



Biographies of fish for the city: Urban metabolism of Laguna Lake aquaculture



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ABSTRACT

This paper examines the complexities of producing fish for the city and substituting wild with farmed fish. Using the urban metabolism framework and commodity biographies approach, it takes the case of peri-urban aquaculture in Laguna Lake, Philippines and focuses on the metabolic transformations of bighead carp, an introduced lake fish primarily consumed in nearby Metro Manila. Increased lake production of cheap fish like bighead carp did not immediately result in greater urban consumption, which remained limited owing to consumer unfamiliarity and the material characteristics of the fish tied to its production in the lake. By following the fish, the paper tells the story of how bighead carp has been and is being made amenable for urban consumption in Metro Manila's wet markets, kitchens and fish processing sites. It discusses the material practices associated with the transformation of fish in their displacement through the metaphors of distancing, entanglement, frictions and flows. It argues that particular relations between fish and the aquatic environment materially produce fish that is in turn metabolized in the city through everyday practices that reconstitute fish commodities. These practices show that despite the production of more cheap fish, the substitution of capture fisheries by aquaculture is a messy process that reflects metabolic contradictions that fish materially embody and that have material effects on fish production and consumption.

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Introduction

States and international organizations promote aquaculture as a novel and efficient means of supplying more fish to more people in the context of production crises in capture fisheries. Half a century of dramatic aquaculture expansion has successfully produced greater volumes of affordable fish that nourished and provided livelihoods to many, particularly in the global South. This suggests the potential of aquaculture to ease pressure on capture fisheries and provide a cheaper substitute for marine wild fish. However, the specific dynamics of aquaculture's interactions with capture fisheries remain poorly understood despite their critical importance. Some scholars have noted, for example, how certain types of farmed fish rely on inputs derived from the catch of marine industrial fishing fleets, a dependence that undermines aquaculture's supposed ecological benefit of reducing demand in capture fisheries. Furthermore, while some types of farmed fish are expected to directly substitute for increasingly expensive wild fish,

most are consumed by a different segment of fish consumers. Farmed freshwater fish species are also considered nutritionally inferior to wild marine fish and are subject to health concerns as a result of routine contamination. Direct substitution or replacement of wild by farmed fish is therefore not a straightforward process. These examples point to the need to investigate the complex and contradictory interactions between aquaculture and capture fisheries.

This paper seeks to contribute to discussions on aquaculture-capture fisheries interactions by focusing on one of aquaculture's socio-ecological contradictions: its production of a materially different fish from capture fisheries. It argues – using the case of the rise of freshwater aquaculture production in Laguna Lake, Philippines – that the substitution of wild by farmed fish requires practices by producers, consumers and intermediaries to materially and symbolically transform farmed fish in response to its particular material production. While other studies have probed food market dynamics and ecological relations between farmed and wild fish, I turn my attention instead on these practices and their outcomes as indicative of aquaculture-capture fisheries interactions. To meet this first objective, the paper employs a commodity biographies approach, one that follows the fish from production to consumption. Narrating commodity biographies teases out the

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process of material and symbolic transformation of commodities in motion.

While several geographic studies have evaluated aquaculture by focusing on high-value fish produced in intensive systems in the global South that are consumed in the global North, domestic commodity flows and urban fish provisioning have received less attention. Building on the first objective – to investigate the material production and transformation of farmed fish as a nexus of the interactions between aquaculture and capture fisheries – the paper's second aim is to frame the processes and outcomes of these transformations within commodity flows that link cities and their frontiers. I employ an urban metabolism framework to examine domestic, urban food provisioning using the example of farmed fish consumed in the city. Urban metabolism, as deployed in the field of urban political ecology, emphasizes the socio-natural production of urban natures through material practices and labor that transform commodity flows from outside the city. It presents a way to examine the historically- and geographically-specific dynamics of commodity flows as these reflect the production of urban natures and the city's relations with its resource frontiers.

This paper examines the complexities of producing fish for the city through aquaculture using the urban metabolism framework paired with a commodity biographies approach. By weaving these two approaches, I provide a narrative of the material transformations of urban fish flows as characteristic of broader aquaculture-capture fisheries interactions and as integral to the production of urban natures. The paper tells the particular story of how and with what effects an introduced farmed fish from Laguna Lake has been and is being made amenable for urban consumption in the nearby megacity of Metro Manila.

