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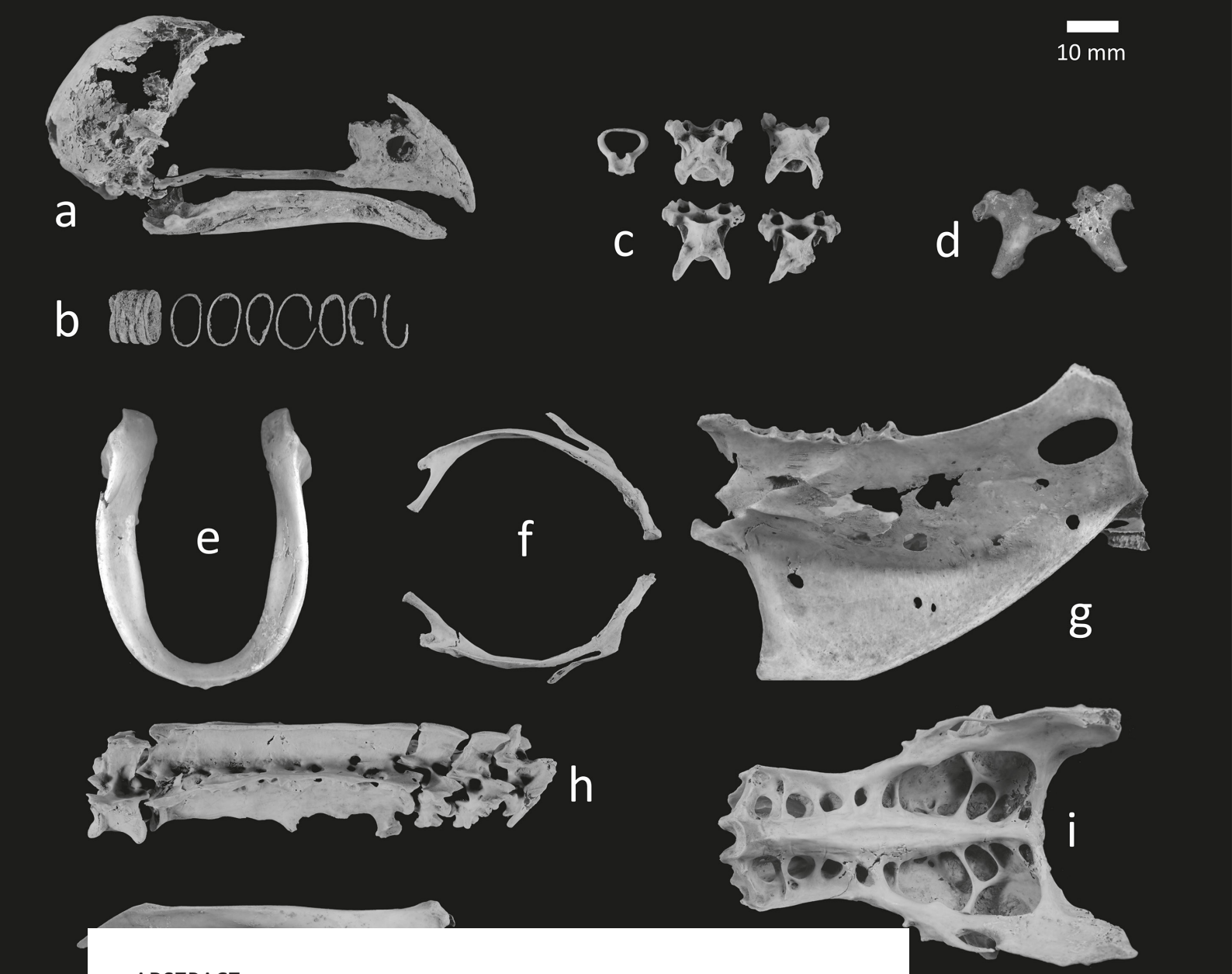

ABSTRACT

A Gyrfalcon *Falco rusticolus* from an Uyghur well in Karabalgasun (Ordu-Baliq), Central Mongolia

Till Töpfer – Christina Franken – Hendrik Rohland – Rainer Hutterer – Ulambayar Erdenebat – Tumurochir Batbayar

A partial skeleton of a female Gyrfalcon, dated at 1044–1214 AD, was excavated in an abandoned well in Karabalgasun, Central Mongolia. Karabalgasun lies in the Orkhon Valley, a landscape of special symbolic, political and spiritual significance in the age of the Turk, Uyghur and Mongol empires. The falcon was interred during the reign of the Khitan (Liao) dynasty. The vertebral ribs show healed fractures, a sign that the bird was nursed in captivity. For falconry was an important element at the imperial court, the presence of the Gyrfalcon indicates the importance of the Orkhon Valley as a place of annual hunting rituals and as a sacred landscape during the reign of the Liao dynasty. The lack of wings, tail and clawed feet of the falcon carcass points towards a post-mortem decorative or ritual use of these body parts. Since Gyrfalcons do not naturally occur in Mongolia, this individual bird may have been a particular symbol of status.

KEYWORDS

Mongolia, Uyghurs, Khitan, Falconry, Gyrfalcon, Burial

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A Gyrfalcon *Falco rusticolus* from an Uyghur well in Karabalgasun (Ordu-Baliq), Central Mongolia

Introduction

1 Karabalgasun (called Ordu Baliq by the Uyghurs), situated in the Orkhon river valley of today's Central Mongolia (47°25'53.61" N 102°39'32.72" E), was the capital of the Uyghur Khanate. It was founded in 745 and existed only until 840 when it was destroyed by the Yenisei Kyrgyz, after which the Uyghurs abandoned this territory. The city was built within a few years and was commissioned by the Uyghurs, a Turkic speaking people primarily concerned with a nomadic lifestyle, and as such it may serve as a model for the creation of a "nomadic city". During the short period of its existence, Karabalgasun was an important location of the Silk Road trade network (Franken – Rohland – Erdenebat et al. 2019). Within the framework of the Mongolian-German Orkhon-Expedition (MONDOrEx) of the Mongolian Academy of Sciences, the National University of Mongolia, Ulaanbaatar, and the Deutsches Archäologisches Institut, Bonn, Germany, the site has been intensively studied since 2007. In 2015, remains of a falcon skeleton were found during the excavation of a filled well shaft in the centre of the courtyard of the city's former citadel (Fig. 1). Here we describe this find in detail and reconstruct the zoo-archaeological and further implications that can be derived from it.

Material & Methods

2 The bird remains consisted of several disarticulated skeletal elements, notably of the skull, the trunk and proximal limbs. All bones were studied in the ornithological collection of the Museum Koenig in Bonn, Germany (ZFMK). They are now held at the collection of the Institute of Archaeology/Mongolian Academy of Science (Number HB2 2015). For identification of species, the bones were compared to reference specimens in the bird skeleton collection of the ZFMK. Additionally, lineal dimensions of bones

Fig. 1: Aerial view of the imperial complex of Karabalgasun, as seen from the north. The citadel, in the courtyard of which the well has been excavated, can be seen in the top corner of the main enclosure.

diagnostic for species identification were measured using a digital calliper to the nearest tenth of a millimetre. These measurements were related to data from ZFMK reference specimens as well as to data from the literature (Solti 1980, Solti 1981). Broken and healed ribs were studied with a Faxitron LX60 x-ray machine.

3 A single bone was dated using the radiocarbon (^{14}C) method in the laboratory of the Klaus-Tschira-Archäometrie-Zentrum at the Curt-Engelhorn-Zentrum Archäometrie in Mannheim, Germany. Collagen was extracted from the bone and the fraction >30kD was separated by ultrafiltration. This fraction was freeze-dried and combusted to CO2 in an elemental analyzer. The resulting CO_2 was catalytically reduced to graphite. The initial calibration was performed with the data set INTCAL13 and the software SwissCal 1.0 (L. Wacker, ETH-Zurich). For comparability with other radiocarbon data from the site, all dates presented in Fig. 2 have been recalibrated using OxCal 4.4 (Bronk Ramsey 2021) with INTCAL20 curve (Reimer – Austin – Bard et al. 2020).

