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Rule to provide for more effective monitoring of at-sea flow scales

Regulatory Impact Review

November 2013

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Abstract: This document contains a Regulatory Impact Review (RIR) evaluating the costs and benefits of an action to revise regulation governing the use of flow scales for weighing fish at-sea in the Alaska Region. The purpose of these regulations is to reduce the potential for fraud, improve catch accounting accuracy, and bring regulations up to date with changes in technology. This RIR is required under Presidential Executive Order 12866.

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Executive summary

This Regulatory Impact Review (RIR), evaluates the costs and benefits of an action to revise regulations governing the use and approval of scales for weighing fish at-sea. The purpose of these regulations is to reduce the potential for fraud, improve catch accounting accuracy, and bring regulations up to date with changes in technology. This RIR is required under Presidential Executive Order (E.O.) 12866 (58 *FR* 51735, September 30, 1993).

The use of at-sea scales can provide very precise and potentially accurate estimates of catch. These estimates are especially useful in catch share fisheries where catch accounting methods must be verifiable. At-sea scales have proven to be reliable and are now used to account for the vast majority of catch by catcher-processors fishing off Alaska.

However, recent concerns with adequate compliance with flow scale regulations call into question the overall accuracy of the approach and indicates that catch estimates based on scale weights could systematically underestimate harvest in those fisheries dependent on scale weights for catch accounting unless these concerns are addressed. Further, since NMFS first implemented weighing requirements for some catcher processors in 1998, the program has grown dramatically; scale technologies have evolved; and NMFS has developed greater expertise with at-sea scales.

Modifications to the at-sea scales program will reduce the potential for fraud, improve catch accounting accuracy, and bring regulations up to date with changes in technology.

NMFS is considering two alternatives, a no action alternative (Alternative 1), and an action alternative (Alternative 2).

The no action alternative would leave scales monitoring and enforcement rules as they are. The no action alternative is the status quo, and conditions under the no action alternative will be treated as the baseline conditions for the analysis. Thus, costs and benefits will not be estimated for the no action alternative itself, but the costs and benefits of the various action alternative options will be estimated with respect to conditions prevailing under the no action alternative.

The action alternative is composed of a combination of eight options. These are described below, grouped under three major headings:

A. Enhance daily scale testing
    1. Require the use of sand bags for daily flow scale tests, rather than fish
    2. Require electronic reporting of daily test results. In order to implement this requirement, all vessels subject to this action would be required to use electronic logbooks.
    3. Require that failed daily scale tests be documented
    4. Clarify the rules governing the frequency of daily testing

5. Reduce allowable daily test errors from 3 percent to:
    5.1 2 percent
    5.2 1 percent

B. Enhance scale software to better monitor faulting and calibration.

C. Enhance video monitoring of scale area

An estimated 68 catcher/processor vessels in the AFA, Amendment 80/GOA rockfish, and BSAI Freezer longline fisheries, may be directly regulated by this action. This estimate includes vessels subject to flow scale inspections in 2012 and 2013, as well as three new freezer longliners expected to enter the fishery in 2014 and 2015. There are a total of 78 vessels licensed to participate in these fisheries. However, for a variety of reasons ten of them have not participated in these fisheries for at least two years and we do not anticipate that they will do so in the future.

The analytical results are summarized in Table 7. The benefits from improved accuracy of scale estimates pay off ultimately with improvements in fisheries stock management and cooperative management that increase the value of the fish stock to society. These ultimate benefits cannot be estimated at this time.

Summary of costs and benefits (in comparison with status quo baseline)

Action Alternative Option	Costs	Benefits
A1: Use sand bags for tests*	23 vessels (about 1/3 of the regulated vessels) will have to start to use sand bags. Tests may take longer, need to store sand bags, small purchase price.	Improve scale-testing accuracy; eliminate a potential way to manipulate test results; tests can take place when relatively few fish are aboard.
A2: Daily electronic reporting*	Some additional time required to input – into an existing daily electronic report - a small amount of information for each test Some vessels will have to adopt use of electronic logbooks and will incur costs for this.	Reduced potential for fraud and improved ability for NMFS to monitor scale status during the year.
A3: Document failed tests*	Additional record keeping when multiple tests take place.	Less bias in overall test results. Ability to monitor scale results.
A4: Clarify regulations on testing frequency*	Number of tests should not be affected, but a small number of vessels may be required to suspend fishing for testing more often.	Better consistency in reporting through time. Enhanced regulatory clarity.
A5: Change maximum allowable percent error	Costs of changing the maximum permissible error to 2 percent or to 1 percent are difficult to estimate. They could be substantial if	If catch estimates are made more precise, there would be benefits for stock management and for cooperative

	vessels are forced to end trips prematurely and return to port for flow scale adjustments or repairs. Costs would be greater for the 1 percent threshold than for the 2 percent threshold.	management. Benefits would be greater for the 1 percent threshold than for the 2 percent threshold. Benefits may be limited if vessels keep testing until they reach the threshold but actual scale performance reverts to mean during operations.
B: Log calibrations and faults*	The estimated cost of new software for the fleet is about $136,000. Ten vessels may be required to replace existing scales sooner under this action than they otherwise would have done. The new scales are estimated to cost $30,400 each. NMFS does not know when this replacement might have occurred for these vessels in the absence of this regulation. For illustrative purposes, it was assumed that these units could have been used for five more years. The total cost for all of these 10 vessels of moving the replacement date forward five years was estimated to be about $41,000.	Automatic recording of flow scale fault conditions and calibrations will enhance the audit trail, provide useful diagnostic information to vessels and NOAA staff, and highlight patterns of improper scale calibration for NOAA investigators.
C: Require video monitoring of scales*	Costs may vary considerably among vessels, depending on existing video installations. Aggregate fleetwide costs were expected to range between $108,000 and $630,000, with a midpoint estimate of about $369,000. Additional estimated costs of about $7,000 would be incurred for NMFS inspections. Costs for use of the video by NOAA OLE in enforcement cases are unknown.	NMFS will be able to verify that all catch is being weighed, that no one is tampering with the scale, and that the scale is operating correctly.
*This option is included in the preliminary preferred alternative.		

On completion of the analysis NMFS identified a preliminary preferred alternative. The preliminary preferred alternative included all options described under the action alternative in the description of the alternatives, <u>except</u> Options A5.1 or A5.2, which would have reduced the maximum percent error from 3 percent to 2 percent or 1 percent.

