

# European Species Action Plan

## Greater Spotted Eagle (*Aquila clanga*)



2015

## **European Species Action Plan for Greater Spotted Eagle (*Aquila clanga*)**

### **Compiled by:**

Bernd-Ulrich Meyburg (WWGBP)  
Lászlo Haraszthy (MME/WWF Hungary)  
Maris Strazds (LOB)  
Norbert Schäffer (RSPB/BirdLife International)

### **with contributions from:**

Haralambos Alivizatos (HOS/BirdLife Greece)  
Alexey Tishechkin (Institute of Zoology of Academy of Science of Belarus)  
Vladimir V. Ivanovski (Hunters' Association of Belarus)  
Petar Iankov (BSPB)  
Alexander Abuladze (Institute of Zoology of Academy of Sciences of Georgia)  
Asko Lohmus (EOU)  
Ulo Vali (EOU)  
Joachim Matthes (Germany)  
Dan Alon (Israeli Ornithological Center, Society for the Protection of Nature in Israel)  
Ugis Bergmanis (Teichi State Reserve)  
Aivars Petrins (Museum of Zoology, University of Latvia)  
Eugenijus Drobelis (Environmental Protection Department of the Republic of Lithuania)  
Karol Zub (Mammals Research Institute, Poland)  
Maciej Rodziewicz (Eagle Conservation Committee, Poland)  
Ireneusz Mirowski (Biodiversity Programme Officer, ECOFUNDUSZ, Poland)  
Jan Kowalski (Biebrza National Park)  
Vladimir M. Galushin (RBCU) Alexander Mishchenko (RBCU)  
Alexander Khokhlov (Stavropol University)  
Miroslav Dravecky (SOVS)  
Martin Tjernberg (Swedish Threatened Species Unit, Sweden)  
Vitaly Vetrov (UTOP)

**Update compiled by:** Paweł Mirski (Poland, Eagle Conservation Committee)

### **with contributions from:**

Grzegorz Maciorowski (Poland, Eagle Conservation Committee)  
Alexander Mischenko (Russia, M.A Mienzbira Russian Society for Bird Conservation and Study)  
Rimgaudas Treinys (Lithuania, Nature Research Centre)  
Ülo Väli (Estonia, Eagle Club)  
Valery Dombrovski (Belarus, National Academy of Sciences)  
Sergey Domashevsky (Ukraine, Ukrainian Bird of Prey Research Centre)

### **Milestones in production of action plan**

Workshop: 14-18 November 1996 (Kemer, Latvia)  
First draft: May 1997 Final draft: November 1997

### **Milestones in updating the action plan**

Workshop: International Workshop on the conservation of the Greater Spotted Eagle, Goniądz (Poland), 25-27<sup>th</sup> January 2012  
First draft: March 2013

## **Review**

This action plan should be reviewed and updated every ten years (first review due 2000). An emergency review will be undertaken if sudden major environmental changes, liable to affect the population, occur within the species' range.

First review was undertaken in 2013 in course of AQC Plan LIFE Project "Securing the Population of *Aquila clanga* in Poland: Preparation of the National Action Plan and Primary Site Conservation" (LIFE08 NAT/PL/000511)

## **Geographical scope**

This action plan is primarily targeted at those European countries where the Greater Spotted Eagle breeds or occurs on migration or in winter. However, given the significance of the Middle East for migration and wintering, and the conservation problems which affect migratory birds of prey in that region, the geographical scope of the action plan was extended to include the key countries of the Middle East as well.

The action plan needs active implementation mainly in: Belarus, Bosnia- Herzegovina, Bulgaria, Croatia,, Estonia, Serbia, Montenegro, Finland, Greece, Latvia, , Lithuania, Poland, Russia, Slovak Republic, Slovenia, , Ukraine. Other countries on the migration path and wintering places (East and South Europe, Middle East and North Africa) may also need implementation of *A. clanga* action plan.

## Contents

Greater Spotted Eagle (*Aquila clanga*) ..... 1

**CONTENTS**..... Error! Bookmark not defined.

**SUMMARY** ..... 5

**Threats and limiting factors**..... 5

**1. Introduction** ..... 6

**2. Background Information**..... 7

**3. Aims and Objectives** ..... 14

**4. References** ..... 21

## **SUMMARY**

The Greater Spotted Eagle (hereafter GSE) is classified as vulnerable on the basis of population size, which is estimated to fewer than 10,000 mature individuals (BirdLife 2012). In Europe it occurs mainly in Belarus and Russian Federation, but in small numbers also in Ukraine, eastern Poland, Estonia, Finland and possibly also very few in Lithuania and Latvia. The total number of pairs in Europe is estimated 1000-1200 pairs. There is a small wintering population in Greece and Turkey.

The Greater Spotted Eagle has shown major population declines at least in European part of its range.

Previously reported nesting in Southern Europe and Israel are doubtful considering latitudes of its current range and past difficulties in recognizing sister species: *A. clanga* and *A. pomarina*.

Although GSE is still declining in its European range, much more attention was brought to species conservation and studies. New steps were undertaken to establish key GSE population numbers and distribution in Russian Federation (Karyakin 2008), but still eastern (Asian) populations are very poorly studied. Population estimates changed in Belarus as a result of more information available due to intensive field studies (Dombrovski & Ivanovsky 2005a). In Estonia unfortunately there is a rapid decline. (Väli 2011). Species biology is still being studied with precise GPS telemetry, molecular analysis, video surveillance at the nests as well as through species and habitat monitoring.

### **Threats and limiting factors**

- Vanishing of wetlands and transformation of habitats
- Shooting on migration routes and on wintering grounds
- Hybridization with Lesser Spotted Eagle
- Poisoning and other factors during migration and on wintering grounds

### **Conservation priorities**

Habitat conservation in the breeding areas

Further research into limiting factors in the breeding range, and during migration and wintering.

Population monitoring and national surveys to clarify population status and breeding success and prevention of destruction during migration.

# 1. Introduction

The Greater Spotted Eagle is a migratory species. In Europe it has suffered a rapid decline in most of its range. In several countries it became extinct or almost extinct, e.g. Finland, Latvia, Lithuania. In November 1996, a second meeting of the International Lesser and Greater Spotted Eagle Working Group took place in Kemeris (Latvia), hosted by the Latvian Ornithological Society and organised by BirdLife International and the World Working Group on Birds of Prey (WWGBP). Representatives from Belarus, Bulgaria, Czech Republic, Estonia, Georgia, Germany, Greece, Hungary, Israel, Latvia, Lithuania, Poland, Russian Federation, Slovak Republic, UK and Ukraine were present. The Lesser and Greater Spotted Eagles' situation was thoroughly discussed and the most important actions to safeguard their future in Europe were outlined.

This action plan is based on the information gathered during that meeting, on the literature and the comments of other experts consulted. It is intended to provide a framework of action for statutory agencies, conservation organisations and individuals responsible for, or interested in, the conservation of the species.

Recently growing attention to GSE conservation in Europe inspired a few conservation projects in Estonia, Belarus, and Poland. National Action Plans for GSE were established in Estonia (Väli 2005), Belarus (Dombrovski 2012), Ukraine (Domashevsky 2000) and soon will also be ready in Poland. A network of GSE researchers and conservationists are working in European and partly the Asian range of this species. In the course of the Polish LIFE project an International Workshop on the conservation of the Greater Spotted Eagle was held in Biebrza National Park (Poland) in January 2012. The information exchanged during the meeting was used to prepare a proposal for the review of the European Species Action Plan for the GSE and are included in the text below.

