IMPROVING PERFORMANCE OF ROADS AND RAILWAYS FOR WILDLIFE CONSERVATION:
Showing results with two case studies in Central Spain.

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Abstract

The Spanish Ornithological Society (SEO/BirdLife) is a non-profit making organization working for the conservation of biodiversity through the conservation of birds and their habitats. SEO/BirdLife is the Spanish representative of BirdLife International, a global partnership of organizations working for nature conservation in over 100 countries.

SEO/BirdLife uses its experience in conservation and research to promote the integration of environmental issues, especially priority areas for birds, into transport planning. This work includes advocacy for the participation of experts from different fields (e.g. environmental and socioeconomic) in the formulation and implementation of transport policies, plans, programs or projects, and covers from strategic planning to project management practice.

This experience has recently been applied in several projects for which national transport authorities requested the assistance of SEO/BirdLife, illustrated by the two case studies presented in this paper. The fist example details the procedure followed regarding four transportation routes (3 motorways and 1 high-speed rail line) planned across a protected area for birds in Madrid metropolitan area. Being a global study, the method applied for the assessment is a wide-scale one. At a more local scale, the second example focuses on the effectiveness of mitigating and compensatory measures being monitored in a steppe area of central Spain. This example is part of a current monitoring project for the high-speed rail line between Madrid and the French border, which follows a prior global assessment for the line.

Introduction

About SEO/BirdLife

The Spanish Ornithological Society (SEO/BirdLife) is a non-profit making organization working for the conservation of biodiversity through the conservation of birds and their habitats. SEO/BirdLife is the Spanish representative of BirdLife International, a global partnership of organizations working for nature conservation in over 100 countries.

SEO/BirdLife=s Conservation work

SEO/BirdLife=s conservation efforts focus on the network of Important Bird Areas (IBAs), which includes the sites that fulfil BirdLife=s scientific criteria in Spain. These criteria are based on population size, diversity and international conservation status of bird species. The 391 IBAs inventoried in Spain cover 16 million hectares and are of international importance for the conservation of 160 bird species listed in European Union (EU) legislation (Viada, 1998).

Among the legal instruments for nature conservation that exist at different levels of government (EU and Spanish central and regional), two of them are of particular importance to support SEO/BirdLife=s work: the Birds and the Habitats Directives (79/409/EEC and 92/43/EEC, respectively)[1]. The IBA inventory is the shadow list used by the EU environmental authorities to check whether the environmental Directives are properly implemented in Member States. The full implementation of these will eventually result in the creation of a network of protected areas representing the whole range of habitats and species across the EU.

Some of the IBA conservation strategies include promoting the integration of biodiversity objectives within sectoral policies, plans and programs, and promoting best management practice for wildlife conservation. Transport is one of the key sectoral policies in which SEO/BirdLife develops its conservation work, mainly through advocacy for the consideration of the IBA network. This advocacy work also includes demands for the participation of experts from different fields (e.g. environmental and socioeconomic) in the formulation and implementation of transport policies, plans, programs or projects, and covers from strategic planning to project implementation and management practice.

The need to improve integration of wildlife issues into transport planning

Spain is relatively underdeveloped within the EU, and on-going efforts are being made to overcome the deficit of infrastructure as compared to northern EU Members. Transport infrastructure is among the fastest growing sectors in the country, which has an outstanding value for wildlife conservation. IBAs cover roughly one third of the total Spanish surface, and Spain is the second European country (after Russia) richer in IBAs by number (BirdLife International, *in press*). Spain is also the richest country for biodiversity in general in the EU. Therefore, a considerable effort is required from the relevant authorities so as to integrate wildlife conservation objectives effectively into transport planning. Such efforts have been further urged by the recent implementation of the EU Habitats Directive. Some of the projects included in this paper are currently under examination by EU authorities regarding compliance with this Directive.

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[1] Directives are the Laws issued at European Union level, and thus apply in the 15 Member States of the European Union.

In this context, national transportation authorities requested SEO/BirdLife=s assistance to improve their performance regarding wildlife conservation objectives. In accepting this, SEO/BirdLife has had important gains that can be useful to improve future conservation strategies and to improve the environmental inputs to transport planning in general. But, most importantly, significant negative impacts on key bird species and their habitats have been identified and prevented. In addition, mitigating and compensatory measures[2] have been proposed, the implementation of which can improve the conservation status of such populations.

The two case studies presented in this paper illustrate the assistance work of SEO/BirdLife in transport planning and implementation in Spain. The fist example details the procedure followed regarding four transportation routes (3 motorways and 1 high-speed rail line) planned across a protected site for birds in Madrid metropolitan area, just 12 km away of Madrid City, that holds over 3 million people (5 million in the whole metropolitan area). Being a global study, the method applied for the assessment is a wide-scale one. At a more local scale, the second example focuses on the effectiveness of mitigating and compensatory measures being monitored in a steppe area of central Spain. This example is part of a current monitoring project for the high-speed rail line between Madrid and the French border, which follows a prior global assessment for the line.

CASE 1: Improving compatibility of multiple transport routes across a bird conservation zone in Madrid Metropolitan Area

Background

This case study corresponds to a wider study commissioned and funded by the Spanish Ministry of Public Works (Secretaría de Estado de Infraestructuras y Transportes del Ministerio de Fomento) (SEO/BirdLife, 1999). The main objective was to determine whether the construction of four routes across a protected area for nature conservation would be critical for the site and, therefore, would undermine the coherence of the EU network of conservation areas aimed at through EU environmental legislation. Compensatory measures were also designed that condition the implementation of the transportation projects.

Transport projects usually undergo Environmental Impact Assessment process, in which formal public consultation takes place. The final decision made by the environmental authorities during the EIA is a condition for final approval of the project. However, the process is not always sufficient to provide the environmental authorities with enough information on the environmental consequences of the projects. Moreover, the EU legislation demands that when plans or projects are likely to affect a protected area, a joint assessment should be carried out for them before development consent is given. Those projects having negative environmental effects that are approved have to justify that they are of the utmost public interest, and have to provide for the implementation of adequate compensatory measures.

Study Area

The region of Madrid, in central Spain, shows a clear contrast between urban areas and nature conservation areas. This is highlighted by the fact that 40% of the regional surface has been proposed to be part of the EU network of protected areas.

