

Analyzing ecosystem services as part of ecological networks in three salt marsh ecosystems

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Abstract

Biodiversity plays important roles in nature's contributions to people (i.e., ecosystem services), but the critical details of how biodiversity contributes are challenging to determine. Efforts to identify the components of an ecosystem that provide services have improved our understanding of which species, functional groups, population, or habitats directly provide services. However, species do not exist in isolation and considerably less is known about how species *indirectly* influence ecosystem services through interacting with those species directly providing services. This uncertainty is even greater when considering that species interact in complex networks. As such, detailed analyses of species interdependencies are rarely included in ecosystem services assessments or conservation decisions. To date, most studies on food webs and on ecosystem services have developed largely in parallel for many services, but these fields and data are ripe for empirical integration. To further this integration, we compiled data sets that linked three existing ecological networks to seven ecosystem functions and services: wave attenuation, shoreline stabilization, carbon sequestration, water filtration, fisheries, birdwatching, and waterfowl hunting. We leveraged high-resolution ecological interaction network data sets from three coastal salt marsh ecosystems including detailed species information (e.g., consumer strategy, body size, biomass) on several hundred species from Carpinteria Salt Marsh in California, USA, and for Estero de Punta Banda and Bahia Falsa in Baja, Mexico from Hechinger et al. (2011). Through an extensive literature synthesis and use of citizen science data, we identified which species in the Hechinger et al. (2011) data provided each ecosystem services directly. We augmented the Hechinger et al. (2011) data published in *Ecology*, particularly the link (or edge) list to include species—service links to indicate a species providing a service, in which species are listed as "Resources" and services are listed as "Consumers." Connecting these data to the previously published ecological networks with species interactions (i.e., trophic, parasitism) formed a topological network with species and service nodes. We also provided a protocol for assigning services to ecological networks that can be used in other ecosystems. This data set provides a step toward advancing the knowledge of important supporting species for ecosystem services and to developing new

ecological network methods for ecosystem services. There are no copyright restrictions; please cite this data paper when the data are used in publications.

KEY WORDS

coastal ecosystems, ecological networks, ecosystem functions, ecosystem services, food webs, salt marsh, species interaction

DATA AVAILABILITY STATEMENT

Code is available on Zenodo at: <https://doi.org/10.5281/zenodo.4750584>

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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