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TABLE OF CONTENTS

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INTRODUCTION

This Regulatory Impact Review (RIR)[1,2] evaluates the costs and benefits of an action to revise regulations governing the use and approval of scales for weighing fish at-sea. The purpose of these regulations is to reduce the potential for fraud, improve catch accounting accuracy, and bring regulations up to date with changes in technology.

What is a Regulatory Impact Review?

This RIR is required under Presidential Executive Order (E.O.) 12866 (58 *FR* 51735, September 30, 1993).[3] The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following statement from the order:

> *In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nonetheless essential to consider. Further, in choosing among alternative regulatory approaches agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.*

E.O. 12866 further requires that the Office of Management and Budget review proposed regulatory programs that are considered to be "significant." A significant regulatory action is one that is likely to:

- *Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, local or tribal governments or communities;*
- *Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;*

[1] NMFS has not prepared a Regulatory Flexibility Act analysis for this draft. NMFS is reviewing the size status of directly regulated vessels and will either prepare a certification, or an Initial Regulatory Flexibility Analysis (IRFA) as appropriate.

[2] The proposed action is a change to previously analyzed and approved programs and the proposed change has no effect individually or cumulatively on the human environment (as defined in NAO 216-6). The only effects of the action are economic, as analyzed in this RIR. As such, it is categorically excluded from the need to prepare an Environmental Assessment.

[3] National Marine Fisheries Service (2007) provides current NMFS guidance for preparation of an RIR; Queirolo (2011) provides a more accessible overview.

- *Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or*
- *Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.*

Problem statement

At-sea scales can provide very precise and potentially accurate estimates of catch. These estimates are especially useful in catch share fisheries where catch accounting methods must be verifiable. At-sea scales have proven to be reliable and are now used to account for the vast majority of catch by catcher-processors fishing off Alaska.

However, recent concerns about adequate compliance with the flow scale regulations[4] calls into question the overall accuracy of the approach and indicates that catch estimates based on scale weights could systematically underestimate harvest in those fisheries dependent on scale weights for catch accounting unless these concerns are addressed. Further, since NMFS first implemented weighing requirements for some catcher/processors in 1998, the program has grown dramatically; scale technologies have evolved; and NMFS has developed greater expertise with at-sea scales.

We believe that a suite of modifications to the at-sea scales program will reduce the potential for fraud, improve catch accounting accuracy, and bring regulations up to date with recent changes in technology.

Statutory authority

NMFS intends to promulgate these regulations under section 305(d) of the Magnuson-Stevens Act, which authorizes the Secretary of Commerce to develop regulations necessary to implement fishery management plans (FMPs). Specifically, this action is necessary to implement the Management Objectives (Section 2.2.1) of the FMP for the Bering Sea and Aleutian Islands Subarea, which list "Increase the quality of monitoring and enforcement data through improved technology "(objective 42) and "Promote enhanced enforceability" (Objective 45).

History of this action

NMFS briefed the Council on the proposed action and provided a short discussion paper at the June 2013 meeting. (NMFS, 2013)

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[4] NOAA Office of General Counsel (NOAA GC) has issued three Notices of Violation and Assessment (NOVAs) for flow scale related violations in 2012 and 2013. Total penalties assessed in the three NOVAs were about $2.7 million. Background information, and two of the NOVAs, may be retrieved at the NOAA GC website: http://www.nmfs.noaa.gov/ole/slider_stories/2013/13_051313americanseafoodsnovas.html .

NMFS prepared a Regulatory Impact Review in the Fall of 2013 and on completion of the analysis identified a preliminary preferred alternative. The preliminary preferred alternative included all options described under the action alternative in the description of the alternatives, except Options A5.1 or A5.2, which would have reduced the maximum percent error from 3 percent to 2 percent or 1 percent.

BACKGROUND

Program history

The at-sea scales program was developed in response to a need for catch accounting methods that were more precise and verifiable at the level of the individual haul and less dependent on estimates generated by at-sea observers. This was necessary as a result of the implementation of large-scale catch share programs that required NMFS to provide verifiable and defensible estimates of quota harvest.

1. The requirements for weighing catch at-sea were implemented in 1998 (63 FR 5836) and affected only trawl catcher/processors participating in the MS CDQ program.
2. The program was expanded significantly in 2000 as a result of statutory requirements of the American Fisheries Act that required all at-sea catch by specified vessels in the BSAI pollock fishery to be weighed (see 65 FR 4520).
3. Further expansion occurred in 2007 to include trawl catcher/processors participating in the GOA rockfish pilot program (71 FR 67210) and non-American Fisheries Act catcher/processors participating in BSAI trawl fisheries (72 FR 52668.
4. Finally, the program was expanded in 2013 to include freezer longliners that participate in BSAI Pacific cod fisheries (79 FR 59053).

A summary of the growth of the program is shown in Table 1.

Table 1. Growth of the At-Sea Scales Program between inception and today

Year	# of vessels weighing catch[1]	Total weighed(mt)[3]	% BSAI TAC
1999	20	121,000	6%
2004	23	836,000	42%
2008	42	944,000	47%
2012	39	1,100,000	55%
2013[2]	63	N/A	N/A

1. BSAI groundfish only, does not include crab.
2. Estimated based on number of vessels with NMFS approved scales on 3/1/2013. Does not include crab catcher/processors.
3. Does not include catch weighed in the GOA, crab catch, or catch weighed in the Pacific Whiting fishery off the West coast.

When the at-sea scales program was developed, NMFS understood that a rigorous scale approval and monitoring program would be necessary, and the program that was developed incorporated three levels of oversight. First, each model of scale approved for use at-sea must have been tested by an independent laboratory and found to meet specified standards of accuracy and reliability. Second, each scale must be inspected annually by NMFS inspectors in order to ensure that it remains accurate and has been adequately maintained and properly installed. Finally, each scale must be tested daily when in use. The first two components of the scale monitoring program are similar to the standards in place for the approval of land scales used in trade applications throughout the United States. The third component, daily testing, is not required for land scales but is necessary because of the demanding environment where these scales are used, and because marine scales are more likely to deviate from baseline test levels than are land scales.

NMFS researched the best available technology before developing regulatory standards. However, since the first at-sea scale rules were implemented, there have been several significant changes. First, catcher/processors and motherships can now communicate more quickly and easily with NMFS. When scales were first required, the electronic logbook (ELB) was in early development stages and its use was not required. Now, with the exception of a few vessels fishing under Amendment 80, all vessels that are required to weigh catch at-sea are also required to report catch daily using an ELB. Second, scale technology and onboard computer technology have advanced significantly. When the at-sea scales regulations were implemented the internal capacity of the scales to store data was very limited. NMFS determined that the most important information to retain was the weight of the prior ten hauls and an audit trail that described recent meteorologically significant changes to the scale. However, the new generation of scales is significantly easier to program and offer a great deal more on-board storage capacity.

