



VANTAGE

FISHING FOR TRUST

Innovations and opportunities for the future of supply chains



INSTITUTE FOR THE FUTURE



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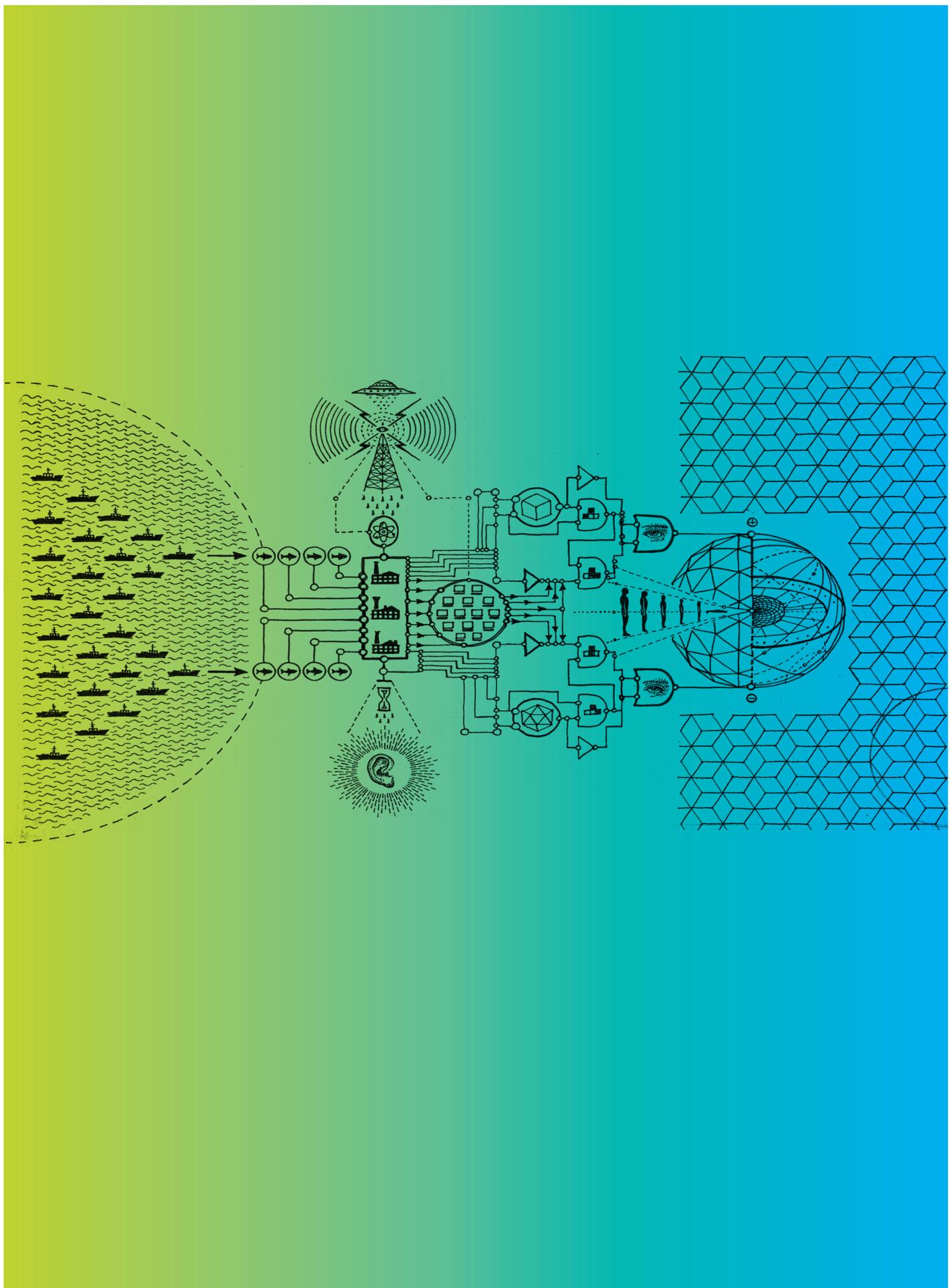
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INTRODUCTION

A fisher off the coast of Alaska illegally catches salmon with a driftnet and transfers the fish to another boat far from land, which then coasts into dock and passes off the illegal catch to an unknowing buyer. A distributor fails to keep track of the origin of her supply and gives her customer incorrect information about its source. At a restaurant, a diner orders one type of fish but is served another—and no one in the restaurant realizes it. Improper storage someplace in the supply chain that cannot be identified causes dozens of consumers to become ill.

All of these are instances of major problems that plague the fish industry. They reveal how the seafood supply chain, like all other supply chains, currently depends on trust at each step. Because of this, the end consumer must rely on an obscure cast of supply chain actors and more or less guess that all of them have passed along trustworthy information about the fish that ends up on his or her plate.

In the United States, one in three fish sold at restaurants and grocery stores is mislabeled.¹ However, the impacts of fish supply chain mismanagement are far more dire than just losing consumer trust. Oceans cover 71 percent of Earth's surface and support an estimated 3 billion people with food and livelihoods.² Today's headlines about our fisheries use terms like “extinction event” and “total collapse” to describe the state of seafood resources. Illegal, unregulated, and unreported (IUU) fishing accounts for 26 million tonnes of fish caught every year—an amount worth somewhere between \$10 and \$23 billion.³ Since the early 2000s, researchers have forecasted that under a business-as-usual scenario our oceans may be empty of fish by 2048.⁴

This report highlights both the technological and social innovations that are emerging in response to the urgent challenges within fish supply chains. In order to conduct this global scan of fishing industry innovation, we consulted experts in fisheries management, ocean conservation, and supply chain management, and we interviewed entrepreneurs about innovations like blockchain tracking, fish hubs, and software tools.

