COUNCIL OF EUROPE CONSEIL DE L'EUROPE

Strasbourg, 25 June 2002 **T-PVS/Inf (2002) 12**
[Inf012e_2002.doc]

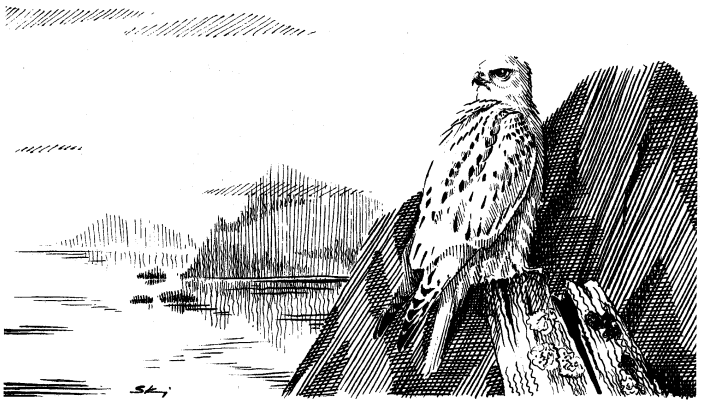
CONVENTION ON THE CONSERVATION OF EUROPEAN WILDLIFE
AND NATURAL HABITATS

Standing Committee

22nd meeting
Strasbourg, 2-5 December 2002

International Species Action Plan

Gyrfalcon (*Falco rusticolus)*



Document
prepared by BirdLife International on behalf of the European Commission

BirdLife INTERNATIONAL

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Timetable

Date and place of workshop: 6–7 March 1999, Kilpisjärvi biological station, Finland

Date of first draft: 5 April 1999

Date of submission: 8 December 1999

Reviews

The Action Plan should be reviewed and updated every five years. An emergency review will be undertaken if sudden major environmental changes liable to affect the population occur within the species' range.

Geographical scope

This Action Plan is primarily targeted and needs active implementation in those European countries where the Gyrfalcon breeds: Iceland, Denmark (Greenland), Norway, Sweden, Finland and Russia west of the Ural Mountains. The Gyrfalcon often remains resident on its breeding range throughout the year, but some birds, especially juveniles and also a minority of adults, disperse hundreds of kilometres south of the breeding range or to the coastal regions in winter.

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Summary

The Gyrfalcon is distributed circumpolarly in the arctic tundra and forest-tundra. It does not belong to the world list of threatened birds, but in Europe, having only about 2,000 breeding pairs (Greenland included), it has been classified as SPEC 3 and Vulnerable by Tucker & Heath (1994).

The species is listed in Annex I of the EU Birds Directive (79/409), in the Appendix I of the Bern Convention and Appendix I of the Washington Convention.

The population seems to have declined considerably, at least in northern Fennoscandia, in the late 19th and early 20th century. This is possibly due to intensive and large-scale egg collecting and simultaneous shooting of adults, decline of the Willow Grouse *Lagopus lagopus* and Ptarmigan *L. mutus* populations, and habitat deterioration. This and other factors are still affecting the population.

Threats and limiting factors

Reduced numbers of prey - high

Disturbance of nest sites - high

Habitat destruction - medium

Robbing of nests for egg-collections, falconry, and captive-breeding programmes - medium

Shooting adults and destroying nests - low

Lack of nests due to decline of Raven populations - low

Collision with cars and fences, and electrocution by power lines - low

Trapping of adults - unknown

Chemical contamination - unknown

Conservation priorities

Including territories in protected areas

Increasing food supply by hunting regulation and other measures

Compiling conservation Action Plans

Improving food availability for the species throughout the year

Reducing incidental mortality from trapping

Continuing present monitoring projects of the Gyrfalcon populations and initiating new programmes in poorly known areas

Intensifying monitoring of population parameters

Promoting research of population viability

Introduction

The Gyrfalcon is distributed circumpolarly in the arctic tundra and forest-tundra. It does not belong to the world list of threatened birds by BirdLife International and The World Conservation Union, IUCN (Collar *et al.* 1994, IUCN 1996). However, in Europe the species, having fewer than 2,500 breeding pairs (Greenland included), has been classified as vulnerable by Tucker & Heath (1994). In addition, BirdLife International classifies it as category 3 among the Species of European Conservation Concern: species whose global populations are not concentrated in Europe, but which have an unfavourable conservation status in Europe (Lindberg 1994). The Gyrfalcon is listed in Annex I of the EU Birds Directive (1979), and following a proposal from Finland and Sweden, it has been included in the informal list of priority species of the directive. It belongs also to the species listed in Appendix I of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1982) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington Convention or CITES). The Gyrfalcon belongs to the species of special European concern in the 1997 list by the Council of Europe. These conventions, together with the

Biodiversity Convention (1992), provide an adequate legal framework for the international co-operation in conservation of the Gyrfalcon and its habitat, and all the countries where the species occurs are encouraged to implement them fully.

In Europe the Gyrfalcon is a rare species (e.g. Lindberg 1994, Falkdalen & Blomqvist 1997, Cade *et al.* 1998). As a breeding species it is confined to Greenland, Iceland, Fennoscandia and northern Russia. At least in northern Fennoscandia the population seems to have declined considerably in the late 19th and early 20th century. This is possibly due to intensive and large-scale egg collecting and simultaneous shooting of adults for decades, decline of the Willow Grouse *Lagopus lagopus* and Ptarmigan *L. mutus* populations, and habitat deterioration (e.g. Rassi et al. 1992, Tømmeraas 1993, 1994, 1998, Väisänen et al. 1998). The Gyrfalcon is largely dependent on these two grouse species for food during winter and spring. Gyrfalcon populations continued to be stressed at least locally up to the late 1900s due to shortage of food, habitat destruction, disturbance of nest sites, and illegal removal of eggs and young for collections and falconry (e.g. Tømmeraas 1993, 1998, Cade *et al.* 1998).

A workshop to compile this Action Plan was organised at Kilpisjärvi biological station, Finnish Lapland, on 6–7 March 1999. The workshop was organised by BirdLife Finland. Representatives from the following countries were present: Finland, Iceland, Norway, Sweden and USA. The Gyrfalcon's status and threats were thoroughly discussed, and the most important actions to safeguard its future in Europe were outlined. The first draft was circulated for comments among the contributors and other experts on 7 April 1999. In addition to the listed contributors, Tom Christensen (Greenland), Torsten Stjernberg (Finland), and Torsten Larsson and Martin Tjernberg (Sweden) commented on the first draft. The second draft was submitted on 8 December. In addition to the workshop and other experts' comments, the information on especially the life history in this Action Plan is based on a thorough literature review by Cade *et al.* (1998). The populations are fairly well known and monitored in Fennoscandia and Iceland, but only locally in Greenland. Information from Russia is very inadequate.

The plan intends to provide a framework of action for the governments, non-governmental conservation organisations, and individuals responsible for, or interested in, the conservation of the Gyrfalcon. The Gyrfalcon is a site-tenacious species breeding in traditional sites which can be preserved by national legislation and other measures.