The study area is a 28.300-ha Special Protection Area (SPA) for birds under EU legislation, and also Regional Park under Madrid region legislation. The site has had statutory protection for several years (since 1994), although the management plan has only recently (early 1999) been issued and is in the early stages of implementation.

During the last 20 years, industrial and urban land uses have become increasingly important in the area, and the new transportation routes will very likely contribute to these changes in land use. In fact, the need to facilitate the urban, industrial and logistic development of the south east of Madrid region is the main rationale behind the motorway projects. These include two ring roads and one eastward toll motorway. A high-speed rail line is also planned (Figure 1).

The SPA is important for it gives shelter to a variety of bird species, of which Peregrine Falcon *Falco peregrinus*, Lesser Kestrel *Falco naumanni*, and Black Kite *Milvus migrans* are key. Watercourses and riparian forest provide additional value to the protected site, which is also important for bird migration. The protected area presents three types of habitat that are listed in the Habitats Directive[3].

The populations of the three key bird species are mainly concentrated in the north of the site, where the four transportation routes have been aligned crossing the Jarama River. The main area affected is a strip of land where the river runs along chalky (gypsum) cliffs. These are breeding sites for Peregrine Falcon and Black Kite (exceptionally, since the species normally breeds on trees). Lesser Kestrel breed in the roofs of old buildings, using the open dry croplands as feeding habitat.

Lesser Kestrel is globally threatened (Collar *et al*., 1984). The species, the largest European populations of which are in Spain and Turkey, is in large decline in Spain (Tucker and Heath, 1994); the 20,000-50,000 pairs estimated in 1980 had fallen to 4,200-5,100 by 1990 (Gonzalez *et al*, 1990). Moreover, Lesser Kestrel has been classified by Madrid regional administration as Ain danger of extinction@.

Methodology

The global assessment of the effects of the four transport routes on the SPA was made resembling current practice in Environmental Impact Assessment and Cumulative Assessment. In a first stage, both the routes and the SPA characteristics were analyzed in order to focus the study on:

a) Project actions/features that are likely to have significant influence on the natural environment. These were described and, when possible, quantified. The analysis also included the way in which these actions/features would affect the study area.

b) Key habitats and wildlife most likely to be significantly affected; these were then given a value according to a set of criteria that included ecological and legal aspects (i.e. protection under current national and EU legislation). This phase included fieldwork, and the results were incorporated into a GIS (Arc/View 3.1 for Windows).

During the second stage, a detailed assessment of the impact of the routes upon the natural environment was undertaken. The impacts were classified as direct, indirect or induced. >Induced impacts= included the ones associated to the development process linked to the improvement of accessibility derived from the construction of the roads, mainly new homes and industrial estates, which seemed to be a major factor of pressure on the SPA. The

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[2] Compensatory measures are the actions proposed to improve the status of the populations of species or habitats that are negatively affected by the construction of infrastructure projects. These can include a wide range of measures, included new protected areas, research, implementation of environmentally friendly farming schemes to improve availability of high quality habitats required by wildlife, etc.

[3] These include the *Gypsophiletalia* of the chalk cliffs, the mixed *Salix /Populus* riparian forest and *Quercus* mediterranean scrubland.

Apressure area@ for induced development was determined according to the traffic forecasts and to the allocation of land in the relevant local plans. The assessment was made with the aid of the GIS and included both quantitative and qualitative appraisal.

Following this initial assessment, it was determined whether the joint development of the four routes would be critical for the maintenance of the conservation value of the SPA. This involved the identification of impact mitigating measures and/or techniques that were feasible and effective (the report included recommendations regarding these measures). The final statement of the assessment was made considering only the impacts that could not be avoided at all and, therefore remained as significant. These >residual impacts= were the basis for the last stage of the study, which consisted of the formulation of the set of compensatory measures for the SPA. These were also subject to feasibility analysis.

<u>Environmental features of the SPA and selection of indicators</u>

Habitats

The description of the SPA was based on the types of vegetation identified in the management plan (Comunidad de Madrid, 1999), the distribution of which was confirmed in visits to the site. These included irrigated and dry croplands, several types of scrubland, Mediterranean always green *Quercus* woodland, pine woodland, riparian forest and wetlands. The SPA was then divided into seven habitat types: (1) Riparian forest; (2) Irrigated croplands; (3) Dry croplands with olive trees; (4) Chalk cliffs; (5) Mediterranean *Quercus* scrubland and woodland; (6) Pine woodland and (7) Wetlands. Habitat types 1, 4 and 5 are protected under the EU Habitats Directive. These are the ones showing the least human influence. Human-made dry croplands are also important, since they are habitat to important populations of the steppe bird species of the SPA, which either breed or feed on them.

All four routes are aligned across the north of the SPA. However, the entire site was studied owing to two main reasons. Firstly, the extent of the impact area had yet to be determined. Besides, any part of the site could be eligible for the implementation of compensatory programs, regardless its relative environmental value. This previous analysis would provide the basic information for such programs.

Wildlife

The groups of wildlife included in the assessment were birds and mammals. Birds were at the center of the analysis from the start, since the study area has been protected, in particular, for the conservation of its bird populations. In addition, the best scientific knowledge was on birds= distribution and habitat selection. Nevertheless, other wildlife groups were considered (mammals, reptiles, amphibians and insects), but after applying a series of criteria, all of them but mammals were left aside. Some of the criteria were:

- The response to impacts arising from the projects should be clear;
- Enough information on them should be available;
- Their distribution in the study area should be homogeneous;
- They should be present in a large number of the habitat types of the site;
- They should include species that are representative of the seven habitat types;

The analysis confirmed that birds were the most suitable group, and mammals were also selected, mainly owing to their likely response to the proposed projects. Therefore, the study only considered these two wildlife groups.

Birds included the three key species of the SPA (see above) and other species for which the area is also important, such as the steppe-living birds of the dry croplands (e.g. Great Bustard and Little Bustard). Overall, 16 species were included in the analysis, and their area of distribution within the site was incorporated into the GIS. The information on the trends of these bird populations was already available, since SEO/BirdLife yearly records it.

Only medium size mammals were likely to live in the site, according to existing records in site or in similar areas of central Spain. The field surveys carried out showed that mammals are very poorly represented in the area both in terms of richness and distribution of species, and only Rabbit, Hare, Fox were common, with Stone Marten and Genet being scarce in the study area[4]. With these results, mammals became marginal in the assessment, although the data obtained were incorporated to the GIS too.

