REPORT OF THE EXPEDITION:

MONITORING ORCHID POPULATIONS IN THE MARINA REGION (SOUTH EAST OF SPAIN)

EDITION 2006

The first edition of this expedition was carried out in May 2006 by two teams. People from Spain, Germany, France and Portugal came to the Marina region as volunteers for developing some field work research on orchids.

This report shows our activities during the expedition as well as brief comments about the outcomes obtained which have been much more important than we expected.

WHICH ENVIRONMENTS DID WE VISIT?

1. Littoral perennial grasslands, thickets and maquis. Thermic vegetation close to the sea shore under wind and drought conditions. Natural communities of perennial grasses as *Brachypodium* sp., *Hyparrhenia* sp., *Stipa* sp., etc., or thyme-like formations as thickets scattered by small stains of maquis.

2. Abandoned traditional fields in littoral environments. Thermic vegetation close to the sea shore under drought conditions. Annual short herbs and grasses (*Leontodon* sp., *Scorpiurus* sp., *Medicago* sp., *Lolium* sp., *Hordeum* sp., etc.) and perennial species of grasses-thickets (*Brachypodium* sp. and *Thymus* sp.). Terraces in slopes close to the sea shore or up to 1 km towards inland.

3. Mountain grasslands and thickets. Shade and sunny slopes at more than 600 masl where a mixture of grasses, thyme-like communities and shrub formations cohexists. *Brachypodium retusum*, *Thymus vulgaris*, *Ulex parviflorus* and *Cistus albidus* are the main edificator plants of the landscape of these areas. Due to the altitude temperatures are lower in each season and humidiy is higher except in summer.

4. Abandoned traditional fields in mountain slopes. Abandoned terraces in inland mountain slopes between 400 to 800 masl, under cold conditions in winter, cool in spring and relatively hot in summer. High humidity conditions from autumn to spring. Perennial grasses (*Brachypodium phoenicoides*, *Hyparrhenia synaica*, etc.), with scattered specimens of thicket elements (*Thymus vulgaris*, *Helichrysum serotinum*, *Ulex parviflorus*, etc.) are the main edificator plants for the landscape of these environments.

HOW DID WE WORK?

- Self-Pollination

To see if the orquid species were able to self-pollinate we conducted an experiment. Insects where excluded from flowers with metal cages (40 cm length, 25 cm diameter) covered with fine gauze. We placed the cages when the flowers were in bud stage to ensure that no pollinators had visited the flower before. The cages remained closed until all the flowers where either dry or fructified.

- Pollinators

To determine which insect visited each orquid species and so that to determine which orquid is insect-pollinator specific, we developed a method of direct observation and capture of the insect for subsequent laboratory determination. Observations of flower visitors were carried out during the late afternoon. Insect visitor counts and capture with net bags were performed by two observers by plant for 15-min periods.

- Reproductive outcome

We carried out an experiment to study and determine the reproductive outcome of some orquid species. It has to be done when the orquid is in full fruit phenology. We have to count in several individuals of the same population the amount of fruits and the number of dried flowers (non-fecundated). That way, we can determine the proportion of fecundated flowers for each individual and have an idea of how good the orquid is having its flowers fecundated in their natural environment.

- New records

We visited several spots, from the coastline towards the inland, to search for new orchid populations and characterize them.

When arriving to a new location, people spread out in pairs to spot some orchid species, when a new record was spotted the following data was collected: species, location, date, GPS location, altitude, soil substrate, aspect of the slope, vegetation, bioclimate, disturbances, phenology of the plant, number of flowers, height, largest diameter of the rosette, smallest diameter of the rosette, flower size, number of fecundated flowers, number of companion orchid in a 30 cm diameter radius.

- *Population ecology*

In some places where there was a good representative population of species, a permanent plot was conducted. Depending on the harshness of the terrain we decided to carry out a rectangular or a degree plot.

The rectangular plots were made in terraces or nearly flat slopes. The center of the rectangle was marked by a stake, then the northern, southern, eastern and western radius was measured and the rectangle was fixed visually by a rope. Then the following data was collected: species, location, date, plot number, GPS location, radius N, E, S, W, altitude, soil substrate, aspect of the slope, vegetation, bioclimate, disturbances, phenology, number of individuals, height average for those full flower plants.

