3.4%) were rare or very rare. All adult females and the subadult male walked about the same amount (2.4%), while foals walked slightly less (2-2.2%; Fig. 37; Gliga et al. *In prep*).

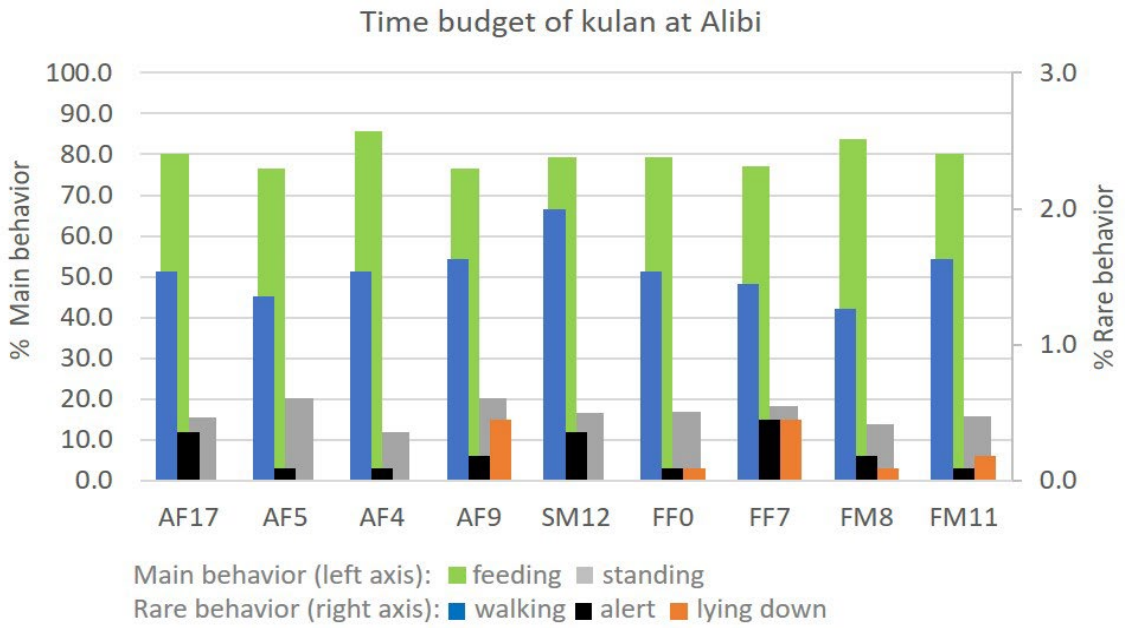


Fig. 37: Time budget of 9 translocated kulan in the 55h acclimatization enclosure at Alibi field station from October 2017 to March 2018.

The nine kulan formed a rather cohesive group and most of the time all individuals moved together. Even the motherless foal FF0 was fully integrated into mutualistic behavior with other foals and adults; the only difference was that FF0 was not allowed to suckle. Aggressive interactions were extremely rare and consisted of brief momentary reactions like biting, kicking or chasing away. Overall 19 aggressive instances were recorded, of which 26% were initiated by AF5 and 31% by SM12, and the rest by the other 5 kulan. Two foals (FF7, FM11) were nursed over the entire monitoring period, while one foal (FM8) belonging to mare AF5 was last seen suckling on 11th Dec 2017. Afterwards, this foal fed solely on vegetation and the mother-foal bond was no longer obvious.

No kulan showed signs of poor body condition, disease, or injuries apart from occasional minor cuts and bruises. We estimated a body condition score of fair to good in all kulan over the entire monitoring period. We initially followed the scoring scheme of Rudman and Keiper 1991, but the different body shape of kulan as compared to horses and the thick winter fur makes it largely impossible to detect subtle changes. The 9 kulan used the shelter already the first night after the transport. The kulan drank water provided at the troughs but also visited the spring at the eastern end of the oxbow lake (Fig. 38). They did not touch hay provided at the feeding troughs but munched on hay provided in the shelter at night (Fig. 39). During windy or rainy conditions, the kulan also used the reed bed and shrub/willow stands for protection (Fig. 40).

Fig. 38: From left to right: Camera trap images showing kulan use of the water troughs and the spring at the east end of the oxbow lake. Photos: Moultrie Digital Game Camera, D. Gliga

Fig. 39: Kulan use of the shelter. Photos: Moultrie Digital Game Camera, D. Gliga and HCO ScoutGard, ACBK

Fig. 40: Exposed behavioural observer and kulan seeking shelter from the wind in the reed beds. Photos: N. Petrova

5.3 Parasite analysis

Fecal examination of endoparasites and treatment are recommended for equid translocations (Moehlman 2002), but eliminating parasites prior to translocation in equids could cause disruptions in a balanced host-parasite relationship, adding an additional stressor to an already stressful intervention involving capture, handling, transport, and acclimatization to a new environment (Dickens et al. 2010; Northover et al. 2018). Based on the project disease risk assessment we refrained from pre-emptive deworming, but rather chose to monitor individual gastrointestinal parasite status by collecting fecal samples at regular intervals to analyse the shedding intensity of strongyle parasites.

Between November 2017 and March 2018, we sampled each individual kulan (watching an individual until it defecated and subsequently collecting the fecal sample) at least once during seven 10-day sampling blocks, providing 63 samples suitable for analysis (Fig. 42). We used the McMaster egg counting method (4g fecal sample, detection threshold 50 eggs per gram - EPG) to measure the amount of parasite eggs passed in feces (fecal egg count (FEC)). Counts were done using a microscope at Alibi field station (Fig. 42).

Based on first visual inspections of feacal samples with the naked eye and under the microscope showed that all kulan harbored strongyles (Strongylinae and Cyathosominae) and pinworms (*Oxyuris equi*). Egg counting shoed a mean strongyle-egg shedding output of 192.9 ± 140.8 EPG per sampling period. We recorded the highest shedding intensity (311.1 ± 224.7 EPG) in sampling block 6 (5-14.03.2018) and the lowest (116.7 ± 96.8 EPG) in sampling block 3 (22-

31.01.2018; Fig. 41). Egg shedding over the entire sampling period differed significantly among individuals (Independent-Samples Kruskal-Wallis Test, $p < 0.001$). Potentially two shedders, which usually had higher values than the other individuals were identified in the kulan group: the subadult male SM12 (292.9 ±130.5) and the adult female AF5 (357.1 ± 145.6; Gliga et al. *In prep*).

However, even in the two highest shedders, FECs were rarely above 400 EPG. There are different opinions about what values are acceptable in domestic equids before antiparasitic treatment is necessary. At levels of 400 EPG domestic horses normally show symptoms of strongylosis (Ogbourne, 1975; Uhlinger, 1991). However, none of the kulan showed signs of gastrointestinal discomfort during the monitoring period.

We conclude that the overall low values and lack of clinical symptoms support our decision to not pre-emptively deworm the wild kulan prior to transport. We had no evidence of any other novel gastrointestinal parasites and conclude that for kulan translocations within Kazakhstan there is likely a low, to no, risk of introducing new parasites.

We suggest that anti-parasite treatment in wild kulan translocated within Kazakhstan is restricted to animals which have unusually high FEC or a continuously increasing trend in EPG. Investigation of fecal parasite egg shedding in combination with behavioral observations is a valuable non-invasive means to monitor health status in future reintroduction programs, permitting an assessment of the need for targeted application of anthelminthics during the acclimatization period (Gliga et al. *In prep*). However, care has to be taken to avoid parasite built-up in the acclimatization enclosure over time. For this reason, the shelter was cleared kulan feces at regular intervals over the winter 2017/18.

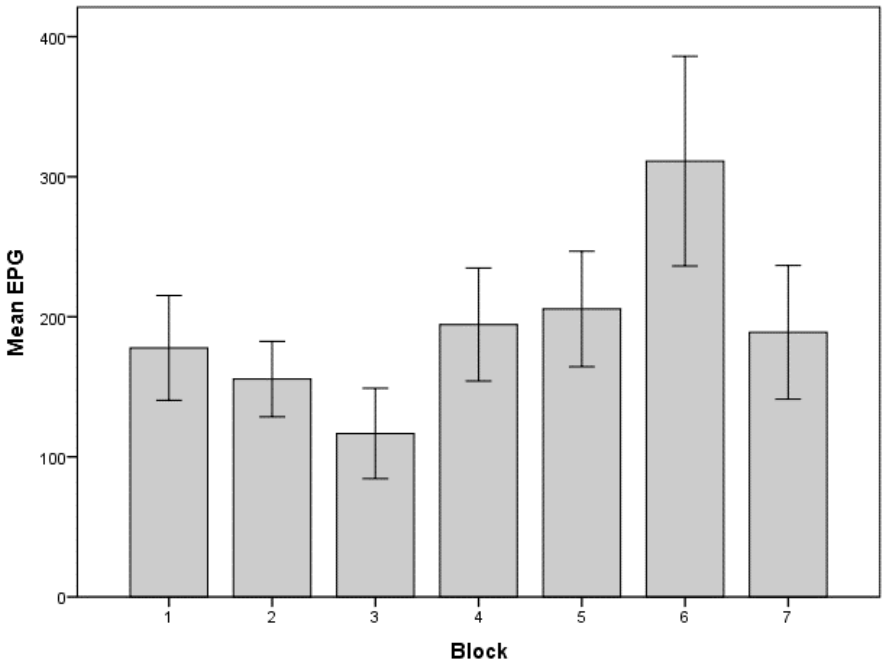


Fig. 41: Mean strongyle-egg shedding output over the sampling time between October 2017 and March 2018.

Fig. 42: Right: Mare AF4 and her fresh scat. Left: Parasite analysis in the field lab by Diana Gliga (front) and Natalia Petrova (back). Photo: ACBK

5.4 Pregnancy analysis

Blood serum samples and a subset of the scat samples were analyzed for steroid metabolites using enzyme immunoassays in the laboratory of Franz Schwarzenberger at the Department for Physiology, Pathophysiology and Experimental Endocrinology, Vetmed Vienna, Austria. The main aim was to determine whether kulan mares were pregnant and were able to keep the fetus until release.

For this, 0.5 g fecal matter from a homogenized dung pile was put into a test tube with 4.5 ml ethanol 80% with a pipette and shaken thoroughly. The mixture was allowed to sit for 1-1.5h, but shaken repeatedly (3-4 times) to allow Steroid metabolite extraction into the ethanol. The tube was centrifuged until sediment and supernatant were clearly separated. Then 0.5 ml were drawn from the supernatant's surface and transferred into a 1.5 ml vial. Vials were labeled and stored in boxes until shipment. During this period the liquid evaporated, which was unintentional as liquid removal under controlled conditions would have been preferable.

Assuming breeding in May/June, kulan mares were expected to be 4-5 months pregnant at capture. In domestic horses, foetal gonads are growing rapidly around this time, surpassing the maternal gonads in size at mid-term (at 6 month pregnant). The foetal gonads secret estrogen and the elevated estrogen levels can be used to determine pregnancy by mid-term; although estrogen decreases towards the end of pregnancy, progesterone then increases (Allen 2005, Schwarzenberger et a. 1991; Fig. 43). In domestic donkeys the elevated estrogen levels are more peaked and progesterone metabolites increase more steeply towards the end of the term (Crisci et al. 2014) and the same seems the case for the Asiatic wild ass (kulan / onager) (Schook et al. 2013).

Blood serum values of mares handled in Altyn Emel NP on 23 October 2017 showed elevated estrogen values for mare 1 (not transported), AF5, AF17, and AF9, suggesting pregnancy. Mare 2 (not transported), AF4, and the two female foals FF7 and FF0 had low values, suggesting no pregnancy (Fig. 43). Progesterone values varied widely between pregnant and non-pregnant mares, but serum samples were collected during capture, a highly stressful operation which likely resulted in the metabolism of other steroid hormones.

Subsequent non-invasive sampling – via analysis of individual faecal samples – confirmed elevated estrogen levels in AF4, AF5, and AF17. However, whereas progesterone levels increased towards the end of the winter in AF4 and AF5, AF17 did not show any increase. This, together with the sudden drop in estrogen levels by early January, suggests that AF17 lost her foetus in late December 2017 in the enclosure. By this time the foetus would be 6-7 months old, weighing only between 5-10kg (Ginther 1979). Such a small foetus would have easily been overlooked in the 55 ha large enclosure, especially as the loss coincided with the Christmas/New

Year break when only basic monitoring was conducted by the caretakers. Furthermore, based on tracks and observations, both foxes and wild boar did frequent the enclosure and could have quickly consumed the foetus.

In summary, serum and faecal hormone analysis suggest that at release into the wild on 4 April 2018, two mares were released pregnant, one had not been pregnant, and one had lost the foetus in the enclosure (Fig. 44).