Natural Value

Once the environmental elements were defined, it was necessary to set relative conservation values within the SPA. With this purpose, the following set of criteria was selected and applied (partially based on Ratcliffe, 1997; NCC, 1989):

- Size: area of habitat or population size of individual species. In general, the larger habitat unit or the populations size the more the conservation value.
- Diversity: species richness and/or diversity in the communities of the site.
- Rarity: determined by the extension of the habitat and/or the size of the population, or the national, regional or local distribution of a given species.
- Naturalness: degree of human influence in a particular habitat.
- Representativeness: extent to which a given area or population is a good example of a particular community or habitat.
- Fragility: degree of sensitiveness of species and communities to changes, either natural or human-induced.
- Position within an ecological unit: whether a particular area acts as buffer or shows a complete succession of ecological stages.
- Need for Conservation: conservation status of an area or species at global, national and regional level.
- Legal protection: conservation commitments through global (International Conventions), EU (Directives) and national and regional legislation.

Firstly, the criteria were applied giving the same weight to habitats and species. The resulting intervals were grouped into three categories of Ahabitat quality@ (high, medium, low). A second stage consisted of the application of additional value to those areas of the SPA that are habitat of bird species that:

- Are key for the designation of the SPA.
- Are globally threatened.
- Are in decline and important populations for their conservation in Europe are recorded in the SPA (over 1% of the Spanish population, with this being over 1% of the European population).

This finally distinguished four categories of Anatural value@ (very high, high, medium, low) within the site, and only Lesser Kestrel was under all the three criteria. The whole process was undertaken in absolute terms, that is, not considering any reference outside the SPA. The eventual

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[4] The working team included an off house expert to undertake the studies on mammals.

classification according to Anatural value@ is key to the subsequent assessment, since it provides the reference to determine the relative significance of the impacts.

Socioeconomic context: indicators of induced development

The Metropolitan Area around Madrid, with over 5 million people, is subject to fast economic growth, with full support from the regional authorities (Comunidad de Madrid, 1996). This is particularly clear in the study area, the south east, where agricultural land has been gradually allocated to industrial and urban uses in the last few years. The study area is between a 1,5-million people urban/industrial agglomeration to the south of Madrid City and Madrid-Barajas International Airport (north of the SPA). The current airport is being enlarged and the project to build a new international airport to the east of the site is very advanced. The SPA is, therefore, at the center of an emerging logistic area, where urban and industrial development is also planned.

The relevant transport authority justifies the three roads assessed as being essential for the fulfillment of the proposed planning for the area around the SPA. Besides, the link between transport and land use planning is clear. Transport infrastructure contributes to land use changes, and new land uses can generate the need for new transport facilities (Headicar & Bixby, 1992; DETR, 1998; Hill *et al*., 1997; Mackie, 1998).

In this context, SEO/BirdLife considered that it was particularly important to address the likely effects of the land use changes linked to the transportation infrastructures, since this could be most important source of negative impacts on the SPA. Only the roads were considered relevant for induced effects, since the land use changes related to the high-speed rail line would occur around the first stop of the line outside Madrid City, which will be at least 60 km away from the SPA, and therefore would not imply significant induced effects.

Several socioeconomic and planning elements were considered good indicators of likely induced development. These include:

- The traffic flows estimated for the new roads, with indication of the origin and destination of trips. This helped estimate the area where the development linked to the roads could take place.
- The land allocation in regional and local land use plans for the SPA and adjacent land. This is an indication of the time scale in which the induced development could take place (short, medium, long term).
- Sectoral planning in the area. This indicates likely cumulative effects resulting from interaction with projects of a different nature.
- Planning history in the area, which can confirm the trends identified.

Key features of the projects: impact indicators and other considerations

The part of the SPA affected by the four projects is the land strip along the Jarama River, and the four projects had to define a long viaduct, some of them for the entire length across the SPA. The land band occupied by the routes was standardize to facilitate the accurate estimation of permanent and temporal loss of land with the GIS (the bandwidth was given 175 m, 100 m if there was a viaduct). Direct and indirect impacts were estimated mainly using the length of the alignment within very high and high natural value areas of the SPA and its position relative to different habitat units, distinguishing between viaduct and non-viaduct sections. The number and location of road junctions was also considered, for it gives indication of future induced development around it. Other elements considered in the socioeconomic and traffic context were useful to estimate direct, indirect and induced development effects. For example, traffic indicated the magnitude of disturbance and was also useful to determine the development area.

An additional issue of particular importance in this case study arises from the road authority promoting the roads. The national Ministry of Public Works promotes the ring road (M-50) and the toll motorways (R-3), while the other ring road (M-45) is the initiative of the regional government of Madrid. The two ring roads run very close to each other in the northern section of their alignments along the SPA, when going across the Jarama River. The need for two separate routes in such a small area is not clear, since it seems reasonable that one single alignment could satisfy the planning objectives.

Impacts considered

The impacts to be considered in the assessment were selected after analyzing the main features of both the projects and the study area, and the interactions between them. The magnitude and significance was finally estimated for the impacts detailed in table of results (see next section).

These impacts were assessed individually for each of the four routes separately and the global impact was determined afterwards. This had both quantitative and qualitative components, and incorporated the possibility of applying feasible and effective mitigating measures.

Results: the need for compensatory programs

The significant impacts are summarized as follows:

IMPACT	HSRL	R-3	M-50	M-45
Hábitat loss or Degradation	medium	medium	high	high
Fragmentation and Barrier effect	N/a	N/a	not significative	not significative
Disturbance to wildlife	high	medium	High	high
Destruction of clutches	high	high	not significative	not significative
Collisions and electrocution	low	low	Low	low
Induced development	N/a	high	High	high

After corrective measures were considered, only habitat loss and degradation, and the impacts resulting from induced development, were identified as globally significant. Therefore, these determined the need for the formulation of programs to compensate their effects. Maximum significant habitat loss was estimated to be 23.22 ha, with maximum significant habitat degradation tallying 25.17 ha.

The likely effects of the M-50 road would be particularly significant for the populations of Lesser Kestrel in the SPA, mainly through the fragmentation and loss of its feeding habitat within the site. Riparian forest in the Jarama River would also be affected. This led to studying alternative alignments. In spite of the little land available, and the multiple factors conditioning the route, it was possible to improve the alignment. Nevertheless, significant impacts remained for the populations of this globally endangered species, mainly as a result of the likely induced development linked to the category of land adjacent to the SPA.

