*Abstract*: The delineation of desmid species was traditionally based on purely morphological features. However, a frequent misinterpretation of morphological variability in desmids has led in the past to extensive taxonomical confusion within this important group of green algae which complicates the interpretation of their biodiversity in freshwater ecology, biogeography and biomonitoring. Consequently, I focused in this thesis predominantly on a previously neglected issue, the application of polyphasic approaches in the species-level taxonomy of desmids. In the most studies, a combination of both traditional morphological and modern molecular phylogenetic and geometric morphometric methods has been used to evaluate the taxonomy of selected desmid species, particularly representatives of the morphologically complex genera *Micrasterias* and *Xanthidium*. In two papers, I used the combination of traditional morphological and autecological data to clear up the taxonomy of several morphologically less prominent desmid taxa. Generally, the results of the thesis demonstrated that the way we recently see the diversity and distribution of desmids should be thoroughly changed. The real species diversity is mostly distinctly finer than that estimated by classical morphological taxonomy, often corresponds to varieties of the traditional morphologically defined species, and is usually well determinable using combination of molecular and morphological data. Consequently, true cryptic diversity appears to be a relatively rare phenomenon in desmids. Moreover, it is likely that the actual species diversity of desmids is for a much greater part than generally supposed related to the patterns of their geographic distribution or to the climatic factors. The biogeographical areas of these phylogenetic species are probably usually much smaller and the proportion of regionally restricted or even endemic species consequently much higher than recently assumed. Herewith, the results contradict the ñubiquity modelò as the possible distribution model of desmids, in favour of Foissnerôs ñmoderate endemicity modelò. The practical use of desmids in biomonitoring and other studies based on species composition data will need to be revised, but still seems to be much more promising than in the absolute majority of other microalgal groups, particularly due to the revealed monophyly of most of the traditional desmid morphospecies studied. Polyphasic approach, based on combination of several mehods, yields a new level of interpretations that could not be reached by the use of any of these methods alone. Nevertheless, it is obvious that the investigation of hidden species diversity in desmids is still at the beginning.