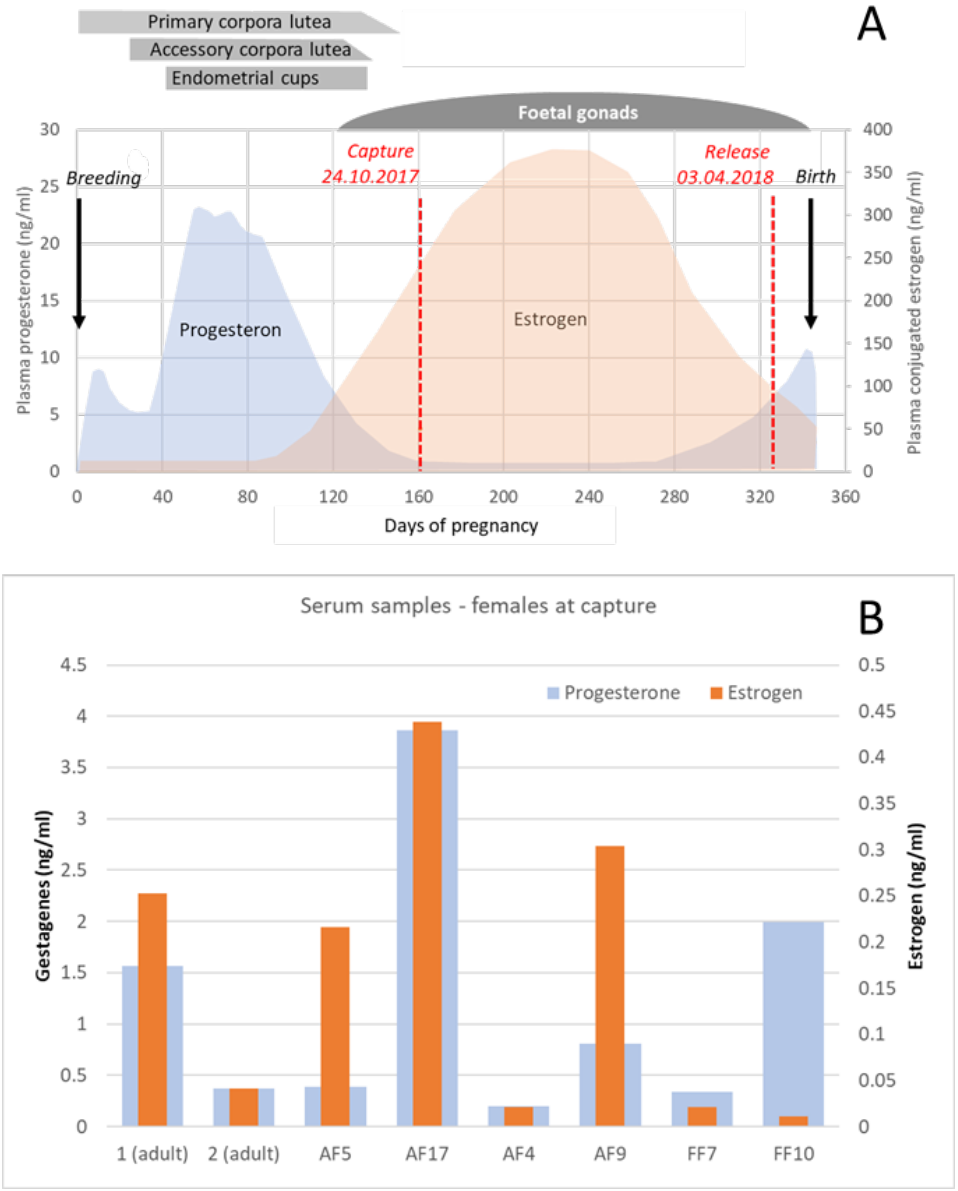


Fig. 43: Estrogene and progesterone in female equids. A: Developmental and endocrinological changes in pregnant domestic horse mares. Adjusted from Allen 2005; B: Serum samples of all females kulan handled in Altyn Emel NP on 23 Oct 2017.

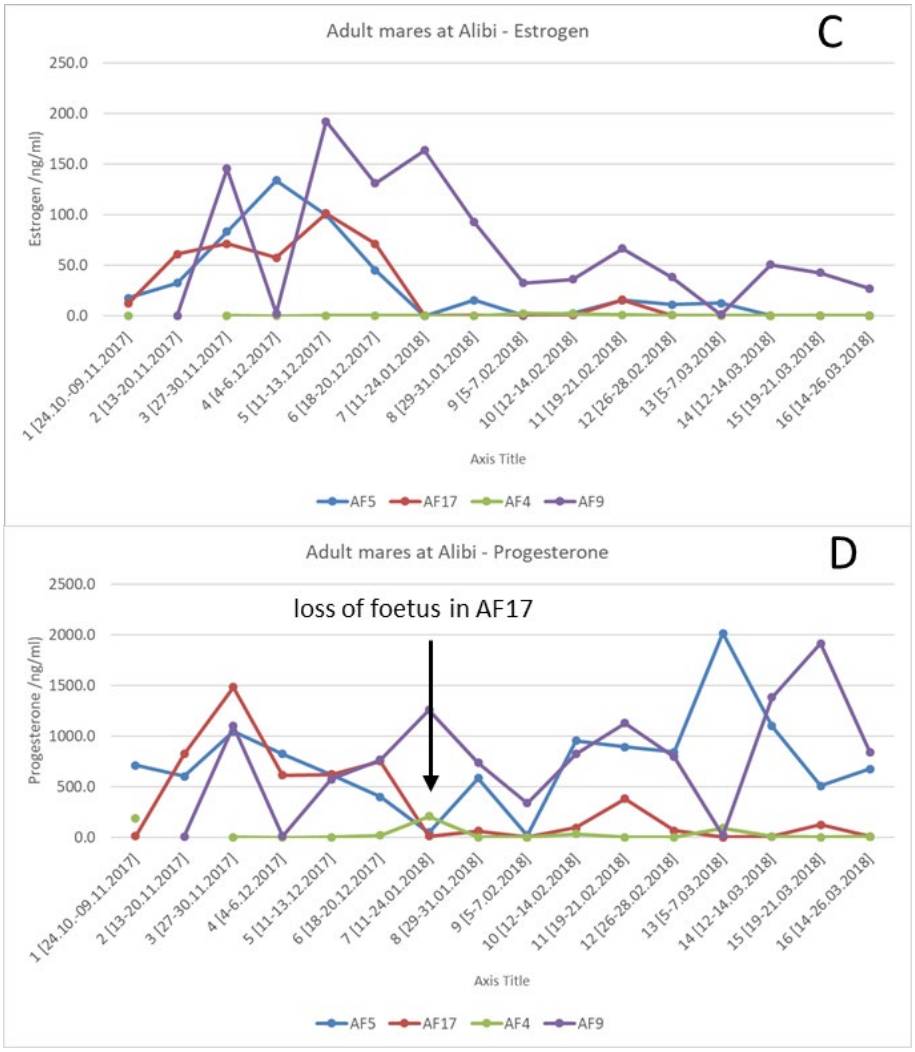


Fig. 43 con't:C: Faecal estrogen levels for the 4 translocated adult mares in the acclimatization enclosure in Alibi field station; D: Feacal progesterone levels for the 4 translocated adult mares in the acclimatization enclosure in Alibi field station.

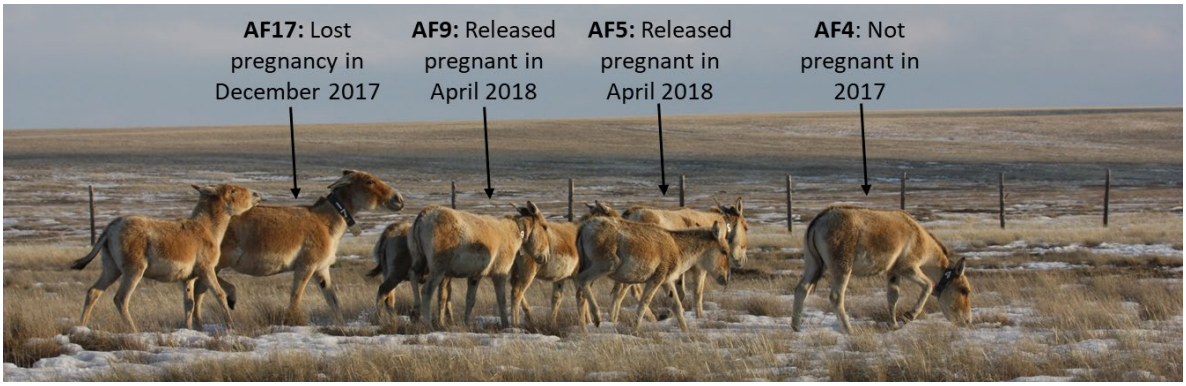


Fig. 44: Pregnancy situation based on estrogen and progesterone levels in faecal samples of the translocated mares shortly before release on 4 April 2018. Photo: N. Petrova and D. Gliga

6 Post-release monitoring 2018 & 2019

The winter 2017/18 was long, cold, and saw frequent snowfalls. By the end of March winter finally loosened its grip and we opened the gates of the enclosure (Fig. 45). But the kulan felt so much at home that it took them until 3rd April 2018, and a bit of persuasion, before they finally left their man-made refuge.

Fig. 45: Open gates at the end of March - but the kulan were not quite ready to leave their home for the last 5 months before 3 April 2018. Photo: Natascha Petrova

6.1 Ground monitoring of GPS collared kulan

6.1.1 Ground monitoring 2018

Pregnancy analysis suggested that mares AF4 and AF5 were released pregnant in early spring 2018. However, ground checks in June did not show the presence of new-born foals with these mares and they likely lost their foals early.

By June 2018, AF5 was travelling alone, mare AF9 together with one of the 2017 foals (likely FF0), and mare AF4 and AF17 were travelling with 3 more kulan, likely their foals (FF7 and FM11) and the subadult stallion SM12. One of the foals (likely FM8) either separated or died.

By July 2018, AF4 and AF17 had also separated and AF17 was travelling with 2 more kulan, likely FF7 and SM12.

By October, AF17 was still travelling with two other kulan, likely her foal FF7 and SM12.

By December, AF9 was still travelling with a second kulan (potentially FF0), AF5 was alone, and AF4 was also alone; so either this second foal (FM11) separated or died. On 27 December, the collars of AF4 stopped moving and subsequent ground investigation confirmed that the mare had been poached (see Fig. 46, Table 8).

Fig. 46: Photographs from ground checks of translocated, free-ranging kulan in 2018. Photos: ACBK

6.1.2 Ground monitoring 2019

By January 2019, AF5 was observed alone.

By February 2019, AF5 was still observed alone.

By February 2019, AF5 was observed alone, but in association with a group of domestic horses. Kulan AF9 was observed with another kulan (FF0?).

By April 2019, AF9 was observed with another kulan (FF0?) from the helicopter also used for saiga counting.

By July 2019, AF5 was still alone and there was no sign of a newborn foal.

In October 2019, mare AF5 was observed and filmed by unknown local people from of a vehicle and this video was posted on Facebook and shared widely (see: https://www.facebook.com/acbk.eng/videos/441572356482257/).

In December 2019, the collar of AF5 stopped moving and subsequent ground investigation confirmed that the mare had been poached, Fig. 47, Table 8).

By February 2020, AF9 was observed with another ear tagged kulan (hence not FF0 as previously assumed, the 2nd kulan also appears to be a male), but without a new foal from 2019.

Fig. 47: Translocated, free-ranging kulan in 2019. Photos: ACBK

Table 8: Ground checks on translocated kulan on the Torgai steppe in 2018 & 2019.

Date	Time	Kulan ID	Latitude	Longitude	N kulan	Comments
26.06.2018	15:50	AF5	49.32150	64.23861	1	No new foal, *photos*
27.06.2018	20:35	AF9	49.15703	64.55472	2	No new foal, *photos*
28.06.2018	11:30	AF4, AF17	49.23831	65.90662	5	No new foal, *photos*
22.07.2018	11:45	AF4, AF17	48.58925	64.12222	5	No new foal, *photos*
22.07.2018	19:20	AF5	48.51472	63.35528	NA	Not found, only footprints
03.10.2018	14:30	AF17	49.74319	67.36167	3	*photos*
06.12.2018	14:38	AF9	49.68053	65.87361	2	*photos*
12.12.2018	14:05	AF5	49.67261	64.19444	1	*photos*
23.12.2018	11:50	AF4	48.71475	64.39417	1	*photos*
14.01.2019	12:25	AF4	48.55617	64.73389	1	Dead – poached, *photos*
24.01.2019	15:50	AF5	49.62997	64.97889	1	*photos*
27.02.2019	13:10	AF5	49.94461	65.25778	1	kulan with horses, *photos*
28.02.2019	NA	AF9	NA	NA	NA	Snowmobile breakdown
28.04.2019	18:50	AF9	49.56167	65.83361	2	from helicopter, *photos*
22.07.2019	16:35	AF5	48.43773	66.63623	1	No new foal
27.12.2019	07:00	AF5	49.91474	65.97014	1	Dead – poached, *photos*
24.02.2020	14:20	AF9	49.43500	65.79674	2	No new foal (2nd kulan is a foal from 2017), *photos*

Ground monitoring has been challenging due to the large distances kulan moved from the acclimatization enclosure. Furthermore, kulan are not seen as a priority for protected area or Ohotzooprom rangers, who are primarily trying to clamp down on the saiga poaching issue. The increase in saiga and the presence of breeding male saiga suggest that they are successful in this activity, although poaching obviously remains a widespread problem.

Overall, more and better documented efforts are needed to follow translocated kulan – at least those with GPS collars who may also reconnect with uncollared individuals (e.g. AAF17, FF7, SM12, FF0, FM8, and FM11) we have lost track of.

6.1.3 Kulan poaching

6.1.3.1 Mare AF4

The collar of AF4 stopped moving on 27.12.2018 at 07:00 and subsequently went into mortality mode on 30.12.2018 at 11:00. A first ground examination on 16.01.2018, revealed the carcass of a kulan with an eartag (blue tag with #5) but without a collar. Near the carcass were tracks of several vehicles. In addition, 3 plastic shotgun cartridges were found. The throat of the kulan had been cut, but no body parts had been removed or any meat taken. There were signs of scavenging, by foxes and wolves (Fig. 48). The ground team was unable to find the collar but restricted their activities to a minimum in order not to disturb the crime scene.

ACBK reported the incident to the police of Karaganda region to initiate a criminal case (this is a requirement in the case of killing or harming a species listed on the Red List of Kazakhstan). Furthermore, ACBK sent a letter to the Committee of Forestry and Wildlife of the Ministry of Ecology, Geology and Natural Resources of Kazakhstan.

The local police initiated an investigation in the course of which they confiscated the entire carcass. The ACBK ground team subsequently returned to the crime scene to search for the collar, which was found 100 m away under the snow. No details of the investigation were revealed and by the end of 2019, the case was closed due to the lack of evidence as to who may have killed the animal.

Fig. 48: Ground inspection of poached kulan mare AF4 16.01.2019. Photos: ACBK

6.1.3.2 Mare AF5

The collar of kulan mare AF5 stopped moving on 20.12.2019 at 14:00. Ground investigation by ACBK field staff on 26 December showed the remains of a kulan and vehicle tracks next to it. This time, the carcass had been removed and only the cut-off head and cut-off collar remained (Fig. 49).

The team immediately informed the Arkalyk police department in Kostanay region. An investigation and a criminal case were initiated. The poaching case was shared on social media and people reacted very strongly and angrily about this second case of kulan poaching.

Fig. 49: Ground inspection of poached kulan mare AF5 26.12.2019. Photos: G. Sadvakasov, ACBK

6.2 Kulan movements

Since October 2017 we have equipped 14 kulan with GPS satellite collars (GPS Lite & GPS Plus; Vectronic Aerospace, Berlin, Germany). Of those 14, 2 were monitored in Altyn Emel NP, 6 in Barsa Kelmes SNR, and 5 on the Torgai steppe (translocated kulan; Table 9).

