Comparing species assemblages has important applications in ecology, since it provides crucial information about the spatial and temporal variations of ecosystems. However, such comparisons are often done by a visual inspection of estimated species accumulation curves in the ecology literature. In this talk, we introduce three statistically rigorous testing procedures for comparing species assemblages based on three different types of data collected in ecological studies. Those testing procedures are developed using mixture models, which are popular choices to model ecological data due to their capabilities to account for heterogeneity among species. We present a simulation study to evaluate the performance of our proposed tests. The application of our tests is further demonstrated on several ecological datasets. This is joint work with Changxuan Mao and Jifei Ban.