RESEARCH PROJECT INVESTIGATIONS

TOPIC AREA:

HUMAN NUTRITION AND HUMAN HEALTH IMPACTS OF AQUACULTURE

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DETERMINING THE ROLE OF WILD-CAUGHT AND AQUACULTURE-BASED INLAND FISHERIES IN MEETING BURMA'S HUMAN NUTRITIONAL NEEDS

ASIA PROJECT: BURMA
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Human Nutrition and Human Health Impacts of Aquaculture/Study/16HHI05MS

Collaborating Institutions and Lead Investigators

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Significance

The average Burmese citizen is estimated to consume about 55 kg of fish on an annual basis (FAO 2015), although average yearly fish consumption likely varies among regions of Burma (Kyaw 2009). Fish consumption from inland areas (both wild capture and aquaculture sources) is estimated to provide 30% of total yearly intake of protein (from both animal and plant sources) in Burma (FAO 2011). However, total fish consumption data, especially for inland fishery resources has been reported to severely miss-estimate both total consumption and total harvest in the rural regions of the world due to the lack of data or sociopolitical pressure to meet specified government production targets (Bartley et al. 2015, Beard et al. 2011). Because of these factors, data from Bangladesh and rural Thailand, for example, suggest that consumption estimates reported to FAO can be as low as 50% of actual consumption (Dey et al. 2005). Furthermore, total caloric amount is just one component of the contribution of inland fish to human nutrition. Inland fish have been reported to provide key contributions to the intake of protein, omega-3 fatty acids, and micronutrients (e.g., iodine, vitamin A, calcium) which can be difficult to obtain through other local food sources (Aung et al. 2010, Youn et al. 2014). Calcium, lysine, and omega-3 fatty acids, all of which are provided by these fishes, are vital for human growth and development, especially for children. The nutritional contributions of fish to the Burmese diet are critically important, especially when considering that more than 35% of Burmese children show signs of stunted growth caused by chronic malnutrition (World Food Programme 2017). Given the key contribution of fish to the nutrition and food security of the Burmese population, and the availability of key nutrients needed for proper child growth and development in inland fish, understanding the contribution of wild-caught inland fish and the role of aquaculture in Burmese food security is critical for ensuring food security and human well-being.

Available Data

The Integrated Household Living Conditions Assessment survey (IHLCA), conducted in Burma by the United Nations Development Program (UNDP) in 2005 and 2010, is a nationally representative household survey of 18,660 Burmese households conducted by the Ministry of National Planning and Economic Development and the United Nations Development Programme. The purpose of the IHLCA is to provide statistical data for determining living conditions in Burma. To meet this purpose, the survey collected household food consumption data during two rounds in each of the survey years, corresponding to pre- and post-monsoon paddy harvesting season, which captured some seasonal variability in food consumption. Seven-day recall was used to capture the quantity of foods consumed, including the amount sourced through the market, the household's own production, and other source (e.g. gifts). The list of fish and fish products is detailed, listing a total of 36 different pre-coded items in the survey. Fish categories listed in the IHLCA fall into 3 categories: species specific (e.g. snakehead, Bombay duck), generic but denoting source (e.g. small marine fish), and generic but not denoting source (e.g. fish paste). For fish categories that are generic and do not denote source (e.g. marine, freshwater, or aquaculture), it will be necessary to infer source and composition as far as possible using available information (e.g. it is likely that most fish paste consumed in coastal state is of marine origin). Trade data show that very little fish is imported in Burma, so import trade should have little impact on the results.

Many of these IHLCA categories are species specific, but some items also cover a variety of generic categories of product (e.g. "other small river fish <= 4 inches", "other dried medium sea fishes"). In these cases, it will be necessary to make some assumptions, based on the knowledge of key informants, about the most important fish species when conducting nutrient analysis. Unfortunately, IHLCA 2010 is the most recent round of the survey and no recent, comparable datasets exist. Because data for 2005 and 2010 provide a time-series, however, it will be possible to identify the direction and rate of trends over this period and thus possible to derive estimates of subsequent change.