Table 9: Overview of kulan monitored in Kazakhstan from October 2017 to December 2019.

Area[1]	Start date	End date	#	Kulan ID[2]	Sex	Age	Collar #	Collar ID	drop date
AE	23.10.2017	ongoing	AE1	AF14	f	7	14	26852	20.10.2020
AE	23.10.2017	ongoing	AE2	AF7	f	10	7	26850	20.10.2020
TS	23.10.2017	20.12.2019 (poached)	AE3	AF5	f	7	5	26860	20.10.2020
TS	23.10.2017	20.10.2018 (dropped)	AE4	AF17	f	7	17 camera	26176	20.10.2018
TS	23.10.2017	27.12.2018 (poached	AE5	AF4	f	6	4	26855	20.10.2020
TS	23.10.2017	ongoing	AE6	AF9	f	5	9	26859	20.10.2020
TS	07.10.2019	ongoing	BK7	AF19	f	>10	19	32671	20.09.2022
TS	08.10.2019	11.10.2019 (euthanized)	BK8	AM13	m	>10	13	26862	22.04.2022
BK	25.04.2019	ongoing	BK1	AF2	f	adult	2	26863	20.10.2021
BK	25.04.2019	ongoing	BK2	AF3	f	adult	3	26861	20.10.2021
BK	26.04.2019	ongoing	BK3	AF18	f	adult	18 camera	26177	20.04.2020
BK	28.09.2019	ongoing	BK4	AF6	f	2-3	6	26854	20.07.2022
BK	03.10.2019	ongoing	BK5	AF15	m	3-4	15	26857	20.04.2022
BK	03.10.2019	ongoing	BK6	AF1	f	5-6	1	26851	20.07.2022

[1]AE = Altyn Emel NP, TS = Torgai steppe (translocated), BK = Barsa Kelmes SNR; [2]AF = Adult female, AM = Adult male; f = mare, m = stallion

6.2.1 Translocated kulan on the Torgai steppe

The 9 kulan were successfully released on 3 April 2018. Telemetry data showed that the 4 collared mares stayed closely together in April. Subsequently the group started to split up: on 21 May 2018 mare AF5 separated from the group, followed by mare AF9 on 27 June 2018, and mare AF4 on 19 August 2018. Since that time all 4 mares have travelled independently of each other within the same broad area, with little evidence of them “trying to reconnect”. All four have stayed within a 150 km radius of the acclimatization enclosure.

The total area covered by the 4 collared mares from release in April 2018 until end of December was 55,118 km^2 (note AF17 collar dropped on 20.10.2018 and mare AF4 was poached on 29.12.2018). The total area covered by the two remaining collared mares between January 2018 and October 2019 was 69,429 km^2 and saw a shift to the SE, due to the movements of AF5 (Fig. 50-top).

The total area covered by all translocated kulan since release in April 2018 was 89,193 km^2 (Fig. 50-bottom). Kulan space use has been remarkably well aligned with the network of protected areas and ecological corridors of the Torgai steppe, but has also expanded into the surrounding unprotected area. Kulan AF5 encountered the new railway between Dzhezkazgan and Saksaulsk in the south, which she successfully crossed 7 times in 2019 (Fig. 50-bottom).

One collared kulan from the 2019 capture season is currently in the acclimatization enclosure and her movements are therefore constrained to the 55ha fenced area.

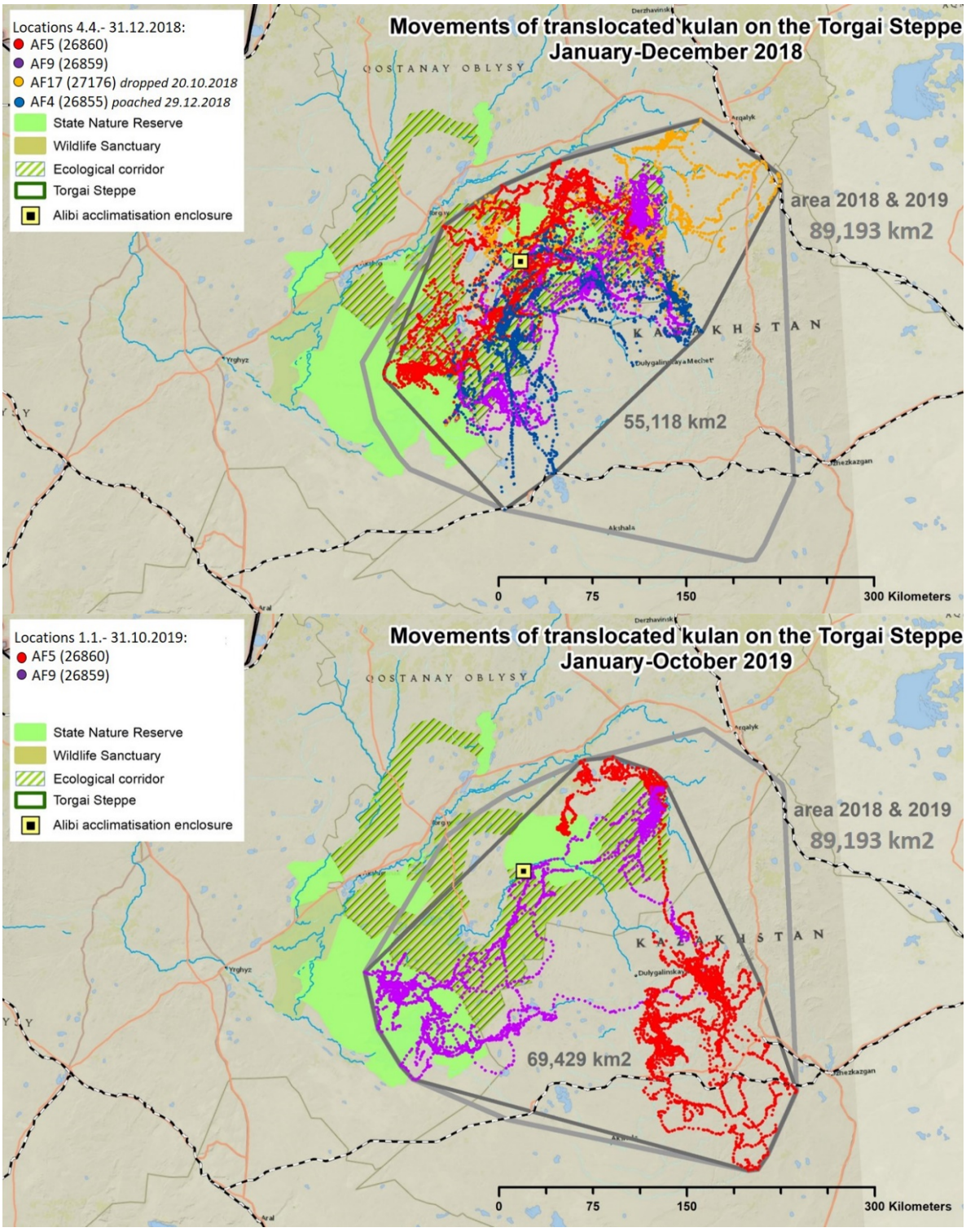


Fig. 50: GPS locations of 4 translocated adult kulan on the Torgai steppe 2018 and 2019.

6.2.2 Kulan in Altyn Emel NP

The two kulan mares in Altyn Emel NP, on the other hand, moved within a very small are small area which was almost identical in 2017, 2018, and 2019. They never crossed into the eastern part of the NP and only rarely ventured out of the NP beyond the western boundary (Fig. 51). Locations were almost exclusively in the plains, with only very few trips into the mountains. The total area covered by the 2 kulan in Altyn Emel NP was 1,397 km^2.

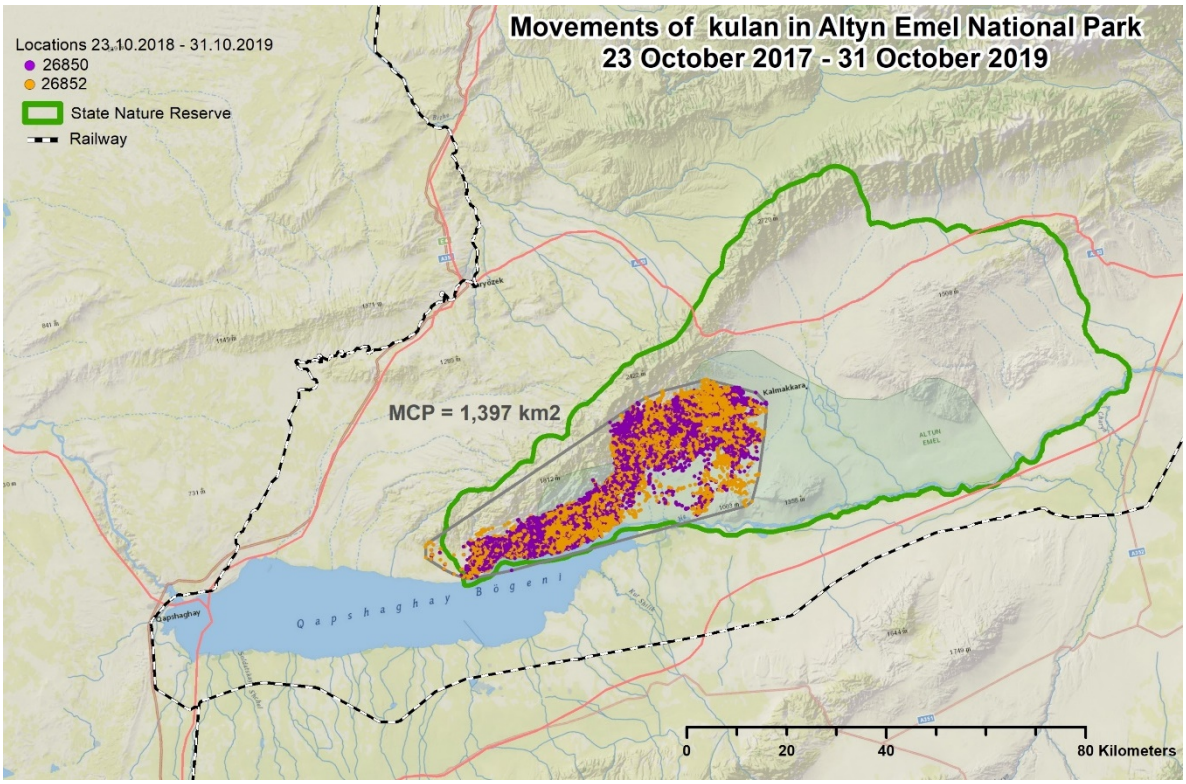


Fig. 51: GPS locations of two adult mares in Altyn Emel NP between October 2018 and October 2019.

6.2.3 Kulan in Barsa Kelmes SNR

Monitoring of kulan in Barsa Kelmes SNR only started in April 2019 with 3 kulan. An additional 3 kulan were collared in October 2019. Until the end of October 2019, these kulan have roamed over an area of 3,816 km^2. The kulan use primarily the Kaskakulan part of Barsa Kelmes SNR, but also venture onto the more recently exposed Aral seabed to the west and south-west and use the former irrigation areas near Karateren in the northeast (Fig. 52). As of the end of March 2020, no animal has moved to the Barsa Kelmes part (west of the Kaskakulan part) of Barsa Kelmes SNR.

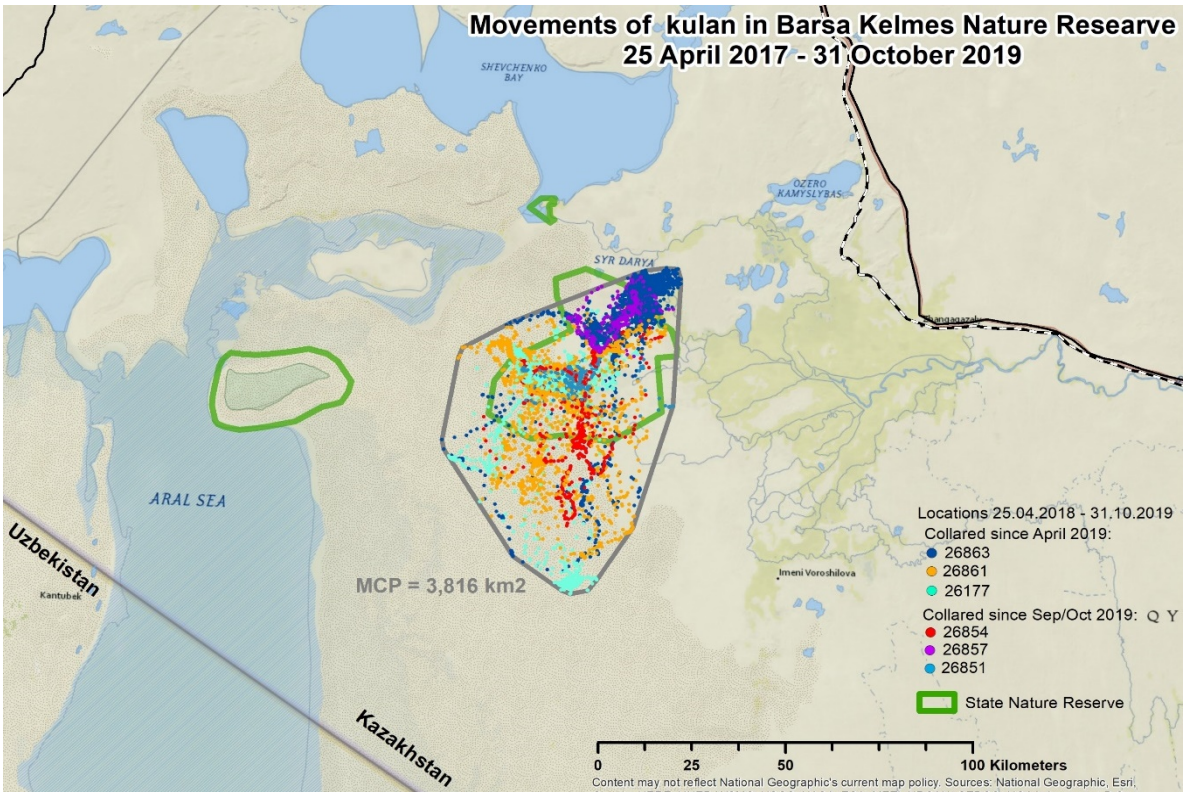


Fig. 52: GPS locations of five adult mares and one adult stallion in Barsa Kelmes SNR between April and October 2019.