The degree plots were used in steep slopes areas. In this case, we fix a centre point with a stake that will stay there for future reference. From that point we measure the radius and orientation of each orchid of the population as well as the species, phenology, number of flowers, largest diameter of the rosette, smallest diameter of the rosette, flower size, number of fecundated flowers and height of each orquid. As in the other method, more data is collected: location, plot number, date, GPS location, soil substrate, aspect, vegetation, bioclimate and disturbances.

RESULTS

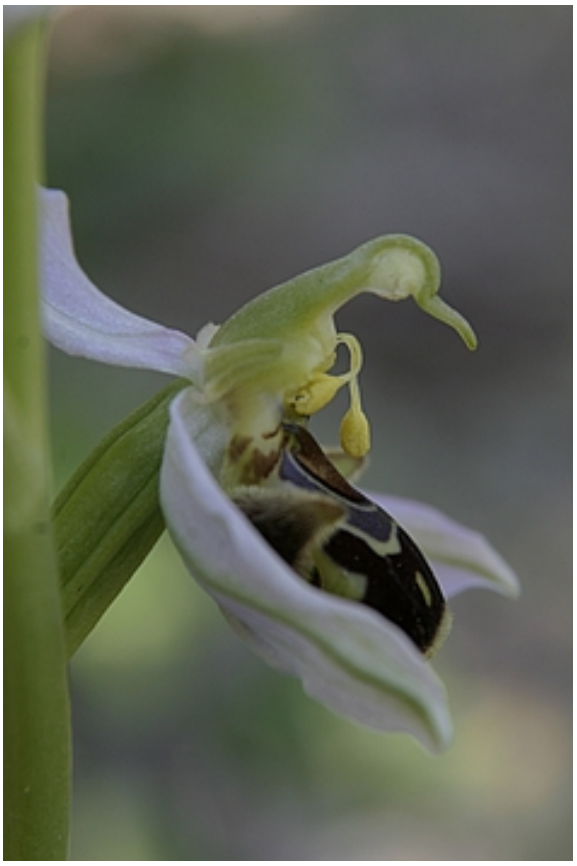
The main results from the 2006 Orchid Volunteering Expedition are:

- We found and recorded far more data records of orchid than we expected.
- The field methodology revealed to be very effective. We kept improving and performing the methodology as we saw what worked and what didn't in the field.
- The population ecology studies in future expeditions will only use the degree permanent plot. We found that this method is easier and faster to set up regardless of the ruggedness of the terrain. Furthermore, we know the exact position of each orchid of the population studied as well as all its biological characteristics. This method allows us to expand or reduce the area of the plot if needed.
- Land use change does affect both the distribution and abundance of orquid species more than expected.

Despite those general results, we have come up with some specific results for each of the studies we've achieved.

- *Self-pollination*

Self-pollination experiments in *Ophrys apifera*, *Ophrys arnoldii*, *Anacamptis pyramidalis* and *Aceras anthropophorum* revealed that the only species (among the studied) able to self-pollinate was *Ophrys apifera*.



Ophrys apifera self-pollinating

- *Pollinators*

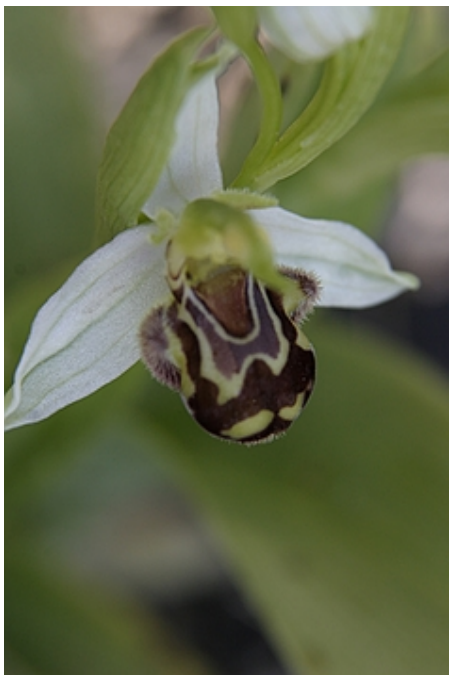
No pollinator visitor was recorded, so we couldn't identify any pollinator species. For future editions of the expedition, pollinator observation will be performed between 10.00 and 14.00, when the flight activity of mate-searching male wasps is highest.

