

5.2 Disruptions in food webs and trophic cascades

Disruptions in food webs and trophic cascades are significant mechanisms contributing to species endangerment. The loss of species diversity can alter the functioning of trophic groups and ecosystems, leading to less efficient resource capture and conversion into biomass (Cardinale et al., 2006). This disruption can have cascading effects throughout the ecosystem, affecting not only the species directly involved but also those that rely on them for survival. For instance, the reduction in species richness can lead to decreased abundance or biomass of focal trophic groups, which in turn affects the entire food web structure.

The impact of biodiversity loss on trophic dynamics is further complicated by the role of dominant species in ecosystems. The “sampling effect” suggests that diverse communities are more likely to contain highly productive species, which can dominate and stabilize ecosystem functions. However, when these key species are lost, the ecosystem's ability to function effectively is compromised, leading to further species declines and potential extinctions. This highlights the interconnectedness of species within ecosystems and the importance of maintaining biodiversity to ensure the stability and resilience of food webs.

5.3 Altered reproductive success and population decline

Environmental changes can lead to altered reproductive success, which is a crucial mechanism driving population decline and species endangerment. Habitat loss and fragmentation can disrupt breeding patterns and reduce the availability of suitable habitats for reproduction, leading to decreased population sizes and increased extinction risk. The reduction in genetic diversity due to habitat fragmentation can also result in lower reproductive success, as inbreeding and genetic drift reduce the overall fitness of populations (Willoughby et al., 2015).

Moreover, anthropogenic disturbances such as habitat modification and climate change can impose additional stress on reproductive processes. For example, changes in temperature and precipitation patterns can affect the timing and success of breeding events, further exacerbating population declines (Hirt et al., 2021). These disruptions in reproductive success highlight the need for conservation strategies that address both the genetic and environmental factors contributing to species endangerment.

5.4 Physiological stress and behavioral changes due to environmental pressures

Physiological stress and behavioral changes induced by environmental pressures are significant mechanisms that contribute to species endangerment. As habitats are altered by human activities, species are forced to adapt to new conditions, which can lead to increased physiological stress and changes in behavior. For instance, habitat loss and fragmentation can limit the space available for species, increasing competition for resources and leading to stress-related declines in health and survival (Hirt et al., 2021).

Behavioral changes, such as altered foraging patterns and migration routes, can also result from environmental pressures. These changes can disrupt established ecological relationships and lead to further declines in population sizes. Additionally, the loss of genetic diversity can exacerbate these effects, as species with reduced genetic variation may lack the adaptive capacity to cope with new environmental challenges (De Almeida-Rocha et al., 2020). Understanding the interplay between physiological stress, behavioral changes, and genetic diversity is crucial for developing effective conservation strategies to mitigate the impacts of environmental pressures on endangered species.

6 Case Study: The Endangerment of Amphibians Due to Environmental Change

6.1 The global amphibian decline crisis

Amphibians are experiencing a significant global decline, with many species facing the threat of extinction. This crisis is largely attributed to a combination of factors, including habitat destruction, climate change, pollution, and disease. A comprehensive assessment indicates that one-third or more of amphibian species are threatened with extinction, a trend exacerbated by their limited geographic ranges and the intense human pressures on their habitats (Wake and Vredenburg, 2008). The decline is particularly severe in tropical regions, where many amphibians have small, specialized habitats that make them vulnerable to environmental changes (Wake and Vredenburg, 2008). The global biodiversity crisis affecting amphibians is a clear indicator of the broader environmental challenges facing ecosystems worldwide.