6.2.4 Overall comparison of individual "annual" ranges

A comparison of the areas covered each calendar year by individual kulan shows that, by far, the largest ranges are for the translocated kulan on the Torgai steppe with the ranges of 30,000 km^2. This is about the same size ranges that kulan have in the South Gobi Region in Mongolia (Kaczensky et al. 2011, Payne et al. 2020). Kulan in Barsa Kelmes SNR have ranges only about 1/10 of the size of those on the Torgai steppe and the kulan in Altyn Emel NP have ranges less than half the size than those in Barsa Kelmes SNR. Ranges sizes were remarkably consistent for those individuals where data for more than one calendar year was available (Fig. 53).

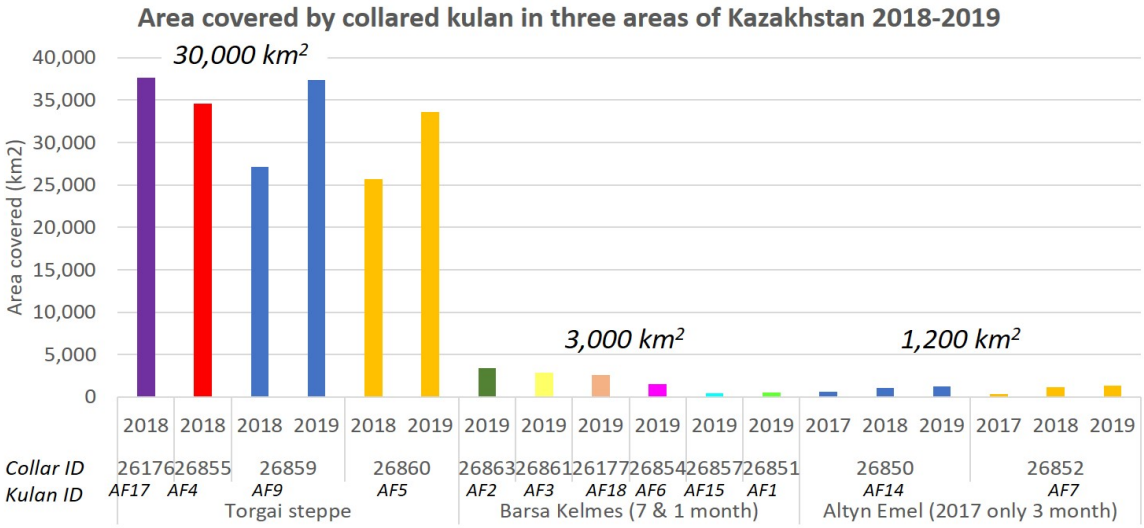


Fig. 53: Comparison of the area around individual kulan GPS positions by calendar year. The areas represent the 100% Minimum Convex Polygons (MVPs).

6.3 Camera collar

The biggest of the adult mares from the 2017 transport, AF17, was equipped with a camera collars (Vectronic Aerospace, Berlin, Germany; also see Kaczensky et al. 2019). This collar was programmed to take a photograph ever 30 min between 8:00 and 20:00 over 12 months. The collar dropped as pre-programmed on 20 October 2018. Unfortunately, the memory card of the camera was corrupted and 90% of the images were erased and the remaining 825 images had no time stamp attached to them anymore – hence an assignment of the images to a specific location was not possible. The retrieved images cover an early period in the acclimatization enclosure (Fig. 54) and an early and late period after release (Fig. 55). The pictures are certainly helpful for communication activities and give some insight into the kulan's behavior.

Fig. 54: Camera collar images from the early days in the acclimatization enclosure at Alibi field station in fall 2017.

Fig. 55: Camera collar images of free-ranging kulan on the Torgai steppe in spring and summer 2018.

7 Pilot camera trapping in Barsa Kelmes SNR

The first camera trap was installed at the *Tree spring* on Kaskakulan at the end of February 2019 and became fully operational by March. Due to the low kulan activity in March, we moved this camera in April to the *Shrub spring*, where it was operational until mid-July. We then moved it into the newly constructed chase-in corral to monitor wildlife visits (data not shown as very few animals visited and the batteries went flat uncharacteristically early).

In September, we deployed 4 new camera traps to monitor the three springs simultaneously until the end of the capture season (Table 10). We used the last new cameras to monitor the big compartment of the capture corral (see point 3.5.4). The five new cameras, which had been purchased by ACBK within the framework of the Central Asian Desert Initiative (CADI; https://cadi.uni-greifswald.de/en/home/), were subsequently handed over to Barsa Kelmes staff for further biodiversity monitoring.

All cameras were programmed to take a burst of 3 photographs, followed by a minimal delay before the next burst of 3 photographs was possible. The total monitoring effort was 186 camera trapping days between 9 March and 9 October 2019 (Table 10). Kulan were photographed at all three springs (Fig. 56).

Kulan use of springs varied by location and time. However, also the small scale location at the spring made a difference; the camera in front of the *Tree spring* picked up more kulan than the camera at the back of the *Tree spring*. The *Tree spring* did not see much kulan activity in spring, but a lot in early fall, the latter was also confirmed by the amount of tracks and dung. The *Shrub spring,* on the other hand, picked up a lot of kulan activity in spring and summer before the feed-in corral was built, but very little activity in fall when the feed-in corral was present. Whether Kulan shifted their activity to the *Tree spring* because of the disturbance caused by the construction and the new structure or some other natural occurrence, we currently do not know. Given the short time monitoring period results should not be overinterpreted.

Table 10: Camera trapping effort at the three artesian springs on Kaskakulan, March to October 2019.

Location	Camera model	Date start	Date end	Days	N images	N kulan images	Kulan / day	% kulan
Tree spring (front)	Rykonex PC900	09.03.2019	26.04.2019	48	3,183	614	66	19.3
Shrub spring	Rykonex PC900	26.04.2019	14.07.2019	79	8,657	3,575	110	41.3
Tree spring (front)	Seelock	18.09.2019	09.10.2019	17	8,207	2,346	483	28.6
Tree spring (back)	Seelock	24.09.2019	30.09.2019	6	207	117	35	56.5
Shrub spring	Seelock	18.09.2019	09.10.2019	21	201	5	10	2.5
Big spring	Seelock	18.09.2019	24.09.2019	15	2,881	2,291	192	79.5
		30.09.2019	09.10.2019					

[1]Batteries went almost flat on 5.10.2019, after which only daytime images were taken

Kulan (39% of all images, including empty ones; Fig. 56), steppe eagle (*Aquila nipalensis*; 12%) and wild boar (*Sus scofa*; 4%) were the animals most frequently photographed. Other species were very rare (<1%), but included goitered gazelle (*Gazella subgutturosa*), foxes (both red *Vulpes vulpes* and corsac fox *Vulpes corsac*), wild cat (*Felis lybica*), grey wolf (*Canis lupus*), golden jackal (*Canis aureus*), hare (*Lepus tolai*), and corvid birds (magpie *Pica pica*, and raven, crow, rook, *Corvus* spec.). In addition, several raptors and owls (including an eagle owl *Bubo bubo*) as well as multiple small birds were photographed (Table 11, Fig. 58).

Fig. 56: Selection of zoomed in camera trapping images of kulan at the three waterpoints on Kaskakulan, Barsa Kelmes SNR between March and October 2019. Photos: Rykonex PC900, J. Linnell and Seelock, ACBK

Camera traps documented the first new born kulan foal at the *Shrub spring* on 11 May. On 10 different occasions the cameras took photos of collared kulan: 6 times between 20 September and 5 October at the *Tree spring* (front; 4 x camera collar #18, 2 x a regular collar but the number was not visible) and 4 times (2 times each on 5 & 9 October) at the *Big spring* (1 x collar #1 see 3.5.4, 3 x a regular collar but the number was not visible). The total number of photos with a collared kulan was only 11 or 0.12% of all kulan photos.

Table 11: Species documented by camera traps at the three artesian springs on Kaskakulan, march to October 2019.

Location	**Tree spring - front**	**Shrub spring**	**Tree spring - front**	**Tree spring - back**	**Shrub spring**	**Big spring**	**Sum**
Camera model	Reconyx PC900	Reconyx PC900	Seelock	Seelock	Seelock	Seelock	
Start	09.03.2019	26.04.2019	18.09.2019	24.09.2019	18.09.2019	09.10.2019	**09.03.3019**
End	26.04.2019	14.07.2019	09.10.2019	30.09.2019	09.10.2019	09.10.2019	**09.10.2019**
Operation days	48	79	17[1]	6	21	15[2]	**186**
Kulan	614	3,575	2,346	117	5	2,291	**8,948**
Wild boar	177	746					**923**
Gazelle			57	9	13		**79**
Fox	3	51	102	6	12	8	**182**
Red fox	18	2			3		**23**
Corsac fox			3	3			**6**
Wildcat	12		17		6		**35**
Wolf		12	5				**17**
Jackal		6					**6**
Wolf or jackal		2					**2**
Hare		3	6		6	76	**91**
Steppe eagle		2,460[3]	347		24	24	**2,855**
Corvids	1	3	34		11	107	**156**
People	173	528	13		21		**735**
Other	102	158	179	9	36	63	**547**
Empty	2,083	1,111	5,098	63	64	312	**8,731**
Total	**3,183**	**8,657**	**8,207**	**207**	**201**	**2,881**	**23,336**

[1]Batteries went almost flat on 5.10.2019, after which only daytime images were taken, [2]Camera did not work between 9-18.10.2019, [3]At some point steppe eagles started to sit on the camera itself which resulted in hundreds of images of tail feathers.

Diurnal pattern of species images showed that kulan and wild boar came to the springs almost exclusively at night with a peak at 1:00, whereas steppe eagles only came during the day with a peak at 13-14:00 (Fig. 57 top). Data for the other species is scarce, but show foxes and wildcat mainly visiting at night, hares strictly visiting at night, gazelles visiting day and night, and wolves or jackals visiting in the early morning and evening (Fig. 57 bottom).

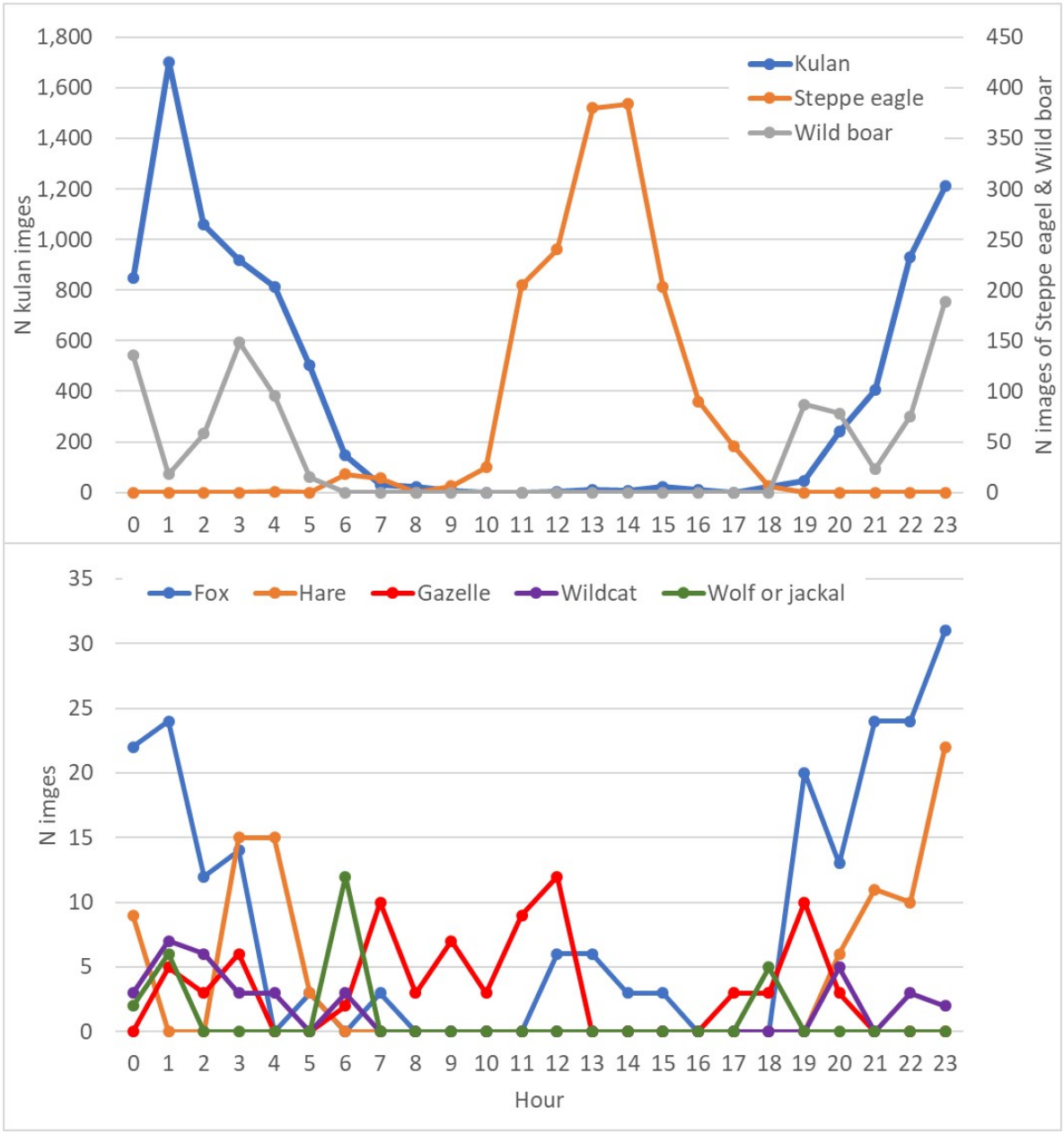


Fig. 57: Diurnal pattern of species on camera trap images from three waterpoints on Kaskakulan, Barsa Kelmes SNR between March and October 2019.

Fig. 58: Selection of zoomed-in images of other wildlife visiting the three waterpoints on Kaskakulan, Barsa Kelmes SNR between March and October 2019. *Photos: Rykonex PC900, J. Linnell and Seelock, ACBK*

8 Pilot drone survey in Barsa Kelmes SNR

8.1 Background

Unmanned aerial vehicle (UAV) technology is increasingly used to estimate the population size and distribution of wildlife. In 2019, ACBK purchased an UAV Supercam S350 drone (http://unmanned.ru/uav/supercam.htm). The drone is registered in Kazakhstan with civil aviation authorities and Albert Salemgareyev, Aleksandr Putilin, and Renat Eskazyuly received a 2-week training and a drone pilot license and proceeded with the test of photo surveys of kulan on the territory of the Barsa Kelmes SNR.