Although this report focuses on fish, it has wider applicability to any supply chain.

Fishing is fraught with logistical challenges. It's an extreme case of managing trust and mistrust. This makes the fish supply chain a great proxy for any supply chain as we hold a magnifying glass over issues involving the management of trust. This report provides examples of practices that can inspire anyone thinking critically about moving physical goods and digital information around the world. **In short, *Fishing for Trust* is a guide to remodeling global supply chains and realigning incentives in order to rebuild trust.**

Today's model of a supply chain is linear and dependent on node-to-node trust.

This simplification helps us make sense of a complicated web of interactions: transfer of ownership, rights, physical shipments, storage, returns, and many other interconnected steps. This model both enables and is a result of short-termism and self-interest. Why does each actor value trust? Only because it benefits the actor in the short term.

Today's signals of innovation and change from the fishing industry point toward the possibility of a new model of supply chains—one where transparency thrives and incentives are aligned for the long-term collective self-interest of all stakeholders. In this system,

- ▶ **PRODUCERS** are better off because regulation compliance is easier and they can demand a price premium for their goods;
- ▶ **NGOs** are better off because it's easier for them to accomplish their environmental, social, and economic development goals in a transparent system;
- ▶ **GOVERNMENTS** are better off because they can act on the urgent need to protect natural resources and meet climate change mitigation goals;
- ▶ **BUSINESSES** are better off because they can serve consumer demand and get higher-quality goods;
- ▶ **THE PUBLIC** is better off because they are less susceptible to foodborne illness and fraudulent commodities; and
- ▶ **THE PLANET** is better off because we can better monitor and regulate illegal, unreported, and unregulated fishing.

Rebuilding trust across supply chains is a shared responsibility. Moving away from today's siloed, private verification systems to a new model of distributed, open trust relies on **innovations across three zones: behaviors, technologies, and networks**. Behavior-change-based approaches enlist purchasing power to influence systemic change. Technology-based strategies will create the tools for collecting and tracking critical information. Network-based practices acknowledge the human communities necessary to build trust. Any effort to remodel supply chains should consider all three of these.

HOW TO USE THIS REPORT

Jump In

To begin, examine the **three innovation zones**, each of which describe necessary components of any supply chain: people or organizations exhibiting new **behaviors** using different kinds of **technologies** across various **networks**. Forecasting across each of these domains unearths new possibilities for future supply chains.