- *Reproductive outcome*

We studied the reproductive outcome of one species, *Aceras anthropophorum*. Twelve individuals of a population located in the north face of a 1000 m high "*sierra*" were counted. Approximately 15% of the flowers of each orchid were fecundated excepting two individuals showing an outstanding reproductive success with more than 90% of their flowers fecundated. Curiously, those two individuals had many flowers and bigger than the other individuals studied. We think that the number of flower per individual and the *"quality"* of those flowers very much determine their reproductive outcome. If there are more flowers and they are bigger, they probably can produce more scent than their companions which in turn makes them much more attractive to pollinators. In any case, further studies must be carried on to see if statistics can prove this hypothesis to be true.

- *New records*

A total of 887 records were collected out of ten orquid species: *Anacamptis pyramidalis*, *Barlia robertiana*, *Himantoglossum hircinum*, *Orchis fragans*, *Ophrys apifera*, *Ophrys lupercalis*, *Ophrys lutea*, *Ophrys scolopax*, *Spirantis spiralis* and *Aceras anthropophorum*.



Ophrys apifera

Anacamptis pyramidalis

Ophrys scolopax

Barlia robertiana in full fruit

Ophrys lutea

Hymantoglossum hircinum in early flower

Aceras anthropophorum

Ophrys lupercalis

Spiranthes spiralis

Orchis fragans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The percentage of records of each orquid species is detailed in fig. 1.

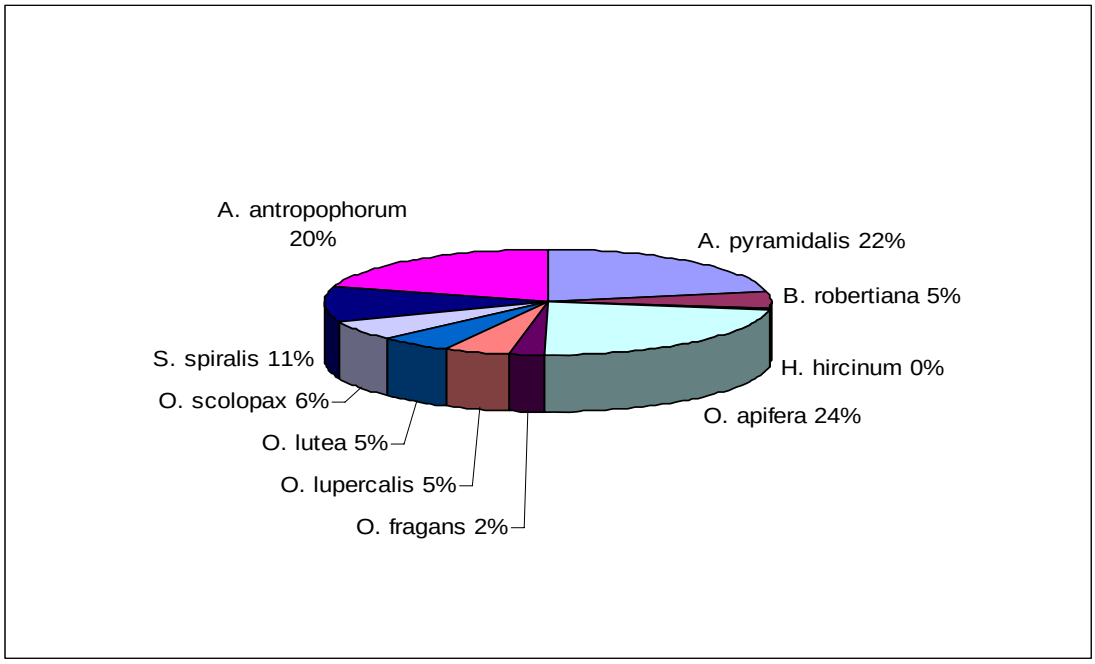

Figure 1. - Percentage of records of each orquid species.

There was far more records than we could expect from the study area. We found a new population of *Ophrys lutea* in Sierra de Aixortà, a place where it was not noticed before. We studied 47 individuals of *O. lutea* of that population.

The total number of records in each study site is shown in fig. 2. The proportion of records of each species in every study site can be seen in fig. 3.