The conservation status and threats to the Gyrfalcon are fairly well understood, although there is very limited knowledge on many basic population parameters such as mortality, longevity, dispersal and main reasons of death. The most important aims of research in the near future are to make a demographic population model and to study the use of habitat by the species. Information on these aspects is badly needed to conserve viable populations effectively. Gyrfalcon populations respond to long-term, more or less cyclic fluctuations of the grouse populations, and ecology of the falcon must be studied and populations monitored preferably for several decades to get reliable results throughout a cycle. The number of territorial pairs in Iceland, for example, has changed by a factor of 1.5 from low to high years (Nielsen 1999), which is probably typical also for other European populations. Fluctuations of the number of breeding pairs and of the breeding success are much higher.

Table 1. *Estimated number of territorial pairs of the Gyrfalcon in the European range states in the late 1990s.*

Finland	20–30
Greenland	500–1000
Iceland	300–400
Norway	*250–385*
Russia	500–700
Sweden	80–135
Total	1,650–2,650

Background Information

Distribution and population

The Gyrfalcon is distributed circumpolarly over a large part of the tundra zone and at the northern limit of the coniferous forest zone, including arctic-alpine mountainous heath, birches and willow scrub. In Europe it breeds in Greenland, Iceland, Norway, north-western Sweden, northern Finland, northern half of the Kola Peninsula and along the timberline east of the Kanin peninsula. Within European Union the species breeds only in northern Finland and Sweden. The majority of the adult population probably stays in the breeding area, except for high Arctic, throughout the year, but at least part of the immature and some adult birds winter in coastal areas of the Atlantic or Arctic Ocean.

The population is fairly well known in Fennoscandia and Iceland but poorly so in Greenland and especially Russia. The total European population has been estimated recently at ca. 800–1,300 without Greenland, and 1,300–2,300 if Greenland is included (Lindberg 1994, Gensbøl & Koskimies 1995, Falkdalen & Blomqvist 1997, Cade *et al*. 1998). According to the most recent information compiled for this report, there are 1,650–2,650 territorial pairs in the whole of Europe (Table 1). Earlier estimates do not deviate markedly from this, except for Russia (Lindberg 1994, Cade *et al*. 1998, see also Gensbøl & Koskimies 1995, Steen 1999).

Gyrfalcon populations fluctuate considerably both annually and in longer terms, depending on the abundance of Willow Grouse and Ptarmigan (Cade et al. 1998). The total population in Europe has probably remained at the same general level since the mid-1900s, although numbers appear to have declined at least locally in northern Fennoscandia and north-western Russia also during the 20th century (Tømmeraas 1993, 1994, Lindberg 1994, Gensbøl & Koskimies 1995, Ahlén & Tjernberg 1996, Koskimies & Kohanov 1998, Väisänen et al. 1998).

Life history

Taxonomic status

The Gyrfalcon was formerly considered trimorphic with white, grey and dark morphs. However, complete gradation among forms and the occurrence of each variety in most parts of range renders term "morph" inappropriate. The Gyrfalcon is most closely related to Saker *Falco cherrug* and arguably conspecific with it (Cade *et al*. 1998).

Breeding

The Gyrfalcon breeds on a cliff ledge or in a cavity, usually in an old stick nest of another species, in particular Raven *Corvus corax*, but also Rough-legged Buzzard *Buteo lagopus*. Birds also accept artificial stick nests (e.g. Tømmeraas 1978). A steep cliff is suitable for the species, if mammalian predators (like Red Foxes *Vulpes vulpes*) are not able to reach the nest. The female starts laying already in April, and the nest site has to provide also shelter from wind, rain (snow cover) and extreme exposure of sunlight by a well-developed overhang. If Gyrfalcons are short of suitable cliffs they sometimes breed in stick nests in trees, more commonly in arctic Russia and Siberia than in north-western Europe. Usually a pair has 2–5 alternate nest sites within a few kilometres, but sometimes up to ca. 15 km from each other (Cade *et al*. 1998).

The normal clutch size is 3–4 eggs, and they are incubated for 34–36 days mostly by the female. The young are brooded up to the age of 10–32 days. Fledging period is 45–50 days, and after that the young are dependent on their parents for several weeks. The young disperse from the natal territory 3–4 weeks after fledging, but some stay there for up to 5–11 weeks.

In most populations the mean productivity is 1.5–2 fledglings per breeding attempt or 2–3 fledglings per successful pair. Generally the brood size varies less than the number of successful pairs; the latter varies usually from 30 to 80% and is dependent on weather conditions during the early phase of nesting and the abundance of food. Although there may be plenty of food, heavy snowstorms or low temperature lasting for days during March and early April may prevent the female from reaching the required condition for egg laying. Some territories are occupied more or less annually, and produce a high number of young compared with territories occupied irregularly. Most birds probably start breeding at 2–3 years old. The youngest individuals of a population have a higher possibility to raise

young successfully in years with abundant food supply than in years with poor food availability (Cade *et al*. 1998).

Feeding

The Willow Grouse and the Ptarmigan are the main prey of the Gyrfalcon in the whole range and throughout the year (Cade *et al.* 1998). During courtship, laying, incubation, and early nestling period falcons in some areas feed almost 100% on *Lagopus spp.*, as well as during winter. A pair has been estimated to consume ca. 470 g of grouse per day (Tømmeraas 1994). A pair with four young requires, on average, 1,160 g biomass/day (with a waste factor of 20%), which is equivalent to a little more than two adult grouse (Lindberg 1983).

During the nestling period the falcons start to take other prey in varying degrees, e.g. waders, larids, ducks and goslings, and even passerines. Gyrfalcons frequently hunt lemmings and other voles especially in Siberian arctic in high microtine years.

Breeding Gyrfalcons may hunt in an area of at least 300–600 km^2, thus ranging some dozens of kilometres from their nest. They probably concentrate, however, in the most productive parts of the home range. The proportion of other prey than grouse (waterfowl, waders, larids and other medium-sized birds) is higher, on average, for pairs nesting near coast, lake, wetland or peatland areas than in homogenous heathland habitats (Cade *et al*. 1998).

Habitat requirements

The Gyrfalcon breeds in cold, arctic and subarctic latitudes, and in arctic-alpine zones at or above timberline, including sea-cliffs and islands. In Fennoscandia and Russia it breeds also in broken and barren pine or birch forests along river valleys and near mountain bases. The majority lives inland in crags and bluffs along rivers through tundra and forest-tundra, and on crags, buttes and escarpments in mountains and uplands where *Lagopus spp.* and other suitable birds like larids, waders and waterfowl flourish.

The most important habitat requirement is a safe nest site on a shelf of an abrupt cliff, providing shelter from mammalian predators and bad weather. Unless based on seabird colonies near-by, Gyrfalcons normally hunt over wide area of open terrain with short, sparse vegetation or willows and other shrub, or around large bodies of water. Birds dispersing elsewhere for winter seek similar open conditions with abundant prey on moors, steppes, coastal belts, around open lakes and reservoirs, even farmland or sometimes towns.

Threats and limiting factors

The following probable threats to the European Gyrfalcon population in the next few decades are listed in their order of importance. There is also a general threat that is more hypothetical than the others are: climate change. The Gyrfalcon, confined to the arctic zones of the Earth, may be one of the species affected most negatively by marked warming of the Arctic zone. Climate change may also have a considerable effect on its prey populations. Because this change probably affects the Gyrfalcon more slowly than the following threats, and due to the difficulties in estimating its effect, it has not been taken into further account in this Action Plan.

