

Action Plan for the Montagu's Harrier, 2011-2015

(Circus pygargus)

Threat classification, Swedish Red List:
Endangered (EN)

The original plan in Swedish has been established by
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Preface

The Swedish Environmental Protection Agency (EPA) has emphasised the importance of developing and implementing action plans for endangered species and biotopes in a several contexts, including in “Aktionsplan för biologisk mångfald” (1995) (“Action plan for biodiversity”). The action plans and their implementation now provide one of several tools for achieving the environmental quality objective “A rich diversity of plant and animal life” (Govt. Bill 2004/05:150, *Environmental quality objectives – a shared responsibility*). This environmental objective states that by 2015 the proportion of threatened species on Sweden's Red List should have decreased by 30% from 2000 levels. In spring 2010, the government bill *Sweden's environmental objectives – for more effective environmental action* (2009/10:155) was presented. The bill highlights the action plan's efforts under the measures for the environmental objective “A rich diversity of plant and animal life”. During the efforts to achieve this objective, it is stated that work on the action plans must be intensified. The action plan is also a step towards achieving the global goal of improving the conservation status of endangered species by 2020. This goal is one of a total of 20 interim targets adopted under the Convention on Biological Diversity to achieve the vision of “Living in harmony with nature”.

The action plan for the conservation of the Montagu's harrier (*Circus pygargus*) has been established by Staffan Rodebrand on behalf of the Swedish EPA. The plan presents the Swedish EPA's view of what measures need to be implemented for the Montagu's harrier.

The action plan contains a brief knowledge overview and presentation of measures needed to improve the conservation status of the Montagu's harrier in Sweden during 2011–2015. The actions are coordinated among different stakeholders, thereby increasing our knowledge and understanding of the species. The actions have been anchored through consultation and a broad referral process in which government authorities, municipalities, experts and interest groups were able to provide input on the design of the plan.

This action plan is part of improving conservation efforts and increasing knowledge about the Montagu's harrier. It is the Swedish EPA's hope that the plan will stimulate engagement and concrete measures at regional and local levels so that the Montagu's harrier can eventually gain a favourable conservation status. The Swedish EPA would like to thank all those who have provided their views in the development of the action plan and who will assist in its implementation.

Stockholm July 2011

Anna Helena Lindahl
Deputy Head of Implementation Department

Establishment, validity, evaluation and availability

In accordance with departmental protocol NV0581311, paragraph 1, the Swedish EPA decided to establish the action plan for the Montagu's harrier on 1 July 2011. The plan serves as guidance and is not a formally binding document. It is valid for the period 2011–2015.

Evaluation or revision takes place during the last year of the plan period. If necessary, the action plan can be reassessed earlier. The action plan's validity period will be extended unless a decision is taken to end the plan or establish a new plan for the Montagu's harrier.

At www.naturvardsverket.se, the Swedish version of this and other action plans can be downloaded for free or purchased as a publication.

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Summary

The Montagu's Harrier, *Circus pygargus*, is protected according to the EU Birds Directive (79/409/EEG, 2009/147/EC) and listed in the Bern, Bonn and CITES conventions. There is fossil evidence that the species has been breeding in Sweden in ancient times. Probably the population has fluctuated corresponding to the occurrence of suitable habitats. In modern times the species was confirmed breeding for the first time in Kvismaren, southcentral Sweden in 1923. Starting in the 1930s on to the early 1940s there was one or a few pairs breeding in two areas in the province Skåne (Scania), southernmost Sweden. The birds suffered from persecution and egg collecting. Montagu's Harrier became a permanent breeder in Sweden when a small population was established on the island Öland, SE Sweden in the early 1940s. Since then the population has increased, and in the latest ten years, there have been 45–60 pairs breeding in Sweden. Of these, more than half breed on Öland, and the rest are scattered over the southern third of Sweden.

When the Montagu's Harrier first colonized Öland the main breeding habitat was in *Cladium mariscus* marshes. After about 20 years these marshes were all occupied, and new pairs colonized *Dasiphora fruticosa* areas on the vast limestone heath Stora Alvaret in the southern part of Öland. There have also been a few pairs breeding in other habitats, mostly agricultural fields.

According to detailed studies in the late 1970s the species arrives in Öland in late April and early May, the median date for the first egg is 29th of May, and the birds leave Öland in late August and early September (mean for all birds = 20th of August). The hunting area did normally not exceed 5 km from the nest. Including lost clutches, the population on Öland produced about 2 fledged young annually per pair 1975–1981. The reproduction was higher in *Cladium* and *Dasiphora* areas, and much lower in agricultural fields.

A total of 421 young harriers were ringed during 1976–1981, with both metal and plastic colour rings, and some studies were carried out on individual basis. Birds born in one vegetation type do not necessarily breed in the same vegetation type, although 62 % did choose to do so. A high fidelity was found to last years' nesting sites, as well as to the breeding area (Öland), and the population is probably self-sustaining to a high degree.

Breeding of Montagu's Harrier in other areas in southern Sweden occurs most frequently on open areas connected with large wetlands, where the transition zone from *Phragmites* to tall growing herbs is used for nests. On the neighbouring island Gotland a few pairs are occupying *Cladium mariscus* marshes, a type of vegetation that is very rare outside Öland and Gotland. Breeding in arable fields also occurs, where pairs that choose fields with a late harvest breed successfully.

The population increased up to at least 1996, and there seemed to be no major threats to the Swedish population at the time. A number of pairs breed within protected areas, and habitat loss seemed to be almost under control. Known natural factors like heavy rain in the hatching period, and predation from Goshawk did however reduce

breeding success. Some years there was also severe disturbance from photographers at the nests.

After 1996 the Swedish population has decreased, especially in the main area on Öland. Recent investigations showed that a large part of the local population now is threatened by habitat loss. Within the framework of a LIFE-financed restoration programme, large areas of *Dasiphora fruticosa* bushland have been cut down in order to obtain suitable habitats for grazing, a prerequisite for being included in agro-environmental schemes. Even more areas are planned to be cut in a near future. Other areas suitable for the species are overgrown by trees and high bushes, in *Dasiphora fruticosa* bushlands as well as *Cladium mariscus* marshes. This is an accelerating process which is also taking place in nature reserves and other areas protected by law because of their nature values. Insufficient attention has been paid to the demands of Montague's Harrier. Up to 2007 only one of about 65 nesting areas on Öland was managed in line with the suggestions in the action plan. Many of the pairs have moved to less optimal breeding areas following that their preferred nest areas have deteriorated or been destroyed. This has led to more pairs trying to breed in arable fields close to their previous natural breeding area, with very poor reproductive success.

Since 1996 the ongoing afforestation of the open heath land on southern Öland (Stora alvaret) has increased the population of Goshawk rendering increased predation on young Montague's Harriers. A new threat in form of windmill parks has been even more prominent, with parks being placed directly in breeding areas or within the foraging areas.

This action plan for Montague's Harrier focuses on Öland, the area hosting the major part of the Swedish population. All breeding sites are mapped in detail making it possible to monitor threats from land use plans, overgrowing etcetera. For each breeding site there is a detailed description of the history, different threats, and detailed plans for habitat restoration. In areas with an undergrowth of high and fresh *Dasiphora fruticosa*, higher vegetation like high bushes and trees are suggested to be removed. In *Cladium mariscus* marshes all bushes and trees are proposed to be cut down, or where possible pulled up with the roots.

The aim of this action plan is to 1) stop the downward trend for the population in Sweden, and 2) to achieve a population of about 45–50 pairs on Öland, and about 20–25 pairs in other parts of Sweden. The cost for full implementation of this action plan during the period 2011–2015 is estimated at approximately 375 000 EUR.

Facts about the species

General morphological description

Description of the Montagu's harrier

The Montagu's harrier belongs to the harrier subfamily, which can be characterised as a group of slender, long-winged diurnal raptors that search for prey while flying in open landscapes. Harriers can be found nearly all over the world, except for on smaller islands and in Antarctica.

Four species have been found in Sweden. The marsh harrier breeds mainly along lake shores and near wetlands, especially those with large reed beds, primarily in southern and central Sweden. The hen harrier is mainly associated with the marshes of the northern hinterland. The pallid harrier is an eastern species that only temporarily breeds in Sweden, though single individuals are sighted every year. The Montagu's harrier breeds in open areas as far north as Uppland, with a few scattered pairs associated with wetlands in several landscapes, as well as a larger permanent population on Öland.

Like other harriers, the adult Montagu's harrier generally displays three different stages of plumage. The juvenile plumage is worn in the young fledgling's first calendar year (1CY). During the second calendar year (2CY), it then begins to moult towards the adult male or female plumage. A melanistic dark and uniformly brown morph also occurs, yet is rare.

The juvenile is predominantly dark brown, with unstreaked rufous underparts and dark secondaries, banded tail feathers and white rump. Its facial pattern is distinct, with dark and light areas around the eye. The female resembles the juvenile, but with a greyer hue, longitudinal streaks on its underparts and distinctly banded secondaries. Its head pattern is slightly less distinct than that of the juvenile. The male sports a more uniform slate-grey plumage with black primaries and a black longitudinal band over the arm. Its head and breast are slate grey, with rufous streaks on its belly and under its wings. Under good conditions, the age of younger males (2-4CY) as well as younger females (2-3CY) can be determined from details in the plumage and soft tissue.



Figure 1. Montagu's harrier, male (left) and female (right), at a *Cladium mariscus* marsh.
Photograph: Staffan Rodebrand

Species confusion

The Montagu's harrier can be confused with other harriers. The most similar are the females, which can easily be confused with both the hen harrier and pallid harrier.

Biology and ecology

Modes of reproduction and dispersal

The Montagu's harrier normally starts breeding when 2 years old for females and 3 years old for males. A full clutch size typically contains 4–5 eggs. Out of 250 verified breeding attempts between 1975 and 1981 on Öland, where the species was studied most thoroughly in Sweden, the average clutch size was 2.0 chicks per pair. If only breeding successes are considered, reproduction was 3.2 chicks per clutch. Broken down by biotope, the figures for *Cladium mariscus* marshes were 2.0 (all breeding attempts) and 3.1 (successes), for *Dasiphora fruticosa* areas 2.1 and 3.3 respectively, and for arable land 1.4 and 2.9 respectively.

A reproduction of 2 chicks per pair annually is believed to be sufficient to maintain a population. Although reproduction details after 1981 are not known, the percentage of completely unsuccessful breeding attempts was higher (47%) during the six inventories (1996, 2004–2008) than during 1975–1981, when only 38% were completely unsuccessful. An important reason for this is believed to be a decrease in the areas of optimal breeding habitat and more breeding attempts in worse areas.

