

## IDENTIFICATION OF POTENTIAL EFFECTS OF MINERAL AGGREGATES EXTRACTION ACTIVITY FOLLOWING AN ADEQUATE IMPACT ASSESSMENT ON PROTECTED BIRD SPECIES IN TWO NATURA 2000 SITES FROM TELEORMAN AND PRAHOVA COUNTIES

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### Abstract

*By its very nature, the extraction of mineral aggregates invariably has an impact, often negative, on the ecosystem where it occurs. In essence, it requires that any extraction of mineral aggregates likely to have a significant effect on protected bird species be subject to an appropriate assessment detailing this impact on them and how will align with the conservation objectives of the two Natura 2000 sites. In this article two Natura 2000 sites from Teleorman and Prahova counties (ROSPA0024 OLT-DANUBE confluence and ROSPA0152 IALOMIȚA corridor) where study considering the impact evaluation of mineral aggregates extraction on the protected bird species.*

**Key words:** environmental impact, mineral aggregates extraction.

### INTRODUCTION

Preserving biodiversity is a prevalent global challenge, and Europe's natural environment encompasses numerous habitats and ecosystems. Romania is proactive in nature conservation and biodiversity preservation by establishing a national network of protected areas based on scientific identification.

Compared to 2016 when some areas of the country were declared Natura 2000 sites (<http://www.mmediu.ro>), a negative influence on bird species of community interest having various causes was observed.

Some of the causes that may negatively influence the protected bird species monitored in Natura 2000 sites are the following (Guide to Extraction of Non-Energy Minerals and Natura 2000 Executive summary, European Union, 2019):

- intensity of mineral aggregate extraction activity on a relatively small area, observing a cumulative impact of this activity;
- lack of exact knowledge of the species of birds protected by hunters, which can be easily confused with unprotected ones, which leads to a decrease in their numbers;
- climate change which has led to landslides, very high temperatures, heavy rainfall in the

spring months leading to flooding of protected bird species habitats;

- the magnitude of the industrialization phenomenon which, through the emissions produced, causes significant damage;
- the chemical fertilisers used in agriculture has led to major imbalances in the food chains and pyramids of terrestrial and aquatic ecosystems where protected bird species have their natural habitat;
- the excessive utilisation of chemical fertilizers has a negative impact to both soil and groundwater (Lingke et al., 2020; Ausubel & Waggoner, 2008; Awuah-Offei & Adekpedjou, 2011; Fischer-Kowalski et al., 2011; Bringezu & Bleischwitz, 2009; Krausmann et al., 2009; Popa et al., 2012).

Like all other forms of land use, the non-energy mineral extraction industry must operate within the framework of European environmental legislation, which includes the Birds and Habitats Directives (Strateanu et al., 2009).

The European Birds and Habitats Directives are cornerstones of EU biodiversity policy and enable Member States to work together to protect and ensure the survival of Europe's most threatened and vulnerable species and habitat types. Article 6 of the Habitats Directive sets out

the procedure to be followed for authorizing plans and projects likely to have a significant effect on a Natura 2000 site (Guide to Extraction of Non-Energy Minerals and Natura 2000 Executive summary, European Union, 2019).

The two main objectives of European directives are:

- protect the species itself throughout the EU (through species protection provisions);
- conserve certain rare and threatened habitat types or the central habitats of certain rare and threatened species to ensure their uninterrupted survival (through site protection provisions, which led to the creation of the Natura 2000 network).

Birds in Natura 2000 sites: ROSPA0024 OLT-DANUBE confluence and ROSPA0152 IALOMIȚA corridor are monitored because they are considered species of Community interest, species that are endangered, vulnerable, rare, endemic on the territory of the European Union. We chose for the study these birds of community interest, because following field monitoring, a decrease in population numbers was observed due to the activity of extracting mineral aggregates.

The quality of surface water is a parameter which needs continuous and carefully monitoring, because the chemical, physical and biological process from water mass are dynamic, are inside in cycling compartments of nutrients and are most vulnerable compartments to nitrites pollution from agricultural and husbandry fields. The continuous monitoring of surface water is a necessity because their quality influences the quality of fresh and underground water.

