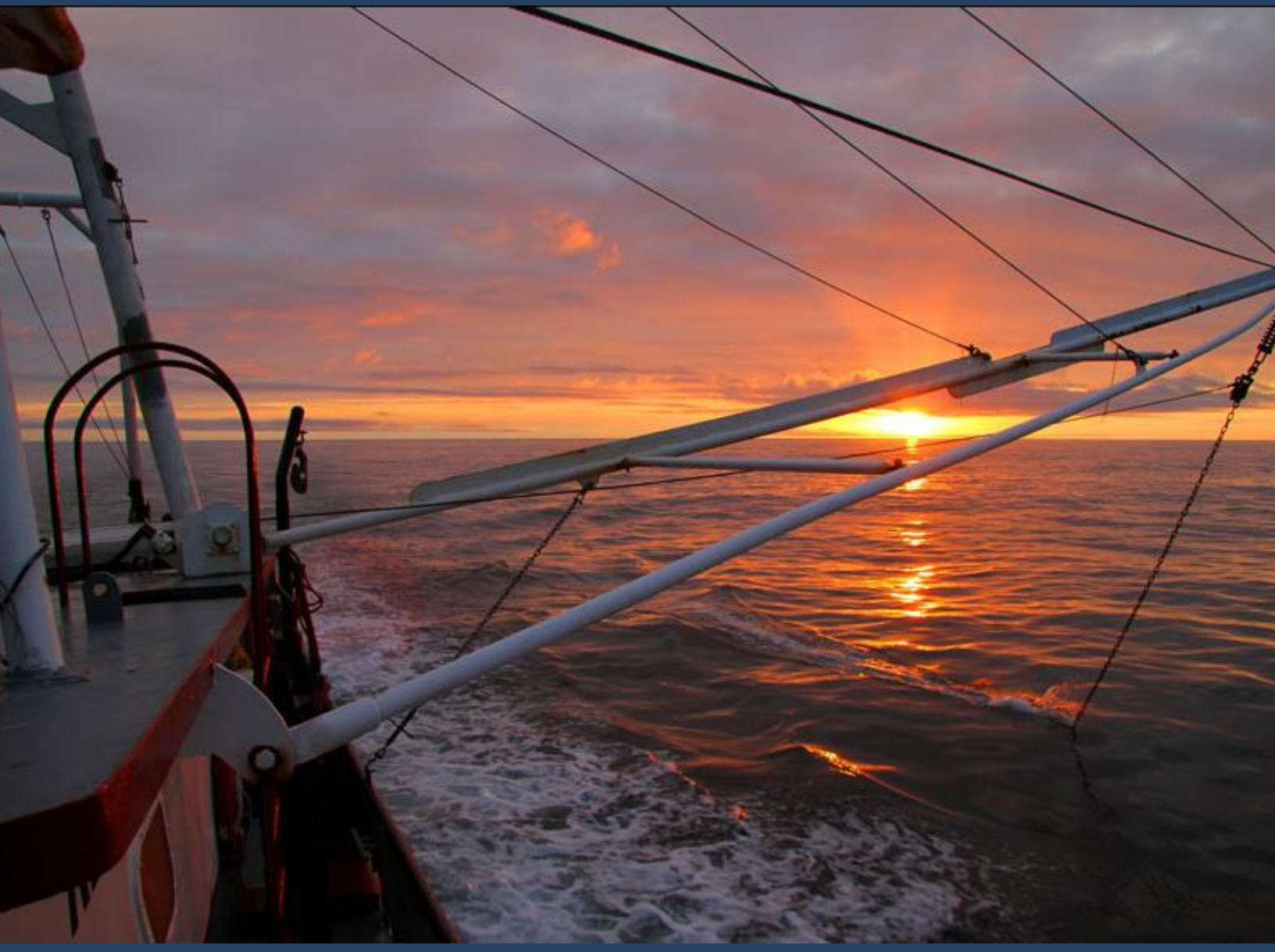
The Safety and Fraud Enforcement for Seafood Act of 2013



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EXECUTIVE SUMMARY

Pervasive mislabeling, poor documentation, and inadequate government regulations in the seafood industry have been brought to the attention of the American public in recent years by several nationwide studies of seafood in markets and restaurants. Seafood fraud is a widespread phenomenon that has complex economic, public health, and environmental implications. In response to the issues associated with seafood fraud, Senator Ed Markey introduced the House Bill 1012, the Safety and Fraud Enforcement for Seafood Act, commonly known as the SAFE Seafood Act, in March 2013. The proposed legislation is designed to improve the safety of the seafood supply and prevent seafood fraud, primarily in the form of mislabeling.

This document provides an analysis of the implementation of the SAFE Seafood Act that includes a breakdown of the bill into five major components. We discuss the bill's legislative history and associated controversies and develop a staffing, budget, and master calendar for its implementation. Methods for measuring the program's success are proposed as a way of verifying the goals of improved traceability along the seafood supply chain.

Through the implementation of these five components - improving tracking, increasing inspections, maintaining a public list of violators, standardizing seafood names and improving interagency cooperation between FDA and NOAA - the goal of mitigating seafood fraud to effect positive changes on broader economic, public health and environmental systems would be met.

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Acronyms and Abbreviations

Commerce: Department of Commerce

HHS: Department of Human Health Services

House: House of Representatives

FAO: Food and Agriculture Organization

FDA: Food and Drug Administration

NOAA: National Oceanic and Atmospheric Administration

SAFE Seafood Act: Safety and Fraud Enforcement for Seafood Act

NMFS: National Marine Fisheries Service

INTRODUCTION

EXAMPLES OF 4 DIFFERENT FISH THAT CAN BE MARKETED AS "SNAPPER" UNDER FDA GUIDELINES. CLOCKWISE FROM TOP LEFT: BLACKFIN SNAPPER, LANE SNAPPER, RED SNAPPER, VERMILLION SNAPPER. IMAGE COURTESY OF SEFSC PASCAGOULA LABORATORY; COLLECTION OF BRANDI NOBLE, NOAA/NMFS/SEFSC

INTRODUCTION

The Safety and Fraud Enforcement for Seafood Act (hereafter, the SAFE Seafood Act) is a piece of legislation introduced to the United States House of Representatives in March of 2013. The stated purpose of the legislation is "to strengthen Federal consumer protection and product traceability with respect to commercially marketed seafood." Its introduction follows in the wake of several studies, including notable ones by Oceana, a marine conservation group, and *The Boston Globe*, which revealed a pervasive problem of seafood mislabeling in the United States.

In practice, the SAFE Seafood Act is a consumer protection bill, with an emphasis on the economic and health consequences of seafood fraud. First, it ensures that the public is paying an appropriate market price for their seafood of choice, rather than unknowingly overpaying for lower quality or less desirable fish. At the same time, the increased seafood traceability and transparency resulting from the bill's mandates would help to safeguard consumers against health risks. For instance, certain segments of the population, such as pregnant women, are instructed to avoid consuming fish high in accumulated toxins, such as mercury. Seafood mislabeling, then, presents a risk if a pregnant woman is unknowingly purchasing a fish with much higher concentrations of mercury than the species she selected. The bill also has unstated environmental implications, since seafood fraud and mislabeling can prevent consumers from making informed decisions on the sustainability of the fish which they eat.

The design of the program proposed here includes five main components: tracking seafood, increasing inspections, tracking violators, establishing a standardized list of seafood names, and improving interagency cooperation. The goal of the tracking seafood program is to develop a system that provides accurate information concerning seafood from catch to consumption. To increase inspections, the FDA and NOAA will collaborate to retain the services of an independent inspection laboratory or laboratories that will be responsible for meeting inspection targets each year. Maintaining a public list of violators and standardizing seafood names would both require short-term contracts to develop a framework for inspectors to upload violator data and to conduct surveys determining consumer and industry preferences for seafood market names, respectively. Lastly, improving interagency cooperation would be part of an ongoing effort between FDA and NOAA that would involve a new or modified memorandum of understanding and regular meetings to set goals, coordinate regulatory efforts, and evaluate annual reports determining progress. Each of these program components is presented with a budget, staffing plan, performance management system, and a master calendar. They all follow the outline of a five-year plan in regards to the implementation of each requirement.

BACKGROUND

WHAT IS SEAFOOD FRAUD?

The inadequacy of current regulations of seafood fraud was highlighted recently in a national study by Oceana, which described widespread mislabeling of seafood and other instances of seafood fraud in American markets (Oceana, 2012). Of particular concern were the species with health advisories that were marketed and sold as other species, an error that could have negative health consequences for high risk groups like pregnant women and children. Mislabeled fish in the marketplace can potentially threaten human health if the consumer is unaware of toxins that may be present in the fish they consume. In 2007, a Florida business illegally imported several hundred thousand pounds of fillets by labeling them as grouper. The fish were eventually identified as Vietnamese catfish and were found to be contaminated with Enrofloxacin, a food additive banned in the United States (NOAA, 2012). This is just one example of a situation in which toxins could be unknowingly consumed as a result of fraudulently labeled fish.

Though seafood fraud can occur at any part of the supply chain from fisherman to consumer, the most common point of occurrence is during processing. Processing involves the removal of the skin, head, and other portions of the fish that could have been otherwise used for identification purposes. For example, anglerfish were 68% more likely to be mislabeled when sold after processing as opposed to being sold as whole fish (Espineira et al. 2008). Distributors can also commit fraud by falsifying shipping documents regarding the seafood's country of origin (Sovacool and Siman-Sovacool 2007).

Whether deliberate or unintentional, seafood fraud is complicated by international trade markets and the fact that seafood can undergo processing in numerous countries before reaching a consumer (Figure 1). After seafood is caught by fisherman either domestically or abroad, it is frequently flash-frozen and taken to a primary processor. Fishermen often take their catch to large at-sea processors where the fish are butchered before delivery to shore. This route of processing is advantageous to the processor because they do not have to place a country of origin label on the shipment until it reaches land (Stiles et al. 2011). This blurring of the processing phase of production can lead to confusion and misinformation regarding the origin of seafood. The SAFE Seafood Act is designed, in part, to combat these issues and improve transparency throughout the supply chain.