Montagu's harriers are often gregarious at their breeding sites and can form several small colonies with nests as close as 20 metres apart. Small, dense colonies of up to four to five pairs have been found in several locations on Öland, both in *Cladium mariscus* marshes and in stands of *Dasiphora fruticosa*. In such areas, breeding birds often do not stay overnight. If we extend the concept of a colony to a larger area (up to a few kilometres between nesting sites), where Montagu's harriers make eye contact and often fly over each other's nesting sites, the colony size

reaches six pairs. Between 1975–1981 and in 1996, 62% of all pairs were solitary, with the rest in “dense” colonies of 2–4 pairs.

Colour ringing of Montagu's harriers in Sweden has revealed that older birds usually return to the previous year's breeding site, especially if breeding has been successful. Montagu's harriers born in a particular biotope, on the other hand, do not necessarily breed in that same biotope. Several older birds have alternated between different biotopes and areas and have shifted between *Cladium mariscus* marshes and *Dasiphora fruticosa* areas, as well as geographically between southern Öland, northern Öland and Gotland.

The first Montagu's harriers normally arrive at Öland during the final days of April, but the majority arrive the first ten days in May. In May, Montagu's harriers are likely most susceptible to disturbances in their nesting area. The birds gradually pair up, and unpaired individuals fly around to different breeding grounds looking for available sites. The male courts the female with prey, and following aerobatic displays and nest-building the first egg is laid at the end of May. Of 116 dated clutches on Öland between 1975 and 1981, the mean first egg-laying date was 29 May, the first egg hatched on 27 June, and the oldest chick was fledged on 26 July. The fledglings then often remain in the nest area, where they are fed by their parents for another couple of weeks.

Migration from Sweden mainly takes place during the second half of August. The mean date of migration for the Montagu's harrier during the period 1975–1981 (313 sightings at Ottenby) was 20 August for all birds. Broken down by sex and age, the mean date was 14 August for females, 20 August for males and 23 August for juveniles. Similar results were also found in a study of data from Ottenby for the period 1972–1998.



Figure 2. A fledgling. Photograph: Staffan Rodebrand

Habitat

The Montagu's harrier hunts in open lowlands such as heaths, alvar plains, wetlands and open farmland. It feeds on smaller prey that it finds in open landscapes. In most surveys, as on Öland, small rodents dominate followed by small birds, large insects and lizards. Like many birds of prey, breeding outcomes tend to be noticeably better during good rodent years (most recently on Öland in 2008). The optimal breeding habitat consists of a larger area, preferably a minimum of 50x50 metres, often of dense metre-high vegetation. This area, in turn, is ideally situated within a larger area that has similar vegetation. The areas usually consist of different shrublands, such as maccia or *Dasiphora fruticosa*, *Cladium mariscus* marshes, or dense and tall herbaceous vegetation in meadows or sparse reed beds. As substitutes for these traditional biotopes, arable land, converted fields and young forest plantations are sometimes used. During winter, the Montagu's harrier is found further south, where western populations overwinter on the African savannah, while eastern populations overwinter on the Indian subcontinent.

The Montagu's harrier first established itself as a breeding bird on Öland in the marshes dominated by great fen sedge, *Cladium mariscus*. Gradually, the species also began to place its nests in larger stands of high-grown shrubby cinquefoil, *Dasiphora fruticosa*. As a result, distribution on Öland extended across most of the island. Until the mid-1970s the proportion of breeding attempts in *Dasiphora fruticosa* areas was the predominant one, but since then the pairs that use sedge fens have been somewhat higher. On Gotland, the species breeds mainly in *Cladium mariscus* marshes, while breeding on the Swedish mainland has recently mainly occurred on the outskirts of floodplain lakes, as well as in fields.

The Montagu's harrier builds a very simple nest compared with most birds of prey – just a thin bed of straw on a reasonably dry surface. The nest platform is formed on a flattened area deep in the vegetation, usually only a few inches above the ground. The nesting site must be protected from view and be difficult for predators to both find and access. Ideally, the Montagu's harrier chooses large sections with high, dense and often impenetrable vegetation like *Cladium mariscus* or *Dasiphora fruticosa*. But breeding occurs regularly even in stands of tall-herb vegetation (often containing cow parsley and preferably on the margins of stands of reeds) and on arable land (grasses, barley, rye, wheat, rapeseed). Regardless of the type of stand, they should be as large as possible and not contain too many taller shrubs or trees. Several nesting sites were abandoned after trees and shrubs became overgrown. Vegetation around the nest should also maintain a certain height. At mid-July 1975–1979, vegetation height at the nest platform (on Öland) was 50–110 cm (average 78 cm) for *Cladium mariscus*, and 40–120 cm (average 76 cm) for *Dasiphora fruticosa*. In reeds and tall-herb stands, the height was 130–160 cm (average 141 cm; Rodebrand 1996). Ideally, the vegetation should also be resistant. Grasses and grains are therefore worse because they easily blow over in heavy rains and strong winds, making the nesting site more exposed. In such cases, converted fields sown with plants like lucerne (alfafa) and cock's-foot have proven to work better.

Important interspecies conditions

Predation on Montagu's harriers has been found in Sweden primarily from the northern goshawk, followed by, in descending order, foxes, ravens, crows and marsh harriers. Predation of nests by badgers has not been documented but is entirely possible. Of the predators, ravens and crows pose a danger during the incubation period and when the nestlings are very small. It is probably this danger that has driven the Montagu's harrier to shun areas where tall shrubs and trees grow back. These areas both serve as lookouts for nest predators and restrict the Montagu's harrier's room to manoeuvre in the less open environment. Foxes and, potentially, badgers pose a danger especially where Montagu's harriers breed in smaller populations of *Dasiphora fruticosa* and *Cladium mariscus*, or in different types of open farmland. These mammals are highly reluctant to enter stands of *Dasiphora fruticosa* or *Cladium mariscus* that are larger and challenging to pry open.

As far as competition is concerned, it comes primarily from marsh hawks. As Öland's marshes and some coastlines have become overgrown, the presence of marsh hawks has increased sharply on Öland. The population reached about 10 pairs in the 1970s, increased to about 15 pairs in the 1990s, and in the early 2000s now consists of about 20 pairs. The marsh hawk has begun to utilise new biotopes in recent years, and now also breeds in marshes solely containing *Cladium mariscus*. In addition to breeding pairs, Öland is also home to a large number of younger, non-breeding birds in the summer. Wherever marsh hawks and Montagu's harriers exist side by side, turf battles often take place. Some competition probably also occurs in the part of the hunting territory close to the nesting site. In this immediate area, the female Montagu's harrier hunts mainly during the latter part of the chicks' time in the nest. But if there are marsh hawks in the same area, they have already reduced prey availability. The marsh hawk's entire breeding cycle is at least a few weeks earlier than that of the Montagu's harrier, giving it several competitive advantages over others in the species. It is also larger and heavier than the Montagu's harrier, and more tenaciously resists being easily chased away. Despite the presence of serious interspecies competition, marsh hawks and Montagu's harriers have long nested together, seemingly successfully, at several wetland areas on northern Öland, such as Knisa Mosse, Petgårde Träsk and Djurstads Träsk, though these are relatively large sites with plenty of space. More recently, the marsh hawk has spread to smaller sites and broadened its choice of nesting site to even include pure *Cladium mariscus* marshes, where competition becomes more palpable.

Distribution and population threats

History and trends

In modern times, the first Montagu's harrier in Sweden was sighted in September 1839 when a female was shot in Lund in the Scania region of southern Sweden. The first Öland find was a male spotted at Törneby, near Köpingsvik, on 15 June

1940. The first Swedish brood of Montagu's harriers was found in Kvismaren, Närke, in 1923. No permanent strain was established until the 1930s, when Skanörs Ljung and the northeastern wetlands of Scania were colonised. In the 1940s and 1950s, Scania's population was heavily impacted by egg collectors and slowly declined, prompting the species to gain a foothold on Öland instead.

Historically the Montagu's harrier has likely bred on Öland for a long period of time, as bone finds suggest. However, since the species requires a certain breeding habitat (including *Cladium mariscus* marshes and larger stands of *Dasiphora fruticosa*), it can be assumed that the size of stocks has fluctuated in pace with the availability of suitable biotopes. Although the Montagu's harrier expanded rapidly in northern Europe at the beginning of the 20th century, it did not establish itself on Öland during this time. The reason may well have been the lack of a suitable breeding habitat. Around the turn of the last century, Öland was overcrowded and land use intensive. The *Cladium mariscus* marshes we know today were at the time either exposed to intensive quarrying or were grazed intensively. On Stora Alvaret, many animals overgrazed all the vegetation, and the few bushes that remained were used as firewood. Large contiguous stands of *Dasiphora fruticosa* were not to be found.

In modern times, the Montagu's harrier has been breeding on Öland since 1942. From its establishment, the population has increased at a steady pace to remain at just over 40 pairs since the end of the 1970s, peaking at 46 pairs in 1981. The flat population numbers on Öland were probably due to the fact that most of the optimal territories were inhabited at the time. Comprehensive inventories of the Öland population were carried out annually during 1975–1981. A follow-up in 1996 resulted in 45 pairs, indicating an unchanged population size. Data on the presence of Montagu's harriers on Öland were collected only at random between 1997 and 2003, so it is not possible to comment on the population size during that time. Inventories on Öland in 2004–2008 have yielded an average of 30 breeding pairs. This is a marked decline following several years with a population size of 40–46 pairs.

Outside Öland, Montagu's harriers expanded between 1975 and 1995. Between 1989 and 1995, there was an average of 19 pairs of Montagu's harriers in the rest of Sweden. Since 1995, breeding outside Öland has increasingly experienced a decline. For the following eight years (1996–2003), the average for the mainland and Gotland together was 9–10 pairs (Vår Fågelvärld Supplement, Bird Year: 1996–2003). In 2004–2009, a total of 16–23 pairs were registered outside Öland (Vår Fågelvärld Supplement, Bird Year: 2004–2009). Of these, several new pairs were found near Öland (Småland, Östergötland and Gotland), which can perhaps be interpreted as a flight of former Öland pairs to new breeding grounds. Swedish sub-populations outside Öland depend, in many cases, on a handful of individuals who return and breed for a few years. The recruitment of new individuals to these areas is uncertain, and outside Öland there are only a few areas where the species can be said to occur regularly with several alternative nesting sites. These are found in northeastern Scania, on Gotland and, more recently, also in Östergötland and

Uppland. The number of breeding pairs (including breeding attempts) on Öland and the rest of Sweden as of 1942 is shown in the figure below.

