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SCAMMED: DISSECTING CYBER SLAVERY IN SOUTH EAST ASIA

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Aquaculture in Uganda

Fish pond at Aquaculture Research and Development Centre, Kajjansi.
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Swimming Upstream: Chinese Overseas Investment in Aquaculture

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This essay examines China's push to increase outbound investment in the aquaculture industry—the growing of aquatic plants and animals for food consumption—alongside host countries' incentives for drawing in such investment. Using cases in eastern and coastal Africa, the essay demonstrates how Chinese investments in Madagascar's seafood processing have enjoyed relative success in supporting the development of host-country supply chains and increasing export revenues, while the Kajjansi Aquaculture Research and Development Centre in Uganda fosters knowledge exchange and other joint benefits. The authors argue that as China develops its own environmental protection norms for its domestic aquaculture sector, the impact of outbound investment can be amplified by sharing research gains and best practices, while oversight remains critical to evaluate local environmental and economic health.

China is home to the world's largest aquaculture industry, raising aquatic plants and animals for food, and was responsible for more than half of global production by 2016 (Zhao et al. 2021). Domestically, Chinese demand for seafood is expected to grow dramatically, with the gap between local demand and local production likely to more than double over the next decade (Crona et al. 2020; FAO 2022). While China is motivated to increase overseas aquaculture output, the sector does not rank highly among Chinese outbound investment or development finance commitments (Ray et al. 2021; Scissors 2022). This apparent paradox is intensified by consumer preferences for imported rather than domestically produced seafood. Despite the expected expansion of seafood demand within China and a series of Chinese Government policies aimed at improving the quality—rather than just the quantity—of domestic production, Chinese outbound investors face challenges for overseas aquaculture involvement. Two challenges in host countries are evident: environmental bottlenecks related to establishing protections to mitigate risks and economic bottlenecks from linking value-adding investment to host-country development goals. We explore this area of tension between China's growing push for overseas aquaculture investment and host countries' relative lack of corresponding interest. It pursues what researchers and policymakers can learn about investor incentives and the host-country policy space embedded in the interplay of 'push and pull' factors in this area of Chinese globalisation.

Within international aquaculture, 1.3 billion USD has been invested by Chinese over the past 15 years, but this represents a mismatch between push and pull factors. Aquaculture is a challenging sector for environmental governance due to the sensitive ecological systems involved, resource potential, and economic opportunities. Thus, it is an interesting case for considering the shared responsibilities of China and host countries as they navigate environmental and economic objectives. Many aquaculture-related environmental risks are localised in the affected aquatic ecosystems, with three main channels of risk meriting discussion: the introduction or removal of species, the alteration of waterways, and changes to the water itself. Farmed species may be directly introduced into an existing ecosystem without sufficient regard for local biodiversity. Predatory wild fish may be removed or prey wild fish may be collected to encourage growth within farmed populations. Escaped fish may spread disease to wild populations and genetically modified fish can produce unintended genetic changes in wild populations (Carballeira et al. 2021). Aquatic contamination—including wastewater, excess feed, antibiotics, and growth hormones—is known to leach into surrounding waters (Carballeira et al. 2021). Contaminants with high levels of organic nutrients, such as nitrogen and phosphorous, significantly affect an ecosystem's water quality and encourage algal blooms (Conley et al. 2009). While investment in aquaculture can alleviate pressures on wild fisheries, the effective monitoring and management of environmental performance in host countries is central to minimising adverse impacts to surrounding waterways and the ecosystem services they provide to communities.

China's Expansion in Overseas Aquaculture Investment

Two factors explain China's increasing interest in outbound aquaculture investment: expanding seafood demand from Chinese consumers and increasing awareness of the environmental impacts of the local aquaculture sector, which is deterring domestic expansion in the short term. In response to these two factors, the Chinese Government has encouraged investment overseas until appropriate environmental standards can be implemented domestically.

Chinese demand for seafood has increased steadily over the past few decades, with an almost tenfold per capita increase in consumption from 1980 to 2015 (Crona et al. 2020; Zhang et al. 2021). It is projected to continue rising in the near term and, by 2030, a production shortfall of up to 18 million tonnes, or roughly one-quarter of the country's total 2020 production, is likely to occur (Crona et al. 2020). The domestic industry is unlikely to meet the demands of Chinese consumers given it has been in decline because of moratoriums targeting freshwater and coastal capture activities (Xie 2022a, 2022b), with similar measures for domestic aquaculture (Godfrey 2019).

