

THE CONSERVATION OF BONELLI'S EAGLE IN FRANCE: THE NATIONAL ACTION PLAN- FOCUS ON ELECTROCUTION MITIGATION -

Olivier Scher¹, Pauline Levionnois¹, Cécile Ponchon², Michel Mure³,
Alain Ravayrol⁴, Patrick Boudarel⁵



✦ STATUS OF BONELLI'S EAGLE IN FRANCE

Bonelli's eagle is known in France since the Pleistocene period (500 000 – 200 000 BC). Nevertheless, accurate estimate of population showed that it declined for roughly 50 years across its range. In France, the breeding population that was estimated to be around 80 pairs in 1960 declined to 22 in 2002 before reaching 34 in 2017. It remains one of the most threatened raptors of France.

Despite its LC status at international scale, it is considered as an endangered species at the French scale.

¹ Conservatoire d'espaces naturels du Languedoc-Roussillon (CEN L-R)

• email: pna@cenlr.org

² Conservatoire d'espaces naturels PACA (CEN PACA)

³ LPO Auvergne-Rhône-Alpes

⁴ La Salsepareille

⁵ DREAL Occitanie

We have a precise knowledge of the French population since 1990 as all pairs are monitored and chicks ringed every year (Fig. 1)

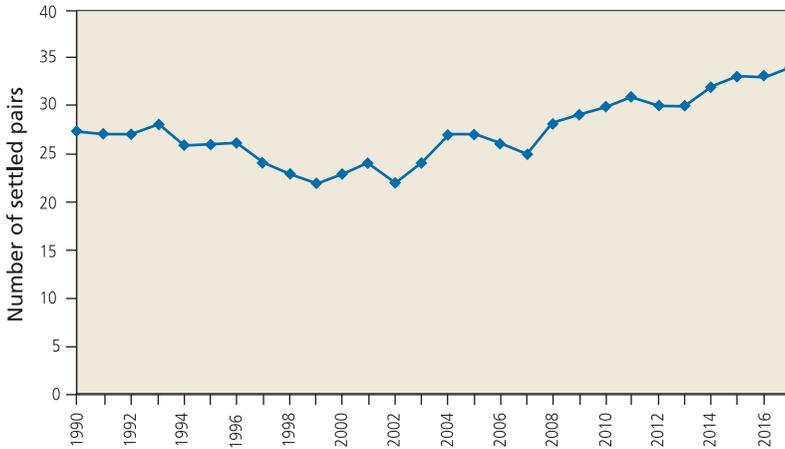


Figure 1.- Evolution of Bonelli's population in France since 1990 (source: PNAAB).

This monitoring and ringing action brought major information on the population' dynamic and demographic parameters which represent the base of all conservation action (Fig. 2).

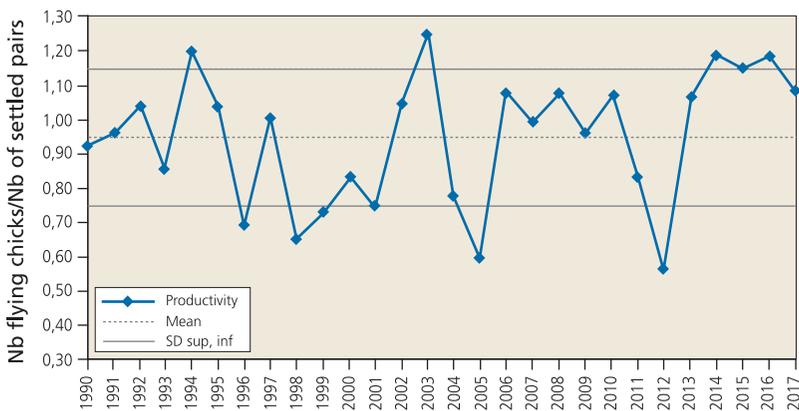


Figure 2.- Evolution of demographic parameters in France since 1990 (source: PNAAB).

CONSERVATION OF BONELLI'S EAGLE IN FRANCE

Naturalist initiated the first actions to protect this threatened species in the 70's and 80's focusing on numbering settled pairs and monitoring the population. At the end of the 90's a European program allowed to obtain the protection for most breeding sites. The first recovery plan (*Plan national de restauration*) was launched in 1999 under the responsibility of the French ministry of environment and lasted for 5 years. It was followed in 2005 by a new action plan (*Plan national d'actions en faveur de l'Aigle de Bonelli PNA AB*) which officially ended up at the end of 2009.

In 2014 the third PNA AB started and is expected to last 10 years which is more in agreement with the ecology of this species and allow a better assessment of actions' efficiency.

Supported by the Environment ministry (DREAL Occitanie) and implemented by NGOs (Conservatoire d'espaces naturels L-R and PACA, LPO Auvergne-Rhône-Alpes) at regional scale and NGOs, stakeholders, state services and volunteers at local scale, this new action plan aims at strengthening the Bonelli's eagle population and ensuring its viability. The actions are focused on the decrease of threats and habitat preservation with specific efforts on historical breeding sites, which represent priority areas for a future development of this population.