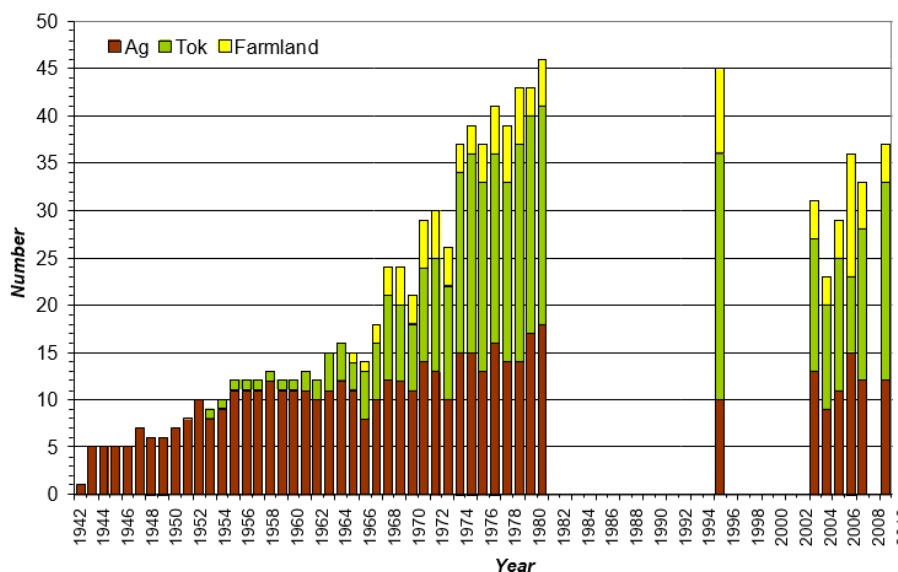


Figure 3. Number of pairs of the Montagu's harrier *Circus pygargus* on Öland (in various biotopes), 1942–2010. Comprehensive inventories were taken on Öland in 1974–1981, 1996, 2004–2008 and 2010, but there is no useful data from the intermediate years.

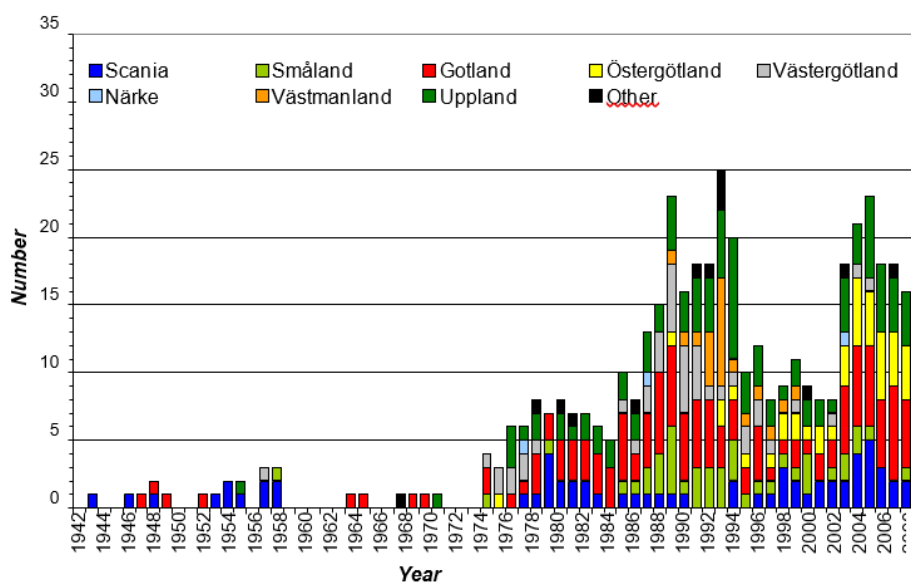


Figure 4. Number of breeding pairs of the Montagu's harrier *Circus pygargus* outside Öland, 1942–2009. Data from Sweden outside Öland are unavailable for 2010.

Internationally, most data are available from the peripheries of the species' ranges where populations are smaller and easily discernible. Here, the Montagu's harrier has shown strong population fluctuations with both increases and declines within a short period of time (e.g. in Denmark, the United Kingdom and the Netherlands). These fluctuations are usually linked to temporary changes in the availability of breeding habitats. Trenching and cultivation have led to declines, while converted fields, pine plantations and overgrowth, or the availability of newly created, nutrient-rich hunting grounds, have led to increases. Over the last three decades of the 20th century, the total population has generally been considered stable or increasing (BirdLife International, 2004), but some of the positive regional estimates may be due to increased inventory activities and knowledge. The question of increases or declines in different stocks as well as the total is both complex and controversial (see e.g. Trierweiler & Koks, 2009). Sweden's neighbouring stocks are considered either stable (Denmark, Estonia and Finland) or slightly increasing (Germany, Poland, Lithuania and Latvia).



Figure 5. Schematic drawing of the distribution of Montagu's harriers as a breeding bird in Sweden. The map is not complete, but is based on the collected breeding data contained in the SLU Swedish Species Information Centre's traditional database of findings and in the Swedish Species Observation System. A red area indicates the traditional (perennial) range of Montagu's harriers, while green indicates more or less temporary breeding attempts. Source: Swedish Species Information Centre of the Swedish University of Agricultural Sciences, Uppsala, 2008.

Causes of decline

Reduced availability of optimal breeding habitats

The Montagu's harrier has proven to be picky in its choice of biotope for building its nest. Too high and dense vegetation, such as dense leaf reeds and shrubland with lots of trees, is simply not good enough. For more information about optimal breeding habitats, see the "Habitat" section.

In many areas of the species' range, the availability of good breeding habitats has decreased. On Öland, many *Dasiphora fruticosa* areas have recently been cleared

to expand the pasture area, fueling the complete disappearance of biotope suitable for Montagu's harriers. Wetlands age and grow back, a natural development that is hastened in the absence of land claims and accelerates during drainage.



Figure 6. Optimal nesting sites for the Montagu's harrier. Top: Öland marsh dominated by great fen sedge, *Cladium mariscus*. Bottom: Öland shrubland dominated by shrubby cinquefoil, *Dasiphora fruticosa*. Photograph: Staffan Rodebrand

Eventually trees and shrubs grow in, making the wetland less suitable as a nesting site for Montagu's harriers. At the same time, trees and taller shrubs have grown back in large alvar areas with dense *Dasiphora fruticosa* stands.

When the Montagu's harrier has been forced to breed in arable land or other secondary environments in the absence of optimal breeding habitats, its breeding results have deteriorated, leading to a decline in stocks. There are concerns in several areas of a further decrease due to the modernisation and intensification of land use in agriculture.

Predation from the northern goshawk

There is severe predation from northern goshawks in several areas on Öland. Many of Öland's breeding sites have been adversely affected, and several seemingly

otherwise intact nesting sites have been abandoned after repeated predation from northern goshawks.

The northern goshawk has always existed in the northern and central parts of Öland, and predation has been noted only on a few occasions always during the years when it was breeding right next to the Montagu's harrier. Northern goshawks have access to plenty of prey during the earlier part of their breeding season, but when the young start to grow in the second half of July and require the maximum amount of food, the prey availability is in decline. That is when northern goshawks prey on young Montagu's harriers, marsh hawks and common kestrels, which are abducted from the nest or when they are newly fledged. This is most pronounced at Stora Alvaret, where the supply of prey can be quite low and most of the birds have moved down to the shoreline meadows when the drought is at its most severe. It is also on Stora Alvaret where most cases of predation have been recorded, and there is much to suggest that Montagu's harriers have completely abandoned certain sites due to severe pressure from northern goshawks. In addition, the alvar population of northern goshawks has increased significantly as older planted groves have matured and new, all-natural groves have appeared. This has made Stora Alvaret better suited to the northern goshawk's hunting technique. A continual clearing and grazing strategy, by which the shrublayer is removed but all groves and trees are spared, puts the Montagu's harrier at a disadvantage while benefitting the northern goshawk. If Stora Alvaret's swaths of thicker soils continue to be deforested in the same way as in recent years, there is a risk that the Montagu's harrier will completely disappear from these areas.

Hunting

Birds of prey are still hunted in many locations, and because of the bird's behaviour and choice of hunting grounds, Montagu's harriers make an easy target and a vulnerable raptor. Data on large numbers of Montagu's harriers that have been shot are available from several countries, such as Malta (Fenech, 1992; Raine & Temuge, 2007).

Interference from photographers

Photography at nesting sites has caused several unsuccessful breeding attempts. In some cases, vegetation was cut down in order to take pictures inside the nest while in others several photographers kept watch for long periods of time near the nesting site.

Agri-environmental support schemes

The support schemes under the EU's common agricultural policy (CAP) have been partly responsible for a reduction in the availability of suitable breeding habitats. In order to receive CAP support, the area must be claimed and bushland with *Dasiphora fruticosa* cleared away. However, the specific commitment plans for cropland (including alvar pasture) developed by the county administrative boards allow for the exemption of *Dasiphora fruticosa* areas with breeding Montagu's harriers from the land clearing requirement. Nowadays it is also possible to include special management conditions in individual commitment plans within the current CAP support scheme, with increased consideration for the Montagu's harrier in

terms of postponing the release of animals to grazing paddocks where the birds breed, for example. For more details, see "Conflicts of interest".

Wind farms

The placement of wind turbines on Öland at Montagu's harrier nesting sites has caused the birds to abandon the area. In addition, wind turbines installed within their hunting territory have caused disturbances. These include a shrinking of hunting territory and longer prey deliveries to the nesting site, since the Montagu's harrier avoids areas with wind farms (S. Rodebrand, personal observations). The problem has not yet been investigated in any extensive study, but wind turbine placement within 5 km of nesting sites has a negative impact on Montagu's harrier breeding. While wind turbines directly at nesting sites (0–1 km) are likely to be completely devastating for the Montagu's harrier, the placement of wind turbines at longer distances (1–5 km) can also bring about a negative impact. The degree of impact can be expected to vary depending on the appearance of the hunting territory. The Montagu's harrier has certainly been observed hunting next to wind turbines, but to a much lesser extent than before the turbines were installed. The region on southwestern Öland that by far has the most, and most dense, wind farms has also lost most of its previous Montagu's harrier populations, even though the nesting site habitat remains otherwise unchanged. Studies during inventories of the huge wind turbines that have been built in Borgholm Municipality have found that Montagu's harriers take major flight path detours around wind turbines when delivering prey. Normally, prey deliveries from the point of capture to the nesting site take place in the least energy-intensive way, which usually means the shortest possible flight distance at a relatively high altitude.

