



# First GPS monitoring of the Capercaillie in high mountain habitats in France

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**Introduction:** One of the southernmost subspecies of the Capercaillie (*Tetrao urogallus*), in the Pyrenees (mountain range at the border between France and Spain), is using different landscapes from the usual habitats of the species, i.e. typically large areas of semi-open little fragmented coniferous forests, on gentle relieves. In contrast, Pyrenean landscape features are constituted of relatively thin patches of good Capercaillie habitats, especially subalpine forests and shrublands, highly fragmented by deep valleys, high mountains, alpine meadows, and unsuitable forests. Since 30 years, French and Spanish state services and hunting organizations have tried to improve the carrying capacity of the Capercaillie in the Pyrenees. Since 15 years, significant efforts have been made in ski resorts to re-establish connectivity between surrounding populations in order to help them to maintain and even develop.

**Main questions:** How is the spatial behaviour of the Capercaillie in habitats highly fragmented, both by natural features and by past and present human uses? Is the habitat improvement effective? Are the restoration attempts in ski resorts effective?

**Study areas:** We studied the spatial behaviour of the Capercaillie and the effects of habitats management in a strongly mountainous landscape in the Game and Wildlife National Reserve of Orlu (central-eastern French Pyrenees). Most of the landscape is constituted by subalpine and alpine habitats much of which being unsuitable for the species, as short alpine meadows and rocky areas. Parts of the forests are dense and medium aged beech forests (*Fagus sylvatica*) without field layer, therefore unsuitable. We started clearing them by creating about 300 small clear-cuts without logging distributed in two forests patches, to simulate forest gaps created by storms, that led to the development of the understorey and often of the Capercaillie populations. Other forests are more or less small, spaced patches of Mountain pine (*Pinus uncinata*), Birch (*Betula pendula*) and Rowan (*Sorbus aucuparia*), nowadays naturally expanding and looking very suitable for the Capercaillie. Nevertheless, parts of the ground cover is made of very dense Rhododendron bushes (*Rhododendron ferrugineum*) that grew as a primary formation after abandonment of heavy sheep grazing, avoided by the birds. We have started since 1999 clearing it in a thin mosaic pattern in an experimental plot.



We studied the spatial behaviour of the Capercaillie in a ski resort in Superbagneres (Central French Pyrenees). The ski area covers about 630 ha, half of it being wooded by rather good and locally very good habitats, mainly clear Fir forests (*Abies alba*), and pioneer vegetation of Birch, Rowan, shrubland of Rhododendron and Bilberry (*Vaccinium myrtillus*), and high grasses. Between 1970 and 2005, the number of Capercaillie living in the ski area declined continuously, until there were virtually extinct by 2005. From 2006 until now, conservation measures took place, and the Capercaillie recolonized the ski area and their number increased up to 15 adults in 2016.

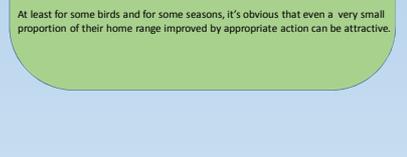
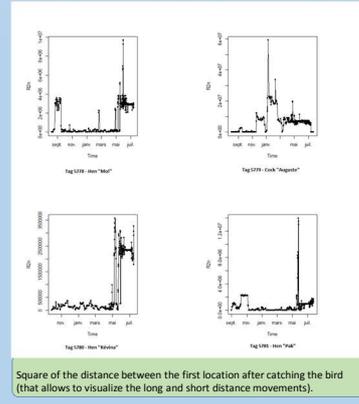
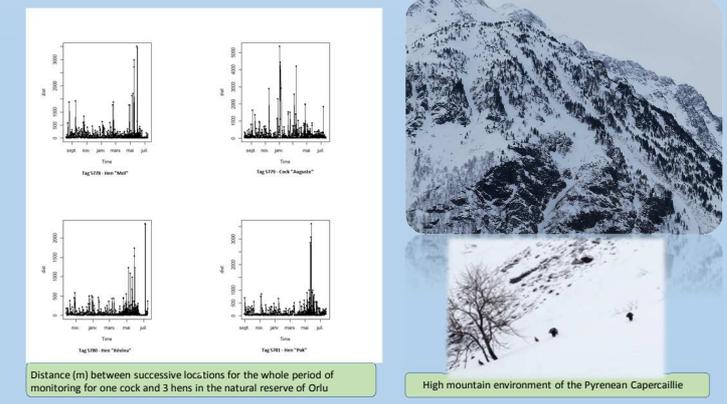
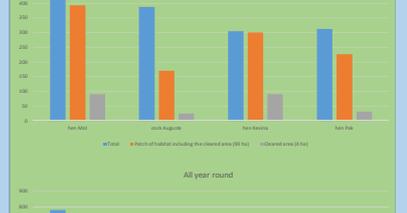
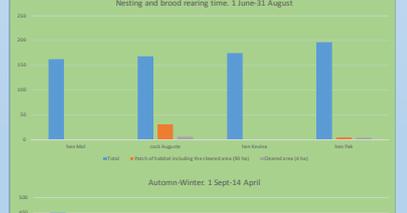
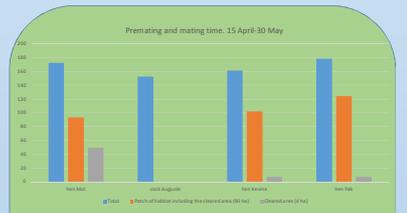
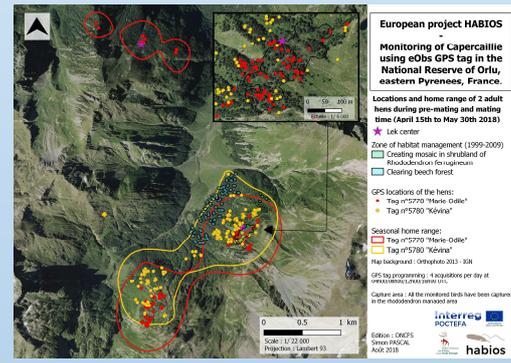
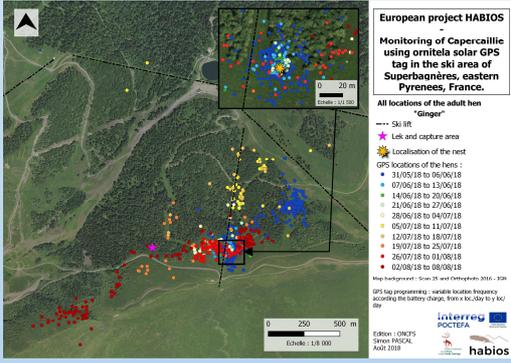