Additionally, the prolonged growth of Chinese demand for seafood is related to trends of urbanisation and rising per capita income. In China, the purchase and consumption of seafood are positively correlated with income (Zhang et al. 2021), as well as residence in urban rather than rural areas (Crona et al. 2020). Beyond an absolute increase in demand, the change in consumer preference may incentivise investment in foreign aquaculture. The government has promoted a shift in the national diet from 'eating well' to 'eating healthily' (Zhang et al. 2021), partly due to food safety issues in China (Fabinyi et al. 2016). Thus, Chinese consumers believe seafood sourced from countries such as Australia, Norway, and North America comes from 'cleaner waters' and assume foreign-farmed fish are of higher quality (Crona et al. 2020). Finally, the increased availability of a broader array of seafood has spurred consumer interest, especially among urban Chinese, beyond the traditional diet in which domestically produced grass and silver carp are dominant (Abbott et al. 2021; Fabinyi et al. 2016; Newton et al. 2021). To that end, foreign aquaculture investment appears poised not only to meet a quantitative rise in China's seafood demand but also a qualitative shift in consumer preference favouring imported products.

Despite increasing demand, China has seen a consistent decrease in the rate of aquaculture production growth in recent years (FAO 2020). This is in major part due to state policy: more stringent domestic fishery regulations in China address the sector's environmental risks, including the removal of aquaculture pen systems from rivers, lakes, and reservoirs (Newton et al. 2021), and robust enforcement of production standards (Godfrey 2019). For instance, the 'Shining Sword' public campaign aimed to safeguard ecosystems and aquatic wildlife resources, ban fishing in key inland waters such as the Yellow River, and combat illegal fishing in closed seasons or protected waters (Ministry of Agriculture and Rural Affairs 2022; Godfrey 2019). Thus, the role of imported seafood and overseas aquaculture activities remains critical to meeting domestic demand (Crona et al. 2020).

Host-Country Reception

Despite the predicted seafood production deficit and investor interest from China, Chinese investors have been met with lukewarm enthusiasm overseas for new aquaculture projects due to two challenges. The first is environmental, concerning the establishment of protections to mitigate risks. The second is economic, wherein a lack of additional value added to host-country aquaculture supply chain stymies pull incentives for Chinese investment.

As China has strengthened its regulatory framework for the aquaculture and fishing industries, host countries have been aware of the same issues and are pursuing similar governance paths. For instance, Indonesia—the world's second-largest aquaculture producer behind China—has set ambitious goals for scaling up aquaculture by an

annual average of 8.5 per cent until 2030 to meet rising domestic demand (Henriksson et al. 2019). In this context, a broad scholarly literature has developed examining the feasibility of these goals and potential best practices in meeting them. Among limiting factors, environmental and social concerns rank high, including threats to smallholder producers from expanding commercial ventures, risks to existing aquatic biodiversity from the introduction of new species and aquaculture waste, and risks to aquaculture projects of all scales from climate change (Henriksson et al. 2017, 2019; Hidayati et al. 2021; Phillips et al. 2015; Prakoso et al. 2020; Rimmer et al. 2013). Recognising the risks to both small and large-scale operations, the Indonesian Government announced two major aquaculture initiatives: capital loans for commercial-scale operations and the establishment of more than 100 'aquaculture villages' to support small-scale producers (Indonesia Seafood 2021; Suriyani and Ambari 2022). In Vietnam, where aquaculture has historically supported subsistence and commercial livelihoods, recent expansion of the sector has drawn attention to the importance of mitigating negative impacts on aquatic ecosystems (Thanh Vinh 2006). The Vietnamese Government has recognised these concerns and responded through cooperation with transnational industry and environmental civil society groups, facilitating the adoption of industry standards and forming the *Public–Private Partnership Cooperation Agreement for Responsible Fisheries and Aquaculture* with industry and environmental groups (Thu Ha and Bush 2010; Thi Anh et al. 2011). The development of these policy and public–private partnership initiatives signals awareness of the environmental and social concerns, as well as the potential for conflict.

Risks of environmental conflicts are particularly acute in host countries where local communities depend on sustainable aquatic ecosystems for their livelihood. In Sierra Leone, prospective Chinese investment in fishmeal plants triggered conflict over factory waste that could damage ecosystems and threaten small-scale fishing livelihoods as well as ecotourism. Disputes have arisen over the process of project approval, with the host government facing accusations of circumventing due diligence processes such as consultation with affected communities (Godfrey 2021; Oirere 2021). Local civil society groups including the Institute for Legal Research and Advocacy for Justice and Namati have mobilised, calling for project cancellation and greater transparency (Nyabiage 2021). In The Gambia, a Chinese-owned fishmeal plant was destroyed in a 2011 arson attack linked to community dissatisfaction over its environmental and economic impacts (Konyim Okai 2021). Thus, the environmental and social risks in host countries represent challenges to attracting Chinese aquaculture investment (Table 1).

