

The complex network of trophic interactions in the Marine Protected Area Namuncurá-Banco Burdwood

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Abstract

Introduction

The objective of the present work was to build the network of predator-prey interactions (food web) for the Marine Protected Area Namuncurá - Banco Burdwood I, and characterize it in terms of complexity and structure.

Methodology

Study area

Food web construction

Food web analysis

We analyzed the MPA food web at 2 levels: 1) global, network-level properties (considers all species and interactions), and 2) species, species-level properties (considers the species' role in the food web). GLOBAL Complexity: # trophic species, # interactions, link density, connectance Degree distribution Mean shortest path length Omnivory Distribution of prey and predator Distribution of interactions by functional group SPECIES Centrality indices (betweenness, closeness) Trophic similarity Topological role

Results

Network-level properties

Most Functional groups show an asymmetric distribution of interactions: few species are relatively more connected than the rest.

Most consumers have a narrow potential diet, few have a broad diet. Few prey are consumed by many predators, most prey have few predators. Consumers w/ broad diet: *Patagonotothen guntheri*, *P. ramsayi*, *Dissostichus eleginoides*, *Bathyraja brachyurops*, *B. griseocauda*. Prey w/ many predators: Detritus, Diatoms (benthic, centric, pennate), *Euphausia* spp., Foraminifera.

Species-level properties

'Network connector' and 'module connector' species are responsible for linking modules and maintaining the connectivity of the food web. TL range for these species: 1 - 3.86.

Betweenness = Species at mid-trophic levels (3-4) present more shortest paths between species than any other species: 'bridge' role. Closeness = Low-trophic level species are relatively closer to other species in the food web.

Trophic similarity: Species are more similar at mid-trophic levels (2-3) than in lower or higher ones. Basal and top species present a higher uniqueness in terms of trophic role.

Discussion

The distribution of the interactions is asymmetric, where few species concentrate most of the interactions: Detritus, Diatoms (x3), Patagonotothen ramsayi & P. guntheri, Euphausia spp. The same happens within each functional group.

The most demanded food sources are: Detritus, Diatoms (x3), Euphausia spp., & Foraminifera. Almost half of the consumers (47.64 %) are omnivores. Those with the broadest diets are: Patagonotothen ramsayi, P. guntheri, Dissostichus eleginoides, Bathyraja brachyurops, B. griseocauda.

Low and mid-trophic level species are responsible for maintaining the connectivity of the food web. The functional groups represented are: Amphipoda, Bivalvia, Bryozoa, Cnidaria, Cumacea, Decapoda, Detritus, Diatoms, Echinodermata, Fish (bentho-pelagic, demersal, chondrichthyes), Foraminifera, Polychaeta, Porifera, Zooplankton.

Low and mid-trophic level species present the highest betweenness and closeness values. These species have an important 'bridge' role and are close to other species. Mid-trophic level species are more redundant than those at low and high trophic levels.

References