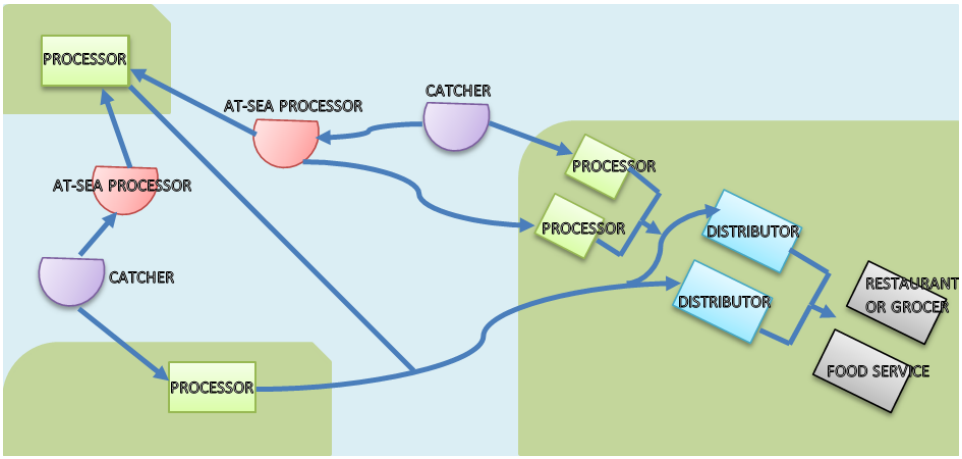


FIGURE 1. THE MAJOR COMPONENTS OF THE SEAFOOD SUPPLY CHAIN. FIGURE ADAPTED FROM AN ORIGINAL BY OCEANA [STILES ET AL 2011].

THE CHALLENGES OF SEAFOOD FRAUD

The SAFE Seafood Act is, in effect, a consumer protection bill, which seeks to restore consumer confidence in the seafood market after recent reports by Oceana (2012) and *The Boston Globe* (2012) which reported about one-third of all seafood sold in restaurants and markets as mislabeled. Rates of fraud are even higher with several types of seafood commonly found in restaurants like red snapper, Chilean seabass, or grouper, all of which were found to be mislabeled up to 77% of the time (Oceana, 2012).

While the focus of the impact of fraud is often on economic and public health consequences, the ecological problems associated with mislabeling are extensive. Many types of marine fish, along with other marine organisms, are experiencing catastrophic declines from overfishing and other forms of ecosystem degradation. In addition to direct threats from overharvest and environmental change, seafood fraud through mislabeling creates a challenge for effective fisheries management. Conservation efforts are unable to identify or prevent instances of overfishing without knowing the origins of seafood. Fish are a vital source of protein for much of the world's population, especially in developing countries where fish can account for over 40% of animal protein intake (Fisheries and Aquaculture, n.d).Fisheries and aquaculture are also estimated to support to livelihoods of 540 million people, or nearly 8% of the global population (Fisheries and Aquaculture, n.d.). Since the seafood market is such a large and potentially lucrative industry, with revenues of approximately $56 billion in the United States in 2011, it is unsurprising that the economic incentive to harvest more fish is often in conflict with management limits set to maintain fish stocks for the long term (McBee, 2013). The global nature of the seafood industry is apparent when one considers the fact that Americans import 85% of their seafood (Oceana, 2012). The problem of overfishing has become so widespread that an estimated 28-33% of global fish stocks are overexploited and 7-13% stocks have collapsed (Branch et al., 2011). By importing the majority of their seafood, demand from the U.S. market puts pressure on those overexploited fisheries.

Approximately 90% of the world's fish are caught within national, rather than international, waters (A Rising Tide 2008). This enables national and sub-national governments to impose rules and regulations to effect change in the way humans manage fish populations. Part of the difficulty in management rests in the inability to accurately count mobile organisms like fish. The Food and Agriculture Organization (FAO) of the United Nations proposes several ways to manage fisheries sustainably, but governments do not always implement these recommendations (UN FAO 2013). While some nations have recognized the need for sustainable fisheries, many have allowed lucrative but highly exploitative fishing, both legal and illegal, to continue. For example, illegal fishing is a frequent occurrence in Mexico due to both weak restrictions and limited enforcement which result in declining fish populations (Information on Fisheries Management in the United Mexican States, n.d.). While lax regulations can be corrected with responsive policy action, the problem of fraud in the seafood industry is a systemic issue that cannot be easily solved.

Increased inspection and transparency not only improve economic efficiency and consumer safety in seafood markets, but can alleviate some of the negative environmental impacts on marine ecosystems. There are several independent programs working to improve transparency in the market on a voluntary basis. Gulf Wild, a program started by commercial fisherman in the Gulf of Mexico, uses its "TransparenSea" program to allow consumers to trace the origins of their seafood (About Gulf Wild, n.d.). By placing tags on their fish, each having a unique number, participating fishermen allow consumers and other interested parties to look up the product's number in a database and obtain further information. This includes a photo and information about the fishermen who caught the fish and a map of where and when the fish was caught.

The proper identification of fish species during inspection is also a significant challenge since DNA testing, the most reliable way to confirm identity, is costly and time-intensive. Although not explicitly discussed in the SAFE Seafood Act, perhaps the most valuable resource in combating fraud associated with mislabeling is the use of DNA testing and a comprehensive database against which samples can be compared. The development of identification databases in the U.S. began with the Regulatory Fish Encyclopedia (hereafter, RFE; U.S. FDA, 2013). The RFE was developed for use by the FDA to identify 1700 finfish and shellfish, associating the following data with each species: market name(s) approved by the FDA, common name, scientific name, vernacular names for cross-reference, RFE isoelectric focusing data, and several high quality images of that fish in varying levels of processing (U.S. FDA, 2013). The RFE design allows these databases to incorporate additional information and analytical tools as they become available which led to the incorporation of DNA barcoding in 2007 (U.S. FDA 2013). The DNA barcodes were developed as part of the Barcode of Life (BOL) initiative which seeks to create an identification system for eukaryotes, based on short, unique gene regions (Barcode of Life, n.d.).

LEGISLATIVE HISTORY

As a response to the issues associated with seafood fraud, Senator Markey introduced House Bill 1012, the Safety and Fraud Enforcement for Seafood Act (SAFE Seafood Act) near the end of his tenure in the House of Representatives (HR 1012, 2013). Senator Markey's stated motivations for introducing the Act – to reduce the undercutting of honest fishermen, improve food safety, and address inefficiency – can be gathered from his introductory remarks for the initial iteration of the bill, which was introduced the previous year (Markey 2012). He begins by citing *The Boston Globe*'s investigation into seafood fraud, as well as subsequent investigations in Los Angeles and Miami in 2012, as exposing a "severe shortcoming in the ability of our nation to ensure the integrity of seafood products offered for sale, especially the 85 percent of those products that come from abroad" (Markey 2012, E1328). From his perspective from Massachusetts, this hurts local honest fishermen by driving down the price of seafood due to competition from what he considers "low quality imported fish and shellfish," especially when these imports are mislabeled as higher value species. Next, he pointed to a Government Accountability Office (GAO) report that found that the U.S. Food and Drug Administration (FDA) inspects only two percent of seafood shipments, causing him to question the FDA's ability to ensure the safety of these products for consumers (U.S. GAO 2011). Lastly, he notes the duplicative, and therefore inefficient, inspections that the FDA and the National Oceanic and Atmospheric Administration's (NOAA) Seafood Inspection Service are conducting. Nowhere in his introductory remarks are environmental concerns identified as a motivating factor, nor are the environmental implications of the bill noted. This is a notable point since Senator Markey is considered an environmentally-minded legislator, dubbed the "first real 'climate candidate'" by the National Journal (Davenport 2013). Ultimately, though, the bill was referred to the Committee on Natural Resources

Currently, the bill has 27 cosponsors, 25 of whom are Democrats and 2 Republicans (GovTrack.us). The SAFE Seafood Act was referred to four committees in the House: the Energy and Commerce subcommittee on Commerce, Manufacturing, and Trade; the Agriculture subcommittee on Livestock, Rural Development, and Credit; the Natural Resources subcommittee on Fisheries, Wildlife, Oceans, and Insular Affairs; and the Committee on Ways and Means.

The SAFE Seafood Act of 2013, H.R. 1012, is a reintroduction of H.R. 6200, a bill of the same name that was introduced in the House in 2012. The 2012 version of the bill was referred to the same committees and did not receive any hearings or markups. The prospects for the 2013 version also appear dim, as predictions have shown that it has a small chance of enactment. These predictions could be attributed to several factors. For one, the House is currently controlled by Republicans in a highly polarized Congress, making it particularly challenging for a Democrat-led bill to pass. Also, because Markey was elected to the Senate, he can no longer champion the SAFE Seafood Act in the House. However, on September 26, 2013 Representative Lois Capps (D-CA-24)

announced that she would become the lead sponsor of the bill, renewing its chances of success as she called for a committee hearing on the issue (Capps, 2013a). Another problem may be the political clout of the bill's opponents, which may include powerful interests in the seafood and restaurant industries who may have had the opportunity to profit from seafood fraud.

The prospects for action on the bill have improved somewhat with its new sponsor, as Representative Capps has already sent a letter to the President urging him to take action and protect the public from seafood fraud, demonstrating her desire to take strong action on the issue (Capps, 2013b.). In fact, in October 2013, only a month after she took on the leadership role for this legislation, she and Republican cosponsor Walter Jones requested the first hearing on the bill in front of the Health Subcommittee of the House Energy and Commerce Committee (Capps, 2013b). On its face, the SAFE Seafood Act is beneficial as both a public health and economic consumer protection bill. GovTrack.us estimates the bill's chance of making it out of committee at only 2 percent, a slight improvement since Representative Capps has taken over sponsorship (Govtrack.us, n.d.) However, the bill's chance of success suffers not as a result of its purpose and likely results, but rather due to the political environment into which it was introduced.