The main aim was to conduct a first pilot survey of the kulan population in Barsa Kelmes SNR to test:

- Whether the UAV is suitable for aerial counting of kulans under field conditions (wind, temperature etc.).
- What camera and flight configuration is best to obtain images of sufficient resolution to identify and count kulan and goitered gazelles.
- Get a feeling for how much effort is needed to get a representative coverage.

The results were meant to be the basis for further kulan and other wildlife surveys in Kazakhstan.

8.2 Equipment

We used a Sony α6000 camera (with a visual angle of 70º) with a 20 mm fixed focus lens (aperture f2.8). When using this equipment and with the anticipated flight heights of 250m, the ground sampling distance was 4.9 cm/pixel and an image covering 294x165 m on the ground. The former should provide a sufficiently high resolution to identify kulan on the ground, whereas the latter provides a reasonable strip width (Table 12, Fig. 14).

Table 12: Relevant technical specifications of the Sony α6000 used with the UAV Supercam S350.

Type	Digital camera
The lens mount	The Nikon E mounts (with AF-coupling and AF contacts)
Sensor	24,3 MP APS-C (23.5 x 15.6 mm)
Image size (pixels) 16:9	Highest resolution: 6000 x 4000 (20m)
Exposure mode	Program automatic mode with flexible adjustment (P), automatic mode with shutter priority (S), automatic mode with aperture priority (A), manual mode (M)
USB	High-speed USB
Camera dimensions (W x H x D)	120 x 66.9 x 45.1 mm
Weight	344 g

8.3 Results of the pilot survey

The flights were carried out at a speed of 80 km/h. The longitudinal and transverse coverage of the images was 60%. With these parameters, the shooting frequency was set to 2 seconds.

We focused our survey on the Kaskakulan section of Barsa Kelmes SNR from the Zhanakurylys-Karateren graded road in the north to the Akbasty hills in the south and from Uzynkair in the west to the Karaaryk river in the east. Hence, we covered the main territory on which rangers count wildlife (Fig. 59). With 4 days of flying, the total length of our flight routes where photographs were taken for counting kulan was 1,130 km on which we took a total of 15,884 images (Table 13).

Table 13: Summary of the survey effort on 4 flying days in fall 2019.

Dates	Flight duration (h:mm)	Effort – transect length (km)	N images
16.09.2019	3:38	282	5,076
17.09.2019	3:13	261	4,824
26.09.2019	1:31	120	778
09.10.2019	5:09	467	5,206
Total:	**13:31**	**1,130**	**15,884**

The first two flight routes were flown at a spacing of 5km to cover the entire territory of Kaskakulan (2,000 km^2) resulting in a flight effort of 543 km, covering 160 km^2 (0.294km*543km) or roughly 8% of the territory.

A first screening of the images did not reveal any kulan and only 1 group of domestic horses (Fig. 60). Therefore, we next attempted a total coverage of a selected area (ca. 32 km^2), where kulan were frequently seen during the day (Fig. 59).

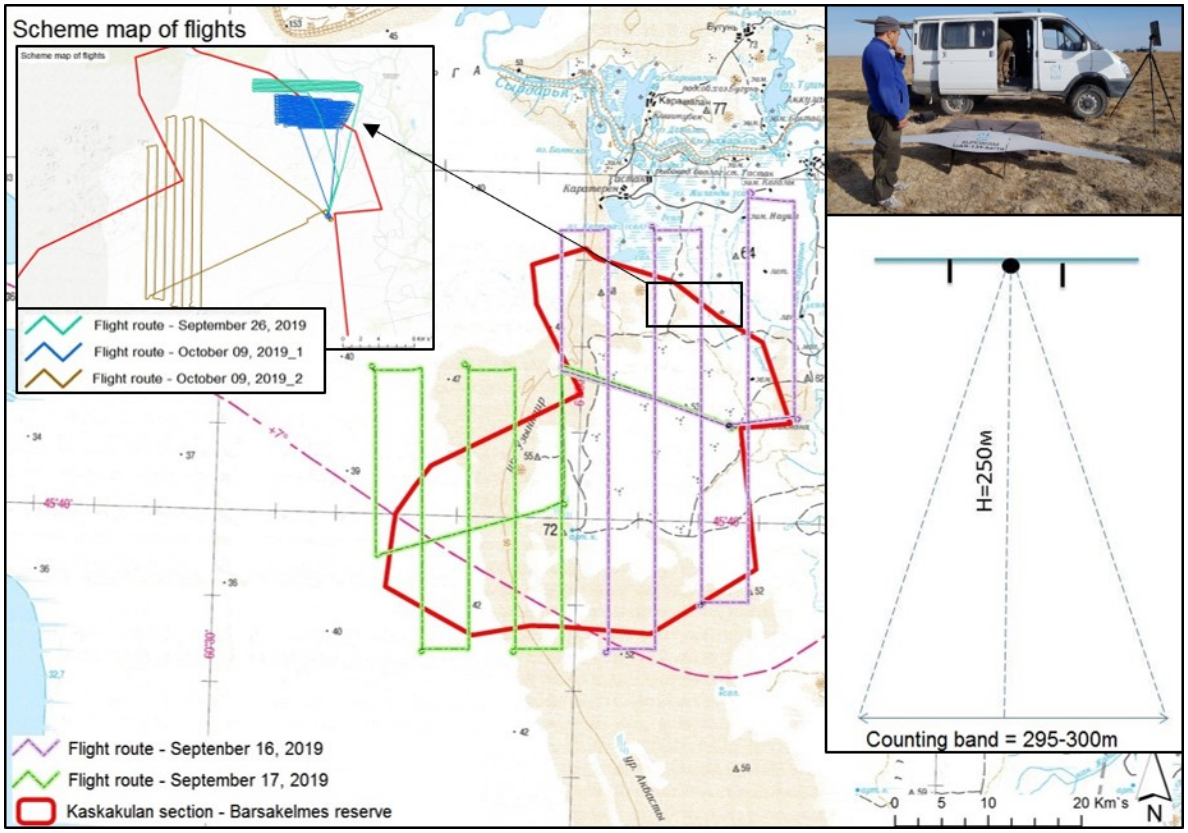


Fig. 59: UAV Supercam S350 flight routes in Barsa Kelmes SNR in September/October 2019.

The results of the kulan survey showed:

- The best time for survey was from 7:30 to 11:00 and again from 16:00 to 19:00, when the wind speed does not reach more than 8-10m/s. Winds of 8-10m/s did not result in any problems for the drone to fly or take clear images.
- No kulan were detected in any of the images, although domestic horses were immediately obvious. However, domestic horses are multicolored and have a much better contrast against the background than kulan. In addition, the group of domestic horses was located in the open. Any animals standing in the shrubs would be much harder to detect. Hence a ground sample distance (GSD) of 4.9 cm seems too low, especially when aiming to also detect smaller species like goitered gazelles.

Recommendations for future surveys:

- To increase the strip width and/or the ground resolution, we recommend in the future to use two cameras and upgrade the camera type from the 24.4 MP Sony α6000 to the 42 MP Sony RX1RM2 camera.
- Aim for a spatial resolution of 2.5-3 cm based on experiences with a multi-species aerial survey taking aerial photographs from a small fixed-winged aircraft.
- With a Sony RX1RM2 camera (sensor width 35.9mm, image: 7942x5304 pixels, focal length 20mm) and a flight height of 130 m, one gets a ground sampling distance of 2.9 cm and an image covering 233x156 m on the ground. With 2 cameras, that would allow for a strip width of ca. 450 m (a 50% increase in coverage to the pilot survey and a 69% increase in resolution; see Table 14 for comparison). Ideally one would use the 50mm lens to be able to fly higher.

Table 14: Comparison of Sony α6000 and Sony RX1RM2. Specifications of the pilot survey marked bold.

Parameter	Sony α6000	Sony RX1RM2
Sensor (mm)	23.5 x 15.6	35.9 x 24.0
Max image size (pixel)	6,000 x 4,000	7,952 x 5,304
Focal length (mm)	20	20
GSD & image width at height 250m	**4.9 [294 x 165]**	5.7 [449 x 300]
GSD & image width at height 130m	2.55 [153 x 86]	2.9 [233 x 156]

$$GSD_w = \frac{Flight\,Height * Sensor\,Width}{Focal\,Length * Image\,Width} \quad GSD_h = \frac{Flight\,Height * Sensor\,Height}{Focal\,Length * Image\,Height}$$

Fig. 60: Drone images (6000x4000 pixels with 4.9 cm/px GSD) of domestic horses in Barsa Kelmes SNR. The ground resolution seems just a bit too low to detect kulan, which have a much lower contrast against the background than multi-colored horses (top), especially in area covered by shrubs (bottom). Photo: Sony α6000, ACBK

9 Outreach and PR activity 2018 & 2019

9.1 Media

The news of the release of the 9 kulan into the wild in early April and the ARTE 360 GEO documentary “The flying kulan of Kazakhstan” in late May were picked up by the international media (list of links in the annexes), raising awareness for the project, species, region and hopefully additional funders.

In addition, several national and regional newspapers in Kazakhstan printed information about the project and the newly released kulan on the Torgai steppe. We also released the 2017 field report as a NINA publication and updated the NINA project website which now includes new sections including an “Picture story of kulan transport and release 2017” and a “Newsblog” section (see 14 Appendix - Press & publications 2018-2019).

9.2 “Kulanmobil" visits to local villages

9.2.1 “Kulanmobil 2018”

Two trips with the information and education vehicle “Kulanmobil” were conducted in 2018, one from 17 to 29 September and one from 10 to 20 November. The aim was to inform local people in the kulan reintroduction area about kulan and the goals and progress of the kulan reintroduction project. The *Kulanmobil* team consisted of ACBK staff Mukhit Suttibayev (PR expert, responsible for the organization of meetings and presentation of the species and project), Baurzhan Iskakov (responsible for the trip logistics) and Dias Kuralbek, a volunteer, who supported the whole campaign and had participated in ACBK activities before.

Letter were sent by ACBK to the district administration, requesting support for the organization and permission to conduct the information events with local people. Upon arrival of the team, the administration of every village was already awaiting them and helped to gather people from the village for the event. The only exception was Sarlyk in Ulytau district of Karaganda region, where the local administration pretended that they had not received any letter. However, the district administration confirmed that the locals in the village were informed and that the school director was ready to support the event. In the end, it was possible to gather people from the village on short notice and to organize an event in the school.

During the outreach campaign the *Kulanmobil* visited 10 settlements during the September trip and 6 during the November trip. The travel distance for both trips was about 2,300 km. Information events were conducted for adults as well as for schoolchildren. In total, 1168 pupils and 629 adults from 20 different schools and/or villages participated in the activities (games, plays) and/or attended presentations around steppe ecology and kulan conservation (Table 15).

For the *Kulanmobil* events we prepared a video about the project using material from the "ARTE" documentary about the kulan capture and transport in 2017. We also prepared a presentation about the project, and updated and re-printed the education and information materials from the previous year:

- Poster "Interesting facts about kulan" (500 copies)
- Poster "Food web of steppe, semi-desert and desert ecosystems" (500 copies)
- Kulan comics 2017 (550 copies)
- Booklets (550 copies)
- Notebooks and pens (300 pcs. each)

For the wall of the meeting rooms, a large banner with the project name was printed. Diplomas and letters of gratitude were printed for particularly active participants of the sessions and winners of competitions (300 copies).

The events were conducted in various formats. In larger settlements, adults and schoolchildren had separate sessions, while in smaller settlements we gathered all together in one room. For the schoolchildren, a presentation about kulan was shown at the beginning, giving a description of the kulan's physical characteristics, behavior, environmental factors influencing it, and the history of kulan reintroduction in Kazakhstan. Afterwards, schoolchildren were invited to play the game "Biocoenosis", for which children took over the role of certain species of animals or plants of the steppe ecosystem. The goal was to identify the connections between the different species and to show the effect of human impacts on the ecosystem. The game also showed the children how the extinction of one species has an effect on all the other species in the ecosystem. The goal of the game was to show that nature is very fragile and every human impact on nature can lead to serious, often unexpected consequences (Fig. 61 & 62).

After the game, the information material (booklets, posters and comics) was given to the children. Especially the comic was very interesting for them, as this is a rather new format for children in rural areas. Immediately all children started reading it. The ACBK team used this interest to invite some children to the stage, write on paper the names of the main heroes of the comic, tape them to the clothes of the children and let them read loudly their role in the comics. At the same time the pages of the comics were project on the wall. Children of higher classes liked the posters and booklets a lot. Posters were taken home to decorate the walls at their home.

In the end, prizes were given to the children that won a drawing competition about kulan. The invitation to conduct this competition had been sent earlier and the children had prepared their drawings already before the *kulanmobil* arrived in their village. From the drawings, the ACBK team selected from each school the best three, and these children received diplomas, letters of gratitude, notebooks and pens, as well as booklets and posters. Especially remarkable was the outcome of the competition in the Sh. Valikhanova school in Arkalyk, where the children had prepared 40 artworks of high quality, which made it hard for the team to choose the winners.

After this part, the children left, and a discussion started with the adults. The ACBK team answered question from the locals, explained the legal background and the conservation status of kulan as well as the prosecution in the case of illegal hunting. The significance of the presence of kulan for the environment was also highlighted.

Questions from settlements, which were visited for the first time, were similar to those in 2017:

- Is it possible to eat kulan meat?
- Is it possible to cross-breed a kulan with a domestic horse?
- Is it possible to domesticate them?
- Is it allowed to hunt them?
- Is there an economic benefit of the return of kulan to the Torgai steppe?

People in the villages, which were visited for a second time, had a generally positive attitude about the project and welcomed it. Interesting remarks from the audience were made in Sarlyk and in Koskol, where people had seen kulan. These observations matched the movement information from the GPS satellite collars of the animals.

Table 15: Stations of the "Kulanmobil" during two trips in September and November 2018.