## 2. Background Information

### 2.1. Distribution and population

The Greater Spotted Eagle is distributed from eastern Poland and the Kaliningrad area to the Pacific Ocean, in southeast Siberia and Manchuria. In Europe it occurs as a breeding species in Belarus, Estonia, Poland, the Russian Federation, Ukraine and exceptionally in Germany (mixed pairs with *A. pomarina*). There are no recent records of pure pairs breeding in Germany, Lithuania and Latvia. A Population estimate is given in Table 1.

Greater Spotted Eagle is a migratory bird, wintering in southern Europe, southern Asia, the Middle East

**TABLE 1: Breeding population estimates**

Country	No. of Pairs
Belarus	150-200
Estonia	5-10
Finland	0-1
Latvia	0
Lithuania	0
Poland	10-13
Russian Federation (European)	800-900
Russian Federation (Asian)	2400-2800
Ukraine	10-15

and Africa as far south as Uganda and Kenya (exceptionally Zambia).

### 2.2 LIFE history *Taxonomic status*

The Greater Spotted Eagle is taxonomically closely related to the Lesser Spotted Eagle (*Aquila pomarina*). It has been supposed that a separation between the mitochondrial lineages of the two species could have occurred slightly less than one million years ago, assuming a substitution rate of 2% per million years for mitochondrial genes (Seibold et al. 1996). Many new cases of hybridization between GSE and LSE were reported recently in Latvia (Bergmanis et al. 1997), Estonia (Lõhmus & Väli 2001), Belarus (Dombrovski 2005), Lithuania (Treinys 2005) and Poland (Meyburg et al. 2005). In the past few years detailed molecular analysis has also been conducted in order to differentiate between both species genotype and genetic structure of GSE populations (Väli et al. 2004, Helbig et al. 2005, Väli et al. 2010). Since interspecific spotted eagle hybrids are fertile and can breed successfully (Väli 2010), also backcrosses constitute the genetic structure of populations in Europe (Väli et al. 2010).

#### ***Breeding***

The Greater Spotted Eagle builds a large nest of sticks on trees below the canopy, mostly in deciduous forest and only rarely in coniferous forest (Galushin 1980, Glotov 1959, Hoffmann 1931, 1932, 1935, Ivanovskiy 1993 a,b, Kutshin 1959, Likhatchev 1957).

The clutch most often consists of two, often of only one egg. Breeding probably starts with the laying of the first egg and takes about six weeks. After hatching chicks stay in the nest for circa 63-67 days. There is a high level of unsuccessful pairs (Meyburg 1994, Maciorowski et al. 1996, Pugacewicz 1995). As with the Lesser Spotted Eagle the species' breeding is characterised by Cainism, whereby the older chick kills its sibling within the first weeks after hatching (Meyburg & Pielowski 1991). Breeding success may oscillate around 50% to 80% depending mostly on prey abundance and water levels – it remains rather low on the oligotrophic high moors and higher in large river Valleys (Dombrovski pers comm.). Cainism is well marked in the European part of the range, but significantly less marked in Western Siberia and Altai-Sayan region (Karyakin 2008). Individuals start to breed around 5<sup>th</sup> calendar year and they settle in the vicinity of their birth place – up to around 20 km (Maciorowski pers comm., data based on ringing results).

Adult plumage is acquired after several (probably 4) years. Partly juvenile plumage may be retained in hybrids (Väli 2010, Maciorowski pers comm.).

The species is not known to have reproduced in captivity.

### ***Feeding***

Food of the species is very variable, depending on availability of prey species. It consists mainly of small mammals, birds, amphibians, lizards, snakes, small fish, carrion and sometimes insects. It was observed that GSE in Estonia brought about 7 prey items daily to the nest, counting about 400 g. Birds (mostly medium size) dominated in biomass (63%), while rodents dominated in prey numbers (63% of all items) (Väli & Lõhmus 2002). Similarly in Belarus small rodents were also most frequent prey, but medium size prey like ducks, waders, rails and water vole dominated in biomass (Dombrovski 2010). In Poland, the share of birds and mammals in prey biomass was similar (about 40%), while amphibians were also quite frequent (12%) (Maciorowski 2013). The share of frogs in studies based on pellet analysis is most probably underestimated, while in poor conditions amphibians account for important prey. In Volga-Ural and Western Siberia mammals, water vole dominated in prey numbers (ca. 75%), while sousliks and pikas were abundant in GSE diet in Altai-Sayan region (Karyakin pers comm.).

### ***Habitat Requirements***

During the breeding season it is an essentially dispersed species nesting at very low densities (Malchevskiy and Pukinskiy 1983). At this time the species needs large wet forests bordering humid meadows, bogs, marshes and other wetlands. It mainly breeds in deciduous lowland forests, but sometimes in mountain forests, up to 1000 m above sea level.

Habitat preferences of both sympatric occurring species were studied in Estonia (Väli & Lohmus 2004) and Poland (Maciorowski & Mirski 2013). Nesting sites were localized far away from human settlements and close to rivers and marshy areas. The foraging grounds comprised of open bogs, river valleys, grasslands (often unmanaged) and shrublands. Home ranges of GSE were significantly larger than of LSE occupying neighborhood territories. An average territory size was estimated at about 1760 ha (up to 2660 ha) in 2011 in Biebrza Valley, but it probably is even bigger (Mirski 2013). Water regimes should be considered as the key element of the GSE habitat preferences and the best barrier against spotted eagles' hybridization (Maciorowski et al., not published).

During migration and wintering a variety of habitats is used - open landscapes, shrubland, and wetlands - but very little is known about habitat requirements and ecology during this period, which extends over half of the year. There may be regular concentrations of birds in certain wintering areas.

## **2.3. Threats and limiting factors**

### ***Habitat alteration caused by forestry***

Several types of forestry operation affecting breeding areas are the most important threat for reproduction. These consist of various activities that cause nest disturbance:



- opening up of new roads by forestry companies
- clear-felling
- selective cutting of old and large trees.

Importance: critical

### ***Habitat alteration by drainage***

*A. clanga* is strictly a wetland species in Europe and share of wetlands is still decreasing –drainage of the wetlands may be the most important threat for the Greater Spotted Eagle.

Importance: critical

### ***Changes in land use and abandonment of agricultural areas***

Previously extensively managed wetlands may become overgrown with trees, shrubs and reed after agricultural recession and by this fact lead to a loss of foraging grounds. This threat involves only part of GSE habitats (mainly low moors) and leads to loss of the mosaic of breeding and feeding habitat.

Importance: high

### ***Disturbance during the breeding season***

The Greater Spotted Eagle is very intolerant of permanent human presence in its breeding area or hunting range and consequently birds abandon their territories once people start to live and work nearby. In several countries privatisation has led to intensive exploitation of feeding habitat, and also of forests. Thousands of people work in the forest in early spring. There are more and more illegal forest activities.

Importance: high

### ***Nest robbing and illegal trade***

The robbing of chicks or eggs and illegal trade is rare, but has occurred several times in Poland.

Importance: low

### ***Shooting***

Every shot bird, especially adult, means a significant loss to local populations because of the species rarity. Poaching is rather uncommon in the European breeding range, but happens quite often during migration and wintering period.

The most dangerous places are Mediterranean Basin and Arabian Peninsula, where the migration routes are narrow and poaching is deep-rooted. Even in South Europe, National Parks and other forms of habitat protection do not guarantee safety from poachers. For example, recently (2012) a male GSE with GPS logger was shot in Skadar Lake National Park in Montenegro. In Greece shooting is considered the main threat to the species (since the foundation of the Hellenic Hospital for Wild Animals and Birds - 13 years ago - they have received about 15 Greater Spotted Eagles, all immature and all except one having been shot).