In line with its post-war visions of development and improved agricultural productivity through green revolution projects, the Philippine state produced peri-urban Laguna Lake as a multi-use resource. It was tapped to supply the expanding capital and megacity of Metro Manila with its fish and water needs while simultaneously serving as a sink for urban effluents and floodwaters. The state emphasized the promise of aquaculture – introduced in the lake in 1970 – to address two related goals with an urban provisioning bent: producing more Laguna Lake fish and producing cheaper fish that could offset rising prices of marine wild fish. Commercial aquaculture expansion and subsequent infrastructure and livelihood programs formulated to realize these visions brought significant social conflicts and ecological changes in the lake. Despite these threats, Laguna Lake aquaculture continues to produce 60,000 metric tons of farmed fish annually and provides a majority of the freshwater fish requirements of Metro Manila.

In this paper, I focus on urban metabolic transformations of Laguna Lake fish consumed in Metro Manila using the case of bighead carp (*Hypophthalmichthys nobilis*), an introduced lake aquaculture species that is currently the most affordable fresh fish in the city. Through ethnographic methods, I followed the fish from lake production to urban consumption and identified the material practices associated with the transformation of fish in the process of their displacement. The empirical case study used in this paper is based on analysis of qualitative data I collected in 12 months of field research in the Philippines through semi-structured interviews with 90 fish producers, intermediaries and consumers in Laguna Lake and Metro Manila. I also employed participant observation in lake fish pen and cage farms, urban fish markets and urban neighborhoods.

The story of the bighead carp – its introduction and its metabolism through urban consumption – is by no means a straightforward one. In periods of less productive lake water conditions, fish pen producers stock bighead carp to address the limits imposed by the lake's materiality and thereby maintain profitability. Increased production of cheap fish, however, did not immediately

translate to greater urban consumption, which remained limited owing to consumer unfamiliarity and the material characteristics of the fish. The paper discusses the transformative practices of urban dwellers that attempt to improve consumption of bighead carp and concludes by considering how these lake-to-city fish flows reflect relations between aquaculture and capture fisheries.

The next section further elaborates the paper's contribution to the literature on aquaculture-capture fisheries interactions, urban metabolism and commodity studies. After providing a brief context to Laguna Lake aquaculture production and Metro Manila fish consumption in the third section, I discuss particular practices of transformations in the fourth section in terms of how these smoothen frictions in commodity flows between the lake and the city through distancing and entanglement in wet market retailing, kitchen cooking and fish processing. These practices highlight the work that actors do to metabolize the fish and create particular urban natures. The concluding sections argue that the substitution of wild fish by farmed fish is a messy process that reflects metabolic contradictions that fish materially embody and that have material effects on fish production and consumption.

Geographies of aquaculture, fish commodities and urban metabolism

Aquaculture–capture fisheries interactions and the production of a materially different fish

Geographers and other social scientists have documented aquaculture's dramatic expansion and its socio-ecological impacts in the past four decades, often approached through political economic and political ecological explanations (Armitage, 2002; Barton and Floysand, 2010; Kelly, 1996; Primavera, 2006; Skladany and Harris, 1995; Stonich and Bailey, 2000; Suryanata and Umemoto, 2003). Several accounts have probed how the introduction of aquaculture transformed agrarian livelihoods and relations of commodity production in the global South, with consequences on rural poverty, accumulation and the development of agrarian capitalism (Belton et al., 2012; Belton and Little, 2008; Edwards, 2000; Flaherty and Vandergeest, 1999; Goss et al., 2000; Hall, 2004; Irz et al., 2007; Lebel et al., 2002; Loc et al., 2010; Vandergeest et al., 1999). These studies collectively contribute to further understanding the dynamics of aquaculture as the "blue revolution", a topic that has long been relatively overlooked in geography (Barton and Staniford, 1998). However, much of this literature has focused on a few high-value crops – particularly salmon, shrimp and pangasius – produced primarily for global North consumption. Domestic production and consumption of other species such as lower-value carp, tilapia, shellfish and seaweed, which Belton and Bush (2014, p. 6) term the "neglected 90% of global aquaculture production," remain poorly understood. This paper seeks to fill this gap by examining the everyday geographies of one of these crops – the bighead carp – in the context of urban food provisioning in the global South and how these reveal broader interactions between aquaculture and capture fisheries.

At a global level, organizations such as the United Nations' Food and Agriculture Organization (FAO) often frame aquaculture as a promising solution or substitute to a problematic capture fisheries sector under crisis (Belton and Thilsted, 2014; Clausen and Clark, 2005; FAO, 2011; Mansfield, 2011; Natale et al., 2013). Although aquaculture production supplied only 41% of total global fish production in 2011, it has rapidly grown at an average annual rate of 9% between 1980 and 2010, and is expected to surpass the share of capture fisheries by 2018 (FAO, 2012). Aquaculture differs from capture fisheries in ownership of property rights, degree of control over production, possibility of intensified production, and poten-

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