In general, inbound aquaculture investments have the potential to support two main economic goals for host countries: contributing to their own seafood supply and increasing economic activities and export revenue. On both fronts, the extent to which Chinese investments can further a host country's goals determine local acceptance and project success. In the Philippines, for example, domestic preferences for seafood consumption and the agenda for export to China are mismatched. China donated

300,000 fry of leopard coral groupers, also known as coral trout, to the Philippines to develop its aquaculture industry with the goal of exporting to China (China Oceanic Development Foundation 2021). However, this fish species is not widely consumed in the Philippines; this investment project is unlikely to boost the Philippines' domestic supply of seafood or add value for local consumers (China Oceanic Development Foundation 2021; Fabinyi 2019). In addition, marginal economic opportunities for host countries have stymied interest in Chinese investment. Chinese consumers prefer to eat seafood immediately after it has been killed, with live fish often populating restaurant fish tanks (Yan 2014), which sees the live-fish trade generate profits but means there are few incentives for the host country to cultivate a robust supply chain with additional gains from processing and packaging seafood products (Godfrey 2018). Overall, it is becoming clear that aquaculture investment objectives from China and within host countries do not necessarily align (Table 1).

Table 1. Chinese Investment in Overseas Aquaculture

	Chinese-based push factors	Host-country bottlenecks
Country level	Increasing demand for imports	Mismatch with domestic seafood consumption patterns
Industry and corporate level	Weakness of domestic fishing 'Shining Sword' campaign	Relative lack of value added
Individual level	Domestic dietary preferences Increasing seafood consumption	Threats to ecosystems and local small-scale producers

Source: Authors' elaboration.

China's Overseas Investment in Aquaculture

Because of this lack of alignment between Chinese and host-country investment goals, relatively few active investments have come to fruition around the world (Table 2). Although investments amount to 1.3 billion USD, a single deal accounts for most of this: Joyvio's purchase of Australis Seafoods in Chile for 987 million USD in 2019. In addition, these ventures have primarily, though not universally, involved existing aquaculture projects, rather than greenfield investments. Mergers and acquisitions (M&A) allowed Chinese firms to circumvent host-country bottlenecks by integrating into existing networks to reduce the risk of conflicts with local communities, limit excessive production expansion, and utilise internal synergies and industry connections. The consolidation between host-country entities and Chinese businesses also allowed

investment projects to access community knowledge, swiftly tap into existing markets, and pool resources with domestic companies. To make sense of these dynamics, we turn to cases in eastern and coastal Africa.

Table 2. Chinese Aquaculture Overseas Investment

Country	Year	Investor	Avenue	Size (Million USD)
Brunei	2009	Guangxi Wangwangda Farmers Co. Ltd, Raoping Jinhang Deep Sea Cage Development[a]	Greenfield Foreign Direct Investment (GFDI)	10
Madagascar	2009	China National Fisheries Corporation (SOMAQUA)[b]	M&A	6.3
Australia	2010, 2011	Pacific Andes International Holdings Ltd (Tassal Group Ltd)[c, d]	M&A	57.6
Japan	2014	Asiasea Industry (Dalian) Co. Ltd, Zhangzidao Group (Xinzhong Japan Co. Ltd)[d]	M&A	1.4
Australia	2015	Beijing Properties Holdings Ltd[d]	M&A	56.6
Russia	2017	Dalian Yifeng Sea Products[e, f, g, h]	GFDI	90
Russia	2018	Dalian Wenlian Aquaculture Company[e]	GFDI	74.5
Chile	2019	Joyvio Agriculture Development Co. (Australis Seafoods SA)[d]	M&A	987.3
Malaysia	2019	Fujian TianMa Science & Technology Group Co. Ltd (Wonder Fry Sdn Bhd)[e, i, j]	M&A	48.6

* Firms in parentheses are acquired entities. Sources: a. Embassy of the People's Republic of China in Negara Brunei Darussalam (2009); b. Chen and Landry (2016); c. Pacific Andes International Holdings (2012); d. DeaLogic (2022); e. Financial Times (2022); f. Ali (2018); g. Vorotnikov (2018); h. White (2018); i. Cai (2022); j. Fujian Tianma (2019).