#	Date	Village	District	Location of event	Number of	
					children	adults
Karaganda region						
1	17.09.2018	Sarlyk	Ulytau	Middle school Sarlyk	44	17
2	12.11.2018	Pioner	Ulytau	Basic school No. 5	14	17
3	13.11.2018	Baykonur	Ulytau	Middle school No. 17	18	55
4	14.11.2018	Koskol	Ulytau	Middle school No. 11	24	74
Kostanay region						
5	19.09.2018	Ekidin	Amangeldy	B. Maylina school	69	16
6	20.09.2018	Zhanakala	Amangeldy	Karatorgai middle school	93	8
7	21.09.2018	Kyzylzhuldyz	Amangeldy	Kyzylzhuldyzskaya middle & general school	63	9
8	24.09.2018	Amangeldy	Amangeldy	Amangeldinskaya middle & general school, B. Koldasbayeva middle & general school , Y. Altynsarina middle & general school	280	30
9	25.09.2018	Urpek	Amangeldy	Zhanaauylskaya middle school	110	17
10	26.09.2018	Kabyrga	Amangeldy	Krupskoy middle & general school	63	12
11	27.09.2018	Kokalat	Zhangeldinskiy	Albarbogetskaya middle school	95	21
12	28.09.2018	Kalam-Karasu	Zhangeldinskiy	Gafu Kaiyrbekova middle school	85	17
13	29.09.2018	Torgai	Zhangeldinskiy	Sh. Valikhanova middle & general school	120	16
14	15.11.2018	Karasu	Zhangeldinskiy	Baytursinova middle school	27	60
15	16.11.2018	Akkol	Zhangeldinskiy	Konkabayeva middle school	23	60
16	19.11.2018	Arkalyk	Torgay	Sh. Valikhanova middle school	32	150
17	19.11.2018	Arkalyk	Torgay	Middle school No. 4	8	50

Fig. 61: Kulanmobil activities 2018. Top: Biocoenosis game, bottom: children with kulan information material. Photos: ACBK

Fig. 62: Kulanmobil activities 2018. Left: available print material, top right: results of drawing contest, and bottom right: winner receiving honors. Photos: ACBK

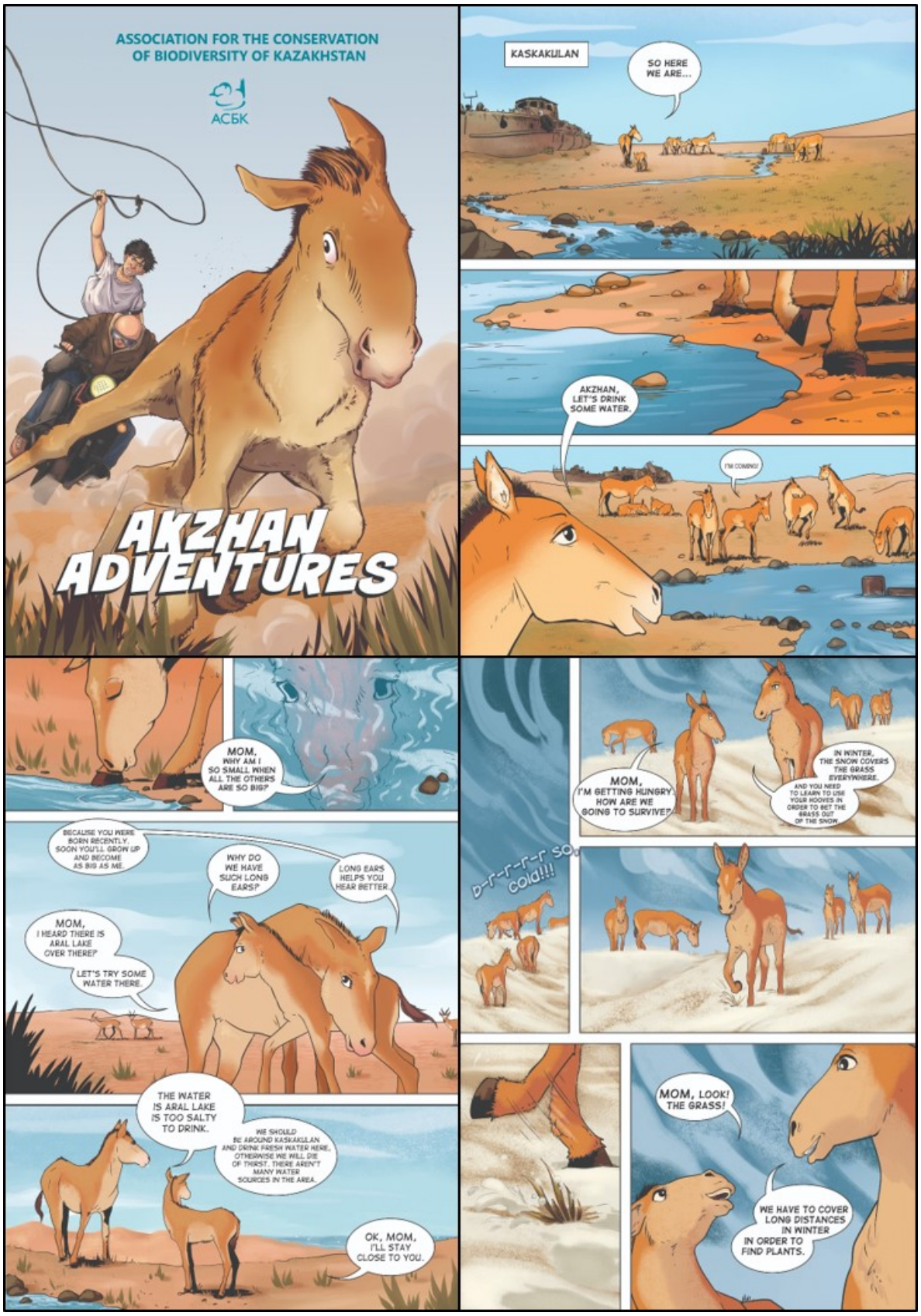
9.2.2 "Kulanmobil 2019"

From 27-30 November 2019, Mukhit Suttibayev organized another tour with the *Kulanmobil*, this time to the Aral region due to our shift of capture efforts. The tour was supported by Barsa Kelmes SNR administration, who provided two vehicles and 17 rangers to help organize the events. The events were organized much like those in 2018. Meetings were held in four villages and five schools and reached more than 300 children and 22 teachers (Tale 16).

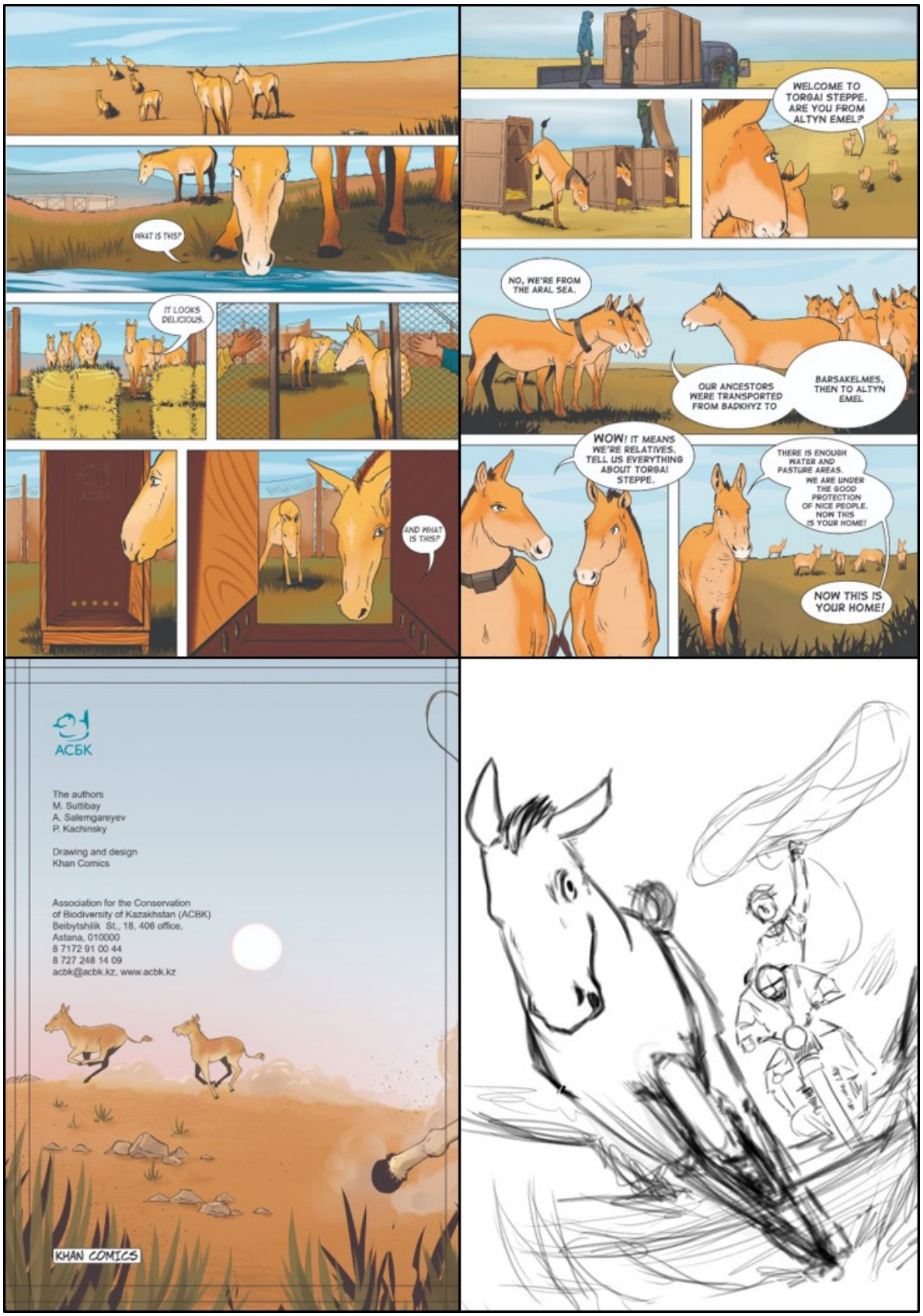
Table 16: Kulanmobil activities in the Aral region in 2019.

Date	Village	Location of event
27.11.2019	Aral town	lyceum №35 & lyceum № 220
28.11.2019	Amanotkel	secondary school №73
29.11.2019	Zhanakurylys	secondary school №74
30.11.2019	Karateren	secondary school №82

The education material in 2019 was supplemented by the new kulan comic "Akzhan's Adventures". The story of kulan *Akzhan* starts out in Barsa Kelmes SNR where she spends her first summer and winter, sees her exploring the landscape outside Barsa Kelmes SNR and follows her to the Torgai steppe in the course of the capture and reintroduction project (see next pages).


ASSOCIATION FOR THE CONSERVATION OF BIODIVERSITY OF KAZAKHSTAN
АСБК
AKZHAN ADVENTURES
KASKAKULAN
SO HERE WE ARE...
AKZHAN, LET'S DRINK SOME WATER.
I'M COMING!
MOM, WHY AM I SO SMALL WHEN ALL THE OTHERS ARE SO BIG?
BECAUSE YOU WERE BORN RECENTLY, SOON YOU'LL GROW UP AND BECOME AS BIG AS ME.
WHY DO WE HAVE SUCH LONG EARS?
LONG EARS HELPS YOU HEAR BETTER.
MOM, I HEARD THERE IS ARAL LAKE OVER THERE?
LET'S TRY SOME WATER THERE.
THE WATER IS ARAL LAKE IS TOO SALTY TO DRINK.
WE SHOULD BE AROUND KASKAKULAN AND DRINK FRESH WATER HERE, OTHERWISE WE WILL DIE OF THIRST. THERE AREN'T MANY WATER SOURCES IN THE AREA.
OK, MOM, I'LL STAY CLOSE TO YOU.
MOM, I'M GETTING HUNGRY. HOW ARE WE GOING TO SURVIVE?
IN WINTER, THE SNOW COVERS THE GRASS EVERYWHERE.
AND YOU NEED TO LEARN TO USE YOUR HOOVES IN ORDER TO GET THE GRASS OUT OF THE SNOW.
D-r-r-r-r SO cold!!!
MOM, LOOK! THE GRASS!
WE HAVE TO COVER LONG DISTANCES IN WINTER IN ORDER TO FIND PLANTS.


FINALLY IT'S SPRING!
AKZHAN, LET'S PLAY TAG. WHO IS THE FASTEST ONE?
MAYA, CATCH ME THEN!
WHAT IS THAT?
IS IT THE SUN??
LET'S RUN!
WOW
I WANT TO HAVE THAT SMALL HORSE OVER THERE. PLEASE, CAN I HAVE ONE!
AHA!
WHAT IS THAT?
Let's find out.
AAAAA
PHEW, FINALLY WE GOT AWAY.
MOM, WHAT IS HANGING AROUND YOUR NECK?
ONE DAY, SOME HUMANS CHASED
AND PUT THIS COLLAR AROUND MY NECK.
I THINK, THEY LIKE IT TO SEE MY LOCATION
BUT DON'T WORRY IT WILL FALL OFF IN TWO YEARS.
DID NOT I WARN YOU THAT IT'S DANGEROUS TO GO BEYOND THE NATURE RESERVE?
THERE ARE INSPECTORS IN THE RESERVE, WHO PATROL THE AREA US. THE INSPECTORS ARE KIND.
MOM, WE GOT CARRIED AWAY WITH THE GAME AND WENT TOO FAR.
SOME BAD PEOPLE WERE CHASING US AND WANTED TO CATCH US WITH THIS ROPE.
I'M SORRY, MOM. I GOT IT NOW.



: “Akzhan’s Adventures”, the 2019 kulan awareness comic.

10 Key lessons learnt

10.1 Capture

Over the two successful capture seasons in 2017 and 2019 we have learnt a lot more in respect to capture, holding kulan in the capture corral until transport, and loading of kulan. This gives us more flexibility to react to the needs of individual kulan, select animals for capture, and decide on capture methods based on kulan presence and distribution. However, capture will always be associated with a low degree of predictability because of the variation in animal behaviour and distribution within and between years.

The key lessons are:

- Night drives into a corral are the only way to capture multiple animals within a short time. Animals captured in this way also tend to belong to a group and likely know each other and are less likely to fight.
- Darting individuals and driving them to the corral is a viable method for targeting specific individuals as a top-up to night chases, or to supplement with specific categories of individuals. The method is not suitable to capture a larger number of animals due to the need to stay within 10-15 km of the corral and the risk associated with having to combine potentially incompatible kulan.
- The annual capture season has a relative short time window:
    - Night drives are only possible during 10-14 days each month during the darkest nights (with a less than half moon, or late rising fuller moon).
    - The overall season is limited to September – October because of the low viability of foals if separated from the mare before this season and difficult weather for transport at the end of the season.
    - Animals can be caught during the day one by one via darting from a vehicle during the whole capture period. However, it creates disturbance in the same area used for the night chase and therefore the two methods interfere with each other.