In general, land allocation within the SPA was consistent with the nature conservation objectives of the site, but urban/industrial uses surrounded the protected area (Figure 2). This was interpreted as an indicator of development pressure in the short-medium term, and could be critical for the populations of Lesser Kestrel (directly by occupying feeding areas) and Peregrine Falcon (indirectly by effects on prey populations and through disturbance). The induced development affecting Lesser Kestrel seemed to be linked to the M-45 and M-50 roads, and the R-3 showed the greatest effects on Peregrine Falcon.

Regarding the ultimate objective of the study, it was determined that the projects would compromise the maintenance of the EU network of protected areas under the Habitats Directive, and it was, therefore, necessary to formulate compensatory measures to prevent critical loss. In addition, the need for coordination between the regional and the national transport authorities to agree on one single route for the M-45 and the M-50 was clear.

The compensatory programs were outlined in several groups of action as shown:

- Group 1: Actions to compensate habitat loss, including natural habitats and non natural habitats that are important for key bird species[5].
- Group 2: Actions to maintain populations of priority bird species within the SPA.
- Group 3: Actions upon general impact sources already existing in the SPA, including power lines.
- Group 4: Monitoring of the program implementation.

These measures included a variety of schemes, ranging from direct wildlife management to campaigns of best practice amongst, for example, farmers and hunters. Some of the measures were useful for one single species, while others were likely to have a wider range of benefits.

Conclusions

Some of the issues raised by this case study include:

1. The importance of undertaking joint analyses for various projects planned in a reduced area. In this case, the four routes are being proposed very closely in time as well. Two of these projects had already been considered as environmentally viable with no major restrictions. However, their analysis together with the other two routes showed a different scenario. Joint analyses can also enhance coordination between different planning authorities (e.g. the case of the M-45 and M-50) and help optimize the use of funds towards common planning objectives.

2. The importance of incorporating environmental considerations at an early stage in transport planning. Despite the late planning stage of the projects analyzed, it was still possible to modify some aspects of the proposals in order to minimize unwanted effects on wildlife. Such project improvements could have resulted in wider environmental adequacy if wildlife criteria had been considered from the very beginning.

An early start in incorporating environmental considerations and consultation could have provided for wiser alignment of the routes and for more effective implementation of preventing measures. For example, the Lesser Kestrel can be reasonably easy to manage, and a program to set breeding sites and to manage feeding areas in suitable plots of the SPA could have been implemented early in the process to try and prevent and mitigate negative effects.

3. The need for coordination between administrations is clearly reminded by the example of the M-45 (regional) and the M-50 (national). These two roads have very similar objectives in the section affecting the SPA, but take different alignments that unnecessarily damage a well preserved riparian fringe. A better coordination between the relevant authorities would have avoided this situation.

4. The importance of considering the land use change associated to roads is also a major outcome of the study, which has showed that, probably due to the Metropolitan context of the study area, this induced development could be the main source of negative impacts on wildlife. The need to integrate transportation and land use planning is thus clear, particularly in Metropolitan areas, where the allocation of land for nature conservation objectives is subject to ongoing pressure.

5. Last, but not least, road and railway planning administrations should incorporate teams of experts in several fields including environmental legislation, scientific and biological knowledge and socioeconomic aspects. Multi-disciplinary assessments should be undertaken, preferably in house, for all the proposals that they issue. This is the starting point to overcome current gaps and inadequacies in the environmental inputs to transport policies, plans, programs and projects.

CASE 2: Testing effectiveness of compensation measures for Dupont=s Lark *Chersophilus Duponti* in a natural steppe area

Background

The EU issued a transport strategy that includes the development of a Trans-European Transport Network (TEN) (European Council, 1996). One of the fourteen priority projects selected in 1994 is the high-speed rail line (HSRL) Madrid-Barcelona-Perpignan- Montpellier. The development of the TEN must take into account environmental considerations, and must comply with EU Directives such as the Environmental Impact Assessment Directive (83/337/EEC) and the Birds and Habitats Directives. The TEN will also be subject to Strategic Environmental Assessment (European Commission, 1994).

In Spain, GIF is the body in charge of developing the HSRL Madrid-France since May 1997, and is integrated within the Spanish Ministry of Public Works. Early after it was set, GIF invited SEO/BirdLife to work co-operatively, and a general framework contract was agreed in order to establish working lines that can contribute to improving the environmental adequacy of new HSRLs. The framework contract, ongoing, was set up with the following objectives:

- A global assessment for the whole route between Madrid and the French border, taking birds and mammals as wildlife indicators (Finished). The objective was to identify areas of likely significant negative impact that had not been previously detected, partly because the environmental analysis of the HSRL had been done for separate sections rather than for the whole alignment. The assessment was done for birds and mammals, and showed that the rail line affected both wildlife groups only in a few areas. In the remaining, either birds or mammals would be significantly affected. Special mitigating and compensatory measures were devised for the conflict areas identified.
- Detailed analysis of particular Ahot spots@ where the HSRL coincides with other transport routes (Finished). One of these >hot spots= was the protected area dealt with in Case 1 (above).
- Monitoring of the actual environmental impact of the HSRL on birds (On course).
- General assessment towards improving the incorporation of environmental parameters into transportation planning and implementation (Ongoing).

5 Impacts on mammals resulted non-significant, mostly due to the fact that they are extremely scarce in the part of the SPA affected.

This case study will focus on the Monitoring of the actual impact of the HSRL. The objectives of the monitoring program are:

- Evaluating the real impact of the line on bird populations, both during construction and during operation.

- Estimating the distance to the rail tracks to which bird populations are affected by noise and vibrations from the HSRL.

- Assessing the likely bird mortality resulting from collision with the trains.

Although it was not initially aimed at testing effectiveness of the compensatory measures formulated for the areas identified, SEO/BirdLife has found this a major outcome of the monitoring program. The program is structured into seven individual projects and has been aimed at including all the bird groups that will be affected by the line. The areas for the implementation of the individual monitoring projects were chosen out of the ones identified in the previous global assessment. The projects are:

10 Monitoring of a population of passerines in ALa Alcarria@

20 Monitoring of a population of steppe-living passerines in APáramos de Layna@

30 Monitoring of a population of cliff nesting raptor in AUrex de Medinaceli@.

40 Monitoring of steppe-living birds in AMonegros@

50 Monitoring of Lesser Kestrel colonies in AMonegros@

60 Monitoring of river crossing areas ARiver Jarama@ and ARiver Ebro@

70 Monitoring collision of birds

Projects 1 to 6 have already started implementation (pre-construction and construction phase of the rail line), and project 7 will start when the line is in operation. This case study will focus on monitoring project number 2, which shows that the compensatory scheme for this area has a high potential for success.

