

# Gelsari and Lentini marshes (Sicily, Italy), a wetland of extremely high biodiversity. Consequences on avifauna from the crossing of an overhead high-voltage power line

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## ABSTRACT

In the Gelsari and Lentini marshes (Sicily, Italy), which constitute a vast and historically well-known wetland on the central eastern coast of Sicily, the crossing of an overhead high-voltage power line surprisingly had been planned and approved. This choice was made despite the high landscape value that these marshes possess, the environmental protection constraints they enjoy, the interest they hold for the biodiversity conservation in Sicily, and their extraordinary ability to attract avifauna. At present, the work, which began in August 2021, has resulted in the placement of all supports. An estimate of the risk of mortality of avifauna that the presence of the power line will produce has been made, limiting the survey to species of high conservation interest, which are among those present in the marshes. It turned out that the risks of collision of avifauna and especially of species considered of high conservation interest, due largely to the characteristics of the power line and especially its route, are extremely high; the damage that is likely to occur does not, therefore, seem to have been properly assessed, neither at the design nor at the approval stages of the project. Given that the impact of the power line does not appear to be mitigable, neither with regard to the landscape nor with regard to avifauna, considering, in the latter case, especially the high mortality risks to which species of high conservation interest would be subjected, it is believed that the only solution to avoid such damage is to make a modification to the route of the power line in the section affecting the marshes.

## KEY WORDS

High biodiversity; overhead high-voltage power line; Sicily; water birds; wetland.

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## INTRODUCTION

Gelsari and Lentini are two coastal marshes located along the sandy shoreline of the Gulf of Catania, between the provinces of Catania and Syracuse (Sicily, Italy), historically known for the extraordinary number of birds they are able to host.

Due to their geographical location, these marshes constitute a strategic wetland for the migration of avifauna between Europe and Africa (De Pietro et al., 2019), and locally act as an exchange node for avifauna with other wetlands in southeastern Sicily (Galasso et al., 2021). Peculiar habitats of communal interest coexist in them, affecting

areas located at an elevation near or below sea level (De Pietro, 2011; De Pietro, 2016). These factors give Gelsari and Lentini marshes a relevant role in the conservation of biodiversity in Sicily and, in particular, underlie the wealth of avifauna that characterizes them.

For more than a decade, Gelsari and Lentini marshes have been part of the ITA070029 ITA070029 Special Protection Area “Biviere di Lentini, tratto mediano e foce del Fiume Simeto e area antistante la foce”, covering, as the portion that concerns them, an area of about 10 km<sup>2</sup>.

Despite these environmental protection constraints and the special natural and landscape values that, in any case, characterize Gelsari and Lentini, the design of an overhead high-voltage power line with a route crossing over the marshes surprisingly had been planned and approved. At present, the work, which began in August 2021, has resulted in the placement of all supports over the concerning marshes.

The agencies that took part in the approval process ignored the extraordinary beauty and value of these places, but above all, they did not provide scientific or any other reasons as to why the power line would not have significant impact on the avifauna they refer to. Evidence of this is the impact assessment, which, due to its nonexistent assessments of the impact that the power line will cause to the marshes, constitutes a mere formal act, even though it is the fundamental document on which the appropriateness or lack thereof of the route should have been assessed. Other documents even omit the very presence of most of the bird species present in the marshes, such as the “ante operam” avifauna analysis, reported in the “Environmental Monitoring Project (PMA) - ante operam avifauna environmental component assessment” - Elaboration Cod. Elab. REGR11005BIAM3170 dated 4/1/2019, which contains two checklists, one for Gelsari and one for Lentini, which do not report, in particular, the presence of waterfowl that, in fact, populate the area and which will be more impacted by the work than any other species.