## MATERIALS AND METHODS

Two Natura 2000 sites were chosen as study areas, from Teleorman and Prahova counties, in which ten protected bird species were evaluated considering the impact of the mineral aggregates extraction activity on them.

We chose the monitoring method depending on each species, namely the linear transect method of 1 km and 5 km, a method that complies with the StandardGuide for monitoringbird species of community interest in Romania, within the project "Completing the level of knowledge of biodiversity by implementing the monitoring system of the conservation status of bird species

of community interest in Romania and reporting based on Article 12 of the Birds Directive 2009/147/EC", financed by the Large Infrastructure Operational Program 2014-2020, guide approved by the Order of the Ministry of Environment, Waters and Forests nr. 1358 of 6 August 2021.

The method involved the numerical evaluation of the population numbers of a number of 10 birds, and for the species of limicole waterfowl, the monitoring was done during the nesting period April 15-June 15, the numerical evaluation being made in the colony and at a distance based on vocalizations and observations of bird colonies. Linear transects in these species of limicole birds were not restricted only to the waterfront, but also the areas of swamps, flooded agricultural lands were followed.

Identification of the geographical studied area in Teleorman and Prahova counties of the mineral aggregates extraction activity in Natura 2000 sites.

The Natura 2000 network is a European ecological network of protected natural areas comprising special protection areas for birds (SPA) established in accordance with the provisions of Directive 79/409/EEC on the conservation of wild birds (Birds Directive).

At Teleorman county level, was identified 1 Natura 2000 site where the extraction of mineral aggregates takes place, namely: ROSPA0024 OLT-DANUBCONFLUENCE - an area of 14672 ha (Figure 1).

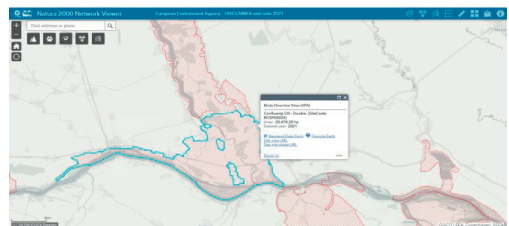


Figure 1. Location of the site ROSPA0024 OLT-DANUBE CONFLUENCE (<http://ananp.gov.ro/ariile-naturale-protejate-ale-romaniei/>)

In this site, bird species were monitored: *Cygnus cygnus* (winter swan) (Figure 2), *Phalacrocorax pygmaeus* (lesser cormorant) (Figure 3), *Falco vespertinus* (evening bream) (Figure 4), *Alcedo atthis* (kingfisher) (Figure 5), *Anas crecca* (dwarf duck) (Figure 6).

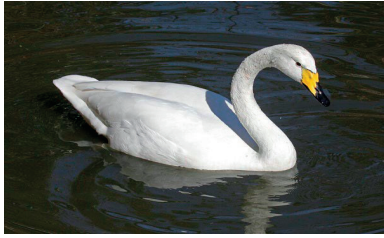


Figure 2. Species *Cygnus cygnus* (winter swan) (<https://ro.wikipedia.org>)



Figure 3. Species *Phalacrocorax pygmaeus* (little cormorant) (<https://ro.wikipedia.org>)



Figure 4. Species *Falco vespertinus* (evening bream) (<https://ro.wikipedia.org>)



Figure 5. Species *Alcedo atthis* (kingfisher) (<https://ro.wikipedia.org>)



Figure 6. Species *Anas crecca* (dwarf duck) (<https://ro.wikipedia.org>)

At Prahova county level, one Natura 2000 site was identified where the mineral aggregates extraction activity takes place, namely: ROSPA0152 IALOMIȚA CORRIDOR - area of 25307.90 ha (Figure 7).