Reduced numbers of prey

The Gyrfalcon is peculiar among raptors for going from courtship to early nestling period by preying on the adult segment of the main prey populations, the Willow Grouse and Ptarmigan, during annual low point in their numbers, even in the harsh environment of the high Arctic. Grouse are the most important, and usually the only available, prey during the most critical periods in winter and spring, and their decline may cause serious difficulties for the birds to over-winter and reach necessary physical condition for breeding. Because grouse populations fluctuate cyclically, availability of a high diversity of other prey species should be guaranteed by protecting also these prey species and their habitats. Especially in Fennoscandia, *Lagopus spp.* populations seem to have declined at least locally in recent decades (Väisänen *et al*. 1998). Possible reasons for the reduced food supply are said to be excessive hunting and changes in vegetation from overuse of forage by livestock and reindeer (e.g.

Tømmeraas 1993, 1994), but the problem needs further study. Rapidly increasing snow mobile traffic may disturb grouse. Expanding Red Fox populations may increase predation on grouse populations.

Importance: high

Disturbance of nest sites

The Gyrfalcon is a sensitive species to human activities near its nest site, and both intentional and unintentional disturbance cause breeding attempts to fail. Gyrfalcons are confined to traditional nest sites which are scarce in many areas, and they have very limited access to alternate sites if disturbed. Due to a long breeding season and the time required for the young to become independent, the female seldom has time enough to lay a repeat clutch if the first clutch has been lost (Cade *et al.* 1998).

Close human encroachment and frequent disturbance result in abandonment of some eyries. Hiking, rock climbing, bicycling, skiing and other kinds of outdoor activities have become more popular all over northern Europe, including also driving off-road vehicles and especially snow mobiles. This has led to the radical diminishing and fragmentation of earlier undisturbed wilderness areas. Also too eager bird-watchers and nature photographers as well as scientists, rangers and other field workers may unintentionally disturb birds e.g. at some well-known nest sites.

Importance: high

Habitat destruction

In addition to availability of prey, other environmental factors of a habitat must remain in a natural state to hold a viable Gyrfalcon population. Although some falcon populations and pairs have adapted to live close to humans if they can find a safe nest site and productive hunting grounds, some environmental changes caused by human activities have negative effects on the Gyrfalcon. The most serious changes include building of dams and reservoirs, roads, snow mobile and skiing routes, and other tourist infrastructure, as well as cottages, reindeer fences and powerlines (Cade et al. 1998). Forest cutting, military activities and reindeer husbandry can also cause problems for the breeding and hunting Gyrfalcons by disturbing the birds and changing their habitat quality. Oil exploration has declined in most parts of European Russia in the 1990s, and some Gyrfalcons have accepted abandoned oil pumps as nest sites in Lower Petchora region. If exploration and development of petroleum industry should be intensified anew, it may cause disturbance to falcons and their prey.

Importance: medium

Robbing of nests for egg-collections, falconry, and captive-breeding programmes

Local collecting of eggs and young has a smaller effect on a Gyrfalcon population than continual killing of adults at a similar geographical scale. The Gyrfalcon, however, belongs to the most highly prized bird species among egg collectors and falconers worldwide and especially in Europe and Arabia. Thus, robbing of nests might extend to such a spatial and temporal intensity that it could cause a population to decline seriously, especially with presumably reduced prey level and many other negatively affecting factors acting simultaneously. In Germany, for example, there were an estimated 500 Gyrfalcons in captivity in the early 1990s, 70–80% of which originated in the wild (Forslund 1993). After several captive generations this proportion is probably now lower. In Britain the number of captive Gyrfalcons is estimated at ca. 400, of which two thirds are hybrids of different sorts.

Illegal robbing of eggs and young for egg collections and falconry has been confirmed in several parts of Norway, and up to the mid-1980s also in Iceland. There are also some hints of nest robbing in Sweden and Finland, although no cases have been verified. Robbing is probably more common than presumed, however, because surveillance has only covered a minority of the nest sites. Young Gyrfalcons have been robbed illegally for captive-breeding programmes and falconry also in several areas in northern Russia, leading to at least temporary disappearance of a local population in the late 1980s (Morozov 1991). In Kola Peninsula robbing of eggs and young by Central European egg collectors and falconers is still considered as the most severe threat (Koskimies & Kohanov 1998). The disintegration of the former Soviet Union in 1991 led to a decline of the general control of the laws protecting wildlife. Because control by customs has relaxed considerably, the CITES regulations are not fully enforced. The methods used for obtaining birds of prey and smuggling them out of Russia seem to be very efficient, although the collapse of infrastructure in the high Arctic at the same time

may give protection to birds in many regions (Flint 1995). The high economic value of especially white Gyrfalcons together with better travelling connections have probably led to an increased proportion of the birds going to the falconry markets of the Gulf States and the Middle and Far East.

An increasing problem for both wild populations of Gyrfalcons and Peregrine falcons (*Falco peregrinus*) is the risk of gene-contamination from escaped captive-produced hybrid falcons. Many of those hybrids (crossing between *Falco rusticolus x peregrinus*, *rusticolus* x *cherrug* etc.) are fertile, and there are some records of hybrids breeding with wild birds. The long term effect on the wild Gyrfalcon population remains unknown but needs to be analysed.

Importance: medium

Shooting adults and destroying nests

Incidental and illegal shooting of adult Gyrfalcons and destroying their nests for game protection and other purposes was formerly a more common threat all over the range. Nowadays it seems to be fairly rare. Locally persecution probably continues, however, especially in Russia, but it probably only has a marginal and local effect in most parts of the range.

Importance: low

Lack of nests due to decline of Raven populations

The Gyrfalcon is dependent to a high degree on old stick nests of Ravens. The decline of Raven populations would thus be detrimental for the Gyrfalcon. Ravens winter in the high Arctic together with Gyrfalcons, and availability of winter food is critical for both of them.

Ravens are dependent on carcasses of dead reindeers and other large mammals during winter. They have benefited by the increasing populations of both reindeer and moose and lessening of persecution in many parts of the range during recent decades (Väisänen *et al*. 1998). The use of carcasses for winter feeding of Eagles and Arctic Fox (*Alopex lagopus*) and also used by nature photographers has increased the availability of food for Ravens. New EU Directives, however, restrict considerably the leaving of slaughtered offal and use of carcasses by photographers, reducing the availability of the main food sources accessible to the Ravens. Raven populations may decline in numbers at least locally. Also persecution of Ravens is still going on in some regions within the Gyrfalcon's range, e.g. fairly intensively in Iceland (Hardardottir & Nielsen 1999). Decline in Raven populations may cause lack of stick nests accessible to Gyrfalcons.

Importance: low

Collision with cars and fences, and electrocution by power lines

Collision with reindeer fences by hunting Gyrfalcons may pose an increasing threat, because at least in Fennoscandia the total length of fences will increase in the future. According to preliminary data, thousands of Willow Grouse and Ptarmigan die each year in a collision with fences. This may have locally an effect also on the prey populations. Collision with cars is also a threat especially in Iceland, Norway and Sweden with several territories close to highways. Collision with power lines and electrocution are occasional factors having most probably only marginal effect on Gyrfalcons. In the high Arctic there are few power lines, but in the future more lines will possibly be built.