**Methods:** we captured all the monitored birds using "Lily trap" or the "Catalan" variant, from August to October 2017 in Orlu, and in May 2018 in Superbagneres. Partners of Habios project also used salmon nets on the leks. The birds were weighted, aged and equipped with GPS tags fitted with harness before to be released. The weight of the tags was comprised between 22 to 26 g (= 2,5 % of the lightest cocks, 1% of the lightest hens). We used eObs material in Orlu, with batteries, equipped with a PINGER allowing us to locate the GPS and to load the data, because no GSM waves are available in this valley. We used Ornitella material in Superbagneres, with solar collector.

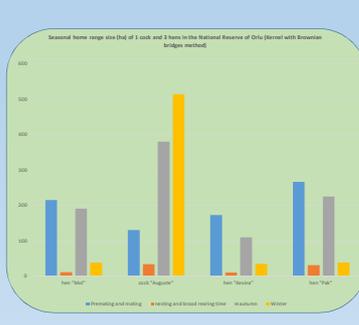


**Data analysis:** We performed all the analyses using 2 R packages ADEHABITAT: LT : Trajectory Analysis (Lavielle), HR: Home Range (MCP and Kernel with Brownian Bridges). Analysis of habitat selection will be performed later when the sample of monitored birds will be higher.

**Preliminary results:** Some examples of our first results are shown below.



**Discussion and conclusion**  
These very preliminary results and this study will take a greater sense when the sample of monitored birds will be more significant and the results will be analyzed altogether. Nowadays, already 20 birds are monitored in different study areas by the partnership of Habios, both in the French and the Spanish side of the Pyrenees. The project will continue in 2019, and very probably more birds will be captured. Nevertheless, the first results lead to some interesting findings:  
✓ GPS tags allow studying the spacing behavior of the Capercaillie in very mountainous landscapes. The birds tolerate well the tags as shown by the successful nesting of all our first four monitored hens.  
✓ The home ranges of the monitored birds in a landscape where the good habitats are patches in a sea of rocky slopes, short alpine meadows and dense forests are quite large. They are sometimes divided in 2 or more clusters, but not always. The birds can move easily across a deep valley and above quite long distances of unsuitable habitat.  
✓ The timberline and very clear pioneer stand of mountain pine and birch are certainly key habitats.  
✓ Cleared dense rhododendron bushes seem attractive even if their surface is modest. On the contrary, the cleared beech forests haven't been used by the monitored birds.  
✓ In a ski resort, infrastructures clearing dense stands are appreciate by a hen, provided the ground vegetation is maintained high enough.  
✓ On the total number of monitored birds in Habios, two adult hens are attended 2 different leks during the mating season (Orlu study area), and one adult cock is attended several leks (low mountains in Cataluña, near the southern limit of the range of the species-Garcia, Camprodon et al. com. pers. ).  
✓ Most of the habitats used by our monitored birds are quickly expanding both as a consequence of the climate changes and of the changes of land use by man, especially pioneer stands of Mountain pine, Birch and Rowan. Thus, we can expect in the next decades an expansion of the range of the Capercaillie toward the higher altitude, may be able to compensate the degradation of the habitats observed in the foothills and at lower altitudes.



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