Trophic Effects of Cyanobacterial Blooms

(1) Bluegreen algae are well known to be a nutritionally inadequate food source for zooplankton
(2) There are three main food quality constraints
    a. Resistance to Grazing
        i. Morphology of cyanobacteria (long filaments and large colonies) make ingestion of cyanobacteria difficult for many zooplankton
        ii. Mechanical interference with zooplankton feeding structures
            1. Filaments clog filtering apparatus
            2. Ingestion requires more energy, which reduces the overall energetic benefit of cyanobacterial consumption
    b. Toxicity
        i. Toxins are harmful to zooplankton
        ii. Large grazers such as daphnia are generalist and do not selectively feed on "non-toxic" phytoplankton
    c. Nutritional deficiency
        i. Cyanobacteria are not an adequate source of sterols and long-chained polyunsaturated fatty acids (PUFAs) which are necessary for regulating cell function in animals
        ii. Sterols and PUFAs are found in cell membranes…cyanobacteria lack membrane bound organelles
(3) Because cyanobacteria are not an adequate food source for zooplankton, environmental controls (grazing) on bluegreen populations are lost allowing blooms to form and persist
(4) Potential effects of cyanobacteria blooms on fish include
    a. Reduced visibility due to increased turbidity can effect the predation success of piscivores who rely on visual hunting
    b. Increased pH and decreased oxygen due to cyanobacterial competitive success and bloom formation
    c. Bioaccumulation of toxins from cyanobacteria → zooplanktons → planktivores → piscivores
    d. Trophic effects of reduced populations of zooplankton from feeding effects listed above

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