Related Legislation

Also introduced in March of 2013, S. 520 is the U.S. Senate's companion legislation to the SAFE Seafood Act. This Senate bill was introduced by Senator Mark Begich of Alaska, a state with extensive fishery resources. Like the SAFE Seafood Act, S. 520 was referred to a committee related to trade: the Committee on Commerce, Science and Transportation. While the bill currently only has 3 cosponsors, GovTrack.us predicts slightly better prospects for the Senate bill, with an 11 percent chance of getting through committee and a 2 percent chance of being enacted. The better prognosis results from the fact that Senator Begich is a member of the committee to which the legislation was referred and is also a member of the majority party, since Democrats control the Senate.

Another relevant piece of legislation is the Magnuson-Stevens Fishery Conservation and Management Act, which is the primary federal law regarding the management of fisheries in the United States. This bill, originally enacted in 1976, was designed to conserve American fisheries by preventing overfishing and rebuilding overfished stocks, protecting essential fish habitats, and realizing "the full potential of the Nation's fishery resources," which includes economic potential (Magnuson-Stevens Fishery Conservation and Management Act 1996). For the purposes of our analysis, a useful conclusion drawn in the Act is that "[t]he collection of reliable data is essential to the effective conservation, management, and scientific understanding of the fishery resources of the United States" (Magnuson-Stevens Fishery Conservation and Management Act 1996, 2). Seafood fraud and mislabeling distort the data which is used to make important fisheries

management decisions, and is therefore a threat to proper management of valuable ecological and economic resources.

Issues and Political Background

There is a great deal of political tension surrounding the proposed addition of regulations to the seafood industry; opponents of this bill include large companies in the restaurant industry as well as the seafood processing industry. Other legislative efforts comparable to the SAFE Seafood Act that have previously been introduced to Congress have faced similar opposition.

Opposition and Support

One reason for support is to protect consumer rights in the marketplace. Another is protection from liability for retailers. For instance, if a restaurant group currently employs an independent company to conduct DNA tests on the seafood they purchase in order to deter fraud, the financial burden of independent testing would be alleviated and transferred to the government. The media may have influenced support for this legislation, since they aided in the wide dissemination of the findings of the studies on mislabeling in the U.S. Lastly, for conservation purposes, environmental groups concerned with fisheries management and ecosystem preservation are supportive of the bill. In fact, Oceana currently has a web-based campaign whereby website visitors can send a pre-drafted letter in support of the SAFE Seafood Act to their Congressional Representative. This pre-drafted letter specifically voices concern over ocean health, while touching upon other issues including consumer health (Fisher 2011).

The primary sources of opposition stem from economic concerns and anti-regulatory ideology. For the former, opponents posit that increased inspection is too costly and impractical, especially since the seafood industry is more diverse than the meat and poultry industry, where there is already some country of origin labeling. For the latter, opponents suggest that more government inspection does not necessarily mean a safer product, and that mandates in this bill would represent an overreach by governmental agencies (Becker 1997).

Unresolved Issues and Challenges

In addition to the bill's dim prospects for passage, the SAFE Seafood Act also has many unresolved issues and challenges that must be addressed in order for implementation to be successful. These challenges primarily stem from the fact that the SAFE Seafood Act is not a comprehensive remedy for the problem of seafood fraud.

Firstly, the bill may face strong opposition by those who may benefit from infrequent inspections and lucrative nature of the fraud. Also, the bill does not describe any particular budget, despite stipulations that inspections must increase. In order to increase the number of inspections, it is almost certain that the regulatory agencies will incur additional implementation costs, which may be difficult to justify in a time of economic hardship. As a result of sequestration in the United States, all federal agencies are experiencing across-the-board cuts to funding. Despite NOAA receiving FY13 funding for mission critical programs, it still received a mandatory 7 percent reduction from its overall budget and the agency is considering a furlough of up to four days for each employee. As of March 27, 2013, NOAA implemented a hiring freeze and, to avoid furloughs, has made significant agency-wide product and service reductions. This specifically includes "reductions to analytical work and assessments that support the Seafood Inspection Program" (NOAA 2013). Even if the bill were enacted, it is not clear that it would be granted sufficient appropriations to implement the proposed changes.

On a practical level, the bill includes a provision that requires inspections to increase every year, never to go below a previous rate of inspection. Because no time window is included in this provision, this continual increase is not realistic over the long-term. Politically, a challenge the bill faces is to gain more support from Republicans, since there is currently a Republican majority in the House but only two Republican cosponsors for the bill, Representative Jo Bonner of Alabama and Representative Walter Jones of North Carolina (Library of Congress Bill Summary & Status Search).

The passage and implementation of the SAFE Seafood Act will not be an easy task, but nevertheless the financial, health, and environmental implications of seafood fraud warrant legislative action. The current system for seafood fraud detection, health inspection, and enforcement can be strengthened with improved traceability and transparency of information regarding seafood products, in addition to coordination of agency efforts. Specific strategies for accomplishing these goals are outlined in the recommended program design for the implementation of the Safety and Fraud Enforcement for Seafood Act.

PROGRAM DESIGN

For the purpose of this design, our team has identified five major goals of the SAFE Seafood Act and has recommended courses of action for their implementation. These goals are tracking seafood, increasing inspections, maintaining a public list of violators, establishing a standardized list of seafood names and improving cooperation between FDA and NOAA.

TRACKING SEAFOOD

The first major component of the SAFE Seafood Act requires the development of a tracking system that provides accurate information about seafood from catch to consumption. To satisfy this requirement, the proposed program design begins with the creation of a working group with a total of four staff, two existing staff from NOAA and two from FDA. This group will be tasked with surveying existing seafood tracking programs, assessing the associated costs, and recommending best options for a federal program. The group would then be responsible for hiring a design team that would be overseen by NOAA's Seafood Inspection Program. Two full-time senior staff and one part-time staff would be hired to continue the process that the working group began and design a federal tracking program. These staff members will transition from a design team to the lead members of the Seafood Tracking Program Team that would be in charge of implementing the program and overseeing its continued operation. Implementation would be done in two phases, domestic and international, and would be fully operational 30 months after the start of the program (Figure 2).

The design of the program will be such that each shipment is labeled with a type of electronic code or identification tag that, when scanned, would provide detailed information of the fish's origins and processing history. These tags would be primarily for the use of NOAA field auditors and inspectors but associated information would also be made available for public use. Seafood distributors would be required to obtain NOAA certification in order to import and sell their products in US markets. For international markets, foreign countries would be able to obtain NOAA certification to verify that their seafood tracking systems are in accordance with a US standards. Though not required for import, NOAA certification of foreign tracking systems would bring an added benefit for importers bringing seafood from these countries such as lower inspection burden or import fee, providing an incentive for foreign governments to improve their management and tracking systems. In order to verify that distributors and foreign markets are abiding by NOAA standards, NOAA field auditors would conduct electronic and on-site audits of their records to verify that no seafood shipment data was inappropriately altered and that all documentation is accurate throughout the supply chain.

STAFFING AND BUDGET

The working group that would be created in January 2014 would consist of two members of existing staff from the FDA and two members of existing staff from NOAA. This group will be supervised by the NOAA Seafood Inspection Program and will be responsible for researching various options for the program design. They will be responsible for surveying existing domestic and international seafood tracking programs, compiling research, and recommending options. After the completion of their research, they will be responsible for passing on the information to the design team.

The design team would be composed of two full-time senior staff and one part-time support staff to be hired by NOAA in January 2015. They would receive and analyze the information from the working group and choose the best tracking program designs for use in the federal system. They would also develop a verification system for foreign tracking systems that would allow for FDA certification of those systems.

Once the design team has completed the program design, they would transition into the Seafood Tracking Program Team. This team would consist of the same staff members that ran the design and would expand to include two additional full-time support staff members, to be hired by January 2016. Their responsibilities will include conducting the first phase of the tracking program's implementation, which would start with media outreach in 2016. They would also work on the procurement of equipment, establishment of standard documentation, and the opening of the certification process for domestic distributors. They would oversee the hire and training of NOAA field auditors and, in 2017, begin the preliminary tracking system for domestic distributors, as well as the testing of this system. One additional full-time support staff member would be hired by January 2017 to assist in conducting the second phase of implementation, which would include opening the certification process to international distributors. The second phase will coincide with the commencement of the full tracking system for domestic distributors. This team will continue to maintain the program once it becomes fully operational in the third quarter of 2018.

The initial working group conducting research of tracking programs will consist of existing staff members and therefore will be drawn from existing budgets. The hiring of the design team is expected to be the first budget item and would cost $500,000. Phase I of the implementation process would cost $2,117,500. This phase of the implementation would take place during the year 2016. Phase II of the implementation process would cost $1,910,000 for additional staff members of the Tracking Team and audits conducted by field staff and would remain at to $1,910,000 for each year the program is fully operational. Thus, the total budget for the five years the program is being developed and beginning operation would be $6,437,500.

The budget for the two phases of implementation has been broken down for each year and is outlined in further detail in Appendix II. Phase I, in addition to the two full-time senior staff and two full-time support staff, includes media relations and the procurement of tracking equipment. Media relations would include the creation of a communications and marketing strategy, a consumer education program, and marketing materials. The tracking equipment would include a form of identification tags and scanners, system software, and mapping software to track the identification tags globally. Fifteen NOAA field auditors would also be hired to conduct audits of distributors. Phase II includes an additional budget for two full-time senior staff and three full-time support staff.