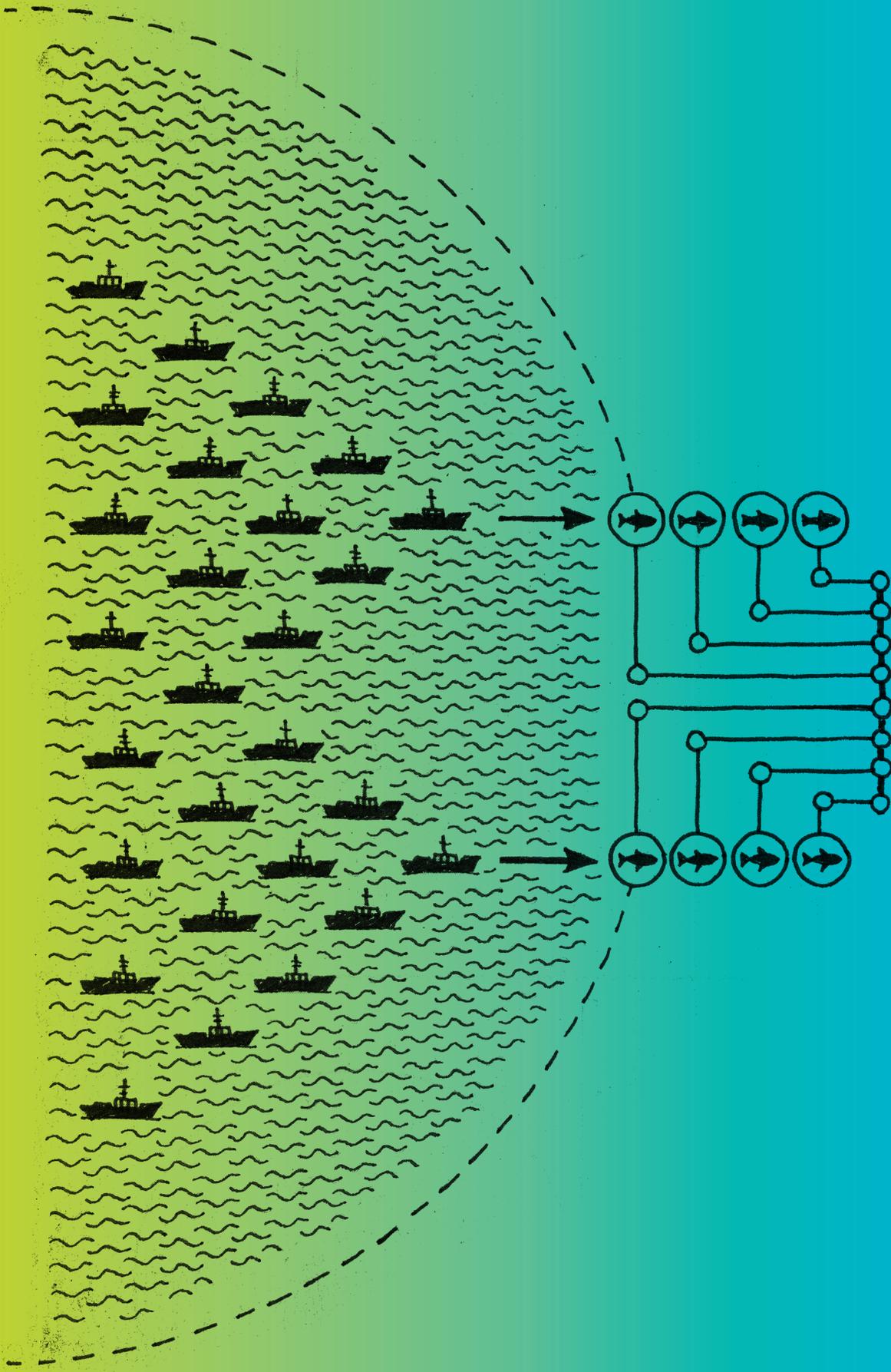
Swim Around

Each innovation zone is broken into **two forecasts**: plausible yet provocative visions for how we might remodel trust across the fishing industry. These forecasts posit a specific direction of change and explore its longer-term consequences. Each zone also contains an insight beyond fish that can be applied to any supply chain.

Dive Deep

Each forecast is supported by **three global signals of change**—real, current innovations that have the potential to scale and disrupt the status quo. These signals point to new possibilities in the way trust cascades through the production, trade, monitoring, delivery, and consumption of fish. When taken altogether, they reveal unexpected possibilities for the future of supply chains.

1. Kimberly Warner, Walker Timme, Beth Lowell, and Michael Hirshfield. February 2013. *Oceana Study Reveals Seafood Fraud Nationwide*, p. 5. <https://oceana.org/reports/oceana-study-reveals-seafood-fraud-nationwide>
2. Food and Agriculture Organization of the United Nations. 2014. *The State of World Fisheries and Aquaculture*. <http://www.fao.org/3/a-i3720e.pdf>
3. Food and Agriculture Organization of the United Nations. 2018. Illegal, Unreported and Unregulated (IUU) Fishing. <http://www.fao.org/iuu-fishing/en/>
4. Boris Worm. 3 May 2016. "Averting a Global Fisheries Disaster." *PNAS: Proceedings of the National Academy of Sciences of the United States of America* 113 (18): 4895–4897. <http://www.pnas.org/content/113/18/4895>



BEHAVIOR INNOVATION ZONE

DISTRIBUTED DATA COLLECTION AND ANALYSIS

BEHAVIORS THAT DRIVE MARKET CHANGE

The complexity of global supply chains is more than any top-down regulatory agency can handle (as evidenced by the OECD's estimate that more than \$460 billion worth of counterfeit goods are traded annually around the globe). We're moving into a world where high-resolution information can be gathered by just about anyone. Sensors and phone apps can verify provenance, and anyone can snap a photo of a boat's ID in order to track shipments. The forecasts in this innovation zone are about enlisting consumers as data collectors to crack down on challenges like seafood authenticity and sustainability. Distributed data collection and analysis change the game by **pushing traceability downstream** and **democratizing data collection** more broadly.

BEYOND FISH

Consumer behavior—choices about where dollars are spent—is a powerful driver of change. For example, campaigns to educate on the inefficiencies and environmental impacts of food waste have resulted in a worldwide movement to embrace “ugly produce,” creating new markets for formerly discarded foods. As consumers bring values supporting environmental resilience, local economies, and fair labor to purchasing decisions beyond food, they will demand more from companies and verify that their preferences are being met.

FORECAST

Pushing Traceability Downstream

Toward consumer-based verification

Scannable codes, package-based sensors, and quick DNA testing are all focused on making it easy to identify a piece of fish and know exactly where it came from. As these tools become commonplace, there may be nowhere left for bad actors to hide. Rather than relying on third-party certifications, the word of a seller, or the reputation of a brand, consumers will be empowered to do their own simple audit of each individual piece of fish they buy. In this future, supply chain actors will be pressured to put all their cards on the table, taking the steps to implement full traceability rather than risk suspicion of wrongdoing. Consumers will be able to make informed choices about the authenticity, quality, and sustainability of the seafood they eat, and those who responsibly harvest and handle the catch will be rewarded.

SIGNALS

ThisFish lets producers fully inform consumers

ThisFish provides a tagged code for seafood products that fishers on Canada’s east and west coasts can opt into in order to make full traceability data available to consumers. This code provides not only species information but also the name of the vessel and fisher, the fishery, supply chain actors along the way who opt in, and the fisher’s contact information.

FISHazam simplifies product ID for everyone

FISHazam is developing a smartphone-based spectrometer and app for consumers that will run on open-source software and use infrared waves to detect the molecular composition of a fish. Using an algorithm similar to the one used by music-identifying app Shazam, it will identify a piece of fish—down to the species and freshness—and report on its authenticity.

