

Where do we feel changes?

The Bavarian State Collection of Zoology Munich (ZSM)

Checklist of butterflies

Even here in Germany, the manifestations of climate change can be seen in a loss of biodiversity. Researchers at the Bavarian Natural History Collections are observing the changes in biodiversity and the distribution of faunal and floral species in nature. They compile broad species lists based on collection material, which allows for comparisons of a species' spatial and temporal propagation over decades and centuries. The Bavarian State Collection of Zoology Munich compiled an extensive checklist of all Bavarian butterflies in 2016. The list is based on 250 years of butterfly studies and more than 400,000 data records. As for Bavaria, over 3,200 species have been established, even including a new discovery from the grass miner moths family (Elachistidae). However, a 13% loss of species was confirmed and even many of the „ordinary species“ like the blood-vein (*Timandra comae*) or the garden tiger (*Arctia caja*) are declining rapidly.

Source: Systematic, revised and commented checklist of Bavaria's butterflies (Insecta: Lepidoptera)

Publication: *Systematische, revidierte und kommentierte Checkliste der Schmetterlinge Bayerns (Insecta: Lepidoptera)*

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Further information [checklist of butterflies](#)

The Bavarian Botany and Mycology State Collection Munich (BSM)

Flora of Bavaria

The last time Bavaria's flora was recorded in a comprehensive work was in 1914 . The initiative „Flora of Bavaria“ at the Botany and Mycology State Collection Munich (BSM) aims to document and compile a record of the flora for the entire state of Bavaria. This will help to evaluate changes in it caused by climate change and land use. Thanks to comparative studies of recent and historic evidence stemming from the Botany Collection, it is possible to compile valuable information such as the „Red Lists“ of threatened species.

Link to Website [Flora von Bayern](#)

The Bavarian Botany and Mycology State Collection Munich (BSM)

Flora of Munich

The last published list of species covering Munich's plants is more than 100 years old. Since that time, the number of inhabitants has multiplied by nearly ten. In this time, there has been a huge decline in species, but also the introduction of new ones, which can be seen by a direct comparison with the mapping project „Flora of Munich“, running since 2006. The Indian strawberry (*Duchesnea indica*), which today is widely spread in the city area, is an example for a new addition that was entirely unknown in this part of the world 100 years ago, or the bee-bums (*Impatiens glandulifera*), which, on the one hand, suppresses indigenous plants, but, on the other, grants valuable phacelia in late summer.

Link to Website [Flora von München](#)

Bavarian State Collection for Paleontology and Geology

Fossils as witnesses of the past

Fossils are witnesses of past life on Earth. Comprehensive collections of fossils from a specific geological formation or a certain region provide clues to the habitat or climate of the past. Such as the fossils and rocks from the Solnhofen Limestone area, which show that around 150 million years ago, there was a tropical climate in Bavaria. The landscape in Upper Jurassic times was characterised by a warm shallow sea, divided into lagoons and reefs. A research project at the Bavarian State Collection for Paleontology and Geology (BSPG) focused intensely on a variety of fish fossils from the Solnhofen Limestone, which are extraordinary well preserved.

Link to [Bayerischen Staatssammlung für Paläontologie und Geologie \(BSPG\)](#)

Munich Botanical Garden (GBM)

Woody plants and climate change

How do native and non-native woody plants cope with climate change? This question is being addressed in the Munich Botanical Garden. For six years now, there have been experimental studies on how the leaves of over 1000 individuals out of 500 species of trees and shrubs sprout. Out of 500 species, some 85 % are not from Central Europe, but from Asia or North America. It is this very variety of species growing next to each other that allows us to find out about their genetically predisposed strategies, since they are all exposed to the same conditions. This way, their „genotype“ is accessible to research. This fundamental research approach is only possible in Munich Botanic Garden and has led to a number of unexpected events: it appeared, for instance, that North American species sprout after a much longer winter period than European or Asian ones and that on average, their leaves bloom three weeks less than those of all the other species. Because the winter period in Munich has shortened by four weeks in the past 100 years, especially American woody plants tend to struggle in this part of the world.

Munich Botanical Garden (BGM)

Botanical Garden, a home for wild bees

The Munich Botanical Garden is home to 107 of the 571 wild bees species found in Germany. Has this number or the range of species changed in the course of the past years? Both questions could be answered by a Master's thesis, since the garden's species of bees had already been compiled once before in 1997, guided by scientists of the Zoological and Botanical Collections (ZSM and BSM). Twenty years ago, 79 species were found. Out of the newly added species, eight are thermophilic, whereas 16 species which could not be found anymore, are adapted to colder conditions. The thermal preference for nest-building and forage crops of many of our bees is still unknown though. The studies are thus carried on in a PhD thesis. One of the possible logical explanations for the monitored changes is the rise in temperature in Munich of 0.5 °C between 1997 and 2017. Generally speaking, the variety of bees increases in warmer regions.

Publication <https://link.springer.com/article/10.1007%2Fs00442-018-4110-x>