Study Area: APáramo de Layna@

The APáramo de Layna@ is located in central Spain. It is a steppe-like, almost treeless, upland plateau with rocky outcrops. Cereal crops are scarce, and vegetation consists mainly of broom (*Genista pumila*) and thyme species (*Thymus sp*.). The APáramo@ is habitat to populations of steppe-living birds, of which Dupont=s Lark (*Chersophilus duponti*), with 500 breeding pairs, is particularly important (Garza & Suárez, 1990, 1992). The area, identified as IBA according to this ornithological importance (Viada, 1998), is affected by the HSRL in its northern part.

Dupont=s Lark is one protected species under Spanish and EU legislation. The populations of this Lark are not concentrated in Europe, but show unfavorable conservation status in the continent. In fact, Spain is the only European country where the species is present, and population trends are clearly negative (Tucker and Heath, 1994).

The monitoring program is organized in five years: 1 control year (prior to construction), two years during construction and two years during operation. The main aim of this monitoring program is to determine the actual impact of the HSRL on the populations of steppe-living birds in the site, with particular focus on the populations of Dupont=s Lark. The data analyzed in this case study have been obtained during the first year of implementation.

As mentioned, this area was identified during the global assessment process of the complete Madrid-French border HSRL. The compensatory measures for the likely impact of the rail line on the site=s bird populations consisted mainly on the purchase of agricultural land towards the center of the area. This is complemented with recommendations regarding best management practice for the conservation of the populations of steppe-living birds.

Methods

Parallel Transects

Bird population censuses have been undertaken for all the steppe-living species along the future railway route and also at 50, 100, 150 and 200 m outside the alignment. The censuses were made along parallel transects to the railway taking 25-m bands either side of the transect line. It will be possible to compare these results with the ones obtained in subsequent years within the complete monitoring program. Overall, eighty 200-m long parallel transects (at distances from 50 to 200 m from the line) have been done, with their respective 25-m band either side. This has covered a total area of 80 ha.

For each transect, all the individuals contacted, either sought or listened, were recorded, and it was specified whether contact had occurred within or outside the 25-m band either side of the surveyor (Järvinen & Väisänen, 1975). All the censuses were undertaken during the early morning hours (Järvinen *et al.*, 1976; Järvinen & Väisänen, 1976, 1977).

The data obtained give an estimate of bird density at different distances to the rail track.

Perpendicular transects

A complementary series of transects perpendicular to the future rail track was also set up in order to determine the minimum and the average distances at which the different bird species of the area are recorded. The objective is to obtain information that allows the estimates of disturbance to birds occurring during the line=s construction and operation (e.g. if subsequent transects show that the distance to the rail track of bird populations is increasing).

A total of 13 one-kilometer long transects with 25-m bands either side of the observer=s line have been surveyed. This has covered a total area of 65 ha. The records included, for each individual detected within the 25-m band, the distance to the proposed rail alignment.

Results

The analysis focused on Dupont=s Lark, Sky Lark, Short-toed Lark, Calandra Lark and Thekla Lark. All these Larks are protected under national and EU legislation, with Sky Lark presenting the most favorable conservation status. The results regarding density and distance to the rail track are:

Density of Larks

The density of Larks at different distance ranges from the rail track have been obtained from the results of the parallel transects to the rail track. The data show that the highest densities occur along the area which will be occupied by the rail track (Figure 3). However, it should be noted that 65% of the records obtained corresponded to Sky Lark.

In general, the distribution of Lark species suggested by the data is consistent with current knowledge on their habitat selection (Tellería *et al*., 1988). Dupont=s Lark is a specialist species most frequently living in unproductive drylands (Aeriales@) and uplands (Aparameras@), while Sky Lark is widely distributed on open areas, although spring population concentrates where croplands and grasslands are dominant. This trend is more clear for Calandra Lark, which shows strong preference for cultivated areas. Short-toed Lark, in turn, is widely distributed in the open areas, and present large numbers in dry uplands (Aparameras@ y Aeriales@). The records obtained for Thekla Lark were too low and it was not possible to determine habitat selection estimates. The differences in habitat selection shown by the four species analyzed determine different distribution patterns regarding the distance to the future rail track.

Another issue behind the distribution patterns identified is the location of the area surveyed, along the rail alignment. The rail track will go across the northern border of the APáramo@, where there is a great influence of the surrounding habitats, mostly agricultural land. The distribution patterns are also due to the croplands existing inside the site, which favor the presence of species linked to these environments.

The lowest densities of Dupont=s Lark have been recorded closest to the rail track, and increase gradually up to a distance of 100 m, where population density becomes more stable (Figure 4). The lowest figures by the rail alignment do not seem to be related to lowest habitat quality, but rather to competence with Sky Lark. In fact, the distribution of Sky Lark is negatively related to that of Dupont=s Lark (r_s=-0,9; P<0,01), with the maximum value being in the rail track area.

The higher abundance of Sky Lark along the future track should be interpreted as resulting from the Aborder effect@. This is also the case for Short-toed Lark and Calandra Lark (Figure 4). These two species are usually more abundant in cultivated areas than in unproductive ones (Aeriales@), and, therefore, the location of the area surveyed in the proximity of cultivated areas bordering the APáramo@ can determine their distribution pattern. This also shows that Short-toed Lark in more tolerant than Calandra Lark to the presence of scrub within its habitats. Figure 5 shows the abundance of each species according to distance to the rail line.

Nevertheless, the differences reflected in the figures are not statistically significative for any of the species. This can be due to: (1) the lack of actual differences, and thus the ones observed can be attributed to survey effects; or (2) the great variability among the data owing to the low density observed for some of the species analyzed and to the fact that these present aggregated distribution.

Distance to the rail track

According to the results of the perpendicular transects, there are no significative differences regarding the average distance to the rail line of each of the species. However, as suggested by Figure 5, the variance seems to have a major influence on these differences.