Toxic burden

The Montagu's harrier winters in areas that are still sprayed heavily with insecticides. In some cases, the species is concentrated near an abundant presence of migratory grasshoppers where spraying takes place at the same time. A high concentration of DDT might be the one of the reasons behind the decline in Montagu's harriers in several areas. In conjunction with nest checks and bird ringing on Öland in 1975–1981, 14 rotten eggs were collected. An analysis revealed low levels of mercury and PCBs but, as expected, slightly higher DDT levels. More recent studies are lacking, and the effects of the toxic burden on today's breeding success are currently unknown.

Drought in the Sahel

Drought in the Sahel region has adversely affected many migratory species. Some calculations have indicated a link between dry periods and the number of nesting Montagu's harriers during the following season.

Current distribution

During breeding season, the Montagu's harrier has a mosaic, fragmented distribution between roughly 35° and 60° N in Eurasia eastwards to the Yenisey River. Their distribution is largely linked to the presence of suitable biotopes. In Sweden, the majority of Montagu's harriers are found on Öland. Scattered pairs

also occur in the rest of southern and central Sweden, north to Västmanland and Uppland.

Current population facts

Western and central Europe, where the Montagu's harrier population in particular is well known, have an estimated 10,000–20,000 pairs. In addition, there is a highly uncertain number in the east (mainly in Russia, Ukraine and Belarus) which, however, is likely to be greater. Estimates of their global population range from 50,000 up to more than 100,000 pairs. In central and western Europe, the largest stocks are found in Poland (1,300–2,500 pairs), France (3,800–5,100 pairs) and the Iberian Peninsula (2,500–10,000 pairs in Spain and 500–1,000 pairs in Portugal). In other countries, populations are smaller. In our neighbouring countries, the figures are estimated as follows: Denmark 36–45 pairs, Germany 234–283 pairs, Lithuania 200–300 pairs, Latvia 260–380 pairs, Estonia 100–200 pairs, and Finland 2–10 pairs (all figures refer to the situation at the turn of the century, *BirdLife International 2004*).

In modern times, Swedish stocks have peaked during the period 1976–1996, at 55–65 pairs. The Swedish population has declined sharply in recent years, and only 44 pairs were registered in 2005 of which 23 were registered on Öland. The situation seems to have improved somewhat since then, but it still involves comparatively low numbers, especially on Öland.

Few data are available on the age composition of the Montagu's harrier population. Calculations from scant material and the utilisation of data from related species (mainly the hen harrier *Circus cyaneus*) suggest an age curve ending at 17 years. Similar calculations of Öland stocks of Montagu's harriers give an average annual reproduction of two fledglings per breeding pair and per year. The majority of Montagu's harriers in Sweden are older breeding birds. Most young Montagu's harriers spend their first year in the wintering areas, and only a few accompany the sexually mature to the breeding areas.

Current threats

In recent decades, the Montagu's harrier has been considered to be anything from critically endangered to being completely omitted from lists of endangered species. This is largely because the size and distribution of its global population is still inadequately understood. In particular, there are no reliable figures from the supposedly large stocks in Russia, where estimates have been made from very poor data. In areas where Montagu's harriers are few, the species is often considered endangered due to the disappearance of suitable breeding habitats. In western Europe, extensively exploited pastures that make up the species' breeding habitat are in decline. This is forcing Montagu's harriers to move out onto cultivated land, leading to reduced reproductive success. Similar scenarios are expected in the eastern parts of the range as land use becomes modernised and rationalised. Currently, the total population is not considered to be threatened (*BirdLife International, 2004; IUCN, 2010*). In Sweden, on the other hand, the species is

classified as Endangered (EN) on the Swedish Red List (Gärdenfors, 2010). Endangered (EN) means that the Swedish population is assessed to be threatened, with a greater than 20% risk of extinction within 20 years, or five generations if the situation does not improve. The assessment for Montagu's harriers was based on the small population and its rapid decline (30–40% in 6 years (1 generation)).

The predominant threat is the reduction in amount of suitable breeding habitats. A review of Öland's 49 traditional breeding sites that have been used more than temporarily through 2005 shows that half of the sites are negatively impacted, including those where suitable habitats have been lost due to clearing (17%). At other sites on Öland (12%), the overgrowth is such that the critical limit has probably been exceeded. Some breeding sites were abandoned after severe predation by northern goshawks (12%). In other cases, nesting sites have also been lost because of various installations (road, wind power, seed cultivation, parking lots) at or right next to previous nesting sites (8%). In addition, wetland overgrowth has driven the shift of nesting sites to worse wetland areas that are more prone to flooding. Problems related to wetland overgrowth also exist in several locations in Scania, Uppland and Gotland. Most wetlands with nesting Montagu's harriers are in different stages of accelerating overgrowth, with some approaching the critical limit of what these birds can accept.

Likely effects of expected climate changes

Looking at the data from the Swedish Meteorological and Hydrological Institute on the average temperature at Öland's southern headland during 1944–2005, there is no explanation for the population trend on Öland. The temperature has slowly risen during the period, landing at a bit above average for the last six years – something that should be beneficial for the Montagu's harrier, which has its northern border in Sweden. Since there are no downward trends in neighbouring countries' stocks, it seems likely that local factors have influenced developments on Öland. There are no in-depth studies of the impact of climate change on the number and distribution of Montagu's harriers. However, an overview of climate change impacts on Europe's breeding birds (Huntley et al., 2007) concludes that a likely future scenario for the Montagu's harrier involves a shift in range to the north and northeast. This scenario would entail a distribution throughout southern Sweden up to Dalälven and further north along Norrland's coast. In the 2000s, many very early breeding attempts were recorded on Öland compared with the period 1975–1981, perhaps indicating that the Montagu's harrier now generally breeds slightly earlier in the year.

Protection status in laws and conventions

The Montagu's harrier has the following status in national legislation, EU directives and ordinances, and international agreements ratified by Sweden. The following protections only address regulations that specifically identify the Montagu's harrier in annexes to directives and ordinances. The general legislation

that can affect a species, or the habitat or area where the species occurs, is not included in this plan.

National legislation

The Montagu's harrier is protected in Sweden under paragraph 4 of the Swedish Species Protection Ordinance (2007:845). This means that specimens of the species must not be caught, killed or otherwise collected or damaged. Removing or damaging the species' eggs or nests is also prohibited. According to paragraph 33 of the Swedish Hunting Ordinance (1987:905), Montagu's harriers are considered "Swedish state wildlife", meaning that if they are found dead or requiring care must be handed over to the police.

EU legislation

The Montagu's harrier is listed in Annex I to the EU Birds Directive (Council Directives 79/409/EEC and 2009/147/EC). This means that the Montagu's harrier must attain favourable conservation status and be protected in special protection areas (SPA). The EU Guidelines on the Habitats Directive (EU Commission 2006) state that in the absence of sufficient information, favourable conservation status can be equated with the distribution and population size the species had in the country at its entry into the EU (1995 for Sweden).

International conventions and action plans

The Montagu's harrier is included in the following international conventions:

- Appendix 2 of the Berne Convention on the Conservation of European Wildlife and Natural Habitats. This means that it is a strictly protected animal species and that the species and its habitats must be protected against hunting, collection, trade, etc. if the activities have an impact on the conservation of the species.
- Appendix 2 of the Bonn Convention on the Conservation of Migratory Species. The appendix lists species that need, or can benefit from, bilateral agreements.
- Appendix A of the CITES Convention on International Trade in Endangered Species of Wild Fauna and Flora, prohibiting all trade and commercial activity with the species.

Croatia has a national conservation plan for Montagu's harriers (listed under birds, priority 2).

Other facts

Experience from previous actions that can affect conservation efforts

As Montagu's harriers have moved their nesting sites out onto cultivated land, new problems have arisen. During early harvests, nests containing eggs or chicks are

destroyed. In several areas of western Europe, many non-profit resources have been devoted to finding nests and marking them. In cases where landowners or users have been positive, an area around the nesting site has been excluded at the time of harvest, or the nest with eggs or chicks has been relocated. Thanks to this marking, the incubating female has also been spared from the harvesting machine. Although many broods have been saved this way, the method requires substantial resources and is not sustainable in the long run. Similar attempts have been made on Öland. For example, nests in fields and grassland leys have been marked and the vegetation around them saved (usually large areas, but in some cases down to 25x25 m). Also, nests with chicks have been relocated in several cases. In general it can be said that nests containing chicks can adequately cope with this procedure, while nests containing eggs cannot manage successfully. In Östergötland as well, cooperation among ornithologists, landowners and county administrative boards has saved several breeding attempts through controlling the time of harvest. Major efforts are being made around the world, mainly by non-profit organisations, to protect breeding in agricultural areas (Arroyo et al., 2002; Belting & Krüger, 2001; Koks & Visser, 2002). On Öland, an information leaflet about Montagu's harriers and their breeding in arable land has been distributed to all farmers' households. This has led to an increase in attention to the species and to the protection of a few more breedings.

Of 49 more-than-temporary breeding areas, 13 are currently full or partial nature reserves, one is a bird protection area and an additional 22 are Natura 2000 sites (detailed information is available only with the relevant county administrative boards due to confidentiality; see Annex 2). Where access is prohibited during breeding times (nature reserves and bird protection areas), no disturbances from ornithologists, photographers or other people have been noted. However, several disturbances were recorded in several locations that lack bans, both at temporary and well-known breeding sites. Some of these have certainly also led to breeding failures. Photographers are usually the source of the disturbances, which are of two types. The more serious and rare kind is when a photo hide is placed near the nest, and all vegetation between the nest platform and the hide is cleared away. The most common disturbance involves some popular and easily accessible nesting sites which face too much pressure from swarms of photographers. On repeated occasions, the female Montagu's harrier has been unable to deliver prey to her young in the nest due to the up-close and intense pursuit of photographers. Such disturbances have been minimised in several places mainly by informing the public and guiding visitors via designated trails, photo hides and bird towers. In one case, outside a nature reserve, access bans were imposed to avoid disturbances.