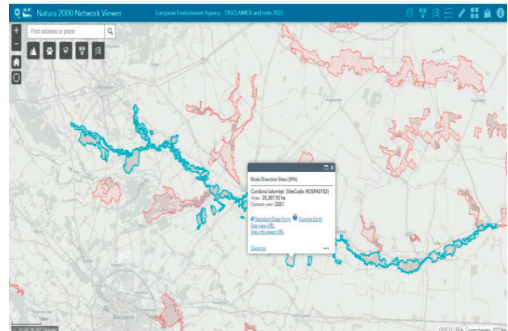


Figure 7. Location of the site ROSPA0152 IALOMIȚA CORRIDOR (<http://anap.gov.ro/ariile-naturale-protejate-ale-romaniei/>)

In this site, bird species were monitored: *Alcedo atthis* (kingfisher) (Figure 8), *Ixobrychus minutus* (dwarf heron) (Figure 9), *Nycticorax nycticorax* (night heron) (Figure 10), *Falco vespertinus* (evening heron) (Figure 11), *Egretta garzetta* (lesser egret) (Figure 12).



Figure 8. Species *Alcedo atthis* (kingfisher) (<https://ro.wikipedia.org>)



Figure 9. *Ixobrychus minutus* (dwarf heron) (<https://ro.wikipedia.org>)



Figure 10. Species *Nycticorax nycticorax* (Night heron) (<https://ro.wikipedia.org>)

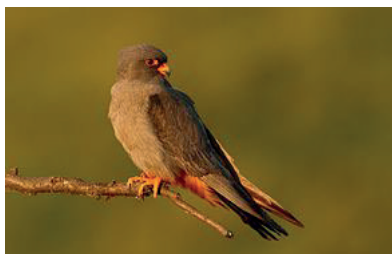


Figure 11. Species *Falco vespertinus* (evening bream) (<https://ro.wikipedia.org>)



Figure 12. Species *Egretta garzetta* (little egret) (<https://ro.wikipedia.org>)

Adequate assessment of the impact of mineral aggregates extraction activity on protected bird species in two Natura 2000 sites in Teleorman

and Prahova counties was done. The type and degree of environmental impacts vary significantly from site to site depending on various factors. They must therefore be determined on a case-by-case basis.

In order to estimate the potential impact on the two sites Natura 2000, ROSPA0024 OLT-DANUBE CONFLUENCE and ROSPA0152 IALOMIȚA CORRIDOR an impact assessment matrix was developed.

The value of the impact generated by the activity of extracting mineral aggregates on species was considered by the consequences and probability depending on the degree of damage and the possibility of occurrence.

The calculation formula used was:

$$\text{Impact} = \text{probability} \times \text{consequence} \quad (1)$$

The probability categories are defined according to the Table 1. The consequences were calculated according to the Table 2.

Table 1. Probability categories (Ozunu & Anghel, 2007)

Probability	Value	Observations
Inevitable	5	The effect will definitely happen
Very likely	4	The effect will manifest frequently
Probably	3	The effect will occur with reduced frequency
Improbable	2	The effect will manifest occasionally
Very unlikely	1	The effect will occur accidentally

Description of consequences are defined according to the Table 2.

Table 2. Description of consequences (Ozunu & Anghel, 2007)

Degree of impairment	Value	Description
Disastrous	5	Reduction of local populations by 81%-100%
Very important	4	Reduction of local populations by 61%-80%
Important	3	Reduction of local populations by 41%-60%
Moderate	2	Reduction of local populations by 21%-40%
Insignificant	1	Reduction of local populations by 0%-20%

The impact matrix was calculated according to the probability of occurrence of the impact and the maximum for useable consequences.

Impact levels of mineral aggregate extraction activity are defined according to the Table 3.

Table 3. Impact levels of mineral aggregate extraction activity (Ozunu & Anghel, 2007)

Value	Impact level
15-25	Significant negative
5-15	Moderately negative
1-5	Negative insignificant

## RESULTS AND DISCUSSIONS

Using the bird monitoring method, in order to interpret the matrix of the impact determined by the extraction of mineral aggregates activity on bird species of community interest from two Natura 2000 site ROSPA0024 OLT-DANUBE CONFLUENCE and ROSPA0152 IALOMIȚA CORRIDOR, we used the methodology described below (Ozunu & Anghel, 2007). The matrix below shows the level of impact of mineral aggregate extraction activity on bird species of community interest from the site ROSPA0024 OLT-DANUBE CONFLUENCE and is defined according to the Table 4. The impact shall be deemed to be moderately negative.

