

Cities as global biodiversity hotspots

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Over half of humanity now lives in urban areas, which cover <3% of Earth's terrestrial surface. Cities are widely perceived as concrete jungles of limited conservation value and little is known about the global patterns and drivers of urban biodiversity. An increasing body of literature documents patterns of plant and bird species diversity within a number of cities, but relatively few studies have compared these patterns across cities at regional or continental scales. It is often suggested that urbanization also drives global biotic homogenization, with urban floras and faunas being dominated by relatively few cosmopolitan "weedy", invasive, or commensal species occurring in most cities. We convened an NCEAS working group of researchers from cities worldwide to develop a synthesis of urban ecology using a comparative approach. We asked the overarching questions: "What makes an urban biota 'urban'?" and within that, "Are the patterns of urban biota and the processes that shape them the same across the world's cities?" We identify a hierarchy of filters that determine patterns of urban biodiversity: 1) regional scale biogeographic context, 2) metropolitan scale urban intensification, and 3) local scale socio-economic/cultural factors. Here we show, using the largest global database (147 cities) compiled to date, that cities house a significant proportion of the world's bird and plant diversity. Of the world's total known species, at least 20% of birds and 5% of vascular plants occur in cities. Contrary to global homogenization concerns, cities tend to contain unique assemblages of species. The majority of urban bird (94%) and plant (70%) species are native. Only a small number of plants and birds are cosmopolitan, *Columba livia* (rock pigeon, in 94% of cities) and *Poa annua* (annual meadow grass, in 96%) being the most common. Urban species richness is predicted primarily by anthropogenic features related to population size and land-cover characteristics. The proportion of urban non-native plants is predicted equally by both non-anthropogenic and anthropogenic factors suggesting their prevalence is not determined exclusively by human activities. While birds and plants exhibit different patterns, overall we see that cities are richer in species and more unique than generally expected, and contain a considerable proportion of global biodiversity. Our study represents the largest current urban global database of multiple taxa, but some areas remain underrepresented, highlighting the lack of systematic studies in most cities. There is an immediate need for better compilation and monitoring of urban biota in areas of high regional biodiversity, such as tropical cities. Cities within the developing world exhibit rapid growth and increasing stress on local natural resources. Understanding the biodiversity in these regions is paramount to reconciling human development with the maintenance of biodiversity and ecosystem services. Conservationists are increasingly concerned that urbanization weakens the connection between people and nature. Our results highlight that cities can support both biodiversity and people, and retain a high potential for sustaining these connections. Despite worldwide biodiversity loss, cities are not depauperate concrete jungles but can play a critical role for biodiversity conservation, restoration and community education.