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SAKER FALCON CONSERVATION STATUS AND RESEARCH REQUIREMENTS**A FINAL REPORT TO THE SAUDI WILDLIFE COMMISSION BY BIRDLIFE
INTERNATIONAL****JULY 2010
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Saker Falcon conservation status and research requirements
A Final report to the Saudi Wildlife Commission

by
BirdLife International

July 2010
Revised January 2011

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Introduction

This report fulfils the final obligation under a contract between SWC and BirdLife International entitled 'Assessing the knowledge and research gaps and reviewing the conservation status of the Saker Falcon' that required BirdLife International, between November 2009 and May 2010, (1) to assess the conservation status of the Saker Falcon against the IUCN Red List criteria, and (2) to identify the research and information gaps that hinder this assessment and to propose ways of filling them.

In 2004 BirdLife International, using evidence compiled from various sources pointing to a rapid decline in the Saker Falcon's global population, determined that this evidence triggered the IUCN Red List criteria for 'Endangered'. In 2008 Croatia, noting that the Saker Falcon is a migratory species, proposed that it be placed on Appendix I of the Convention on Migratory Species (CMS), consistent with the CMS principle that all Endangered migratory species be listed there. Listing on Appendix I would mean that trade in the species would be prohibited by the Parties to the Convention. However, in December 2008, at the Ninth Meeting of the Conference of the Parties, in response to an intervention from Saudi Arabia, CMS adopted Resolution 9.20 urging Parties to (a) take action to conserve the Saker Falcon, (b) support a workshop on the species to be held in the UAE in 2009, and (c) 'assist in the delivery of a research programme, initially supported by Saudi Arabia, designed to re-evaluate vigorously the conservation status of the species across its range'. This resolution also requested the CMS Scientific Council to review progress of these activities and strongly recommended the listing of the Saker Falcon on Appendix I 'unless there is a transparent and significant improvement in the conservation status of the species across its full range'.

The 'research programme, initially supported by Saudi Arabia, designed to re-evaluate vigorously the conservation status of the species across its range' (as adopted at the Ninth Meeting of the Conference of the Parties to the CMS, Resolution 9.20) is the work undertaken under the BirdLife/SWC contract (Part 1 below plus Appendices A, B and C), but this was extended under the contract to include the research and information gap analysis (Part 2 and Conclusions and recommendations below). A financial report appears in Appendix D and a tabulation of key recommendations appears in Appendix E.

From 5–7 April 2009 the United Arab Emirates hosted a 'Specialist meeting on the conservation of the Saker Falcon'. This workshop, mentioned in CMS Resolution 9.20, heard from a variety of national stakeholders and considered issues surrounding the sustainable use of falcons for falconry. The meeting concluded with five points:

1. Cooperation is needed between all range states and stakeholders to improve the species's conservation status, under the CMS umbrella;
2. Saudi Arabia initiative for a regional Action Plan was supported;
3. BirdLife International will undertake a full status review (this document);
4. Arab falconry associations could promote the need to educate end-users in conservation matters, and quantify the numbers of falcons and falconers involved;
5. Parties must fulfil their obligations to multilateral environmental agreements (CMS, CITES), but MEAs should better reflect the various needs of parties.

Part 1. The conservation status of the Saker Falcon

A complete review of recent literature concerning the Saker Falcon was undertaken over the period of the project from November to early March 2010 inclusive. A large number of bibliographic references was assembled, stored in a dedicated filing system, and filtered for information relevant to the particular issue of reassessing the species's IUCN Red List category. These references were then carefully checked and their information extracted and assigned to key subject areas for comparisons and analysis.

A relatively small number of countries holds a disproportionately large number of Saker Falcons, and from the outset of the review it was apparent that information from these countries would be critically important to the reassessment of the Saker's IUCN status. As of 2007–2009, all the countries in the European landmass west of Russia accounted for only 291–366 pairs, while Afghanistan, Iraq, Iran, Pakistan, Turkey and Turkmenistan accounted for only another 125–520 pairs, with Ukraine contributing 270–345 pairs. These numbers, totalling 686–1,231 pairs, have not fluctuated greatly over the previous 20 years or so, and could therefore be set aside. The remaining six countries were, by contrast, each judged to have held at least 500 pairs around 1990, and in the assessment undertaken by BirdLife in 2003 (prior to the 2004 listing as Endangered) it was the reported declines in the populations of five of these six countries that had caused the IUCN Red List criteria to be triggered. The countries in question were Kazakhstan (1,300–3,000 pairs in 1990 down to 200 pairs in 2003), Kyrgyzstan (500–600 to 120–200), Mongolia (2,668 to 1,000–1,200), Russian Federation (1,780–2,301 to 550–700) and Uzbekistan (1,000–1,500 to 100–150), with only China apparently stable (1,000–1,200 to 1,000–1,200). It was therefore these six countries that became the target of particular investigation in the present study.

The results of this investigation are presented in [Appendix A](#), which is a copy of the text that was set out online on the BirdLife International 'Data Zone' website discussion forum on 7 March 2010. This forum allows experts from around the world to contribute their opinion and information so that BirdLife staff can then synthesise and reconcile data and judgements in a final assessment that is as inclusive and comprehensive as possible, and which therefore carries the highest level of authority and approval. In order to be sure to obtain feedback from the world's experts on the text posted on 7 March, BirdLife sent emails to everyone known or believed to have expert knowledge and opinion on the Saker Falcon, inviting them to read the text and contribute their commentaries and data. In the period between 7 and 30 March, expert evidence was received in 27 postings from 14 sources, and these were reviewed and synthesised by BirdLife in a statement set out online on 1 April ([Appendix B](#)), in which it was determined that the evidence now indicated a classification of the species as Vulnerable. Once again, world experts were invited to comment on this assessment within ten days, and no dissenting opinions were voiced. The new IUCN status became official on 10 May 2010. The current BirdLife entry in the 'Data Zone' for the Saker Falcon is presented in [Appendix C](#).

In brief, the investigation conducted up to the start of March suggested that, on the basis of evidence available, the Saker Falcon continued to merit classification under the IUCN category 'Endangered', having experienced a decline in the order of 65% over three generations (almost 20 years), with estimated total number of pairs 31,579 in 1990 but only 10,467 in 2010. However, in the online consultation that followed the posting of this assessment, new information was provided which resulted in a highly significant revision of numbers in China and some important adjustments

to estimates for Mongolia and Russia, so that the 1990 'baseline' total was revised downwards by around 50%, allowing the rate of decline from this baseline to be recalculated as 32%, which over three generations triggers the IUCN category 'Vulnerable'.

Part 2. Knowledge and research gaps

The data needed for an IUCN Red List status assessment are very rarely so complete that no inference or assumption is needed. The great majority of species require the assessment to extrapolate from relatively incomplete datasets, allowing various degrees of probability to inform the process. Among the most difficult species to assess are those that live at low densities but occupy very large ranges encompassing very remote regions. The typical circumstance of such species is that they have been studied by a few surveys over several time periods, almost always covering different areas and using different methods, so that comparisons are fundamentally very problematic. Nevertheless, the IUCN guidelines require assessors not to classify species as 'Data Deficient' (meaning that there is insufficient evidence to decide on status) if it is possible to make some kind of deduction of status from the available body of evidence, however incompatible its parts.

The Saker Falcon presents this kind of problem. It has a massive range, and the countries in which its largest populations are (or were) thought to occur—China, Kazakhstan, Mongolia, Russia (i.e. Asian Russia) and Uzbekistan, as well as countries with potentially large populations such as Ukraine and Turkmenistan—are all large, with significant areas of relatively inaccessible terrain where a biological research presence is either very small or non-existent. The reviews in Appendix A below demonstrate the very significant degree of uncertainty and speculation that accompanies the population estimates for the six nations targeted for close investigation. The gaps in knowledge are in fact so great that they can only here be outlined in generality. They fall into five different types, concerning: (1) distribution; (2) population sizes and trends; (3) ecological issues; (4) trade effects; and (5) anthropogenic pressures other than trade. Each of these is considered here in turn.

Distribution

The most fundamental items of information in conservation and conservation assessment concern range and numbers. These two parameters are crucial elements in determining both Red List status and appropriate measures of management. In the case of the Saker Falcon, the distribution of the species in each of the key countries listed in Appendix A remains insufficiently clear. For example, the true breeding ranges in Kazakhstan and China are still very far from being understood; in other major countries the situation is only marginally better. Unless and until this clarification happens across all countries, population estimates will remain very uncertain. Moreover, once more precise levels of knowledge have been reached over the breeding range, use of remote sensing will allow the creation of a predictive map of the range of the species and a far more accurate assessment of numbers while also of course indicating new areas with a similar habitat signature which might hold populations.

A second dimension in the issue of distribution concerns migratory patterns and winter quarters. Some limited work, using satellite transmitters, has been undertaken on this in Hungary, Kazakhstan and Mongolia, indicating that Saker Falcons exhibit complex patterns of movement outside the breeding season, occupying many areas at least briefly that were completely unknown for the species before and

possibly therefore encountering threats that were previously undocumented. Again, a study of sites used for migratory route and wintering grounds would produce a new map that could be subject to analysis in terms of threats and habitat utilisation, and thus provide key information for the long-term conservation of populations.

Population sizes and trends

Robust information on population sizes and trends is essential to good conservation practice and status assessment. Information on population *sizes* can be generated through targeted surveys and extrapolation, but its accuracy increases with increased area covered and time invested by fieldwork. However, once a robust set of population values has been established through rigorous fieldwork and analysis, information on population *trends* can be generated through standardised monitoring protocols that sample areas across the range within each country, without involving the same degree of geographic coverage as the population size surveys. By means of the population size surveys a baseline is established; by means of the population trends surveys a monitoring programme develops.

Despite (a) its extraordinary economic value and (b) the very considerable endeavours of some excellent fieldworkers, outside of Hungary the Saker Falcon has never been subject to scientific survey and monitoring of this type. Consequently all the data available for analysis in this project (Appendix A) have been low in quality. Independently, Dixon (2009, *Falco* 33: 4-10) actually provided his own assessment of the data quality of the national population figures he assembled for Asia. He classified data quality in 13 countries into five classes (excellent, good, medium, poor, guess) and found 1 was medium, 6 were poor and 6 were guesses. Although more data were assembled for the present project, their quality cannot be said to have been significantly better. This of course has serious implications for the robustness of the Red List assessment. It is an assessment built on a general consensus and based on the best information currently available. However, it is open to challenge from new but still incomplete pieces of evidence at any time, and is thus inherently unstable. New negative information could quickly take the Saker Falcon back up to Endangered and, given CMS resolution 9.20, this would seem likely to result in its uplisting to Appendix I.

There is therefore a pressing need to institute a rigorous and comprehensive programme of population evaluation and monitoring across the Asian range of the species, preferably with the inclusion of the Ukraine.