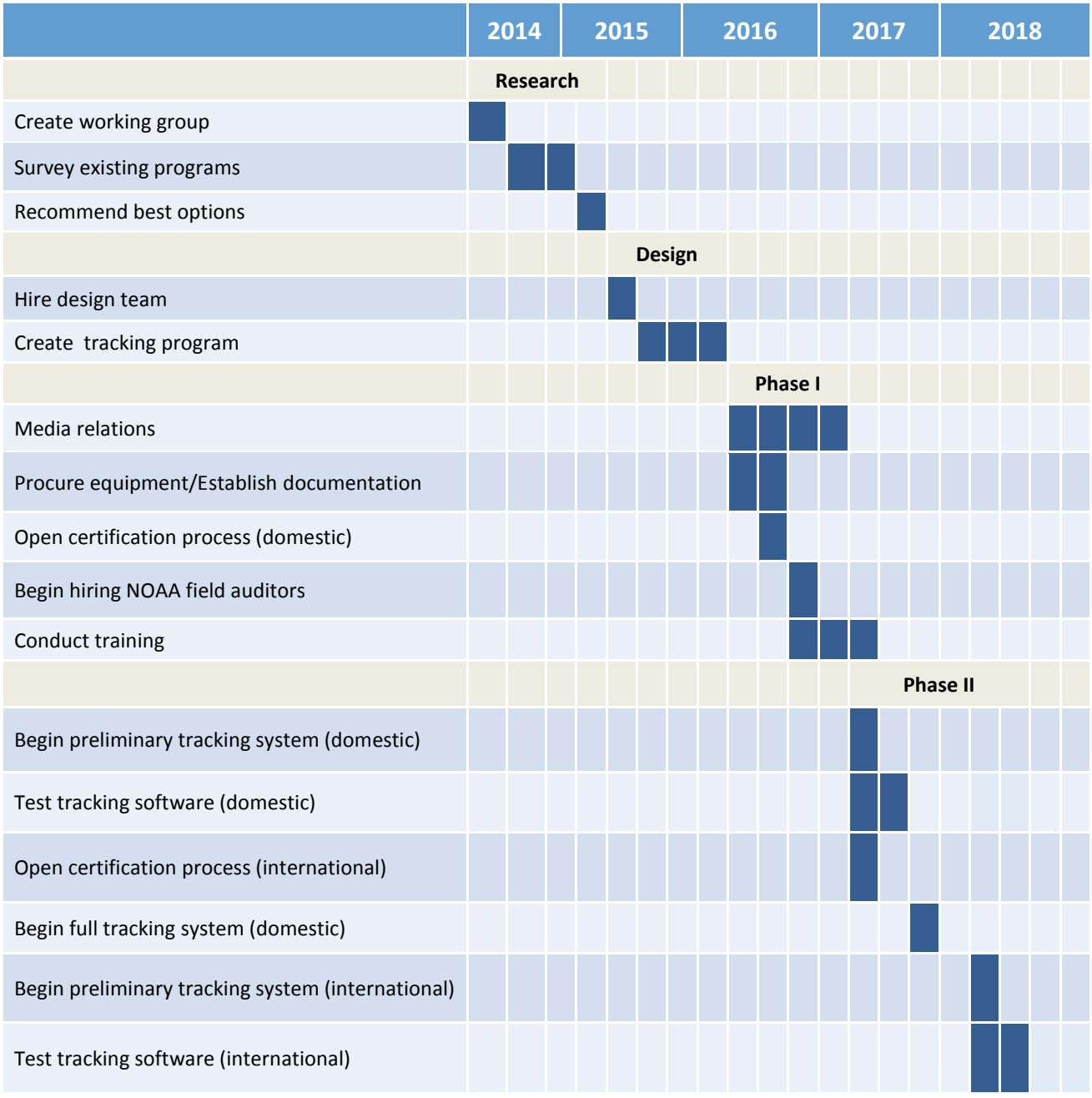


FIGURE 2. TIMELINE FOR THE IMPLEMENTATION OF THE TRACKING PROGRAM

Performance Management

The overall performance of the tracking program will be measured periodically throughout implementation. The first performance measurement tool will be a chain of custody audit. Each seafood shipment will be given a method of identification and the chain of custody audit will electronically check that the seafood is being tracked properly throughout the supply chain and that the proper documentation is in place at each location through which the shipment has traveled. Distributors will be certified by NOAA and will be required to have information on the shipment's origins, destinations, lot numbers, weights, number of catch, and packaging information to maintain their certifications. Food distributors and later portions of supply chain are not allowed to change any of the information applied by the distributor regarding the fish or its packaging to maintain identification quality and transparent tracking.

The accuracy and completeness of this information at various stages will be assessed by NOAA field auditors and the results sent to the Seafood Tracking Program Team. The documented information must be correct and thorough at the time of the records inspection. Any discrepancies in tracking must be amended within a 48-hour time period, at which point the NOAA field auditors will reevaluate their compliance status. Failure to do so may result in the placement of the distributor on probation or the revocation of their certification.

A second method of measuring the performance of the tracking system will be spot-checks. The SAFE Seafood Tracking Program Team will randomly select distributors to audit and will conduct site visits at each of the areas in the supply chain listed according to the documentation to ensure that the proper documentation is in place physically as well as electronically. If discrepancies are found, each member of the supply chain will be given a 48 hour time period to fix any errors identified by NOAA.

The individual tracking records for each distributor collected by the NOAA field auditors will be provided to the Seafood Tracking Program Team, who will maintain individual files for each certified distributor. These records will include both the chain of custody and tracking audit information, recording any and all violations. Individual files will be reviewed by the Seafood Tracking Program Team who will produce a yearly comprehensive report.

Seafood Inspections

In order to meet the SAFE Seafood Act's goal of increasing inspections, the FDA would contract with a commercial lab to perform analytical tests for the identification of seafood products. Because of tight budgetary constraints, the costs of this contract would be offset by assessing inspection fees on all seafood importers. The amount of the inspection fee would depend on the number of shipments received from each importer, and the reliability of the country of origin's seafood tracking system. The FDA would evaluate

the tracking systems of major seafood exporting nations who apply for FDA certification, and allocate inspection capacity accordingly. Countries with a reliable tracking system would be subject to fewer inspections, and thus pay lower inspection fees, than countries whose tracking systems are not certified.

In 2014, the FDA would establish a contract with a suitable commercial lab by the end of the second quarter. Throughout 2015, the inspection rate of shipments evaluated for seafood fraud would increase to 0.5 percent of all shipments, with inspection targets of 1，1.5，3 and 5 percent for each subsequent year (Figure 3). The rationale behind the phased increase is to allow the inspection system to develop over time to accommodate the volume of samples. Once the inspection program reaches 5% of all shipments, the FDA should evaluate the effectiveness of the increased inspection rates on the incidence of seafood fraud. If 5% is deemed a sufficient level for countering most fraud, the FDA may recommend against increasing the percent inspection rate in subsequent years. Because the SAFE Seafood Act does not specify an end to the increases of inspections, this would require Congressional authorization.

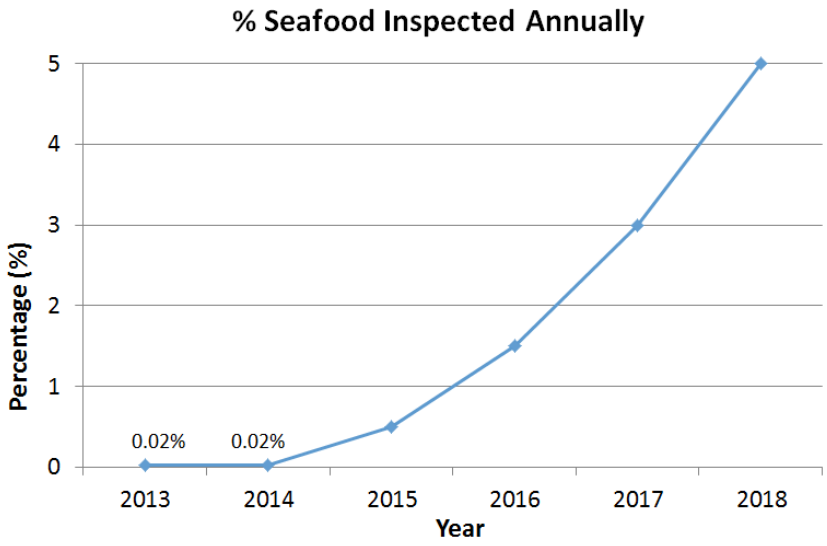


FIGURE 3. ANNUAL INCREASE IN PERCENTAGE OF SEAFOOD SHIPMENTS INSPECTED

STAFFING AND BUDGET

An internal working group of existing staff within the FDA will create the inspection contract. An Inspections and Violations Unit would be formed to administer the contract and would be overseen by the FDA's Division of Seafood Safety. The unit would consist of one contract manager and three supporting staff. Responsibilities of the unit include collecting inspection data from the commercial labs, ensuring inspection targets are met by each individual lab, issuing a quarterly report with updates on rate of inspection in

alignment with predetermined goals, and sending samples to be analyzed by independent third party labs to test the accuracy of the results submitted by the contractor's labs.

The creation of the Inspections and Violations Unit would add four permanent positions. The contract manager would have a budget of $96,000 annually while four supporting staff each have a $45,000 annual budget, totaling a cost of $231,000 per year.

The majority of the cost for the inspection program comes from the inspection contract. 2014 is expected to be budget neutral as it will utilize existing staff members while the independent labs are contracted and begin operations. It is expected that a lab would be prepared to begin processing inspections in 2015, and the short-term goal of increasing inspections to 5% of total entry lines will be reached by 2019. Therefore, the budget focuses solely on this time period. To estimate the cost of the contract, we use historical data. In 2007, there were 868,000 entry lines of seafood imported to the United States. Of that, 0.02% of shipments were inspected for fraud. Using 2007 numbers as a baseline, we have established a goal for 2015 of inspecting 0.5% of shipments. Future goals include 1% inspections in 2016, 3% inspections in 2018, and 5% in 2019. To reach the 0.5% inspection level, we would need to inspect 4340 entry lines, compared to the current 174 entry lines. Using an estimate of $1,800 per inspection, we anticipate that this will cost roughly $7,812,000 in 2015 (FishDNAID n.d.). Projecting these costs forward, we expect to spend $78,120,000 in 2019 when the 5% inspection rate goal is reached. In total, the contract will cost $171,864,000 for years 2014 to 2019.

There will also be budget allocations for monthly audits relating to the contractor's progress in meeting FDA's inspection goals. Each month, the support staff from the Inspections and Violations Unit would select ten samples from the contracted lab to send to a third party lab for verification. Using the same estimate of $1,800 for the cost of the DNA testing, this component of the performance management system is expected to cost a total of $216,000 annually.