In recent years, a few *Cladium mariscus* marshes with Montagu's harriers on northern Öland have been subject to clearing and vegetation management. At Gillsby Mossar (Bärsmossen), accelerating overgrowth of willow shrubs has been stopped by using a crawler excavator to dig out the bushes along with their root systems. A blocked waterway has also been opened to reduce the risk of temporary flooding during heavy summer rains. These efforts have brought a clear improvement in both the size of the local population and breeding results. At

Djurstads Träsk, larger areas of *Cladium mariscus* have been mowed for vegetation-management purposes. When the mowing was not resumed, the plant not only regained its previous height but is significantly healthier and freer from the overgrowth of woody plants than before. These areas have now become more attractive as breeding habitats for Montagu's harriers than the unmanaged areas where overgrowth has accelerated. The experiments demonstrate that it is possible to manage stands of *Cladium mariscus* in a suitable way. However, this presupposes the availability of large areas of *Cladium mariscus* that can be alternately managed every few years, and where each year there is enough of the plant at the appropriate height and density for Montagu's harriers.

Vision and objectives

The population size of Montagu's harriers in Sweden has decreased since 1996, and it is not large enough today for its conservation status to be considered favourable. The bird's population on Öland has also declined, and several breeding sites are under threat.

The population size on Öland in 1981 and 1996, 45–46 pairs, has been the culmination of modern-day Öland stocks. During those years, the number of breeding pairs in the rest of Sweden began to rise, an increase that did not seem to benefit Öland since the population remained the same in 1996. In the rest of Sweden, major stocks should hardly be expected since there are no larger contiguous areas with suitable biotopes. Single breeding attempts up to a total of 20–25 pairs at wetlands on Gotland and the flatlands of central and southern Sweden should be viewed as realistic.

Vision

Sweden aims to have a viable, stable and slightly increasing population of about 65–75 pairs of Montagu's harriers, whose habitats have improved and have been managed appropriately.

The majority of their most important breeding sites have long-term protection, with management practices adapted to the species' requirements. In addition, all breeding sites that are more than temporary are known to the relevant authorities and operators.

Long-term objective

The objective is a self-reproducing population (two fledglings per pair and year) at the level that prevailed through much of the 1980s and 1990s, with 40–45 breeding pairs on Öland and a slightly increasing population in the rest of Sweden by 2025. Thus, the Montagu's harrier cannot be removed from the Swedish Red List until it has regained its position in Sweden as a bird species with a regionally positive conservation status relative to the amount of suitable habitat (cf. Favourable Reference Range and Favourable Reference Population in the Article 17 Guidelines of the Habitats Directive; EU Commission 2006).

Short-term objective

By 2012, the decline of the Montagu's harrier population on Öland should have tapered off and not fall below 2004–2008 levels (30 pairs). By 2012, all habitat restoration measures have been taken in all priority 1 breeding areas in the action plan. Management plans in land conservation areas should be adapted to the requirements of the Montagu's harrier by 2013, and procedures put in place to prevent negative measures at Montagu's harrier nesting sites in connection with land support and related conditions for clearing. By 2012, the Swedish presence outside Öland will have been surveyed and the needs for measures there

investigated. By 2015, Öland's population of Montagu's harriers will have started to increase again. Habitat restoration measures will have been carried out in all priority 1-2 breeding areas (see Annexes I and II) and some in priority 3.

Action and recommendations

Description of actions

This chapter outlines the proposed actions, actions needed, how they should be implemented, and what the results should be. Information on individual actions can also be found in the attached action table (Annex 1) and with the relevant county administrative boards (Annex 2).

It is essential that the management of land where the Montagu's harrier is or has been present, and which is funded through for example agri-environmental support schemes, is adapted in order to achieve and retain a favourable conservation status for the Montagu's harrier (Dir. 2009/147/EC).

Information and events

An informational leaflet on Montagu's harriers, similar to the one previously produced in collaboration between WWF and both Sweden's and Öland's ornithological associations, should be printed and distributed to affected landowners and users in the Montagu's harrier's core sites. In addition to Montagu's harrier breeding in cultivated land, breeding in *Dasiphora fruticosa* areas and *Cladium mariscus* marshes must also be highlighted in order to prevent clearing at the breeding sites. The annexes to the action plan must be treated confidentially in order to prevent the dissemination of site data.

Education

At the government level (the relevant county administrative boards), at least one responsible administrator should serve as a contact person and be given enough knowledge about Montagu's harriers to ensure that the species is not overlooked during planning, licensing and similar. This contact person should be responsible for training administrators to process cases related to grazing grants and management plans so that they can take into account the Montagu's harrier distribution, biotope requirements and needs for protection. In addition, planning maps should be available that post warnings for Montagu's harriers and other sensitive fauna and flora, so that case administrators can consult the relevant contact person when a case concerns such an area. At the Swedish Forest Agency and the municipalities concerned, such map information should be provided indicating the presence of disturbance-sensitive fauna on 5x5 km grids. These maps should be kept updated by the county administrative boards and should contain a reference to the responsible administrators there. The spreading of information about Montagu's harrier nesting sites should be kept to a minimum beyond the relevant authorities and municipalities. This especially applies to the detailed

classified information that is available with the relevant county administrative boards (Annex 2).

International contacts should be established in order to draw lessons from ongoing efforts to protect Montagu's harriers in other countries. This can be done through study visits or participation in conferences, for example.

Guidance

The county administrative boards should distribute, or provide on request, an information booklet for landowners, users, wind farm planners and other relevant stakeholders. Each year, the boards should send information about the Montagu's harrier to farmers in a leaflet (or similar) offering guidance on the special considerations needed in the species' core sites in Sweden.

Adapting the commitment plans

For alvars and pastures that are of special value (according to the rules for the agri-environmental support schemes), a commitment plan is required for each parcel of land. In addition, commitment plans can be established for areas of general value. In these plans, the county administrative boards can, for example, state specific management conditions or can exempt areas from clearing. It is critical that the commitment plans related to breeding sites for the Montagu's harrier are adapted to the species' requirements.

New knowledge and inventory

A detailed survey is needed of the Swedish Montagu's harrier population outside Öland. Data should be collected on breeding sites, breeding habitats, and protection and action measures. An initial inventory and compilation was completed in 2006 (Annex 2). In areas where the Montagu's harrier is scarce and present at a few sites only, the continuous registration through the Swedish Species Observation System and "Svalan" as well as the regional report committees is sufficient, while core areas containing several different sites (northwest Scania, Uppland and Gotland) need to be studied specifically.

Determining whether marsh harrier breeding discourages or perhaps favours the presence of Montagu's harriers where they breed at the same site requires detailed studies over the course of several years. Extensive ongoing projects, especially those in France where wing marks and satellite transmitters are being used, can also hopefully provide more information in addition to migration data about the gene flow among different subpopulations.

Review of current provisions

When the Montagu's harrier breeds in grazed areas, a conflict often arises with the EU agri-environmental support schemes (see further under "Conflicts of interest"). New and partly amended rules, as well as leeway for interpretation and adaptation, have not yet been fully tested. The application of the rules needs to be reviewed in order to avoid conflicts with the Birds Directive.

Area protection

Nature reserves should be established on Amunds Mosse, and the need for reinforced area protection should be investigated for all priority-1 Montagu's harrier sites in Annex I.

Management in protected areas

The action plan serves as guidance for action measures in protected areas. In protected areas, implemented measures must be consistent with the governing documents for the area, such as purpose, regulations and management plan. In general, therefore, measures should be directed primarily at protected areas where they are consistent with the objectives and management plans. The purpose of the protected area must be taken into account when revising management plans, as must the area's combined natural values. Changing decisions about protection is a more comprehensive process than revising management plans.

The management plan for Petgärdeträsk Nature Reserve must be revised with consideration for the needs of the Montagu's harrier. Similarly, the management plans for other reserves and Natura 2000 areas where the Montagu's harrier breeds must be reviewed in order to adapt to the species' requirements when necessary.

Habitat conservation

Generally, an optimal breeding habitat for Montagu's harriers must be pursued in the relevant breeding areas. This means that tall-grown and large stands of *Dasiphora fruticosa*, *Cladium mariscus* marshes, and dense, tall herb vegetation in meadows or in sparse reed beds should be maintained or restored. Such habitats usually feature an ongoing succession involving a sprouting up of more tall-growing woody plants. These bushes and trees need to be cleared every few years. To attain the most cost-effective management of these areas, annual late-summer activities, mowing and burning at long intervals are useful methods. The method chosen should be adapted depending on the site conditions.



Figure 7. Removal of willow shrubs in a *Cladium mariscus* marsh. Photograph: Staffan Rodebrand

Habitat restoration and rejuvenation

Restoration and adapted management are proposed for most of the known breeding sites on Öland as well as for several marshes on Gotland, where overgrowth through trees and tall shrubs is on the rise. A detailed plan for this is set out in Annexes 1 and 2.

Coniferous forest groves at Stora Alvaret on Öland should be felled or thinned heavily to discourage breeding of northern goshawks in the area. The northern goshawk has found its way in as planted groves have grown. Through seed dispersion, the groves have also led to alvar afforestation and a biotope that increasingly suits northern goshawks to the detriment of Montagu's harriers. At the end of harvesting, the Swedish Forest Agency and county administrative board should use the means at their disposal to strive towards converting the land to pasture or deciduous forest.

Environmental monitoring

The Montagu's harrier population on Öland has been inventoried at irregular intervals since 1976. This work has included a survey of all nesting sites and studies of reproductive success. Monitoring was conducted in 1975–1981, 1996, 2004–2008 and 2010. Populations at the species' core sites must be inventoried to understand how the population is evolving and which breeding sites should be prioritised in biotope improvement measures. Multiple inventories every few years are needed to monitor population developments and to register any new breeding grounds. The frequency of such inventories should be adapted to the population development. So, a population in change might need to be inventoried annually or at least once every three years, while more stable population can be inventoried

less frequently (once every 5–10 years). Continued monitoring of the Montagu's harrier population at core sites is being planned for 2012 and 2015.

Follow-up

The plan includes a comprehensive package of measures involving the restoration of a large number of sites. It is vital to follow up on how the Montagu's harrier responds to different types of restoration measures at an early stage. In many cases, the measures include tree and tall shrub felling at the breeding sites and immediate surroundings. For specific inspections, or in conjunction with environmental monitoring carried out every few years (see above), the measures should be followed up and analysed. Sites that have undergone restoration should be monitored at more frequent intervals, preferably annually, in order to understand whether the species is trying to return to its former premises and whether breeding is successful. Thanks to annual follow-up at restored sites, we can get an idea about the progress of the species' reestablishment in former primary sites. If species establishment at restored sites fails several years after restoration takes place, a deeper analysis of the surrounding landscape should be performed and additional initiatives should be taken. In combination with the comprehensive environmental monitoring efforts in 2010 and 2012, it is also possible to follow up on whether the Montagu's harrier is reclaiming primary breeding environments in *Dasiphora fruticosa* areas and *Cladium mariscus* marshes or whether the trend of breeding attempts on farmland is continuing.