Fig. 2: List of radiocarbon datings cited. AD data calibrated using OxCal 4.4 (Bronk Ramsey 2021) with INTCAL20 curve (Reimer et. al. 2020).

No.	Lab. no.	Sample	Years BP	±	1 sigma/cal AD	2 sigma/cal AD
1	MAMS-27851	Bone from the falcon skeleton	907	21	1049–1203	1044–1214
2	MAMS-29240	Tooth from human burial	794	18	1229–1266	1222–1272
3	MAMS-29242	Wood from the filling of the well shaft	815	18	1222–1260	1215–1270
4	MAMS-34849	Wooden construction of the well above the hexagonal stone setting	1322	20	660–771	655–774
5	MAMS-40381	Well, Wooden post under the stone casing	1199	19	783–880	775–885
6	MAMS-40385	Well, wooden boards of the inner wooden box	1244	17	705–821	681–875

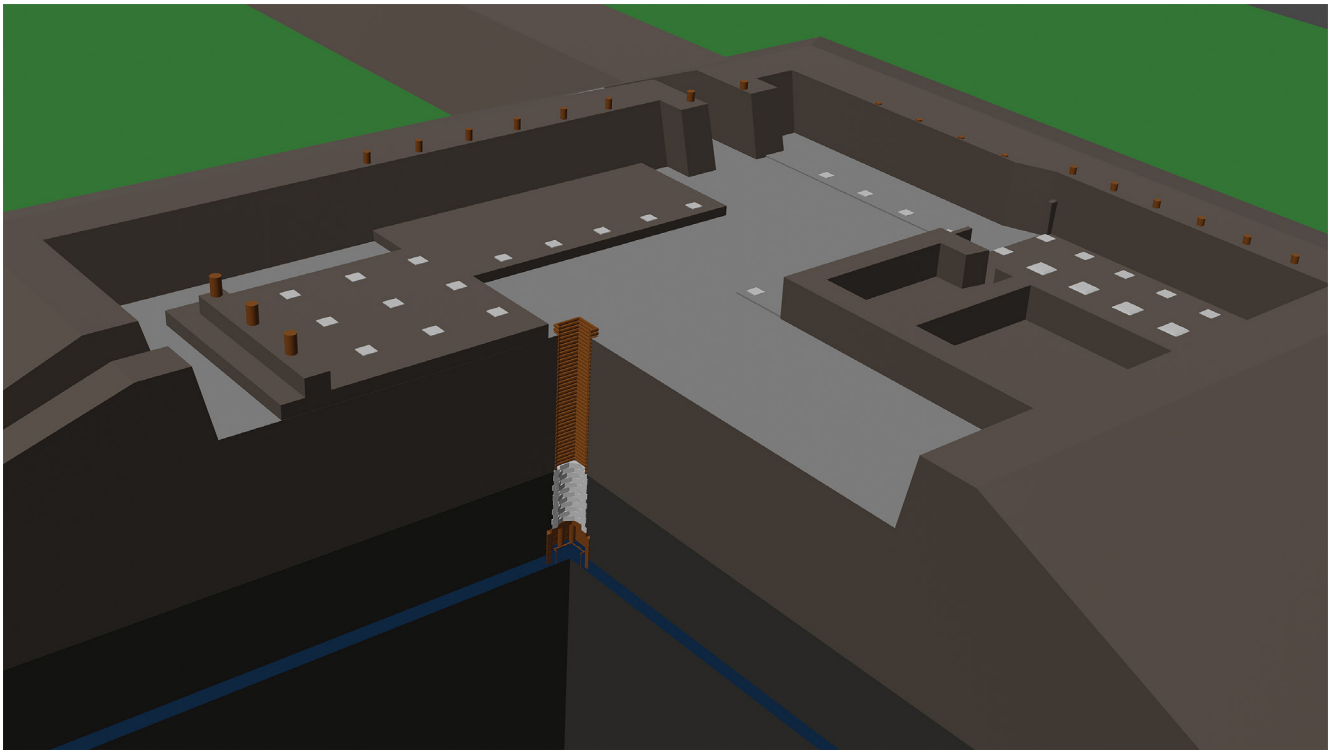

Fig. 3: Schematic depiction of the arrangement of building remains of the citadel. In the south-eastern corner to the right, the foundations of the tower with the column bases of the seigneurial hall can be seen. On the left, the podium of the western building with its regularly spaced column bases is depicted. It has been partially cut away to visualize the situation of the well shaft in front of the building.

Results

Archaeological situation

4 The skeleton was found in the filling of a well which is situated in the courtyard of the citadel of the so-called imperial complex of Karabalgasun. The complex consists of a main enclosure of 460 × 390 m with an annex protracting further 300 m to the east. It is situated at the centre of the eastern edge of the city with its main gate directed towards the east. The enclosed area is further subdivided by smaller walls. In the centre of the complex there are the remains of two large temple-buildings and a large mound resembling a Stupa (Dähne 2017). The citadel itself occupies the south-eastern corner of the imperial complex. It consists of an artificial mound made of rammed earth in the shape of a truncated pyramid. The outer walls still raise up to 12 m over the surroundings, the inner courtyard is elevated approximately 7 m above ground level. The general layout of the citadel can be imagined as follows: a large gate from the north, crowned with a small tower or gatehouse, gave access to a paved courtyard surrounded by the columns of an ambulatory. In the south-eastern corner, opposite of the gate, stood a large, square building which contained a prestigious seigneurial hall. The large quantity of debris in this area of the citadel suggests that the building there was multi-storeyed and thus can be designated as a tower or keep. To the west of the northern gate was an ambulatory, too, enclosing the courtyard area, which was delimited by a Chinese-style hall building on its western side. In front of that building a 15 metres-deep well was discovered (Franken – Rohland – Erdenebat et al. 2019; Fig. 3).

5 The well was excavated starting in 2015, when the deposit of the falcon skeleton, a ceramic vessel and some granite stones belonging to a former balustrade were uncovered in an almost circular pit. The pit itself had been exposed within a test trench in the courtyard of the citadel (Fig. 4). The pit was filled up with alternating layers of settlement debris, among which the falcon bones have been found approximately 2 m below the floor level of the courtyard. The bones formed an assemblage that reflected

Fig. 4: The circular pit above the well shaft as it appeared during the further excavations in 2016, approximately 60 cm above the level where the falcon skeleton was found in 2015. In its upper layers the shaft appeared circular and was filled with a lot of debris but contained also burnt animal bones and fragments of pottery vessels. The rectangular disturbance on the right is the test trench of the 2015 campaign wherein the falcon had been found.

Fig. 5: The remains of the Gyrfalcon have been found in correct anatomical position within the pit. The falcon was found close to a large vessel and other burnt animal bones, which possibly have been deposited in the pit as sacrifices.

Fig. 6: In the levels below the artificial mound of the citadel the well was built with a stone casing. Below the stones, in the level of the aquifer, was a wooden construction which was excellently preserved thanks to the wet conditions. Within the well, many artefacts have been recovered, such as the completely preserved vessels visible in the image.

the correct anatomical position of individual bones to each other (Fig. 5). It is thus likely that the remains were buried as a complete carcass.