Importance: low

Trapping of adults

Up to the early 1990s as many as 2,000 Gyrfalcons have been estimated to have been killed each winter in Russian arctic by traps set for Arctic Fox (Ellis & Smith 1993). Although this estimate needs verification, trapping seems to have been one of the major threats to Gyrfalcons. As far as is known, trapping is much less intensive in European Russia than in Siberia. Due to the collapse of fur markets in Russia, fur farms and most individual trappers have ceased to operate in the 1990s, and the number of killed Gyrfalcons is probably a small fraction of that in the years of maximum trapping efforts in 1987–1988. Trapping of Arctic and Red Foxes has been practised on a minor scale in other parts of the range as well, but outside Russia it probably has a minor effect on the species.

Importance: unknown

Chemical contamination

Pesticides and other chemicals seem to have affected Gyrfalcon populations considerably less than many other raptors, probably due to the remoteness of the breeding range from the main source areas of chemical contamination and the sedentary habits of the Gyrfalcon (e.g. Lindberg 1984, Ólafsdóttir *et al*. 1995). Acid rain and radioactive fallout may also be potential, but probably not serious, problems that need more study, especially in Russia (Cade *et al*. 1998). Lead intoxication is a potential threat to Gyrfalcons eating Willow Grouse, Ptarmigan and waterfowl in areas with a high hunting intensity. The probable poisonous effects of the Russian satellite and military rockets and their fuel rumoured to fall down in the tundra need to be studied. More study is needed to evaluate the importance of chemical contamination, however, because there are some new sampled eggs with high levels of chemicals.

Importance: unknown

Conservation status and recent conservation measures

Finland

The Gyrfalcon has been protected by the Nature Conservation Law in Finland since 1926. It is listed as vulnerable in the official Red Data Book of 1991, and will probably hold the same category in the new listing of 1999, based on the new international criteria standardised by IUCN. It is prohibited to export Gyrfalcons, their eggs and any products made from the species from the country. This is also true for all other countries within this Action Plan, as they all are members of CITES.

The species breeds very sparsely in northern Lapland, and fewer than a quarter of the pairs breed in national parks and other strictly protected areas, part of which have been included also in the Important Bird Areas (IBA) network by BirdLife International. The majority of the pairs, however, live in areas protected by the Wilderness Law, which regulates e.g. forest cutting, building of roads and cottages etc. The physical environment of the Gyrfalcon is fairly well preserved. There are neither specific action plans for the Gyrfalcon nor other species-specific conservation efforts in Finland. The whole population has been monitored since the early 1990s (Koskimies 1995, 1998).

Greenland

The Gyrfalcon's eggs were totally protected in Greenland in 1958, and in the following year export of live or dead birds was prohibited for all of the country. From 1960 to 1976 the bird and its eggs were fully protected in all of Greenland from 15 May to 31 August, and this protection was extended throughout the year since 1977. These Greenlandic prohibitions were replaced in 1988 by countrywide laws under Greenlandic Home Rule (Information from K. Kampp and D.M. Boertmann).

Gyrfalcons breed widely but sparsely throughout the ice-free lands of the north, east, south, and west coasts; only a few pairs are known to nest in the national park located in north-east Greenland, the only protected area. There is no specific action plan, and no systematic monitoring has occurred in any part of the island. Some information is available from the region around Sondre Stromfjord, where from 1972 to the present more than 50 breeding locations have been catalogued but no more than 19 are known to be occupied in any given year. In some years none were occupied (information obtained incidentally from intensive study of the Peregrine Falcon, W.G. Mattox and associates). Also, in 1999 a combined helicopter and dog-sledding reconnaissance of ca. 9,000 sq. km in Jameson Land and Liverpool Land, north of Scoresbysund, located 10 occupied nesting territories (all by white birds) and another 10–12 apparently unoccupied but obviously long-used eyries (T.J. Cade and Ó.K. Nielsen, unpublished data).

Iceland

The Gyrfalcon was protected for the first time in Iceland from 1919 to 1929, and permanently since 1951. The Gyrfalcon has been listed as an endangered species due to a small population size (Red data book on the birds of Iceland by the Icelandic Institute of Natural History, in press). The species breeds in all parts of Iceland, with the densest population at the edge of Central Highlands. There are ca. 30 occupied territories in nature reserves. The most important conservation efforts are the laws giving to the Gyrfalcon a total protection and prohibiting disturbance at the nest site. State-

paid wardens have guarded nest sites at Lake Myvatn. Research and education have been published through mass media. A population in north-eastern Iceland has been monitored since 1981.

Norway

The Gyrfalcon has been protected by law in Norway since 1971. It has been listed as a threatened species, classified as vulnerable in 1992 and rare in 1996. In the Norwegian Red List of 1998 it is once again classified as vulnerable. In northern Norway ca. 15–20% of the pairs breed in protected areas.

The breeding range extends from south of Hardangervidda to Finnmark. In western Finnmark and northern Troms County, a monitoring project has been carried out for over 30 years (P.J. Tømmeraas et al.). Gyrfalcon territories have also been monitored in three areas in southern and mid-Norway in the "Monitoring Programme for Terrestrial Ecosystem" by the Directorate for Nature Management since 1990.

Russia

In the Russian Federation the Gyrfalcon has been included in the list of threatened animals as a rare species. It has also been protected by various hunting regulations. The order by the General Game Management Committee (1964) prohibits the shooting, capturing and nest control of birds of prey in areas where game hunting is allowed. According to general hunting regulations, adopted in March 1979, shooting of all birds of prey and owls is forbidden. These rules were inherited in the new federal law on the protection of Animal Kingdom (Adopted by the state Duma on 22 March 1995). There are also penalties for the illegal extermination of the Red Data Book species, made harsher since 1984. A law on Conservation and exploitation of the Animal Kingdom prohibits any actions, which may result in the death or decrease in numbers of species listed in the Red Data Book, or the destruction of their habitat.

Sweden

The Gyrfalcon has been totally protected since 1957 and is classified as vulnerable according to Swedish Red Data Book of Vertebrates 1996. In a coming revision the species will be placed in the category Endangered according to the international criteria by IUCN. The species breeds in the mountain area of north-western Sweden, and about 25% of the population is found in areas protected as national parks or nature reserves. However, these parks are used for grouse-hunting, reindeer husbandry, and partly for intensive outdoor recreational activities such as snowmobile traffic, which disturb the birds. The Gyrfalcon breeds in at least 4–5 areas classified as Special Protection Areas in Sweden.

The Swedish Ornithological Society started in 1994 a monitoring project for the species in part of the breeding-range (Jämtland-Härjedalen). It has been followed by local surveys by the county administrative boards in Västerbotten and Norrbotten. These surveys have been conducted as concern was raised about the long term survival of the Gyrfalcon due to new hunting regulations (1993) increasing the pressure on grouse populations. The Swedish Environment Protection Board will propose an action plan for the species. The action plan will consider long term monitoring of the Gyrfalcon population, research on population dynamics (e.g. survival, dispersal and reproduction), and monitoring of grouse populations. The rodent populations in the Swedish mountain area have decreased during the last 20 years, and the cyclic peaks seem to be lower than earlier. The interaction between increased reindeer grazing, rodents and grouse need to be investigated.