Importance: critical

### **Poisoning**

A possibly serious threat is poisoning, mainly lead poisoning (in Greece, the Greater Spotted Eagle is thought to feed in a large extent on birds -such as ducks and coots- injured or killed, but not retrieved, by hunters). Since the species also takes carrion, poisons put out to kill foxes and other "vermin" are also a threat to the species.

Importance: critical

### **Collisions**

Powerline and wind turbines are a serious threat for large soaring birds, especially eagles (Lucas et al. 2000) and shouldn't be located in the vicinity of GSE nests and on the main migration routes. Power lines also pose a risk of collision.

Importance: medium

### **Electrocution**

This threat is considered serious, especially in steppe zones of Russia, where individuals killed by electrocution were found (Karyakin pers comm.)

Importance: medium

### **Hybridization with LSE**

There is strong evidence of hybridisation between this species and Lesser Spotted Eagle *Aquila pomarina* (Bergmanis *et al.* 1997, Lohmus & Vali 2001, Dombrovski 2002, Vali *et al.* 2010). In some European countries mixed pairs can constitute 50% of Greater Spotted Eagle pairs (Maciorowski and Mizera 2010) or even more (Vali 2011). It is unclear whether this represents a new phenomenon or a conservation concern, but *A. pomarina* is far more numerous than *A. clanga* in the zone of overlap, and the range of *A. pomarina* appears to be spreading east, further into the range of *A. clanga*.

## **2.4. Conservation status and recent conservation measures**

### **Belarus**

Population is well studied: population numbers (150-200 pairs) and GSE occurrence in Belarus are known and documented (Dombrovski & Ivaovsky2005a). Since 2006 population monitoring is running, unfortunately signaling a fast population decline. One third of the population breeds on wetlands which are not effectively protected, including the most important population breeding on Olmanskie Bolota. Recently a significant share of GSE nest sites was included in protected areas with requirements similar to Natura 2000. A National Action Plan for GSE was written and accepted in Belarus in 2011 (Dombrovski 2012).

### **Estonia**

Rapid population decline was noted in last years despite conservation efforts. GSE population in this

country is isolated and most pairs are formed with LSE. Crossbreeding with LSE is considered the highest threat for GSE population. Species monitoring is run from 1994. National Action Plan for GSE is also established. Current population estimates are 5-10 with predominance of mixed pairs (Väli pers comm.).

### **Finland**

The Greater Spotted Eagle is now probably extinct or only an occasional breeding bird in the south of this country.

### **Latvia**

Since 1996 there are no records of pure pairs of GSE breeding in this country. Genetic analysis indicated that a few per cent of spotted eagle nestlings show some characteristics of GSE (Bergmanis 2013). Since there are no known GSE pairs, there are no conservation steps aimed at this species in Latvia.

### **Lithuania**

Between 1988 and 2011 no pure GSE pairs were registered as breeding. During 2000-2004 –over 250 spotted eagles were observed. 2.7% of those birds were recognized as GSE (Treinys 2005). Occurrence of mixed GSE and LSE pairs is probable (Treinys 2013). No conservation attempts were taken out, since there aren't any recognized territories of pure GSE.

### **Poland**

There is only one population in Poland –in Biebrza Valley, counting 11 pairs plus 10 mixed pairs. There are also two mixed pairs breeding also in Eastern part of Poland. Species monitoring has been running since 1996, but there is also some previous data. Telemetry studies, molecular analysis and habitat studies were conducted recently. A National Action Plan for the species is prepared. Conservation actions like nest protection from pine marten, erection of artificial nests and establishing protection zones are taken regularly. In the course of a LIFE project also foraging grounds of the species were managed by backing up the water level, mowing the wetlands and reducing shrubs.

### **Russian Federation**

A decline in population numbers (800-900 pairs) and distribution area was noted in European part of Russia (Mischenko & Melnikov 2013). Other regions like Western Siberia, Volga-Ural, Altai-Sayan region were surveyed recently (Karyakin 2008, Karyakin et al. 2009). Russia holds the biggest known population of GSE estimated to count 2400-2800 pairs, but not all of the species range was studied. Unfortunately this species populations and habitats are not properly protected by law. Also GSE in Russia is not classified by proper conservation status and not monitored by state programs. Conservation actions like building artificial nests and preventing electrocution were conducted locally.

### **Ukraine**

Main population (North-Western Ukraine) may constitute the continuum of the Belarusian population. Apart from that GSE was also noted in Western and Southern Ukraine (Dombrovski 2007). National Action Plan for both spotted eagles species was prepared over a decade ago (Domashevsky 2000). Apart from the breeding population, Ukraine is important for GSE as a migration corridor and stop over site. Population is estimated at only 10-15 pairs (Domashevsky 2009).

### **Mediterranean Basin**

Greater Spotted Eagles are passing Mediterranean Basin and can also winter there. Most records of wintering birds come from Greece and Turkey (according to Meyburg & Meybrug 2005 as well as other Polish and Estonian satellite tracking data). Generally the entire north coast of the Mediterranean Sea serve as a wintering place for *A. clanga*. Greater Spotted Eagles tracked with GPS telemetry devices or by colour rings were wintering in Spain, Italy, Montenegro, Israel.

Annually 5-10 birds with unknown origin are wintering in wetland habitats of Hungary, as the northernmost known wintering area of the species (MME BirdLife Hungary).

### **Middle East**

The western part is a passing corridor (Turkey, Syria, Lebanon, Israel, Jordan, Egypt), while some parts like Turkey, Israel, Yemen, Oman and Saudi Arabia are known to also serve as wintering sites. Turkey may be especially important. Individuals from Poland and Estonia with satellite transmitters and GPS loggers were found to winter there. The main issue for *A. clanga* in Middle East is shooting, mostly in Lebanon, the other may be the lack of wetlands protected by law.

### **Africa**

In Africa GSEs are wintering mostly in the wetlands at the border of Sudan and South Sudan, also in Egypt, Chad and Zambia (based on data from Polish and Estonian satellite transmitters, Meyburg & Meyburg 2005). After arriving at wintering grounds, birds stay mostly in a small area till March. Mortality rate seems to be the highest in Egypt, but generally seems lower than in the Mediterranean Basin. No conservation activity was focused on wintering places in Africa. Wetlands in North Africa should be protected by law. Poaching may also be a threat for wintering GSEs.

### **Asia**

Not much is known about population numbers of Greater Spotted Eagle in Asia, but the species is rather rare and connected with wetland habitats. Apart from Russia it breeds also in mainland China, Pakistan, north-west India and presumably in northern Mongolia (Birdlife 2001) and Kazakhstan (Gavrilov & Gavrilov 2005). Distribution has been poorly studied so far. Similarly not much is known about migration paths of Asian populations. Greater Spotted Eagles from the Asian part of the range, winter mostly in South Asia. Wintering or passing birds were noted in Japan, South Korea, mainland China, Hong Kong, Taiwan, Pakistan, India, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, Laos, Cambodia, Vietnam, Peninsular Malaysia, Singapore and Sumatra in Indonesia (Birdlife 2001). Declines in the availability of habitat and prey are considered the main threat and disturbance, hunting and pollution are secondary. More attention is needed in general to determine key populations and actual threats to better understand the conservation needs of this species in Asia.

### **International**

An International Lesser & Greater Spotted Eagle Working Group was founded several years ago in Germany under the aegis of the WWGBP (World Working Group on Birds of Prey).

### **3. Aims and Objectives**

#### **Aims**

In the short term, to halt the decline in the population and safe all existing breeding, roosting and wintering habitat.

In the long term, to safe the distribution and numbers of the European population of the Greater Spotted Eagle, restoring the range to what it was in 1920.