6 After the extension of the excavation trench during the following campaigns, it was possible to follow the pit further down to a depth of 12 m. From a depth of 5.4 m, a square wooden well shaft was preserved, albeit in bad condition. Below that, the well shaft was continued by a stone construction consisting of 12 layers of hexagonal stone rings of respectively six trapezoid-shaped granite stones (Fig. 6). While the wooden well shaft was located within the rammed earth of the platform of the citadel, the hexagonal stone casing reached down 2.8 m into the natural ground. It was again supported by a wooden construction further below. Inside this construction was a wooden box, in which the water of the aquifer was collected. The stratigraphy showed that the well was constructed at the same time with the building of the rammed earth platform of the citadel. Thus, its radiocarbon dates and the uncovered artefacts provide a firm proof for the dating of the whole complex of the citadel into the Uyghur period and the early phases of Karabalgasun (Fig. 2, nos. 4–6).

7 The well was most likely given up and partially filled-in upon the destruction of the city in 840 AD. The well shaft was filled with alternating layers of debris and fire remnants that contained rubble and frequently also remains of architectural decoration and architectural elements. The pit filling also contained several fragments of so-called jade books – polished stone tablets with Chinese inscriptions which were incrusted with gold. Many further artefacts were recovered from the muddy filling in the lowest layers of the well. In the waterlogged environment wood and other materials where excellently preserved. Amongst the artefacts are wooden building and furniture parts, a large iron padlock, a bronze bell and completely preserved pottery vessels.

8 The well and its artefacts are important not only for a fuller description of the architectural components of the imperial complex but also for a discussion of the site chronology. The upper three metres of the shaft, wherein the falcon has been found,

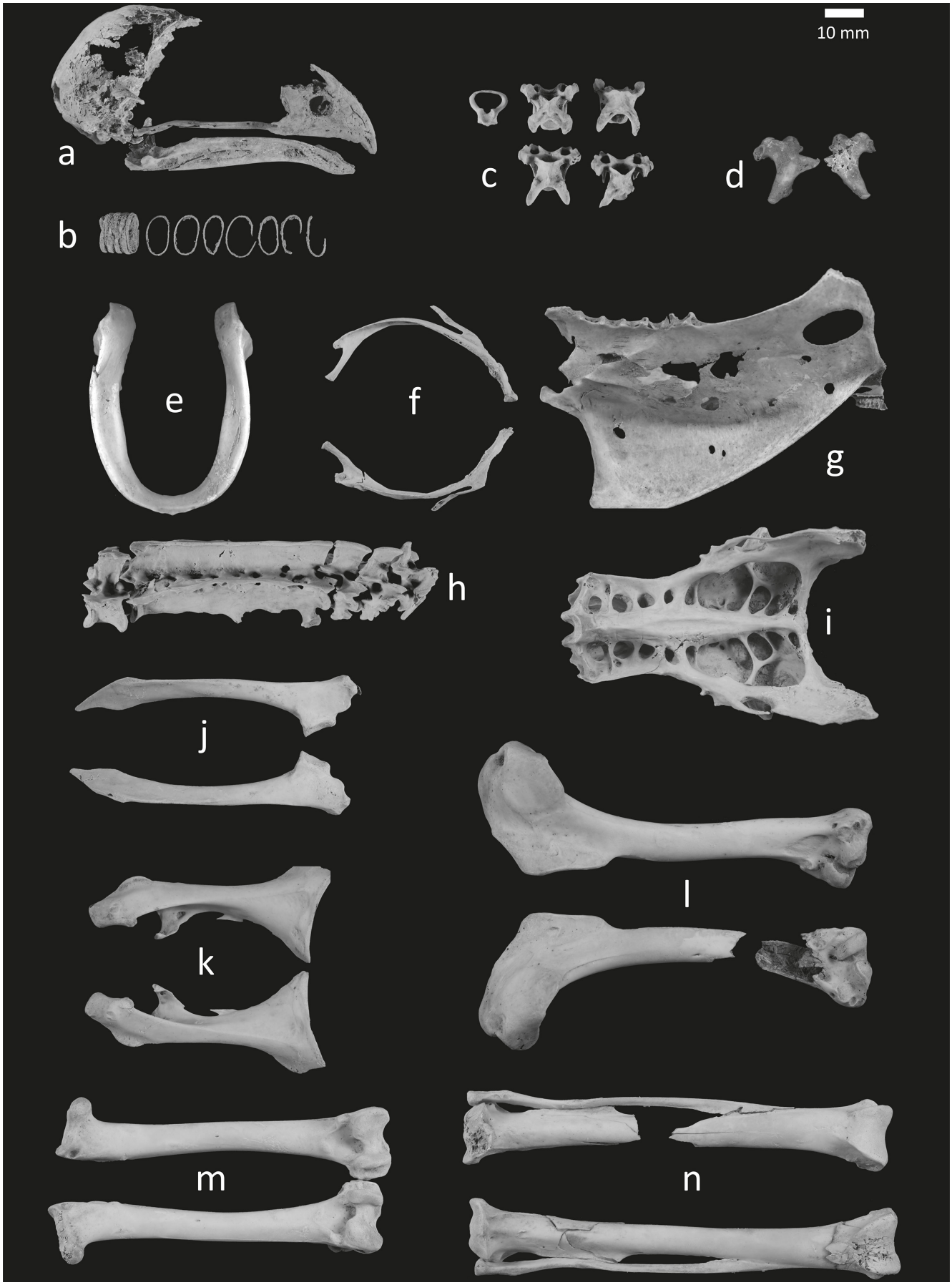

Fig. 7: Bones of the Gyrfalcon *Falco rusticolus* found in Karabalgasun (HB2 2015). Except for the skull, the bones found represent either elements of the trunk skeleton or of the proximal limbs. The skull was virtually reconstructed of two fragments (part of braincase and distal part of praemaxilla) and the dentary. a – skull; b – trachea; c – neck vertebrae; d – ossa quadrata; e – furcula; f - vertebral ribs; g – sternum; h – notarium (fused thoracic vertebrae); i – pelvis; j – scapulae; k – coracoids; l – humeri; m – femura; n – tibiotarsi.

Fig. 8: Articulated skeleton of a male Peregrine Falcon *Falco peregrinus* in flight posture. The bones not preserved in the Karabalgasun specimen are highlighted in colour. Obviously, the distal parts of both forelimbs (ulna, radius, carpometacarpus, phalanges of digits) and of both hindlimbs (tarsometatarsus, phalanges of toes) are missing in the Karabalgasun bird. Original drawing by Katrina van Grouw, with kind permission

had been dug up and expanded to form the above-mentioned circular pit after the well was already out of use. The remains recovered from the circular pit and more particularly the deposit of the falcon skeleton which is dated to the Khitan or early Mongol period suggests that even after the collapse of the Uyghur empire activities took place in Karabalgasun.

Bird remains

9 Except for the skull (incomplete braincase, distal part of praemaxilla, mandible, 2 ossa quadrata), the bones found represent elements of the trunk skeleton (several neck vertebrae, notarium, pelvis, furcula, 2 scapulae, 2 coracoids, several vertebral ribs, sternum) and of the proximal limbs (2 humeri, 2 femura, 2 tibiotarsi), while the distal parts both of the forelimb (ulna, radius, carpometacarpus, phalanges of digits) and of the hindlimb (tarsometatarsus, phalanges of toes) are missing. There are no tail vertebrae likewise, whereas the present neck vertebrae suggest that the skull was still connected to the trunk when the bird was buried (Fig. 5). This is further indicated by the presence of a large portion of the trachea. Therefore, in simple words, the carcass of the falcon lacked the wings (incl. the primary and secondary flight feathers), the tail (rectrices), and the clawed feet (Fig. 7, Fig. 8). Some of the rib bones show signs of older, healed fractures with well-visible bone calluses (Fig. 9).