The Seafood Slavery Risk Tool provides human rights data

An open, online, collaborative database, the Seafood Slavery Risk Tool allows businesses to see whether human rights issues are associated with seafood products they buy, sell, or invest in. It’s simple enough to use and transparent enough in its methodology that a consumer could pull it up and make a decision on buying a species of fish from a certain region based on real-time information.



Source: thisfish.info



Source: fishazam.com



Source: seafoodslaveryrisk.org

FORECAST

Democratizing Data Collection

Toward distributed monitoring and enforcement

With the right tools, anyone can act as an authority—at least in a small way. Citizens taking photos of fishing vessels can contribute data points to digital platforms that monitor suspicious fishing activity. Aquaculturists—oftentimes producers in developing nations with little more than a cheap phone—can self-report their practices, which can be verified by a combination of auditors, crowdsourced consumer data, and algorithms. NGOs, fishers, tech companies, governments, and curious passersby all can contribute and access equally relevant information on open databases. This means that monitoring and enforcement will become distributed. There will be no single source of authority, but rather a pastiche of actors and technologies that will collectively ensure regulations are followed.

SIGNALS

Verifik8 collects and verifies farmers' self-reports

Verifik8 is a mobile and web application used by farmers of such commodities as shrimp and sugar cane to demonstrate their socio-environmental responsibility and receive feedback about how to improve. The platform allows farmers with smartphones to shift from reporting to auditors to self-reporting in real time. Verifik8 can then verify the data and provide a more transparent view of the supply chain to build trust between producers and buyers.

FISH-i works to stop illegal catch

FISH-i Africa unites eight African coastal countries in obtaining and sharing data on suspect vessels to halt large-scale illegal, unregulated, and unreported fishing. The task force uses both high-tech satellite tracking and low-tech photos of boats' features to enable authorities to identify and act against criminal fishers. The hope is to end illegal fishing in the western Indian Ocean.

Citizen water monitoring broadens data collection

Citizens are playing a critical role in addressing local water challenges by participating in monitoring systems that would otherwise be untenable. For example, in Spring Creek, Pennsylvania, several dozen groups coordinate local watershed monitoring programs by sharing equipment, funding, and data across multiple volunteers, nonprofits, municipal entities, townships, and water authorities. Their work raises awareness and strengthens trust and social capital throughout the community.



