

PROJECT I.D.
1.1. Acronym: FORSEE-CARABOID
1.2. Project title: Effects of certain ecological variables on the carabid (Coleoptera: Carabidae) community in native and non-native woodland in the Ibaizabal Valley (Bizkaya, Basque Country).
1.3. Financial backers: European Union and IKT S.A. (Agricultural Research and Technology-Nekazal Ikerketa eta Teknologia)
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NEIKER DETAILS
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1.6. Start date: January 2005
1.7. End date: September 2007

Summary:

We investigated the coleoptera carabidae in 5 different types of woodland in the Ibaizabal Valley (Northern Spain). The landscape consists of remnants of native woodland surrounded by conifer plantations. The carabidae were captured in 52 plots of mixed woodland, beeches, oaks, mixed pine and *Pinus radiata* plantations during 2005 and 2006. The main aims of the study were to compare the diversity of the carabidae, identify the characteristic species (indicators) of each habitat and study the effect of ecological variables on the composition of the species of carabidae present in the different types of woodland. The main aim of the project was to find biological indicators that could be used to measure the degree of preservation of each type of woodland, so that they could be used in the future as a tool to be taken into account by the different forestry certification systems.

Overall aims:

The project was designed to study the composition of the community of carabid beetles (Coleoptera: Carabidae) in different types of woodland in the Ibaizabal Valley (Biscay, Basque Country, Spain). This can be broken down into three parts:

- 1) To compare the biodiversity of carabid beetles in different types of woodland (native and exotic plantations).
- 2) To find characteristic species and indicators of said woodlands.
- 3) To study the effect of certain ecological variables on the carabid communities.

Results:

1. Abundance of species, richness and diversity

During the study, we captured 12,073 individuals belonging to 27 different species of carabidae. The captures were dominated by 5 species that were common to all habitats: *Steropus gallega* (25.75%), *Carabus nemoralis* (23.08%), *Abax parallelepipedus* (20.99%), *Carabus lineatus* (12.07%) and *Carabus purpurascens* (7.89%). These species account for approximately 90% of the total number of individuals captured. Over half the captures of beetles by trap and by type of woodland were obtained in the pine plantations. On the contrary, the captures made in the holm oak woods represented 6%, with 17% in the beech wood and mixed woodland. The greatest number of species was captured in mixed woodland (20 species), closely followed by the beech wood (18 species). The *Pinus radiata* woodland and the holm oak woodland provided less species (16, 15 and 12, respectively). However, the statistical analyses carried out

(ANOVA) did not show any significant differences for either the average richness of carabidae, nor the Shannon diversity index, nor for the abundance per trap and type of woodland plot.

2. Classification of the habitats of the carabidae

The species of carabidae have been classified into 3 groups by characterisation of the habitats and characteristic species, identifying: (a) generalist woodland species that are very frequent in all kinds of woodland; (b) specialist species for native woodlands that appear exclusively or more abundantly in woodland with native trees, and (c) specialist species for non-native woodland, which were captured exclusively or most abundantly in woodland with non-native trees. (a) The generalist woodland species were represented by *Carabus nemoralis*, *Steropus gallega*, *Abax parallelepipedus*, *Carabus lineatus*, *Carabus purpurascens*, *Pterostichus cristatus*, *Carabus cancellatus*, *Carabus convexus* and *Nebria brevicollis*. (b) The native woodland specialists were represented by 3 species. *Carabus splendens* and *Cychrus spinicollis* were significant bio-indicators of the beech wood and *Carabus auratus* was a bio-indicator of the mixed woodland "MF" although not significant. (c) Non-native woodland specialist species were represented by *Laemostenus oblongus* and *Carabus macrocephalus*. Both species were significant bio-indicators of mixed woodland. The relative proportions between the generalist species and specialist species of the woodland by type of habitat showed that over 90% of the individuals captured belonged to the generalist species.

3. Correspondence analysis (CA) of the plots based on the composition of carabidae

CA was used to study the distribution of plots according to the abundances of carabidae. The distribution of the plots behaved in a highly mixed fashion (the two analysis axes contained 40% of the total variation observed in the carabid communities). However, a group of four beech woods behaved in similar fashion and contained differentiated communities. Especially relevant were the populations of *Carabus splendens* and *Pterostichus cristatus* at these four points located at great height. A group of *Pinus radiata* plots appear to share very similar carabid communities, although not united with said species of carabidae. The isolated plots of *Pinus radiata* and mixed woodland had communities that not only differed to woodland of the same type, but also from the rest of the plots studied. The rest of the plots grouped in the centre of the analysis showed a very mixed distribution of shared carabid communities. The species of carabidae grouped in the centre of the chart were not associated to any type of woodland, their distributions overlapped in such a way that they did not show communities that were specific to any particular type of woodland.

4. Ecological variables that affect the carabid community.

We analysed the relationships between the data for the species and the ecological variables (height, temperature, precipitation, frost-free period, vegetative period, tree height, organic material, plant coverage, bush coverage, grass coverage and number and species of trees) and the Canonical Correspondence Analysis showed a significant influence on the distribution of the carabid community. The *Steropus gallega*, *Carabus nemoralis*, *Abax parallelepipedus*, *Carabus lineatus* and *Carabus purpurascens* communities were grouped in the centre of the chart with a non-differentiated pattern. No preferences for the habitat based on the ecological variables detected for said species were found. However, the less abundant species showed more specific habitat requirements. *Pterostichus cristatus* and *Carabus splendens* were influenced by the height of the plot. The *Carabus auratus* communities were affected by the frost-free period. The *Carabus cancellatus* communities appear to develop better on plots with high percentages of grasses. The presence of the two latter species was influenced and they were related with warm plots. *Carabus convexus* was influenced by the percentage of grass cover and height, while *Laemostenus oblongus* was also influenced by height. Other variables that affected other species included temperature and height, defining a possible temperature gradient, with *Carabus cancellatus* and *Carabus auratus* clearly associated with warm plots, while *Carabus splendens*, *Pterostichus cristatus* and *Laemostenus oblongus* preferred colder ones.

Impact

The ecological studies that attempt to study the effect of different repopulations in the edofauna are of great importance for implanting corrective measures that mitigate the loss of biodiversity. In addition, detecting bio-indicator species of insect for each type of woodland is an interesting tool for developing environmental impact studies, measuring the quality of ecosystems and creating sustainable management tools that can be used with forest certification systems.

Publication

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