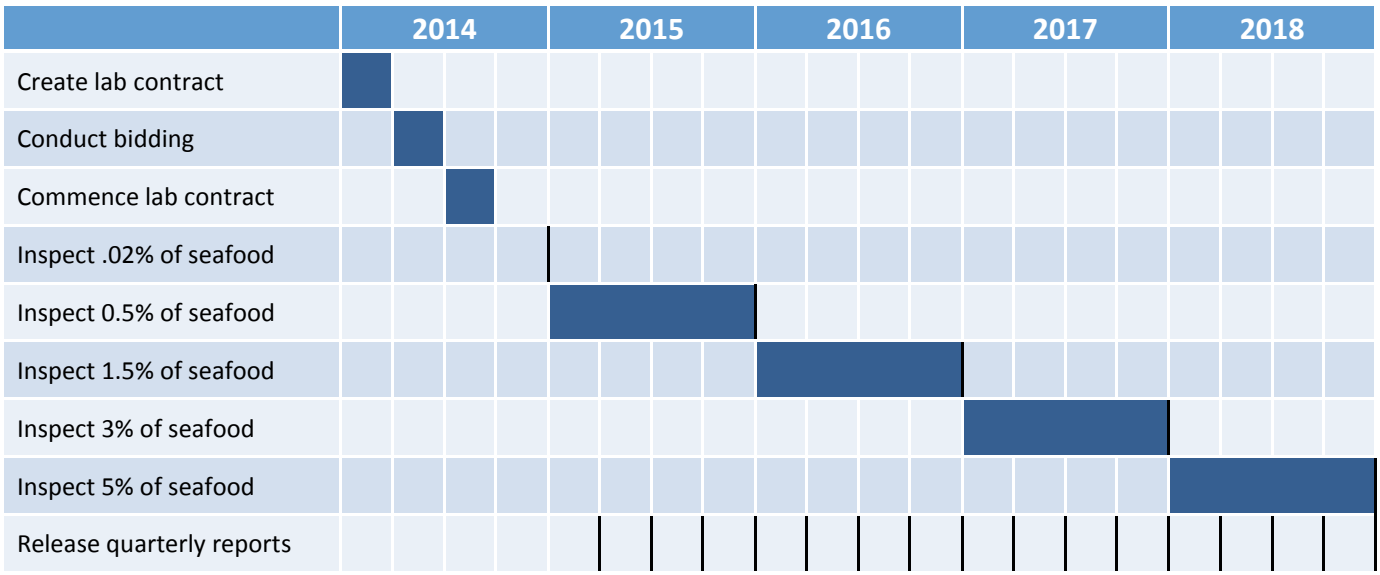


FIGURE 4. TIMELINE FOR THE SEAFOOD INSPECTION PROGRAM

Performance Management

The company managing the inspection labs will report to a contract manager who will be the lead for the Inspections and Violations Unit under the FDA Division of Seafood Safety. The contractor will be subject to monthly audits when support staff from the Inspections and Violations Unit would select samples to submit for third party verification. The contractor must also provide results with 48 hours of collection for all of their sample analysis, and a summary of sample processing times must be provided each month to the contract manager detailing their results. The contractor will also be expected to lose fewer than 1 in every 500 samples to contamination.

The Inspections and Violations Unit will communicate with the contractor through the contract manager. They will be responsible for collecting results from the inspection labs and entering violation data into a database. To evaluate the inspection contractor's progress, they will supervise monthly audits of the contractor's seafood samples and will compile quarterly progress reports. If the inspection contractor fails to meet inspection goals in three separate months, the contract manager will be responsible for determining whether to terminate the existing contract or supplement the inspection contract with an additional contract hire.

Public List of Violators

The FDA would contract with a private information technology company to establish a database for tracking violators of the Act. After the creation of the database and its associated interfaces, the Inspections and Violations Unit will be responsible for entering violation reports into the database, and the general maintenance of a public list of these violators.

Staffing and Budget

The contract will be written by existing FDA staff members. The contractor will have six months to design and build a database to input existing and new violation data. Tools to assess and track violations and a technology monitoring system should accompany the database. The Inspections and Violations Unit of FDA would be in charge of the daily operations and maintenance of the database once the contract is completed.

Writing the contract is expected to be budget neutral since it will utilize existing staff members. The contract would involve software development, integration of existing violation data, developing a system to input new data, and initiating a monitoring system. Labor is estimated to cost roughly $100 per hour, and that it will take approximately 960 hours (6 months) to establish this database (Smith 2013). Thus, the total cost for this contract is estimated to be $96,000.

Performance Management

After the six month contract is complete and the software for populating the list is functional, the Inspections and Violations Unit will assume management of the list. They will evaluate the system's performance based on metrics such as the overall number of database errors, rate of website errors and their resolution, and the number of times technical support is needed per year. By quantifying this information, one or two NOAA employees in the Inspections and Violations Unit can identify strengths and weaknesses in the system and revise the database system as necessary.

An online user satisfaction survey evaluating the ease of use of the public list of violators will be conducted and made available to the public. The Inspections and Violations Unit will review the result of the survey annually and use it to guide future improvements.

Standardizing Seafood Names

The SAFE Seafood Act stipulates that the Secretary of Health and Human Services, in consultation with the Secretary of Commerce, maintain and update as appropriate its "Guide to Acceptable Market Names for Seafood Sold in Interstate Commerce" as a list of standardized names for identification of seafood at the distribution, marketing, and retail stages. The FDA already maintains the Guide to Acceptable Market Names for Seafood Sold in Interstate Commerce, also known as the Seafood List, which is accessible on the FDA website. The FDA will improve the Seafood List to better reflect consumer and industry preferences regarding market names by using focus groups and public surveys. The FDA will retain the services of a contractor presenting the most effective public engagement. The contractor will convene meetings with two focus groups; one sample of seafood consumers and a second focused on commercial fisherman and distributors. Each focus group will be asked to evaluate the utility of names on the Seafood List, with special attention to names that have regional variation and names that frequently confused or interchangeable in the market. Following these focus groups, the contractor will develop a survey to be distributed to a much larger audience of consumers and producers. The contractor will analyze the results of the survey and present them to the FDA for the agency to improve the management and utility of the List.

Staffing and Budget

A collaborative working group led by the FDA, in consultation with NOAA, will draft the contract for a market research firm. The first quarter of 2014 will involve writing the contract. In the second quarter, the agencies will retain a research firm's services. The contract will begin in the third quarter, with the firm conducting the focus groups and the

survey. In the fourth quarter, they will analyze the results and convey the findings to the FDA.

Current employees in FDA's Division of Seafood Safety will use the information gathered by the contractor and will manage the Seafood List accordingly. Standardization of seafood names will help to reduce confusion over the official market names, which may help to reduce seafood fraud, especially unintentional mislabeling of seafood.

Writing the contract is expected to be budget neutral since it will utilize existing staff members from the FDA and NOAA. The contract would involve two focus groups, which are estimated to cost $7,000 each. The cost of conducting the survey is expected to be $10,000. The analyst report is expected to cost $1000. Thus, the total cost for this program will be approximately $32,500.

Performance Management

After the contract is complete, the FDA's Division of Seafood Safety supervisors can evaluate performance of the standardizing seafood names program based on metrics such as requests for changes to the List, requests for clarifications on the use of names, the number of fraud violations due to cases of confusion or misinterpretation of market names, reported errors in the list, response time to clarification requests, and error resolution in the list. To track performance in the long term, the Division of Seafood Safety should summarize incidents of confusion and public petitions for changes in annual reports.

Interagency Cooperation

The SAFE Seafood Act stipulates that the Secretary of Commerce and the Secretary of Health and Human Services shall execute a memorandum of understanding to improve interagency cooperation of seafood safety and seafood fraud prevention. The FDA and NOAA will execute a new memorandum of understanding (MOU) or edit an existing MOU from 2009 to address compatibility of standards, policies, and procedures to facilitate collaboration between agencies. The memorandum should also establish or designate specific roles and responsibilities for each agency to reduce any currently duplicative efforts. Additionally, the agencies will develop standard operating procedures and an interagency standards handbook to facilitate and improve sharing of information and cross training of personnel.

Staffing and Budget

Improving interagency cooperation will not require hiring of any new staff, but rather the formation of a working group composed of one supervisor and three support staff from the FDA's Division of Seafood Safety and one supervisor and three support staff from NOAA's Seafood Inspection Program Office. No additional funding will be required for the establishment of these working groups.

Performance Management

In quarterly meetings, the working group members will give updates on their respective agencies and address any needs from each department. The working group will compile annual progress reports on meeting interagency goals. After three years, the working group will invite an external evaluator to assess progress in interagency cooperation and fulfilling the memorandum of understanding. The two supervisors in the working group would then be able to respond to any critiques and recommendations made by the evaluator and facilitate improvements accordingly.

Conclusion

Given the widespread practice and serious consequences of seafood fraud, the SAFE Seafood Act has set up ambitious goals to regulate the long-neglected problems of fraudulent practices in the seafood industry. The requirements proposed by the Act have been divided into five components and each was provided with a program design to ensure adherence to the bill's requirement in an efficient manner.

The SAFE Seafood Act requires a tracking system that provides accurate seafood information from catch to consumption. Such a system will be established by synthesizing the best design among existing tracking systems. NOAA would create a working group to survey existing programs and hire new staff members to design the new tracking system, which is expected to be fully operational by the third quarter of 2018. The total budget for the tracking system is estimated to be $6.4 million over the next five years.

Secondly, inspections would increase on an escalating scale – by far, the most expensive requirement. This will be implemented by contracting with a private lab to increase inspection capacity. The contract, written and administered by FDA staff, is estimated to cost $172 million over the first five years, and would increase inspection rates from 0.02% to 5% by the end of the fifth year. The proposed method for funding these costs is to establish an inspection or import fee that would charge distributors importing seafood to the U.S. Whether they would be charged on a per unit weight basis or a per shipment basis would be determined by a government agency, but since the number of entry lines of seafood have increased steadily each year, fees could generate sufficient revenues to offset inspection costs (Van Voorhees 2012).