#### **Objectives**

##### **3.1. Policy and legislation**

*3.1.1. To promote policies which ensure long-term conservation of all populations of the Greater Spotted Eagle*

#### 3.1.1.1. Forestry and wetland management

Wetland and forestry management conflict with conservation in several countries. Governments should review their wetland and forestry policy to ensure that this is compatible with the conservation of the Greater Spotted Eagle. It is recommended that all national forest and wetland policies should include the following elements:

- Priority for the protection of globally threatened, vulnerable and rare species
- All forestry activity should be forbidden in nesting habitat within at least 300 m of all nests of the Greater Spotted Eagle –protection areas should be established in Ukraine, Belarus and Russia
- Precise guidelines for forest management in areas where sensitive species breed
- Co-operation with forest owners and managers to secure successful breeding
- All forestry activity should be forbidden in nesting habitat between April and September
- All kinds of wetland should be protected in *A. clanga* distribution range from destruction their natural water regime should be maintained.

Priority: high

Timescale: medium

#### 3.1.1.2. Farming and agriculture

The Greater Spotted Eagle breeds in forest but feeds in open landscape, wet meadows and agricultural areas. The species prefers many types of wetlands. It is most important to preserve the mosaic of breeding-feeding habitat, yet in some breeding areas there is a conflict between human activity and the needs of the Greater Spotted Eagle.

It is important to create guidelines for farming compatible with the presence of this species as a traditional breeding bird. It is recommended that such a policy should incorporate the following elements:

- to stop loss of all kinds of wetlands
- to prevent land use change and withdraw all kinds of state support for change in feeding areas
- to prevent all kinds of intensive farming methods in breeding areas and ensure that this also applies to new EU countries
- EU Agri-environmental schemes should be more flexible in order to manage wetlands in general (very extensive mowing, sometimes irregular - depending on water levels)
- Common Agricultural Policy of EU should compensate difficult conditions of agricultural management of wetlands to avoid drainage by land owners and managers
- Promoting diversity of agriculture landscapes, especially in *A. clanga* habitats (wetlands, grasslands). Patches of high vegetation like sedges, reed and shrubs may be an important part of GSE foraging grounds

Priority: high

Timescale: medium

#### 3.1.1.3. Protected areas policy

Protected areas policies and regulation should promote the following:

- Conservation management of all Natura 2000 sites or Important Bird Areas where the Greater Spotted Eagle breeds and winters, along with regular foraging and migration stopover sites.
- Conservation of remaining natural forests, particularly all kinds of wet forest and floodplain forest.

- Establishing new protected areas is still important in Europe, especially for *A. clanga* breeding grounds in Belarus, wintering grounds in Turkey and Eastern Greece

#### 3.1.1.4. International co-operation

Co-operation and information exchange between conservationists working on the Greater Spotted Eagle and its habitats should be promoted. Training on, *inter alia*, nest surveillance should be provided by those groups that are carrying out similar programmes with other large raptors.

Priority: medium  
Time-scale: short

#### 3.1.2. National strategies for conservation of the species

##### 3.1.2.1. To promote national legislation which adequately protects the species and its habitat

Where appropriate, a review and update of national laws and regulations relating to nature conservation should be encouraged.

. In particular, any revisions should ensure:

- that Greater Spotted Eagle enjoys the maximum level of protection, and make it a criminal offence to shoot, trap, take, poison or disturb any member of that species
- that environmental impact assessments are made before afforestation, dam construction, or any other infrastructure which may have an impact on Greater Spotted Eagle habitat
- that the national legislation safeguards the forest and feeding habitat, not only in the breeding season but all year round.

Priority: high  
Time-scale: short/medium

##### 3.1.2.2. National Action Planning

Most of European countries hosting the GSE breeding population already have National Action Plans for *A. clanga* (Belarus, Estonia, Ukraine) or those documents are being prepared (Poland). Development and implementation of National Species Action plans is proved to be a good approach for addressing the main threats to a species population and this approach should be encouraged.

Priority: medium  
Time-scale: medium

## **3.2. Species and habitat conservation**

### *3.2.1. To ensure that good quality Greater Spotted Eagle habitat is maintained through appropriate habitat measures*

#### 3.2.1.1. Forestry operation

Forest management operations should be even more restricted than previously proposed. From half of March till half of October there should be no disturbance in the zone of about 500 meters from active nests. Then from half of October till half of March the vicinity of the nest (zone of 200 meters radius) should not be changed by forest operations.

Priority: high

Timescale: short

Priority: high



Time-scale: short/medium

#### 3.2.1.2. Prevention of disturbance in breeding areas near the nest

- during the breeding season, all kinds of human activity in breeding habitat should be restricted within 500 m radius round the nest.
- all kinds of human activity which alter the mosaic of the breeding and feeding habitat should be forbidden
- all kinds of human activity involving disturbances of the groundwater system should be restricted within 2000 m. surrounding a nest.
- large scale building such as new roads, new powerlines, extension of towns etc. should be prohibited within a 3000 m. radius around the nest.

Priority: high

Time-scale: short

#### 3.2.1.3. Prevention of poisoning

All forms of the usage of poisoned baits should be prohibited in Europe. Also the use of pesticides should be prohibited in wetland areas. Countries of Southern Europe (especially Greece) should fight against poisoned baits, used to eradicate raptors. Priority: medium

Time-scale: short

### 3.2.2. *Designation and management of protected areas*

Better protection is needed in Belarus (i.e. Olmanskie Bolota site) and Russia. Smaller European populations are already situated on protected areas. Greater Spotted Eagle wintering sites may be not protected enough, but more studies (wintering census, GPS telemetry) are needed to point out key sites, especially in the Middle East and Africa. Protected areas in Southern Europe are not safe enough for birds (i.e. Polish *A. clanga* adult was shot in Skadar Lake National Park in Montenegro in 2012). More attention should be brought to the poaching problem in the Mediterranean Basin, including national parks and Natura 2000 sites. Passage corridors of GSE and other migrants should be protected from windfarms and high voltage power lines.

In countries other than Russia, all breeding sites should be identified and protection measures taken. These should include, as a minimum, prevention of disturbance during the breeding season and any relative concentrations should be identified and designated as protected areas, with appropriate management. Such measures should be taken alongside general habitat measures outlined in 1.1 above.

In Russia large protected areas may effectively conserve the species as has been shown in the Oka Nature Reserve (Rjazan). All key breeding habitats should be identified and other protected areas need to be established where there are particular concentrations, including in some large areas such as in the Tver and Novgorod regions.

Wintering grounds should be identified and appropriate designation and management measures taken. Regular roosts should be strictly protected.

Priority: high

Time-scale: short/medium

### 3.2.3. *Species protection and management*

#### 3.2.3.1. Control of hunting

Many Greater Spotted Eagles migrate through southern Europe and the Middle East, where the risk of being shot is very high for them, especially in the Lebanon. One of three adult eagles fitted with satellite transmitters in Poland was most probably shot in this country. It is therefore very important to try to stop

the killing of raptors and other migrants in these countries, e.g. by campaigns and through better legislation and enforcement.

Measures to curb the shooting and associated disturbance in and around wetlands where the species winters, including creation of no hunting zones and better policing is required.

Priority: very high

Time-scale: short

#### 3.2.3.2. Increase breeding success by saving the second chick

It has been found out that GSE productivity in Western Siberia and Altai-Sayan region is very high (1.6-nestlings per successful nest) and almost 50% of successful broods consist of 2 nestlings (Karyakin 2008)). Probably the higher aggression between chicks in western populations is a result of poorer foraging conditions and smaller average size of the prey. Artificially saving the second chick requires at least one visit in the nest during the crucial time for the birds – at the very early stage for chicks. The female will be scared away from the nest by the climber and at this time predation on the older chick by ravens or goshawks is possible. Managing such an operation is difficult and can be done only in a small number of cases. Nests under the video surveillance offer the best chance to undertake such actions, since the exact time of the second chick hatching would be known and female behaviour could be monitored.