General recommendations

This chapter is intended for anyone outside the sphere of government who, through their job or leisure activity, comes into contact with Montagu's harriers and wants guidance on how to take action in order to protect the species.

Actions that can harm or benefit the species

Clearing larger stands of Öland's *Dasiphora fruticosa*, mowing pastures and draining wetlands are all devastating for Montagu's harrier nesting sites. In addition, facilities such as parking lots and wind farms are disturbing near the nesting sites. Grazing can pose a threat in some breeding areas before the chicks are just over two weeks old, which is during the second half of July. In these locations, nesting sites may need to be removed or grazing operations postponed.

Ornithological and conservation organisations should agree on and publish guidelines to ensure that nesting sites for sensitive, endangered species like Montagu's harriers are not exploited for photography. In addition, ringing of nestlings should be avoided as this always involves an additional disturbance. The recovery percentage and value of randomly ringing individual broods of Montagu's harriers do not justify this disturbance. Ringing should only take place for a broader purpose, for example, if an entire population is tagged using individual colour rings for more extensive studies.



Figure 8. The new fledgling contemplates the clearing just outside its nursery. Photograph: Staffan Rodebrand

Landowners and users can benefit the Montagu's harrier by maintaining healthy stocks of *Dasiphora fruticosa* and *Cladium mariscus* and gradually clearing away taller trees and shrubs. Grazing in places where the Montagu's harrier breeds should be scheduled for late summer and autumn, with grazing beginning around 1 August. When Montagu's harriers are detected breeding in arable land, an unbroken area should be saved around the nesting site, or the county administrative board and ornithological experts should be contacted. The saved area should be as large as possible, as well as adapted to field boundaries and time of year. Areas down to 25x25 metres have worked adequately in cases with nestlings over a week old in the nest, but the area should typically not be smaller than 50x50 metres.

Funding the actions

The new rural programme, in force during 2007–2013, offers new forms of regional and local actions that can fully or partly fund habitat conservation efforts for Montagu's harriers on lands that not yet are part of any agri-environmental support scheme. A variety of local operators can apply for investment support for wetland construction and restoration, which might be useful in conservation efforts for the Montagu's harrier. Various forms of environmental support and investment support for the restoration of pastures and hay meadows that fall under "Designated environment" mean the continued scope to carry out restoration of overgrown Montagu's harrier sites. Within "Designated environment" special attention should also be paid to "Special actions for the landscape's natural and cultural heritage values", which provides the opportunity to take measures that promote or increase biodiversity (and cultural heritage values) which do not fit anywhere else in the environmental support scheme. For example, compensation could be sought for

measures to improve and restore hydrological conditions in wetlands that have been Montagu's harrier sites or have the potential to become so after measures are taken. This environmental investment has a maximum amount of 200,000 kronor and can reimburse actual costs up to 90%. To obtain compensation, the measures must benefit the natural and cultural heritage values of the agricultural landscape, in addition to recreational and landscape values.

The new rural development programme also brings positive news, with new forms of "Designated environment" compensation that promote species associated with cultivated grasslands. Financial environmental support for creating bird fields and for ley farming can sometimes benefit the Montagu's harrier if repeated breeding attempts are made in grassland leys. A clear trend during the 21st century is the attempt of the Montagu's harrier to breed in secondary environments in fields of primarily grass cultivation.

Certain types of conservation efforts to promote Montagu's harriers can also be carried out through local LEADER projects, a method of working with local rural development. Rural areas that are part of LEADER areas have specific development strategies developed by local action groups. Projects that improve the environment and local tourism can be implemented under LEADER. Near wetlands where Montagu's harriers are found, there is sometimes a need to reduce disturbances from tourists and birdwatchers closest to the breeding grounds. The installation of hiking trails, bird towers, and bird platforms in wetlands where Montagu's harriers are present are examples of projects that benefit both the natural environment and local tourism, and they can in many cases be done within the framework of these LEADER projects.

Reinforcement

For Montagu's harriers, there is no need for any reinforcement.

Authorities can provide information on applicable legislation

The property owner or usufructuary who uses land or water where endangered species and their habitats are located should be aware of how the area is farmed. Users who understand the need to manage natural values (or to refrain from intervening) and show consideration in their use generally guarantee the sound maintenance of the species in the area.

Regardless of the operator's knowledge of and interest in maintaining natural values, any applicable laws, regulations and ordinances might still place requirements on them. The authority that has oversight of the activity or action, usually the county administrative board, can provide information about such requirements. For activities covered by the Swedish Forestry Act, the Swedish Forest Agency serves as the supervisory authority. It is always possible to call the county administrative board to find out which authority to contact.

The supervisory authorities can provide information on the relevant regulatory framework that applies. There might be requirements around permitting, obligation

to give notice, or consultation. The relevant authority can provide information on what a notification or application should contain and when it should be submitted before the activity begins.

Recommendations on processing observation data

According to the Public Access to Information and Secrecy Act (2009:400), data confidentiality on endangered animal or plant species applies if it can be assumed that efforts to preserve the species within the country are counteracted if the data is disclosed. Knowledge of the presence of endangered species requires discretion in the dissemination of such information, since illegal hunting and collection can pose a threat to the species.

Under the Swedish Environmental Protection Agency's policy, information should, as far as possible, be disseminated to landowners and usufructuaries so that they can consider the species in their use of the area where the species occurs permanently or temporarily.

As regards the species in this plan, the following restrictions should apply to the disclosure of observation data.

In general, information on Montagu's harrier nesting sites should be disseminated as little as possible. This is due to the risk of interference from photographers (the cause of several unsuccessful breeding attempts in recent years) and possibly egg collectors (though many documented cases exist, we are unsure whether egg collecting still occurs). The general public should be given information about the sensitivity of the Montagu's harrier, for example regarding photography next to nesting sites, and preferably in coordination with information on other such species.

Consequences and coordination

Consequences

Effects of the action plan on other red-listed species

Species that are currently found in the wetter open shrublands and *Dasiphora fruticosa* areas of Stora Alvaret, such as the red-backed shrike, *Lanius collurio*, and barred warbler, *Sylvia nisoria*, are favoured since the plan prevents afforestation of shrubland. By preventing wetland (*Cladium mariscus* marsh) overgrowth and leaving margins grazed, a range of wetland-bound plants and organisms associated with these habitats can benefit. Clearing efforts in sites with a high nature value for Montagu's harriers on Öland are mainly focused on felling trees and tall shrubs that have grown in the *Dasiphora fruticosa* stands themselves or in the *Cladium mariscus* marshes. In some cases, clearing also needs to take place beyond the most sensitive, wettest part of the breeding habitat in the immediate area. Clearing near the peripheries of Montagu's harrier sites benefit many other red-listed species, such as the musk orchid, *Herminium monorchis*, (Besser) krasch, *Artemisia oelandica*, prostrate rocket, *Sisymbrium supinum*, dwarf plantain, *Plantago tenuiflora*, slender hare's-ear, *Bupleurum tenuissimum*, Hartman's sedge, *Carex hartmanii*, doubtful chickweed, *Selinum dubium*, meadow rue, *Thalictrum simplex* subsp. *tenuifolium* and several earthstars, *Geastrum* subsp.

Effects of the action plan on different habitat types

The plan mainly favours the presence of two special habitat types: scrublands dominated by *Dasiphora fruticosa* on wet alvars as well as *Cladium mariscus* marshes. To the extent that the plan contributes to the removal of coniferous forest groves on Stora Alvaret, this contributes to an open alvar.

The plan somewhat places the expansion of grazing area at a disadvantage, as well as the possibility of converting certain *Cladium mariscus* marshes (or parts of them) into more free water surface wetlands and more varied vegetation.

Conflicts of interest

When the Montagu's harrier breeds in grazed areas, a conflict often arises with the EU agri-environmental support schemes. For an area to receive financial environmental support, one of the requirements is that it must be grazed. In some cases, larger areas of *Dasiphora fruticosa* both with and without Montagu's harriers can be included in or excluded from the support, provided that the user is aware of this. If the user does not want to exclude the *Dasiphora fruticosa* area, it must usually be cleared, which will cause the Montagu's harrier habitat to

disappear. During previous funding periods it was only possible to provide support for uncleared *Dasiphora fruticosa* areas in exceptional cases, with a prerequisite for receiving payment that the area was clearly affected by grazing or had sparse vegetation. An optimal Montagu's harrier habitat requires sufficiently large, tall and dense stands of *Dasiphora fruticosa*. Although these can occur in grazed areas, they must in that case be allowed to maintain a structure that prevents grazing animals from wandering directly through the stands. This used to be a major problem whose solution was the key to survival for the Montagu's harrier on Öland. The current environmental support scheme (2007–2013) allows for significantly greater flexibility in adapting management conditions to the needs of endangered species, including Montagu's harriers. However, it has not yet been fully utilised, partly due to a lack of coordination between the county administrative boards' agricultural and conservation units. To change this, all known sites with a high nature value for Montagu's harriers in Kalmar County were digitised in 2007. This documentation is currently used by environmental compensation administrators and those who conduct inspections to facilitate dialogue between conservation administrators and environmental compensation administrators. At present, it is difficult to cope with the requirement that all new land areas added to the compensation for pastureland must be completely cleared by the time the application is submitted. This means that the authority does not come into contact with the user until the clearing is already completed, which is often too late for adapting the cleared land to the Montagu's harrier. On the other hand, in the context of restoration support, there is much leeway for applying a wide range of instruments thanks to early dialogue among stakeholders. Financial environmental support should promote biodiversity and should not conflict with the Birds Directive, which includes the Montagu's harrier. The requirements for compensation should therefore be adapted to enable full compensation to be paid.

In 2008, a new definition of pasture was introduced in the rural development programme (Swedish Board of Agriculture's brochure "Träd och buskar i betesmarker", JS19). According to the definition, contiguous hard-to-penetrate areas larger than .01 hectares (100 square metres) with shrubs or scrub are not entitled to support. As a result, there is a risk that many users considering seeking environmental compensation for pastures will perform excessive clearing of the shrub layer on their land. In alvar parcels that are dominated by larger, contiguous stands of *Dasiphora fruticosa*, the risk is especially high that the stands will be cleared away to help secure the compensation. It is difficult to assess whether the new definition of pastureland poses a threat to Montagu's harrier sites, but the risk of conflicts of interest does exist. This increases the need for information outreach that is targeted to landowners and farmers, especially in high-value Montagu's harrier sites. To conserve the Montagu's harrier, successful coordination is essential between the agricultural unit's environmental compensation administrator and the nature conservation administration at each affected county administrative board.

