Migratory Behaviour and Conservation of European Montagu's Harriers studied by satellite telemetry

Background

Applied science or conservation science delivers basic data for the conservation of (threatened) species and thereby contributes to conservation of biodiversity. The population of Montagu's Harriers *Circus pygargus* declined in central Europe during the 20th century as a consequence of extensive habitat destruction and human persecution. Since then, Montagu's Harriers are red-listed in many European countries as declining or threatened species. In Germany and the Netherlands, there were around 350 BP at the beginning of the 21st century.

The original breeding habitats were heaths, moors, dunes and hay meadows. Since the end of the 20th century, around 90 % of the W-European Montagu's Harriers bred in farmland. Breeding in agricultural land includes the danger of destruction of nests, females and young during the harvest.

By successful co-operation projects of ornithologists and farmers, and especially nest protection measures, Montagu's Harriers breed successfully in farmland in many places now. For a further essential improvement in the breeding area, it is necessary to improve the (hunting) habitat. Today, this happens by agri-environmental schemes, which can improve food availability. Set-aside strips improve biological diversity in an intensively used agricultural landscape. Passerines and other farmland birds as well as voles and insects find good conditions for reproduction in the strips. In areas of the Netherlands and Germany, a slight increase in the number of Montagu's Harrier breeding pairs could be observed as a consequence of nest protection and agri-environmental schemes. The predator is at the top of the food chain and his well-being indicates a good health of the underlying eco-system.

Montagu's Harrier is a typical long-distance migrant. NW-European Harriers spend the winter – more than half a year – in W-Africa, mainly in the Sahel. Our most recent studies show, that they are still prone to human persecution there, and furthermore threatened by extensive habitat destruction and pesticide use against grasshoppers, which often are their main prey. A global protection of the species can only be realised by international measures, which are measures including the migratory pathways and winter areas. Concerning this period in the life cycle of the Harriers, there are still large gaps in our knowledge. To fill these gaps for the conservation of a protected raptor species, we analyse migratory pathways and habitat use during the winter using satellite telemetry. This will be the basis for an international protection strategy.

Results up to now

In 2005, the Dutch Montagu's Foundation together with the University of Groningen, Holland, and the Vogelwarte Helgoland, Germany, have launched a project on migration of Montagu's Harriers using satellite telemetry. The most part of the project has been financed by the Deutsche Bundesstiftung Umwelt and the Dutch Montagu's Harrier Foundation. Our goals up to now were the analyses of migratory pathways, the location of the winter areas and patterns of habitat use of NW-European Montagu's Harriers in the winter areas.

From 2005 – 2007, 19 Montagu's Harriers have been marked with satellite tags, of which 15 in the Netherlands and Germany, and each two in E-Poland and W-Belarus. Of these 19 birds, we have up to now recorded 24 migratory routes, of which 20 autumn and 4 spring routes. More spring routes have been documented in spring

2008 (not yet analysed). The majority of the birds was captured during the 2007 breeding season. Three of the six birds which were marked in 2006, and six of the 11 birds marked in 2007 are still alive and carry functioning satellite transmitters.