Aims and objectives

Aims

In the short term, to maintain the present numbers of the Gyrfalcon throughout its present range.

In the medium to long term to ensure range expansion and population growth in areas where the species has disappeared due to human factors.

Objectives

1. Policy and legislation

1.1 To promote policies which ensure long-term conservation of the habitat of the Gyrfalcon

1.1.1 Including territories in protected areas

The most important habitats of the Gyrfalcon, including nest sites and productive hunting areas, should be protected as thoroughly as possible. In protected areas the quality of the habitat can be protected and improved through appropriate management, and the species-specific requirements can fully be taken into account. As many Gyrfalcon territories as possible should be included in national parks and other protected areas. To evaluate the present situation, it should be checked how many pairs are included in legal nature reserves in each country. The protection of the Gyrfalcon habitat should be kept in mind when designing new protected areas, e.g. based on EU´s Natura 2000 programme, Birds Directive (Special Protection Areas, SPA) and BirdLife International's Important Bird Areas (IBA) project. Protection of new areas containing three or more pairs should be given the highest priority. In addition to extensive nature reserves, possibilities of founding local and smaller protection zones around individual eyries should be encouraged.

Priority: high

Time-scale: ongoing

1.1.2 Increasing food supply by hunting regulation and other measures

Availability of food is crucial for the conservation of the Gyrfalcon. Every effort should be made to try to increase the numbers of Willow Grouse and Ptarmigan, including conservation of their habitats, improvement of degraded habitats, and regulation of excessive hunting. The most productive grouse habitats should be protected against all disturbing factors, including building of fences and hunting. In many other areas with importance to grouse populations hunting should be restricted e.g. by lower bag limits, later starting period and earlier stopping than at present. Compared to the present hunting should be more restricted especially in mid-winter, because that is the most critical period for the Gyrfalcon, and because especially at that time hunting probably increases mortality. Many waders, larids and other summer prey species seem to be stable or to have increased in numbers in recent decades at least in northern Fennoscandia (Väisänen *et al.* 1998), which probably means adequate food availability during the nestling and fledgling periods.

Priority: high

Time-scale: short

1.1.3 Taking Gyrfalcon into account in management plans

The Gyrfalcon will be able to sustain on its own without intensive and costly management, if availability of food and undisturbed nest sites are provided. The Gyrfalcon is a very special bird species in the north: both falconers and collectors are extremely interested in adults, young and eggs from the wild. At the same time persistent, decade- or century-long occupation of traditional nest-sites cause threat to the species, because in many regions the birds have poor opportunities to find alternate, safe nest-sites due to the scarcity of suitable cliffs. Because the disturbance of nest sites and illegal robbing of eggs and young are among the probably growing threats to the species, e.g. due to the increasing popularity of all kinds of outdoor activities, nest sites should neither be collected in a public register nor given freely and in detail to the authorities. With a growing number of non-specialists knowing exact nest-sites the risk of intentional disturbance increases.

Habitat and other requirements of the Gyrfalcon should be taken into account in management and utilisation plans for protected areas. At present, including territories and nest sites in national parks and other nature reserves does not automatically ensure adequate protection for the species except of the preservation of nest sites – in many protected areas it is allowed, for example, to hunt grouse, visit nest sites, etc. Photographing birds at nest or access to nest sites in other non-conservation purposes should be prohibited without special permits, whether the nests lie in a nature reserve or not.

Because part of the territories are not likely to be declared protected areas in the short term, it must be ensured that they retain their capacity to sustain Gyrfalcons also without area protection. Also for these non-protected areas an environmental impact assessment should be prepared for any work or project that might alter or have an effect on the Gyrfalcon or its habitat throughout the year. Especially disturbance of nest-sites should be avoided at least from late winter to late summer. In areas where construction of roads, hiking routes and buildings, use of natural resources, reindeer husbandry, and other human activities may lead to habitat deterioration, and where nature conservation authorities are really able to influence these plans, they should be in contact with researchers and other specialists of the Gyrfalcon to solve these kinds of site-specific problems.

Priority: medium

Time-scale: ongoing

1.1.4 Warding of sensitive nest sites

There are some nest sites that have been robbed or disturbed for years. The primary effort should be attracting the birds to a new secret site by providing them an artificial nest in a safer place. If this is not possible, the most seriously disturbed nests should be warded. Its organisation should be primarily the task of governmental officials co-operating with non-governmental conservation societies. In addition to well-educated wardens, automatic cameras and other equipment can also be used in surveillance work.

Priority: low

Time-scale: ongoing

1.2 To promote national legislation which adequately protects the species and its habitat

1.2.1 Compiling national action plan.

Every range state should compile a national action plan of the Gyrfalcon and its habitat, based on this European-wide plan and taking into account that Fennoscandia and northern Russia have a common metapopulation of the species. The plan should take into account the species-specific habitat and other requirements, threats, and conservation possibilities, monitoring and research. It should include, among others, instructions on how to take the species into account when compiling environmental impact assessment for dam construction, power plants, roads, tourist centres or any other infrastructure likely to affect the habitat of the Gyrfalcon, without increasing the threat of both intentional and unintentional disturbance of nest-sites when using monitoring data for these plans. The plan should also include all types of conservation activities to maintain the present numbers of the Gyrfalcon, as well as to ensure population growth in the future.

Priority: high

Time-scale: short

1.2.2 Reviewing and updating national laws

A review and update of national laws and regulations relating to nature conservation should be encouraged to ensure that the Gyrfalcon is given the maximum level of protection, and that heavy penalties are instated for shooting, trapping, taking, poisoning, disturbing, possessing or trading specimens or eggs. Better enforcement of the laws needs to be instituted in some regions.

Priority: low

Time-scale: ongoing

1.3 To promote implementation of international conventions and treaties

1.3.1 Implementing international conventions and treaties

The two major international treaties, Bern Convention and CITES, together with the Biodiversity Convention and the EU Birds Directive, provide an adequate framework for the conservation of the Gyrfalcon and its habitat. All the countries where the species occurs, having ratified the conventions, will be encouraged to implement these conventions into full effect.

Priority: medium

Time-scale: ongoing

1.3.2 Controlling of captive-breeding programmes

Several hundreds of Gyrfalcons are kept in Europe for falconry and captive breeding purposes. Their origin has not been studied systematically. Many proofs indicate, however, that there are still individuals being robbed from the wild, either because captive stocks are highly inbred or to increase the total number of breeders. In the year 1992, for example, more than 35 Gyrfalcons, all collected from the wild in Fennoscandia, were confiscated by the police in Germany. The number of birds robbed and smuggled from Russia is probably much higher and growing rapidly. Captive-breeding programmes should continue to be monitored by DNA methods to discourage the illegal entry of wild birds into captive collections. The increased number of captive-produced hybrids, some of which are fertile, may influence wild populations as gene-polluters. The number of lost hybrid-falcons has increased, and several cases have been recorded with Gyrfalcon hybrids breeding with wild Peregrine Falcons. Hybrids between Gyrfalcons and Sakers are fully fertile among themselves as well as in backcrossing with their parental species and, therefore, have the greatest potential to influence the gene pools of wild Gyrfalcon and Saker populations. The hybrids should be sterilised before they are sold or released for hunting.