It is clearly evident that the power line is anything but marginal with respect to the marshes and especially with respect to the Lentini marsh, which of the two is the one of greatest interest; this marsh is bordered by the power line, for much of its western bank and is entirely crossed by it, in its central

southern portion. The damage that will be caused to one of Sicily’s most intact, vast and beautiful marsh landscapes will, therefore, be extremely significant and aggravated by being permanent and not mitigable (Figs. 1, 2). But even more serious and permanent will be the damage to the avifauna.

Bird mortality due to overhead power lines is known to be related to two types of events: collision or electrocution. The probability of occurrence of such events depends on many factors, including the characteristics of the power line and its location in relation to the areas capable of attracting avifauna, as Gelsari and Lentini are, in fact. In the specific case it is a 380 kV single three-phase overhead high-voltage power line, with tubular supports, triple-bundle phases and guard wire. Therefore, although it is a highly visible structure for avifauna, the risk of collisions will be exacerbated by the route of the power line (Quinn et al., 2011; Bernardino et al., 2018; Pigniczki et al., 2019). In fact, the power line structures will cross areas, such as the south-central areas of the Lentini marsh, in which multitudes of birds take off, land, rest, feed, and breed. Many of these species in high concentrations of individuals, as shown in Figs. 3 and 4, relative to the Greater Flamingo (*Phoenicopterus roseus*) and the White Stork (*Ciconia ciconia*) are in the areas affected by the line. The latter species, in particular, is known to be one of those at highest risk of not only collision but also electrocution. The concentrations of White Stork that are recorded at the marshes, which exceed and even peaks at 70 individuals, in particular at the Lentini marsh, (De Pietro et al., 2019), suggest that the collision mortality for this species could be of a magnitude even higher than that inferred from the scientific literature in the field or that emerged from the cases studied in Sicily (Zafarana & Barbera, 2016).

The risk of collision due to the route is not even mitigated by the albeit high visibility of the conductors; in fact, it may be reduced under various circumstances, such as in adverse weather conditions, during the night, or due to particular flight angles of the birds where the conductors do not stand out in the sky but may blend in with the background, leading to collision events. In any case, even when visibility remains high, birds in order to dodge the conductors they encounter on their flight path may rise in altitude and have a good chance of colliding with the guard wire, the con-

ductor placed at the top of the power line (to defend it from the effects of lightning surges) of very small cross section and therefore extremely less visible (Penteriani, 1998).

Even the section of power line placed along the western bank of the Lentini marsh, pointed towards NE-SW, which might appear less impactful than the one crossing the same marsh, will likely result in collision mortality of many bird species (Figs. 5-6), and of raptors in particular. The Lentini marsh, in fact, is bordered on the west by the San Demetrio ridge, a NE-SW horst made up of Neogene-Quaternary sedimentary and volcanic rocks. Many raptors frequent this ridge and take advantage of the thermal updrafts it generates. Movements from the San Demetrio ridge to the Lentini marsh that involve crossing the route of the power line, which today is still without conductors, are widely documented and occur, especially of the direction from the marsh to the ridge, at flight heights close to that of the power line (Fig. 7).

## **MATERIAL AND METHODS**

As pointed out, the power line is under construction and is still without the conductors (September 2022). At this stage, therefore, it is possible only to estimate the risk of bird mortality as a result of the presence of the power line.

Of the factors that may influence this risk, reference has been made to the species-specific ones, limiting it to the most significant species in relation to their conservation status. For this purpose, among all the species of avifauna detected in the marshes, those with high conservation interest were considered based on their placement in the Birds Directive and the European Red List of Birds (2021) and for the SPEC category reported in the “European Birds of Conservation Concern” - Birdlife International (2017); these species were included in Table 1, reporting their conservation status. The species included in that table are among those detected in previous work (De Pietro, 2012; De Pietro, 2019).