This dramatic increase in testing will likely identify several instances of seafood fraud, so the Act requires the creation and maintenance of a public list of violators. The digital

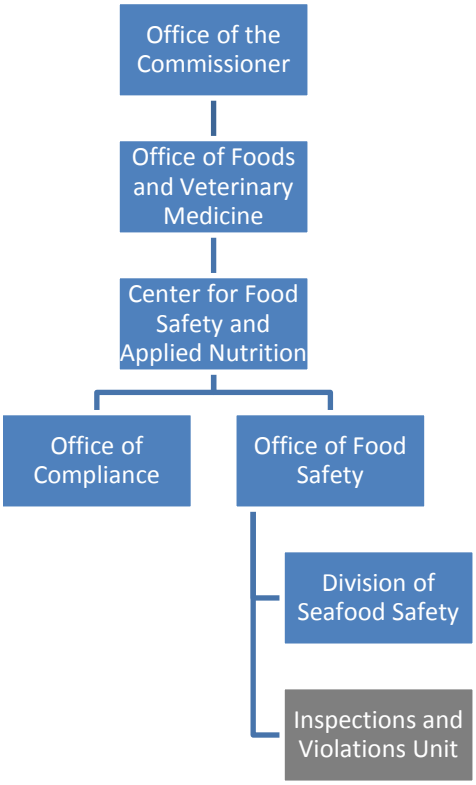
infrastructure for this list will be created through a contract with an information technology company. Similar to that of the inspection contract, the FDA would develop a contract requiring the list to be fully functional within six months from the contract's start date. The total cost for building the software tools for the public violator list is approximately $96,000.

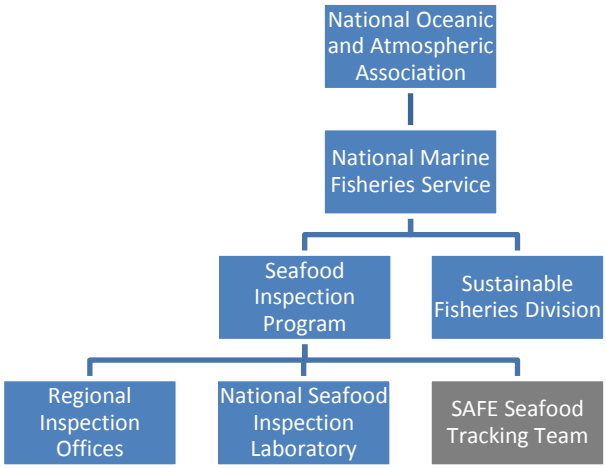
In order to reduce confusion in the market, the SAFE Seafood Act also mandates the FDA to update its List of Standardized Seafood Market Names. The FDA would contract with a market research firm to study focus groups and utilize surveys to better understand industry and consumer preferences regarding market names. The cost of this market research is approximately $32,500.

Finally, the SAFE Seafood Act seeks better cooperation between NOAA and FDA. Since a memorandum of understanding already exists, the plan is to facilitate implementation of that MOU. The proposed implementation would mandate that NOAA and FDA create a working group that will conduct quarterly meeting to discuss ways to better improve cooperation and reduce overlapping efforts. The execution of the MOU is considered to be budget neutral unless the working group finds it necessary for both agencies to invest additional resources into the collaboration process.

The total cost of the program design is therefore estimated to be approximately $180 million over five years, which is a modest cost for reducing fraudulent practices in the $56 billion seafood industry. Though the exact costs of economic losses due to fraud are currently unknown (and difficult to measure), it could be estimated based on individual cases of fraud that the profits and problem run rampant throughout the industry. Although the SAFE Seafood Act is not a panacea for solving the problems of seafood fraud, the implementation of the Act will certainly add transparency to the seafood market, honor the assiduous work of many honest fishermen, and perhaps more importantly, protect the rights and safety of millions of American consumers.

Appendix I: Staffing Plan





APPENDIX I. THE GRAPHICS ABOVE SHOW THE CHANGES TO THE FDA AND NOAA STAFFING DEPARTMENTS WITH EXISTING DEPARTMENTS IN BLUE AND ADDED DEPARTMENTS IN GREY.

Staffing	Responsibilities
TRACKING SEAFOOD	
Working Group	Survey existing tracking programs
	Compile research findings
	Present report with recommended action

Design Team	Choose a tracking system based off of report
	Develop a foreign tracking system
SAFE Seafood Tracking Team	Execute phase I and II of implementation
	Design a marketing and outreach project
	Purchase tracking technology
	Perform chain of custody audits
	Perform random sample audits and site checks
	Compile audit data
	Publish an annual comprehensive report
INCREASING INSPECTIONS	
Working Group	Create a contract with a third party inspection lab
Inspections and Violations Unit	Collect inspection data
	Analyze adherence to inspection goals
	Audit contracted lab for accuracy
	Manage contract and extend or rehire as necessary
Third Party Contractor	Meet inspection goals listed in contract
	Send inspection data to FDA
MAINTAINING PUBLIC LIST OF VIOLATORS	
Working Group	Write IT contract
Inspections and Violations Unit	Manage IT contract until complete
	Compile data on software errors
	Analyze information and update software as needed
	Analyze public survey data
Third Party Contractor	Develop a database to publish violator data
	Design tools to assess and organize data
STANDARDIZING SEAFOOD NAMES	
Working Group	Write and manage contract for third party market research
FDA Division of Seafood Safety	Update existing FDA seafood list with findings
	Evaluate success of seafood name changes

Third Party Contractor	Conduct focus group sessions and public surveys on preferred market names
	Analyze data from focus groups and surveys
	Report findings to FDA
IMPROVING INTERAGENCY COOPERATION	
Working Group	Meet quarterly
	Discuss SAFE Seafood goals and progress
	Communicate needs for assistance or shared resources
	Compile an annual report on progress
	Request third party audit on meeting cooperation goals

APPENDIX II: BUDGET

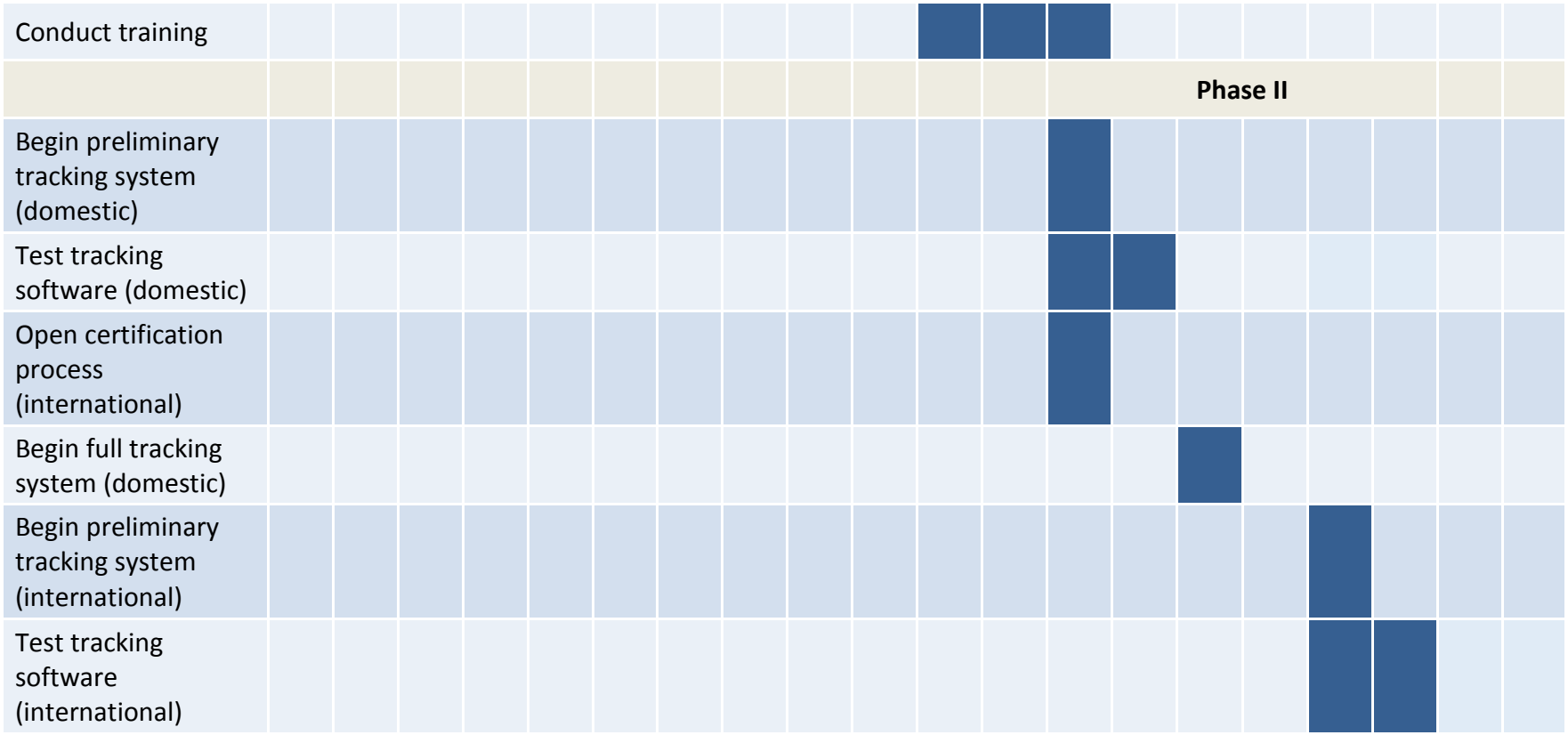
Items	Details	2014				2015	2016	2017	2018	TOTAL
		Q1	Q2	Q3	Q4					
TRACKING										
Working Group										
	Staffing: 2 existing staff from FDA 2 existing staff from NOAA	$ -	$ -	$ -	$ -					$ -
Design Team	2 full-time senior staff									
	1 part-time support staff					$500,000				$500,000
Implementation										
Phase I	2 full-time senior staff									
	2 full-time support staff						$800,000			$800,000
	Media relations: -Communications & marketing strategy -Consumer education -Marketing materials						$600,000			$600,000
	Tracking Equipment: -RFID readers -System software -Mapping software						$42,500			$42,500