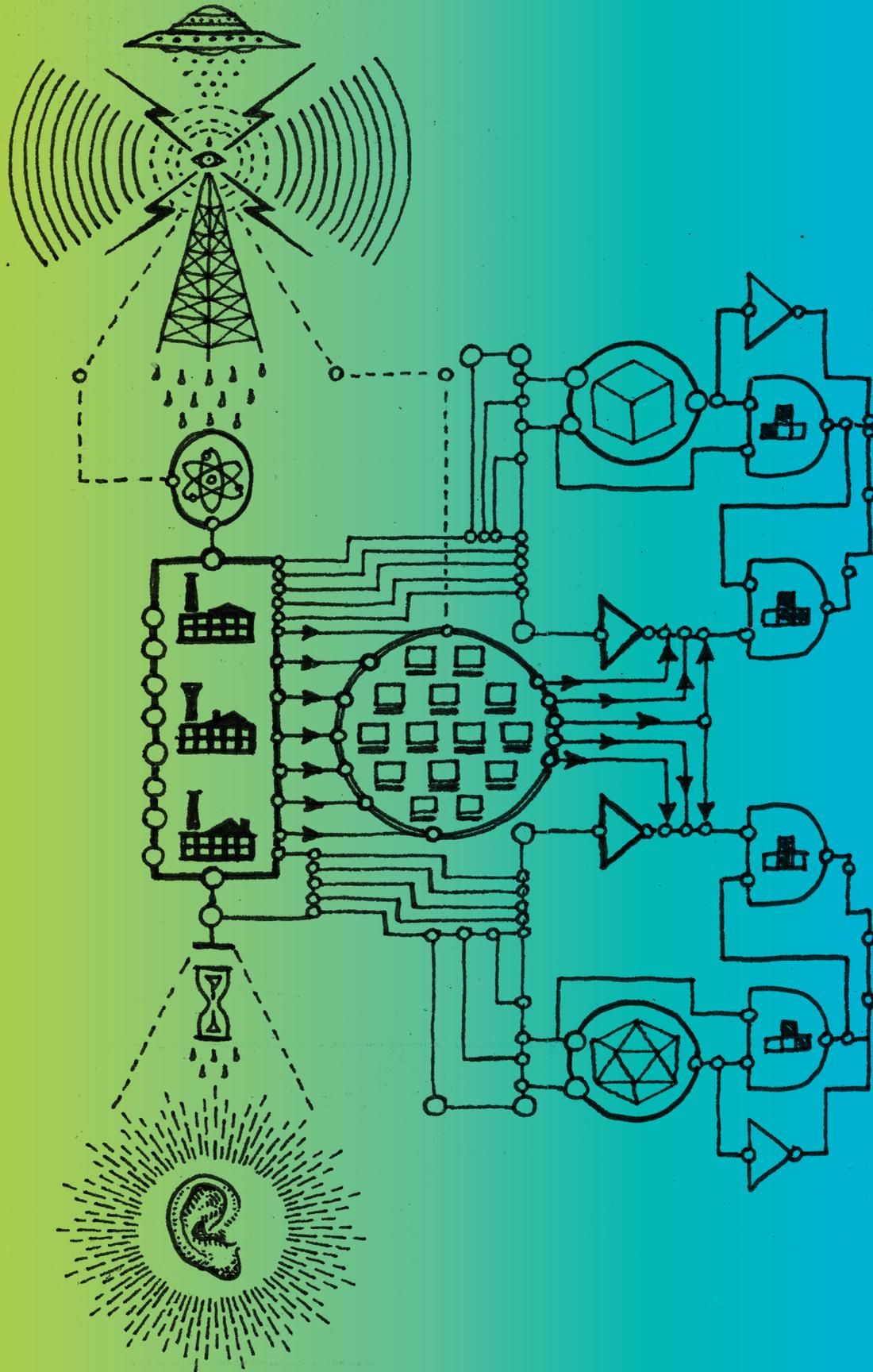
Source: verifik8.com



Source: fish-i-africa.org



Source: theconversation.com



TECHNOLOGY INNOVATION ZONE

ENCODED ENFORCEMENT

TECHNOLOGIES THAT TRANSFORM HOW AND WHAT WE MEASURE

A stack of emerging technologies—computer vision, machine learning, blockchain, low-cost sensors, and more—are being combined to nudge people to play by the rules as they produce, ship, and trade fish. These new technologies and processes will make compliance the invisible default in the seafood industry by building monitoring and enforcement into the infrastructure of the supply chain itself, as well as scaling up systems that have a high degree of inherent trust. Enforcement will be written into the rules of operation rather than imposed from the top down through policing and punishment. The forecasts in this innovation zone outline the technological underpinnings for the next decade's seafood supply chains. Encoded enforcement characterizes a future where we are **automating compliance** and **scaling up lines of sight** across supply chains.

BEYOND FISH

Enforcing rules and executing agreements across many of today's supply chains is an antiquated process reliant on reams of paper. It's prone to human error, and it's pretty easy for those acting in bad faith to get away with it. Whether your supply chain handles pharmaceuticals or farmed tilapia, rebuilding trust will require integrating new technologies that allow for precise measurement and monitoring at every step in a product's journey. Product price premiums will come from traceability and verifiability.

FORECAST

Automating Compliance

Toward embedded rules and regulations

As multiple technologies are put to use monitoring and analyzing activities on fishing vessels, compliance with regulations will become an automated part of the global seafood trade. Tech tools will be used increasingly by commercial fishermen to document and verify their catches and their compliance with regulations so that they can avoid fines and command a premium price in the marketplace. For example, smart nets that release unwanted or prohibited fish will allow operators to always be compliant with local laws around fishing operations. Machine vision devices that can identify the type, size, and geographic origin of fish brought on board will be able to instantly check if the fish is legal, and even write citations or levy fines if the fisher is out of compliance. As encoded rules become easier to follow than to subvert, enforcement in the fishing system will become ubiquitous and nearly invisible.

SIGNALS

Fish Face will help record and sort fish

The Fish Face project under development by The Nature Conservancy, Refind Technologies, and sustainability entrepreneur Seth Heine will use image recognition software to identify fish species from photos. The goal is to build the technology into a smartphone app that can be used on fishing boats to record the catch and sort fish rapidly and accurately. Ultimately, the app will provide the data necessary to assess and manage struggling fisheries around the world.

SmartCatch helps fishers reduce bycatch

SmartCatch serves commercial fishermen with state-of-the-art tech products that help reduce bycatch (marine life caught unintentionally) and resulting fines. DigiCatch is a camera and sensor system for nets that allows real-time monitoring from the wheelhouse, and SmartNet is a remote-controlled smart release system. DigiServices performs analytics on data captured by way of DigiCatch to help fishermen improve operational transparency, quality, compliance, and efficiency.

Shellcatch boosts traceability for small fishers

Shellcatch works with small fishing operations in Latin America to improve livelihoods and enhance environmental sustainability via catch-verification technology. The company provides smartphone-based tools to document catch method, catch weight, and bycatch and share this information with the rest of the supply chain. Seafood caught on Shellcatch-equipped boats can then command a premium price because it is responsible, traceable, and verifiable. It can also be regulated more efficiently by governments.



Source: refind.se
Image: The Nature Conservancy



Source: smart-catch.com
Image: Fisherman's News



Source: shellcatch.com

FORECAST

Scaling Up Lines of Sight

Toward collaborative real-time monitoring

Small-scale fisheries—like those you might find in a tiny rural fishing village—have trust baked into the supply chain. People can monitor each other and quickly spread the word about bad actors, whether fishers who are catching too many fish or sellers who are handling the product improperly. But once the supply chain gets longer, that small-scale line of sight is lost, and along with it, a large degree of trust. Technologies such as increasingly available satellite monitoring and cheap sensors are able to return line of sight to the supply chain on a global scale. In the coming decade, these technologies will bring direct monitoring to supply chains of any length and in effect return trust to every transaction in the chain. Those who participate in partnerships with multiple organizations will have access to powerful sensor networks that will give supply chain managers instant insight into their operations.