Ecological issues

The ecology of the Saker Falcon, an arid-country falcon requiring secure nest-sites and a food supply consisting mainly of rodents, is moderately well known. However, there has been little peer-reviewed in-depth scientific work on the species, at least in the main parts of its range. This means that there is no real information on

- the relationship between presence/abundance of Sakers, habitat characteristics (including nest-site availability) and prey availability,
- how this relationship changes with cycles in rodent abundance,
- how breeding success and juvenile survival in Sakers vary with rodent numbers,
- the issue of rodent plagues, human endeavours at controlling them, and the responses of Saker populations either to the plagues or to the controls,
- the way that anthropogenic habitat change within its range has affected the species's prey-base and influenced its numbers and survival rates, or

- its winter ecology—what habitat it selects, what food it seeks, how birds space out.

These are all significant weaknesses from the point of view of conservation biology. The key aim of conservationists dealing with the Saker Falcon is to ensure that its populations are managed sustainably, and this aim is unachievable and unverifiable without a firm knowledge of the parameters listed above.

Trade effects

The effects of illegal trade on populations of the Saker Falcon are not understood at all. This is hardly surprising, since illegal trade is, by its nature, clandestine. However, a strong consideration from the review in Appendix A is that illegal trade appears to have been decisively important in the presumed or evident declines of the species in the major countries among the range states. Thus, drawing on evidence assembled in Appendix A:

- in China there was a report in 2001 that ‘thousands of foreigners claiming to be tourists or businessmen came to China and caught Sakers illegally’;
- in Kazakhstan exports of 1,000 falcons (presumably Sakers) a year in the years 1994–1996 were reported, with the trapping pressure moving eastwards in 1997 owing to depletion of exploited areas;
- in Kyrgyzstan 100–120 birds were reported to be trapped annually through the 1990s (i.e. 1,000 birds taken in this period) and 80% of all nests robbed;
- in Mongolia almost 1,000 birds were reported to have been exported legally in the period 1993–2002, but that in the same period the same number or more were exported illegally;
- in Asiatic Russia illegal trapping has been claimed as the primary cause of decline, with speculation that 1,000 Altai-Sayan Sakers might be caught on migration annually for the falcon trade;
- in Uzbekistan ‘mass trapping’ of adults (50 or more adults being trapped per year) and the removal of chicks from nests have been the main threats since 1990.

These reports are obviously highly speculative. However, the fact that all countries have reports of illegal trade reinforces the overall impression that covert trapping and trading is a major and enduring issue in Saker conservation across its range. One of the central problems in the Saker trade, legal or illegal, is the great preference of consumers for females, and the way in which populations suffer as a result of the removal of females remains unstudied yet of crucial importance.

Because it is illegal, the levels and effects of Saker smuggling are not an easy subject for research workers to investigate; and without clearer understanding of the problem, policy responses will remain ineffective and probably unimplemented. However, if the research on Saker population sizes and trends is conducted as recommended here, a baseline will be set by which the impacts of illegal activities can for the first time be assessed and quantified, allowing for an appropriate policy response. This research will also provide range states with sufficient evidence to gauge appropriate offtake levels for legal trade under CITES provisions. Moreover, if the countries in question devote part of the income from such sales to the policing and protection of wild populations, then the domestic management and circumstances of Saker Falcons will be likely to improve dramatically. Finally, even smugglers are not necessarily immune from investigation, and inducements of various types might be expected to bring about conversions of smugglers and the break-up of their networks.

Anthropogenic pressures other than trade

Several threats to Saker populations require study. Of these, *agricultural change* is probably the most important and least understood. Even minor increases in vegetation height as a result of irrigation and fertilisation can reduce the hunting ability of the Saker, while practices which reduce the biomass of mammalian granivores also tend to depress Saker presence. Thus new farming initiatives and increasing cattle-grazing in parts of Kazakhstan have greatly altered the ecologies of certain grassland areas, and diminished the prey base and hence numbers of Sakers. Similarly, in Hungary, Bulgaria and Ukraine rodents (in particular ground squirrels) have been literally marginalised, being confined to narrow strips of habitat along banks and verges, suggesting that the Saker may only survive in the long term in areas where the land is too poor to cultivate. In Central Asia agricultural abandonment may benefit Sakers, but abandonment of sheep-grazing increases vegetation cover to the detriment of suslik populations.

The costs and benefits of *powerlines* remain to be elucidated. Electrocutation may be significant in some areas, whereas pylons can supply nest-sites and may compensate in some areas for the cutting of trees. Clearly, however, it is important and now timely to examine ways of minimising electrocutions of Sakers and other raptors across the range state steppelands and of maximising their safe use of transmission poles and pylons. Work has begun on these aspects but a synthesis of information and evidence remains to be achieved.

Other possible negative factors include deliberate human persecution, accidental human disturbance, nest losses to domestic carnivores, and mortality in nests caused by litter (rope, string, plastic). These effects need to be quantified through studies that can be incorporated into the work focused on the ecology of the species and its responses to other problems listed above.

Conclusion and recommendations

There is consensus on the BirdLife discussion forum that BirdLife's re-evaluation of the IUCN Red List status of the Saker Falcon is a fair and full treatment of the latest and most relevant evidence, and that the new classification of Vulnerable is appropriate in the circumstances. However, it is also apparent that the evidence in question is far from full or dependable, and that the new classification is therefore relatively unstable. With even only small amounts of additional information, themselves no more or less dependable than those already used in the classification, there could be grounds to change the IUCN Red List status once more.

While this potential instability is inevitable in the short term, in the longer term assessment can be made considerably more robust through a concerted research programme targeted on the many key information gaps identified above. Such a programme would also, of course, result in a steadily improving capacity to conserve and manage Saker Falcon populations, allowing the option of their verifiably sustainable exploitation. In a remote-living, low-density species like the Saker Falcon the time-frame for obtain scientifically robust results and using them as the basis for successful management practices will inevitably be large. Thousands of man-years have gone into the study of economically important species such as Ring-necked Pheasant *Phasianus colchicus*, Red Grouse *Lagopus lagopus*, Woodcock *Scolopax rusticola*, Mallard *Anas platyrhynchos* and Houbara Bustard *Chlamydotis undulata*, and the cumulative cost of this work amounts to many millions of dollars. The need clearly exists for similar kinds of investment in understanding the biology and conservation of the Saker Falcon.

This investment might be framed as an initial five- or ten-year programme of studies of the Saker Falcon, involving the following key areas (tabulated in Appendix E).

1. Intensive springtime survey work by well-briefed, well-equipped teams in China, Kazakhstan, Kyrgyzstan, Mongolia, Russia (European and Asiatic), Ukraine and Uzbekistan, aiming at
 - a. visiting all areas in each country where the species is likely to occur, in order to produce a comprehensive map of national distributions,
 - b. sampling a high number of representative areas within the national ranges defined above, in order to generate robust estimates of breeding population sizes,
 - c. identifying appropriate strategies for the long-term monitoring of populations, and
 - d. interviewing local leaders, hunters, farmers and experts to generate a profile of the recent past status of the species and its habitat, and the possible causes of any changes.
2. Programme of ecological research in three countries (perhaps China, Kazakhstan, Russia) where comparable but contrasting conditions exist, including populations under various and variously intense anthropogenic pressures, aiming at
 - a. understanding Saker presence/abundance in relation to habitat and prey,
 - b. clarifying Saker presence, abundance, breeding success and juvenile survival rates in relation to rodent cycles,
 - c. assessing the impact of human anti-rodent measures on Saker numbers,
 - d. investigating the influence of different types of habitat change on Saker numbers with particular respect to prey availability,
 - e. identifying the economic drivers of anthropogenic habitat change in Saker breeding ranges,
 - f. measuring the positive and negative effects of powerlines on the distribution and survival of the species, and
 - g. enumerating all threats to the species, prioritising the need for responses to these threats and proposing mitigations
3. Satellite-telemetry project in the three countries and several others (perhaps Mongolia, Ukraine) aiming at
 - a. clearer definition of migratory routes, wintering areas, habitat selection and prey selection in different parts of the non-breeding range,
 - b. stronger assessment of survival rates of adults and juveniles, and
 - c. deeper understanding of rates of trapping and their influence on Saker populations in different regions, especially in relation to sex biases.
4. Technical unit to oversee the project, compile all data on the Saker Falcon, coordinate fieldwork, store, manage and analyse new data, troubleshoot issues (e.g. the optimal design of powerline transmission systems), develop policy and recommendations relevant to CMS and CITES, and plan longer-term initiatives (e.g. management measures, conferences and training workshops).

Appendix A

Text prepared by BirdLife International for its discussion forum,
online 7 March 2010

The global status of the Saker Falcon in 2010

Summary.—The status of the Saker Falcon is reviewed in the ‘big four’ countries in which it occurs: China, Kazakhstan, Mongolia and Asiatic Russia, along with Kyrgyzstan and Uzbekistan (for which in 2004 there was evidence of a steep decline). Numbers for other range states have been evaluated recently and are not re-evaluated here, partly because they are relatively small and partly because they show little variation. Despite general uncertainty, which is greatest with respect to China, the evidence from the population estimates indicates a decline over three generations (19.2 years) in the immediate past of 46–79%, median 65%, triggering the IUCN status Endangered, in which category the species is already classified.

BACKGROUND

This review of the global status of the Saker Falcon has been coordinated by BirdLife International (which is the official Red List Authority for birds for the IUCN Red List) via the BirdLife Globally Threatened Bird Discussion Forums (see http://www.birdlife.org/action/science/species/global_species_programme/gtb_forums.html). The results of the review will feed into the 2010 Red List which will be released (for birds) by BirdLife in May 2010 and (for all taxa) by IUCN in September 2010. The review has been undertaken following a workshop to consider the status and conservation needs of the species, held in Abu Dhabi in April 2009. It was initiated by Saudi Arabia who, with other Parties to the Convention on Migratory Species (CMS), were urged to develop a research programme to “re-evaluate vigorously the conservation status of the species across its range” in CMS Resolution 9.20 (adopted by the ninth Conference of the Parties in December 2008). BirdLife is urgently seeking further input and comment on the proposed assessment of the status of the Saker Falcon as Endangered, recognising the particular interest in this species, and its relevance to the implementation of both CMS and CITES.

INTRODUCTION

The Saker Falcon *Falco cherrug* occupies a very wide longitudinal breeding range in the Palearctic from Central Europe east to western China, some birds wintering south into the Afrotropical region. The ‘Altai Falcon’, regarded variously as a species, *Falco altaicus* (e.g. Ferguson-Lees & Christie 2001), a subspecies *F. cherrug altaicus*, a morph of Saker Falcon or simply a synonym of it, seems likely to be limited to the Altai-Sayan Mountains in Russia and Kazakhstan (Moseikin 2000); it may be derived from a certain amount of interbreeding with Gyr Falcons *Falco rusticolus* (Potapov *et al.* 2002).