10.2 Selection of animals for transport

The small number of animals captured and transported does not allow us to draw strong conclusions, but suggests the following:

- Leucocyte Copying Capacity (LCC) in combination with overall blood chemistry appears to be a promising tool to identify individuals with a higher probability of developing problems during transport. Animals with a flat, low LCC curve or blood values deviating extremely from the average values from 2017 and 2019 should ideally not be transported.
- Foals age ≥4 month are able to feed on their own and can bond with females other than their mothers, although they will not be allowed to suckle. Therefore, it seems acceptable to transport mares without their foals and/or foals without their mares.
- However, the difference in body size (and hence variable fit of the transport boxes) and the weaker constitution of foals will likely increase their chances of experiencing problems. We therefore feel that for long and rugged transports, foals should be avoided.
- Adult stallions in their prime may present a bigger challenge to transport due to their overall body strength and stamina. Such stallions may also be incompatible with other kulan in the confined space of a capture corral. During captures in the past, the need to selectively release aggressive stallions came up as did issues with stallions damaging boxes and ultimately themselves (V. Levanov pers. comm. 2017).

10.3 Transport

Over the last three years we explored different capture and transport options for kulan translocations within Kazakhstan. The initial plan of a direct helicopter transport from Altyn Emel NP to the Torgai steppe was realized in 2017 and was the most successful approach (also see Kaczensky et al. 2017, Kaczensky et al. 2018a). A 5-fold increase in the helicopter price in 2018 necessitated a change to a less expensive airplane and truck transport. However, a scarcity of kulan at the capture location and various logistical challenges did not allow for the capture of kulan in time and the transport was cancelled. After re-evaluating the experiences from 2017 and 2018, we decided to switch to Barsa Kelmes SNR for kulan capture. This site is closer to the Torgai steppe (ca. 450 km straight line distance versus 1,200 km to Altyn Emel NP) and allowed a plan for a truck-only transport. Challenges with kulan capture in this new location only resulted in a partial success, but the length of the ground transport did not leave any safety margin in case future road conditions are less perfect than they were in October 2019 (Fig.).

	2017	2018	2019
Area	**Altyn Emel**	**Altyn Emel**	**Barsa Kelmes**
Capture infrastructure	New chase corral built by Levanov	Chase corral built by Levanov	New refined chase corral ACBK & feed-in corral
Transport plan	**MI-26 helicopter**	**AN-12 plane & Kamaz truck**	**Kamaz truck**
Kulan transported	**10 (-1)**	**0**	**3 (-1)**
Kulan captured	53 (11 + 42; 43 released)	0	13 (5 escaped, 5 released)
Kulan planned to transport	16	18	20-30
Route	Altyn Emel – Alibi	Altyn Emel –truck– Almaty –air– Kostanay –truck– Alibi	Barsa Kelmes–Aralsk–Torgai–Alibi
Transport distance	**1,300 km**	**2,270 km [1,490 km AN-12 & 780 km truck]**	**950 km**
Steppe road	0 km	230 km	570 km
# loading/unloading	1	4	1
Transport time	**9 hours**	**29 hours***	**23 hours**
Additional kulan info	2 collared kulan	0	6 collared kulan, camera trapping survey, drone survey
Main obstacles on site	Major conflicts with park, conflicts with veterinarians	Major conflict between park and Okhotzooprom, low number of kulan	New team, new area (saxaul & sand), low number of kulan, corral too low
Additional issues	Poor preparation due to unsuitable national coordinator	Engine failure of plane, airport change from Arkalik to Kostanay	Delayed permit for construction, mandatory Okhotzooprom training
Highlights	MI-26 helicopter transport	Sunsets	High flexibility for different approaches
Kulan transport costs only (€)	**50,000** [now 250,000]	**72,000 (air) & 5,000 (truck)**	**14,500**

**This was the expected time for a transport that was not implemented.*

Fig. 63: Comparison of kulan capture and transport methods, effort, and success in Kazkahstan 2017-2019.

The main lessons learnt from the three different transport approaches are:

- Ground transport from Barsa Kelmes SNR is very long and rough, and brings kulan and the capture team to the limits of human safety and animal welfare - with very little, to no, safety margin in case of problems/delays.
- Ground transport from Altyn Emel NP will be much longer and is not a viable option.
- A combined truck-airplane-truck transport from Altyn Emel NP to Alibi field station involves complex logistics including the adherence to a predetermined, inflexible time table. The overall transport time will be even longer than the ground transport from Barsa Kelmes SNR.
- Given the experience from the last 3 years, the direct helicopter transport is by far the best option for future transports of wild kulan to Alibi field station from Barsa Kelmes SNR or Altyn Emel NP.

10.4 Pre-release enclosure

The acclimatization enclosure worked well and kulan seemed to be in overall good health, although one mare had an abortion for unknown reasons.

The main lessons we learnt:

- The 1.80m fence is sufficient as no kulan escaped or made any obvious attempts to escape even in winter when snow was high.
- Kulan in 2017 immediately used the shelter and accepted water in the water troughs and hay, when it was provided in the shelter. Kulan from 2019 have not been using the shelters, but have accepted hay as additional feed to the vegetation available in the enclosure.
- Monitoring of behavioral, body condition, and faecal parasite loads of known individuals allowed us to assess overall wellbeing and pregnancy status and suggested the animals were doing well and did not suffer from social stress or aggression; but we only had one, young stallion in the group.
- Enclosing an oxbow lake seemed like a good idea to guarantee water supply, but also harbors the risk of kulan breaking through unstable ice in early winter or spring or getting stuck in soft mud during periods of extensive rainfall. However, so far kulan have dealt well with this risk.

10.5 Post-release behavior and monitoring

The animals released in 2018 (from the 2017 transport) appear to have adapted well to their new environment. The lack of reproduction in 2018 may be attributed to the stress of dealing with a new environment and/or higher vulnerability to accidents and predation due to a lack of knowledge of the area and the break-up of the group. Furthermore, the lack of adult stallions in the 2017 transport likely was the reason for the lack of reproduction in 2019.

The translocated kulan have been roaming over a massive area (almost 90.000 km^2) which may limit the ability of males and females to meet during the breeding season – in an area where there are no traditional meeting points, yet. The large range also make ground-based monitoring and pre-emptive anti-poaching patrols extremely difficult. Basically what makes the Torgai steppe so attractive as a release site – its remoteness and inaccessibility – also limits the possibilities for monitoring and transporting kulan.

The implication is:

- It will take repeated transports over multiple more years to reach a sufficient number of founders for this population to establish.
- To continue, we will need access to a considerable amount of funding (which will allow us to cover the costs of helicopter transports), over multiple years, with a patient funder who understands that these projects take time.
- Alternatively or in parallel, we may want to explore the possibility to bring zoo animals from the Turkmen kulan EEP by air to Kostanay and then transport them by truck to Alibi. A large part of the funding for such an operation could come from the zoos, but permits, veterinary requirements, and transport details will have to be carefully evaluated. This approach will use less stressed animals, a more predictable “capture”, a calm air transport in combination with a 7-8 hour truck transport from Kostenay, most of which is on asphalt.
- It is absolutely instrumental to collar translocated kulan to monitor their movement and fate. Therefore efforts should be made to recollar kulan prior to pre-scheduled collar drop

to prolong the monitoring and to collar all uncollared kulan if the opportunity arises (e.g. if seen with a collared individual or prior to release if body size suggests no or only minimal further growth).

- The inability to monitor foals with GPS satellite collars is currently an additional argument against transporting foals; it makes it almost impossible to monitor the individuals whereabouts or assess their survival once they have separated from their GPS tagged mothers.

10.6 Summary

The experience of these years constitutes a proof-of-concept demonstrating that kulan reintroduction to the central steppes is possible, but underlines the logistical challenges associated with making this happen. This includes the need for human capacity to organize the complex logistics, the need for highly skilled veterinarians and capture crews, the need for adaptive management based on sound monitoring, the need for administrative support, the need for large amounts of funding, and the need for a long-term commitment from all partners over a period of 5 to 10 years as a minimum.

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12 Appendix – Summary of kulan capture 2019

QULAN DALA
ҚҰЛАНДЫ ТАРИХИ МЕКЕНІНЕ ҚАЙТАРУ ЖОБАСЫ

Summary of kulan translocation activities - 2019

Background

The plan was to capture up to 30 adult kulan in Barsa Kelmes State Nature Reserve and transport them by truck over 850 km on a combination of asphalt, graded and steppe roads to the release site at Alibi in the central Torgai steppe.

April 2019

A total of 3 kulan were GPS collared in order to gain some insights into how the animals use the landscape to help focus capture activities in fall (see field report 05/2019). In addition, potential sites for corrals were explored and plans were discussed with the protected areas administration.

July 2019

A feed-in corral for capture at spring 2 on Kaskakulan (a former island with 3 artesian springs) was constructed. The site for the chase-in corral near to the Begim-Ana ranger station was selected. Additional meetings were held with the reserve's administration. The entire potential truck transport route from Barsa Kelmes to Alibi was driven to identify bottlenecks and find the best alternative sections.

August 2019

Construction of the chase-in corral 1.5 km from Barsa Kelmes base camp at Begim-Ana ranger tower.

September 2019

Activities in Barsa Kelmes

15 – 19 Sep 2019	Final preparation of corrals. No kulan activity documented (either tracks or camera-trap images) at the feed-in corral on Kaskakulan.
20 – 21 Sep 2019	A total of 3 attempts at chasing kulan into the chase-in corral during day time, of which none is successful.
21 Sep 2019	Arrival of first international veterinarian team.
4 Oct 2019	Departure of first international veterinarian team.
5 Oct 2019	Arrival of second international veterinarian team.
4 – 5 Oct 2019	Modification of chase-in corral by raising fence from 2 m to 2.7 m.
23 Sep – 5 Oct 2019	A total of 7 attempts at chasing animals into chase-in corral at night, of which 3 were successful.
28 Sep – 8 Oct 2019	A total of 10 attempts at darting individual kulan from a vehicle and transporting them back to the corral on the flatbed of the pick-up, of which 3 are successful.
16 Sep – 9 Oct 2019	16 hours and 37 minutes of drone flying to obtain a kulan population estimate for Barsa Kelmes.

1

18 Sep – 9 Oct 2019	5 camera traps active to monitor kulan (and other wildlife) use of water sources on Kaskakulan.
10 October	Immobilisation and boxing of 3 kulan for transport to Alibi.

Animals captured

By night drive	
27 Sep 2019	3 kulan captured: Adult female (5-6 years) and her foal plus another foal. All released on 3.10.2019 – adult female was ear-tagged & GPS-collared [collar 26851 with #1] before release. Female and 2 foals on camera trap at Kaskakulan on 5.10.2019.
2 Oct 2019	5 kulan captured: 3 jumped corral within 5 min of capture, 1 jumped at night, and 1 young stallion was left in the morning. The young stallion (3-4 years) was ear-tagged & GPS-collared [collar 26857 with #15] before release on 3.10.2019.
4 Oct 2019	1 kulan captured: The young stallion (2-3 years) was kept in the corral until 10.10.2019, when he was transported to Alibi. He did not receive a collar due to his small size.
By jeep darting & transport to corral	
28 Sep 2019	1 young female (2-3 years) without foal, ear-tagged & GPS-collared [collar 26854 with #6] in the field, returned to corral but escaped immediately.
29 Sep 2019	1 small, adult female (15 years) not suitable for collaring or transport.
7 Oct 2019	1 adult female (>10 years) with foal, ear-tagged & GPS-collared [collar 32671 with #19] in the field, returned to corral. Kept in corral until 10.10.2019, when she was transported to Alibi.
8 Oct 2019	1 adult stallion (>10 years), ear-tagged & GPS-collared [collar 26862 with #13] in the field, returned to corral. Kept in corral until 10.10.2019, when he was transported to Alibi.

Animals transported

10/11 Oct 2019	1 adult stallion (>10 years; collar 26862 with #13). Euthanized in Alibi due to severe tongue injury and weak condition.
10/11 Oct 2019	1 adult female (>10 years; collar 32671 with #19]. Successfully released into big enclosure in Alibi.
10/11 Oct 2019	1 subadult stallion (2-3 years; no collar). Successfully released into big enclosure in Alibi.

Challenges that we faced from the start

- New area – Barsa Kelmes.
- New team – ACBK (with international support), Barsa Kelmes rangers, Okhotzooprom rangers.
- New way of transporting animals using a 850 km truck transport over a combination of asphalt, graded, and steppe roads.

Impacts of these challenges

- It took time to get to know how animals used the landscape.
- Chasing kulan was challenging due to:

  - Deep irrigation channels which can only be crossed at certain locations by vehicles.
  - Dust stirred up by the vehicles and kulan which greatly reduced visibility while chasing.
  - Areas of soft sand and collapsing gerbil colonies where vehicles easily get stuck.
  - Saxaul bushes with very hard wood which when snapped can easily puncture even solid off-road tires.
  - Stands of high saxaul bushes and sand dunes which make it easy for kulan to shake off pursuing vehicles, particularly in the dark.
- It took time to get the team to work together well and accept constraints and procedures:
  - Daytime chases into the corral are not possible, even if animals are close.
  - Searching for kulan at night once a group is lost is not efficient and just results in disturbance of the area and is hard on the vehicles.
  - The irrigation ditches and saxaul patches made it necessary to plan the night chase carefully, necessitating detours around known obstacles or pre-placing of vehicles ahead of the chase start.
  - Night chases only made sense if groups of around 10 kulan could be spotted in the afternoon at distances of ≤20 km from the chase corral.
- The need to construct a totally new capture infrastructure (corrals) – and the unexpected need to modify the height to 2.7 m after we experienced kulan jumping out of the 2 m high corral.

What we gained?