Contextually considered was the “Convention on the Conservation of European Wildlife and Natural Habitats - Recommendation No. 110 (2004) on minimizing adverse effects of above-ground

electricity transmission facilities (power lines) on birds” of the Council of Europe. That document provides a table that assigns, to the families of birds considered, the risk sensitivity for electrocution and collision assessed on the basis of the following scale:

- 0 – no casualties reported or likely;
- I – casualties reported, but with no apparent threat to the bird population;
- II – regionally or locally high casualties, but with no significant impact on the overall species population;
- III – casualties are a major mortality factor, threatening a species with extinction, regionally or on a larger scale.

This risk sensitivity was reported in Table 1 in columns 8 and 9 for electrocution and collision, respectively.

The sensitivity of avifauna to electrical risk has also been taken into account and reported in the “Guidelines for Mitigation of the Impact of Power Lines on Avifauna,” edited by the Ministero dell’Ambiente e della Tutela del Territorio e del Mare and Sea and ISPRA - Istituto Superiore per la Protezione e la Ricerca Ambientale (2008). Here, sensitivity to electrical risk is associated with species, using a single synthetic index, both for collision and for electrocution, defined as follows:

- 0 – absent or unlikely incidence;
- I – sensitive species (numerically insignificant mortality and zero incidence on populations);
- II – very sensitive species (numerically significant local mortality but with insignificant incidence on populations);
- III – extremely sensitive species (very high mortality; mortality from electrocution or collision results as one of the main causes of death). The indexes of such sensitivity are given in column 10 of Table 1.

## **RESULTS**

Table 1 highlights that, with reference to the risk factors attributed to the families reported in Recommendation No. 110, all of the species in the Gelsari and Lentini marshes that are considered to be of





Figure 1. The landscape impact produced by the power line will be irremediable and unmitigated. Photo shows the crossing of the Lentini marsh by the power line that is still without the conductors (May 14, 2022).



Figure 2. The power line structures and conductors will overtop areas where many species of birds take off, land, stop, feed, and breed (Lentini marsh July 26, 2022).





Figure 3. Greater Flamingo (*Phoenicopterus roseus*) and Black-winged Stilt (*Himantopus himantopus*) filmed during the construction of a support, which are stationed in an area that, when completed, will be topped by power line conductors (Lentini marsh, April 3, 2022).



Figure 4. The White Stork (*Ciconia ciconia*) is present in the marshes with high concentrations of individuals, as shown in the photo at the Lentini marsh (January 24, 2021).





Figure 5. A flock of 46 Glossy Ibis (*Plegadis falcinellus*) and one White Stork (*Ciconia ciconia*) in flight along the track bordering the west bank of the Lentini marsh. In the background Masseria Bertuccia, in the San Demetrio ridge. At that date, work on the power line had not yet begun (April 10, 2021).



Figure 6. Glossy Ibises (*Plegadis falcinellus*) take off from a flooded area near the west bank of the Lentini marsh. In such cases it has often been observed that the birds may head toward the San Demetrio ridge (visible in the background of the photo), flying over it. In doing so, the birds cross the line of the power line, the location of which can be inferred from the reference provided by one of the supports under construction on the date of the photo (April 9, 2022).





Figure 7. White-tailed buzzard (*Buteo rufinus*) flies over the Lentini marsh, coming from the San Dementrio ridge (in the background on the left in the photo), thus crossing the areas where the power line borders the west bank of the marsh. At that date, work on the power line had not yet begun (June 27, 2020).

high conservation value present a risk of collision of type I-II or II-III and that about one-third of them present a risk II-III or III.

With reference to the sensitivity to electrical hazard from the guidelines, it appears that nearly 80 percent of the species are among those considered to be at very sensitive (II) or extremely sensitive (III) risk of collision and electrocution, and that the latter, i.e., those at extremely sensitive (III) risk, account for nearly 50 percent.

These findings indicate that the damage that the power line may produce does not appear to have been properly assessed, neither at the design nor at the project approval stages.