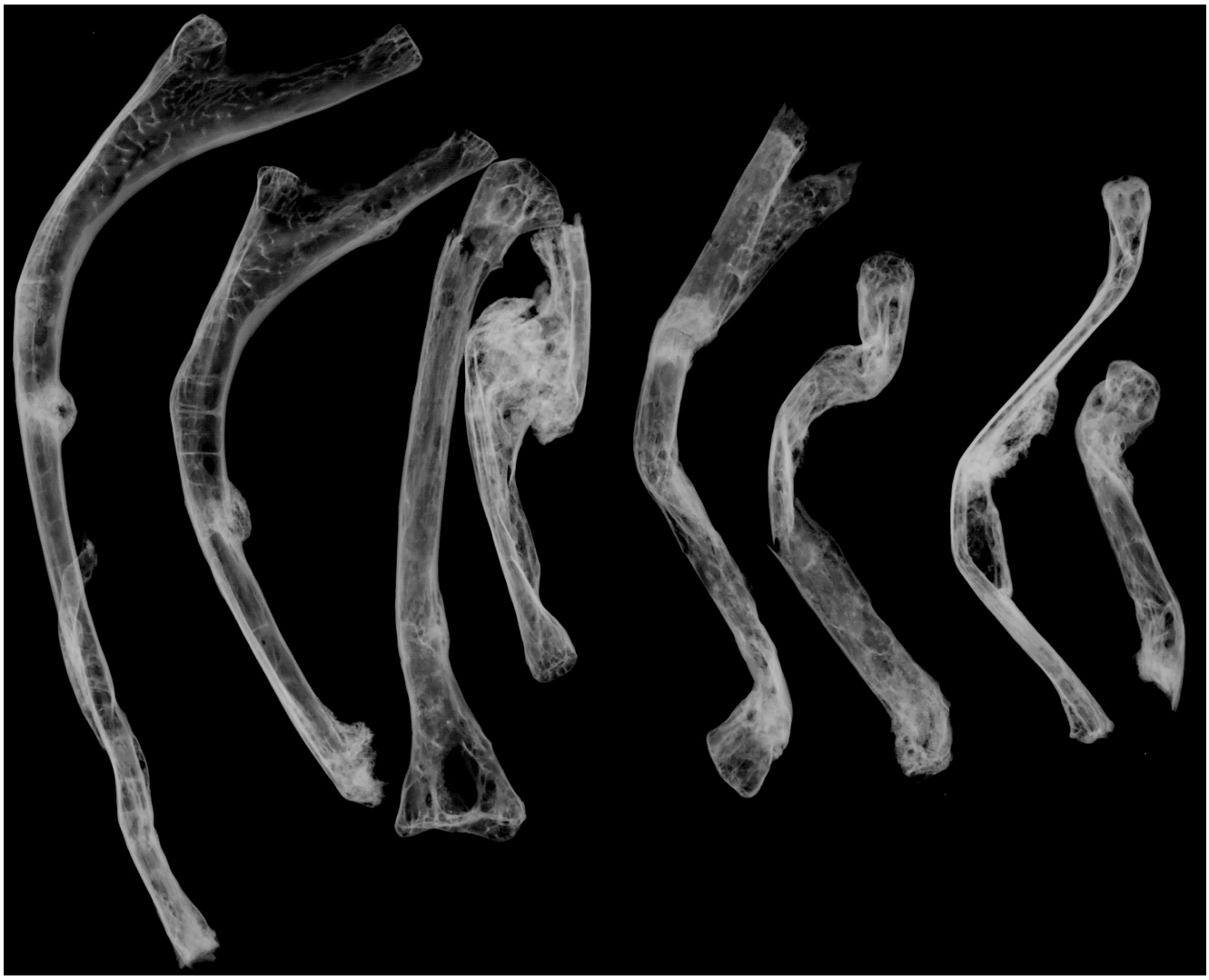

Fig. 9: X-ray of vertebral ribs showing signs of healed fractures visible by bone callus. The shape of individual bones is partly distorted and suggests a minor deformation of the bird's ribcage in life.

Dating of bones and state of preservation

10 The bones were dated 907 ±21 years by radiocarbon dating (lab no. MAMS 27851; δ13C AMS: -22,9 ‰, calibration 1-sigma: AD 1049–1203; calibration 2-sigma: AD 1044–1214; C:N ratio: 3,2; C content: 42,2 %; collagen 12,5 %; Fig. 2, 1). The data indicates both a normal carbon-to-nitrogen ratio and a normal carbon content as well as a good collagen content.

Identification

11 The shape and dimension of the skeletal elements of the Karabalgasun individual point towards a large falcon of the genus *Falco*. All skeletal dimensions of this specimen exclusively correspond to the size range of the Gyrfalcon *Falco rusticolus*, while the skeletal sizes of the two other falcon species potentially occurring in the area, Saker Falcon *F. cherrug* and Peregrine Falcon *F. peregrinus*, are much smaller (Fig. 10). Gyrfalcons show a marked sexual dimorphism with females being on average 40 % larger (Potapov – Sale 2005). This difference is also reflected in the dimensions of several skeletal elements of the Karabalgasun bird (Fig. 10; Fig. 13): greatest length of skull (GL), proximal width of humerus (TP), and median width (MB) and smallest width between acetabula (AA) of the pelvis exceed all previously documented dimensions (even of