When the program began, NMFS approved flow scales manufactured by Marel hf and Skanvaegt, and platform scales (used by observers to weigh samples or individual fish) manufactured by Marel, Skanvaegt and Pols. While technologically advanced at the time of approval, these scales were comparatively primitive by today’s standards. They used LED lighting for the displays; were unable to communicate or integrate with other on-board equipment; had minimal on-board data storage capabilities; and could not be quickly and easily reprogrammed as vessel or NMFS needs changed. The first generation scale electronics are reaching the end of their functional lives and are being replaced by considerably more sophisticated electronics. At this time, only 19 of the 68 vessels with NMFS-approved flow scales continue to use first generation scales and, based on communications with scale manufacturers, we anticipate that about half of these first-generation electronics will be replaced by the time this proposed action would be implemented.

Technical background

In popular usage, the term weight is synonymous with mass. However, the two are not the same. For the purposes of this section, we will differentiate between them. But in the rest of the document weight will be considered synonymous with mass, and the more common term—weight, will be used. Mass is a measure of the amount of matter in an object, whereas weight is a measure of the pull of gravity on an object. The mass of an object is constant but weight changes with gravity. Since gravity is constant on earth, mass and weight can be used interchangeably. The kilogram and the pound are both measures of mass, though historically the pound was also considered to be a unit of weight.

Mass is normally measured in one of two ways. A balance measures mass directly by comparing an object of known mass with an object of unknown mass. A scale measures mass indirectly by measuring the gravitational force that an object exerts on a spring or a load cell. If a balance and a scale are placed in an elevator and the elevator goes up and down, the balance will continue to be "correct" and the object of known weight will continue to balance with the equal weight on the other side. The scale, however, will be incorrect. As the elevator rises the scale will show that the object has an apparently greater mass, and as the elevator descends the scale will indicate that the object has an apparently lower mass.

Modern electronic scales rely on load cells to estimate weight and mass. As a load is applied to the load cell, the force causes it to bend. This bending changes the electrical resistance of the load cell. A fixed current is applied to the load cell and as the resistance of the load cell increases, the voltage passing across the load cell decreases. An analog to digital converter converts the voltage to an estimate of mass that is displayed on the scale. In the case of a marine scale, the analog output from the reference load cell is integrated into the analog output from the working load cell in order to give an estimate of actual mass.

All modern marine scales use a similar technology to account for motion-induced errors. A marine scale has two load cells, a working load cell and a reference load cell. The reference load cell has a known mass on it. When the scale is in use, the apparent weight on the reference load cell is compared to the apparent weight on the working load cell. So in an elevator going up, if the reference load cell has a known weight of 10 kg, and an apparent weight of 9.9 kg, the apparent weight on the working load cell will be corrected by adding 1% to yield an estimate of the actual mass. This technology is quite good but has some limitations. In the case where the scale rises and falls evenly, such as an elevator, the location of the reference load cell in relation to the working load cell is unimportant.

However, the type of motion found on a fishing vessel does not affect all parts of a scale equally. This can be visualized by assuming that the reference load cell is at one end of the scale, and the working load cell is at the other. If the end of the scale with the working load cell is lifted up and down, and the end with the reference load cell is not, the weight on the reference load cell would not change, and the scale would be unable to compensate for that motion. This issue is made worse because the degree of tilt of the scale can change across time, which affects the geometry of the relationship between the reference and working load cells.

While scale manufacturers seek to address this issue by keeping the load cells in close proximity, a better estimate of the effect of motion can be made if the scale is frequently calibrated. During a calibration routine, known masses (generally 10 kg and/or 25 kg) are placed on the scale and the reference load cell is compared against the known masses on the working load cell. If an incorrect mass is placed on the scale during a calibration, the scale will be incorrect, proportional to the amount the calibration weight is in error.

On a flow scale, the scale electronics "sample" the mass on the working load cell (as well as the reference load cell) approximately 60 times/second and estimate the instantaneous mass on the platform as an object moves over it. If the speed of the object over the weighing platform is known, the scale electronics can accurately estimate the mass of the object by integrating the speed of the belt with the instantaneous weight measurements. For this measurement to be accurate, the estimate of the object's speed must also be accurate. This is estimated in two ways. The speed of the sprockets pulling the belt over the scale can be measured, and the frequency with which a specific point on the belt passes a sensor can be measured. If each link in the belt is properly pulled by the sprocket, and the belt length does not change, the two numbers will have a consistent relationship, if the belt slips, or bunches up, they will not. Sudden changes in the relationship between the belt speed and the sprocket speed will trigger a fault condition in the scale. Finally, for the scale to accurately estimate weight, the object on the scale must move at the same speed as the belt. If fish slide more quickly over the belt weight will be underestimated. If fish bunch up and the belt moves under them, weight will be overestimated.

All vessels that are required to use scales are also required to maintain a set of test weights of known mass (sufficient to test a scale at 10, 25 and 50 kg)[5]. When scales are inspected by NMFS staff, the test weights are compared against NMFS weight standards to ensure that they have functionally identical mass to the NMFS standards. The NMFS standards, in turn are periodically compared against the standards maintained by the Washington State Meteorologist and adjusted by adding or removing small amounts of weight to make their weight the same as the State standards.

Scale error and the potential for scale fraud

There are numerous steps involved in generating an accurate estimate of the weight of fish that pass over a flow scale. Each step is vulnerable to error or fraud. When flow scales are well maintained they can be quite accurate. During annual testing, scales are allowed to be off by as much as one percent when tested. However, such large errors are

[5] Note that the weights in this paragraph are for testing a scale; weights described in the second paragraph up are those for calibrating a scale. These are two separate activities.

not the norm and any error greater than a quarter of a percent would be cause for requesting that the scale receive additional service.

Scales are tested annually by passing a test load consisting of approximately 100 kg across the flow scale at least 16 times. The inspector looks for overall accuracy, but also assesses the precision of the scale. A new, or well maintained, scale can be expected to be precise within +/- 0.2 kg between runs and within +/- 0.3 percent for the entire test.