Considering only the average distance to the rail track, it is Dupont=s Lark and Short-toed Lark that seem to be closer. Although this result may appear as contradictory according to the results of the parallel transects, it is not. Actually, what this reflects is that these two species present a better (more homogeneous) distribution in the area, while the average value for those species strongly linked to cultivated areas is markedly biased, under the influence of the croplands located between 500 and 1,000 m away from the proposed alignment. The results also show that those species with the lowest densities (Dupont=s Lark and Short-toed Lark) are also the ones presenting the highest variance.

Conclusions

The main conclusions out of the monitoring project analyzed in this case study are two-fold. The main set of conclusions, below, are those regarding the objectives of the monitoring program. Nevertheless, another clear conclusion regards, like in case study 1, the need to undertake this kind of assessments for all new projects, and to integrate wildlife experts into the transport planning teams. These multi-skilled teams will be in a better position to assess the global impact of long routes that are usually divided into shorter sections for its environmental evaluation, and will have better information to take the most adequate measures to prevent, mitigate and compensate negative impacts.

The results for Dupont=s Lark in APáramo de Layna@ show that there is a border effect that is particularly negative on this species as compared to Sky Lark. The former presents lower densities at the border of the APáramo@ than the latter, and this seems to be a result of competence between species from the neighboring cultivated areas. Owing to this situation, even though the area of land taken by the HSRL is not large, land take can have a significant negative effect on the populations of Dupont=s Lark because of the reduced total area of the steppe habitat in the site.

Considering the existing relationship between species and habitats, the purchase and adequate management of agricultural land inside the APáramo@ appears excellent as compensatory measure for the likely impact of the HSRL on the population of Dupont=s Lark that was estimated in the global assessment. This measure actually implies the exchange of mid-value steppe plots at the border of the Páramo, which anyway are occupied by the line, for very high-value plots in the center of the steppe area. The scheme can ultimately favor the species, since the core population in the area will be consolidated.

The application of this program at an early stage of project implementation has almost turned a compensatory measure into a preventing measure for the impact of the line on Dupont´s Lark. This is particularly useful for the conservation of populations of one single species with unfavorable conservation status.

The monitoring of the actual impact on wildlife of the HSRL has provided the relevant railway administration and SEO/BirdLife with sufficient information to design new mitigating/compensatory programs, or to improve existing ones. Using this information, such programs can gain efficacy in minimizing the negative impacts arising from the implementation of large transportation routes along particular areas that are key for the conservation of priority wildlife species.

Acknowledgements

The authors would like to acknowledge the Spanish Ministry of Public Works and GIF (Gestor de Infraestructuras Ferroviarias) that promoted, commissioned and funded the projects detailed in this paper. Particular thanks are due to Cristòfol Jordà, of the cabinet of the Secretary of State for Transport and Infrastructure, Spanish Ministry of Public Works, who has been the main driving force on the part of the transport authorities, and to Fernando Martínez and Carles Casas of GIF. Emilio Virgós (consultant), Marcos Llorente (consultant) and Jesús Rubio (Road Planning Authority, Spanish Ministry of Public Works) were also actively involved in the completion of the projects, and Roberto Bruna, Pedro Mengotti, Pilar Olalde and Emilio Recuenco, from INTECSA, provided technical support for the first case study.

