

## **POLLINATOR DIVERSITY AND SUSTAINABLE AGRICULTURE IN THE NETHERLANDS**

A. de Ruijter

### **ABSTRACT**

In densely populated countries of Europe pollinator diversity is under great pressure. Wild bee species are in decline, as is the number of honey bee hives. Reasons for declines and taxonomic impediments are discussed. A warning that sustainable agriculture does not necessarily assume pollinator conservation is given.

The Netherlands is a densely populated country (450 inhabitants per square kilometre), but it is nevertheless an important producer of agricultural products. Land use in the Netherlands is becoming more and more intensive and this means that pollinator diversity has come under great pressure.

### **The Status of Wild Bee Species**

Of 322 species of bees, 60 species have not been seen after 1980. Of these 60 species 13 disappeared before 1950, 15 species in the fifties, 16 in the sixties and another 16 in the seventies. This looks like a rather constant rate of decline. We know less about the abundance of bees. Several species show a decline in abundance, but some generalists seem to thrive well. In the genus *Bombus* for example, several species have become very rare (e.g. *B. sylvarum*, *B. muscorum*), others are still very common (*B. terrestris*, *B. pascuorum*). Even in this well-known genus, we do not know the reasons for these differences. Another problem we have to deal with is taxonomy. In our institute we reared *B. terrestris*, *B. lucorum*, *Bombus cryptarum* and *B. magnus* and although it seems obvious that these are four different species, the status of *B. cryptarum* and even *B. magnus* is still disputed. We know even less of the taxonomy of many other genera.

### **Economic importance**

Managed and wild pollinators play an important role in the pollination of agricultural crops. In 1992 the ministry of agriculture estimated the contribution of pollinating insects at about 200 million Dutch guilders a year (=100 million US\$). Managed honeybees, bumblebees (*Bombus terrestris*) and solitary bees (*Osmia rufa*) are used for the pollination of fruit crops, vegetables and seeds. In 1995 we introduced insect pollination of greenhouse tomatoes, using honeybees as pollinators. This worked very well as long as the windows were closed or provided with gauze to keep the bees inside. Of course when Mr. De Jonghe in Belgium found out three years later that bumblebees could do the same job with the windows open, we started to use bumblebees for the pollination of greenhouse tomatoes. We also developed a management system for the use of *Osmia rufa* in seed production. In order to study the biology of this important species, we tried and succeeded rearing them in the laboratory.

### **The Status Of Honeybees**

Simultaneously with the decline in wild bee species, the number of honeybee colonies has gone down from about 160.000 just after the second world war to about 80.000 today.

## **Reasons For The Decline**

Although the reasons for the decline of individual wild bee species are not always clear, it is generally agreed that the loss of food plants and nesting sites are the most important factors. As a result of changes in agricultural practice, during the last 50 years the numbers of flowering plants have decreased substantially. From the variety of crops grown in the past, only high yield field crops (such as potatoes, wheat and sugar beets) are still grown in large areas. Due to the use of herbicides many weeds have disappeared from crop fields. In a country like the Netherlands, there are no refugia like mountain areas or land that is not suitable for agriculture. The Dutch have drained the swamps, pumped water out of lakes and even use the bottom of the sea for agriculture.

## **Conservation Measures**

Recently attempts have been made to change the management systems for different types of habitats. Roadsides, field margins and waterways are now managed in a way to increase the diversity of plants. Under set-aside regulations farmers can now use a variety of plant species on land that is temporarily not used for agricultural production. The plants on these lists are sustaining a variety of game, birds and flower visiting insects.

The government supports measures that make agriculture more sustainable. The use of pesticides is cut down and there are strong regulations on the use of manure and fertilisers. Fragmentation of the landscape makes rare species more susceptible to extinction. For this reason the government's policy is to maintain and recreate corridors between important habitats and to enlarge small natural reserve areas by buying farmland and turning it into nature areas. There is still a lot of discussion about this policy. Probably there were less opposition against these measures if the management systems would be less strict. A diverse approach with room to try different strategies would probably give the best results in the end. A diverse, multifunctional landscape creates chances for a diversity of pollinators.

## **A Warning**

Sustainable agriculture does not automatically lead to the conservation of pollinator diversity. In particular the production of large amounts of biomass for energy may result in desert-like habitats. We have to be aware that what is being build up by carefully managing the landscape, is not torn down by large-scale biomass projects.

## **Research**

At our institute Ambrosiushoeve, with respect to pollinator diversity, we are running two research projects at the moment. The first one deals with the effect of pollination by managed honeybees and other insects on blackberry. Blackberry is a wild plant in the Netherlands that grows both in natural and semi-natural habitats. The berries are an important food source for birds. The other project deals with managed bees and wild pollinators in fruit orchards. After an inventory of the different species present in fruit orchards, we want to focus on the needs of different species (food, shelter, nesting sites) and describe the measures fruit growers can take themselves in order to maintain a local population of pollinating insects.

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