When in use at-sea, this level of accuracy and precision is rarely achieved. Unpredictable conditions of motion, gurry and slime stuck to the belt, aging of the belt and electronics, highly variable quantities of fish, extremes of temperature variation all contribute to a baseline error in the estimation of catch weight. An examination of daily test results, discussed in a later section, indicates that flow scales can generally be maintained within +/- 1% the majority of the time. In comparison to other methods of estimating catch such as cod end estimates or bin-volumetric measurements, these errors are quite small.

As used in this RIR, fraud is an action that deliberately causes the scale to incorrectly report the weight passing over it. Scale fraud can theoretically result in a significant underestimation of catch. At each stage of the weighing process, the scale is vulnerable to tampering. We believe discussing specific techniques for defrauding scale equipment to be counterproductive. However, in order to explain how the alternatives may prevent some of these techniques, some explanation is necessary.

Some of the more commonly observed ways to do this are described below.

Allowing the scale to operate with a consistently negative error. Scales must be tested daily and may not be used if the test indicates that the scale is weighing more than 3% differently than a motion compensated platform scale. The platform scale's accuracy in turn is assessed by testing it with known weights. It is not possible for the operator to directly adjust the scale electronics to read high or low, but when the scale is reading in their favor the operator may choose to delay repairs. Further, adjusting various mechanical components of the scale can often cause the scale to weigh higher or lower. Finally, when the scale error exceeds 3% the vessel operator may not show the observer the actual results from the scale test, or may replace the daily test form with one that shows a passing result. Vessels may test their scale as often as they wish; the only requirement is that the scale must pass a daily test every 24 hours. If the scale is tested multiple times, the average error may exceed 3%, but a single test where the error is less than that allows them to continue fishing.

Unloading the weighing platform. This can be done by mechanically preventing the full load from acting on the weighing platform by placing an object between the load and the weighing platform and thus preventing the full weight of the load from acting on the weighing platform. Since the load cell only registers the actual weight on it this results in a lower apparent weight on the scale. Actions that reduce the perceived weight will result in a biased estimate of weight.

Deliberate miscalibration of the scale. Scales are calibrated with a 10 kg test weight several times per day. If the test weight weighs more than 10 kg, the scale will under-weigh by the same amount following calibration. For example, if the scale is calibrated with an 11 kg weight, following calibration the scale will indicate that the 11 kg weight weighs 10 kg, so that when the scale shows 1,000 kg has passed over the scale, the true weight is 1,100 kg.

Bypassing the scale. Fish can be passed around the scale, or the scale can be turned off, when no observer is present.

Manipulating the daily test. If the scale operator is aware that the scale is operating with an error of more than 3%, the operator can attempt to have the flow scale overestimate weight during the test by holding fish back on the weighing platform, or the operator can attempt to have the platform scale underestimate the weight by not weighing all of the fish on the platform scale, or allowing the fish to dry between weighing the fish on the flow scale and weighing them on the platform scale (the implications if the fish move at a different rate from the flow scale's belt were discussed on page 14).

Impacted entities

This action would impact vessels that are required to use scales to account for catch at-sea under various management programs. For each of these programs (listed below), there are vessels authorized to participate in the fishery that do not do so. Depending on the fishery this occurs because: a company owns multiple vessels but is able to harvest its entire quota without using all of the available boats; a company decides to use one of its vessels for those fisheries where weighing at-sea is not required; a vessel is not able to participate in the fishery because it is unusable or contractually prohibited from fishing. In the BSAI Pacific cod freezer longline fishery, vessels may choose to weigh all Pacific cod catch or provide additional observers in lieu of weighing all Pacific cod and some vessels participating in this fishery have chosen to not install at-sea scales.

For the purposes of this analysis, NMFS has identified two classes of vessels that it estimates will be directly regulated by this action when it becomes effective: (1) vessels with flow scales that were inspected by NMFS staff in 2012 and/or 2013, and (2) three vessels under construction that NMFS expects to enter the freezer longline fleet and to use flow scales in 2014 or 2015. The fleet to be analyzed includes 68 separate vessels. This number is somewhat lower than the number of potential vessels for the reasons discussed in the preceding paragraph. Table 2 breaks these 68 vessels out by fleet, and shows the numbers of vessels that are potentially regulated.

Table 2. Number of entities potentially impacted directly by the preferred alternative.

Fishery	Number of potential vessels[1]	Number of vessels with currently /recently approved scales[2]
American Fisheries Act	22	19
Amendment 80/rockfish trawlers	22	19
BSAI Freezer-longline vessels	34	30
TOTAL	78	68

1. Includes vessels authorized by statute, FMP, or regulation to participate in a fishery that may require flow scale use.
2. This includes any vessel that has had a scale approved by NMFS during 2012-2013, plus three vessels NMFS expects to enter a fishery and begin using flow scales in 2014 or 2015.

Currently four programs in the Alaska Region require catcher/processors or motherships to weigh their catch at-sea. The vessels participating in these programs are all catcher/processors that use trawl or longline gear, or are motherships.

American Fisheries Act (AFA). Subsection 208(e) of the AFA, which took effect on January 1, 1999, lists by name catcher/processors and motherships that are eligible to harvest the catcher/processor sector BSAI pollock directed fishing allowance. Vessels in this fleet range in size from 224 feet to 684 feet and are among the largest, most sophisticated fishing vessels in the world. They produce a wide variety of products but principally produce fillets and surimi. Each year, after subtracting an allocation for CDQ and an incidental catch allowance, the remaining TAC is apportioned between sectors as a Directed Fishing Allowance (DFA). The catcher/processor sector receives 40 percent of the DFA and the mothership sector receives 10%. These DFAs are allocated to a single cooperative for each sector (mothership and catcher/processor) and then suballocated by the cooperative to the individual vessels . The AFA was implemented through a series of emergency interim rules (65FR4520, and 65 FR 380) in 2000, and further details concerning this fleet can be found in those actions as well as the FEIS prepared as part of the final implementation of the AFA (Final Environmental Impact Statement for American Fisheries Act Amendments 61/61/13/8, National Marine Fisheries Service, February 2002).

Under statute, AFA catcher/processors are required to weigh all catch at-sea. Regulations implementing the AFA also require motherships to weigh all catch at-sea. All AFA participating vessels must also provide a motion compensated platform scale for the observer's use.