SIGNALS

Project Eyes on the Seas automates fisheries monitoring

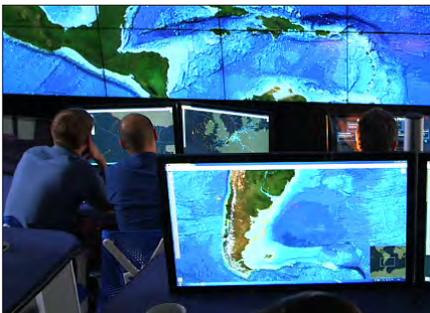
Project Eyes on the Seas helps authorities detect suspicious fishing activity via a technology platform that combines satellite monitoring and imagery data with information such as fishing vessel databases and oceanographic data. The UK grocer Metro, which handles more than \$1.4 billion of fish each year, is partnering with Project Eyes on the Seas to help customers know where and how their fish were caught.

Global Fishing Watch brings transparency to the global fleet

Global Fishing Watch offers free, near-real-time tracking of global fishing activity via an online public map. A partnership between Skytruth, Oceana, and Google, the platform takes advantage of automatic identification systems (AIS) onboard vessels, as well as local-government-enforced monitoring systems, to track ships via satellite. The aim is to promote ocean sustainability through greater transparency.

Albatrosses supplement drones as surveillance tools

Albatrosses equipped with GPS loggers and transmitters are being deployed in the south Indian Ocean to help detect illegal fishing activity and alert the authorities. French ecologist Henri Weimerskirch came up with the idea as a cheap, low-impact way to monitor thousands of square miles of ocean per day in real time. The birds don't draw attention from fishing boats since they naturally congregate above such vessels.