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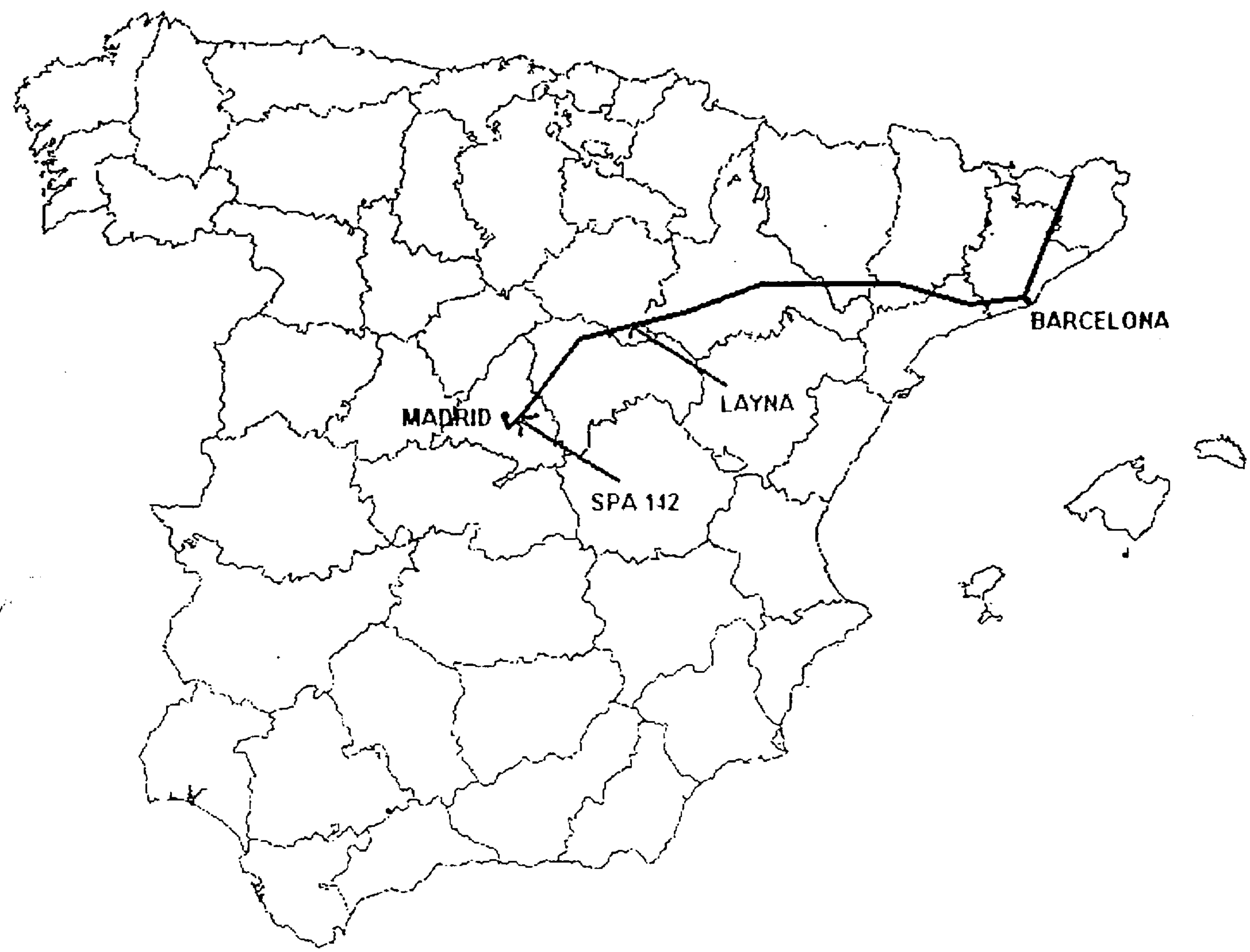
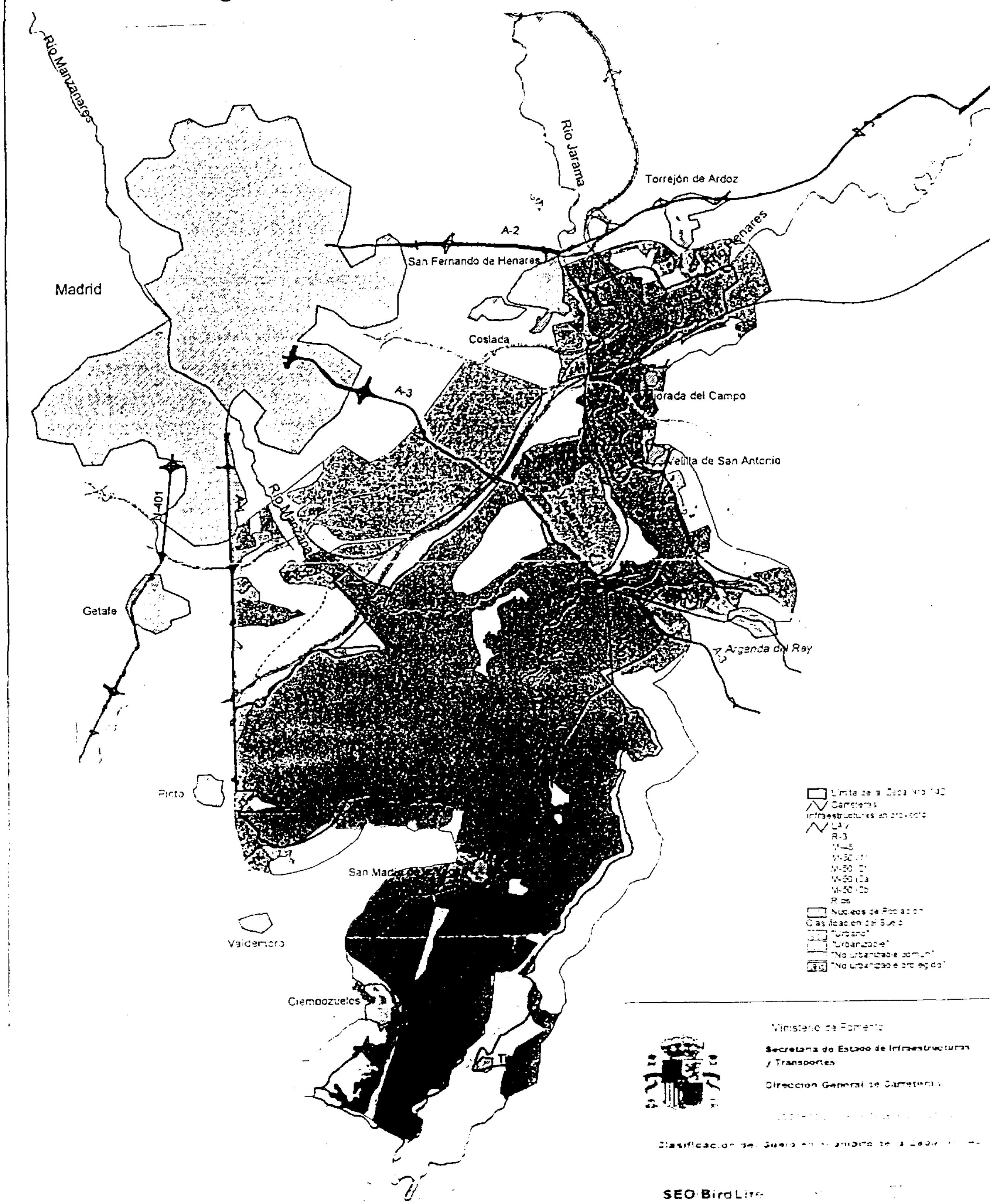


Figure 1. Location of the High-Speed Rail Line Madrid - France Border with indication of the study area for Case Study 1 (SPA 142) and Case Study 2 (Layna