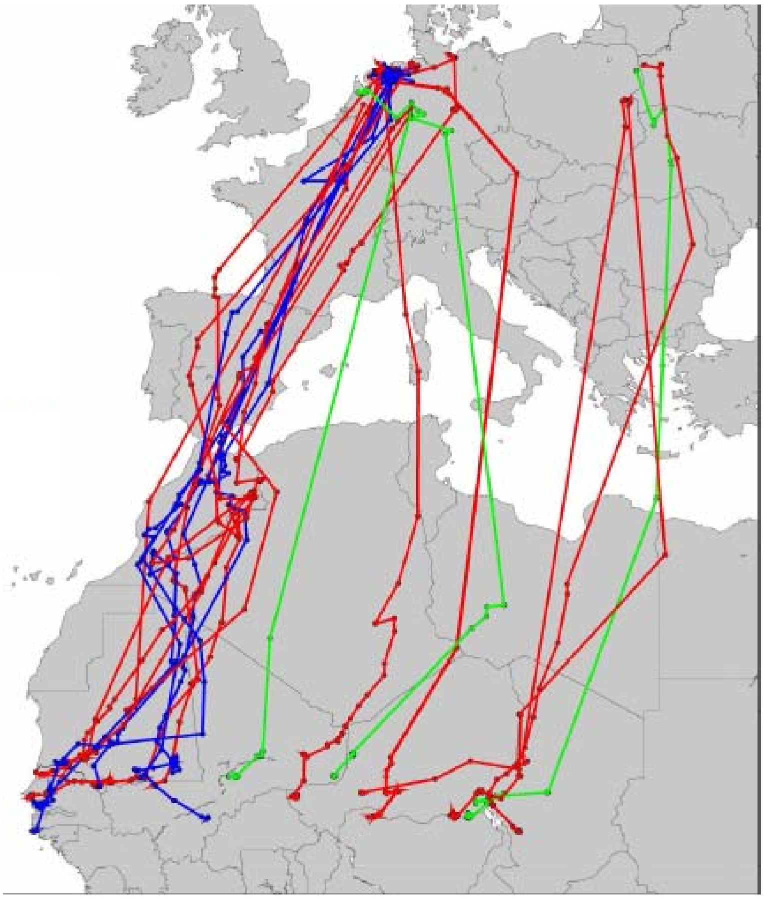

Fig. 1: Autumn migrations of European Montagu's Harriers documented by satellite telemetry 2005 – 2007. Red – females, blue – males, green – juveniles. Copyright Dutch Montagu's Harrier Foundation.

Different sub-populations migrate on different pathways to their winter quarters (fig. 1): 70% of German and Dutch Harriers migrated in autumn via France and Spain to W-Africa, the others via Italy or Sardinia. The eastern European breeding birds crossed the Mediterranean further to the east via Greece. Individuals seem to choose similar routes in autumn and spring. The different breeding populations migrate in population-specific narrow paths, and concentrate on the same hotspots (e.g. in Morocco). Knowledge of the migratory routes and hotspots is the introduction to general conservation measures.

The hypothesis of loop migration, wich was launched in the 1990s, postulates that W-European breeding birds migrate to Africa via France/Spain, follow migratory locust swarms to the east and return to Europe via Italy. Our findings up to now do not indicate such a loop migration.

It is noticeable that almost all European breeding birds, no matter which pathway they follow, end up in a narrow band, between 10° und 20°N, in their winter areas. NW- and NE-European breeding birds winter in the same habitat type, and sometimes even in the same area. Data on repeated journey indicate site fidelity in the winter area.

Building on our satellite telemetry studies, we travelled to the winter areas of the Montagu's Harriers in the winters of 2006-2008. The excursion took one month each and we visited Cameroon, Niger, Burkina Faso, Benin, Mali and Senegal. The main focus of monitoring and collecting ecological information on wintering behaviour was in western Niger. Using localisations of the tagged birds, we could identify roosts and activity areas. Two tagged birds were observed directly (in Mali and Senegal), and pellets from several roosts of tagged birds could be collected. We collected habitat information and pellets, which are analysed by local counterparts. Our observations indicate that grasshoppers are the main prey in many places, but diet can be much more diverse than expected.

Satellite telemetry is also a means to collect data on mortality of the birds. Often, the time and cause of death can be deduced from the satellite data. This makes it possible to judge important causes of mortality. Ten of the birds that have been marked since 2005 have died in the meantime. Two of them died in the breeding area, 2 in the winter area, 1 during autumn migration and 5 during spring migration. The last spring migration (2008) was fatal to many birds presumably due to extremly harsh weather conditions (sand storms and unfavourable winds). Of the two dead birds in winter, at least one was killed by a local farmer, who tried to protect his poultry. The bird that died during autumn migration and two of the birds that died during spring migration passed traditional hunting points in Morocco and on Malta and may have died from shooting. Raptor persecution is still a daily reality in Africa. This and the habitat destruction and pesticide use make it necessary to know precisely, which winter areas are important to our birds, in order to launch effective conservation measures.