## DISCUSSION

The most recent works reporting checklists of the avifauna present in Gelsari and Lentini attest to the extraordinary importance of this wetland for avifauna and, in particular, for many species of high conservation interest, making it clear how unacceptable the damage that the power line may inflict on it is.

Rendering the choice of the route unjustifiable is the fact that it is the result of an error in the assessment of the real biological and conservation value of the environmental assets involved, which is not based on technical grounds that could have made it neither necessary nor justifiable. In fact, the route has proven to be a bad choice even from a technical point of view, since it has resulted in the placement of the supports in areas that are prone to being flooded and that, under such conditions, due to the insufficient bearing capacities of the soils, cannot be reached and will not be reached by mechanical means even during its operation.

## CONCLUSIONS

There are no interventions that can bring the impact of the power line to an acceptable degree of tolerability, neither with regard to the environment, nor with regard to the avifauna; in fact, it burdens a wetland characterized by one of the most beautiful and vast marsh landscapes of Sicily, high in biodi-



Species	Birds Directive (2009)	European Red List of Birds (2021)			Birdlife (2017)	Sensitivity of birds to electrical risk		
		Season of assessment	IUCN Red List category	IUCN Red List criteria (Europe)		Recommendation No. 110/2004 Berne Convention		Guidelines for impact mitigation
						Electrocution	Collision	Electrocution and collision
<i>Aythya nyroca</i> , Ferruginous Duck	Annex I	B	LC		SPEC 1	0	II	II
<i>Phoenicopterus roseus</i> , Greater Flamingo	Annex I	B	LC			0	II	III
<i>Ciconia ciconia</i> , White Stork	Annex I	B	LC			III	III	III
<i>Ciconia nigra</i> , Black Stork	Annex I	B	LC			III	III	III
<i>Platalea leucorodia</i> , Eurasian Spoonbill	Annex I	B	LC			I	II	II
<i>Plegadis falcinellus</i> , Glossy Ibis	Annex I	B	LC			I	II	II
<i>Nycticorax nycticorax</i> , Black-crowned Night-heron	Annex I	B	LC		SPEC 3	I	II	III
<i>Ardeola ralloides</i> , Squacco Heron	Annex I	B	LC		SPEC 3	I	II	II
<i>Ardea purpurea</i> , Purple Heron	Annex I	B	LC		SPEC 3	I	II	III
<i>Botaurus stellaris</i> , Eurasian Bittern	Annex I	B	LC		SPEC 3	I	II	III
<i>Casmerodius albus</i> , Great White Egret	Annex I	B	LC			I	II	III
<i>Egretta garzetta</i> , Little Egret	Annex I	B	LC			I	II	III
<i>Burhinus oedicanus</i> , Eurasian Thick-knee	Annex I	B	LC		SPEC 3	I	II-III	II
<i>Recurvirostra avosetta</i> , Pied Avocet	Annex I	B	LC			I	II-III	I
<i>Himantopus himantopus</i> , Black-winged Stilt	Annex I	B	LC			I	II-III	I
<i>Limosa lapponica</i> , Bar-tailed Godwit	Annex I	B	NT	A2bcde	SPEC 1	i	II-III	I
<i>Calidris alpina</i> , Dunlin	Annex I	W	LC		SPEC 3	I	II-III	II
<i>Tringa glareola</i> , Wood Sandpiper	Annex I	B	LC		SPEC 3	I	II-III	I
<i>Chlidonias hybrida</i> , Wood Sandpiper	Annex I	B	LC			0-I	II	I
<i>Vanellus vanellus</i> , Northern Lapwing	Annex IIB	B	VU	A2bcde	SPEC 1	I	II-III	III
<i>Pandion haliaetus</i> , Osprey	Annex I	B	LC			II-III	I-II	III
<i>Hieraetus pennatus</i> , Booted Eagle	Annex I	B	LC			II-III	I-II	III
<i>Circus aeruginosus</i> , Western Marsh-harrier	Annex I	B	LC			II-III	I-II	III
<i>Circus gallicus</i> , Short-toed Snake-eagle	Annex I	B	LC			II-III	I-II	III
<i>Buteo rufinus</i> , Long-legged Buzzard	Annex I	B	LC			II-III	I-II	II
<i>Circus pygargus</i> , Long-legged Buzzard	Annex I	B	LC			II-III	I-II	II
<i>Falco vespertinus</i> , Red-footed Falcon	Annex I	B	VU	A2abcde+4a bcde	SPEC 1	II-III	I-II	II

