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Fisheries in transition: Food and nutrition security implications for the global South ☆

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ABSTRACT

Fisheries and fish supply are undergoing a fundamental structural transition, as indicated by a ten country analysis. Aquaculture now provides around half the fish for direct human consumption and is set to grow further, but capture fisheries continue to make essential contributions to food and nutrition security throughout the global South. Capture fisheries provide diverse, nutritionally valuable fish and fish products which are often culturally preferred and easily accessed by the poor. Technological changes in aquaculture have dramatically increased fish supply, lowered relative fish prices, and reigned in price volatility. Policies that recognize and safeguard the diversity and complementarity of roles played by capture fisheries and aquaculture are needed to ensure that the transition in fisheries sustainably improves food and nutrition security in the global South.

1. Introduction

Fish and other aquatic animals make an 'irreplaceable' contribution to food and nutrition security in many Asian and African countries where large numbers of people are poor and undernourished (Kent, 1987). Fish are a rich source of high quality protein, a range of micronutrients, and fatty acids essential for human brain development (Tacon and Metian, 2013). They are also often the cheapest and most frequently consumed animal-source food in low income food deficit countries (World Bank, 2006), making an important contribution to diversity in otherwise monotonous diets dominated by starchy staples (Thilsted, 2013). Fish make a further contribution to food and nutrition security above that of their intrinsic nutrient content because the consumption of animal-source food facilitates uptake of nutrients from dietary components of vegetable origin (Leroy and Frongillo, 2007). This role is particularly important in countries such as Bangladesh, Cambodia, Ghana, Nigeria, and the Pacific islands, where many people are impoverished and fish is by far the most frequently consumed animal-source food (Belton et al., 2011; Hortle, 2007; Biederlack and Rivers, 2009; Gomna and Rana, 2007; Bell et al., 2009).

Aquaculture, simply defined, is the farming of fish and other aquatic organisms, with 'farming' implying (a) some form of intervention to increase yields, and (b) some form of private ownership of the stock subject to intervention (Beveridge and Little, 2002). In contrast, the fish stocks targeted by capture fisheries remain as a common property until harvested. At the aggregate global level, capture fisheries output has stagnated since the late 1980s, and 80% of 523 world fish stocks for which assessment data are available are reported as fully or over-exploited (Muir, 2013). This is an outcome of what Pauly (1990, p3) has labeled 'Malthusian overfishing', whereby fisheries, 'can generate in the long term *at best* a *steady* yield, or a yield oscillating more or less strongly around some mean value, once the rush following resource development is over' [italics in original]. Aquaculture has grown faster than all other major food sectors since 1980, at 8.8%/year (FAO, 2013a). Average annual intakes of fish reached a record level of 18.6 kg per capita in 2011 as a result (FAO, 2012a). It is predicted that the proportion of food fish derived from aquaculture will exceed that from capture fisheries by 2018 (FAO, 2012a) and that by 2030 aquaculture will provide 16 million and 47 million additional tonnes of fish (Hall et al., 2011); an increase of 26–76% over the current output of 62 million tonnes (FAO, 2013a). The primary driver of this growth will be demand from an increasingly wealthy, urban global middleclass (Garcia and Rosenberg, 2010).

These trends have resulted in policy narratives which position capture fisheries as 'doomed', or subject to 'inevitable decline' (Friend et al., 2009), and emphasize that 'any increase in demand for fish can only be met by aquaculture' (Hall et al., 2011, p52). Thus, aquaculture is frequently presented as a 'modern' activity in official development discourses, while there is a tendency for fisheries – particularly small-scale – to be positioned as 'backward', or disregarded entirely (Bush, 2008).

Although a fundamental structural transition in the provisioning of fish for food is currently underway, this blanket assessment

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obscures a great deal of heterogeneity between, and even within, countries. Moreover, although crude increases in average fish intake per capita have occurred in many locations, it does not automatically follow that increased availability of fish from aquaculture equates to better access to fish by poor consumers (Allison, 2011). Evidence also suggests that large farmed freshwater fish often possess micronutrient and lipid profiles inferior to those of small species derived from marine and inland capture fisheries (Roos et al., 2007; Tacon and Metian, 2013). The implications of the capture fisheries – aquaculture transition therefore remain poorly understood in respect to food and nutrition security.