	Karabalgasun specimen	*Falco rusticolus*		*F. cherrug*		*F. peregrinus*
Sex		female	male	female	male	female
Skull						
GL	85.0	84.0 (83.2 – 84.4; 3)	79.2 (77.0 – 81.3; 2)	75.4 (1)	68.7 (1)	68.3 (64.7 – 71.8; 2)
Mandible						
GL	59.7	61.2 (60.3 – 62.9; 3)	57.1 (55.3 – 58.8; 2)	54.9 (1)	49.3 (1)	49.1 (48.7 – 49.3; 4)
Furcula						
GW	42.1	46.3 (44.6 – 48.0; 2)	40.2 (40.6 – 44.6; 3)	-	-	-
Sternum						
LC	84.5	86.4 (84.5 – 88.3; 4)	79.2 (77.3 – 80.6; 3)	75.5 (1)	63.4 (1)	77.6 (75.4 – 79.8; 5)
Coracoid						
GL	63.1 / 62.7	64.3 (62.9 – 65.3; 4)	58.6 (57.0 – 60.8; 3)	55.6 (55.3 – 55.8; 2)	49.3 (1)	52.5 (51.9 – 53.3; 3)
LM	57.2 / 57.2	55.8 (55.7 – 55.9; 2)	50.8 (47.2 – 54.0; 3)	49.6 (49.5 – 49.7; 2)	45.2 (1)	47.7 (46.3 – 48.7; 3)
BB	26 / 26	33.6 (23.3 – 27.6; 4)	24.1 (23.4 – 24.8; 3)	22.4 (22.0 – 22.7; 2)	19.5 (1)	20.1 (19.5 – 20.8; 3)
Scapula						
GL	71.7 / 71.4	72.9 (71.1 – 75.0; 4)	67.0 (65.1 – 68.3; 3)	62.8 (62.0 – 63.6; 2)	57.5 (1)	61.5 (61.1 – 61.9; 2)
BC	18.2 / 18.5	18.4 (18.0 – 19.0; 4)	16.6 (16.1 – 17.3; 3)	14.8 (14.0 – 15.6; 2)	14.0 (1)	17.1 (17.0 – 17.1; 2)
Humerus						
GL	105.0	111.4 (107.3 – 116.6; 5)	101.0 (96.4 – 105.5; 2)	99.3 (1)	88.1 (1)	88,5 (88.0 – 89.5; 5)
TP	27.8 / 28.2	24.9 (23.0 – 26.0; 5)	22.9 (21.8 – 24.0; 2)	22.5 (1)	19.3 (1)	20.7 (20.2 – 21.0; 3)
TD	20.9 / 20.3	20.6 (18.1 – 21.0; 5)	18.9 (18.4 – 19.3; 2)	18.8 (1)	16.7 (1)	17.8 (17.6 – 18.1; 5)
KT	9.4 / 9.4	9.2 (8.3 – 9.7; 5)	8.3 (8.1 – 8.5; 2)	8.3 (1)	7.4 (1)	7.8 (7.7 – 7.9; 5)
Pelvis						
GL	88.4	88.6 (86.3 – 90.9; 2)	77.7 (72.5 – 83.3; 3)	-	-	-
CB	29.6	29.9 (28.2 – 31.5; 2)	28.8 (26.1 – 31.0; 3)	-	-	-
KB	25.2	25.6 (24.5 – 26.7; 2)	25.2 (23.3 – 27.6; 3)	21.8 (21.6 – 22.0; 2)	23.0 (1)	21.1 (21.0 – 21.2; 2)
MB	51.4	49.0 (47.9 – 50.0; 2)	46.5 (44.4 – 50.6; 3)	43.9 (43.6 – 44.2; 2)	41.0 (1)	41.5 (41.3 – 41.6; 2)
AA	41.1	34.9 (32.6 – 37.1; 2)	35.5 (33.6 – 37.5; 3)	29.4 (28.6 – 30.2; 2)	27.5 (1)	27.1 (27.0 – 27.2; 2)
Femur						
GL	86.8 / 86.9	91.1 (88.3 – 94.4; 5)	84.6 (81.1 – 88.1; 2)	75.7 (74.2 – 77.1; 2)	71.6 (1)	70.6 (69.7 – 71.4; 3)
LM	82.4 / 82.4	88.0 (86.1 – 90.6; 3)	81.6 (80.2 – 83.0; 2)	72.8 (71.1 – 74.4; 2)	69.0 (1)	67.8 (66.5 – 68.5; 3)
BD	18.3 / 18.5	18.4 (18.3 – 18.5; 5)	17.5 (16.7 – 18.3; 2)	15.2 (2)	13.7 (1)	13.6 (13.0 – 14.0; 3)
BP	17.9 / 16.9	17.6 (16.5 – 19.0; 3)	-	14.1 (14.0 – 14.2; 2)	13.3 (1)	14.0 (13.5 -14.2; 3)
Tibiotarsus						
GL	107	109.2 (105.2 – 113.2; 5)	102.3 (99.6 – 105.0; 2)	94.3 (90.7 – 97.9; 2)	90.7 (1)	92.9 (91.1 – 95.4; 5)
BD	17.3 / 16.4	17.0 (16.6 – 17.7; 5)	17.4 (16.5 – 18.2; 2)	14.6 (13.8 – 15.3; 2)	13.8 (1)	14.1 (13.8 – 14.4; 5)
TD	11.5 / 10.8	11.5 (10.7 – 11.8; 3)	11.2 (10.4 – 11.9; 2)	-	-	-

Fig. 10: Dimensions of skeletal elements of the Karabalgasun individual (given separately for left / right limbs if possible) in comparison to other Gyrfalcon *Falco rusticolus*, Saker Falcon *F. cherrug* and Peregrine Falcon *F. peregrinus* reference specimens. Measurements are given as mean values (range; n) in mm. Data for *F. rusticolus* are pooled from our own measurements (Fig. 13) and from Solti (1980), data for *F. cherrug* and *F. peregrinus* are taken from Solti (1981). Since most dimensions fall within the typical size range of females, the Karabalgasun bird was likely a female. Acronyms of measurements (mostly following Solti 1981): Skull, GL (greatest length); Mandible, GL (greatest length); Furcula, GW (greatest width); Sternum, LC (length of Crista sterni); Coracoid, GL (greatest length), LM (medial length), BB (distal width); Scapula, GL (greatest length), BC (width of cranial epiphysis); Humerus, GL (greatest length), TP (proximal width), TD (distal width), KT (central width); Pelvis, GL (greatest length), CB (proximal width), KB (smallest width), MB (median width), AA (smallest width between Acetabula); Femur, GL (greatest length), LM (medial length), BD (distal width), BP (proximal width); Tibiotarsus, GL (greatest length), BD (distal width), TD (distal depth). Individual measurements are given in Fig. 13.

female Gyrfalcons'); all measurements of mandible, sternum, coracoid and scapula are well within the size range of female Gyrfalcons, just as distal width (TD) and central width (KT) of humerus, greatest length (GL) of pelvis, proximal width (BP) of femur and greatest length (GL) of tibiotarsus. Greatest length (GL) of humerus, proximal width (CB) and smallest width (KB) of pelvis, distal width (BD) of femur and distal width (BD) and distal depth (TD) of tibiotarsus are within the size range of both females and males; only the furcula size lies in the size range of Gyrfalcon males. Therefore, taken the generally large dimensions of the Karabalgasun bird into account, we consider it a female Gyrfalcon.

Discussion

Species identification and avifaunal considerations

12 Among the regularly occurring large falcon species of Eurasia, the Gyrfalcon is the largest in several skeletal dimensions which supports our identification as a Gyrfalcon. The Saker Falcon *F. cherrug*, widespread in Mongolia, does not reach these skeletal dimensions (Solti 1980, Solti 1981). The only other Eurasian falcon that could potentially reach the same skeletal dimension like the Gyrfalcon is the so-called "Altai Falcon", that has been either considered a separate species *F. altaicus* or a subspecies of the Saker Falcon *F. cherrug* or of the Gyrfalcon *F. rusticolus*, respectively, or a hybrid of the aforementioned two. Currently, *altaicus* is not considered a valid taxon, with the Altai and Sayan populations being included in the subspecies *milvipes* of the Saker Falcon (del Hoyo – Collar 2014; Gill – Donsker – Rasmussen 2022). Although these birds are known to be larger than the other Saker Falcon subspecies, mensural data on the skeleton of the Altai Falcon is lacking, which is why we cannot rule out entirely the possibility of the Karabalgasun specimen to be a large *altaicus* falcon.

13 Gyrfalcons typically inhabit the tundra zones of northern Eurasia and North America during breeding (Potapov – Sale 2005). Therefore, from a historical falconry point of view, the Gyrfalcon can be considered an "exotic" species in large parts of Eurasia (Allsen 2006; Buquet 2021). Indeed, also Karabalgasun lies far off the Gyrfalcons' current southernmost breeding sites ever reliably documented. Nonetheless, juveniles and immatures may variably disperse over vast areas in the sub-Arctic during wintertime, while adults tend to remain sedentary in their breeding territories year-round. However, migratory movements of Gyrfalcons may be triggered by changes in food supply (Potapov – Sale 2005). Still, Gyrfalcons are recorded today only as very rare winter visitors to Mongolia that occur only between November and January (Gombobaatar – Leahy 2019), although some earlier Mongolian records are now considered misidentified Saker Falcons *F. cherrug* instead (Potapov – Sale 2005). Since we regard this Gyrfalcon most likely to have been brought to Karabalgasun via the well-established falconry trading networks of those days (Allsen 2006), we refrain from considering it a proper avifaunal record for present-day Mongolia as required by current ornithological criteria (Töpfer 2010). Nonetheless, regarding its general rarity in the region, it would have made the Karabalgasun bird a specimen of particular interest and maybe even of spiritual importance in Proto-Mongolia.