We conclude that the satellite telemetry project has been successful up to now in identifying the basis of the migratory pathways and location of winter areas, as well as patterns of space use during the winter, within a relatively short study period. Relying on the localisations of the tagged birds, we can investigate the most important habitat paramters in the breeding and wintering areas. This is the basis for identifying habitat needs and Harrier hotspots during migration and winter, which is needed for an effective year-round conservation.

The Harrier in Denmark

Up to now, the focus of our satellite telemetry study has been exclusively on either W- or E-European Harrier populations. In 2008, our focus will be on tagging juveniles of parents which have been tracked before. Next to this, we would like to increase the sample size in eastern Europe, and the sample size of males in general, to better document the eastern pathway and the behaviour of males (compared to the large sample of females).

Although some of the western birds migrated via a central route (Italy, Sardinia) through the Mediterranean, we have not been able to sufficiently characterize this pathway, compared to the eastern and certainly the western pathways. A possibility for better investigating the migratory behaviour, route choice and wintering areas of Harriers choosing the „central“ route, is to tag birds at more central longitudes in Europe. The population in Denmark fulfills this criterium. Consequently, we propose to tag one or two adult Montagu's Harriers in Denmark.

What do we expect from the migrations of the Danish Harriers? Up to now, there is little information on the migratory behaviour of more central and northern European Harrier populations. The scarce ring recoveries from Denmark and Sweden do not include recoveries from the African continent. The recoveries from southern Europe (during migration) indicate that the northern populations may mainly use the „central“ route via Italy, and next to this the „western“ route via Spain.

Applying satellite tags to Harriers in Denmark would make the picture of European Harrier migrations more complete, and would add detailed knowledge about the migratory and winter behaviour of the Danish Harriers.

Technical part

Satellite transmitters

The type of transmitter we use is the following: Microwave PTT-100 12 g solar (see www.microwavetelemetry.com and our website www.grauwekiekendief.nl for a picture and technical details). In our experience, the performance of the 12 g tags is better than that of the 9.5 g tags. The battery of the transmitter is fed by solar pannels. Transmission can also proceed during bad light conditions and during night as long as the battery has been charged properly before. When a female incubates, the solar pannel cannot charge enough during several weeks and no signals can be sent. During prolonged flight and activity (migration) and in the winter (intense light conditions), the performance is optimal.

The precision of the signals is often poor in Europe and there can be problems in the Mediterranean area due to military radio disturbance (few and low quality signals). The highest precision is reached in Africa (good light and activity conditions al well as few disturbance).

The technical life expectancy of the transmitters is around 3 years, with a maximum of 7 years. Technical problems within the transmitter or death of the bird reduce the actual life expectancy. In 2008, we use exclusively transmitters with a 6:16 on:off cycle this, which means that under good circumstances, signals are received every day.

Harness

We use teflon ribbon to fix the transmitter on the bird, a method which has been invented by German White Stork researches and has been used on Eleonora's Falcons as well. We learned the method from Marion Gschweng (Eleonora's Falcons researcher) and use it successfully since 2005. It includes three loops: one around the neck and one around each wing. There's a flat knot on the breast and no ribbon over the shoulders, which gives the wings maximum freedom to move. Up to now we had no problems with ill-fitting harnesses. We have changed the transmitter of one female during a recapture after she wore the transmitter during one year (and went to Senegal and back), and found no signs of weak points or corrosion in the harness. Also we observed no skin irritation, a proper growth of the feathers under the transmitter, and no parasites between transmitter, feathers and skin. The bottom of the transmitter is a soft pad that does not irritate the skin. We have chosen for a permanent harness design in order to prevent premature transmitter loss, and prevent accidents of the bird caused by partly harness release.