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Artikel: Phenological methods in permanent plot research : the indicator value of phenological phenomena : a study in limestone grassland in Northern Switzerland = Phänologische Methoden bei Dauerquadratuntersuchungen : der prognostische Wert phänologischer Phänomene : eine Untersuchung in Halbtrockenrasen (Mesobrometum) in der Nordschweiz

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Summary

The present paper deals with the possible indicative value of short- and mid-term phenological observations. The investigations were carried out in *Mesobrometum* limestone grassland in northern Switzerland. The first data on the phenological behaviour as well as the cover of seven plant species within surfaces subjected to one of four different treatments (cutting in June, cutting in October, burning in March, no management) is presented. In addition, the phenological response of whole communities to the aforementioned treatments as represented by synthetic colour diagrams is considered.

Short-term phenological records collected throughout a single vegetation season led to conclusions that were not always found to be infallible. Mid-term observations, on the other hand, turned out to be quite good predictors of future development; conclusions based upon these observations were corroborated by comparing communities representing various successional stages as well as by the long term data of other authors. Phenological observations were shown to indicate habitat alterations earlier than traditional relevés, not only when considering individual species, but also where whole communities are concerned; the time difference sometimes reached as much as ten years. Conclusions drawn from mid-term phenological data were in the long term often more correct than those based upon mid-term phytosociological records.

As far as the cover of a given species is concerned, the response to changing environmental conditions was found to be mostly slow and sometimes rather ambiguous. On the other hand, the different treatments affected the flowering intensity of the seven presented species in the following way:

- Cutting in June proved to be rather unfavourable for *Aster amellus*, *Buphthalmum salicifolium*, *Brachypodium pinnatum* and *Primula veris* s.l., advantageous for *Bromus erectus*, *Ranunculus bulbosus* and *Orchis pallens*.
- Burning in March was not shown to date to cause severe damage to any of the studied species, excepting *Ranunculus bulbosus*; it turned out to be advantageous for *Aster amellus* and particularly so for *Brachypodium pinnatum*.
- Cutting in October was observed to considerably damage *Bromus erectus* and *Ranunculus bulbosus*; the performance of *Buphthalmum salicifolium* was only slightly affected whereas the behaviour of *Primula veris* s.l., *Aster amellus* and *Brachypodium pinnatum* apparently remained unaltered. *Orchis pallens* was not observed in those surfaces.
- 'No management' proved to have a highly unfavourable influence upon *Bromus erectus* and *Ranunculus bulbosus*; it was apparently advantageous for *Primula veris* s.l., *Aster amellus* and *Buphthalmum salicifolium*. *Orchis pallens* and *Brachypodium pinnatum* appeared to remain unaffected.

The limitations of phenological methods are briefly discussed. Phenological phenomena being very responsive to meteorological conditions, the use of control plots is most important. Furthermore, microdifferentiation occurring in some species may limit the indicator value of phenological data.

In conclusion, the significance of phenological methods in active conservation management is stressed; particularly in this connection, early indicators revealing possible unfavourable effects of a given treatment on threatened species are greatly needed.