Priority: medium

Time-scale: ongoing

1.3.3 Intensification of co-operation between nature conservation authorities, customs, and police

Illegal trade of Gyrfalcon eggs and young is a threat to the species at least locally, and its importance may increase in the future. Customs officials should be educated more thoroughly than at present in the problems of bird crime by environmental administrators and non-governmental bird and nature conservation organisations. Also other co-operation between authorities and the general public should be intensified, in order to increase possibilities of noticing and identifying robbers of eggs and young before they manage to leave a country.

Priority: low

Time-scale: ongoing

1.3.4 Activating international co-operation in research and conservation

Gyrfalcon populations are not confined to national borders. In Fennoscandia, for example, several pairs have alternate nest sites in two countries. Moreover, individuals are capable of dispersing over distances measured in hundreds of kilometres and migrating over thousands of kilometres. Therefore the entire Eurasian metapopulation could be viewed as a single conservation entity. Also many threats are common throughout the entire range, and, thus, effects of the respective conservation measures increase with increasing spatial scale. Conservation of Gyrfalcons benefits from keen international co-operation among researchers and environmental administrators, e.g. in compiling national action plans. Resources should be increased co-operatively to monitor and research Gyrfalcons especially in areas that until now have been poorly studied, e.g. Russia and Greenland.

Priority: low

Time-scale: ongoing

2. Species and habitat protection

2.1 To ensure that the habitat retains the necessary conditions for the presence of the Gyrfalcon

2.1.1 Improving food availability for the species throughout the year

The lack of food is probably a serious threat at least locally and in some years to the Gyrfalcon. The availability and numbers of the Willow Grouse and Ptarmigan, the main prey species in the critical period from autumn to early nestling period in early summer, should be increased by protecting productive habitats, improving degraded range, regulating hunting seasons (no hunting before

September and from February to April), and reducing mortality due to hunting, reindeer fences, and other factors.

Priority: high

Time-scale: short/ongoing

2.1.2 Improving the availability and quality of nests

The Gyrfalcon breeds usually in abandoned Raven nests. Their number and quality depends on the abundance of the Raven. Raven populations are mostly dependent on food availability during winter. By providing carcasses Ravens may be attracted to live and probably breed in the same areas as the Gyrfalcons; fortunately the Raven is regarded as a pest bird only locally. Another means of improving the quality of nests is to reinforce badly constructed nests or nests in suboptimal ledges, where they are likely to fall during nesting.

If there are too few Ravens to build safe natural nests for the Gyrfalcons, or the cliff ledges are not optimal although the nest site is otherwise suitable, artificial nests should be provided for the falcons. They should be built in similar sites as the natural nests, and they should resemble natural nests as much as possible. Artificial nests should also be used to attract falcons to alternate sites when traditional nest sites have become unsafe for any reason.

Priority: low

Time-scale: ongoing

2.2 To eliminate or control non-natural factors which are affecting the Gyrfalcon

2.2.1 Reducing incidental mortality from trapping

The use of leg-hold traps for the commercial capture of fur-bearing animals, especially Arctic Fox, has been widespread in several countries across the Gyrfalcon's range, although according to EU Directives and Bern Convention it is forbidden to use traps killing other species than those for which the traps have been put for. A high number of Gyrfalcons is said to be killed by these traps in Arctic Russia, but more information is needed to confirm the current effect of trapping on the species. The use of sight-baited leg-hold traps should be discouraged in all areas frequently used by falcons, and possibilities to change traps or trapping techniques should be investigated to prevent the falcons getting caught (see Glenn 1998).

Priority: high

Time-scale: short

2.2.2 Preventing human disturbance

As a general rule, disturbance and robbing of eggs and young may be avoided in most territories by leaving the birds on their own – the fewer persons know the exact eyries the better. If a special need for territory-specific measures appears, reliable field workers responsible for monitoring of their respective nest sites should contact responsible nature conservation authorities. In opposite, authorities should contact researchers in the respective land-use planning possibly affecting Gyrfalcon habitat in order to receive appropriate data on the species.

Human disturbance may be prevented by constructing snow mobile or skiing routes, paths, cottages and other infrastructure further away from Gyrfalcon nest sites and other core parts of their territories. Also bird-watching tours to Gyrfalcon nests should be prohibited in areas without a good surveillance due to a risk that visitors might distribute information on exact eyries to potential robbers. A “safety zone“ will vary according to the characteristics of the land; 1 km is recommended as a minimum distance if the nest cliff remains invisible from a longer distance, but it may increase to 2–3 km for a visible nest dependant on cliff-height. In nest sites where human disturbance is a persistent cause of breeding failure and where there are no suitable alternate sites even with the help of artificial nests, warding should be organised to prevent both intentional and unintentional disturbance to nesting birds.

Priority: medium

Time-scale: ongoing

2.2.3 Preventing nest robbing and illegal trade

Illegal nest robbing and trade of eggs, young and full-grown Gyrfalcons must be prevented by increasing surveillance and warding of those nests which are regularly robbed or probably under threat of robbing. Heavy fines for taking birds should be included in national laws, and they should be adequately publicised and enforced. Also the parentage of birds in captive-breeding programmes should continue to be controlled by DNA testing. The Eurogroup Against Bird Crime, national customs authorities, CITES Secretariat and other responsible organisations should give more publicity to the illegal trade of Gyrfalcons and encourage politicians and police to take action. A permanent liaison and information exchange between the above organisations is essential. European and former Soviet Union zoos must be warned about the risks of accepting birds of uncertain wild origin. Also more information needs to be gathered about the way nest robbers operate and the routes of the illegal trade.

Priority: medium

Time-scale: ongoing

2.2.4 Reducing mortality due to intentional hunting and other directly affecting activities

Gyrfalcons are locally still persecuted by shooting and destroying nests. Governments should be urged to enforce control of this illegal persecution and increase surveillance especially in protected areas where Gyrfalcons occur. Also some birds following grouse hunters and their dogs are probably shot accidentally every now and then. Awareness campaigns targeted at hunters' associations should be undertaken in those areas where these problems are especially acute.

Priority: low

Time-scale: ongoing

2.2.5 Reducing mortality from collision by reindeer fences and electrocution by powerlines

With the help of environmental impact assessment, reindeer fences, powerlines, windmills and other constructions causing a threat to hunting and flying falcons should be built further away from Gyrfalcon nest sites and most productive hunting areas. Reindeer fences should probably be marked more clearly to warn both Gyrfalcons and grouse. Certain types of pylons, for instance, are more dangerous than others. Information is available also on anti-electrocution measures and modifications, some of which are easy to apply and inexpensive.