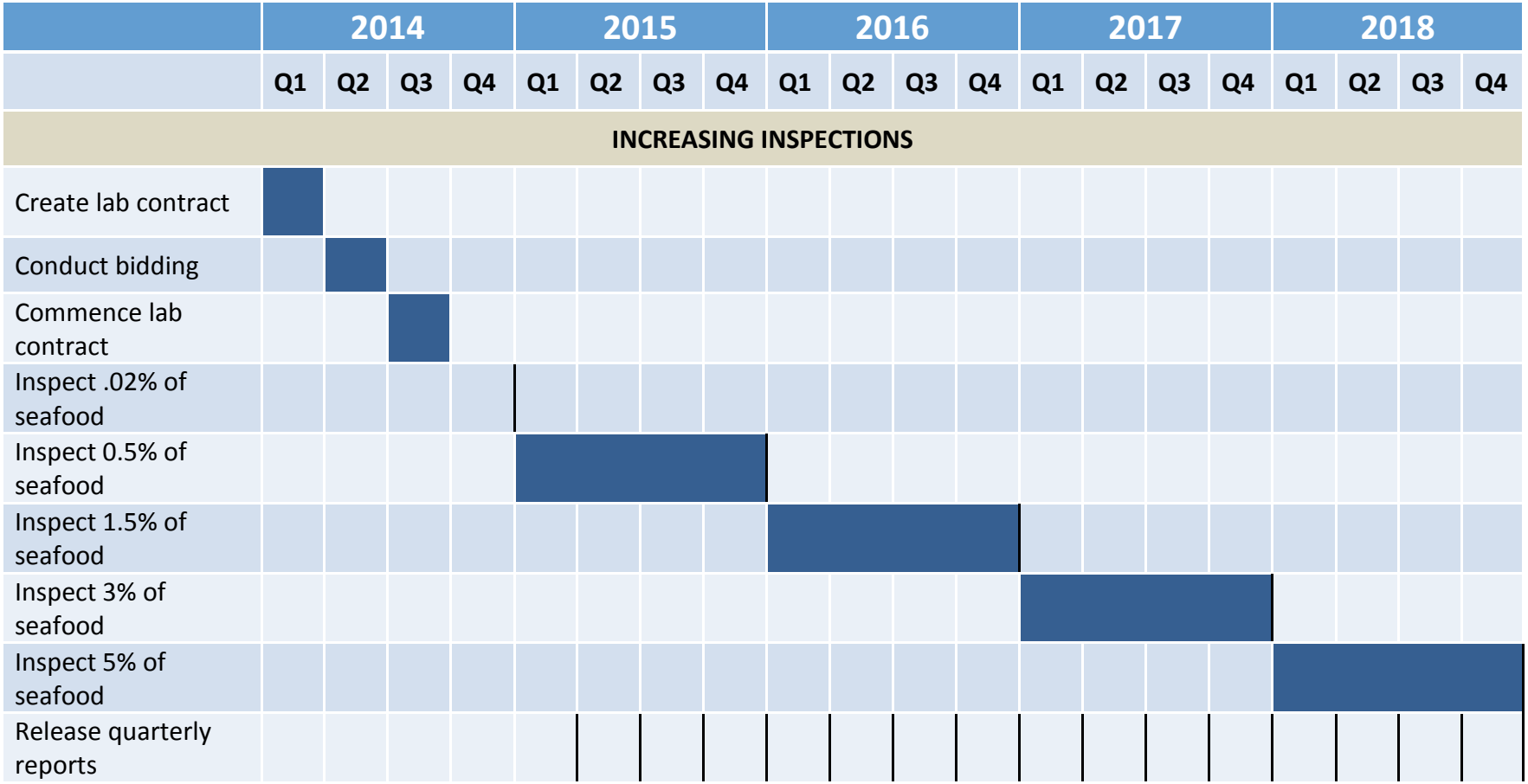
	15 NOAA field auditors						$675,000			$675,000
Phase II	2 full-time senior staff									
	3 full-time support staff							$1,000,000		$1,000,000
	15 NOAA field auditors + 5 additional							$900,000		$900,000
	Testing Software							$10,000		$10,000
Fully Operational Program	2 full-time senior staff									
	3 full-time support staff								$1,000,000	$1,000,000
	20 NOAA field auditors								$900,000	$900,000
	Testing Software								$10,000	$10,000
INSPECTIONS										
Working Group	Staffing: 2 existing staff from FDA 1 existing staff from NOAA	$ -	$ -	$ -	$ -					$ -
Inspection Contract	To include:					$7,812,000	$23,436,000	$46,872,000	$93,744,000	$171,864,000
Inspections and Violations Unit										$ -
	Contract Manager					$96,000	$96,000	$96,000	$96,000	$384,000
	3 support staff					$45,000	$45,000	$45,000	$45,000	$180,000
Performance Management	To include:					$216,000	$216,000	$216,000	$216,000	$864,000
VIOLATORS										$ -
Working Group		$ -	$ -	$ -	$ -					$ -

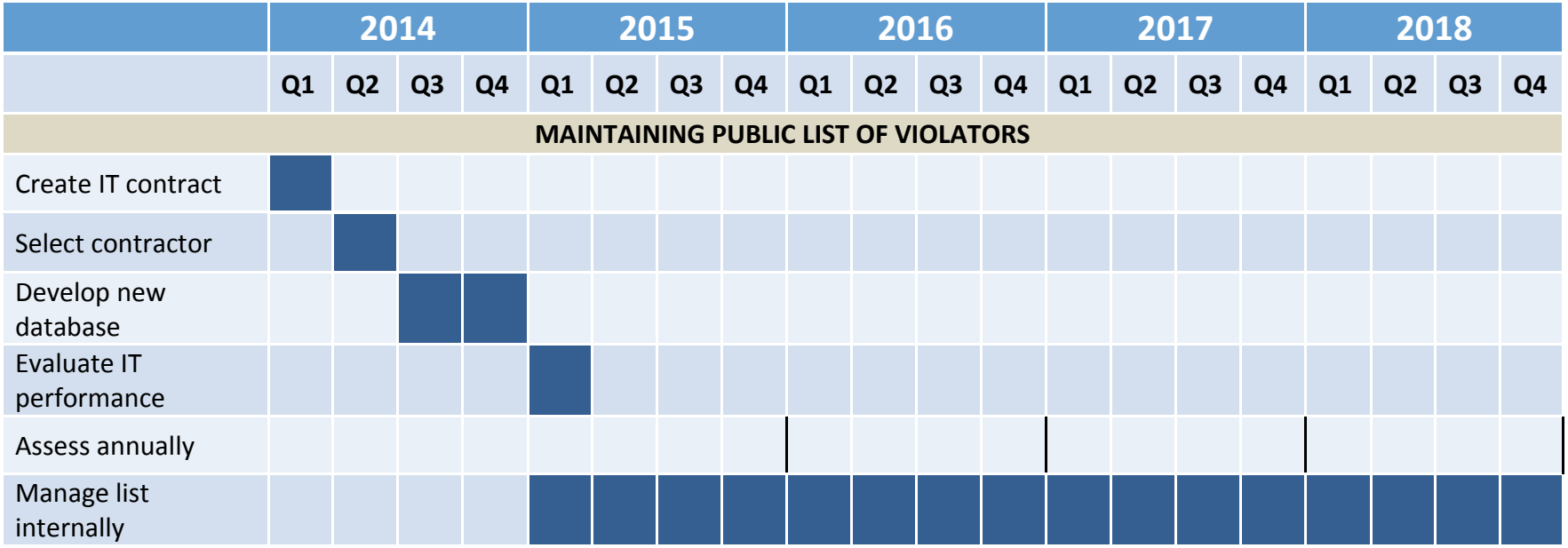
	2 existing NOAA staff 1 existing FDA staff									$ -
IT Contract	To include:		$96,000							$96,000
SEAFOOD NAMES										$ -
Working Group		$ -	$ -	$ -	$ -					$ -
	2 existing FDA staff 1 existing NOAA staff									$ -
Market Survey Contract	To include:		$32,500							$32,500
INTERAGENCY COOPERATION										$ -
Working Group	1 Supervisor + 3 support staff from Division of Seafood Safety, FDA 1 Supervisor + 3 support staff from Seafood Inspection Program Office, NOAA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL		$128,500				$8,669,000	$25,910,500	$49,139,000	$96,011,000	$179,858,000