The installation of wind turbines next to Montagu's harrier breeding sites has driven these birds to abandon these areas. Wind turbines should not be sited closer

than 1 km to breeding sites on open ground, and not within the same wetland area. To completely eliminate impacts on Montagu's harrier nesting sites and hunting territory, wind turbines should be sited at least 5 km from nesting sites.



Figure 9. Former breeding ground for the Montagu's harrier. Photograph: Staffan Rodebrand

Coordination

Coordination with other action plans

Generally, coordination should take place when establishing and revising management plans for protected areas.

Coordination might need to take place specifically with other action plans involving species or biotopes that coincide with areas where the Montagu's harrier breeds. In some cases, other action plans may favour measures contrary to ones that are optimal for Montagu's harriers. Potential conflicts might include proposals for *Dasiphora fruticosa* areas to be completely cleared, or for margins in reed areas and *Cladium mariscus* marshes to be cleared and grazed for the purpose of creating biotopes suitable for wading birds.

Coordination that should take place with environmental monitoring

Coordination with the data collection via "Svalan" in the Swedish Species Observation System must be done. Since breeding data in this reporting system is confidential, people at the county administrative boards should be appointed as responsible and granted access to the data.

References

Where references are not given continuously in the text, reference is made to Clarke (1996) and for Swedish conditions mainly Rodebrand (1996). In both of these, literature and references that are not repeated in the list below are also reported.

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Annex 1. Proposed actions

Action	County	Area/site	Actor	Funder	Cost	Priority	Implement by
Survey of breeding sites, planning and preparatory work	H, I, M, E, AB, C, O, U	Sweden outside Öland	County admin. board	SEPA* action plan	40 000	1	2011
Survey of breeding sites	H, I, M, E, AB, C, O, U	Sweden outside Öland	County admin. board	SEPA action plan	70 000	1	2012
2008 inventory on Öland	H	All sites on Öland	County admin. board	SEPA action plan	50 000	1	2008
2010 inventory on Öland	H	All sites on Öland	County admin. board	SEPA action plan	120 000	1	2010
2012 inventory on Öland	H	All sites on Öland	County admin. board	SEPA action plan	120 000	1	2012
2015 inventory on Öland	H	All sites on Öland	County admin. board	SEPA action plan	120 000	1	2015
Information brochure about the Montagu's Harrier	H		County admin. board	SEPA action plan	10 000	1	2012
Information and guidance to farmers	H		County admin. board	SEPA action plan/ Agricultural unit	0	1	2009
Action routines at the County administrative board	H		County admin. board	SEPA action plan	0	1	2008
Training for administrators at the County administrative boards agricultural and nature unit	H		County admin. board	SEPA action plan	0	1	2007
Review of management plan	H	Petgårde träsk	County admin. board	County admin. board	0	1	2011
Review of management plans	H	Natura 2000 sites	County admin. board	County admin. board	0	1	2011

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Adaptation of commitment plans for alvars	H	All sites on southern Öland	County admin. board	Agricultural unit in cooperation with action plan	0	1	2009
Channelling visitors (hiking trails, bird towers, parking)	H	Gillsby mossar	County admin. board	SEPA action plan, SEPA mgmt., Leader	60 000	1	2013
Habitat conservation at breeding site	H	Gillsby mossar	County admin. board	SEPA action plan/SEPA mgmt	50 000	1	2006
Habitat conservation at breeding site	H	Öjmossen/Hörninge mosse	County admin. board/municipality	SEPA action plan/municipality	160 000	1	2008
Habitat conservation at breeding site	H	Träby	County admin. board	SEPA action plan	135 000	1	2008
Habitat conservation at breeding site	H	Sebberneby	County admin. board	SEPA action plan	250 000	1	2009
Habitat conservation at breeding site	H	Djurstad träsk	County admin. board	SEPA management	0	1	2011
Habitat conservation at breeding site	H	Petgårde träsk	County admin. board	SEPA management	0	1	2012
Habitat conservation at breeding site	H	Ryd	County admin. board	SEPA action plan	90 000	2	2011
Habitat conservation at breeding site	H	Knisa mosse	County admin. board	SEPA management	0	1	2012
Habitat conservation at breeding site	H	Ekelunda	County admin. board	SEPA action plan	85 000	1	2012
Habitat conservation at breeding site	H	Amunds mosse	County admin. board	SEPA management	0	1	2012

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Action	County	Area/site	Actor	Funder	Cost	Priority	Implement by
Habitat conservation at breeding site	H	Torvmossen	County admin. board	SEPA action plan	70 000	2	2013
Habitat conservation at breeding site	H	Lofa mosse	County admin. board/municipality	SEPA action plan/municipality	100 000	2	2013
Habitat conservation at breeding site	H	Karl X:s mur	County admin. board	SEPA action plan	90 000	2	2013
Habitat conservation at breeding site	H	N. Kvinneby	County admin. board	SEPA action plan	85 000	2	2014
Habitat conservation at breeding site	H	Lunda, S.	County admin. board	SEPA action plan	85 000	2	2014
Habitat conservation at breeding site	H	Vället	County admin. board	SEPA action plan	90 000	2	2014
Habitat conservation at breeding site	H	Kalkstad, Penåsa, Frösslunda, Gösslunda, Lunda N., Träskmossen, Ö. Segerstad, Eketorp, Gamlegärde, Frönäs mosse, Vedborms träsk, Träbyborg, Skarpa Alby, Sandbyborg, Storåsen	County admin. board	SEPA action plan/SEPA management	920 000	3	2015 or during next plan period
Habitat conservation	I	Limmorträsk, Nygårdsmyr, Nasume myr, Verkmyr	County admin. board	SEPA action plan	500 000	2	2015
Establishment of nature reserve	H	Amunds mosse	County admin. board	SEPA area protection	0	1	2015
Investigation of the need for enhanced protection at all priority 1 sites in this annex	H	All priority 1 sites on Öland	County admin. board	SEPA management/ SEPA action plan	0	2	2015

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Action	County	Area/site	Actor	Funder	Cost	Priority	Implement by
Review of environmental compensation rules			SJV**, SEPA		0	1	2010
Agreement with users at Montagu's harrier breeding sites in grassland leys or fields	H	Breeding on farmland	County admin. board	SEPA action plan	80 000	1	2008–2015, ongoing
Total cost, NV action plan					3 380 000		

* Swedish Environmental Protection Agency (SEPA)

** Swedish Board of Agriculture (SJV)

Some of the actions were completed while this plan was under development. The following actions are completed: survey of breeding sites outside Öland through 2008, annual inventory of breeding sites on Öland 2005–2008 and 2010, habitat conservation and restoration of Gillsby mossar, Öjmossen/Hörninge mosse, Träby and Sebberneby. A half-day course on the Montagu's harrier for administrators at the agricultural and nature unit at the County Administrative Board of Kalmar was carried out in 2007. Field training was also arranged in the autumn of 2007. A landowner agreement on biotope conservation measures at the Träby breeding site was signed in 2007. Landowner agreement on habitat conservation at the breeding sites Kalkstad, Ryd, Vället and Torvmossen was carried out in 2007–2008. Development of procedures at Kalmar County administrative board to deepen coordination between environmental support administration and nature conservation.

Annex 2.

List of classified material stored at the relevant County administrative board and included in the action plan for the Montagu's harrier, *Circus pygargus*.

1. *Known breeding and breeding attempts outside Öland through 2007.*
2. *Description (2007) of and proposed measures for known breeding sites on Öland.*
Contains a description and trend forecast for 49 regular breeding sites as well as detailed action measures. Refers to the 49 more regular of 73 breeding sites registered in 1975–2007. (12 pages).
3. *History. Breeding sites on Öland, 1942–1974.*
Contains data on the number of breeding pairs with site indications for the period 1942–1974.
4. *Overview of disturbances and threats.*
Table with data on current status and occurrence of disturbances and threats at 73 defined breeding sites on Öland. Information is given per site if the site is temporary, currently undisturbed, unnatural (arable land), overgrown, cleared away, disturbed by buildings, predation risk from northern goshawks, and future estimated threats through overgrowth or clearing.
5. *Breeding results and coordinates of known nesting sites on Öland 1975–1981, 1996, 2004–2008 and 2010.*
Contains detailed information on the location of breeding sites and breeding outcomes for all known breeding attempts on Öland during 1975–1981, 1996, 2004–2008 and 2010.
6. *Overview of breeding sites on Öland.*
Register containing data from all recent breeding sites on Öland (from 1975). Shows the protection status, priority, availability of orthophotos (aerial photography with local boundaries), records of ground photographs, biotopes, and the number of pairs and breeding attempts at different sites, in detail for later years and as totals and averages over longer periods of time.
7. *Orthophotos of breeding sites on Öland.*
Aerial images (53) with breeding areas (protected areas) delimited and drawn in detail for breeding sites in natural biotopes on Öland.

8. *Ground photographs from breeding sites on Öland.*
Digital photographs (233) taken at breeding areas/nesting sites on Öland. Photo shoot locations for ground photos are indicated in the orthophotos.
9. *Major recent Swedish breeding sites outside Öland (from the year 2000) of the Montagu's harrier, Circus pygargus.*
Overview of breeding sites in Scania, Småland, Östergötland, Gotland and Uppland. Coordinates and comments on the site's status (value for Montagu's harrier and threats). (4 pages).
10. *Ground photographs from breeding sites outside Öland taken in 2006.*
Digital photographs from Gotland (62), Scania (17), Småland (8), Uppland (49) and Östergötland (10).

Annex 3.

Inventory methodology for Montagu's harrier and reporting in "Svalan"

Introduction

When the original Montagu's harrier project was initiated in 1974, older materials were collected and the foundation was laid for future inventories. This, the methodology for continuous inventories on Öland in 1975–1981, and the inventory in 1996, are described by Rodebrand (1996). In addition, comprehensive inventories were carried out on Öland in 2005–2008 and 2010 (a total of less than 13 years). The aim was to find all the breeding pairs on the island. For the first seven years, the aim was also to try to ring all the young, while the nesting sites were only checked from a distance to determine whether or not breeding was successful during the last six inventories.

In the rest of Sweden, no comprehensive inventories have been carried out. Known breeding sites have been checked on a handful of occasions, and some new breeding was detected after visits to presumed breeding grounds.

Basis for the inventories

In addition to a thorough literature review and personal contacts (by letter or verbally) with many people familiar with the Montagu's harrier, extensive map and aerial image studies were also conducted before the project began. These were supplemented by follow-up field studies, mainly in 1974. When the inventories began in earnest in 1975, knowledge was thus available of all known previous breeding sites, a large number of other sites where the Montagu's harrier was observed more than temporarily, and additional sites classified as presumed based on biotope studies.