Priority: low

Time-scale: long

2.3 To extend the current distribution area and increase density

2.3.1 Surveying of potential recolonisation areas

It should be stressed that recolonisation will be used only if there are no certain methods to keep the natural populations viable in the present natural area. But if a marked part of the Gyrfalcon's current range becomes unsuitable for the species, or there are other good reasons and practical ways for extending or moving the breeding range, areas where recolonisation would be possible should be identified. This can be based on good knowledge of the historical distribution of the species and its habitat requirements. Possible recolonisation should be pursued in connection with the present area in order to facilitate the genetic exchange between subpopulations. All potential recolonisation areas must be carefully identified before any juveniles can be released. Inventory should include e.g. the mapping of nest sites, food availability, threats and conservation measures. In general, the IUCN Species Survival Commission's guidelines on re-introductions should be followed (IUCN 1998).

Priority: low

Time-scale: long

2.3.2 Maintaining captive breeding programme for recolonisation

If a natural catastrophe or disease brings population levels dangerously low, it may be necessary to have access to a captive-breeding stock to provide for reintroduction or population boosting projects. Young and adult birds, either captive-bred or stolen, victims of accidents etc. can be used to extend the breeding area by returning them to the wild. The hacking technique with young falcons is the best way to release falcons and get them fully accustomed to the wild. Any captive-breeding and release programme shall only use falcons originating from the region or close-by from which it disappeared.

Priority: low

Time-scale: long

3. Monitoring and research

3.1 Monitoring

3.1.1 Continuing present monitoring projects of the Gyrfalcon populations and initiating new programmes in poorly known areas

Special monitoring projects cover most accurately Finland and Sweden at present, and also central and northern parts of Norway and northern Iceland. Monitoring covers practically the whole population only in Finland, with the smallest national range and number of pairs. Monitoring projects should be extended also in other countries to ensure the representativeness of monitored areas, e.g. the optimality of food availability and nest sites. Nature conservation authorities should have responsibility for the funding of the monitoring work to ensure its continuation, but the leading of the field work and data analysing should be done by professional ornithologists to guarantee the scientific validity of the work.

The status of the species is more poorly known in Greenland and especially Russia than in the Nordic countries. In these most poorly known areas intensive monitoring of the distribution and size of the population should be initiated in order to establish population trends and problems and to evaluate the effectiveness of conservation measures adopted. The projects should be integrated so that the number of breeding pairs and their productivity will be determined in a standard way. A periodic count of territorial pairs and young is the minimum way of monitoring. All previously known and potential sites should be visited to determine the number of pairs trying to breed in a given area.

Priority: high

Time-scale: ongoing

3.1.2 Intensifying monitoring of population parameters

In addition to pair numbers, monitoring projects should be intensified to cover the most important population parameters having effect on the population size and trends. The most important of them include natality and mortality. The number of young per pair should be counted at or near fledging, and young should be ringed if possible. Mortality, site fidelity and other life history traits should be studied by identifying breeding adults with the help of plumage, rings, calls or other marks, including DNA analysis from moulted feathers collected at eyries.

Priority: high

Time-scale: ongoing

3.1.3 Monitoring grouse populations and availability of nest sites

Intensive monitoring of the Gyrfalcon should cover abundance of prey animals, especially the Willow Grouse and Ptarmigan. In addition to monitoring the number of birds, the population ecology of these two grouse species should be more thoroughly studied to identify the key factors having the greatest effect on their natality and mortality. The importance of the grouse should be studied by gathering and identifying food remnants of the Gyrfalcon all over the range and from year to year.

Availability of suitable nest sites is another key element of the Gyrfalcon habitat. Their quality, as well as that of the other most important features of the habitats, should be evaluated in an

internationally standardised manner. This information helps in determining how healthy the environment is for the species.

Priority: medium

Time-scale: ongoing

3.1.4 Monitoring levels of chemical pollutants in eggs

The amount of organochlorines and heavy metals in unhatched eggs, feathers and adults has only been studied locally. The effect of pesticides on the productivity and mortality of the Gyrfalcon is thus documented imperfectly. Probably the pesticides only have a minor effect on Gyrfalcon populations. As a part of the monitoring of breeding, unhatched eggs should be removed for analysis of organochlorines and heavy metals. In addition to eggs, it would be interesting also to monitor the levels of chemical pollutants in adult Gyrfalcons. Birds found dead or shot should be investigated, as well as feathers found in the field. If there are no resources to analyse samples at once, material should be stored adequately for future research, e.g. analyses of new synthetic chemicals.

Priority: medium

Time-scale: ongoing

3.2 Research

3.2.1 Promoting research of population viability

One of the most important gaps in our knowledge of the Gyrfalcon's ecology is the lack of a usable model for survival rates of both young and adult birds. They are not known in any part of the range. In spite of practical difficulties of the fieldwork, a thorough and long-lasting research should be started in several study areas representing different conditions within the breeding range. The most effective method is trapping and marking adults. Other methods of identification should also be used when possible, including photographs, calls, feathers and behavioural traits. In well-monitored populations young should be colour-ringed as well. By ringing a marked proportion of the young with colour-rings, within a few years it is possible to get a number of marked breeding adults to be monitored for mortality studies.

Based on survival and other population parameters, a viable population analysis should be made as a part of creating a more detailed action plan regionally or nationally for the Gyrfalcon. Making a population model, and understanding demographic, genetic, geographic and other variables affecting the viability of the populations, would be very useful in establishing more accurately the main aim of the species action plans and finding out how close the objectives come to achieving it. It is also of utmost importance to estimate, for example, the effect of grouse hunting and other factors on breeding success.

Priority: high

Time-scale: long

3.2.2 Promoting research which helps to identify limiting factors and population renewal

The Gyrfalcon lives in a harsh subarctic and arctic environment. A better understanding of the species' habitat and energy use, the home range of adult pairs, and the movements of the young after leaving the nest would be very helpful for future conservation efforts. Radiomarking and tracking fledglings, as well as breeding adults, with radio-transmitters would enable the gathering of very useful information about the risks and threats that these birds undergo in their day-to-day life. The mechanisms regulating population density and requirements for settlement of new pairs in potential habitats are also important research objects. Also the energy requirements of breeding birds need to be investigated: the number of young that can be produced, the cost for the adults, and the amount of food required. Factors involved in the formation of new pairs and the integration of immatures into the breeding population are unknown. They should be investigated in order to evaluate the mechanisms regulating populations and to establish the population size needed to ensure the long-term survival of the species.

Priority: medium

Time-scale: long

3.2.3 Studying wintering areas and migration routes

Satellite tracking has proved to be an effective way to study the dispersal and migratory movements of various raptors. Especially adult Gyrfalcons should be marked to delineate migration routes, to identify mortality factors outside breeding season, and to locate the wintering areas of birds belonging to different European populations. Ringing projects should be promoted and activated all over the range to raise the number of recoveries.

Priority: medium

Time-scale: ongoing

3.2.4 Studying techniques for increasing grouse populations

Although the population dynamics of the Willow Grouse and Ptarmigan have been studied in many parts of the Gyrfalcon's range, there is only local information on the possibilities of increasing the size of grouse populations. The relationships between grouse populations, habitat changes, hunting pressure and other human-caused factors should be studied to find out techniques for increasing the density of grouse. Those goals should be reached by intensive co-operation with game and Gyrfalcon researchers as well as nature conservation authorities.