Archaeological context

14 The dating of the skeleton revealed an age of 907 ±21 years, which corresponds to an estimated period between AD 1047 and 1164 (1-sigma error). Considering the good quality of the bone samples with regard to carbon content, carbon-to-nitrogen ratio and collagen content, the dating can be considered reliable and accurate within a reasonable error margin. Therefore, the skeleton is at least 200 years younger than the timespan during which Karabalgasun flourished as the Uyghur capital. The remains recovered from the pit in the upper metres of the well shaft and more particularly the deposit of the falcon skeleton which is dated to the Khitan or early Mongol period suggests that even after the collapse of the Uyghur empire activities took place in Karabalgasun. The fact that the ruins were known by the Mongols is not surprising given the short distance between Karabalgasun and the Mongol capital Karakorum and is also attested in the written sources (Juvaini 1997: 54, 236). Three burials and a vessel-deposit, which where interred within the ruins after the destruction of the city in various places in the area of Karabalgasun (Hüttel – Dähne 2012; Dähne 2017) illustrate the importance that was

apparently still attached to the monumental ruins. A burial on the citadel not far away from the well was ^{14}C dated to 1222–1272 (Fig. 2, 2). However, the city seemed to have changed its meaning completely. The Mongols called it Ma'u Baligh (Muu baliq – which means "bad city" (Juvaini 1997:54, 236). The name seems then to refer to a place of the dead or a lost city, where no living creature was meant to be. Some of the objects in the pit therefore can possibly be interpreted as offerings connected to an ancestral cultus taking place in the deserted town. It is notable that during the time of the foundation of Karakorum, the Mongols also searched the ruins of Karabalgasun and uncovered a well and a Uyghur stele as is stated by the Persian chronicler Juvaini (Juvaini 1997: 54–55). This exemplifies how the Mongols where aware of and strived to appropriate the symbolic and spiritual power of the site and its surroundings (Allsen 1996).

15 The healed fractures of some vertebral ribs (Fig. 9) of the Gyrfalcon indicate a serious, though non-lethal, injury of the ribcage that that likely would have caused a longer period of recovery, possibly as a captive bird. The reason for these injuries may have been caused by a collision or resulted from violent encounter with another raptorial bird or mammal. In any case, the recovery phase was a critical period since it impaired the mobility of the bird substantially, possibly rendering it unable to hunt. From other archaeological finds of pathologically changes in bones it is concluded that injured birds of prey have been nursed to health in captivity (Girininkas – Daugnora 2018; Heinrich – Teegen 2018; Vretemark 2018) or that abnormal bone formation resulted directly from effects of captivity, e.g. from leg rings, hawking equipment and associated inflammatory reactions or formation of new bone material (Heinrich – Teegen 2018; Maldre – Tomek – Peets 2018; Zinoviev 2018). Since the healed fractures of the ribs obviously were not the cause of death in the Karabalgasun falcon, it is not unlikely that the recovery took place under human care, i.e. that the bird was held (and fed) in captivity. This would prove the regional knowledge of keeping and nursing birds of prey, possibly in a decided falconry context, and it could also indicate the importance of this particular bird as an esteemed symbol of status and wealth (De Smet 2018; Buquet 2021).

16 It is known that wings, feathers and claws of birds of prey have been used since prehistoric times as decorative or symbolic elements of clothing or ceremonial gear as well as raw material for tools, ornamental objects or even musical instruments (Mannermaa 2018; Mannermaa – Kirkinen 2020; Osten-Sacken 2020). In particular, feathers have been important elements of everyday clothing and ritual costumes in different cultures worldwide, although archaeological evidence of feathers is scarce due to their poor conservation over time (Mannermaa – Kirkinen 2020). As wings and feet may form parts of different kinds of clothing, including ritual costumes (Mannermaa 2018; Mannermaa – Kirkinen 2020), it is thus not unlikely that those of the Karabalgasun specimen may have been used similarly. In Mongolia, the custom of preserving the claws and feathers of hunting birds and making them into toys or clothing as a blessing for children has survived to this day (Altangul 2016).

17 Moreover, if the emphasized placement of the carcass implies a particular appreciation of the bird, it is fair to assume that its wings, tail and feet may have equally served a prominent function as elements of clothing or ritual gear. Additionally, since the skeletal material found in Karabalgasun does not contain the falcon's last tail vertebrae, to which the long tail feathers are attached, it is likely that the rectrices have been taken off deliberately to be used in a similar fashion like the wings. Famously, the straight and symmetrically shaped tail feathers are predestined to be used as stabilizers of arrows (Mannermaa 2018), but an ornamental use of the whole (fanned) tail is also conceivable. While wing bones and feathers are very versatile material sources, raptor talons apparently served mainly decorative or symbolic purposes as signs of clan affiliation, social prestige or as amulets and pendants (including grave goods), representing the powerfulness of these birds (Gansum 2018; Ludowici 2018; Maldre – Tomek – Peets

2018; Mannermaa 2018; Osten-Sacken 2020; Vretemark 2018). We consider it likely that the Karabalgasun falcon's clawed feet have been taken off the carcass in a comparable context, just like its wings and tail[1].

Cultural, religious and political significance of Gyrfalcons in the Nomad empires of Asia

18 Falconry is known from Central Asian and West Eurasian steppe regions for about at least 2,500 years and has been of substantial socio-cultural importance, e.g. for hunting, fur-acquisition and trading as well as for rituals or as status symbols (Erdenebat 2018; Kosintsev – Nekrasov 2018; Soma 2014, Soma 2018). Depictions of equestrian falconers are already known from the Xiongnu age, dating back until 300 B.C. (Soma 2014) and birds of prey feature prominently in many depictions of elite members from the Xiongnu age until the Mongol era and after (Эрдэнэбат 2014). In the area of modern-day Mongolia, hunting with birds may date back 5,000 years where it was a common hunting practice performed by the nomadic steppe peoples: the Uyghurs, rulers of Karabalgasun, are known to have undertaken large battues in the 8th and 9th century that included trained falcons as well (Erdenebat 2018). Among their regional successors, the nomadic Khitans employed hunting with birds of prey during the following three centuries (Erdenebat 2018). In his famous accounts, Marco Polo mentions the sophisticated state of falconry that was well-established in Mongolia about 150 years after the Karabalgasun bird had died (Anderson 2016). Although it remains unclear if the falcons he saw were actually Gyrfalcons as interpreted later (Schlegel – Verster van Wulverhorst 1844–53; Anderson 2016), it is obvious that detailed knowledge about keeping birds of prey apparently existed in the area in those days, with widely practiced falconry in the Middle Ages (5th to 10th century AD; Erdenebat 2018; Kosintsev – Nekrasov 2018).

19 Hunting with falcons subsequently became an important element of the elite-culture all over Eurasia, and archaeological finds from different European sites show that around 1000 AD, e.g. during the time of the Karabalgasun find, falconry was often connected to specials sites such as seats of power, cities or trading places (Grimm 2018). In any way, Asian and in particular Mongolian falconry had a substantial impact on the development of Eurasian falconry, with medieval Russia later melting European and Asian traditions (Allsen 2006; Zinoviev 2018). In particular, Gyrfalcons rose to great popularity among European falconers as a result of the Mongolian expansion in the 13th century AD (Allsen 2006).