Around 1980 the assumption was made that the global total population of the Saker lay somewhere between 20,000 and 100,000 pairs (Cade 1982). Around 1990 these wide limits had been narrowed, and the total world population was estimated to be in the range of 35,000–40,000 pairs (Baumgart 1991). Of this number, a mere ‘1%’ (based on 370–610 pairs) were thought to breed in Europe west of the Ural Mountains (Baumgart 1994), although as many as 5,000–10,000 pairs bred in that region in the latter part of the nineteenth century (Baumgart *et al.* 1993). Thus the species is thought

to have declined by 88–96% in the hundred years from 1890 to 1990, with the trend certainly continuing in the years after 1970 (Baumgart 1994). Indeed, after around 1970 the consumption of Sakers for falconry in Arab countries (Bahrain, Kuwait, Qatar, Saudi Arabia and United Arab Emirates) began to accelerate. Cade (1982) speculated that some 2,000 would be required each year to meet demand. At the start of the 1990s, annual harvest estimates for traditional falconry were around 2,750 per year (Riddle & Remple 1994). At this time, Saker populations in many newly independent Central Asian range states became accessible. A decade later, Barton (2002) gathered data from falcon hospitals and concluded that as many as 6,825–8,400 Saker Falcons, the vast majority (96%) of them females, would be caught each year to supply falconers in the Arabian Peninsula (Saudi Arabia 4,000, Qatar 1,000, Bahrain 500–1,000, Kuwait 500–1,000 and UAE 500–1,000, with 5% added to account for mortality). It was not apparent that this level of consumption could be met by sustainable off-take of wild birds.

Simultaneously, biologists working for ERWDA (now the Environment Agency of Abu Dhabi, EAD) documented a very rapid population decline, particularly in Central Asia, attributed to this inadequately controlled off-take for the falcon trade (ERWDA 2003). In the course of the 1990s high demand coupled with increasing rarity in the wild made the falcon trade very profitable and provided a major incentive for local communities to trap falcons, which, at the end of the chain, could typically command US\$20,000–40,000 and even higher for exceptional specimens (Ostrowski *et al.* 2008). In 2002 a trade ban was imposed by CITES on UAE involving a passport system (Ostrowski *et al.* 2008). Figures reported to CITES show that in the years 1990–1999 the annual average of birds exported from the breeding range states was 300, but that this rose to 575 for the years 2000–2008, which suggests an intensification of exploitation (although the proportion that were captive-bred may have been higher in the second sample); as noted on the BirdLife Globally Threatened Birds Discussion Forum (<http://www.birdlifeforums.org/WebX/.2cba6d3d>), clandestine trafficking of Sakers may be an order of magnitude larger.

Using the evidence on the Saker's global population status around the year 2000 assembled by Haines (2002) and ERWDA (2003), and with back-calculation by Haines (2002) using whatever evidence was available to arrive at plausible numbers of the species in 1990, BirdLife International re-evaluated the status of the species for the 2004 IUCN Red List (BirdLife International 2004). For the Red List criterion A, which simply involves rate of decline irrespective of total numbers or range size, a period of 10 years or three generations (whichever is the longer) is used as the unit of measurement, with a rate of 30% for Vulnerable, 50% for Endangered and 80% for Critically Endangered. In the case of the Saker, generation length was calculated two ways: (a) $(1/\text{adult mortality}) + \text{age at first breeding}$, or (b) $(\text{maximum longevity} - \text{age at first breeding})/2 + \text{age at first breeding}$. Cramp & Simmons (1980) give age at first breeding of 2 and an annual survival of 67%, thus (a) $(1/0.33) + 2 = 5$. From various sources, maximum longevity of eight species of *Falco* is 13.6 years, thus (b) $(13.6 - 2)/2 + 2 = 7.8$. The mean of these two estimates $(5, 7.8) = 6.4$, and three generations thus = 19.2. The data assembled by BirdLife indicated a decline of 53–75% (median estimate 66%) over three generations (19.2 years), and the species was uplisted to Endangered.

A helpful commentary by Dixon (2005) asked whether it was time to question 'the value of country-scale population estimates in light of their obvious unreliability', pointing out that these are not necessary to establish the trends in population sizes. N. Fox (*in litt.* 2010 to BirdLife; see <http://www.birdlifeforums.org/WebX/.2cba6d3d>)

also stresses the highly tentative nature of these estimates but admits that there is at present little else to depend on. Likewise, Dixon (2007, 2009) has continued to use them in his assessment of Saker status, and in the absence of any better evidence they are used as a key resource in this assessment also. However, it is worth noting that the quality of all this information is poor. This is not a comment on the endeavours over many years of researchers working in very difficult conditions, but simply a reflection of the fact that a relatively low-density raptor distributed across some of the remotest areas in the world represents a challenge to which ornithological science on modest budgets has yet to find the means to rise. However, not only are many assessments inconsistent and incompatible with other each other but they also fail to recognise this fact. Possible explanations for these disparities are hardly ever offered. This makes the business of interpreting the information particularly difficult and unrewarding. Information about illegal trade is even less dependable or in any way quantified, but the text below highlights items of information where some expression of its magnitude has been made and appears relevant to an appreciation that declines in numbers are very likely to have resulted; as such, they give some justification to the choice of earlier population figures in the table.

For the purposes of this review, the information on the Saker's population and status given in Dixon (2007, 2009) is accepted for all of 'Europe' (here including Armenia, Georgia, Moldova, European Russia, Turkey and Ukraine) and for Afghanistan, India, Iran, Iraq, Kyrgyzstan, Pakistan, Tajikistan and Turkmenistan (there may be more recent and slightly different information, but for simplicity this can be set aside). The crucial countries reviewed here, therefore, are China, Kazakhstan, Mongolia, Asiatic Russia and Uzbekistan, the first of which remains problematic in terms of population size and trend, while the last four were the ones that showed major declines between 1990 and 2000 which were decisive in the 2004 Red List assessment. Items of information which are regarded of particular import are underlined.

CHINA

Distribution The species occurs in the provinces of Xinjiang, Qinghai, Sichuan, Gansu, Tibet, Inner Mongolia, Ningxia, Heilongjiang, Liaoning and Hebei (Cheng 1987, Zheng 1994 in Li *et al.* 2000); details and important map in Ye *et al.* (2001). Studies in 2001 resulted in the judgement that the species 'might breed in small numbers in Alashan mountains, along the Mongolian border, in Altay foothills and in Quinhai [*sic*] province' (Ye & Ma 2002).

Population Several highly contradictory accounts of the situation in China have been produced.

(1) Baumgart (1991), citing as his sources 'Weigold 1922, Schäfer 1938, Vaurie 1972', reported the Saker as breeding at remarkably high densities in Tibet, and estimated a total national population of 15,000–20,000 pairs.

(2) At a symposium in 2000, Ye *et al.* (2001) wrote: 'The numbers of Sakers in China according to the preliminary estimates is 64,000–102,000 individuals' and that 'Xinjiang [*sic*] and Qinghai are the important breeding areas'. The numbers were tabulated as 30,000–50,000 in Xinjiang, 10,000–20,000 in Qinghai, 8,000–10,000 in Gansu, 6,000–8,000 in Xizang, '5,000–8,000?' in Inner Mongolia and 5,000–6,000 in Heilongjiang, all based on estimations but by several different workers.

(3) In 2001, new surveys of the Saker were conducted in Xinjiang province, where fieldwork established that the Tarim and Dzhungar basins were unsuitable for

the species but that the Tien Shan and Altai mountains (surrounding the Dzhungar basin) and the Tien Shan ridge and Tibetan Plateau (surrounding the Tarim basin) contained appropriate habitat (Ye & Ma 2002). Nevertheless, the foothills of the Tien Shan held very few raptors and, even in the mountains, human use appeared to be too intensive to permit Saker occupancy; in an unspecified area 22 nests were found, nine with chicks, while in the Altai, in August, 10 territories with adults and empty nests were found (Ye & Ma 2002). Based on this study, the population of Sakers in Xinjiang province was revised down from 30,000–50,000 individuals to 350 pairs, and Nei Monggol (Inner Mongolia Autonomous Province) was found to have ‘extremely low’ numbers of all bird species, with no Sakers reported; the conclusion was that the high human population and human attitudes are unfavourable to Sakers, that the former estimate of 64,000–102,000 individuals for China was consequently mistaken, and that the population might not exceed 500 pairs for the entire country (Ye & Ma 2002).

(4) These figures are slightly contradicted by [Xiaodi=] Ye & Fox (2003), who give even lower values, calculating that only 14 breeding pairs might be present in all Inner Mongolia and judging that ‘there might be as few as 200 breeding pairs across the entire country’. Barton (2002) had remarked that ‘East Ukraine, Central Kazakhstan and Chinese populations have disappeared or are severely overexploited’, indicating that the change in estimates for China was not merely a matter of improved knowledge but also and perhaps largely or entirely a result of a genuine change in numbers (which incidentally he gave as ‘about 300 pairs’).

(5) ERWDA (2003) offered two assessments, one of 300 pairs, based on three sources (none of which mentions this figure), and one of 1,000–1,200 pairs, based on ‘Ming and Potapov in press’ (which seems never to have been published and has never otherwise been referred to). This latter figure, being ‘in press’, was assumed to carry new authority and was used by BirdLife in its assessment of the Saker’s status in 2003–2004, standing for both the 1990 and 2000 values in the absence of greater clarity on trends in the population.

(6) To some extent the work by Ma *et al.* (2006) revealed the basis for the downward revision, since in the years 2005–2006 they found 1.1–1.5 breeding pairs per 1,000 km² (in 5,400 km² of study area). Despite this, Ma & Chen (2007) made the extraordinary remark that ‘China possibly has the largest breeding Saker Falcon population of any country in the world’.

(7) By contrast, Wu *et al.* (2007)—whose authors included Ma—reported that the Saker in China ‘will be on the edge of extinction for next years’, its population having ‘collapsed’.

(8) Dixon (2009), viewing the Qinghai-Tibetan Plateau as the most important area in China, ‘with a large breeding and wintering population’, estimated 3,000–5,000 pairs of Sakers for the country, but felt that, given various threats, the trend in numbers is likely to be downward.

Discussion

We thus have wildly varying assessments of status for China—up to 20,000 pairs, up to 102,000 individuals, 500 pairs, 200 or 300 pairs, 1,000–1,200 pairs, possibly the world’s largest population, population collapsed and soon nearly extinct, 3,000–5,000 pairs. It is difficult to know how to interpret this situation. The most recently proposed values would carry more weight if the preceding estimates were steadily convergent, but this is not so. Although the estimate in Dixon (2009) is derived from various figures and values, there is not a single reference associated with any of them, so their sources are unknown; the reference list for Dixon (2009), not published with the paper but downloadable, contains no Chinese papers. There is no

discussion of the earlier estimates and comments (1–6 above), even though the estimate of as few as 200 pairs derives from work co-authored by a colleague. However, if it is now accepted that at least the values of the two earliest estimates (20,000 pairs and 102,000 individuals) cannot be used for contemporary numbers, it is perhaps safest to place the Chinese population range between 200 and 5,000 pairs, and allow Baumgart's 1991 estimate to stand for the situation in 1990. (However, Baumgart's figures are remarkably high, and they have a strong effect on the assessment of global decline rates, so China perhaps needs to be set aside in consideration of these latter, given that the picture is so obscure.)

Threats and issues The volume of smuggled Sakers from China into Pakistan was large at around the end of the twentieth century (Li *et al.* 2000). Illegal capture began in Xinjiang in 1992 and spread quickly to Qinghai, Ningxia and Inner Mongolia, most smugglers being Pakistanis and the routes typically either via Beijing or across the Xinjiang/Pakistan border (Li *et al.* 2000). Wan (2001) reported that 'at the beginning of the 1990s, thousands of foreigners claiming to be tourists or businessmen came to China and caught sakers illegally', indicating a slightly different schedule and distribution of activity than in the account above.