Priority: medium

Time-scale: medium

3.2.5 Studying feasibility of reintroducing Gyrfalcons by hacking captive-bred or confiscated young

Although there is no immediate need for large-scale releases in any part of the species' range, it would nevertheless be worthwhile to determine whether or not the same techniques used successfully for the Peregrine Falcon will work for the Gyrfalcon. Small-scale experimental releases should be carried out.

Priority: low

Time-scale: long

4. Public awareness

4.1 To improve and maintain awareness, concern and support for the protection of the Gyrfalcon and its habitat among the public

4.1.1 Implementing awareness campaigns for the general public

All the above-mentioned conservation measures will only achieve maximum efficacy when there is a sufficient level of awareness and sympathy at all social levels involved. It is hoped that the public will come to know better the species and its importance. It is especially important to tell the people how to avoid disturbance of the nesting birds. The Gyrfalcon can be used as a symbol of the arctic tundra and north alpine habitats. Information should be given to the public on the status and needs of falcons and the relationship between falcon conservation and the well being of man. This could succeed with educational material like brochures, talks, lectures, round tables and film shows that cover activities related to the biology, management and conservation problems of the Gyrfalcon. The willingness of the general, well-informed public to cover the costs of the management of the species should be guaranteed.

Priority: medium

Time-scale: ongoing

4.1.2 Raising awareness of the special problems facing Gyrfalcons

Specific problems such as disturbance by hikers, rock-climbers, photographers, naturalists, wardens, tourists, reindeer people and other drivers of snow mobiles must be resolved by focusing education of the species' needs on specific groups of people. The methods include e.g. awareness-raising and publicity campaigns with high-quality educational materials. In Russia, for example, there

is a marked interest of western bird-watching companies to find nest sites, leading to increasing disturbance by both tourists and local people willing to earn money by guiding western visitors. These visits can lead to a wider publicity of exact nest-sites also among nest-robbers. Nature and ecotourism companies and their guides should be informed of the risks of their operation on the birds, and of the ways of looking at the birds without disturbing them.

Priority: medium

Time-scale: ongoing

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Annex: Recommended conservation actions by country

Finland

1.1.1 Include territories in protected areas

1.1.2 Increase food supply by hunting regulation and other measures

1.1.3 Take Gyrfalcon into account in management plans

1.2.1 Compile national species action plan

1.3.3 Intensify co-operation between nature conservation authorities, customs, and police

1.3.4 Activate international co-operation in research and conservation

2.1.1 Improve food availability for the species throughout the year

2.1.2 Improve the availability and quality of nests

2.2.2 Prevent human disturbance

2.2.3 Prevent nest robbing and illegal trade

3.1.1 Continue present monitoring project

3.1.2 Intensify monitoring of population parameters

3.1.3 Monitor grouse populations and availability of nest sites

3.1.4 Monitor levels of chemical pollutants in eggs

3.2.1 Promote research of population viability

3.2.2 Promote research, which helps to identify limiting factors and population renewal

3.2.3 Study wintering areas and migration routes

3.2.4 Study techniques for increasing grouse populations

4.1.1 Implement awareness campaigns for the general public

4.1.2 Raise awareness of the special problems facing Gyrfalcons

Greenland

1.1.3 Take Gyrfalcon into account in management plans

1.3.4 Activate international co-operation in research and conservation

2.2.2 Prevent human disturbance

2.2.3 Prevent nest robbing and illegal trade

3.1.1 Continue present monitoring project

3.1.2 Intensify monitoring of population parameters

3.2.2 Promote research which helps to identify limiting factors and
population renewal'

Iceland

1.1.1 Include territories in protected areas

1.1.2 Increase food supply by hunting regulation and other measures

1.1.3 Take Gyrfalcon into account in management plans

1.2.1 Compile national species action plan

1.3.3 Intensify co-operation between nature conservation authorities, customs, and police

1.3.4 Activate international co-operation in research and conservation

2.1.1 Improve food availability for the species throughout the year

2.1.2 Improve the availability and quality of nests

2.2.2 Prevent human disturbance

2.2.3 Prevent nest robbing and illegal trade

2.2.4 Reduce mortality due to intentional hunting and other directly affecting activities

3.1.1 Continue present monitoring project and initiate new programmes in poorly known areas

3.1.2 Intensify monitoring of population parameters

3.1.3 Monitor grouse populations and availability of nest sites

3.1.4 Monitor levels of chemical pollutants in eggs

3.2.1 Promote research of population viability

3.2.2 Promote research, which helps to identify limiting factors and population renewal

3.2.4 Study techniques for increasing grouse populations

4.1.1 Implement awareness campaigns for the general public

4.1.2 Raise awareness of the special problems facing Gyrfalcons

Norway

1.1.3 Take Gyrfalcon into account in management plans

1.3.3 Intensify co-operation between nature conservation authorities, customs, and police

1.3.4 Activate international co-operation in research and conservation

2.1.1 Improve food availability for the species throughout the year

2.2.2 Prevent human disturbance

2.2.3 Prevent nest robbing and illegal trade

3.1.1 Continue present monitoring project and initiate new programmes in poorly known areas

3.1.2 Intensify monitoring of population parameters

3.1.3 Monitor grouse populations and availability of nest sites

3.1.4 Monitor levels of chemical pollutants in eggs

3.2.1 Promote research of population viability

4.1.1 Implement awareness campaigns for the general public

4.1.2 Raise awareness of the special problems facing Gyrfalcons

Russia

1.1.1 Include territories in protected areas

1.1.2 Increase food supply by hunting regulation and other measures

1.1.3 Take Gyrfalcon into account in management plans

1.2.1 Compile national species action plan

1.3.3 Intensify co-operation between nature conservation authorities, customs, and police

1.3.4 Activate international co-operation in research and conservation

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2.1.2 Improve the availability and quality of nests

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3.2.2 Promote research, which helps to identify limiting factors and population renewal

3.2.3 Study wintering areas and migration routes

4.1.1 Implement awareness campaigns for the general public

4.1.2 Raise awareness of the special problems facing Gyrfalcons

Sweden

1.1.1 Include territories in protected areas

1.1.2 Increase food supply by hunting regulation and other measures

1.1.3 Take Gyrfalcon into account in management plans

1.2.1 Compile national species action plan

1.3.3 Intensify co-operation between nature conservation authorities, customs, and police

1.3.4 Activate international co-operation in research and conservation

2.1.1 Improve food availability for the species throughout the year

2.1.2 Improve the availability and quality of nests

2.2.2 Prevent human disturbance

2.2.3 Prevent nest robbing and illegal trade

2.2.4 Reduce mortality due to intentional hunting and other directly affecting activities

2.2.5 Reduce mortality from collision by reindeer fences and electrocution by powerlines

3.1.1 Continue present monitoring project and initiate new programmes in poorly known areas

3.1.2 Intensify monitoring of population parameters

3.1.3 Monitor grouse populations and availability of nest sites

3.1.4 Monitor levels of chemical pollutants in eggs

3.2.1 Promote research of population viability

3.2.2 Promote research, which helps to identify limiting factors and population renewal

3.2.3 Study wintering areas and migration routes

3.2.4 Study techniques for increasing grouse populations

4.1.1 Implement awareness campaigns for the general public

4.1.2 Raise awareness of the special problems facing Gyrfalcons