In Madagascar—a country with rich natural seafood resources—China National Fisheries Corporation acquired Madagascar Fisheries in a joint venture with the Japanese Maruha Group to establish SOMAQUA. Two companies are active throughout the seafood supply chain in the country: SOMAQUA and Longfei. Longfei, while initially present in Madagascar's cement industry, later diversified to include aquaculture (Chen and Landry 2016). Both companies process live fish and shellfish for export and operate in Mahajanga on the northern coast of the island, where the aquaculture sector represents one of the major Malagasy exports to China. Processing aquaculture products creates economic opportunities in Madagascar by developing host-country supply chains and increasing export revenues. Furthermore, both companies also invested

in local facilities and plants for farming seafood: Longfei has a holding plant for farming seafood in Ivato near the airport that serves Antananarivo, Madagascar's capital.

In addition, the Chinese Government and Chinese firms have been active in complementary activities beyond direct investment in the aquaculture sector, such as joint agreements and demonstration projects. For instance, the Kajjansi Aquaculture Research and Development Centre in Uganda, funded by the Government of China, researches fish species and offers technical training and demonstration of highly effective freshwater aquaculture techniques. The centre is also designed to foster freshwater fry breeding techniques and exhibit improved fish feed processing and application, in addition to promoting large-scale breeding of Nile perch—the main species in Uganda's waters—and distributing knowledge to fish farmers across Uganda (The Fish Site 2009). This initiative directly addresses bottlenecks by offering host-country training and technological gains.

Finally, infrastructure development initiatives have channelled China's overseas investment push into related sectors that leverage capital from policy banks. For instance, the Export–Import Bank

Sharing Gains and Best Practices

Uganda-China Friendship Agricultural Technology Demonstration Center.
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of China lent Mozambique 120 million USD to rehabilitate the Beira fishing port in 2014 and the China Development Bank lent Ghana 186 million USD for the construction of 11 coastal fishing landing sites in 2019 (Ray et al. 2021). These projects include support for the expansion of fishing through new ports, boats, or additional facilities in existing aquaculture industries that add value to host-country supply chains. This extends beyond economic gains from export activities, promoting developmental progress that may have longer-term knock-on effects.

While these more holistic approaches to aquaculture and fishing investments hold promise for local economic development, effective oversight and monitoring are crucial to safeguard the health of ecosystems and the communities they support. Risks remain of overexploitation of resources, displacement of small-scale fishing livelihoods, and national debt sustainability. For example, at the time of writing, 30 Chinese fishing vessels operate out of the Beira fishing port in Mozambique, drawing complaints from local fishers and ship-owners that they are fishing during closed seasons and using prohibited equipment (Alden and Chichava 2022). Furthermore, while China's 2014 loan to Mozambique for the Port of Beira was just 120 million USD, it was part of more than 1 billion USD in loans that Mozambique took from China between 2012 and 2014. By 2017, Mozambique found itself in default and in need of debt restructuring (Acker et al. 2020). Madagascar, on the other hand, has made significant strides in improving oversight, including by joining the Fisheries Transparency Initiative and committing itself to sustainable fisheries management (May 2021). The task of developing this sector in a way that feeds a growing planet while protecting communities and ecosystems requires continuing work, including the establishment of robust regulatory frameworks, impact evaluations, and social responsibility standards. Independent monitoring bodies, incorporating representatives from civil society and local businesses, have critical roles to play in overseeing compliance and responsibility in Global China's activities in the aquaculture and fishery sector.

Moving Global China's Aquaculture Engagement Forward

Presently, overseas aquaculture investment provides critical supply to the Chinese market and remains a complex manifestation of Chinese globalisation. On the one hand, tightening aquaculture regulations constrains China's domestic production. On the other, host countries are often less than enthusiastic due to risks to ecosystems and existing small-scale producers, as well as the limited local value-added opportunities. Although reported investment projects amount to 1.3 billion USD, they largely occur through mergers and acquisitions to integrate with existing networks. Establishing host-country governance frameworks will be key for future equitable investment; upstream due diligence, such as thorough environmental impact assessments and the

development of projects that complement national goals for sustainable livelihoods, can moderate some of these challenges. Downstream project monitoring and accountability mechanisms may also protect small-scale producers from impacts on local systems. China's technical knowledge can be shared across host countries to facilitate cooperation in the aquaculture sector and to channel fishing away from high-impact areas. Due to the significant risks to aquatic ecosystems and societies, it is crucial for host countries to set up developmental priorities, determine whether expanded aquaculture production falls within those priorities, and, if so, establish robust regulations that optimise sustainable resource management and value-adding opportunities from Chinese capital. As the relative success of technical cooperation initiatives demonstrates, using China's global platform to share knowledge and best practices is key to maximising joint benefits while mitigating risks to aquatic ecosystems and the local economies that depend on them. ●