20 In European falconry, Gyrfalcons have experienced a particular appreciation ever since. They have been given as extraordinary presents (alliance gifts) to rulers (De Smet 2018, Orten Lie 2018) and because some Gyrfalcon populations consist of very light or almost white individuals, that were particularly sought after at times (Allsen 2006). An extensive trade network of these birds from Greenland and Iceland to Northern Europe (Denmark, Norway) existed at least between 1000 and 1850 AD, that was often controlled directly by the royalty with hundreds of Gyrfalcons being exported each year (Mehler – Küchelmann – Holtermann 2018; Orten Lie 2018). In Mongolia, it was also customary to present falcons as diplomatic gifts among the leaders

1 There is striking resemblance to the carcasses a present-day taxidermist would produce when skinning a bird in order to preserve it as a specimen. The earliest attempts of whole-bird preservation that went beyond a simple mummification of carcasses are documented at least from the 16th century AD, but the use of avian body parts for hunting, clothing and even falconry is much older: for example, the use of bird lures in falconry that were made of bird skin material dates back to the transition of the 3rd and 2nd century BC (Schulze-Hagen – Steinheimer – Kinzelbach et al. 2003). However, we have no information if and how a preservation of whole birds has possibly been developed in Proto-Mongolian times, and the lacking wings and feet are more likely to be explained by the aforementioned ritual or decorative use.

of nomadic tribes or empires as early as the 3rd century BC (Erdenebat 2018). Likewise, a similar trading network specifically focussing on Gyrfalcons existed in Mongolia and falcons also served as objects of foreign trade from Europe in the 13th century AD (Allsen 2006; Erdenebat 2018; Buquet 2021). Between the 10th and 15th century, (Gyr)falcons also may have been included in Mongolian tax payments (Otgonsaikhan – Erdenebat 2010), and rulers like Genghis Khan being presented Gyrfalcons as a sign of homage of by other regents (Schlegel – Verster van Wulverhorst 1844–53). Again, white Gyrfalcons were considered the most prestigious raptor species in Mongolian falconry (Allsen 2006). Because of this high estimation, the Khitan organized systematic northbound expeditions in order to acquire Gyrfalcons (Allsen 2006).

21 Looking more closely at the time of the burial of the Karabalgasun falcon, sources attest to a decidedly high regard and exclusive ritual use of Gyrfalcons by the highest echelons of the nomadic elite: During the period of the Khitan and Jurchen, which are also known as the Liao (916–1125) and Jin dynasties (1115–1234) respectively, in Chinese sources, falconry and Gyrfalcons were part of imperial rituals and thereby of political significance. Both dynasties had been founded by nomadic people from Manchuria and Inner Mongolia and had thereby strong nomadic traditions in the realm of hunting. The Liao maintained five departments for falconry, where court officials where tasked with the acquisition, keeping and training of birds of prey for the royal hunting rituals. The history of the Liao dynasty reports that during the imperial hunt during the spring time, called "spring water" (*chūnshuǐ* 春水), the ruler hunted swans using Gyrfalcons. The event seems to have been highly ritualized: imperial servants where lined up around a lake, drums where beaten to frighten the swans and make them fly off. Officials from the five departments of falconry would kneel and present the Gyrfalcons to the emperor for him to release them. When the Gyrfalcon caught a swan, the attendants around the lake would recover the prey and the falcon. The first swan would be offered as a sacrifice in the ancestral temple (Haenisch 1935: 64–65). This tradition has been held up too during the later Jin dynasty and is also reflected in artworks of that age. The visual motive of a falcon attacking a swan was called chunshui or springwater and is depicted on textiles and jade carvings of the Jin Dynasty. The very same motive can be found on the famous painting "Khubilai Khan Hunting" by Liu Guandao, painted about 1280 (Fig. 11). In the centre of the image, a falconer can be seen, holding a white bird of prey on his right hand. Next to his knee, the chunshui motive is depicted on what seems to be a pouch attached to his saddle (Cheng 2018; 1875–1879).

22 The acquisition and keeping of falcons for the ritual hunts seems to have been of big political importance. Until 1058 AD it was forbidden to officials and commoners to raise falcons and goshawks and in 1061 AD it was explicitly forbidden to keep and raise Gyrfalcons. Since the Gyrfalcon was not to be found within the realm of the Liao, it had to be acquired from farther away. The Song dynasty historian Xu Mengshen reported that the Liao rulers urged the Jurchen tribe, which was subject to them, to send troops on a campaign against the Five Kingdoms northeast of the Liao, in the area of Chinas Heilongjiang province and the Russian Khabarovsk region. There they had to catch Gyrfalcons in their nests "east of the ocean". This had to be done every year. According to Xu, it was this yearly chore that brought the Jurchen to rebel against their Liao overlords, which ultimately led to their overthrowing and the establishment of the Jin dynasty (Cheng 2018).

23 The falcon skeleton from Karabalgasun is dated to the Khitan period. However, the Khitan originated in Inner Mongolia, while Outer Mongolia, according to sources such as the Liao-shih account, was populated by the nomadic Tsu-pu people (Weiers 1973).

24 In order to tyrannically dominate and control the native Tsu-pu peoples, the Liao Khitans built numerous fortified city complexes in the steppe regions of Mongolia,

Fig. 11: Excerpt of the painting "Khubilai Khan Hunting" a falconer can be seen in the lower left of the centre, holding a white bird of prey and with the springwater motive on the pouch close to his knee. Paint and ink on silk, painted by Liu Guandao 劉貫道 about 1280. National Palace Museum, Taipeh.

such as Khar Bukhyn balgas, Chin tolgoin balgas, Talyn Ulaan kherem or Baruun Zuun kherem. These fortified urban complexes were home to the Liao garrisons responsible for controlling the Tsu-pu. The massive fortifications show that there were apparently frequent clashes and strong resistance. Hunting with falcons was also common among the Tsu-pu.

25 Other sources attest to the prestige of falcons and other birds of prey in the Mongolian period. The Secret History of the Mongols, for example, reports the appearance of a Gyrfalcon, which eventually adorned the crest of the Khiyad Borjin, the golden clan of Genghis Khan. The Source reports:

26 "When Temüjin was nine years old, Yisügei Ba'atur set out to go to the Olqunu'ut people, relatives of Mother Hö'elün, taking Temüjin with him and saying, 'I shall ask his maternal uncles for a girl in marriage for him.' On the way, between Mount Čekčer and Mount Čiqurqu, he met Dei Sečen of the Onggirat. Dei Sečen said, [...]

27 'Quda Yisügei, I had a dream last night, I did. A white Gyrfalcon clasping both sun and moon in its claws flew down to me and perched on my hand. I told the people about this dream of mine, saying, ''Before, when I looked, I could only see the sun and the moon from afar; now this Gyrfalcon has brought them to me and has perched on my hand. He has alighted, all white. Just what sort of good thing does this show?'' I had my dream, quad Yisügei, just as you were coming here bringing your son. I had a dream of good omen (Rachewiltz 2015, 12–13).

28 A map of Asia is also depicted on panel VI of the Catalan Atlas by the Mallorcan cartographer Abraham Cresques in 1375. This map makes use of information from travellers such as Marco Polo, who actually had visited the area. In the far north or north-east of the map, there are two islands with depictions of white raptors to be seen (Fig. 12). The legend next to them reads: 'In these islands are born very good Gyrfalcons and falcons that the inhabitants do not there [dare?] to capture except at the service of the Great Khan, Lord, and Emperor of Cathay' (Ceva 2021). This can be an indication that in the Mongol period Gyrfalcons where still held in high regard and where reserved exclusively for the imperial court. However, it must be kept in mind that generically depicted pale or white birds of prey are not automatically to be regarded as genuine evidence of Gyrfalcons.