.Priority: moderate

Time-scale: long

### **3.3. Monitoring and research**

#### 3.3.1. *Distribution and population*

##### 3.3.1.1. Surveys of breeding areas

National surveys and monitoring are being conducted in few European countries (Belarus, Poland, Estonia) and should be continued. More data on *A. clanga* occurrence should be gathered in Ukraine and Russia. There is a need for a complex species census in Ukraine and species monitoring on large sample plots in Russia. Eastern part of the species range is the least studied. There are almost no data from Asia except from Russia (Karyakin 2008, 2013).

Priority: high

Time-scale: medium/ongoing

##### 3.3.1.2. Migration and wintering

Satellite telemetry on Greater Spotted Eagle is currently being conducted in Poland and Estonia and for the first time in Russia. New actions of *A. clanga* colour ringing in Russia and Ukraine were undertaken recently. *A. clanga* marking actions with colour rings are conducted each year in Poland, Estonia and Belarus (in this country also with the use of wingtags). *A. clanga* telemetry should be undertaken in key populations in Belarus and Russia in order to study spatial ecology, migration paths and wintering sites. Rapid development of this method still upgrades the amount and quality of data gathered by those devices and lower the costs of telemetry.

Priority: high

Time-scale: medium/ongoing

##### 3.3.1.3. Roosting places

Although the migration paths are better known, there are no clear roosting places found. More data from GPS telemetry would be helpful, but it is possible that no distinct roosting places would be found because of the small number of tracked birds or may the species doesn't gather in groups i.e. roosting palces

doesn't exist. However. All wetlands on GSE migration pathways should be treated as potential roosting places.

Priority: medium  
Time-scale: medium

### 3.3.2. *Research into limiting factors*

#### 3.3.2.1. Habitat and food

Both habitat and food were studied quite recently in Estonia (Lõmus & Väli 2004), Belarus (Dombrovski & Ivanovsky 2005b), Russia (Karyakin 2008) and Poland (Maciorowski & Mirski 2013). A detailed analysis on *A. clanga* habitat, its prey and hydrological conditions is now being conducted in Poland. Food composition was also studied in Belarus (Dombrovski 2010), Estonia (Väli & Lõhmus 2002) and Poland (Maciorowski 2013) and on wintering sites in Greece (Alivizatos et al. 2004). However comprehensive studies on *A. clanga* habitat are still needed. Research on habitat barriers between *A. clanga* and *A. pomarina* is also of a great importance because of the crossbreeding between the two species. Especially hydrological aspects should be studied in detail. Food composition studies are still based mostly on small prey samples. More data from different populations is also needed.

.Priority: high  
Time-scale: medium

#### 3.3.2.2. Hybridisation with the Lesser Spotted Eagle

This problem was found out to be much more important than previously expected, as mixed Greater and Lesser Spotted Eagle pairs may dominate in some small populations like Estonia (Väli 2011). Hybridisation between those two sister species was found in Latvia (Bergmanis et al. 1997), Estonia (Lõhmus & Väli 2001), Belarus (Dombrovski 2005), Lithuania (Treinys 2005) and Poland (Meyburg et al. 2005). Recently this phenomenon has been studied using molecular analysis (Väli et al. 2004, Helbig et al. 2005, Väli et al. 2010). Hybrids are fertile (Väli 2010) and may pair with both GSE and LSE, which enables backcrosses to occur in population gene pool (Väli et al. 2010). Transformation of wetland habitats greatly affects hybridization probability (Dombrovski & Ivanovsky 2005b, Maciorowski & Mirski inprep.) with mixed pairs occurring mostly in wetlands transformed to managed grasslands. Species monitoring must focus on identifying species of both birds in spotted eagle pairs at *A. clanga* breeding sites or at least on examination the chicks (differences in morphology of pure species and hybrids have already been described (Väli & Lõhmus 2004, Dombrovski 2009, Lontkowski & Maciorowski 2010). Genetic analyses of key populations should be done regularly, in a several year intervals to track the dynamics of this phenomenon. It is of utmost importance to gather knowledge on causes of hybridisation on such a scale. It is currently presumed that hydrology and vegetation management are crucial in this case.

Priority: high  
Time-scale: medium/ongoing

### 3.3.3. *Reintroduction and recolonisation experiments*

Reintroduction attempts should be carried out only where conditions are suitable in accordance with IUCN criteria. These experiments could, however, provide a unique opportunity to study the process of recolonization of empty areas formerly inhabited and the establishment of new populations. Second-hatched nestlings, otherwise lost through Cainism, might possibly be used for this purpose.

Priority: low  
Time-scale: long

### 3.3.4. *Information exchange*

Co-operation and information exchange between research groups working on the Greater Spotted Eagle should be promoted, as well as exchange of workers. Training on research techniques and methodology should be provided by those groups that are carrying out intensive research programmes with the Greater Spotted Eagle. The ongoing work of the International Lesser & Greater Spotted Eagle Working Group within WWGBP should be intensified and supported by other organisations, and international meetings should be held at regular intervals.

Priority: medium

Time-scale: ongoing

### **3.4. Public awareness and training**

The Greater Spotted Eagle is a little known species. In several countries shooting of raptors including the Greater Spotted Eagle still takes place. Therefore education of decision-makers, landowners, farmers and foresters on priority requirements of the species and conservation needs is very important. More attention should be brought to local communities on problems connected to preserving the wetlands and protection of the natural water regimes in marshy areas.