Additionally, Dr. Belton (MSU) has collected data (the Myanmar Aquaculture-Agriculture Survey; MAAS) on the aquaculture production practices and socioeconomic characteristics of 224 fish farming households in the main aquaculture areas of Burma (e.g. lower Irrawaddy delta). The survey was implemented in May 2016. MAAS adopted a two-stage sampling strategy. For the first stage, 40 village tracts identified from analysis of satellite images as having the highest densities of fish ponds in Burma were purposively selected from four townships (Maubin, Twantay, Kayan, and Nyaungdon). The townships fall within a radius of approximately 60km from the country's main city, Yangon. For second-stage sampling, enumeration areas (EAs) were selected from these village tracts by probability proportional to size, using the national population census of 2014 as the sampling frame. This procedure yielded a sample of 78 EAs. A census of households was conducted in every selected EA to serve as the final sample frame for randomized selection of respondent households. Eight farm and seven non-farm households were selected for interviews in each EA, using a structured questionnaire. Respondents from 1,102 households, representing a total population of 37,390 households, were interviewed. Among these households, 246 were fish-farming households. Fish-farming households answered a set of questionnaire modules on fish farm stocking and management practices, costs, returns, and yields. Aquaculture households represented the entire population of fish-farming households' resident in the sampled village tracts. Data have been analyzed and a report, not yet publically available, prepared for publication. The data from the MAAS will inform the proposed project because they contain data on the area of land used for aquaculture and yields from fish farms. This information can be used to triangulate and validate projected changes in consumption of farmed fish for the 2011-2017 period that will be calculated using the IHLCA data.

In addition to the two datasets described above, secondary production and consumption data of freshwater fish are available from the Burmese government and United Nations surveys and accessible by Dr. Belton. Fish (marine, inland and aquaculture) production data reported by the Burmese government to FAO (FAO FishStat database) and monthly data on retail fish prices for approximately 10 main fish

products collected by the Burmese Central Statistical Office (used to calibrate Burma's consumer price index) will be used to provide an indication of changes over time in the relative availability of fish from different sources (e.g. marine, inland, and aquaculture).

Research Design and Activity Plan

Location

Michigan State University, East Lansing, Michigan, USA.

Methods

Using the data from the IHLCA survey, we will develop a map of Burma's fisheries that illustrates the contribution of marine, inland wild capture, and aquaculture fisheries to Burmese food and nutritional security. This map will show consumption of various types of fish by region, identify the relative contributions of aquaculture and wild-capture fish to the diet, and illustrate how fish consumption has changed between 2005 and 2010. Data from Bogard et al. (2015) will be used to obtain estimates of the nutrient content for the most commonly consumed fish, determined based on data from the IHLCA survey. These estimates will be used to estimate the nutritional benefits (e.g., calcium, vitamin A, iron, zinc) different fish species provide and how nutrient availability differs in various regions of Burma, depending on which fish species are available and their presence in the diet of Burmese people. Because dried, fermented, and salted fish account for a large share of the fish consumed in Burma, we will consider the impacts of processing (e.g. fish consumed whole, dried, or as paste) on the nutritional content of fish consumed and the potential nutritional implications of processing. These considerations will be based on secondary source information available for accounting for differences in nutrition due to processing.

Additionally, using data from the Integrated Household Living Conditions Assessment survey, we will also compare changes in Burmese fish consumption between 2005 and 2010. We will analyze the species and origin of the fish (e.g., inland wild-capture, aquaculture, marine), location (region, urban, or rural), and income level of consumers. We will also use weekly fish price data collected by the Central Statistical Office for at least 10 key species of fish (used by the government to construct the consumer price index) to evaluate the change in fish prices over time, which may provide an indication of the relative abundance or scarcity of different fish species during that same time period. Combined with the description we develop of the Burmese fishery system, we will track changes in fisheries production and consumption across Burma over this 2005 to 2010 time period. If fish consumption patterns have changed in these regions between 2005 and 2010, these areas may be of potential concern for food security and nutrient-deficiency related human diseases. We hope to provide a descriptive analysis of temporal changes in fish consumption by fish source (marine, inland, aquaculture) and estimate changes in dietary micronutrient intakes derived from these fish sources.

Schedule

Project Month	Tasks/Events
1	Compile existing consumption data
2	Kick-off project team meeting
3	Workshop at American Fisheries Society Annual Meeting
4	Estimate contribution of inland fish to nutrition in 2005 and 2010
5	
6	
7	
8	
9	Wrap-up project team meeting
10	Complete final project report and submit by February 2018

AquaFish Innovation Lab Implementation Plan: 2016-2018, Addendum

Deliverables

A map showing the relative contribution of fish (marine, inland, and aquaculture) to Burmese diet, food security, and micronutrient contribution for various regions in Burma in 2005 and 2010. The map will indicate the relative level of dependence of different regions in Burma on fish as a food and nutrient source.