Amendment 80 trawl catcher/processor and GOA rockfish catcher/processors. Amendment 80 to the BSAI FMP established a quota-based program for non-AFA catcher/processors in the BSAI, and Amendment 88 to the GOA FMP established a similar program for catcher/processors that harvest rockfish in the Central GOA (76 FR 81248, December 27, 2011). All of the vessels that participate in the catcher/processor sector of the GOA rockfish fishery also participate in Amendment 80 fisheries in the BSAI and the fleets can be considered together. These vessels tend to be somewhat smaller (103 to 295 feet) than AFA catcher/processors and generally produce a "head and gut" product where the harvested catch is minimally processed and frozen at-sea for further processing at another location. These vessels participate in a wide array of trawl fisheries including Atka mackerel, Pacific Ocean perch and various flatfish fisheries. Further information on both of these fleets can be found in the analyses prepared for Amendments 80 (NPFMC 2007) and 88 (NPFMC and NMFS 2011).

Under regulation, all catcher/processors that wish to participate in these fisheries must weigh all catch at-sea on a NMFS approved scale as well as provide a motion compensated platform scale for the observer's use.

BSAI Pacific cod Freezer Longliners. The freezer longline fleet fishes primarily for Pacific cod with stationary lines onto which baited hooks are attached by gangions. The longline is retrieved with hydraulic power over a roller mounted on the side of the vessel. Fish hauled onboard are immediately shaken loose and place into a trough. A crew member known as the "bleeder" bleeds the fish as soon as possible. Fish are headed and gutted, sorted by size, frozen in plate freezers, and packed. This fleet also fishes in the GOA for Pacific cod as well as sablefish IFQ fisheries.

Since 2003, freezer longliners have been required to have a Pacific cod longline catcher/processor endorsement on their LLP license to target BSAI Pacific cod. The Consolidated Appropriations Act of 2005 (Section 219(a)(1)) defined eligibility in the longline catcher/processor sector as the holder of an LLP license that is transferable, or becomes transferable, and that is endorsed for BS or AI catcher/processor fishing activity, Pacific Cod and longline gear.

Since 2006, most of the persons holding LLP licenses endorsed for freezer longliner have been members of the Freezer Longline Conservation Cooperative (FLCC). In June 2010, the remaining LLP license holders joined the cooperative, so that with the start of the 2010 "B" season on August 15, all holders of LLP licenses authorizing the use of these vessels were members of the cooperative. (Down, personal communications; NMFS AKR in-season management).

The FLCC incorporated in the State of Washington in February, 2004, for the purpose of the buyback program. It was not initially a harvest cooperative. (Council 2007b: 153).

However, the FLCC has now, reportedly, transformed itself into a harvest cooperative, creating an individual quota program within the sector. Each year FLCC members each receive a share of the sectoral 30 allocation; shares are issued in proportion to historical fishing activity with the LLP license. FLCC members are free to exchange their quota shares among themselves, and to stack shares on individual vessels. The program is implemented as a private contract among cooperative members. Compliance with the program is monitored by SeaState, Inc., and the contract signed by the members imposes heavy financial penalties for non-compliance. (Down, personal communications; NMFS AKR in-season management)

In 2013, the FLCC began fishing under new regulations to improve the precision of their catch estimates of Pacific cod. The regulations required vessels to either choose increased observer coverage or one observer and the use of a motion compensated flow scale

ALTERNATIVES

NMFS is considering two alternatives: (1) a no action alternative (Alternative 1); (2) an action alternative (Alternative 2).

The no action alternative would leave scales monitoring and enforcement rules as they are. The no action alternative is the status quo, and conditions under the no action alternative will be treated as the baseline conditions for the analysis. Thus, costs and benefits will not be estimated for the no action alternative itself, but the costs and benefits of the various action alternative options will be estimated with respect to conditions prevailing under the no action alternative.

The action alternative is composed of a combination of eight options. These are described below, grouped under three major headings:

A. Enhance daily scale testing
    1. Require the use of sand bags for daily flow scale tests, rather than fish
    2. Require electronic reporting of daily test results. In order to implement this requirement, all vessels subject to this action would be required to use electronic logbooks.

3. Require that failed daily scale tests be documented
4. Clarify the rules governing the frequency of daily testing
5. Reduce allowable daily test errors from 3 percent to:
    - 5.1 2 percent
    - 5.2 1 percent

B. Enhance scale software to better monitor faulting and calibration.

C. Enhance video monitoring of scale area

On the basis of the analysis which follows, NMFS has identified a preliminary preferred alternative which includes all options described under the action alternative, except Options A5.1 or A5.2.

ANALYSIS

A.1. Require the use of sand bags for daily scale testing.

Current regulations allow daily scale testing using either fish or sandbags. NMFS believes that the use of fish introduces unnecessary error into the daily test and creates opportunities for manipulating the test procedure.

If fish are being used for flow scale testing, the test is begun by stopping the flow of fish over the scale and reading the current weight. The scale is then run until a total of at least 400 kg of fish have passed over the scale. The scale is stopped a second time, and the weight is read again. The difference between the first and second weight readings is the flow scale estimate of the weight of the fish. Once fish have passed over the flow scale they are placed in baskets. These baskets of fish are then weighed on the observer platform scale and returned to the sorting line below the flow scale (the empty baskets are weighed either before or after, and their weight is subtracted from the platform scale weight of the fish). The flow scale and platform weights (net of the basket weights) can then be compared.

Inadvertent errors can occur when fish are used to test the flow scale. Between the time the fish are weighed on the flow scale and the time they are weighed on the platform scale, the fish may lose weight as they dry. In addition, accurate scale tests require that all materials passing over the flow scale be weighed on the platform scale. However, smaller objects that may have been weighed with the fish, such as mud, jellyfish, or even small fish, may not make it into the baskets. Since the flow scale weights will appear to exceed actual weights, scale adjustments will tend to bias the flow scale so that it underestimates the actual weight. The magnitude of the error introduced by these losses is unknown.

More seriously, NMFS staff believe that some vessels deliberately manipulate the operation of the flow scale to make the fish on it appear to weigh more than they actually do. As explained on page 14, the scale may overestimate weight if the fish bunch up on the moving belt. This would occur if the passage of fish over the flow scale was slowed enough to cause the belt to move independently below the fish. This can be done by deliberately causing an excess of fish to flow onto the scale so that they can jam up in place and don't move freely over the scale. When these fish are then weighed on the platform scale, it will appear that the flow scale weight readings for a given volume of fish is higher than it actually is, which would mask a persistent low reading of the scale under normal operating conditions. This would lead to a bias in the flow scale so that it underestimated the actual weight. Again, the magnitude of the error introduced by manipulation of this type is unknown.

