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Biodiversity knowledge and loss of natural vegetation in protected areas in Sub-Saharan Africa

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ABSTRACT:

Knowledge of the biodiversity present in protected areas (PAs) is of ultimate importance to define adequate conservation strategies. Nevertheless, acquiring this knowledge is challenging given the complexities involved in collecting and documenting biodiversity. Collating already existing biodiversity data stored in natural collections is an attractive option to provide a comprehensive picture of the overall biodiversity represented in PAs. However, it is unclear whether the data stored in natural collections represents the actual biodiversity of PAs, as recent land cover change may have caused loss of natural vegetation in and around PAs. To address this problem, we present a timely integrated overview of the historical coverage of herbaria specimens collected and the loss of natural vegetation in and around PAs in Sub-Saharan Africa. We used 934,676 herbaria specimens representing 47,238 species collected between the years 1709 and 2012. Loss of natural vegetation was derived from imagery from years 1990, 2000 and 2010, covering about 1000 PAs with a buffer of 20 km around each of them. Recent advances in the availability of free satellite imagery ease the collection and selection process for good quality, cloud free imagery for a certain date for any geographical region of interest, such as PAs and their buffer zones. We obtained for every PA the temporal and spatial coverage of specimens occurring in areas that have been subject to loss of natural vegetation. We found that most of the specimens in Southern African PAs were collected in the 1960s and 1970s, and since then land cover change has contributed to the loss of natural vegetation in and around PAs. On the other hand, specimens were recently collected for PAs in Benin (Western Africa). Additionally, we found that gaps in botanical collections overlap with intense land-cover change, for instance, in PAs located in Mozambique. We suggest that PAs, which are poorly represented in the herbaria because outdated or scarce botanical inventory, and subject to intense land-cover change, should be the focus of biodiversity research. Moreover, as pressure in and outside of the PAs is ever increasing a monitoring system based on free satellite imagery would certainly improve the detection of pressure and thus emphasize areas, sites and regions where direct actions would be most needed.