Priority: medium

Time-scale: ongoing

## 4. References

### Bibliography of *Aquila clanga*:

- Alivizatos H., Papandropoulos D., Zogaris S. 2004. Winter diet of the Greater Spotted Eagle (*Aquila clanga*) in the Amvrakikos Wetlands, Greece. *Journal of Raptor Research* 38: 371-374.
- Bazutin, S. V. (1990) Replacement of the downy plumage in the chicks of the Osprey and Greater Spotted Eagle. *Fauna and ecology of animals*. Tver': 44-48. (in Russian).
- Bergmanis U. (1989) How to identify the Spotted Eagle *Aquila clanga* Pallas and the Lesser Spotted Eagle *Aquila pomarina* C.L. Brehm. *Putni daba* 2: 113-122 Riga, "Zinatne". (in Latvian).
- Bergmanis, U. (1996) on the taxonomy of the Lesser Spotted Eagle *Aquila pomarina* and Greater Spotted Eagle *A. clanga*. Pp. 199-205 in: Meyburg, B.-U. & Chancellor, R.D. (eds): *Eagle Studies*. World Working Group on Birds of Prey, Berlin, London & Paris.
- Bergmanis, U., Petrins, A., Strazds, M. & Krams, I. (1997) Possible case of hybridization of the Lesser Spotted Eagle and the Greater Spotted Eagle in Eastern Latvia. *Putni daba* 6.3: 2-6 (in Latvian with an Engl. summary)
- Bergmanis U, Petrins A, Strazds M, Krams I. 1997. Possible case of hybridization of the Lesser Spotted eagle and the Greater Spotted eagle in Eastern Latvia. *Putni Daba* 3:2-6.
- Bergmanis U. 2013. Breeding history of Greater Spotted Eagle and hybrids with Lesser Spotted Eagle in Latvia. In: Mirski P. (ed.) *Conservation of the Greater Spotted Eagle*. Proceedings of the International Workshop, Goniądz, Poland 25-27 January 2012
- BirdLife International 2001. *Threatened birds of Asia: the BirdLife International Red Data Book*. Cambridge, UK: BirdLife International. 678-711 pp.
- BirdLife International 2012. *Aquila clanga*. In: IUCN 2013. *IUCN Red List of Threatened Species*. Version 2013.1. <[www.iucnredlist.org](http://www.iucnredlist.org)>. Downloaded on 06 November 2013.
- Bokotej, A. A. (1996) Greater Spotted Eagle *Aquila clanga* breeding in Western Ukraine. Pp. 303 in: Meyburg, B.-U. & Chancellor, R.D. (eds.). *Eagle Studies*. World Working Group on Birds of Prey, Berlin, London & Paris.
- Bulavin, A. (1933) on the Biology of the Greater Spotted Eagle. *Hunter and Fisher of Siberia* 9: 26 (in Russian).
- Clark, W. S. (1988) Spotted Eagle with rufous nape patch. *Brit. Birds* 83: 397-398.
- Dementiev, G.P., Gladkov, N.A., Ptushenko, E.S., Spangenberg, E.P. & Sudilovskaya, A.M. (1951) *Birds of the Soviet Union*. Vol. 1. Moscow. (in Russian)
- Domashevsky S.V. 2000. National Action Plan for the conservation of the Great Spotted Eagle (*Aquila clanga*) and Lesser Spotted Eagle (*A. pomarina*) in Ukraine. –In: O. Mykytyuk (ed.) *National Action Plans on conservation of globally threatened bird species*. SoftART, Kyiv, pp. 122 –132. [in Ukrainian]
- Domashevsky S.V. 2009. Greater Spotted Eagle. In: I.A. Akimov.(ed.) *Red Book of Ukraine*. Animals. Globalconsalting, Kyiv, p. 428. [in Ukrainian]
- Dombrovski V. 2005. Hybridation entre Aigles criard *Aquila clanga* et pomarin *A. pomarina* en Biélorussie: conséquence taxonomique. *Nos Oiseaux* 52: 27–30.
- Dombrovski V., Ivanovsky V. 2005a. Ned data on numbers and distribution of birds of prey breeding in Belarus. *Acta Zoologica Lituonica* 15: 218-227
- Dombrovski V., Ivanovsky V. 2005b. Number, distribution and breeding ecology of the Greater Spotted Eagle (*Aquila clanga*) in Belarus. *Ornithologia* 32: 56-69
- Dombrovski V. 2007. About breeding of Greater Spotted Eagle in Western and Southern Ukraine. *Berkut* 16: 205-212

- Dombrovski V. 2009. About species identification of Lesser and Greater Spotted Eagles and their hybrids in the field conditions. *Raptor Conservation* 15: 97-110.
- Dombrovski V. 2010. The diet of the greater spotted eagle (*Aquila clanga*) in Belarusian Polesie. *Slovak Raptor Journal* 4: 23-36
- Dombrovski V. 2012. National action plan for Greater Spotted Eagle conservation in Belarus. Minsk, 48 pp.
- Francois, J. 1992. Observation sur la presence hivernale de l'aigle criard (*Aquila clanga*) en Moselle. *Ciconia* 16 (3): 117-125
- Forsman, D. (1991) Die Bestimmung von Schell- *Aquila clanga*, Schrei- *A. pomarina* und Steppenadler *A. nipalensis*. *Limicola* 5: 145-185
- Galushin, V.M. (1962) The Greater Spotted Eagle in the valley of the Oka river and its influence on the numbers of some birds. *Uch. zapiski Moskov. pedagog. inst. im. Lenina* 186: 115-151. (in Russian).
- Galushin, V.M. (1980) Birds of prey of the forest. Moscow, Lesnaya Promyshlennost. (in Russian).
- Gavrilov E. I., Gavrilov A. E. "The Birds of Kazakhstan". Almaty, 2005
- Glotov, I. N. (1959) Materials on the biology of the Greater Spotted Eagle (*Aquila clanga* Pal). *Trudy Biol. Inst. Sib. Otd. Akad. Nauk Novosibirsk* 5: 167-170. (in Russian).
- Gorban, I. (1996) Lesser and Greater Spotted Eagle *Aquila pomarina* and *A. clanga* in Ukraine. Pp. 301-302 in: Meyburg, B.-U. & Chancellor, R. D. (eds.): *Eagle Studies*. World Working Group on Birds of Prey, Berlin, London & Paris.
- Greve, C. von (1910) Der Grosse Schreiadler im Kurland. *Zool. Beob.* 51: 369-372.
- Grote, H. (1933) Zwei flügge Junge bei *Aquila clanga* Pall. *Beitr. Fortpflanzungsbiol. Vögel* 9: 188.
- Grote, H. (1939) Beutetiere des Schelladlers. *Falco* 35: 15
- Haas, G. (1956) Vorkommen und Verhalten des Schelladlers (*Aquila clanga*) in Württemberg. *Vogelwelt* 77: 22-24.
- Handrinos, G. and Akriotis, T. 1997. *The Birds of Greece*. Helm, London.
- Handrinos, G. 1992. Birds. In: *The Red Book of threatened Vertebrates of Greece*. Hellenic Zoological Society, Hellenic Ornithological Society, pp. 123-143. (In Greek).
- Helbig A., Seibold I., Kocum A., Liebers D., Irwin J., Bergmanis U., Meyburg B.-U., Scheller W., Stubbe M., Bensch. S. 2005. Genetic differentiation and hybridization between greater and lesser spotted eagles (Accipitriformes: *Aquila clanga*, *A. pomarina*). *Journal of Ornithology* 146: 226-234
- Hoffmann, G. (1931) Brut eines Schelladlers in Ostpreussen. *Orn. Mber.* 39: 161-163.
- Hoffmann, G. (1932) Der Schelladler. *Aus der Heimat* 25: 259-262.
- Hoffmann, G. (1935) Vom Schelladler (*Aquila clanga*) in Ostpreussen. *Orn. Mber.* 43: 25-26
- Iankov, P., T. Petrov, T. Michev & L. Profirov (1996) Status of the Spotted Eagle (*Aquila clanga*) and the Lesser Spotted Eagle (*Aquila pomarina*) in the Mediterranean. Pp. 77-81 in: Muntaner, J. & Mayol, J. (1996):

Biology and conservation of Mediterranean raptors. Monografia 4. SEO / BirdLife.

Ivanovsky, V.V. (1993a) Materials on comparative ecology of the Greater Spotted Eagle (*Aquila clanga*) and Lesser Spotted Eagle (*Aquila pomarina*). ONP NPEC "Veras-eco" and Inst. of Zool. of Ac. of Sc. of Byelorussia: 15-25 (in Russian).

Ivanovsky, V.V. (1993b) The Greater Spotted Eagle in the Vitebsk Region. In: Problems of the conservation of biological diversity in Belarous. Abstr. of intern. scient.- pract. conf. Minsk: 213-215 (in Russian).

Ivanovsky, V. (1996) Notes on the Breeding Biology of Spotted Eagles *Aquila clanga* and *A. pomarina* in Byelorussia. Pp. 297-299 in Meyburg, B.-U. & Chancellor, R. D. (eds.): Eagle Studies. World Working Group on Birds of Prey: Berlin, London & Paris.

Karyakin I. 2008. The Greater Spotted Eagle in the Volga Region, Ural Mountains and Western Siberia. Raptors conservation 11: 23-69. In: Mirski P. (ed.) Conservation of the Greater Spotted Eagle. Proceedings of the International Workshop, Goniądz, Poland 25-27 January 2012

Karyakin I., Nikolenko E., Bekmansurov R. 2009. Results of monitoring of Greater Spotted Eagle and Imperial Eagle Breeding Groups in the Altai Pine Forests in 2009, Russia. Raptors Conservation 17: 125-130

Karyakin I. 2013. Greater spotted eagle *Aquila clanga* in the regions of Volga-Ural, Western Siberia and Altaysk-Saiansk.