When sand bags are used for testing, the flow of fish over the flow scale is stopped and the operator records the weight on the flow scale at the time testing begins. The sand bags are first weighed on the platform scale and then sent across the flow scale. The bags may need to go across the flow scale multiple times to meet the 400 kg requirement. For example, if the vessel has 7 sand bags that weigh a total of 40 kilograms, all 7 sand bags will need to be sent over the flow scale at least 10 times. After the sandbags have been run across the scale the required number of times, the weight on the flow scale is recorded. The flow scale and platform weights can then be compared. Unlike the fish, that only need to be handled once (the transfer from the flow scale to the platform scale), sand bags may need to be handled multiple times.

It is harder to manipulate flow and platform scale estimates with sand bags of uniform weight. Testing with consistent weights each time and every day will eliminate one variable from the equation and make it easier for managers to identify errors or manipulation. This benefit from using sand bags would be enhanced if Option A.2., which requires daily electronic monitoring of results, and Option A.3., which requires that all tests, including failed tests, be reported, are adopted.

In the fall of 2013, 23 of the vessels with approved flow scales, or approximately 1/3, used fish for the daily test. Most of the vessels using fish are pollock factory trawlers or motherships as well as a few Amendment 80 catcher/processors. Testing with fish offers advantages to these boats. Depending on the layout of the factory, some vessel crew report that testing with fish rather than sand is three to five minutes faster; there is no additional equipment to store (storage is always an issue on a boat and the sand bags require about 4 cubic feet), and no additional equipment to purchase. Because of the nature of fishing operations, it is impractical to test a scale on a freezer/longliner using fish, thus all of these vessels use sand bags at this time.

On the other hand, with sand bags, scales can be tested at times when there are no fish aboard, or not enough to conduct the scale test. There may be cases where several tests may need to be conducted and low catches have occurred, making it difficult for vessels to obtain enough fish to conduct a test. This is especially true for freezer longline vessels which bring in fish one at a time.

Because regulations do not specify the number of sandbags that must be used or the material used for their construction, it is not possible to precisely estimate the cost of purchasing sand bags. However, the bags used by NMFS inspectors cost $11 each and on average we estimate that a vessel will carry approximately ten bags, for a total cost of $110. Sandbags must also be stored on board and use factory space. We estimate that vessels using sand bags would lose between 4 and 6 cubic feet of storage space in the vicinity of the flow scale.

In summary, required use of sand bags is expected to reduce errors in daily testing, and the opportunity for crew to manipulate the results of daily tests, but by unknown amounts. One third of the vessels would be required to purchase and store sand bags, and sand bag use may result in increased testing times.

A.2. Require electronic reporting of daily scale test results

Vessel owners are required to maintain paper records of daily scale tests, but are not currently required to submit the daily test results as they occur. At the time of the annual scale inspection, NMFS inspectors review the daily test records for the previous year and discuss those results with the vessel crew.

However, there have been reports of vessels changing the results of the daily test after an observer has witnessed it, and NMFS is unable to determine, during the year, if a vessel is consistently operating with a scale that is inaccurate. There is a long time lag, ranging from one month to a year, between when a daily scale test is conducted and when NMFS is able to review the tests. Because the tests are recorded on paper forms, the only way for NMFS staff to monitor fleet-wide scale performance is to collect the hard-copy forms and enter them into a data base. Because of the number of tests, this is a time consuming process. Further, because these data are recorded on paper forms that can be altered, there are opportunities for the vessel crew to change the form after scale testing.

Requiring the electronic submission of daily scale test data will reduce the potential for fraud and increase NMFS' ability to monitor the status of at-sea scales during the fishing year because NMFS will receive test results daily and be able to identify trends immediately. If daily scale test results are submitted electronically, NMFS will be able to monitor the scale errors throughout the fishing season. If those errors are consistently high, staff can work with the vessel in near-real time to resolve the issues. Further, it will not be possible for vessels to revise daily test results after they have been submitted, which is a possible way in which a scale operator could prevent NMFS staff from knowing the extent of scale errors.

Under this option, as part of this daily electronic reporting of logbook data (ELB), vessels required to weigh catch at-sea would also be required to submit the results of daily scale testing. This would include information on the flow scale weight, the platform scale weight, the calculated percent error, and, if the proposal to require sandbags is not adopted, whether fish or sandbags were used for the test. If Option A.3. (requiring reporting of failed as well as successful tests) is adopted, this would involve reporting the results for all tests, whether or not they were successful, thus increasing the number of reports above those required if Option A.3. is not adopted.

The vessels regulated by this option fall into three groups, and the costs to each may be different. NMFS staff estimates that (1) there are 49 vessels that currently have, and use ELB software; (2) there are 10 vessels that have ELB software, but are not required to use it all the time; (3) there are 9 vessels that do not currently have ELB software.

The action will not impose additional financial costs on the 49 vessels that currently have and use electronic logbooks. It will require a small amount of extra time for the user of the electronic software to enter the additional three numbers for each scale test conducted during the past 24 hours; NMFS Paperwork Reduction Analysis (PRA) estimates this will add about three minutes to the time it takes to complete each catcher/processor daily logbook entry. The daily test entry screen is shown below in Figure 1.

Figure 1. Screenshot of test daily flow scale data entry screen.

Ten vessels are required to use ELBs while they are participating in the Central GOA rockfish fisheries but are not required to do so at other times. However, the majority of these vessels have agreed to voluntarily use the electronic logbook while fishing outside the Central GOA rockfish fishery. Therefore, these vessel costs could be considered equivalent to the costs for the 49 vessels currently required to use ELBs described above. A minority of these 10 vessels do not make voluntary use of the ELBs when they are fishing in fisheries where these are not required. These vessels do have the hardware and software capability to use the logbooks, and do use them when they are active in the Central GOA rockfish fishery. However, for internal business reasons, they do not use them when they are not required. NMFS cannot estimate the costs of requiring the electronic logbook for these vessels at all times, because the specific business practices are not known.

Nine vessels that would be affected by this action currently do not have ELBs. The ELBs would replace the currently required catcher/processor daily cumulative production logbook (DCPL) paper logbooks. The discard, disposition, and production information, formerly recorded in the DCPL, would be entered through eLandings. This new step would remove the requirement for these vessels to record any information in the DCPL and, thus, remove the catcher/processor DCPL from use for these vessels. The ELBs would be an additional component to eLandings, the program through which the operators of catcher/processors currently submit their daily production reports.