Inventory period

The time for inventory was concentrated to specific periods in order to maximise efficiency. This means that fieldwork was carried out intensively, using all the time available during the most favourable periods.

The Montagu's harrier has a time-bound breeding season on Öland from about 1 May to mid-August. Even if not all breeding takes place at exactly the same time, this still means that the best inventory periods fall on 10 May–5 June and on 5 July–5 August. During the earlier period, there is often large activity at the breeding sites when the birds pair up. Courtship then ensues, with deliveries of food, aerobatic displays and nest-building. Although the birds leave the area now and then, they usually remain on site and then displays frequently. Once the female starts to brood, the level of activity drops noticeably, and it might seem like the site

has been abandoned. The male arrives with only a few food deliveries for the female, at long intervals, and some males will also very rarely appear near the nesting site. There are exceptions, with some males spending the night nearby and apparently flying over the nesting site from time to time to make sure that all is well. During the later period, activity increases again as the brood hatches and the male's prey deliveries become more frequent. After several weeks, the female leaves the nest more and more often and keeps watch over the nest from surrounding areas. As their young grow, many females take part in the search for prey, flying farther and farther away from the nesting site. When the young are fledged but do not yet hunt themselves, many stop near the site and wait for prey deliveries from their parents. In some cases, however, the young fledglings leave the nesting site early and accompany the older birds to the hunting territory, even though they still rely on prey deliveries from their parents.

Inventories in 1975–1981

During all inventory seasons, the author was assisted by a varying number of assistants from Öland's Ornithological Association (financial compensation for travel costs was provided through grants from WWF and the Alvin and Elis Wide foundations). These assistants were assigned sites to monitor, often repeatedly, to determine whether or not Montagu's harriers were present at the site. In addition, the assistants participated in simultaneous observations in which several observers who maintained contact covered larger open spaces (mainly on Stora Alvaret) to survey the hunting territory, prey transport and breeding grounds. During these years, the aim was also to verify breeding outcomes and attempt to ring all the nestlings.

The different phases of the inventory were as follows:

1. Repeated inspections at all known previous breeding sites. All previous nesting sites were visited, including ones whose breeding habitat was destroyed but where the Montagu's harrier may have chosen a new site nearby. This is mainly the case for agricultural land, where differences in farming practices (crops) can mean that last year's fields are no longer suitable. "Repeated" means both short random checks (effective mainly during the Montagu's harriers' peak active periods) and longer continuous monitoring (up to 4 hours) to see whether the Montagu's harriers were breeding at the site. During their peak activity period, at least one 3-hour watch in good weather without observations is needed to make sure the Montagu's harriers are not breeding at the site.
2. Inspections of a large number of potential breeding sites in terms of biotope. In essence, the checks were done using random sampling with shorter visits to the site. In some cases where breeding was strongly suspected, longer watches took place.
3. Inspections in regions attractive to the Montagu's harrier (mainly for finding breeding in fields). Previously known areas were searched, as were areas with

scattered Montagu's harrier observations, through both random checks and more long-lasting observations from places that had a good overview.

4. Ongoing checks in areas where Montagu's harrier sightings were reported. All observations of Montagu's harriers during breeding season, where the observation could not be traced to a known pair, were followed up with inspections at presumed breeding sites (areas, biotopes).
5. Regular contact with ornithologists who were staying on Öland during the relevant period to collect reports on the Montagu's harrier. In addition, appeals were published and requests for Montagu's harrier data were communicated in other ways.

Inventories in 1996 and 2004–2008

The methodology during these years was the same as during the period 1975–1981, with a few exceptions.

6. In 1996, I had the help of another full-time surveyor, but without the “voluntary” participants as in previous years. In terms of time, it roughly translates to similar assistance during the inventories.
7. The nestlings were not counted or ringed in these inventories. Instead, all breeding was checked at a distance over a corresponding period of time (around 10 July to 5 August). These inspections determined whether the nesting site was abandoned or there were no feedings (indicating a breeding failure), or whether the Montagu's harrier pair was still feeding one or more nestlings (indicating a breeding success).
8. Between 2004 and 2008, another resource became available: observations could be reported in “Svalan”. As a result, new reports could be produced continuously and followed up on almost immediately. It was important, however to maintain contact with the many other ornithologists who did not report in “Svalan”.

Discussion

The inventories have aimed to find 100 percent of all breeding instances on Öland. Everyone probably realises the difficulty of reaching this goal, so a variety of approaches was used to get as close as possible to it. The problem here is that the inventory was not done using any easily quantifiable or repeatable method, like the line intercept or point intercept method. The main metric that can be used is time spent in the field during the inventory. For the past six years, the inventories were carried out by the same person, Staffan Rodebrand, who has many years of experience in inventorying Montagu's harriers on Öland, and the time spent in the field was recorded. There are advantages to this approach. It provided a generally solid understanding of the behaviour of Montagu's harriers, which simplifies reading and assessing the significance of observations, and excellent local knowledge down to the micro level, which allows us to know and quickly assess optimal observation sites. To achieve an equivalent inventory effort with less experienced surveyors would likely require much more time for taking inventory.

Over the past five years, inventory in the field including local trips has taken 625–650 hours each year. Attempts have always been made to keep travel times and miles driven down in order to maximise efficiency and minimise costs. The actual time spent was assessed as reasonable because the inventory's objectives could largely be met. Additional inventory time would probably have resulted in the discovery of another few pairs with failed breeding attempts. If breeding fails very soon after egg-laying, a new attempt is often made, but if this does not happen it can be difficult to get the breeding registered. If additional inventory time were added, it would be needed during the first phase of breeding, in which case an additional surveyor would be needed during that period.

Inventories outside Öland

On a few occasions during the first years of the project, as in 2006, inventories were also done outside Öland. These were not as comprehensive but were mainly done as checks of previously known breeding sites.

During the early period, sites were visited mainly in northeastern Scania, Småland and Gotland. On Gotland in particular, visits were made to many presumed sites (mainly *Cladium mariscus* marshes) to look for previously unknown occurrences. All in all, some breeding Montagu's harriers were found during these visits, both at old, known sites and at some new ones.

In 2006, several well-known sites in Scania, Småland, Gotland, Östergötland, Västmanland and Uppland were visited to check what the sites looked like, whether they could still be considered attractive for Montagu's harriers, and to determine the extent to which management measures were deemed necessary to restore or maintain them. Montagu's harriers were found at several sites. But the visits were only temporary and not adequate to determine with certainty whether the species was absent at the locations where no birds were sighted.

Comparison with reporting in "Svalan" (Swedish Species Observation System)

Discussions have been held on using the online reporting system "Svalan" (www.artportalen.se) to monitor Montagu's harriers and their population trends. "Svalan" currently has many users who contribute a great many observations. The material can certainly be used in many contexts to show distribution, occurrence, trends, etc. in different bird populations. There are limitations, of course. One of the most important, perhaps, is that most of the reports are not inventory results but rather observations from short visits in the field. For example, the number of contributors in different areas plays a major role and certain time periods become overrepresented. Another problem is that some people choose not to report their observations in "Svalan" for various reasons. The observations are reviewed by a rarities committee, and if they do not meet the set requirements they are made private so that no one except for the observer can view them. This can lead to major differences in reporting for less common species, where there is a risk that the proportion of reported and approved finds falls far short of the number

observed. For Montagu's harrier reports, this has little significance in Öland's case other than for seasonally rare finds (before mid-April and after mid-October) which might require detailed reports. In some parts of Sweden where the species is rarer, however, detailed descriptions of the observations are required more often.

In order to compare inventory results from 2004–2008 with the observations recorded in "Svalan", some calculations have been made. First, reports submitted in "Svalan" by the action plan author were removed. Second, reports from the different years were weighted relative to the total reporting on Öland for each time. The values used for the purpose of comparisons for the five years were:

I:1. Inventory results on the number of breeding pairs.

I:2. The breeding outcome, meaning the number of successful breeding attempts.

S:1. Total number of reports from "Svalan" (excluding juveniles, 1CY) during the breeding season 5 May–5 August.

S:2. Total number of reported juveniles from "Svalan" (1CY) during the autumn, 20 July–5 October.

S:3. Total number of reported birds, e.g. with breeding criteria, from "Svalan" (search on probable and certain breeding successes) during 5 May–15 August.

S:4. Total number of reported breeding pairs from "Svalan" at different sites (search on probable and certain breeding successes).

S:5. Reporting frequency (number of reports) in "Svalan" of all species on Öland between 18-31/5 and 18-31/7.

S:6. Total number of reports (S1) weighted relative to reporting frequency (S5), $S1/S5 \times \text{average for } S5$.

Year	I1	I2	S1	S2	S3	S4	S5	S6
2004	31	17	422	28	53	14	15 907	583
2005	23	10	472	35	33	17	14 800	700
2006	29	16	757	45	57	19	26 573	626
2007	36	16	663	103	32	14	25 408	573
2008	33	23	620	200	36	19	27 120	502
Average	30	16	587	82	42	17	21 962	597

When asked if reports to "Svalan" can be used to estimate the stock of Montagu's harriers on Öland, the answer was no. On average, "Svalan" reports just over half (17 out of 30) of the number of breeding pairs. When asked if "Svalan" can reliably indicate the difference in stock size in different years, the answer was also no, even if reporting frequency is taken into account. The reports in "Svalan" of fledged yearlings in the autumn also did not show any consistency with the breeding results during each year.

There are probably several reasons why the presence of Montagu's harriers is described so poorly in "Svalan". One reason is species-specific: for example, many breeding sites are in places that are rarely visited by ornithologists. Another reason is shortcomings and irregularities in the reporting. A meticulously detailed report from a home breeding ground is assigned the same status in "Svalan" as a summary report of one example at a vaguely defined geographical location. More than once, a personal direct follow-up of a vague report has succeeded in providing more decisive information, for example the bird in question was a male with prey in his talons that purposefully flew in a certain direction (a clear indication of breeding in a certain area). For reporting in "Svalan" to be used for monitoring Montagu's harriers in a dense population (such as on Öland), a more targeted collection of observations is probably needed that allows for negative observations. This means information about visits to presumed Montagu's harrier sites where they have not been sighted. Generally speaking, a higher quality of reports is also needed. This can be accomplished by providing detailed instructions on which parameters should be included to make the reports more valuable. In addition, a greater number of participating contributors is needed since too many people with substantial local knowledge are not currently submitting reports.