Table 1. Bird species of high conservation interest found in Gelsari and Lentini related to species-specific risk factors for electrocution and collision due to the power line; these high-risk values have not been properly assessed.

versity and capable of attracting bird species of very high conservation interest.

The only solution to prevent such serious and permanent damage is to make a change in the route of the power line. This could have been done even before the laying of the supports was carried out, if only the “oversight” in the evaluation of the route affecting the marshes had been recognized.

## REFERENCES

- Bernardino J., Bevanger K., Barrientos R., Dwyer J.F., Marques A.T., Martins R.C., Shaw J.M., Silva J.P. & Moreira F., 2018. Birds collision with power lines: State of the art and priority areas for research. *Biological conservation*, 222: 1–13.  
<https://doi.org/10.1016/j.biocon.2018.02.029>
- De Pietro R., Ientile R., Puccia S. & Sabella G., 2019. Birds of Gelsari and Lentini marshes, special protection area for the protection and maintenance of aquatic avifauna in central Mediterranean. *Ocean and Coastal Management*, 169: 96–103.  
<https://doi.org/10.1016/j.ocecoaman.2018.12.010>
- De Pietro R., 2016. Quale futuro per i pantani di Gelsari e di Lentini e per la Zona di Protezione Speciale ITA070029? *Il Naturalista siciliano*, 40: 9–20.
- De Pietro R. & De Pietro R., 2012. I Pantani di Lentini e di Gelsari (Sicilia Orientale): stato di conoscenze sull'avifauna e strategie di conservazione per la biodiversità. *Il Naturalista siciliano*, 36: 533–544.
- De Pietro R., 2011. Importanza naturalistica delle residue zone umide della Piana di Catania e dei suoi margini meridionali. Una proposta di tutela per le aree in cui si estendevano i pantani di Lentini e di Gelsari. *Il Naturalista siciliano*, 35: 215–232.
- Galasso P., Cappuzzello C., Gambino E., Torre G., Galasso G. & Patti N., 2021. Avifauna of “Sicilian southeast swamp lakes” and surroundings areas (Ragusa and Syracuse, Sicily) with commented records of interest. *Biodiversity Journal*, 12: 441–462.  
<https://doi.org/10.31396/Biodiv.Jour.2021.12.2.441.462>.
- Penteriani V., 1998. L'impatto delle linee elettriche sull'avifauna – Serie Scientifica n. 4 – WWF – Regione Toscana Dipartimento Sviluppo Economico.
- Pigniczki C., Bakró-Nagy Z., Bakacsi G., Barkóczi C., Nagy T., Puskás J. & Enyedi R., 2019. Preliminary results on bird collision with overhead power lines in Hungary: a case study around Pusztaszer Landscape Protection Area. *Ornis Hungarica*, 27: 221–238.
- Quinn M., Alexander S., Heck N. & Chernoff G., 2011. Identification of Bird Collision Hotspots along Transmission Power Lines in Alberta: An Expert-Based Geographic Information System (GIS) Approach. *Journal of Environmental Informatics*, 18: 12–21.  
<https://doi.org/10.3808/jei.201100194>
- Zafarana M.A. & Barbera A., 2016. Gravi casi di mortalità per elettrocuzione per la Cicogna bianca *Ciconia ciconia*. *Il Naturalista siciliano*, 40: 301–311.