Table 4. Matrix of consequences of the mineral aggregates extraction activity on bird species of community interest from the site ROSPA0024 OLT-DANUBE CONFLUENCE

Consequence	<i>Cygnus cygnus</i>	<i>Phalacrocorax pygmaeus</i>	<i>Falco vesperlinus</i>	<i>Alcedo atthis</i>	<i>Anas crecca</i>
5					
4					
3					
2	x				
1		x	x	x	x

From the analysis of the information contained in the table above, of the five bird species studied, it appears that for a single bird species, namely *Cygnus cygnus*, the consequence being considered of a moderate level, signifies a reduction of the local population 21-40%, for the rest of the bird species the consequence being considered of an insignificant level signifies a reduction of the local population 0-20%. The matrix below shows probability of occurrence of negative effects of mineral aggregates extraction activity on bird species of community interest from site ROSPA0024 OLT-DANUBE CONFLUENCE and is defined according to the Table 5. The impact shall be deemed to be moderately negative.

Table 5. Matrix of probability of occurrence of negative effects of mineral aggregates extraction activity on bird species of community interest from site ROSPA0024 OLT-DANUBE CONFLUENCE

Probability	<i>Cygnus cygnus</i>	<i>Phalacrocorax pygmaeus</i>	<i>Falco vesperlinus</i>	<i>Alcedo atthis</i>	<i>Anas crecca</i>
5					
4					
3					
2	x				
1		x	x	x	x

From the analysis of the information contained in the table above, of the five bird species studied, it appears that for only one bird species, namely *Cygnus cygnus*, the impact of the mineral aggregate extraction activity will occasionally manifest, and for the rest of the bird species the impact of the mineral aggregate extraction activity will occur accidentally. The impact of mineral aggregate extraction activity on the bird species is considered insignificantly negative as evidenced by the analysis of the information contained in Table 6, it appears that for the studied bird species from the site ROSPA0024 OLT-DANUBE CONFLUENCE.

Table 6. Matrix of the impact determined by the extraction of mineral aggregates activity on bird species of community interest from the site ROSPA0024 OLT-DANUBE CONFLUENCE

Impact	<i>Cygnus cygnus</i>	<i>Phalacrocorax pygmaeus</i>	<i>Falco vesperlinus</i>	<i>Alcedo atthis</i>	<i>Anas crecca</i>
15-25					
5-15					
1-5	4	1	1	1	1

In order to estimate the potential impact on the site ROSPA0152 IALOMIȚA CORRIDOR, an impact assessment matrix was developed. The matrix below shows consequences of the implementation of mineral aggregates extraction activity on bird species of community interest from the site ROSPA0152 IALOMIȚA CORRIDOR CONFLUENCE and is defined according to the Table 7.

Table 7. Matrix of consequences of the implementation of mineral aggregates extraction activity on bird species of community interest from the site ROSPA0152 IALOMIȚA CORRIDOR

Consequence	<i>Alcedo atthis</i>	<i>Ixobrychus minutus</i>	<i>Nycticorax nycticorax</i>	<i>Falco vesperlinus</i>	<i>Egretta garzetta</i>
5					
4					
3		x	x	x	x
2	x				
1					

From the analysis of the information contained in the table above, of the five bird species studied, it appears that for a single bird species, namely *Alcedo atthis*, the consequence being considered of a moderate level, signifies a reduction of the local population 21-40%, for the rest of the bird species the consequence being considered of an important level signifies a reduction of the local population 41-60%.

The matrix below shows probability of occurrence of negative effects of mineral aggregates extraction activity on bird species of community interest from the site ROSPA0152 IALOMIȚA CORRIDOR CONFLUENCE and is defined according to the Table 8.