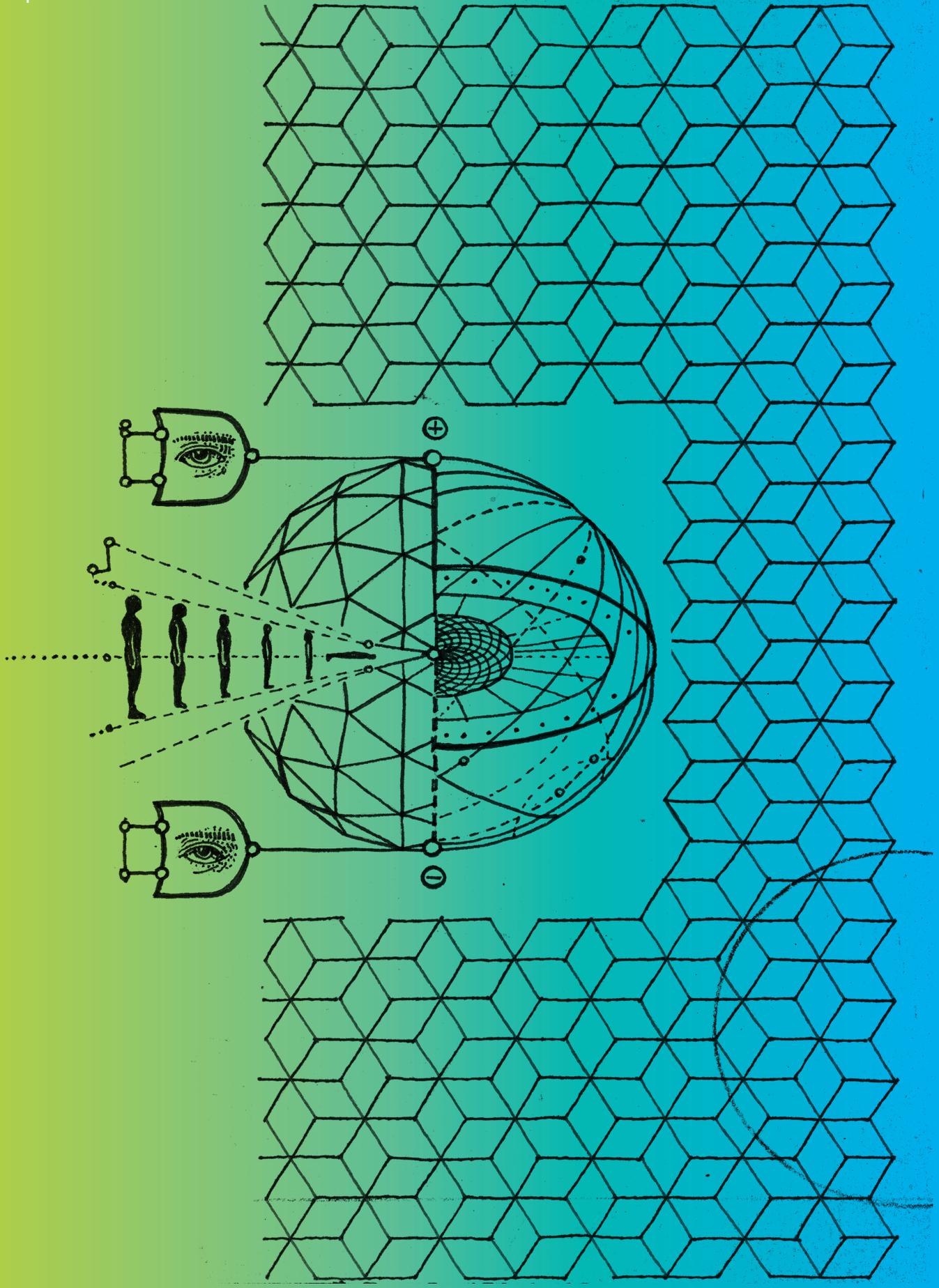


Source: pewtrusts.org



Source: globalfishingwatch.org

Source: slate.com
Image: Le Parisian



NETWORK INNOVATION ZONE

NEW STANDARDS OF TRUST

NETWORKS THAT BUILD TRUST THROUGH THE COMMONS

Traditionally, trust has been managed through interpersonal relationships, third-party certifications, and legal frameworks. We're seeing the growth of new standards of trust in the fish supply chain that are defined by networks and communities, both digital and physical. Some of these networks involve familiar actors, like NGOs attempting to make supply chains more ethical and sustainable, while others are arising from the ground up in new sources of trust, like regional fish hubs that bridge the gap between producers and end consumers. The forecasts in this innovation zone are about how these new physical and digital communities are inviting more people to participate in creating standards. They involve opportunities for lending credibility to transitional producers as well as amplifying soft standards.

BEYOND FISH

The power of the commons to establish new standards of trust is growing, thanks to innovations in how humans build communities and networks. For example, Wikipedia has become a trusted source of information by creating and maintaining an open knowledge commons that relies on contributions from across a massive network. Look for self-organizing efforts that enable trust in supply chains by formulating standards that reflect a community's values and making them clear to producers.

FORECAST

Lending Credibility to Transitional Producers

Toward recognizing and rewarding improvement

Fishery improvement projects (FIPs) and their aquaculture equivalent (AIPs) are an increasingly popular model for aggregating and supplying credibility for a certain strata of producers—those who don’t qualify for (or can’t afford) third-party certifications but who are still making genuine efforts toward transparency and/or sustainability. By recognizing the efforts of these transitional producers and enabling buyers to connect and communicate with them, these projects lower barriers to entry for becoming a trusted source. As more transitional producers are able to sell their goods to more discerning buyers, they will have more incentive to operate within standards. The growth of these projects will lead to a world where smaller and transitional producers will become a widely trusted source for sustainable seafood.

SIGNALS

Fishackathon calls for matching fishers with researchers

Fishackathon 2018, a partnership between the US Department of State and HackerNest, included a challenge statement recognizing that small-scale operators often lack the resources, technical knowledge, and/or research capabilities needed to qualify for sustainability certifications. One proposed solution was to create a matchmaking app that would partner small fisheries with experts, researchers, and PhD students who could help them improve practices and build credibility.

FisheryProgress.org tracks FIP progress toward sustainability

Launched in 2016, the FisheryProgress.org website bills itself as a one-stop shop for information on the progress of global FIPs. It includes a directory of FIPs around the world, as well as progress ratings and guidance from NGOs and researchers to help seafood buyers make better decisions about sourcing from FIPs. A joint project of FishChoice and the Conservation Alliance for Seafood Solutions, the site lends credibility to fisheries as they work toward improvement and certification.

Certified Transitional program sets precedent for product labeling

The Certified Transitional program launched by QAI in 2016 allows farmers who are actively transitioning to organic production—a lengthy and costly process—to reap the rewards of recognition. Although it hasn’t expanded to fish, this QAI certification program provides precedent for labeling the consumer product, something that FIPs could pursue. It also models one way that organizations can provide trust as a service.



Source: fishackathon.co



Source: fisheryprogress.org



Source: qai-inc.com

FORECAST

Amplifying Soft Standards

Toward signaling consumer values to producers

Fish hubs are essentially aggregators of fish—they may operate as co-ops, or they may be traditional businesses that are run with the intent of gathering fish from trusted sources. These hubs are distinct from other distributors in that they are formed around a local supply of fish and champion the fisher as a visible part of the customer’s supply chain. They gain the trust of consumers by doing the work of screening producers as well as implementing verification and traceability tools that small fishers might not be able to undertake individually. Over the next decade, the fishers who supply these fish hubs will be influenced to improve the sustainability and traceability of their operations as a direct result of communicating with the end consumer. This will lead to communities of mutual trust and a culture of compliance with “soft standards” rather than formal certification standards.

SIGNALS

Pesky Fish connects fishers directly to chefs

Entrepreneur Ben King started Pesky Fish to bring fresher fish to chefs directly from fishermen. Pesky Fish provides a platform through which chefs can buy fish from specific fishermen in five UK ports, cutting out the buyers and merchants in between. Through fostering direct conversation, this supply model lets fishers be guided by consumer preferences, such as favoring the use of a Japanese kill method, Ike-Jime, that’s more humane and results in fresher-tasting fish.

Smartfish rewards fishers for responsible fishing

Smartfish is a social enterprise that was created to address the lack of good intermediaries bringing sustainable seafood to market. It identifies fishers and co-ops in Mexico that have made demonstrable efforts to increase transparency and traceability and connects them with appropriate buyers. One of Smartfish’s key initiatives is to “empower artisanal fishermen to own more of their supply chains in order to directly reward them for more responsible fishing.”

Sustainable Fish Cities encourages buyers to reward sustainability

Sustainable Fish Cities is an initiative organized by an alliance of conservation and sustainable food nonprofits to encourage companies, organizations, and towns and cities to buy, serve, and promote only sustainable fish. Their approach combines grassroots organizing, political pressure, training, and capacity building, with the goal of making an entire city’s seafood supply chain sustainable.



