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Dollars without Sense: The Bait for Big-Money Tuna Ranching around the World

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The technical achievements of the green revolution—the industrialization of agriculture in the 1950s and 1960s, which allowed exponential population growth—have been exhausted. Physical and economic access to safe, nutritious, and culturally appropriate food is a major challenge for the rapidly growing global population. A potential silver bullet that has come into sharp focus recently is industrial aquaculture, also known as "the blue revolution." Advocates argue that the blue revolution promises to take pressure off wild stocks, generate a net surplus of seafood, and provide financial opportunity for economically marginalized groups.

As the seas are the last vestige of our hunter–gatherer past, there is a certain sense of inevitability and logic in moving from hunting to farming marine species. Even so, industrial aquaculture has come under fire. It is a far cry from the subsistence aquaculture practiced for four millennia and still common in much of the world. Bioamplified toxins in flesh, exotic escapees threatening already diminished wild stocks, and farms acting as incubators for parasites and pathogens are a few of the issues regularly appearing in headlines. Less appreciated is that these issues have socioeconomic, not scientific, roots. The purpose of industry is to maximize profit, regardless of whether the product is running shoes, computer software, or food. Thus, industrial aquaculture does not seek altruistically to increase the global protein supply (à la "the blue revolution"). Simply put, more materials and energy are consumed in industrial aquaculture than are produced (see the comprehensive review by Troell and colleagues [2004]). Profitability derives from the raw materials in open net-pen systems being relatively cheap (in narrow, conventional economic terms) or even free—natural subsidies such as clean, oxygenated water and tides for waste removal do not show up in any economic review. Black ink turns deep red when the full cost of farming carnivorous species such as salmon or shrimp is absorbed by the producer and not offloaded to the public (for example, when open net pens are replaced with land-based closed containment systems). The solvency of the entire enterprise rests on highly questionable premises of political economy and socioecological valuation and accounting.

"Bluefin tuna" includes three species. Southern bluefin, according to the Australian government, is being harvested at a rate 30 percent greater than the total allowable catch set by international treaties. The growing scarcity of southern bluefin is a significant factor contributing to its role as the preferred species for the Japanese sashimi market, which in turn aggravates the problem of its scarcity. Atlantic bluefin, found in the Mediterranean and in the cold waters of the North Atlantic, is the target of intensive and lucrative fisheries from both sides of the Atlantic. This pressure currently fuels the explosive growth of ranching in the Mediterranean. The Pacific bluefin is thought also to be in steep decline, but unlike its southern and Atlantic counterparts, this species does not benefit from oversight by an international regulatory body. Its population status is therefore largely unknown.

Tuna-ranching nations are led by Australia and Spain but include Croatia, Japan, Mexico, and Morocco. The term "ranching" is used because in conventional fish farms (for example, those raising salmon), the fish are produced in-house by breeding captive-reared brood stock. Ranches, in contrast, rely on wild-caught, typically younger individuals held captive in pens to be fattened and eventually harvested. The majority of the product is destined for the Japanese market, where prices paid can be exorbitant—more than US$200 per kilogram (kg) for sashimi grade—although seemingly slight imperfections can dramatically affect value. Harvesting under the optimal conditions of a ranch safeguards carcass quality and minimizes processing and transport times.

The present hub of southern bluefin tuna ranching is Port Lincoln, Australia, where the struggling fishing community of less than a decade ago is now reputedly home to the highest number of millionaires per capita in the Southern Hemisphere. From December to March each year, approximately 260,000 wild juveniles (15 to 25 kg each) are captured off the southern coast of Australia (Great Australian Bight). They are towed in lots of 7000 for 17 days (at 1 knot, or 1.85 kilometers [km] per hour) in specially engineered net pens or "tow pontoons" 40 to 50 meters (m) in diameter. At Port Lincoln they are transferred to one of the 150 circular (40 m in diameter by 16 m deep) stationary pontoons hugging the local coastline. There they will stay, fed baitfish, until they are harvested, most likely the following July or August, by which time each bluefin will have gained 10 to 20 kg. Similar scenarios play out annually in other parts of the world, with the Mediterranean rapidly becoming a major hub and Mexico not far behind.

