Aquatic food production and resource management - Freshwater use in Chinese aquaculture

Lara D. Mateos

Supervisor: Dr. Max Troell
Co-Supervisors: Dr. Lisa Deutsch & Patrik J. G. Henriksson

ABSTRACT

Aquaculture will play an important role for future seafood supply, but its increasing dependency on freshwater resources may pose a challenge for its growth. This thesis explores the freshwater footprint of cultured aquatic animals, using the global aquaculture giant, China, as a case study. Main objectives were to: a) perform a preliminary estimation of the freshwater footprint (m$^3$ tonne$^{-1}$) at the national/regional scale, using the conceptual framework and methodology of the Water Footprint Network (WFN), b) identify key methodological aspects and variables specifically related to measuring the water footprint in aquaculture, c) analyse and discuss water consumption to inform future sustainable water management strategies, through a deeper understanding of Chinese aquaculture as a social-ecological system. Results show that aquaculture’s freshwater footprint is similar to terrestrial animal production systems, with an average of 14 952 m$^3$ tonne$^{-1}$. Water consumption mainly takes place at the farm through evaporation from freshwater ponds, and dilution of freshwater in brackish water ponds. Indirect water footprint through feed consumption is mainly influenced by the composition of ingredients, and the assimilation efficiency of the different species. The trend is towards intensification of production, and this has the potential to lower water consumption per yield, however, increased consumption of higher quality feed in such systems may work in the opposite direction. Key sustainability aspects that require further attention within the WFN’s methodology include cross-scale interactions between the focal scale with its upper and lower scales, and the interconnectedness of water scarcity issues to other resource uses and associated impacts. An integrated framework is needed to allow the comparison and aggregation of indices across the three pillars of sustainability. Here, the transdisciplinarity of the SES approach can help create sustainability criteria that reflect water consumption impacts in a more integrated way.