Figure 2. The Study Area Showing Current Land Allocation



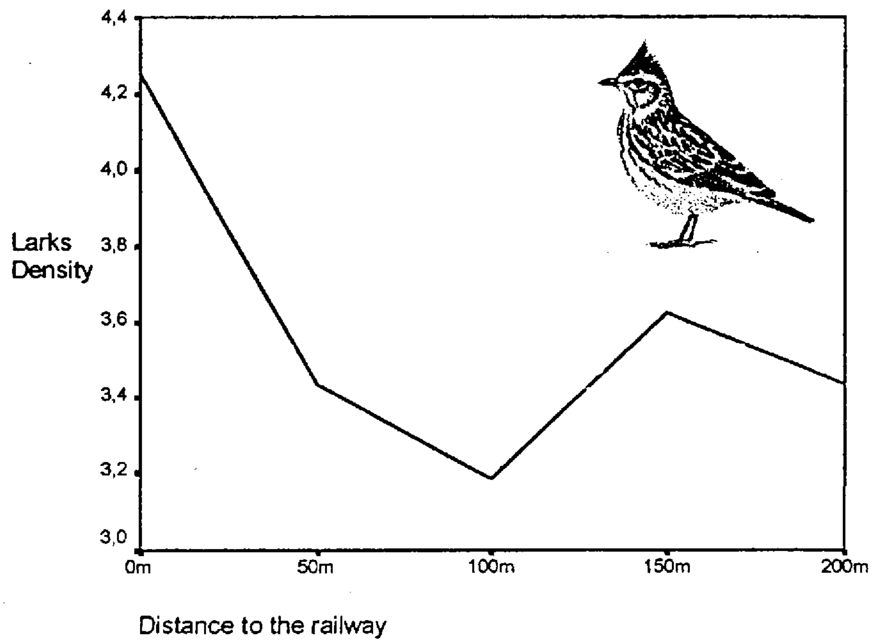


Figure 3. Lark densities at different distances to the future rail track

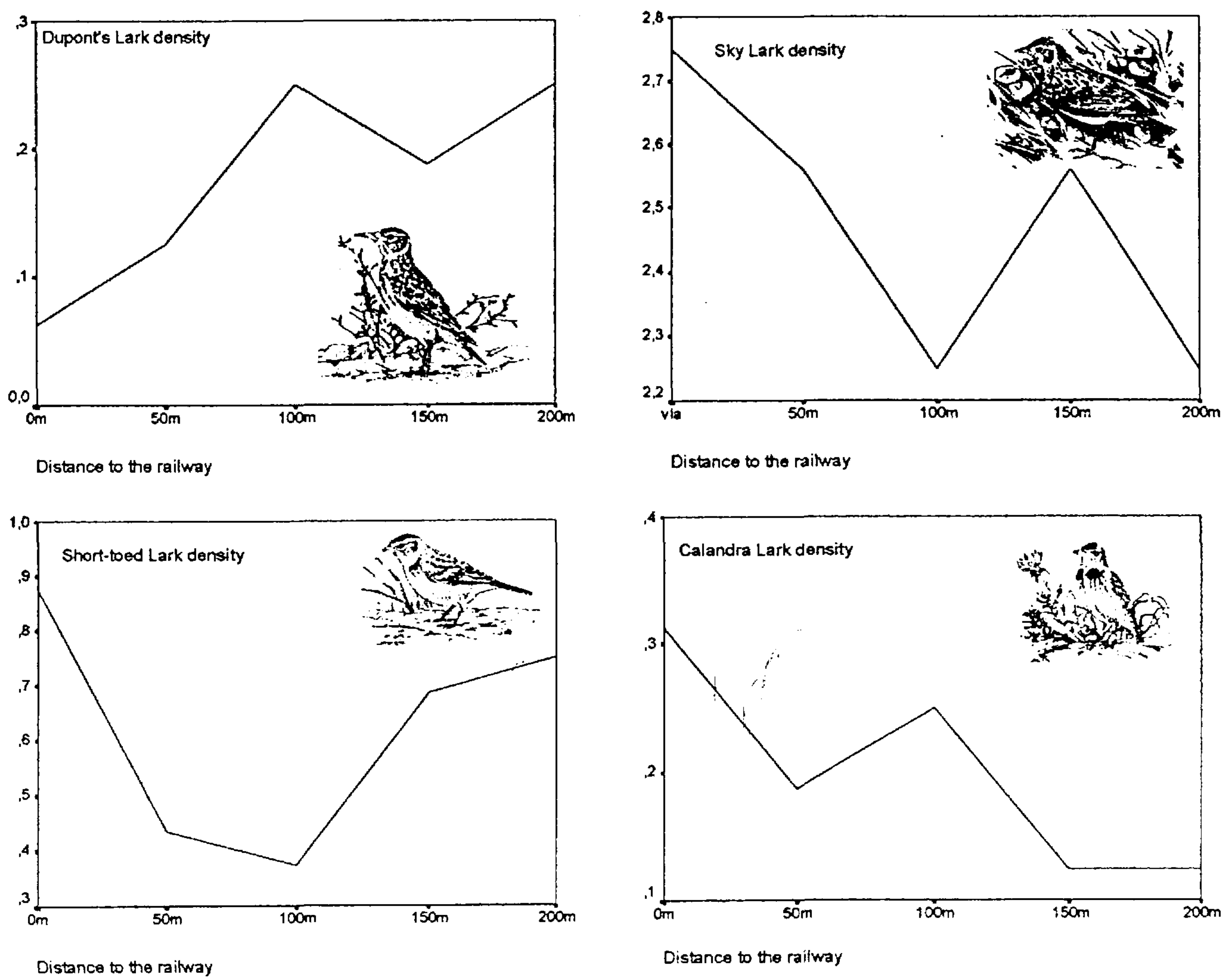


Figure 4. Densities of the population of four lark species in the study area

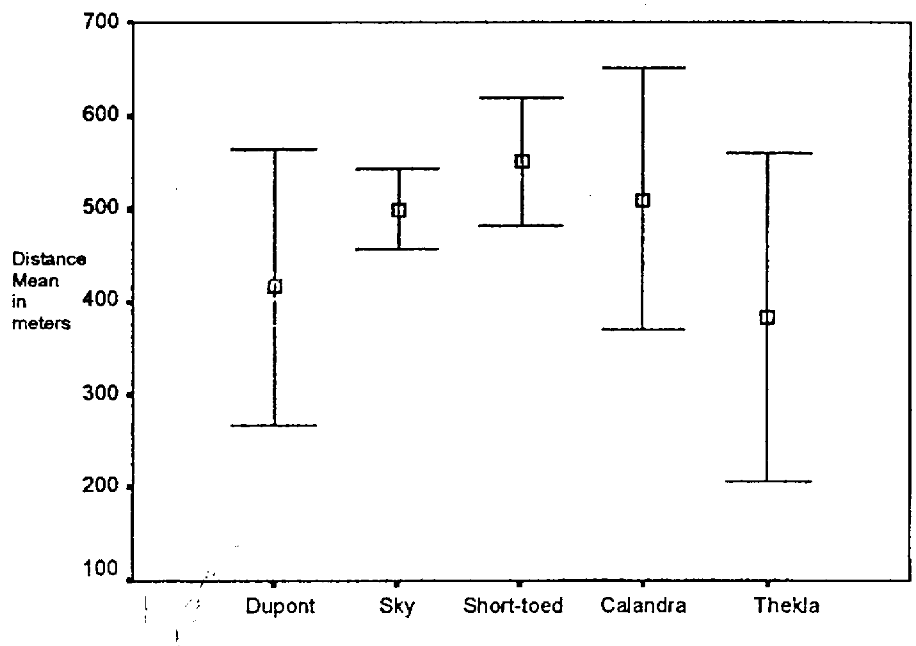


Figure 5. Distance of the different lark species to the track (Mean and Standard Deviation)