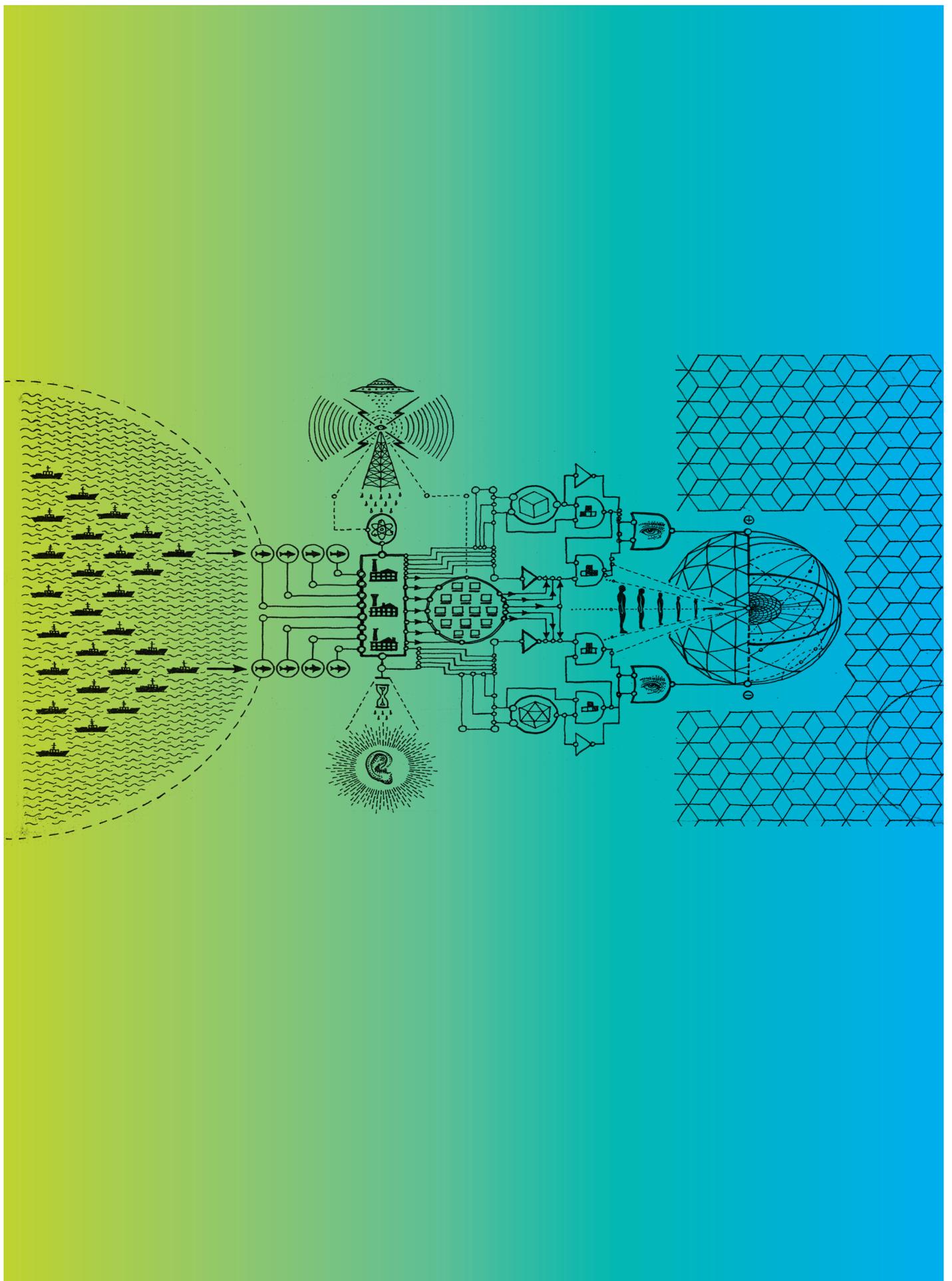
Source: peskyfish.co.uk



Source: conservation.org



Source: sustainweb.org



INSIGHTS FOR TRUST IN YOUR SUPPLY CHAIN

The six future of fish forecasts in this report each point to long-term strategies for re-building trust across supply chains in many industries. These insights point toward practical opportunities to begin building the future of the supply chain today.

- ▶ **LEAD WITH VALUES** | As consumers continue to gain abilities to verify the contents of their purchases, they will look beyond price when buying fish and other food. Developments like handheld sensing devices and systems of citizen monitoring could make an average shopper just as influential as auditors and regulators when it comes to verification and traceability of your product. By creating clear value propositions that include—and exceed—low-cost, you can appeal to this growing demand.
- ▶ **BUILD FOR TRANSPARENCY** | Currently-siloed supply chain technologies like machine learning, blockchain, satellite monitoring, and smart devices will converge to create systems of automated enforcement. Supply chains will become transparent by default, and those who resist transparency may put their value at risk. On the other hand, those who embrace automated monitoring and regulation will also benefit from increased traceability and better purchasing pathways.
- ▶ **DEFINE STANDARDS WITH COMMUNITIES** | Self-organizing communities will become increasingly influential in defining standards and operations, especially as networks begin to form between previously antagonistic or isolated groups like regulators and operators, buyers and uncertified producers, or consumers and distributors. By working with community interest groups now, you can influence standards and regulations to ensure an operating climate that thrives in the long run.