The action plan has seven objectives which regroup a total of 27 actions:

- 1.- Reducing and preventing mortality due to human activities.
- 2.- Preserving, restoring and improving habitats.
- 3.- Organizing surveillance and reducing disturbance.
- 4.- Improving knowledge for a better management and conservation of the Bonelli's Eagle.
- 5.- Promoting the integration of the actions into public conservation policy.
- 6.- Promoting the image of Bonelli's eagle and its local heritage interest.
- 7.- Coordinating the actions and improving international cooperation.

✦ ELECTROCUTION MITIGATION: THE FRENCH APPROACH

If persecution (shooting, trapping, poisoning) and loss of hunting areas resulting from human activities (urbanization, disturbance near breeding area) are still of huge concern, electric lines (electrocution and collision) remain the first source of mortality for this species in France.

Indeed, since 1990, 32 birds have been found killed by electrocution under electric lines while 5 were killed by collision. On those 32 birds, only 2 were electrocuted on very high power lines (Fig. 3).



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Figure 3.- Electrocuted Bonelli's eagle on a power line.

This situation pushed NGOs to work locally with electricity providers since the 90's. At first, to insulate some poles that have caused damages or appeared to be at risk for birds and, after 1997, by signing agreement with electricity providers, NGOs began to map the power lines in order to guide mitigation measures.

These maps aimed at identifying dangerous electricity lines in the vicinity of breeding pairs as well as in areas known as dispersal ones. This hierarchy

of lines based on their hazardousness for birds is based on a methodology developed by ERDF (2009). Three parameters are taken into account:

- 1.- Type of support ,
- 2.- Richness of area (prey, type of vegetation, etc.),
- 3.- Attractiveness of support (presence of droppings, pellets, etc.).

Each parameter is quoted from 1 to 3. The total will give a global note to the support (3: huge risk to 1: low risk) and then to the electric line itself. Maps are then produced and integrated to their GIS by electricity providers as a “risk” layer.

A first analysis was done by Chevallier *et al.* (2015) demonstrated that insulation of power lines was relevant for the conservation of large bird species at a population scale and allowed the survival rate of all age classes to increase. It also had a strong positive impact on population growth rate (as no other possible explanation parameter (e.g. productivity and immigration) seems to have changed significantly since then (Lieury *et al.* 2016)).

These strong and significant results urge conservationists to increase their actions with power lines stakeholders in order to erase this threat.

✦ ELECTROCUTION MITIGATION: THE EXAMPLE OF LANGUEDOC-ROUSSILLON REGION

In Languedoc-Roussillon region, a first regional agreement was signed in 2011 with ENEDIS in order to organize the actions at this territory scale and to digitize paper maps that have been produced the years before. If the actions were focused on the Bonelli’s eagle, other species were also taken in account: Cinereous vulture, Egyptian vulture and the Bearded vulture.

Moreover, two actions were targeted by the agreement: (1) preventive insulation of dangerous power lines and (2) effective insulation of poles involved in bird mortality.

In 2014 (2nd agreement), we added an article about period of maintenance in order to keep period of quietness during breeding time.

In 2017 we signed the third agreement in order to continue the actions.

As a whole, considering 17 occupied sites and 3 dispersal areas, we monitored more than 1076 km of power lines from which 234 km were considered as high risk for birds (Table 1).

	Risk level				Insulation	
	1	2	3	ND	0	1
Occupied sites	178	373	219	142	825	89
Dispersal areas	14	8	15	126	35	128

Table 1.- Length of power lines (km) at each risk level (ND refers to null or non-informed data). Length of insulated (1) or not (0) power lines (km). Source PNAAB.

From this table we can see that after 20 years of actions (only punctual in the first years), about 22 % of risk 3 power lines were insulated. In dispersal areas this very positive result comes from a massive insulation (risk 1 to 3) of a large area where 6 Bonelli's eagle were killed (electrocution and collision) during winter from 2008 to 2012.

At occupied site level, we have huge differences in terms of power lines network (from 31 to 211 km) and risk level (13 to 46 km as risk 3). Moreover, in the considered area, there is a national electricity provider (ENEDIS) and a local one (CESML) with which we only started to work in 2017 with the aim of mapping all its network (4 occupied sites are concerned).

Moreover, a similar approach has been done in PACA and Rhône-Alpes regions resulting in a large awareness at the species' distribution scale.

WHAT WE LEARNED

Working on electrocution mitigation requires a lot of work and time. We spent many time to share our needs and to find a common language. Moreover the insulation of power lines enlists specialized team that have a cost (the work is done without cutting power supply). This cost is entirely supported by ENEDIS with about 100 000 € involved every year for the mitigation of electrocution in this region.

We meet 2 or 3 times a year to define together what we consider as priorities for Bonelli's conservation and then make an assessment at the end of the year.

GIS play a key role to follow the actions and offer opportunities to insulate risk power lines during other maintenance intervention (such as power lines burying).

OUR PHILOSOPHY

All actions done in France aim at mitigate direct threats and protect habitats in order to let Bonelli's eagle population grow and access to safe sites. Analysis showed that we increased survival rate by working on power lines and we clearly observed an increase of Bonelli's eagle population in France in the last 15 years (from 22 pairs in 2002 to 34 nowadays).

Nevertheless, the road is long until we reach our goal: each new recovered territory by a pair of Bonelli's eagle is often a new territory to assess for electrocution risk! Moreover, we face new challenges with the quick development of wind and solar power plants that represent new threats for the Bonelli's population.

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