Kutshin, A.P. (1959 a) On the biology of the Greater Spotted Eagle in the Bijskaya forest steppe. 2nd All-Union Orn. Conf, Moscow, Part 3: 75-76 (in Russian).

Kutshin, A.P. (1959 b). On the feeding biology of the Greater Spotted Eagle under the conditions of the Bijskaya forest steppe. Report and abstracts of the scient. conf "Nature and natural resources of the Altai Territory", Bijsk: 122-123 (in Russian).

Lehtonen, L. (1942) Schelladler (*Aquila clanga* Pallas) als Brutvogel in Kananaien, Ost-Karelien. Ornis fenn. 19: 121-122

Likhatchev, G.N. (1957) Studies on the breeding of large birds of prey in a deciduous forest. Pp. 308-336 in: Trudy vtovoj Priblatiskoj orn. Konf., Moscow. (in Russian).

Lontkowski J., Maciorowski G. 2010. Identification of juvenile Greater Spotted Eagle, Lesser Spotted Eagles and hybrids. Dutch Birding 32: 384-397

Lõhmus A, Väli Ü. 2001. Interbreeding of the Greater *Aquila clanga* and Lesser Spotted Eagle *A. pomarina*. Acta Ornithoecologica 4: 377-384.

Lõhmus A., Väli Ü. 2005. Habitat use by the Vulnerable greater spotted eagle *Aquila clanga* interbreeding with the lesser spotted eagle *Aquila pomarina* in Estonia. Oryx 39: 170-177

Lucas M., Jans G.F.E., Whitfield D.P., Ferrer M. 2008. Collision fatality of raptors in wind farms does not depend on raptor abundance. Journal of Applied Ecology 45: 1695-1703

Maciorowski, G., Meyburg, B.-U., Matthes, J. & Mizera, T. (1996) Breeding biology of the Greater Spotted Eagle (*Aquila clanga*) in Poland. 2nd Intern. Conf. on Raptors: 35-36 (Abstract).

Maciorowski G. 2013. Results of diet analysis basing on CCTV observation of the *Aquila clanga* nests. In: Mirski P. (ed.) Conservation of the Greater Spotted Eagle. Proceedings of the International Workshop, Goniądz, Poland 25-27 January 2012

Maciorowski G., Mirski P. 2013. Habitat alteration enables hybridization in between the Lesser and Greater spotted eagle in NE Poland. Bird conservation International, in print

Malchevskiy A. S. & Pukinskiy, Y. B. 1983. (The Birds of Leningrad region and adjacent territories). Leningrad: Leningrad University (In Russian).

Markgren, G. & Markgren, M. (1960) On the Spotted Eagle and its occurrence in Sweden. Var Fagelvärld 19: 273-285.

- Meyburg, B.-U. (1978) Productivity manipulation in wild eagles. Pp. 81-91 in Geer, T.A. (ed.): Birds of Prey Management Techniques. Oxford: Brit. Falconers' Club.
- Meyburg, B.-U. (1983) The significance for captive breeding programmes of fratricide and cainism in birds of prey. Intern. Zoo. Yearb. 23: 110-113
- Meyburg, B.-U. (1994) 207. Greater Spotted Eagle *Aquila clanga*. Pp. 193 in: del Hoyo, J., Elliott, A. & Sargatal, J. (eds.): Handbook of the Birds of the World. Vol. 2. Barcelona: Lynx Edicions.
- Meyburg, B.-U. & Pielowski, Z. (1991) Cainism in the Greater Spotted Eagle *Aquila clanga*. Birds of Prey Bull. 4: 143- 148.
- Meyburg, B.-U., Mizera, T., Maciorowski, G., Dylawski, M & Smyk, A. (1995) Juvenile Spotted Eagle apparently killed by Eagle Owl Brit. Birds 88: 376.
- Meyburg, B.-U., X. Eichaker, C. Meyburg & P. Paillat (1995) Migrations of an adult Spotted Eagle tracked by satellite. Brit. Birds 88: 357-361.
- Meyburg, B.-U., Mizera, T., Maciorowski, G. & Kowalski, J. (1997) Schelladler (*Aquila clanga*) brütet in partiellem Jugendgefieder. Limicola 11: 82-87.
- Meyburg, B.-U., Meyburg, C., Mizera, T., Maciorowski, G. & Kowalski, J. (1997) Zugund Überwinterungsverhalten des Schelladlers *Aquila clanga*: Satellitentelemetrische Untersuchungen. 130. Jahresvers. DO-G. Abstract.
- Meyburg B.-U., Mizera T, Matthes J, Graszynski K, Schwanbeck JP, Maciorowski G. 2005. Hybridization of Greater *Aquila clanga* and Lesser Spotted Eagle *A. pomarinain* Poland and Germany. In: Mizera T, Meyburg BU(eds.) International Meeting on Spotted Eagles (*Aquila clanga*, *A. pomarina* and *A. hastata*) –Research and Conservation. Osowiec: Biebrza National Park, 115–117.(in Polish with English summary)
- Meyburg, B.-U. , Meyburg C. 2005. Tracking the Endangered Greater Spotted Eagle. Tracker News 6: 4
- Miller, I.D. (1989) Information on the Greater Spotted Eagle. Pp. 61 in: Rare animals and those needing protection. Materials on the Red Data Book. Coll. of scient. papers. Moscow. (in Russian).
- Mirski P. 2013. Habitat preferences, territory sizes and feeding habitats usage by Greater Spotted Eagles in Biebrza Valley. In: Mirski P. (ed.) Conservation of the Greater Spotted Eagle. Proceedings of the International Workshop, Goniądz, Poland 25-27 January 2012
- Mishchenko, A.L. (1984) Discovery of a nest of the Greater Spotted Eagle in the Moscow region. Ornitologiya 19: 183 (in Russian).
- Mischenko & Melnikov 2013. Greater spotted eagle in European part of Russia: main nesting areas, size dynamics and threats to the population. In: Mirski P. (ed.) Conservation of the Greater Spotted Eagle. Proceedings of the International Workshop, Goniądz, Poland 25-27 January 2012
- Moltoni, D.E. (1943) L'alimentazione dell' *Aquila anatraia* (*Aquila clanga*). Riv. Ital. Orn. 13: 97-100.
- Nielsen, B.P. & Christensen, S. (1969) On the autumn migration of spotted eagles and buzzards in the Middle East. Ibis 111: 620-621.