Ye & Fox (2003) listed five threats: (1) nest despoliation; (2) trapping of adults and juveniles; (3) conversion of steppe to agriculture; (4) desertification; (5) use of pesticides. More threats are listed by Ma *et al.* (2006: 61-63) and by Wu *et al.* (2007: 43-45).

Conservation measures Penalties for illegal trade in Sakers were so light in the 1990s that the law needed reforming in order for it to have any deterrent effect; moreover, nature reserves lacked funding for wardens, allowing traffickers to operate with impunity (Li *et al.* 2000). Ma (2004), however, reported that penalties 'today' are strong, including long or life imprisonment and even death, while Wu *et al.* (2007) remarked that 'penalty is too low and difficult to apply'. Wan (2001) pointed out that China made Saker trade legal in 1997 as a means of reducing poaching and smuggling, exporting 44 in 1997, 61 in 1998, 75 in 1999 and an estimated 90 in 2000. (This is presumably according to the quota mentioned below.)

Ye & Fox (2003) list seven recommendations by the Institute of Zoology in Beijing: (1) curb smuggling and decrease official harvest quota (something not mentioned elsewhere in the paper); (2) implement awareness campaigns; (3) put Saker on CITES Appendix I; (4) stop pesticide use; (5) protect main breeding area; (6) establish a captive-breeding project; (7) implement conservation in wintering areas. See also Ye *et al.* (2001) for details and further ideas, including the need for study of the species in China, which was partly fulfilled by a five-year project in northern Xinjiang, 2001–2006 (Ma *et al.* 2006). According to Ma & Chen (2007) a captive-breeding project was duly established in 2004 in Qitai county, Xinjiang, by the Forestry Bureau, at a cost of US\$575,000, but is 'completely useless' (also 'ridiculous, ill-thought out') and 'can only be a temporary holding place for wild-caught birds before they are sold on', resulting in 60–100 birds being legally captured and exported from Xinjiang annually. This place is not mentioned by Wu *et al.* (2007), who however called for a rescue station to be built in Xinjiang by the 'Ministry of Forestry' and remarked that 'artificial breeding... is outstanding mode to relieve the pressure of supply and demand'.

KAZAKHSTAN

Distribution The species does not breed throughout the country, but chiefly in the north, central, south and east (where suitable rocky areas for nesting exist); Sakers breeding in northern Kazakhstan appear to migrate south-west at least as far as the Middle East; those from southern and eastern regions appear to be far more sedentary, and some overwinter locally (Kenward *et al.* 1998, Levin *et al.* 2000).

Population (General) There is some confusion about the nature of the decline in the country.

(1) Baumgart (1991) cited Riabov as indicating serious declines in conditions in the north, where wooded steppe diminished by 20% and open steppe by 10–12.5%, apparently from the 1960s to the early 1980s.

(2) However, in another account the Saker population was judged to be 2,000–5,000 birds up to 1985, with nests 3–5 km apart and no sign of problems at least near Alma-Aty, but in the subsequent 15 years it plunged to ‘the brink of extinction’, although still numbering 300–400 pairs (Levin 2000). The following year the same author, after saying that there were ‘until recently... 1000–3000 pairs in the republic’ (i.e. a somewhat different statement from his previous), estimated the national population at only 150–200 pairs (Levin 2001; also in Barton 2001).

(3) The extent to which these figures were based on extrapolation from a small sample is not clear: from south-east and central Kazakhstan Levin *et al.* (2000)—one of whose authors was N. Fox—tabulated (a) a decline in nesting pairs from 24 before 1993 to <5 in 1997, and (b) the nesting and fledging success of a subset of these pairs (maximum number of nests checked: 23) in the years 1995–1998, basing on this evidence the view that, as a result of taking birds at nests, ‘nest success and productivity of the Saker in Kazakhstan reached an all-time low in 1998’, at which point ‘the number of occupied nests was reduced to a critical level, with the complete removal of sub-populations from some monitored regions’. Levin *et al.* (2000) indicated the decline to have been ‘especially marked in the more accessible southeast of the Republic’, but that overall ‘the current situation appears to be threatening the status of the Saker as a breeding bird in Kazakhstan [sic]’. This evidently led Levin (2001) to his remark above re 150–200 pairs.

(4) In pointing out that Levin’s (2001) estimate was ‘based on studies conducted within a fraction of the Saker Falcon’s breeding range’—something which the paragraph above cannot confirm or deny, but which in any case was accepted and used by ERWDA (2003) without question—Dixon (2005) remarked that based on new work in 2004 ‘the population is believed to be in excess of 1500 breeding pairs’.

(5) In reviewing recent project publications which yielded a number of estimates for various parts of each of the main regions, Dixon (2009) concluded: ‘Given that no data exists for an enormous area of suitable habitat in Kazakhstan, the current breeding population of the country undoubtedly exceeds 2000 breeding pairs’, and he went on to tabulate the population as 2,000–3,000 breeding pairs, marking this entry as involving a ‘stable/declining’ trend.

(6) **(Northern and western areas)** In northern Kazakhstan, the highest population is within the Naurzum Forest Reserve (Pine Forest), with 29 pairs in 1999 and an estimated 40 pairs altogether (Bragin 2001). Bragin (2001) reported that the forest islands of the steppes in the south of this region perhaps hold the only stable population in the country. In 2003–2004 a large, apparently previously unsuspected population was discovered in the ‘north-west’ of the country, although in one part of the resulting paper this is given as an extrapolation of 1,204–1,427 (median 1,316) pairs, of which 145–165 pairs are in the northern sector and the rest (ergo 1,059–1,262

pairs) in the western sector (c.1,119 pairs on the Ustyurt Plateau alone), while in another part of the paper the population for all Kazakhstan is 'projected' as 1,165 pairs (Karyakin *et al.* 2004b, 2005a). The comment was then made that 'the newly discovered population is the largest in Middle Asia, and the Saker's survival depends on its state' (Karyakin *et al.* 2004b, 2005a). In 2005 the area around the Aral Sea was further investigated, 21 breeding territories found, 130–245 pairs estimated for the region and a total of 1,306–1,638 (median 1,482) pairs given as the total for 'Western Kazakhstan' (Karyakin *et al.* 2005e), but with few or no birds for unknown reasons in the Mugodzhary Mountains (Karyakin *et al.* 2007a), only 6–8 pairs on the Shagray Plateau (Pazhenkov & Korzhev 2006) and perhaps just one on the Akkeregeshin Chalk Plateau (Pestov & Saraev 2009).

(7) (Southern areas) Levin (2001) referred to 'the complete devastation of the southern regions of the country' by trappers, leaving only the east as the species's last refuge.

(8) (Central areas) In 2005 the Ulytau Mountains, 20,000 km², were investigated and 28–38 pairs were estimated for the range (Karyakin & Barabashin 2006). Immediately to the east, in 2005 and 2007 the Sarysu River basin, 300,000 km² in extent, was surveyed and 93–127 pairs were estimated to breed there (Karyakin *et al.* 2008). Again immediately east of this lies the Betpak-Dala desert, which lost all its Sakers in the 1990s when trapping and exploitation was at its height, but with the advent of powerlines the species has occupied new areas and some 50 pairs were estimated for the region (Levin & Karpov 2005). Thus adding these values together gives 171–215 pairs for these components of the central areas of the country.

(9) (Eastern areas) Levin (2001) said that 'according to the most optimistic estimations the number of Sakers in Eastern Kazakhstan does not exceed 50 pairs'. Although once 'densely populated by Sakers', a journey of 5,000 km in 2000 could only find nine nests, typically in the least accessible areas (Levin 2001). Levin (2003), referring to 'south-eastern' areas, indicated that numbers and densities had improved somewhat, owing to the recovery of suslik populations from some sort of recent but unexplained numerical 'depression'. Levin (2008a), making no reference to his earlier pronouncements, mentioned 400–450 pairs estimated as the original population of the eastern region, this dropping to 120–145 pairs 'for last 15 years'. However, Levin (2008b) and Levin & Dixon (2008) presented data on numbers of territories found between 2000 and 2008 and maintained that they showed a 65% decline in the breeding population over this nine-year period. This appears to include the findings of Smelansky *et al.* (2006), whose fieldwork in 2006 led to an estimate of 20–30 pairs of Sakers for the small discrete Kalbinsky Mountains, and perhaps of Smelansky *et al.* (2008), whose fieldwork in 2007 resulted in the discovery of eight breeding territories across an unspecified area of steppe in the 'Eastern Kazakhstan hill massifs'. Pine forests in the north-east of the country (area not specified) were judged to hold 39–42 breeding pairs in 2005 (Karyakin *et al.* 2005d). In 2006 a survey (whose comparability to that of the previous year is not discussed although the author of the 2005 survey is acknowledged) found 10 nests (Levin *et al.* 2007).

Discussion

At the time of the review process prior to BirdLife's uplisting of the Saker to Endangered, the figure of 200 pairs for all Kazakhstan was the most recent published figure, and it had been used in a submission by ERWDA (2003) to the CITES Animals Committee, suggesting its acceptance by Gulf state authorities. That it was erroneous, as subsequent studies now tend to suggest (rather than there having been a recovery) is not something that assessors in 2003–2004 could have risked presuming.

However, it is extremely difficult to work out the overlap or gap between regions in these subsequent studies. Dixon's (2009) point about no data existing 'for an enormous area of suitable habitat' carried the implication that many more areas might be expected to hold Sakers, but the extrapolations outlined in the paragraphs above appear to cover areas for which no data exist, in which case the implication cannot be allowed. Therefore, assuming that the underlined values in the four regional paragraphs above represent fully independent assessments and cover all the regions of the country, they may be added to produce 1,742–2,163 pairs for the country. This partly supports Dixon's (2009) contention that more than 2,000 pairs breed in the country, but it does not conform to the assertion of 2,000–3,000 pairs there; moreover, the evidence below and in Levin & Dixon (2008) concerning a 65% decline in nine years in eastern Kazakhstan suggests that a 'stable/declining' designation may be insufficiently precautionary and that a declining status is more appropriate. In the light of this, the most plausible of estimates of population size around 1990 is the 2,000–5,000 suggested for 1985.

Threats and issues Trapping for falconry was identified as the main reason for the decline of the Saker in the 1990s (Levin *et al.* 2000): although at first carried out by trappers from Arab countries, the practice quickly spread to local human populations and resulted in nests being despoiled before it was realised that more money existed in trapping adult birds far more favoured by consumers. Levin (2001) cited 'Sklyarenko (1998)'—while Levin (2008a) cited 'Sklyarenko (1995)'—as reporting the export of 1,000 falcons (presumably Sakers) a year in the years 1994–1996, with the pressure moving eastwards in 1997 owing to depletion of exploited areas. In autumn 1998 and 1999 a 'mass trapping effort' occurred in the Zaisan Depression in the east of the country. In 1999 the relevant ministry issued licences to trap 165 Sakers in spite of evidence that 'not more than 300 pairs' persisted (Levin 2001). In 2002 'extensive trapping' continued in southern Kazakhstan (Levin 2003), and in 2003–2004 it did so in the north-western regions where, however, grow-back of steppe grasslands was thought also to have greatly reduced the prey-base of the species (Karyakin *et al.* 2004b).