Conclusions

29 How does the falcon skeleton of Karabalgasun fit into that overall picture? The healed fractures indicate some damage to the ribcage that likely would have caused a longer period of recovery, most likely as a captive bird. The falcon was intentionally interred on the citadel, which is a special landmark, and was accompanied by a vessel. This treatment underlines the status of the bird as highly cherished by its owners. As mentioned above, its ^{14}C dating falls into the time of the Khitan or Liao empire. The Orkhon Valley was part of that empire, albeit the region seems to have been not as important as it had been in the Uyghur and later Mongol age, since no permanent Khitan-period settlements are known in the vicinity of Karabalgasun and Karakorum so far. So why would such a valuable bird have been brought here during the Khitan period? The area is well suited for the hunting of migratory birds. In the early 13th century, during the reign of Genghis Khan's son Ögedei, a little palace was built only 15 km northeast of the citadel of Karabalgasun on a hill called Dojtijn Tolgoj. It lies between a chain of small seasonal lakes and close to the larger lake Ögij Nuur. All of these attract a lot of different birds until today. The palace was reportedly used in the spring time by the ruler, when he stayed here to enjoy himself hunting with his falcons (Rashīd al-Dīn 1971: 63; Эрдэнэбат 2021: 169–171). It can be assumed that also in earlier times such

Fig. 12: Plate VI of the Catalan atlas of Abraham Cresques, 1375. The map shows eastern Asia, also Karakorum is depicted. In the lower right, the islands with the falcon-like birds can be seen.

events took place here, but without leaving traces in the form of building remains. Thus, the finding of a Gyrfalcon on the citadel of Karabalgasun, likely from Khitan times, can be interpreted as an indication that the area was visited by members of the top ranks of the Khitan elite for ritual hunting events, at least occasionally.

30 This has further implications for the discussion of the ideological significance of the Orkhon Valley. It is well known that the Orkhon Valley and its surroundings had been a sacred heartland to the Turks and Uyghurs and that the Mongols referred to this tradition when they founded Karakorum (Allsen 1996; Hüttel 2007). However, it remains unclear how the Mongols came to be aware of this tradition almost 400 years after the abandonment of the region by the Uyghurs. If the area was visited for ritual hunting by elites of the Khitan Empire, it appears likely that the significance of the region for the political ideology of nomad statehood was also remembered during this time. This is supported by the fact that the first emperor of the Liao, Yelü Abaoji (r. 907–926), visited the area and also Karabalgasun in 924 AD and had water and stones from the region brought to the sacred mountain of the Khitan (Hüttel 2007). The question of the inclusion of the Orkhon Valley into the political ideology of the Khitans has to be studied further in comparison with the written sources. If it proves right, the apparent gap between the Uyghur and the Mongol occupation of the Orkhon Valley would be considerably narrowed.

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Species	*Falco rusticolus*									*Falco cherrug*			*Falco peregrinus*
Specimen	**Karabalgasun**	**ZFMK 4**	**ZFMK 5**	**ZFMK 6**	**Solti (1980) 1**	**Solti (1980) 3**	**ZFMK 1**	**ZFMK 2**	**ZFMK 3**	**Solti (1981) 5**	**Solti (1981) 6**	**Solti (1981) 1**	**Solti (1981) 9,10,12-15**
Sex		female	female	female	female	female	male	male	male	female	female	male	females
Skull													
GL	85.0	84.4	84.3	83.2	-	-	-	81.3	77.0	75.4	-	68.7	64.7 – 71.8
Mandible													
GL	59.7	62.9	60.3	60.5	-	-	-	58.8	55.3	54.9	-	49.3	48.7 – 49.3
Furcula													
GW	42.1	-	44.6	48	-	-	41.5	44.6	40.6	-	-	-	-
Sternum													
LC	84.5	-	88.2	88.3	84.5	84.5	77.3	79.8	80.6	-	75.5	63.4	75.4 – 79.8
Coracoid													
GL	63.1 / 62.7	-	62.9	64.4	65.3	64.4	57.0	60.8	58.1	55.8	55.3	49.3	51.9 – 53.3
LM	57.2 / 57.2	-	55.9	55.7	-	-	51.1	54.0	47.2	49.7	49.5	45.2	46.3 – 48.7
BB	26 / 26	-	27.6	25	23.3	25.0	24.0	24.8	23.4	22.0	22.7	19.5	19.5 – 20.8
Scapula													
GL	71.7 / 71.4	-	71.1	72.5	75.0	73.0	65.1	68.3	67.6	62.0	63.6	57.5	61.1 – 61.9
BC	18.2 / 18.5	-	18.4	19	18.0	18.0	16.1	17.3	16.5	15.6	16.0	14.0	17.0 – 17.1
Humerus													
GL	105.0	116.6	107.3	111.3	112.0	110.0	-	105.5	96.4	99.3	-	88.1	88.0 – 89.5
TP	27.8 / 28.2	25.4	24.9	25.1	23.0	26.0	-	24.0	21.8	22.5	-	19.3	20.2 – 21.0
TD	20.9 / 20.3	20.7	18.1	22.1	21.0	21.0	-	19.3	18.4	18.8	-	16.7	17.6 – 18.1
KT	9.4 / 9.4	9.3	8.3	9.7	9.5	9.2	-	8.5	8.1	8.3	-	7.4	7.7 – 7.9
Pelvis													
GL	88.4	-	86.3	90.9	-	-	72.5	83.3	77.3	-	-	-	-
CB	29.6	-	28.2	31.5	-	-	26.1	31.0	29.4	-	-	-	-
KB	25.2	-	24.5	26.7	-	-	23.3	27.6	24.8	22.0	21.6	23.0	21.0 – 21.2
MB	51.4	-	47.9	50.0	-	-	44.6	50.6	44.4	43.6	44.2	41.0	41.3 – 41.6
AA	41.1	-	32.6	37.1	-	-	35.4	37.5	33.6	28.6	30.2	27.5	27.0 – 27.2
Femur													
GL	86.8 / 86.9	94.4	88.3	89.7	92.0	91.2	-	88.1	81.1	77.1	74.2	71.6	69.7 – 71.4
LM	82.4 / 82.4	90.6	87.2	86.1	-	-	-	83.0	80.2	74.4	71.1	69.0	66.5 – 68.5
BD	18.3 / 18.5	18.3	18.3	18.4	18.5	18.5	-	18.2	16.7	15.2	15.2	13.7	13.0 – 14.0
BP	17.9 / 16.9	17.3	-	-	19.0	16.5	-	-	-	14.2	14.0	13.3	13.5 -14.2
Tibiotarsus													
GL	107	113.2	105.2	107.2	109.5	111.0	-	105	99.6	97.9	-	90.7	91.1 – 95.4
BD	17.3 / 16.4	16.8	16.6	17.7	17.7	16.0	-	18.2	16.5	15.3	-	13.8	13.8 – 14.4
TD	11.5 / 10.8	11.8	10.7	11.9	-	-	-	11.9	10.4	-	-	-	-

Fig. 13: Dimensions of skeletal elements of the Karabalgasun individual (given separately for left / right limbs if possible) in comparison to other Gyrfalcon *Falco rusticolus*, Saker Falcon *F. cherrug* and Peregrine Falcon *F. peregrinus* reference specimens. All measurements in mm. Since most dimensions fall within the typical size range of females, the Karabalgasun bird was likely a female. Specimen data: ZFMK 1 (1908, partial skeleton), ZFMK 2 (01.10.1909, Iceland, mounted skeleton), ZFMK 3 (04.10.1909, Iceland, mounted skeleton), ZFMK 4 (17.09.1912, partial skeleton), ZFMK 5 (1907, Lappland, mounted skeleton), ZFMK 6 (14.07.1912, Iceland, mounted skeleton). Solti's specimen numbers follow numbers given by Solti (1980, 1981). Acronyms of measurements (mostly following Solti 1981): Skull, GL (greatest length); Mandible, GL (greatest length); Furcula, GW (greatest width); Sternum, LC (length of Crista sterni); Coracoid, GL (greatest length), LM (medial length), BB (distal width); Scapula, GL (greatest length), BC (width of cranial epiphysis); Humerus, GL (greatest length), TP (proximal width), TD (distal width), KT (central width); Pelvis, GL (greatest length), CB (proximal width), KB (smallest width), MB (median width), AA (smallest width between Acetabula); Femur, GL (greatest length), LM (medial length), BD (distal width), BP (proximal width); Tibiotarsus, GL (greatest length), BD (distal width), TD (distal depth).

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