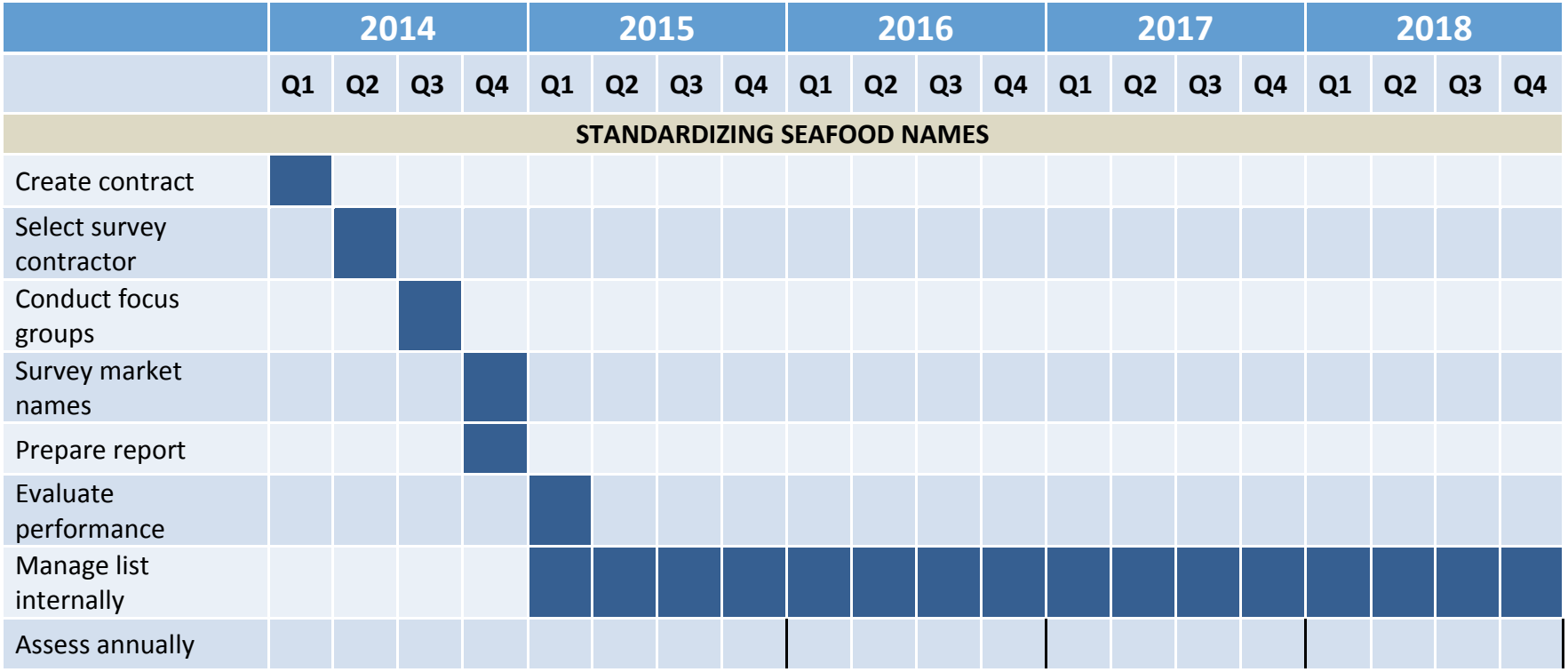
APPENDIX III: MASTER CALENDAR

	2014				2015				2016				2017				2018			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
TRACKING SEAFOOD																				
	Research																			
Create a working group	■																			
Survey existing programs		■	■																	
Recommend best options				■																
					Design															
Hire a design team					■															
Create tracking program						■	■	■												
									Phase I											
Media relations									■	■	■	■								
Procure equipment/Establish documentation									■	■										
Open certification process (domestic)										■										
Begin hiring NOAA field auditors											■									


Conduct training
Phase II
Begin preliminary tracking system (domestic)
Test tracking software (domestic)
Open certification process (international)
Begin full tracking system (domestic)
Begin preliminary tracking system (international)
Test tracking software (international)


2014
2015
2016
2017
2018
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
INCREASING INSPECTIONS
Create lab contract
Conduct bidding
Commence lab contract
Inspect .02% of seafood
Inspect 0.5% of seafood
Inspect 1.5% of seafood
Inspect 3% of seafood
Inspect 5% of seafood
Release quarterly reports


2014
2015
2016
2017
2018
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
MAINTAINING PUBLIC LIST OF VIOLATORS
Create IT contract
Select contractor
Develop new database
Evaluate IT performance
Assess annually
Manage list internally


2014
2015
2016
2017
2018
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
STANDARDIZING SEAFOOD NAMES
Create contract
Select survey contractor
Conduct focus groups
Survey market names
Prepare report
Evaluate performance
Manage list internally
Assess annually

	2014				2015				2016				2017				2018			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
IMPROVING INTERAGENCY COOPERATION																				
Develop a working group																				
Create memorandum of understanding																				
Hold quarterly meeting																				
GAO evaluation																				

REFERENCES

About Gulf Wild. (n.d.). *Gulf Wild*. Retrieved August 4, 2013, from http://www.mygulfwild.com

A Rising Tide. (2008). *Economist, from print ed.: Science and Technology*. May 30, 1997. Retrieved August 15, 2013, from http://www.economist.com/node/12253181.

Becker, Geoffrey S, "Seafood Safety and Inspection." *Oceans and Coastal Resources: A Briefing Book (CRS Report 97-588 ENR)*, Accessed September 17, 2013. http://www.cnie.org/NLE/CRSreports/briefingbooks/oceans/i.cfm

Branch, T., Jensen, O., Ricard D., Yimin, Y., & Hilborn, R. (2011). Contrasting Global Trends in Marine Fishery Status Obtained from Catches and from Stock Assessments. *Conservation Biology*, 25(4), 777-86. doi: 10.1111/j.1523-1739.2011.01687.x

Congresswoman Lois Capps. *Capps Takes on Sponsorship of Bill to Improve Seafood Traceability*. Congresswoman Lois Capps, 26 Sept. 2013a. Web. 26 Nov. 2013. <http://capps.house.gov/press-release/capps-takes-sponsorship-bill-improve-seafood-traceability>.

Congresswoman Lois Capps. *Capps Urges President to Take Action on Seafood Fraud*. Congresswoman Lois Capps, 26 Sept. 2013b. Web. 26 Nov. 2013. <http://capps.house.gov/press-release/capps-takes-sponsorship-bill-improve-seafood-traceability>.

Davenport, Coral. "Senate Race in Massachusetts Features First Real 'Climate Candidate'." NationalJournal.com. National Journal, 10 June 2013. Web. 05 Dec. 2013. <http://www.nationaljournal.com/daily/senate-race-in-massachusetts-features-first-real-climate-candidate-20130610>.

Espineira, M., N. Gonzalez-Lavin, J.M. Veites and F. Santaclara. 2008. Authentification of anglerfish species (Lophius spp) by means of polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) and forensically informative nucleotide sequencing (FINS) methodologies. Journal of Agricultural and Food Chemistry 56:10594-10599.

Fish barcode of life (n.d.). iBOL Working Group. Retrieved July 13, 2013, from http://www.fishbol.org/index.php

Fisher, Emily. "Introducing Oceana's New Seafood Fraud Campaign." *Oceana.org*. Oceana, 25 May 2011. Web. 10 Dec. 2013. <http://oceana.org/en/blog/2011/05/introducing-oceana-s-new-seafood-fraud-campaign>.

"Fisheries and Aquaculture." FAO.org. Food and Agriculture Organization of the United Nations, n.d. Web. Accessed 5 Dec. 2013. <http://www.fao.org/docrep/014/am859e/am859e07.pdf>.

Hansen, T.E. (2013). Seafood Inspection Program: Notice of Change in Fees and Charges for the U.S. Department of Commerce Seafood Inspection Program--Effective January 1, 2013. United States Department of Commerce. Retrieved August 4, 2013, from http://www.seafood.nmfs.noaa.gov/Fees11.pdf.

"H.R. 1012: Safety and Fraud Enforcement for Seafood Act." *GovTrack.us*, Accessed December 12, 2013. http://www.govtrack.us/congress/bills/113/hr1012.

"Information on Fisheries Management in the United Mexican States." FAO.org. Food and Agriculture Organization of the United Nations, Dec. 2003. Web. Accessed 5 Dec. 2013. <http://www.fao.org/fi/oldsite/FCP/en/mex/body.htm>.

Lenstra, J. A. (2003). DNA Methods for Identifying Plant and Animal Species in Food. In M. Lees (ed.), *Food Authenticity and Traceability* (pp. 34-53). Cambridge: Woodhead Publishing Limited.

Library of Congress Bill Summary & Status Search. *The Library of Congress-Thomas*. Accessed September 17, 2013. http://thomas.loc.gov/cgi-bin/bdquery/D?d113:7:./temp/~bdXGrB::|/home/LegislativeData.php?n=BSS;c=113|.

"Magnuson-Steven Fishery Conservation and Management Act." *NMFS*. October 11, 1996. Accessed September 17, 2013. http://www.nmfs.noaa.gov/sfa/magact/.

Markey, Edward J, "Introduction Safety and Fraud Enforcement for Seafood Act." *Congressional Record*, July 25, 2012. http://beta.congress.gov/crec/2012/07/25/CREC-2012-07-25-pt1-PgE1327-4.pdf.

McBee, J. (2013, January). IBISWorld Industry Report 44522. Fish and Seafood Markets in the US. Retrieved June 2013 from IBISWorld database.

NOAA. (2013, April 1). Technology helps fight fraud- it's no joke. *FishWatch: U.S. Seafood Facts*. Retrieved August 1, 2013, from http://www.fishwatch.gov/features/technology_fraud_4_1_13.html.

"Services." FishDNAID.com. FishDNAID, n.d. Web. <http://www.fishdnaid.com/services.html>.

Rasmussen, R. S. (2008, July 9). DNA-Based Methods for the Identification of Commercial Fish and Seafood Species. *Comprehensive Reviews in Food Science and Food Safety*, 7(3), 280-95. doi: 10.1111/j.1541-4337.2008.00046.x.

"S. 520: Safety and Fraud Enforcement for Seafood Act." *GovTrack.us*, Accessed September 17, 2013. http://www.govtrack.us/congress/bills/113/s520.

"Sequestration frequently asked questions." *NOAA*, Last modified April 16, 2013. http://www.noaanews.noaa.gov/stories2013/20130416_sequestration.html.

Sovacool, B., and K. E. Siman-Sovacool. 2007. Creating Legal Teeth for Toothfish. Using the Market to Protect Fish Stocks in Antarctica. Journal of Environmental Law 20:15-33.

Stiles, Margot L., Heather Lahr, William Lahey, Emily Shaftel, David Bethel, Justin Falls, and Michael F. Hirshfield. "Bait and Switch: How Seafood Fraud Hurts Our Oceans, Our Wallets and Our Health." *Oceana* (2011).

U.N. FAO. (2013). *Technical Guidelines for Responsible Fisheries 4.* Fisheries and Aquaculture Department. Retrieved from http://www.fao.org/docrep/003/w4230e/w4230e05.htm.

U.S. FDA. (2013) FDA Seafood List. FDA. Retrieved from http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Seafood/ucm345098.htm.

U.S. GAO. "FDA Needs to Improve Oversight of Imported Seafood and Better Leverage Limited Resources."

2011. http://www.gao.gov/products/GAO-11-286

Van Voorhees, David, and Alan Lowther. *Fisheries of the United States*. Rep. Silver Spring, MD: National Oceanic and Atmospheric Administration, 2012. Print.

Warner, Kimberly, Walker Timme, Beth Lowell, and Margot Stiles. "Persistent Seafood Fraud Found in South Florida." *Oceana* (2012): 1-20. http://oceana.org/sites/default/files/reports/South_FL_Seafood_Testing_Report_FINAL.pdf

"What Is DNA Barcoding?" Barcode of Life. IBOL, n.d. Web. 05 Dec. 2013. <http://www.barcodeoflife.org/content/about/what-dna-barcoding>.