Levin (2008a,b; also Levin & Dixon 2008) continued to emphasise trapping as a threat in the eastern regions (trappers from Syria in particular), but also mentioned electrocutions as a factor in the species's decline; Levin (2008a) mentioned, perhaps for the first time, that the trapping of females has led to the balance of the sexes being 'disturbed' in the wild, with males outnumbering females, while Levin (2008b) mentioned the notion that food shortages might have contributed to the decline he recorded in the 2000s. This latter was explicitly discounted in Levin & Dixon (2008) but it was suggested as a significant possible limiting factor by Watson & Clarke (2000). Electrocutions were highlighted as a potentially serious danger by Starikov (1997) and McGregor (2001).

Conservation measures In 2000 Kazakhstan became a signatory to CITES but government involvement in the trade (see above) suggested that smuggling would continue (Levin 2001). In the same year the Institute of Zoology launched a campaign to change government practices (Levin 2001:70–71). In 2007 a state programme, 'Restoration of the Saker population in south-east Kazakhstan', released 60 birds captive-bred in the Sunkar facility (although because this was widely advertised, many trappers came to the area with the intention of catching them) (Levin 2008a); in 2008 another 50 were released (Levin 2008b). Levin & Dixon (2008) also reported these

releases but added that 'since 1995 about 600 Saker Falcons were released from this facility into the wild'.

KYRGYZSTAN

Distribution Some 40% of the country is unsuitable for the species, being above 3,000 m, but the comment by Sushkin below suggests that the species was once widespread in lower-lying areas. Turganbaev (2001) reported that it occurs throughout Kyrgyzstan but mainly 'in the northern part of the Republic'. Prior to recent research initiatives the only specific area mentioned appears to be (Lake) Issyk-kul; but in 1998 the species was found in the western part (Balykchy) of Issyk-kul and in the 'Ak-Say study area' (Gott *et al.* 2000). The only other area cited is 'near Nyrin', where a small population was wiped out by trapping (Gott *et al.* 2000). In winter, a few seemingly local Sakers remain, but most emigrate (Andersen 2006).

Population At the start of the twentieth century the species was described as 'abundant' (Sushkin 1908 in Gott *et al.* 2000) but in the 1970s and 1980s it was considered to be in decline (Shalna & Sorokin 1981 and Vorobyov & Shukarov 1985 in Gott *et al.* 2000), and it was placed on the national red list in 1986 (Shukurov & Davletbakov 2001). At this time the (Lake) Issyk-kul area was estimated to hold 12–15 pairs (Shalna & Sorokin 1981 and Galushin & Pererva 1983 in Gott *et al.* 2000). In May–June 1998 the Balykchy part of Issyk-kul was found to hold only three breeding pairs, with another two pairs in the Ak Say study area (Gott *et al.* 2000). In one account, 'before 1990s' there were 150–200 pairs in the main breeding areas but in the 1990s numbers steadily declined and continue to do so, with 'up to 20% of nests... robbed for quick profit' (Turganbaev 2001). In another, at the start of the twenty-first century the national population was estimated (with no reinforcing evidence) at 100–120 pairs, but 'the number is declining very fast' (Shukurov & Davletbakov 2001). A recent comment on the Saker in Kyrgyzstan is that it is 'nowhere common... but a very questionable estimate is ca. 50 breeding pairs' (Andersen 2006), which tends to confirm the notion that the decline was indeed steep and continuing.

Discussion

In seeking to estimate a population size for 1990, Haines (2002) assumed that the 80% nest-robbing figure for the 1990s (below) could stand as the decline rate, and since the 2000 figures were 100–120 pairs (i.e. 20% of 1990 values) the number of pairs in 1990 would have been 500–600. Given the underlined text in the section below, and Sushkin's comment about the species having been abundant, this figure does not seem implausible. However, Dixon (2009) produced evidence from the 1980s which suggested a serious decline in the 1970s and a seemingly small breeding population in the 1980s. The problem with this evidence is that it is difficult to reconcile with the reports below of so many trappers and so much trapping in the country, unless it is the case that Kyrgyzstan is actually on a migration route of the species. Pending clarification of this possibility, Haines's back-projection for 1990 is accepted here, and the assessment of numbers in Andersen (2006), despite his explicit uncertainty, is also accepted here.

Threats and issues In the two easternmost districts of the country (Issyk-kul and Naryn) where the species is mostly concentrated, there were 15 falconers using Sakers around the year 2000 and, more ominously, 'about 1000 people who are actively trying to catch and sell falcons', in response to the demand since the start of the 1990s for Sakers for use in Arabia, which saw 100–120 birds trapped annually through the

decade (i.e. as many as 1,000 birds taken all told in this period) and 80% of all nests robbed (Shukurov & Davletbakov 2001)—note 20% in Turganbaev (2001). The species has suffered from the widespread practice of shooting raptors, and indirectly from environmental pollution, especially DDT, which was widely applied over many years in the Issyk-Kul basin; illegal trapping of birds is also ‘a serious problem’ (Andersen 2006).

Conservation measures In 2006 the low price for a captive Saker was attributed to the fact that avian flu in Central Asia had depressed prices for wild-caught falcons (Andersen 2006).

MONGOLIA

Distribution An outline of records and studies of the species in Mongolia is provided in Shagdarsuren (2000); further notes on range are in Bold & Boldbaatar (2001). An expansion of range and presumably of numbers occurred in the 1990s when birds began nesting on disused man-made structures following the withdrawal of the Soviet military and an economic depression (Potapov *et al.* 1999a). In winter a good number of Sakers remain in Mongolia, at least in the central and southern parts (Shagdarsuren 2000, Sumiya *et al.* 2001); only adult birds remain in central Mongolia (Gombobaatar *et al.* 2004).

Population In the 1960s the species was ‘not rare’ in the Mongolian and Gobi Altai and the Trans-Altai mountains (Shagdarsuren 2000). The same author reported that a population of some 3,000 pairs was present, producing around 10,000 young, although surveys in 2000 suggested that numbers might have fallen (Barton 2001). The figures are rather different in another review of the situation before the country ‘underwent a transition towards a market economy’ (by implication in the period up to the mid-1980s): in this account, ‘estimates of the Saker population in Mongolia varied from 1500 to 20,000 individuals’, although the latter value was evidently problematic, since ‘the decision to delist Sakers [from what is not stated] was based on ... one unverified estimation [of] the numbers of Sakers in Mongolia as high as 20,000 individuals’ (Shijirmaa *et al.* 2000). Baumgart (1991), reviewing publications from the years 1930–1981, judged that no great changes in numbers had taken place in this period and that the country probably harboured around 5,000 breeding pairs (in the 1980s). Numbers of Sakers are related to Brandt’s Voles *Lasiopodomys brandtii* cycles (Bold & Boldbaatar 2001), and they may be distributed in a fairly uneven pattern (Shagdarsuren *et al.* 2001).

By extrapolating an observed average of 2.7 pairs per 1,000 km² to the size of the country, after making allowances for areas of unsuitable habitat, 2,823 pairs were projected as the national total by the end of the 1990s (Shijirmaa *et al.* 2000). Using this value of 2,823 pairs, combined with the observed average of 3.2 nestlings per brood and a 70.6% participation annually in nesting by available pairs, a total annual output of 6,382 (strictly on these figures: 6,377) young were then estimated to be produced per year (Shijirmaa *et al.* 2000). Using the same techniques, the national population of breeding pairs was 2,961 in 1999 (9,834 young produced) and 2,220 in 2000 (4,450 young produced) (Shagdarsuren *et al.* 2001).

Reference (see next section for quotation) to a ‘swift decline’ in Mongolia’s Saker population (Gombobaatar *et al.* 2004) is based on no presented evidence, and indeed the same authors report that ‘according to our studies of 1998–2005, there was no significant decline of numbers of breeding pairs in Central Mongolian study areas’

(Gombobaatar *et al.* 2007), while Dixon *et al.* (2008) pointed out that the take-up of artificial nest-sites suggested a surplus population in Mongolia which would not exist if the population there was in decline. However, in a report not yet seen ('Fox *et al.* 2003'), the number of pairs breeding in Mongolia in 2003 was put at 1,000–1,200 (*vide* Suhchuluun 2008), which certainly implies a significant decline.

Dixon (2009) considered the situation in Mongolia at length, but arrived at a very wide range of 2,000–5,000 pairs for the present-day population. His initial computation using a 'conservative' density value yielded 2,000 breeding pairs for the entire country, but for the steppe zone he used values that yielded 1,400–4,100 breeding pairs. To this he added 400–500 pairs breeding on electricity pylons (explanation difficult to follow) and by this means rounded figures that would then be 1,800–4,600 up to 2,000–5,000, and he regarded the population as stable.

Discussion

All calculations of overall population size have been based on very tentative assumptions of densities, but those of Shijirmaa *et al.* (2000) and Shagdarsuren *et al.* (2001) appear to be more cautious in their views of habitat suitability, and the disparities between estimations on this point is not an issue that Dixon (2009) addressed. Moreover, six years previously N. Fox, a colleague of A. Dixon, had judged a population size only half of those provided by Shijirmaa *et al.* (2000) and Shagdarsuren *et al.* (2001). If all these values are added and averaged, we have 2,823 + 2,961 + 2,220 + 1,000 or 1,200 + 2,000 or 5,000 divided by 5, i.e. 2,201–2,841, and at present this might be a reasonable precautionary range with which to work, along with Baumgart's estimate from the 1980s for the number in 1990.

Threats and issues The problem of exploitation of birds for the falconry trade is highly controversial in Mongolia. In one account, in print only as an abstract, 'smuggling is rampant' but concealed by government agencies paid high fees from Arab sources, with the further remark that Arab-financed research is 'a Trojan horse in promoting wildlife exploitation' (Ellis & Parrot 2006). However, this same research has documented levels of exports in the period 1994–2004 and commented that 'the current level of exportation... is the main cause of the swift decline of the Saker falcon population' (Gombobaatar *et al.* 2004), although these authors also indicate that incidental mortality wrought by inexperienced trappers attempting to capitalise on the interest in trade is high and therefore must greatly and adversely affect the situation. Suhchuluun (2008) reported that almost 1,000 birds were exported legally in the period 1993–2002, but that in the same period the same number or more were exported illegally.

The control of vole populations by the deployment of grain poisoned with bromadiolone in 2002–2004 caused serious mortality to many birds of prey, with up to 7% of total adult Saker mortality attributable (Batdelger & Potapov 2002, Gombobaatar *et al.* 2004). The main limiting factor in breeding success appears to be the availability of voles, with weather conditions also playing a role (Gombobaatar *et al.* 2007).

Discarded rubbish incorporated into nests can entangle birds (Ellis *et al.* 1997, Ellis & Lish 1999, Potapov *et al.* 1999b). Electrocution also remains a source of mortality, particularly in less experienced juvenile birds (Gombobaatar *et al.* 2004).

The issue of estimating a sustainable yield is live in Mongolia owing to the opportunity there to increase wild populations through the provision of nest-sites.