- Pankin, N.S. (1972) On the feeding of the Greater Spotted Eagle (*Aquila clanga* Pallas) in the Bureya river valley (Amur region). Pp. 331-333 in: Zool. problems of Siberia. Mater. of the IV Meeting of Zool. of Siberia, Nauka, Sib. Dept. Novosibirsk. (in Russian)
- Pererva, V. I. (1989) On three species of eagles in need of protection according to the Red Data Book of the USSR. Probl. gos. kadastra zivot. mira USSR: 65-72 (in Russian).
- Petrins, A., Strazds, M. & Bergmanis, U. (1997) The Greater Spotted Eagle in Latvia - a historical review. Putni daba 6.3: 7-14 (in Latvian with an Engl. summary).
- Pouloupoulos, G. 1997. The very rare Greater Spotted Eagle (continues to visit us). Hellenic Rehabilitation Centre of Wild Animals and Birds. In: Forced Landings, pp. 6-9.(In Greek).
- Priklonsky, S. G. (1958) On the downy plumage of Greater Spotted Eagle nestlings from observations in the Oka Reserve in 1954-1955. Trudy Okskogo Gosud. Zapovednika 2: 177-178 (in Russian).
- Priklonsky, S. G. (1960) On the food of the Greater Spotted Eagle at the mouth of the Belaya river. Ornitologiya 3: 174-179 (in Russian).
- Pugacewicz, E. (1995) Population of the Spotted Eagle (*Aquila clanga*) in the Biebrza Marshes in 1989-1993. Notatki orn. 36: 311-321 (in Polish with an Engl. summ.).
- Pukinskiy, Yu. B. (1966) On the feeding of the Greater Spotted Eagle during the nestling period. Mater. VI Baltic Orn. Conf. 125-127 (in Russian).
- Seibold, I., Helbig, A.J., Meyburg, B.-U., Negro, J.J. & Wink, M. (1996) Genetic differentiation and molecular phylogeny of European *Aquila* Eagles according to cytochrome b nucleotide sequences. Pp. 115 in: Meyburg, B.-U. & R. D. Chancellor (eds.): Eagle Studies. Berlin, London & Paris: World Working Group on Birds of Prey.
- Svensson, L. (1975) Större skrikörn *Aquila clanga* och mindre skrikörn *A. pomarina* - problemet att artbestämna dem. Var Fagelvärld 34: 1-26.
- Svensson, L. (1987) Underwing pattern of Steppe, Spotted and Lesser Spotted Eagles. Pp. 12-14 in: International Bird Identification. Proc. 4th Intern. Identification Meeting. Eilat
- Quednau, A. (1930) Schelladler am Mauersee. Orn. Mber. 38: 69-72
- Treiny R. 2005. The Greater Spotted Eagle *Aquila clanga*: previous, current status and hybridization in Lithuania. Acta Zoologica Lituanica 15: 31-38.
- Treiny R. 2013. Greater Spotted Eagle (*Aquila clanga*) in Lithuania: Past and present status. In: Mirski P. (ed.) Conservation of the Greater Spotted Eagle. Proceedings of the International Workshop, Goniądz, Poland 25-27 January 2012
- Väli Ü., Lõhmus A. 2002. Parental care, nestling growth and diet in a Spotted Eagle *Aquila clanga* nest. Bird Study 49: 93-95
- Väli Ü., Lõhmus A. 2004. Nestling characteristics and identification of the lesser spotted eagle *Aquila pomarina*, greater spotted eagle *A. clanga*, and their hybrids. Journal of Ornithology 145: 256-263
- Väli Ü., Treiny R., Lõhmus A. 2004. Geographical variation in macrohabitat use and preferences of the Lesser Spotted Eagle *Aquila pomarina*. Ibis 146: 661-671
- Väli Ü. 2005. The conservation action plan for the Greater Spotted Eagle in Estonia in 2006-2010. Eagle Club, Tartu.
- Väli Ü. 2010. Successful breeding of a ten-year-old hybrid spotted eagle *Aquila clanga* x *A. pomarina* retaining immature plumage characters. Ardea 98: 235-241
- Väli Ü., Dombrowski V., Treiny R., Bergmanis U., Daróczy S., Dravecky M., Ivanovsky V., Lontkowski J., Maciorowski G., Meyburg B.U., Mizera T., Zeitz R., Ellegren H. 2010. Wide-spread hybridization between the Greater Spotted Eagle *Aquila clanga* and the Lesser Spotted Eagle *Aquila pomarina* (Aves: Accipitriformes) in Europe. Biol. J. Linn. Soc. 100: 725-736
- Väli Ü. 2011. Numbers and hybridization of spotted eagles in Estonia as revealed by country-wide field

observations and genetic analysis. Estonian Journal of Ecology 60: 143-154

Volke, V. (1996) The status of the Greater Spotted Eagle *Aquila clanga* and Lesser Spotted Eagle *A. pomarina* in Estonia. Pp. 285-289 in: Meyburg, B.-U. & Chancellor, R. D. (eds.): Eagle Studies. World Working Group on Birds of Prey, Berlin, London & Paris.

Wendland, V. (1959) Schreiadler und Schelladler. A.Ziemsens-Verlag, WittenbergLutherstadt

Zhezherin, V.P. (1969) On taxonomic interrelations of *Aquila clanga* and *Aquila pomarina*. Zbirn. prats. zool. mus. 33: 91-97 (in Ukrainian).

## **5. ANNEX**

### **Recommended conservation actions by country**

#### **Albania**

4. Undertake an education campaign about the shooting of the Greater Spotted Eagle and other migratory birds of prey.

#### **Belarus**

- 1.1.1. Optimise forestry and hydrological regimes in key breeding GSE sites. Take measures to restore the drained terrains.
- 1.1.2. Optimise the agriculture for key species nesting places. Control of habitat condition.
- 3.1.1. Monitor the state of the population

#### **Estonia**

- 1.1.1. Preventing drainage of wetlands and restoring natural water regimes in actual and historical territories of the GSE.
- 1.1.2. In current and historical territories of the GSE the loss of grasslands should be prevented; grasslands should not be managed every year but instead left unmanaged every third year.
- 3.1.1. Continuing species monitoring and searching previously unknown breeding territories. Due to the high degree of hybridization, genetic, as well as morphological analysis should be part of the monitoring.

#### **Greece**

- 2.1.3. Using poisoned baits against raptors should be pursued. Carcass should be monitored regarding toxins by governmental institutions.
- 2.3.1. Control of hunting, especially in wetlands areas. Eagle poachers should be punished harshly.

## **Latvia**

- 1.1.1 Prepare precise guidelines for forest management in the breeding areas.
- 2.1.1 Establish regular contacts with new private landowners and reduce all kinds of human disturbance in the breeding habitat.
- 2.2 Promote designation of any newly discovered breeding sites to be included in legally protected areas.
- 3.1 Undertake a national survey of the Greater Spotted Eagle and start a monitoring programme.
- 4 Undertake an education campaign for new landowners and foresters and raise public awareness and support for the protection of the Lesser Spotted Eagle.

## **Middle East**

- 2.3.1 Undertake an education campaign about the shooting of the Greater Spotted Eagle and other 4 migratory birds of prey.

## **Lithuania**

- 3.1.1. Carefully describing adult birds of spotted eagles, estimating exact species by morphology or genetic and gathering information on GSE and their hybrids observation places during migration and breeding time.

## **Poland**

- 1.1.1. Prevent drainage of wetlands, especially in Biebrza Valley Natura 2000 site and along eastern border of country.

Restoration of natural water regimes in GSE's current and historical territories should be conducted in order to prevent hybridization with LSE.

- 1.1.2. Promote habitat mosaics in Biebrza Valley, leaving significant part of patches of shrubs and reed unmanaged in GSE territories. It is also very important to support local farmers managing wetlands, to mow flooded grasslands only seldom, not necessary each year.
- 3.1.1. Continue the species monitoring, and search for single territories along eastern border. Studies on species habitat should also be continued, focusing on hydrological aspects.

## **Russian Federation**

- 1.1.1. Prepare guidelines for forest management in all areas where the Greater Spotted Eagle breeds.
- 1.2.2. Preparation of the National Action plan for the Greater Spotted Eagle
- 2.2.1. Promote designation of most important breeding sites to be included in legally protected areas.
- 3.1.1. Undertake a national survey of the Greater Spotted Eagle and start a monitoring programme.
- 3.4. Raise public awareness to reduce illegal hunting, illegal taxidermy and support for saving breeding and feeding habitat of the Greater Spotted Eagle.

## **Turkey**

- 1 Increase public awareness to reduce illegal hunting on the migration route and wintering grounds of the Greater Spotted Eagle.

## **Ukraine**

- 1.1.1 Promote designation of sanctuaries around nests.
- 2.1.2 Encourage restriction on human (forestry) activities during the breeding period (April May) within 300 m of nest sites.