WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES

Commercial Finfish Net Pen Aquaculture & Washington State Aquatic Habitats

Background and Purpose

The purpose of this document is to share key findings from a synthesis of the best available science concerning the habitat stressors from commercial finfish net pen aquaculture (CFNPA), and how those stressors interact with aquatic habitats and habitat elements of interest to Washington State. It also highlights the possibility of cumulative impacts in the face of climate-induced changes.

Stressors to Priority Habitats from Commercial Finfish Net Pen Aquaculture

1. Shading

- Eelgrass beds, kelp forests, and other macroalgae are recognized for their ecological, economic, and sociocultural values. Shading from floating infrastructure can slow or prevent growth of these organisms as they are sunlight-dependent species [1].
- Shading can promote the growth of more shade tolerant turf algae and epiphytes that accumulate sediments and outcompete kelps for habitat and further shade eelgrass by growing on their blades [2].
- Direct shading from CFNPA has been shown to negatively effects submerged aquatic vegetation and macrofauna [3,4].
- CFNPA structure serves as aggregating structure, attracting other mobile species such as predatory fish and birds due to its 3-dimensional structure and the presence of feed that can attract and be consumed by non-target species [5].

2. Effluent

- Particulate discharge from CFNPA can remain suspended in the water column causing declines in light availability creating conditions unsuitable for kelp and eelgrass and more favorable for shade and sediment tolerant turf algae [6].
- Antibiotics can be transferred to the benthos through both uneaten feed and particulate excrement, where they are then found in organisms underneath or surrounding the site of impact [7,8].
- Commercial finfish net pens are a point source of heavy metals such as zinc and copper that are transferred to the environment from fish feed and pen cleaning [9].
- Measurable levels of benthic impact are observed months to years after a commercial finfish net pen has been removed from a site [10,11].

3. Hydrodynamics

- Floating CFNPA structures can alter surface flow leading to alterations in lateral circulation, water momentum and vertical mixing [12].

- A CFNPA structure can reduce current velocity causing increased particle deposition and accumulation of fine materials beneath the structure [12].
- Hydrodynamic effects of CFNPA may be site-specific and depend on seasonal variations in water currents.

Cumulative Effects of Multiple Stressors

Cumulative effects of diminished flushing and continuous nutrient input (feces, feed) can increase organic loading, leading to increased bacterial decomposition and lowering dissolved oxygen and increasing sulfate concentrations beneath CFNPA and in the root zones where aquatic vegetation resides.

It is suspected that adjustments to natural cycles (water level, current, eutrophication, stratification, acidification, light penetration, runoff, temperature, weather extremes) via climate change may already have increased the risk of pathogens and parasites, eutrophication, algal blooms, and the presence of invasive and non-native species within natural systems which is cause for concern if said adjustments interact with CFNPA related stressors.

Summary References

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