Conservation measures Provision of artificial nest-sites in high-density vole areas has proved to be an excellent way of attracting breeding Sakers, in 2004 reaching a density of 9.25 pairs per 1,000 km², far higher than recorded in unmanaged habitat (Potapov *et al.* 2003, 2004, Sumya *et al.* 2003). 'In theory, at least, there is sufficient nest site-limited steppe in Mongolia to accommodate up to 30,000 extra pairs of Sakers', and this could provide not only a source of income to the state but also a biological control of the economically troublesome vole population (Potapov 2005). Dixon *et al.* (2008) observed that there is no conservation imperative for such provision given the relative abundance and stability of the species in Mongolia, but that such a system would allow the Mongolian government to provide non-detriment evidence to CITES in respect of the export quotas it establishes.

Suhchuluun (2008) urged • fuller census work across Mongolia, • pesticide prohibition, • better counter-contraband systems, • artificial nest-site deployment, and • a captive-breeding centre to release birds in Mongolia.

RUSSIA

Distribution The Russian population, whose population covers an area totalling 1,084,000 km² (Karyakin *et al.* 2004a), can be divided up into two main areas, European Russia (west of the Urals) and Asiatic Russia (east of the Urals). Many details of historical records are in Karyakin *et al.* (2004a). The range of the Saker in Asiatic Russia is described as 'a relatively large enclave south of the Ural mountains with a chain of small fragments or isolated nesting areas along the state border with Kazakhstan up to... the Altay-Sayan mountains and... Baikal Lake' (Galushin 2004). However, this assessment omitted the populations that extend over the north and east of Mongolia, chiefly in 'Chita district' and with only tiny numbers in Amur, Evreyskaya and Primorskiy regions (documented in Karyakin 2008). Migration studies are at an early stage but show some distinct patterns (Karyakin *et al.* 2005b).

Population (General) In the 1970s the population 'decreased significantly' inside what was then the Soviet Union (Baumgart 1991). At the beginning of the 1980s the national population was judged unlikely to be fewer than 1,000 pairs (Red Data Book 1983 in Galushin & Moseikin 2000); at that time the Saker was thought to have disappeared from several areas including Tula, Voronesh, Riasan (Baumgart 1991). Moreover, in its submission to the CITES Animals Committee, ERWDA (2003) indicated that the population of the entire Russian Federation (by implication around the year 2000) was 550–700 pairs, basing this on a conflation of two published papers (Galushin *et al.* 2001, Ryabtsev 2001) and one internal report (with Galushin and Karyakin included in the authorship).

However, by contrast, in a recent assessment, Karyakin (2008) postulated that the population in the 1970s was 9,000 pairs, with 3,000 in European Russia (1,000 in the south, 2,000 in the south-east), 500 in south-west Siberia, 1,500 in Altai, 2,800 in Tuva, 600 in the Baikal region, and 600 in the Chita region. On this basis (and it is not clear how the figures for the 1970s were computed) Karyakin (2008) concluded there has been 76% decline over 30 years across the country, since he generated bottom-line totals of 1,854–2,542 (mean 2,183) pairs for Russia in 2007, reflecting an 11% decline on his equivalent 2003 figures (2,117–2,683, mean 2,461).

European Russia

Writing of all of European Russia, Baumgart (1994) noted there were roughly 80–150 pairs in recent years (up to around 1990), with a small decrease in numbers; this was re-set as 110 pairs for the year 2000 (Galushin *et al.* 2001). However,

Galushin (2004) referred to 'an almost total crash in... European Russia in 1990s' and to the fact that the species 'has almost disappeared there'. Densities from surveys in the late 1990s allowed an extrapolation that resulted in some 100 pairs being postulated as present in the eastern region (Galushin *et al.* 2001). For the south-central region Galushin (2004) uses the Saratov area as an example of how seriously numbers have decreased: in the 1930s the species was abundant with nests only 1–2 km apart, but by the 2000s only 5–10 pairs remained. By 1997–1998 only four (1998) and 10 (1997) breeding areas were found in an area of 35,000–50,000 km² in the Don River basin, with 22 (1997) and 24 (1998) in 120,000 km² of suitable habitat in the Volga–Ural interfluvium (Galushin & Moseikin 2000), although the densities invoked by these researchers (see Ecology) are higher than those to be derived from these data (see Remarks 5). Using their own density values, Galushin & Moseikin (2000; also Galushin *et al.* 2001) suggested that in 1997 and 1998 the entire Don basin was populated by just 20–30 and 10–15 pairs respectively (with maybe only 5–10 pairs by 2000), and that in the same years the Volga–Urals interfluvium held 100–120 pairs.

On this basis the entire Saker population in European Russia was judged to be 110–140 pairs (or 100–150 pairs: Galushin 2004), or, as a single value, 120 pairs (Galushin & Moseikin 2000), and by the 2000s this number was 30–50 pairs or merely 25 pairs or even 'already extinct' (see Galushin 2004). The low value of the 1990s was judged to be supported by the tiny numbers seen in 1997 (11) and 1998 (three) at the Caucasus raptor migration bottlenecks (Abuladze 1998 in Galushin & Moseikin 2000), but there might be no connexion if, as seems possible, the species simply does not concentrate at migration points. The population was judged to be in steep decline and 'on the brink of extinction', although suslik population recovery (from what is not said) suggested that a Saker comeback might also be on the cards (Galushin *et al.* 2001).

It is worth noting that in 2000 the range of the species in European Russia was regarded as only around 50,000 km², i.e. '20 times less than its former range of 30–50 years ago' (Galushin *et al.* 2001), which indicates a truly massive decline rate in the period since roughly the 1960s.

Asiatic Russia

The Altay-Tuva-Sayan area (450,000 km²) holds 1,600–2,100 pairs, the Lake Baikal area (400,000 km²) holds 300–500 pairs, the Ural–south-western Siberia enclave (250,000 km²) holds 200–300 pairs, yielding a total for Russia of 2,000–3,000 pairs (on the figure above: 2,100–2,900) although these 'continue to decline almost everywhere', with less than half the pairs breeding successfully in some areas (Galushin 2004). In another account (one that Galushin 2004 himself is citing for these figures) these figures come out as 2,115–2,925 pairs (Karyakin *et al.* 2004a), but this included the very small numbers from European Russia (=west of Urals), 30–59 pairs, as well as from southern Siberia (=east of Urals from Chelyabinsk to Novosibirsk), 83–121 pairs (see Karyakin *et al.* 2004a), although these latter count as Asiatic Russia. Karyakin *et al.* (2004a) continued to compute that as only 41% of breeding attempts are successful only some 860–1,200 pairs in Russia can be considered active breeders; they also considered that the number of Sakers east of the Urals is 'more or less stable'. Figures supplied by Karyakin *et al.* (2005c) for the Altai Kray (103–147 pairs) are almost exactly coincident with those cited earlier (99–140 pairs) in Karyakin *et al.* (2004a).

It is not clear if the Irkutsk and Buryatia regions are included in the figures collated by Karyakin *et al.* (2004a), but Karyakin *et al.* (2006) carried new information on both areas: for the 'depressions of Buryatia' they gave 135–165 pairs, but for

Irkutsk, although they found 50–65 pairs in the Balagano-Nukutskaya forest-steppe, somehow they projected '42–52 pairs living on the all territory [*sic*] of the Irkutsk district'. However, it seems likely that these two areas *were* included in earlier computations, since Karyakin *et al.* (2006) referred both to a decline in numbers in Irkutsk by half ('decrease in about 2 times') over the previous ten years, and to a decrease in part of Buryatia 'especially around Ulan-Ude'.

In a revision of the Altai-Sayan region (which includes Tuva) Karyakin & Nikolenko (2008) documented an overall decline of 18% in number of Sakers in a five-year period. These numbers are broken down by three areas (Khakassia and Krasnoyarsk Kray; Altai Republic; Tuva Republic) and contain figures for 2006 also. The bottom-line change is from 1,600–2,096 pairs (consistent with those above in Galushin 2004) to 1,372–1,646 pairs (Karyakin & Nikolenko 2008). An earlier decline in Altai numbers was inferred from the registration of 44 records, 1986–1990, as against 16 records, 1991–1997 (Kuchin & Zubakina 2001). Likewise, tabulation of three successive surveys in the two areas of Krasnoyarsk District and the Tuva Republic revealed that the number of occupied territories declined from 53 in 1999 to 31 in 2001 (Karyakin 2002).

Discussion

BirdLife International (2004) used the ERWDA (2003) values in calculating decline rates since 1990. One of ERWDA's sources, Ryabtsev (2001), gave the total number of Sakers in the Baikal region as 70–130 pairs and reported that 'in the second half on [*sic*] 1990s the numbers declined 5–10 times', and Haines (2002) used the lower decline rate (five-fold) to back-calculate a 1990 population of 350–650 pairs for the region.

Dixon (2009), although offering some rather unspecific caveats, praised Karyakin (2008) for the endeavour that lay behind his figures of 1,854–2,542 pairs for all Russia, and turned them into the broader range of 1,500–3,000 pairs, accepting the evidence that the species is in decline. However, for present purposes there is no compelling reason to discard Karyakin's original figures, and it is worth bearing in mind that the cumulative evidence points at a long-term and fairly serious decline in numbers (11% in four years is particularly alarming, equivalent to 52% over three generations).

Although the justification for the figure of 9,000 pairs in the 1970s is far from clear and inconsistent with certain other testimony, it has at least the authority of having been broken down by region, mapped and evidently considered at some length. Allowing a 30-year span between 9,000 pairs and roughly 2,000 pairs in the mid-2000s (Karyakin 2008), and assuming an exponential decline rate, a population of 3,656 pairs (rounded to 3,700) may be interpolated for the year 1990.

Threats and issues In 1997 it was guessed, on the basis of a report of 300 birds being confiscated in European Russia, that as many as 1,000 birds were smuggled out of the country, which would represent a very high proportion of the total national population. 'The Saker population crash coincided with widespread peregrine-DDT contamination..., a massive development of pristine steppe, and a sharp decline in quarry species..., which were severely controlled on arable lands', but 'the Saker has not been able to recover because its most productive areas happened to be those under intensive agricultural pressure at the time, and there were no refuges', the 'slow recovery' being 'confounded by an intensive wild take by bird traffickers' (Karyakin *et al.* 2004a).

European Russia

Threats are poorly documented and explained for this region, and to a large degree contradictory. In one account the chronic collapse of the suslik population was identified as a major cause of the decline but the only explanation referred to the decade immediately preceding this judgement, during which a decline in livestock led to grassland areas becoming too long to support susliks (Galushin *et al.* 2001). However, Galushin (2004) blamed (a) widespread use of DDT from the 1950s, (b) eradication of susliks (reason not stated but evidently a proactive pursuit) and (c) mass persecution of raptors which only ended in the late 1960s. The illegal falcon trade was also identified as a threat, but with no detail (Galushin *et al.* 2001), but Karyakin (2005a) then argued that this factor was the primary cause of the problem: he said that the 'crash decline' occurred in the 1980s and 1990s when other birds of prey were recovering their numbers (evidence for which is not explicit or referenced), so that 'this paradox is possible to explain only by an increased demand for sakers in the Gulf States at that time'. He added that the erection of pylons had to some extent countered this problem but that the theft of these pylons had negated the effect, adding that the decline in livestock-grazing had led to the virtual of 'gophers' (declined by 50–100 times) from the grassland ecosystems in the region (Karyakin 2005a).