By the late 1990s, southern bluefin tuna stocks were at an all-time low, with abundances at less than 9 percent of 1960 figures. Stiff and growing competition for access to fish to replenish ranches has led to many allegations of companies simply not reporting captures or playing fast and loose with catch documentation. Tuna ranching is officially considered a "post-harvesting" sys-

tem, because the capture vessel does not "land" the tuna; and when tuna finally make landfall many months later, they are often in a different country. This loophole allows companies to circumvent every regional and international regulation established to protect tuna populations.

The tuna themselves are not the only species threatened. It takes 3 kg of wild fish to produce 1 kg of farmed salmon (i.e., a 3:1 ratio); for farmed cod the ratio is 5:1; but the ratio reaches 20:1 for ranched tuna (in part because tuna are warm-blooded, an energy-intensive physiological state for a cold-water fish). The farms around Port Lincoln alone consume more than 20,000 kg of pilchard, sardine, herring, and anchovy per day. Clearly, the consumption of 20 units of edible fish to make one unit of product is no one's idea of a conservation strategy. What ecosystem-level effects are associated with this scale of wholesale biomass removal and transfer remains unknown—let alone what population-level impacts are manifesting for these baitfish species.

Ranched tuna eat a lot of fish—so much, in fact, that the local environment can rarely keep pace, necessitating the import of feed fish from other regions. Beyond the obvious issues of energy expenditure, this potentially opens a Pandora's box of epidemiological problems. For instance, 30 percent of the fish fed to Australian tuna last year were imported. In 1995, a herpes virus erupted in southern Australian waters near the tuna farms. The virus moved through regional waters at 30 km per day, leaving 75 percent of the pilchard population dead and triggering mass starvation of piscivorous birds such as gannets and penguins (Dalton 2004). The story repeated in 1998. Where the virus originated remains unknown, but given the growing list of agribusiness horror stories that begin with insufficiently regulated transcontinental transfer of organisms, one can't help but be highly apprehensive about tuna ranching's possible role.

Ironically, today's greatest threat to the bluefin may be what ultimately saves it. Current markets, including Japan, are at or near saturation. Continued supply-side growth will reduce product value. According to a WWF report, Mediterranean ranches are flooding world markets, resulting in a decline in value of ranch tuna by 50 percent from 2003 to 2004 (7.50 to 3.75 per kg) (WWF 2004). In Japan, recent average prices have fallen as much as 60 percent, while on-ranch costs of production have risen 30 percent. Tuna ranching is viable only as long as the premium price of its product is protected, which in turn demands scarcity of supply. The industry is showing every sign of becoming a victim of its own success. If present rates of growth are maintained, an industry-wide collapse is imminent. Particularly worrisome is that as companies approach collapse, motivation to offload production costs will grow, resulting in more violations of the emaciated regulation regime. This is sure to make the current bad situation worse. From the ashes, a handful of large multinational players will most likely emerge to supply markets in an OPEC-like quota supply model. But what will be lost between now and then?

Unfortunately, the uniqueness of tuna ranching means that other forms of aquaculture with longer track records can do little to inform this debate. For instance, the salmon and shrimp farming stories do not have a silver lining. The lack of a premium market has set in motion a cyclical race to the bottom. The industry's response to diminishing prices has been to increase production—further driving down prices and initiating another round of rationalization and cost offloading. Salmon and shrimp are becoming homogenous, low-value commodities—battery chickens of the sea. For tuna, the lower-end market niche is already filled by albacore and other species, so bluefin are spared this fate. What remains to be done is a full accounting of the costs of tuna ranching, and the creation of an equitable system to determine who is going to pay.

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