Table 8. Matrix of probability of occurrence of negative effects of mineral aggregates extraction activity on bird species of community interest from the site ROSPA0152 IALOMIȚA CORRIDOR

Probability	<i>Alcedo atthis</i>	<i>Ixobrychus minutus</i>	<i>Nycticorax nycticorax</i>	<i>Falco vespertinus</i>	<i>Egretta garzetta</i>
5					
4					
3		x	x	x	x
2	x				
1					

From the analysis of the information contained in the table above, of the five bird species studied, it appears that for only one bird species, namely *Alcedo atthis*, the impact of the mineral aggregate extraction activity will occasionally manifest, and for the rest of the bird species the impact of the mineral aggregate extraction activity will occur with reduced frequency.

The impact of mineral aggregate extraction activity on the bird species is considered moderately negative as evidenced by the analysis of the information contained in Table 9, it appears that for the studied bird species from the site ROSPA0152 IALOMIȚA CORRIDOR.

Table 9. Matrix of the impact determined by the mineral aggregates extraction activity on bird species of community interest from the site ROSPA0152 IALOMIȚA CORRIDOR

Impact	<i>Alcedo atthis</i>	<i>Ixobrychus minutus</i>	<i>Nycticorax nycticorax</i>	<i>Falco vespertinus</i>	<i>Egretta garzetta</i>
15-25					
5-15		9	9	9	9
1-5	4				

The analysis of the level of impact of mineral aggregates extraction activity on bird species of Community interest from the site ROSPA0024 OLT-DANUBE CONFLUENCE took into account the consequences and probability of

negative effects taking into account the particularities of the area, the technical characteristics of the project, the degree of reversibility of the effects produced and the observations made in the field. The result is defined as the level of impact, the impact being considered an insignificant negative.

The analysis of the level of impact of mineral aggregates extraction activity on bird species of Community interest from the site ROSPA0152 IALOMIȚA CORRIDOR took into account the consequences and probability of negative effects taking into account the particularities of the area, the technical characteristics of the project, the degree of reversibility of the effects produced and the observations made in the field. The outcome is defined as the level of impact, the impact being considered moderately negative.

Compared to the data contained in the Natura 2000 Standard Form prepared in 2016 (<http://www.mmediu.ro>) for the bird species from the site ROSPA0024 OLT-DANUBE CONFLUENCE: *Cygnus cygnus* (winter swan) - 5 ex., *Phalacrocorax pygmaeus* (lesser cormorant) - 450 ex., *Falco vespertinus* (evening bream) - 25 ex., *Alcedo atthis* (kingfisher) - 6 ex., *Anas crecca* (dwarf duck) - 1 ex. and for the bird species from the site ROSPA0152 IALOMIȚA CORRIDOR: *Alcedo atthis* (kingfisher) - 30 ex., *Ixobrychus minutus* (dwarf heron) - 15 ex., *Nycticorax nycticorax* (night heron) - 60 ex., *Falco vespertinus* (evening heron) - 300 ex., *Egretta garzetta* (lesser egret) - 50 ex., it was found that the population decreased by a small percentage of up to 10% of the total bird populations of Community interest at site level, due to the extraction of mineral aggregates from these Natura 2000 sites.

The monitoring of threatened species revealed a change in the number, composition and distribution of wild bird species analyzed that may indicate changes in ecological processes, especially in the capacity to sustain sustainable populations of essential species.

The need to ensure biodiversity conservation is seen as a measure to adapt to climate change and at the same time protect vulnerable species by preserving and restoring ecosystems.

From the study it is found that the bird species *Falco vespertinus* (Evening heron) is a vulnerable species that requires the adoption of

conservation measures, both active and long-term restrictive measures.

## CONCLUSIONS

From the number of specimens of bird species analyzed and included in the Standard Form of the two Natura 2000 sites established in 2016, as well as from the analysis of the information contained in the impact matrices, it appears that the extraction of mineral aggregates in the two studied Natura 2000 sites may have an insignificant negative impact in the OLT-DANUBE CONFLUENCE ROSPA0024 site and a moderate negative impact in the Natura 2000 site ROSPA0152 IALOMIȚA CORRIDOR.

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