Asiatic Russia

Illegal trapping for trade has been the primary cause of decline (Galushin 2004). For the Altay-Sayan region the decline is attributed to capture of birds outside of the region in Mongolia and China (Karyakin & Nikolenko 2008; note that references are cited for this as 'Nikolenko 2007, Karyakin 2008, Suhchuluun 2008' but the paper has no reference list), although in the same year Karyakin (2008) also attributed the decline to loss of nest-poles, loss of prey-base and the poisoning incidents of 2002–2003 in Mongolia, but speculated (based on references given in Russian) that 1,000 Altai-Sayan Sakers might be caught on migration annually for the falcon trade.

Conservation measures European Russia Captive breeding and release has taken place at Galichya Gora Nature Reserve, Lipetsk region (Galushin *et al.* 2001).

Asiatic Russia A programme of installing artificial nest-sites in Tuva Republic has encountered difficulties from herders removing the metal containers, while in areas where birds used irrigated trees the herders have removed transmission poles for firewood, thus causing tree-death (Karyakin 2005a,b), but the work continues (Karyakin & Nikolenko 2006).

UZBEKISTAN

Distribution The species nests in suitable habitats between the Amudarya and Sirdarya rivers, mainly in the low mountains and foothills of the Kyzylkum Desert and in the southern foothills of the Pamiro-Alai mountain system, with a small monitoring scheme near Sudochie Lake on the Ustyurt Plateau (Kreuzberg-Mukhina *et al.* 2001). In winter, breeding birds move south but are replaced by individuals from northern Kazakhstan and Siberia, but most birds leave and only a small number of birds are resident (Kreuzberg-Mukhina *et al.* 2001).

Population The population in around 2000 was estimated at 100–150 pairs, in decline in the more accessible areas owing to poaching for commercial gain, a phenomenon noted since the early 1990s, and offset to some extent by the species's adoption of pylons for nesting, which has allowed it to 'spread across the steppes' (Abdunazarov & Atadjanov 2002). The decline has elsewhere (by the same authors) been described

as a 'drastic decrease' which is 'in some regions by 10 times and more' (e.g. near Termez, which had 20 pairs '10 years ago' and now has 2–4 pairs), but the numbers 'now' (also given as 100–150 pairs) are 'relatively stable' and (as a result of pole use) 'on the increase in several areas' (Kreuzberg-Mukhina *et al.* 2001). There appears to be no subsequent information on the Saker's status in the country (none in Dixon 2009).

Discussion

In assessing the decline of the Saker in Uzbekistan, Haines (2002) made the explicit assumption that a ten-fold decrease across the country over ten years could be inferred from the comments above about populations being 'drastic' and 'in some regions by 10 times and more' with an example drawn from '10 years ago'. For this reason he simply multiplied the figure of 100–150 pairs in 2000 to estimate 1,000–1,500 pairs in 1990. This reasoning was accepted by BirdLife International without further scrutiny, and it is still a defensible position to take from the very limited and fragmentary evidence available (including that below on trapping and nest-robbing). However, it is arguably too extreme an interpretation to use as a means of calculating a decline rate. Nevertheless, it is accepted that 'a high level of indiscriminate trapping' (Dixon 2009) did take place in the country in the 1990s. It might be possible through an intensive programme of interviews with older members of rural communities to construct a plausible status in 1990, but in the meantime it is here proposed to use a five-fold decline, with numbers in 1990 therefore inferred to be 500–750 pairs.

Threats and issues In recent decades many Sakers have been poached and trapped by local people and 'foreign visitors' for falconry purposes (Kreuzberg-Mukhina *et al.* 2001). Before 1990 the main threat was shooting and nest-robbing, but 'mass trapping' of adults (50 or more adults being trapped per year) and the removal of chicks from nests have been the main threats since then (Kreuzberg-Mukhina *et al.* 2001). Monitoring has not been sufficiently strong to determine the dynamics of the population (Kreuzberg-Mukhina *et al.* 2001).

Conservation measures In 1996 the import or export of falcons was prohibited (Kreuzberg-Mukhina *et al.* 2001). The protection of breeding areas through 'nature reserves' has been mentioned (Abdunazarov & Atadjanov 2002) although it is not clear if these are to be created for the purpose or already exist and simply need better wardening—but according to Kreuzberg-Mukhina *et al.* (2001) some 20 pairs 'are protected in nature reserves' or, shortly after this statement, some 10–12 pairs in six nature reserves. A captive breeding programme was established in 1993 (Kreuzberg-Mukhina *et al.* 2001) with the aim to maintain 30 pairs in order to produce birds for release, and already at the start of this century '50 were prepared for release into the wild' (Abdunazarov & Atadjanov 2002). In Kreuzberg-Mukhina *et al.* (2001) a more complicated scenario is outlined in which three apparently separate captive-breeding initiatives have been developed, although the differences between them are blurred to the point of opacity: in one, set up in 1993, is reported that 10 birds were released in August 1996 and the plan is to release c.20 birds every year, in the second, set up in 1987, over 60 had already been released and some 50 birds per year were expected to be released, and in the third, a 'new' facility of the State Committee for Nature Protection at Tashkent plans 'to release about 50 young falcons every year' so as to 'discourage the illegal trapping and trade of falcons' while 'providing a public awareness campaign... to prevent illegal trapping'.

DISCUSSION AND CONCLUSION

The data detailed above are summarised in Table 1. Their application to the IUCN Red List criterion A yields a decline over the last three generations of 46–79%, with a median estimate of 65% (calculations detailed in a spreadsheet at <http://www.birdlifeforums.org/WebX/.2cba6d3d>). These data, and the uncertainty associated with them, do not provide strong evidence for revising the existing categorisation of Endangered: the most optimistic interpretation of the available data leads to an overall decline that only just dips below the threshold for Endangered (50%). However, it should be noted that the results are influenced by the uncertainty associated with the estimates for China. Excluding these (i.e. assuming trends in China equated to the average of trends elsewhere in the range) gives a decline of 24–56% (median estimate: 42%). Hence, improved data, in particular from China, may in due course warrant downlisting the species to Vulnerable or even Near Threatened. However, on the basis of the evidence available and collated for this review, it would be premature to revise the current status at present, albeit with explicit caveats regarding uncertainties.

A. Dixon (*in litt.* on the Discussion Forum, 17 February 2010) points out that a risk here is that Croatia has:

proposed moving the Saker to Appendix I of CMS based on its EN status. CMS requires that there is no trade in Appendix I species. Effectively all trade in wild Sakers would be banned for CMS Parties. This would compromise the conservation scheme we [IWS] are developing in Mongolia, which is based on sustainable use. It would either end all potential for establishing a regulated trade in wild Sakers or force countries to take a reservation in relation to falcons (as Saudi has done for CITES). Reservations can only weaken the effectiveness of MEAs [multilateral environmental agreements] like CITES and CMS, and should be avoided. Prohibition of a regulated legal trade leaves the door open only for unregulated illegal trade (as is the case for Gyrfalcons and Peregrines).

This is an issue worth further debate, but of course it is not in BirdLife's power to modify its application of the IUCN Red List criteria. N. Fox (*in litt.* on the Discussion Forum, 17 February 2010) makes the point that the surveys of which the data presented and analysed here were seriously compromised by matters of scale, and are 'statistically flawed', so that in the IUCN system of assessment 'the resulting decisions are only as good as the numbers fed in'. This is entirely true. However, what is desperately difficult to determine is which way the figures generated by the surveys are biased. Are they too high? Are they too low? Since in the recent past they seem to have been both, perhaps we can assume that they have a certain balance.

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Continuation of Appendix A

Table 1. Minimum, maximum and median population estimates for Saker Falcon in 1990 and 2010. Dixon = Dixon (2007, 2009), Haines = Haines (2002).

	1990 (pairs)				2010 (pairs)			
	Min	Max	Median	Source	Min	Max	Median	Source
Afghanistan	10	100	55	Dixon	10	100	55	Dixon
Austria	5	10	8	Haines	15	25	20	Dixon
Bulgaria	20	50	35	Haines	.0	10	5	Dixon
China	15,000	20,000	17,500	Main text	200	5,000	2,600	Main text
Croatia	10	15	13	Haines	5	10	8	Dixon
Czech Republic	8	15	12	Haines	10	15	13	Dixon
Georgia	3	5	4	Dixon	3	5	4	Dixon
Germany	0	0	0	Dixon	0	1	1	Dixon
Hungary	100	100	100	Haines	176	190	183	Dixon
Iraq	0	50	25	Dixon	0	50	25	Dixon
Iran	10	100	55	D.A.Scott	10	100	55	Dixon
Kazakhstan	2,000	5,000	3,500	Main text	1,742	2,163	1,953	Main text
Kyrgyzstan	500	600	550	Main text	50	50	50	Main text
Macedonia	0	3	2	Dixon	0	3	2	Dixon
Moldova	5	7	6	Haines	8	15	12	Dixon
Mongolia	5,000	5,000	5,000	Main text	2,201	2,841	2,521	Main text
Pakistan	0	50	25	Dixon	0	50	25	Dixon
Poland	0	2	1	Burfield	0	2	1	Dixon
Romania	2	6	4	Haines	2	12	7	Dixon
Russia	3,700	3,700	3,600	Main text	1,854	2,542	2,198	Main text
Serbia	52	64	58	Burfield	52	64	58	Dixon
Slovakia	30	45	38	Haines	23	25	24	Dixon
Tajikistan	10	100	55	Dixon	10	100	55	Dixon
Turkey	10	100	55	Haines	5	70	38	Dixon
Turkmenistan	100	150	125	Dixon	100	150	125	Dixon
Ukraine	120	140	130	Haines	270	345	308	Dixon
Uzbekistan	500	750	625	Main text	100	150	125	Main text
	27,195	35,962	31,579		6,846	14,088	10,467	

Appendix B

BirdLife International's public synthesis (1 April 2010) of discussion forum feedback on 7 March posting on 'Data Zone' webpage ('bp' = breeding pairs), in which the IUCN status of the Saker Falcon is determined as Vulnerable

The discussion forum has seen some very helpful commentaries and statements and we would like to thank all those who have posted material. Two commentaries in particular have illuminated the situation for several countries, and as a result we have largely accepted the new figures into the calculations. However, we make the following adjustments to the table offered by Andrew Dixon in his posting, which result in a revised proposal to reclassify the species as Vulnerable.

China

Assume that AD's figures for 2010 (3,000–5,000 bp) are correct, but also assume that there was indeed a degree of trapping pressure after 1990 (AD admits this possibility, and he does not mention Wan 2001, who referred to 'thousands of foreigners' catching Sakers illegally 'at the beginning of the 1990s'). Thus for 1990 values, add 1,000 bp to both min and max for 2010: 4,000–6,000, median 5,000.

