

Urbanization Effects on Biodiversity Revealed by a Two-Scale Analysis of Species Functional Uniqueness vs. Redundancy



International audience, Urbanization is one of the most intensive and rapid human-driven factors that threaten biodiversity. Finding an indicator of species community responses to urbanization is crucial for predicting the consequences of anthropogenic land cover changes. Here, we develop a framework that relies on functional originality. A species is original or equivalently distinct, regarding its traits, if it possesses rare trait values in a community of species. The most original species have the greatest contributions to the trait diversity of that community. We studied plant species originality, in light of observed changes in the level of species richness, along an urbanization gradient in the region of Paris, France. To evaluate potential impacts of urbanization on species assemblages, we simultaneously considered the local community and regional pool as reference scales where to calculate the originality of each species. Then, for each community, we calculated the mean and skewness of local and regional originalities and the ratio of local to regional originality, providing indication on how functionally diverse a community is, how original it is compared to other communities of the region, how evenly distributed species were in the local and regional functional space, and whether regionally-redundant species become original locally due to limiting similarity. The mean functional originality increased with urbanization at both local and regional scales, although this increase vanished in communities with high species richness. The skewness of originalities increased from zero to positive values with species richness in built-up areas and the ratio of local-to-regional originality increasing along the urbanization gradient, except in species-rich communities. Here our results suggest that urban plant communities are composed of both locally and regionally unique urbanophile species, suggesting processes that limit niche overlap to allow species coexistence. In richer communities, these unique species coexist with regionally-redundant species the occurrence of which could be stochastic. Our conceptual framework shows that species originality can inform on environmental processes that influence biodiversity during community assembly. It is flexible enough to be extended to other regions and other contexts complementing diversity metrics in the research of the mechanisms by which human activities impact species assemblages.

Auteurs du document : Kondratyeva, Anna, Knapp, Sonja, Durka, Walter, Kuhn, Ingolf, Vallet, Jeanne, Machon, Nathalie, Martin, Gabrielle, Motard, Eric, Grandcolas, Philippe, Pavoine, Sandrine, Centre d'Ecologie et des Sciences de la COnservation (CESCO) ; Muséum national d'Histoire naturelle (MNHN)-Sorbonne Université (SU)-Centre National de la Recherche Scientifique (CNRS), Institut de Systématique, Evolution, Biodiversité (ISYEB) ; Muséum national d'Histoire naturelle (MNHN)-École pratique des hautes études (EPHE) ; Université Paris sciences et lettres (PSL)-Université Paris sciences et lettres (PSL)-Sorbonne Université (SU)-Centre National de la Recherche Scientifique (CNRS)-Université des Antilles (UA), Department Community Ecology [UFZ Leipzig] ; Helmholtz Zentrum für Umweltforschung = Helmholtz Centre for Environmental Research (UFZ), Technische Universität Berlin (TU), German Centre for Integrative Biodiversity Research (iDiv), Martin-Luther-University Halle-Wittenberg, Conservatoire Botanique National du Bassin Parisien (CBNBP) ; Muséum national d'Histoire naturelle (MNHN), Institut méditerranéen de biodiversité et d'écologie marine et continentale (IMBE) ; Avignon Université (AU)-Aix Marseille Université (AMU)-Institut de recherche pour le développement [IRD] : UMR237-Centre National de la Recherche Scientifique (CNRS), Institut d'écologie et des sciences de l'environnement de Paris (iEES) ; Institut National de la Recherche Agronomique (INRA)-Université Pierre et Marie Curie - Paris 6 (UPMC)-Université Paris-Est Créteil Val-de-Marne - Paris 12 (UPEC UP12)-Centre National de la Recherche Scientifique (CNRS), ANR-10-LABX-0003,BCDiv,Biological and Cultural Diversities : Origins, Evolution, Interactions, Future(2010)

Obtenir le document : HAL CCSD

Mots clés : biodiversity measure, community assembly, disturbance, environmental filtering, functional trait, originality measure, spatial scale, [SDV.EE]Life Sciences [q-bio]/Ecology, environment, [SDV.EE.IEO]Life Sciences [q-bio]/Ecology, environment/Symbiosis, [SDV.BID]Life Sciences [q-bio]/Biodiversity

Thème (issu du Text Mining) : INFORMATION - INFORMATIQUE, ENVIRONNEMENT, MILIEU NATUREL, AMENAGEMENT DU TERRITOIRE - PAYSAGE

Date : 2020-03-24

Format : text/xml

Identifiant Documentaire : mnhn-02917015, DOI: 10.3389/fevo.2020.00073

Source : ISSN: 2296-701X, Frontiers in Ecology and Evolution, <https://hal-mnhn.archives-ouvertes.fr/mnhn-02917015>, Frontiers in Ecology and Evolution, Frontiers Media S.A., 2020, 8, pp.73. (10.3389/fevo.2020.00073)

Langue : Anglais

Droits d'utilisation : info:eu-repo/semantics/OpenAccess

Télécharger les documents : <https://hal-mnhn.archives-ouvertes.fr/mnhn-02917015>

<https://hal-mnhn.archives-ouvertes.fr/mnhn-02917015/document>

<https://hal-mnhn.archives-ouvertes.fr/mnhn-02917015/file/fevo-08-00073%281%29.pdf>

Permalien : <https://www.documentation.eauetbiodiversite.fr/notice/urbanization-effects-on-biodiversity-revealed-by-a-two-scale-analysis-of-species-functional-unique0>

Evaluer cette notice:



Ce portail, créé et géré par l'Office International de l'Eau (OIEau), est géré avec l'appui de l'Office français de la biodiversité (OFB)