Costs for this include distribution and installation of the software, and training for vessel officers in the use of the software. Software delivery is inexpensive. Installation may be carried out by crew, or by NMFS staff. For the purpose of projecting costs, NMFS assumes that training and distribution will take place as part of annual workshops with vessel operators in Seattle. The logbook software would be distributed on a CD at that time. The cost of this to NMFS is the cost of time required for workshop preparation and delivery, and of travel between Juneau and Seattle. (Mondragon, pers. comm., July 25, 2011). Assuming the workshop is conducted in connection the normal planned annual eLandings workshops, and takes three hours during the course of a morning, private sector costs are assumed to be about $1500 and NMFS costs are assumed to be $2,800.[6] After installation, these vessels would incur the costs of data entry described above.

There may also be an additional time cost in transferring the test results obtained at the flow scale in the factory to the location of data entry, usually the wheelhouse. Given the distance between these two locations varies greatly between vessels this cost is hard to define. To the extent that crewmembers may be moving between these two locations for other reasons the cost of taking the data from the scale to the data entry location may be minimal.

NMFS is currently modifying the ELBs to accommodate this data entry. These modifications will permit voluntary electronic reporting of daily test results in 2014. Because this work will be done whether or not this action is adopted, the costs of the work are not attributable to the action.

In summary, this option makes it possible for NMFS to identify potential scale problems during, rather than after, a fishing year, and to more effectively analyze overall trends in scale testing, at a small additional keypunching cost to most vessels, and the cost to NMFS of updating its web-based data collection. A small number of vessels may be required to modify their business practices to use electronic logbooks.

[6] Private costs assume a three hour workshop attended by an officer from each of the 9 vessels at $56/hour. Public costs include three hours of time at $56/hour, $1,230 in travel expenses, and $200 for hall rental

A.3. Require that all daily scale tests be documented, including failed tests.

Current regulations do not specify how often a scale may be tested during a day, only that it must be tested at least once every 24 hours. When a scale is not operating properly, it may be tested and recalibrated multiple times before a test is successful. NMFS believes that allowing vessels to test scales multiple times, gives them the flexibility to diagnose and resolve scale problems.

However, NMFS has received reports of vessels conducting numerous scale tests over the course of the day and only retaining the "best" test, or the passed tests. If a series of tests normally produces a distribution of test results, and if vessel operators are allowed to "cherry pick" the best results, there can be a tendency to bias flow scale operations in a way that could lead to underestimates of catch.

A vessel can fail one or more scale tests but pass a subsequent test for many reasons. The scale could require adjustment or be suffering from an intermittent problem; crew could inadvertently pass too many, or too few, sand bags over the scale, the scale could require calibration; the vessel could be choosing to cherry pick the best test so that the scale appears more precise than it is; or the vessel could be engaged in fraudulent activity.

A requirement that each scale test should be documented will prevent abuse of the current system and allow NMFS staff the ability to more accurately assess the accuracy of the scale. Vessels that had an unusually high rate of test-failures could be examined more closely in order to mitigate these problems. NMFS would be aware of all test results, in close to real time if Option A.2 is also adopted, and an awareness of patterns of pass, fail, and pass, but in the wrong direction, will provide evidence of scale manipulation. If a scale passes at +2 percent, but twenty minutes later is tested again and passes at -1 percent, there may be reason to investigate further.

Under this option, at the time the first test weight passes over the flow scale, a test would be considered started. If the test is not completed, or if it does not pass, the individual conducting the test would be required to record how much weight did pass over the scale and to enter either the percent error or the word "stopped".

Crew normally summarize the results of both successful and unsuccessful daily scale tests on standard forms supplied by NMFS. This option would thus not require completion of additional forms. Moreover, based on conversations with vessel crew that conduct scale testing, NMFS believes that most days the daily test occurs successfully on the first try and that retests are relatively unusual. The option would require that vessels retain forms completed to document unsuccessful tests for one year, along with the forms documenting successful tests. Unsuccessful test results would also have to be entered with successful test results in electronic logs. This may add a small amount of additional time to fill out the form shown in Figure 1 for additional tests. Additional costs to retain paper reports on failed tests should be *de minimus*. Thus the estimated cost of this requirement is close to zero.

In summary, this option should reduce the potential for bias in scale testing by an unknown amount, and provide NMFS valuable information on scale testing practices, at a small cost for additional recordkeeping.

A.4. Clarify regulations concerning frequency of daily scale testing

Regulations at §679.28(b)(3) state that ".... the vessel operator must test each scale or scale system used to weigh total catch one time during each 24 hour period when use of the scale is required. " The intent of this regulation was to ensure that flow scales were tested at least once every 24 hours.

However, this regulation has been interpreted to mean that a vessel can test a scale at the very end of one 24 hour period, followed almost immediately by another test at the beginning of the next 24 hour period, followed by a gap of 48 hours. Anecdotal evidence suggests that few vessels operate this way. Vessels that do so may operate this way because scale tests require that they stop fishing, and grouping tests in this manner may allow them to reduce the number of scale-testing induced fishery suspensions.

This current language in the regulation also refers to scales used to weigh total catch; in the Pacific cod fishery, vessels are only required to weigh catch of Pacific cod, however, they are expected to test their scale daily.

Under this option to the action alternative, this regulation would be clarified to state: "The vessel operator must ensure that each scale used by the vessel to weigh catch is tested at least once during every 24 hour period and no more than 24 hours may elapse between tests when use of the scale is required".

Although this option may not change the number of tests to be conducted, it may increase costs for a small number of vessels by increasing the number of separate times they must suspend fishing for scale tests. It should contribute to effective monitoring and enforcement by providing for more uniform temporal sampling.

In summary, this option would provide contribute to effective monitoring and enforcement at a cost to a small number of vessels.

A.5. Lower the MPE for daily scale testing to 1% or 2%.[7]

Under the no-action, status quo alternative, flow scales are allowed to have a maximum percentage error (MPE) of 3 percent. Regulations at 679.28(b)(2) specify that the percent error is determined by subtracting the known weight of the test material from the weight recorded on the flow scale, dividing that amount by the known weight of the test material, and multiplying by 100. Known weights are determined from the observer's platform scale. The formula for the percent error is:

[7] These options are not included in the preliminary preferred alternative.

$$Percent\ Error = \left(\frac{Flow\ scale\ weight - \ Platform\ scale\ weigth}{Platform\ scale\ weight}\right) * 100$$

Under Action Alternative Options A.5.1 and A.5.2, the MPE would be lowered to 2 percent or 1 percent respectively.