- 2 kulan were successfully transported to the acclimatisation enclosures in Alibi.
- 3 more kulan were collared in Barsa Kelmes – bringing the number of GPS-collared kulan to six. This is a very good basis for gaining valuable information on movements and habitat use to better protect this very important kulan population and eventually plan future captures.
- Preliminary camera trapping on Kaskakulan – providing first insight into kulan behaviour at water and confirming the presence of other large and medium sized species (e.g. gazelles, wolves).
- The first drone based surveys of kulan to obtain population estimates which can be compared to the ground based population census conducted by Barsa Kelmes staff around 13 October 2019.
- Construction of a functional chase-in capture corral in a good location for future kulan captures.
- Successful implementation of a new capture method – individual darting and transport on a pick-up flatbed to the capture corral.
- Modifications of veterinary procedures and sedative dosage protocols for capture and transport.
- Experience with keeping kulan in a corral for up to one week and with integrating kulan from different captures.
- Experience with different procedures to handle and load kulan into boxes giving higher flexibility in handling depending on the circumstances (i) walking the kulan into the box before full anaesthesia takes full effect, (ii) carrying fully anaesthetized kulan into box and anaesthesia reversal in box, and (iii) reversal of fully anaesthetized kulan in front of box and pushing animal into box with onset of reversal.
- Experience with a long-distance truck transport, which suggests that the combination of a long transport (23 hours) over large stretches on bumpy graded and steppe roads is bringing

the kulan and the capture team close to the limits, leaving no safety margin to deal with unexpected events or difficulties (e.g. delays, car problems, detours, obstacles).

What this means for the future?

- For future transports of wild kulan from both Barsa Kelmes and Altyn Emel to Alibi a ground transport is too long and does not leave enough of a safety margin to deal with unexpected events or delays. Hence we feel the risk for kulan and the capture team is too high. Transport by plane (as was planned in the 2018 season) is not only logistically challenging but also includes a long stretch of ground transport over graded and steppe roads at both ends of the journey. This basically leaves transport using a large transport helicopter - as successfully tested in 2017 – as the only safe option for availing of the wild source populations in Barsa Kelmes and Altyn Emel.
- We now have a larger toolkit in respect to capture, holding in the capture corral until transport, and loading of kulan which gives us more flexibility to react to the needs of individual kulan, select animals for capture, and decide on capture methods based on kulan presence and distribution. Night drives into a corral are the only way to capture multiple animals within a short time. Animals tend to belong to a group and likely know each other and are less likely to fight.
- Darting individuals and driving them to the corral is a viable method for targeting specific individuals as a top-up to night chases, or to supplement with specific categories of individuals.
- However, capture will always be associated with a low degree of predictability because of the variation in animal behaviour and distribution within and between years.
- The annual capture season has a short time window:
    - Night drives are only possible during 10-14 days each month during the darkest nights (with a less than half moon, or late rising fuller moon).
    - The overall season is limited to September – October because of the low viability of foals if separated from the mare before this season and difficult weather for transport at the end of the season.
    - Animals can be caught during the day one by one via darting from a vehicle during the whole capture period. However, it creates disturbance in the same area used for the night chase and therefore the two methods interfere with each other.
- The animals released in 2018 (from the 2017 transport) appear to have adapted well to their new environment (although we have not documented reproduction yet). However, they have been roaming over a massive area (60.000 km^2) which may limit the ability of males and females to meet during the breeding season and which makes any ground-based monitoring very difficult.
    - The implication is that it will take repeated transports over multiple more years to reach a sufficient number of founders for this population to establish.
    - To continue, we need access to a considerable amount of funding (which will allow us to cover the costs of helicopter transports), over multiple years, with a patient funder who understands that these projects take time.
    - Alternatively or in parallel, we may want to explore the possibility to bring zoo animals from the Turkmen kulan EEP by air to Kostanay and then transport them by truck to Alibi. A large part of the funding for such an operation could come from the zoos, but permits, veterinary requirements, and transport details will have to be carefully evaluated. This approach will use less stressed animals, a more predictable

"capture", a calm air transport in combination with a 7-8 hour truck transport from Kostenay, most of which is on asphalt.

Further considerations

- Capture vehicles need to be in good condition and have to be equipped with the most sturdy tyres available. Costs for tyres and suspension of chase vehicles needs to be planned for in the capture budget. A good supply of extra tyres needs to be purchased in advance.
- In order to allow more flexibility in holding kulan from different capture events over a limited period until transport, there is a need to add 2-3 additional small holding corrals as satellites to the main capture corral, particularly to accommodate single stallions.
- The chase-in corrals would profit from additional gates, facilitating release or addition of kulan from different capture events.
- Consider the construction of a small holding corral at Alibi in case a transported animal needs to be monitored or treated for a short period after transport and before release.
- Consider video monitoring of the kulan inside the transport boxes during transport to get a better understanding of their behaviours and possible problems in the crates.

13 Appendix - Protocol of kulan transport 2019

QULAN DALA
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Protocol of kulan transport from Barsa Kelmes to Alibi on 10/11 October 2019

**All times given in Kyzylorda time [UTC+5]*

1. Boxing kulan in Barsa Kelmes

- Adult male (captured by jeep and collared on 8.10.2019**) loaded in new stallion box [Darted at 9:30, boxed at 9:50, standing in box 10:03]
- Adult female (captured by jeep and collared on 7.10.2019**) loaded in box 25 [Darted 10:31, boxed: 10:56, standing in box 10:58]
- Young stallion (captured by night drive on 2.10.2019, no collar**) loaded in box 20 [Darted 10:38, boxed at 10:41 (walked into box), standing in box 10:44]

***All captures occurred without any problems and the all animals coped well with the anaesthesia*

During the boxing procedure we analysed clinical blood parameters giving information regarding the health status of the animals using a field laboratory (VETSCAN; equid settings). None of the boxed animals showed signs of disease or weakness.

2. Anaesthesia protocol

- 0,4 ml Captivon
- 1,2 ml Butorphanol 10 mg/ml
- 1,2 ml Detomidine 10 mg/ml

Reversal of anaesthetic drugs:

0,8 ml M50/50 intra venous for both stallions and 0,25 ml 50 mg/ml naltrexone subcutaneous (sc).

1 ml M50/50 intra venous for the mare and 0,25 ml 50 mg/ml naltrexone sc.

Long acting neuroleptics (= sedation for transport; LANs):

- 30 mg haloperidol and 110 mg perphenazine-decanoate for the young stallion and the mare
- 35 mg haloperidol and 110 mg perphenazine-decanoate for the adult stallion

3. Loading of kulan onto the Kamaz

- Loading of kulan started: 11:59
- Loading of kulan finished: 12:16

Loading went smooth and without problems.

4. Transport to Alibi

- Leaving camp: 13:13
- Ponton bridge: 15:20
- Steppe bridge: 00:24
- Arrival Alibi: 12:04

Total transport time: 23 hours

5. Checking schedule during transport

We conducted short checks every hour and additional checks whenever we needed to stop for other reasons. We minimized all stops to not stress the animals by our presence. We attempted to provide the kulan with water, but none of the animals accepted water so we felt these attempts created more stress than benefits.

- Adult female remained standing throughout the journey, she turned around in her crate at some point facing the opposite direction than she was loaded (this likely happened between the 17:30 and 18:30 check).
- Young stallion was occasionally lying down from the middle of the trip onwards, but was always standing up during the next check.
- Adult stallion had abrasions in the face from the beginning (sustained while being held in the capture corral), but there was no indication of any serious problems. He started to lay down late at night, but was always standing again on the next checks. At the check at 02:17 it became obvious that the stallion was facing problems; he was half down in the box, there was more blood, and he did not respond to being touched. However, in the darkness and the limited vision afforded by the crate we were unable to see the tongue injury which only became obvious after unloading from the crate upon arrival in Alibi.
  In addition, this far into the transport, longer stops would have created problems for the other two animals as unloading and attempts to treat the kulan would have greatly increased the overall transport time, increasing the risk for the other two animals.

6. Unloading in Alibi

6.1. Adult female & young stallion into big enclosure

- Unloading start: 12:06
- Release from box: 12:17

The animals left their boxes calm and in good condition, moving without problems and starting to feed within minutes (see video). Check up around 15:30 showed both animals feeding at the far end of the enclosure, but in separate locations.

6.2. Adult stallion

- Unloading start: 12:45
- Pulled out of box: 12:50
- Euthanasia: 13:20
- Post-mortem conducted: 15:13

Euthanasia protocol adult stallion:
An initial anaesthesia was induced using a combination of:

- 5 ml Detomidine 10 mg/ml intra venous
- 5 ml Butorphanol 10 mg/ml intra venous

When the animal was asleep a 50 ml T-61 injection was given intracardially. The animal at this stage was already deeply anaesthetised, so did not react on the intracardial injection. Listening to the ceased heartbeat with a stethoscope confirmed the death.

Post mortem results of adult stallion:
Summary: Shock and age related alterations (deviations), body condition normal for an animal of this age

Details:

- No intra-abdominal fat stores, some unattached parasitic worms in abdominal cavity.
- *Gastrointestinal tract:* stomach empty, 2/3 of the wall covered with stomach botflies (larval stages of *Gasterophilus intestinalis*), reddening of the duodenal wall, colon (large intestine) tightly packed with ingesta (gut content).
- *Oral cavity:* mild wave formation of the teeth (basically uneven wear), tooth hooks (uneven wear of tooth forming a hook) a on the first premolars of both sides of the mandibula, canines worn down to about 5 mm above gingiva level, tongue laceration about 7 cm in length completely splitting the tongue tissue into 2 longitudinal parts and 1 part divided by 2 further lacerations of 1-3cm cm length
- Left eye showed corneal oedema (whitening of the eye)
- *Kidneys*: no fat around kidneys, could not be released out of capsule without loss of substance (=not normal), left kidney no structural abnormalities but gelatinous mass in kidney pelvis, right kidneys some infarction zones (visible as lighter coloured areas in between unaffected dark red areas)
- *Liver*: without findings
- *Spleen*: severely depleted, only connective tissue left
- *Testes*: equally sized, soft, low activity (season related)
- *Lungs*: left lung lobes well collapsed, (= normal) right lung lobe not completely collapsed but no abnormalities on cut surfaces apart from mild anthracosis on the surface
- *Heart*: filled with coagulated blood, no abnormalities apart from euthanasia artefacts, left heart chambers with very thick wall (about 2.5cm) relatively large size compared to body size
- *Pelvic limb muscles*: gross section of the pelvic limb muscles dark red, no abnormalities visible

7. Overall assessment of the transport

Every capture and transport of wild animals is associated with a certain risk of injury or death. Using the best available practices and veterinary procedures can minimise these risks, but never exclude them totally. In this case we cannot see any aspects of the handling procedures which could have been done differently to prevent the stallion`s injuries because it appears to have been due to an unfortunate accident (the biting of the tongue) of the type that cannot be prevented or treated. The bite to the tongue was so severe that it would have been impossible to feed and survive such that it would have had a painful death within a short period of time so that humane euthanasia was the only viable option to minimise suffering.

8. Responsible team

Petra Kaczensky, Wildlife ecologist at NINA, Norway; Alibi 11.10.2019

Endre Sos, Veterinarian at Budapest Zoo, Hungary; Alibi 11.10.2019

John Linnell, Wildlife ecologist at NINA, Norway; Alibi 11.10.2019

Christina Geiger, Veterinarian at Frankfurt Zoo, Germany; Alibi 11.10.2019

Albert Salemgareyev, Wildlife ecologist at ACBK; Alibi 11.10.2019

Nikolaus Huber, Researcher at Veterinary University Vienna, Austria; Alibi 11.10.2019

14 Appendix – Press & publications 2018 – 2019

14.1 Press & publications 2018

14.1.1 International

- Helen Briggs, H. 2018. Last of the wild asses back from the brink. BBC News Science & Environment, 18 April 2018; http://www.bbc.com/news/science-environment-43799388
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14.1.3 Scientific publications & presentations

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- Helmut Mägdefrau. 2018. Translocation of kulans in Rebublic of Kazakhstan. EAZA Annual Conference. 17 September 2018 in Athens, Greece.
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14.2 Press & publications 2019/2020

14.2.1 International

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14.2.2 National – Kazakhstan

- Қазақстанда жойылып кеткен құлан қайта көбейе бастады – вице-министр http://lenta.inform.kz/kz/kazakstanda-zhoyylyp-ketken-kulan-kayta-kobeye-bastady-vice-ministr_a3602610?fbclid=IwAR2j1pcmWZwAcEWiNlZua7Af57NuV3ocSpwWBAUooxeQkufFGY0ZPKqAQZQ
- Скорая помощь кулану http://bit.ly/2SPwVZJ
- Краснокнижная жертва браконьеров (про кулана) http://bit.ly/2OZWNRf
- Браконьеры убили кулана, выпущенного в Тургайскую степь http://bit.ly/38uv5UB
- Полицейские обходят дома в Костанайской области в поисках браконьеров (о кулане) http://bit.ly/2SOexjW
- Браконьеры убили выпущенную в степь самку кулана http://bit.ly/322hd1s
- Браконьеры убили краснокнижного кулана в Костанайской области (есть видео) http://bit.ly/38xCRgo
- Браконьеры убили краснокнижного кулана в Костанайской области http://bit.ly/2vDq25F
- В Костанайской области браконьеры убили самку кулана http://bit.ly/39J8OTo
- Полицейские продолжают искать браконьеров, убивших самку кулана http://bit.ly/39EGgKt
- Неизвестные убили кулана, отслеживаемого с помощью GPS http://bit.ly/38zlqvP

14.2.3 Scientific publications & presentations

Publications:

- Huber, N., V. Marasco, J. Painer, S. G. Vetter, F. Göritz, P. Kaczensky, and C. Walzer. 2019. Leukocyte Coping Capacity: An Integrative Parameter for Wildlife Welfare within Conservation Interventions. Frontiers in Veterinary Science **6**:105.
- Gliga, D.S., N. Petrova, J. D. C. Linnell, A. R. Salemgareyev, S. Zuther, C. Walzer, P. Kaczensky. *In prep.* Intestinal parasite dynamics in a group of translocated wild-captured Asiatic wild asses in Kazakhstan.

Presentations:

- John D.C, Linnell, Petra Kaczensky, Albert Salemgareyev, Steffen Zuther, Eldar Rustamov, Shirin Karryeva, Ralph Kuehn. 2019. Reintroduction, persistence and local extinction of central Asian kulan in Turkmenistan and Kazakhstan. 32-33.-International Wild Equid Conference; SEP 1-10, 2019; Prague, Czech Republic.
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www.nina.no

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NINA Report

ISSN: 1504-3312
ISBN: 978-82-426-4539-5

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