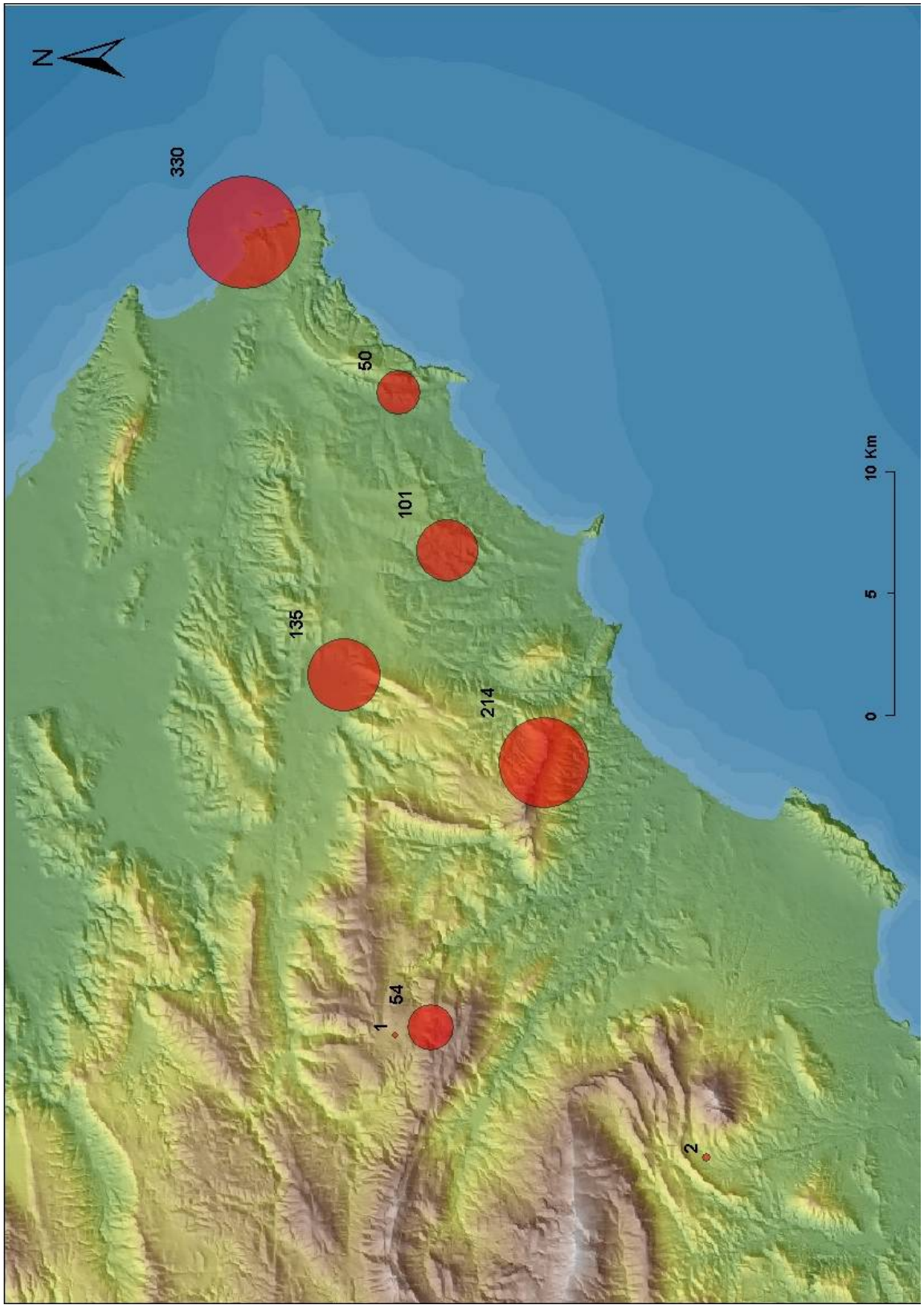

Figure 2. - Number of records from each study site in the Marina Region, Spain. The size of the pies is proportional to the number of records.