Mongolia

AD's suggested reworking of the numbers is very reasonable, but it results in no suggestion of a decline, whereas the body of evidence generally suggests that trade might well have had an impact. If we accept the assertion by Suhchuluun (2008) that in 1993–2002 almost 1,000 birds were traded legally and at least another 1,000 illegally, with a further impact from rodent poisoning in the following years, it would seem reasonable to raise the minimum number of pairs in Mongolia in 1990 from 2,000 to 3,000.

Russia

Igor Karyakin's explanation of his figure of 9,000 bp for 1990 is most helpful, but it indicates that it represents a very large extrapolation from a relatively small sample, and one must question whether this does not represent a very high figure. He mentions Galushin's (2004) 10,000 bp, apparently in support of his conclusion. However, it is perhaps more telling that whereas IK estimates 3,000 bp for European Russia in 1990, Galushin estimated only 1,000 bp for the same area into the 1950s. If we assume (1) that no great change in status occurred between 1960 and 1990, and (2) that both estimates for European Russia were based on reasonable familiarity with the territory, then the fact that one estimate was only a third of the other suggests that the minimum for all Russia in 1990 might also be a third of IK's extrapolated total. We therefore propose European Russia in 1990 min 3,000, max 9,000, median 6,000.

These new figures result in a median decline rate of 32% over the past 19 years (three generations), which means that the species qualifies as Vulnerable under the A criterion (see attached table), with a 'worst case' scenario of a 62% decline (Endangered) and a 'best case' decline of 29% (Near Threatened). This range of possible outcomes illustrates the high degree of uncertainty that still surrounds the global status of Saker Falcon, and demonstrates the importance of improving future efforts to monitor key populations. Because of the need to achieve consensus and understanding, we request further commentary on this evaluation prior to the posting of a final decision in the week commencing 11 April.

Appendix C

Current (since May 2010) entry on BirdLife International's 'Data Zone' webpage for
Saker Falcon *Falco cherrug*

2010 IUCN Red List Category (as evaluated by BirdLife International - the official Red List Authority for birds for IUCN): **Vulnerable**

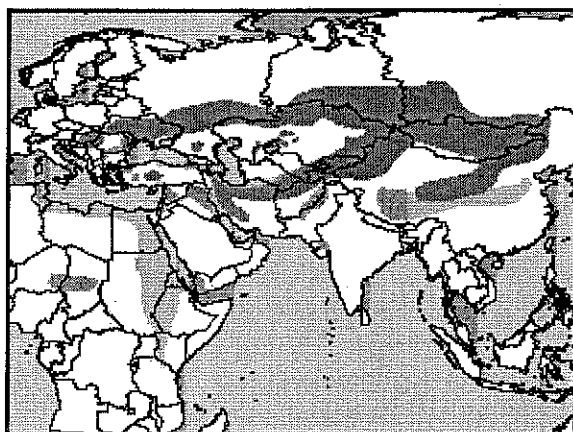
Justification This species has been reclassified as Vulnerable because a recent analysis of all available data suggests that declines have been less severe than was previously suspected. It has nevertheless undergone a rapid population decline, particularly on the central Asian breeding grounds, owing to unsustainable capture for the falconry trade, as well as habitat degradation and the impacts of agrochemicals. Further research to monitor key populations and to clarify the extent of the threat from trapping and its effect on population trends is vital.

Family/Sub-family Falconidae

Species name author Gray, 1834

Taxonomic source(s) AERC TAC (2003), Cramp and Simmons (1977-1994), Dowsett and Forbes-Watson (1993), Sibley and Monroe (1990, 1993)

Population estimate	Population trend	Range estimate (breeding/resident)	Country endemic?
19,200-34,000	decreasing	10,300,000 km ²	No



Range & population *Falco cherrug* occurs in a wide range across the Palearctic region from eastern Europe to western China, breeding in **Austria, Hungary, Czech Republic, Slovakia, Serbia & Montenegro, Bulgaria, Romania, Moldova, Belarus, Ukraine, Turkey, Iraq, Armenia, Russian Federation, Uzbekistan, Tajikistan, Kyrgyzstan, Kazakhstan, Mongolia and China**, and at least formerly in **Turkmenistan** and probably **Afghanistan**, possibly **India (Ladakh)**, with wintering or passage populations regularly in **Italy, Malta, Cyprus, Israel, Jordan, Egypt, Libya, Sudan, Tunisia, Ethiopia, Kenya, Saudi Arabia, Yemen, Oman, UAE, Bahrain, Kuwait, Iran, Pakistan, India, Nepal, Afghanistan and Azerbaijan**, with much smaller numbers or vagrants reaching many other countries^{3,4,6,9,11}. The historical global population size remains subject to some uncertainty, however a recent analysis of available data resulted in a revised global population estimate of 13,000-27,000 breeding pairs in 1990, with the majority in China (4,000-6,000 pairs), Kazakhstan (2,000-5,000), Mongolia (3,000-5,000) and Russia (3,000-9,000); and a total

population of 9,500-17,000 pairs in 2010 (China 3,000-5,000, Kazakhstan 2,000-3,000, Mongolia 2,000-5,000 and Russia (1,854-2,542)¹⁵. Assuming a generation length of 6.4 years and that the decline of the Saker had already begun (at least in some areas) prior to the 1990s (consumption of Sakers in the Middle East was heavy by mid-1980s), the declines over the 19 year period 1991-2010 equate to 32% (based on median estimates), with a minimum-maximum of 29-62%¹⁵.

Important Bird Areas [Click here to view map showing IBAs where species is recorded and triggers any of the IBA criteria.](#)

Ecology: The Saker is physically adapted to hunting close to the ground in open terrain, combining rapid acceleration with high manoeuvrability, thus specialising on mid-sized diurnal terrestrial rodents (especially ground squirrels *Citellus*) of open grassy landscapes such as desert edge, semi-desert, steppes and arid montane areas; in some areas, particularly near water, it switches to birds as key prey, and has recently substituted domestic pigeons for rodents in parts of Europe^{3,11}. It uses copses or cliffs for nest sites (sometimes even the ground), occupying the old nests of other birds^{3,11}. Clutch sizes varies from two to six, with means from 3.2 to 3.9 in different circumstances^{3,11}. Breeding success varies with year (especially in areas where rodents cycle)^{3,11}. Birds are sedentary, part-migratory or fully migratory, largely depending on the extent to which food supply in breeding areas disappears in winter^{3,11}.

Threats In Europe the Saker has suffered mainly from the loss and degradation of steppes and dry grasslands through agricultural intensification, plantation establishment and declines in sheep pastoralism, causing a decline in key prey species; offtake for falconry is also a problem, which has caused local extinctions^{3,4,13}. In eastern Hungary, landscape reversion following the abandonment of agriculture could have a negative influence, as most prey species require short swards that are maintained by agricultural practices¹². Elsewhere declines are mainly attributable to offtake for falconry, although human persecution, pesticide use (notably in Mongolia in 2003) and agrochemical deployment play a lesser part^{2,3,5,6,7,9,10}. The number of Sakers trapped annually for Middle East falconers has been estimated at 4,000 in Saudi Arabia, 1,000 in Qatar and 500-1,000 in each of Bahrain, Kuwait and UAE, which, allowing for a 5% mortality prior to receipt, indicates an annual consumption of 6,825-8,400 birds^{6,7}. Of these, the great majority (77%) were believed to be juvenile females, followed by 19% adult females, 3% juvenile males and 1% adult males, potentially creating a major bias in the wild population^{6,7}. Another study however gives a far lower estimate for numbers legally trapped in Saudi Arabia, at an average of 22 birds per year in the period 2002-2009¹⁷. Hybridisation with escaped or released hybrid falcons could influence the genetic integrity of wild populations^{12,14}.

Conservation measures underway The Saker is a protected and red-listed species in many range states, particularly in the western parts of its range^{3,4}. It is listed on CITES Appendix II, and in 2002 CITES imposed a trade ban on UAE, strongly affecting the unregulated market there⁷. Intensive wardening and management has produced a steadily rising population in Hungary⁴. Controls of illegal trade were implemented in various countries in western range in 1990s⁴. Captive breeding has developed strongly in some countries including UAE as a means of substituting farmed for wild-caught birds^{8,10}. Clinics have also been set up to improve the longevity and availability of wild-caught birds in various Gulf states^{1,10}. New research programmes in many parts

of the range have begun to establish baseline data on distribution, population, ecology and threats. In Mongolia the process of erecting 5,000 artificial nests has begun, funded by the Environment Agency Abu Dhabi, which are predicted to provide nesting sites for up to 500 pairs of Sakers by 2015¹⁶.

Conservation measures proposed Maintain or implement programmes of population and habitat management throughout the range. Maintain or improve systems of wardening and customs control (including DNA sampling to check provenance of traded birds). Continue key biological researches^{3,4}. Enforce CITES regulations, particularly in the Middle East and Asia. Improve exportation standards including meeting IATA transportation specifications. Improve import regulations, staff capacity and practices (quarantine facilities). Monitor markets to quantify falcon trade. Develop existing microchipping schemes to help monitor and regulate trade and quantify its effects. Increase awareness of health and conservation issues among falconers. Continue studying, monitoring and censusing falcons throughout. Maintain ecologically and socially sustainable grazing systems to ensure long-term survival of key prey species. Bring greater protection (against conversion, degradation and pollution) to key breeding environments^{1,3,6,7}.

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Appendix E
Recommendations for further research

Activity / Research	Countries	Actions
1. Intensive springtime survey work	China, Kazakhstan, Kyrgyzstan, Mongolia, Russia (European and Asiatic), Ukraine and Uzbekistan	<ul style="list-style-type: none"> a) visit all areas in each country where the species is likely to occur, in order to produce a comprehensive map of national distributions b) sample a high number of representative areas within the national ranges defined above, in order to generate robust estimates of breeding population sizes c) identify appropriate strategies for the long-term monitoring of populations d) interview local leaders, hunters, farmers and experts to generate a profile of the recent past status of the species and its habitat, and the possible causes of any changes
2. Programme of ecological research	Three countries, perhaps China, Kazakhstan, Russia	<ul style="list-style-type: none"> a) understand Saker presence/abundance in relation to habitat and prey b) clarify Saker presence, abundance, breeding success and juvenile survival rates in relation to rodent cycles c) assess the impact of human anti-rodent measures on Saker numbers d) investigate the influence of different types of habitat change on Saker numbers with particular respect to prey availability e) identify the economic drivers of anthropogenic habitat change in Saker breeding ranges f) measure the positive and negative effects of powerlines on the distribution and survival of the species g) enumerate all threats to the species, prioritising the need for responses to these threats and proposing mitigations
3. Satellite-telemetry project	Three countries as above plus several others, perhaps Mongolia, Ukraine	<ul style="list-style-type: none"> a) clearly define migratory routes, wintering areas, habitat selection and prey selection in different parts of the non-breeding range b) strongly assess survival rates of adults and juveniles c) fully understand rates of trapping and their influence on Saker populations in different regions, especially in relation to sex biases
4. Technical unit	To be decided	<ul style="list-style-type: none"> a) oversee the work outlined above b) compile all data on the Saker Falcon c) coordinate fieldwork d) store, manage and analyse new data e) troubleshoot issues (e.g. the optimal design of powerline transmission systems) f) develop policy and recommendations relevant to CMS and CITES g) plan longer-term initiatives (e.g. management measures, conferences and training workshops)