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How does human exploitation influence the transition between stock-level and ecosystem-level processes in high-trophic level species compared to low-trophic level species in a marine system?

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Abstract

Human exploitation of the natural environment has been shown to have a significant impact on both stock-level and ecosystem-level processes. In turn this leads to altered food webs, where different trophic levels are affected differently, leading to changes in ecosystem regulation. This presentation will examine how human exploitation influences the transition between stock-level and ecosystem-level processes in high-trophic level species compared to low-trophic level species in marine systems. It will do this by analysing case studies and peer-reviewed literature.

High-level trophic species, which include apex predators, have been shown to maintain ecosystem stability through top-down control of an ecosystem by regulating prey populations. A decrease in the prey population prevents the overconsumption of resources. However human activities such as hunting and overfishing, can have pronounced ecosystem-level effects: a trophic cascade takes place and top-down controls are weakened. The loss of apex predators has a negative impact on species fitness at higher trophic levels and also can lower ecosystem resilience.

On the other hand, low-level trophic species, such as primary producers or herbivores, maintain ecosystem stability through bottom-up control of an ecosystem. This is possible as they are the source of nutrient availability and primary productivity. When they are affected by human activities such as overharvesting and habitat disturbance, they show less pronounced ecosystem level effects compared to high-trophic level species. They are more likely to have an indirect impact on ecosystem processes which isn't as immediately visible.

Ultimately, it is argued that human exploitation disproportionately affects high-trophic level species, triggering long-term changes in marine biodiversity and ecosystem resilience, and calls for refined ecosystem management strategies that account for these uneven impacts.

Keywords

Ecosystem Resilience; Habitat Disturbance; Ecosystem Management; Food Web Dynamics; Trophic Cascades; Biodiversity Loss

Recent Publications: I have no publications as of yet, as I am a Bachelor student.

Biography

Mae McGinley Smith is a third-year Biology student at Radboud University, specializing in Ecology with a minor in Data Science. Passionate about conservation and environmental science, Mae has

been involved in research projects ranging from microclimate effects on insect development to ecological restoration initiatives. She has hands-on experience in field research, statistical analysis, and scientific reporting, aiming to integrate data-driven insights with real-world conservation efforts.

Outside of academia, Mae has actively contributed to conservation projects, including biodiversity monitoring in Mauritius and marine ecosystem assessments. As Chair of the Alumni Committee at Radboud University's Biology Association, she has developed leadership, event coordination, and networking skills. Through interdisciplinary collaboration, Mae hopes to contribute to global biodiversity conservation and climate resilience.

Presenting Author Details and Photo

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