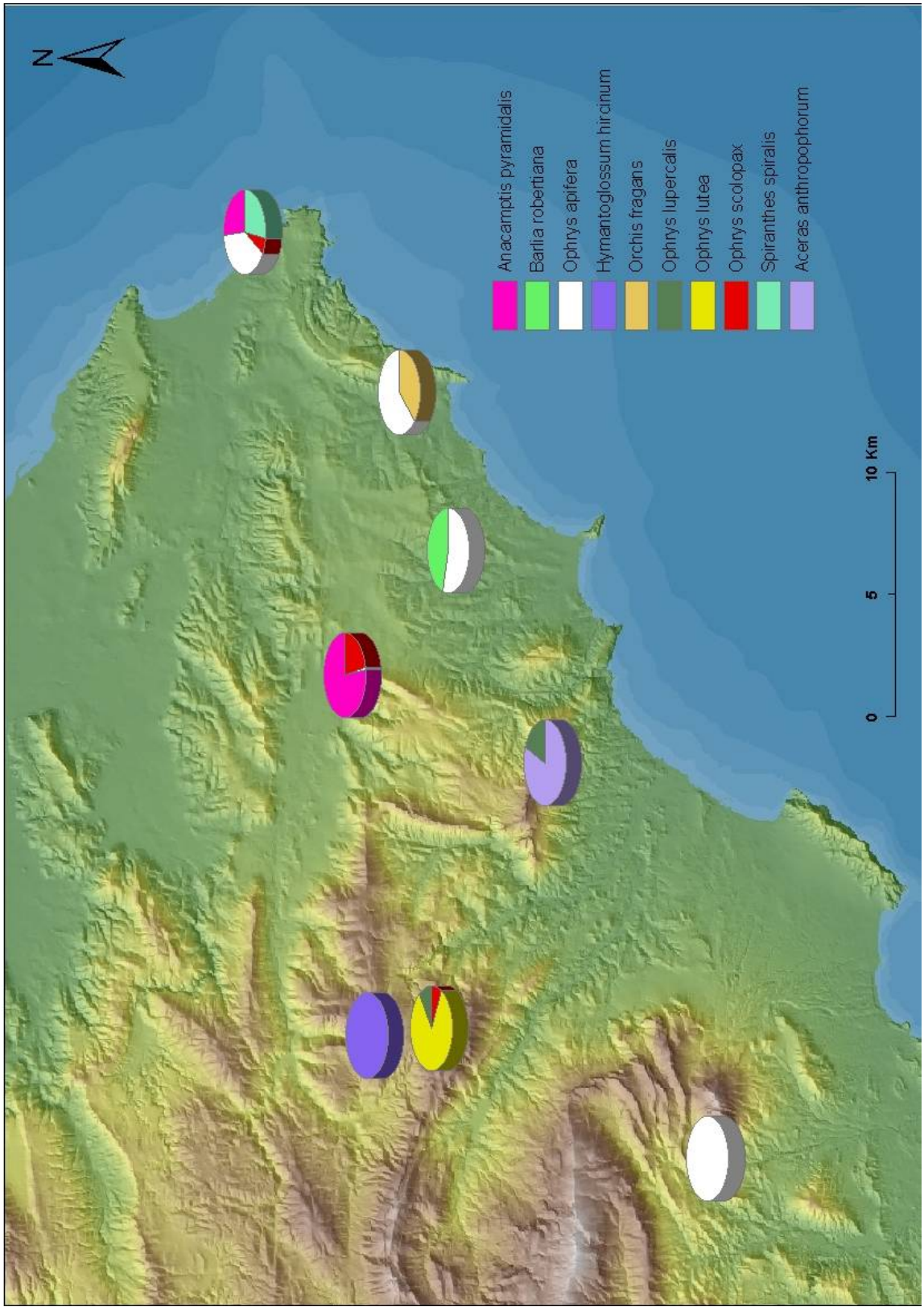

Figure 3.- Proportion of records of each species in every study site in the Marina Region, Spain.

- Population ecology

The permanent plots we placed over the area studied will reveal in next expeditions some so far unknown key points about the ecology and evolution of orchid populations. These are the main points we will determine:

- How does the density of the populations evolve in different areas? We still don't know if the density of the populations will raise or diminish with land use changes and disturbances.
- Where the recruitment does comes from: vegetative or sexual reproduction?
- Recruitment rate
- How the populations expand physically, that is, if they tend to occupy smaller or larger areas over time.

A total of 9 permanent plots were placed. We recorded biological data of 366 individuals of seven species: *Anacamptis pyramidalis, Orchis fragans, Ophrys apifera, Ophrys lupercalis, Ophrys scolopax, Spirantis spiralis* and *Aceras anthropophorum*.

AS A CONCLUSION

The first edition of the expedition has been very interesting according to the results and the experience itself. Attendant's opinions encourage us to organize more editions. And why? Because, on one hand, the good environments we visit conform pleasant working experiences in the field and people get satisfied after the week living with us.

On the other hand, we already know that in a medium term period we will have enough information to state more definitive results, some of then unknown and, furthermore, unpredicted or unexpected.

We want to thank every body who came to experience with us an unforgettable week and we are really pleased of inviting you to share this adventure for next spring.

We hope to see you soon

Best regards

Toni Barber & Nico Moity