The remainder of the paper addresses ways in which capture fisheries, aquaculture, and the interactions between them, contribute to or detract from food and nutrition security. Macrolevel changes in the sectoral composition of fish production and consumption are presented for ten countries in the global South. The implications for food and nutrition security at a range of scales are then explored in detail, with reference to livelihoods, product diversity and cultural significance, nutritional quality, prices and ecological trade-offs between capture fisheries and aquaculture.

2. The global transition in fish supply

The following section reviews capture fisheries and aquaculture output and fish consumption in ten major fish producing countries; eight Asian, two African. These were selected for comparison based on their status as low or middle income countries and major producers and consumers of capture fisheries and aquaculture products. Together, they account for 50% of global population, 55% of the world's malnourished people and 60% of all fish production (UNDESA, 2011; FAO, 2012b, 2013a).

Fish production and consumption in all ten countries is summarized in Table 1. Together, these account for 86% of global aquaculture production, while the two African nations alone contribute 86% of African aquaculture output. However, in only two countries (China and Egypt), is aquaculture's share of production substantially greater than that of capture fisheries. Capture fisheries are two to four times larger than aquaculture in five countries, and of similar size in three. China dominates both capture fisheries and aquaculture production; by almost an order of magnitude more than the second largest producer (India) in the case of latter.

Capture fisheries grew at an average rate of 1–4% per annum in seven countries over the period 1990–2011, with net negative growth in a single country (Thailand). Aquaculture grew between two and seven times faster than capture fisheries in all ten countries, exceeding an annual growth rate of 10% in five, and achieving 6–9% growth in a further four. Average annual fish consumption per capita varies widely, from a low of 5.4 kg in India (where, for cultural and religious reasons, many states do not have a strong tradition of fish consumption), to a maximum of 50 kg in Myanmar. Consumption in all but Nigeria, Egypt and India is considerably in excess of, or very close to, the global average of 18.6 kg (FAO, 2012a). Fish constitutes between 25% and 45% of animal-source food (including meat, milk, eggs and animal fats) in eight countries, and a slightly higher proportion of animal-source protein, indicating its importance to food security.

Despite the clear tendency for aquaculture growth to outstrip that of capture fisheries, this summary highlights the continued dominance of capture fisheries in most countries in terms of total quantities of fish produced, as well as considerable heterogeneity in the size and relative importance of the two sectors. The extent and form of this variation is apparent from Fig. 1a–l. The mismatch between trends in supply and consumption which is evident in many of the figures occurs because around a quarter of capture fisheries production is diverted for non-food uses (FAO, 2012a),

Table 1
Capture fisheries and aquaculture production and consumption in selected countries (data derived from FAO, 2013a; 2013b; Tacon and Metian, 2013).

Country	Total capture fisheries production (million tonnes)	Total aquaculture production (million tonnes)[a]	Global rank in capture fisheries production	Global rank in aquaculture production	Capture fisheries production as % aquaculture production	Annual capture fisheries growth rate, 1990–2011 (%)	Annual aquaculture growth rate, 1990–2011 (%)	Aquaculture growth rate as % capture growth rate	Fish consumption per capita (kg/year)	Fish consumption as % total animal-source food consumption	Fish as % animal protein
Bangladesh	1.6	1.5	15	5	107	4.4	10.4	237	18.7	41.8	56.5
China	15.5	38.0	1	1	41	4.2	8.9	211	31.6	27.4	22.3
Egypt	0.4	1.0	40	8	40	1.9	14.1	729	16.5	20.2	39.5
India	4.3	4.6	5	2	93	2.1	7.4	354	5.4	6.6	16.8
Indonesia	5.7	2.8	3	4	204	4.0	8.5	214	25.2	46.1	53.7
Myanmar	3.3	0.8	8	10	413	7.5	25.4	340	50.4	42.7	45.4
Nigeria	0.6	0.2	26	22	300	3.5	17.6	504	13.9	39.7	41.1
Philippines	2.4	0.8	11	11	300	1.2	3.4	277	35.8	39.4	42.6
Thailand	1.8	1.0	13	7	190	−1.4	6.1	631	24.5	29.3	32.0
Viet Nam	2.5	2.8	10	3	89	5.7	14.7	257	32.2	31.5	35.3

[a] All production statistics for aquaculture cited in this paper exclude seaweeds and aquatic plants.