A total of 5,239 daily 2010 scale test results from 34 vessels were analyzed to determine the distribution of scale test results. The sampled records were collected from vessels inspected in Seattle in December or January 2011-2012. This does not include vessels which may have been inspected in Dutch Harbor, or BSAI freezer-longline vessels, which were not required to use flow scales at that time. These are records of successful tests reported pursuant to regulations. This is not a complete record of all tests, as unsuccessful tests are not currently reported. Thus, in cases where a series of tests and flow scale calibrations culminate in a successful test, only the information about the last, successful, test is reported. In cases where the scale failed all tests and the fishing operation had to suspend fishing operations until flow scale repairs could be made, no test results are available.

As discussed earlier in this RIR, there is evidence that some vessels may have deliberately falsified their daily scale tests. If so, the result of an examination of the tests may be suspect. However, the tests were examined with the purpose of determining whether a lower daily scale test threshold should be required. To the extent that actual scale error is being concealed by deliberate misreporting, changing the standard would have no effect because it would, for example, be almost as easy to misreport an error of 2 percent as it would be to misreport an error of 2.9 percent.

When a flow scale's error is negative:

$$Negative\ percent\ error: Flow\ scale\ weight < Platform\ scale\ weight$$

the vessel's flow scale reports less catch than was actually harvested; when an error is positive, the vessel's flow scale reports more catch than was actually harvested:

$$Positive\ percent\ error: Flow\ scale\ weight > Platform\ scale\ weight$$

A negative percent error means that (a) the vessel is underreporting the actual harvest of fish, and (b) the vessel may exceed its allowable quota without awareness by other parties. The first problem affects NMFS' ability to set species specifications with confidence, the second affects NMFS's ability to manage in-season, and can affect intra-cooperative dynamics.

Ignoring other considerations (such as the time lost and uncertainty associated with repeated tests), a vessel subject to an individual vessel quota has an incentive to reduce its percent error as closely as possible to -3 percent; a negative percent error will be associated with greater revenues from any given quantity of retained catch than a positive percent error, all else equal. When a flow scale's error is positive (when the platform scale weight is less than the flow scale weight) the vessel reports more catch than was actually harvested. The vessel has no incentive to do this. A positive percent error means that (a) the vessel is reporting that it caught more than it did, and (b) the vessel may fall short of taking its allowable quota. A positive error is associated with a lower quality of catch data used to determine species specifications, and the waste of allowable harvest quotas.

The distribution of 2010 errors for the 34 vessels examined is shown in Figure 1.

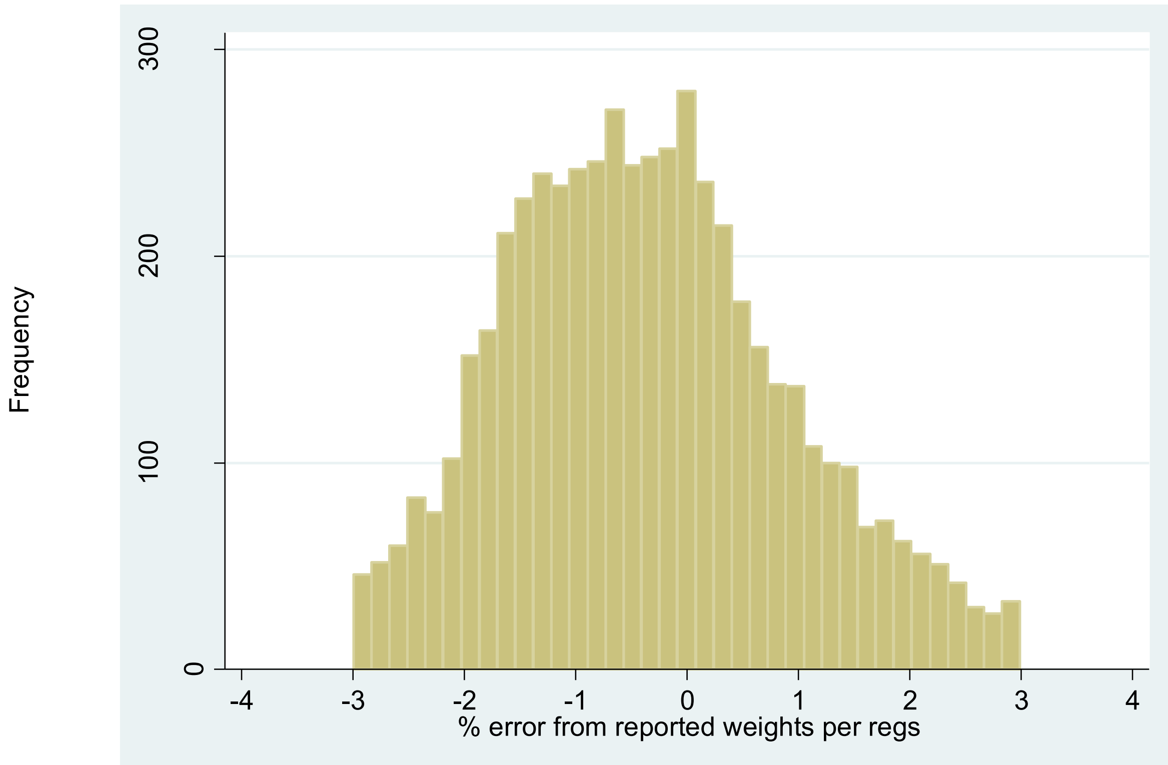

Figure 1. Distribution of percent errors from successful flow scale tests in 2010

As shown in Figure 1, the distribution of errors is skewed to the left of zero, so that more errors were negative than positive. The distribution is truncated abruptly at plus and minus 3 percent. Operating a flow scale after test results that fall outside of that range of errors is illegal, and tests that fell outside that range would not have been reported.

The mean percent error was -0.35 percent, and the median percent error (half the tests were below this and half above) was -0.43 percent. Five percent of the observations were below -2.30 percent, and five percent were greater than 1.95 percent. The quantity of fish harvested per day varies greatly between vessels. Thus, while the average daily scale test error is 0.35 percent, it is not possible to state that this represents a 0.35 percent underestimation of total catch.

Because averages obscure actions by individual vessels, we also looked at the scale tests on a vessel-by-vessel level. The number of tests examined for each of the 34 vessels ranged from 55 to 242. No vessel had an average flow scale error less than -1.68 percent, and over three-fourths (76 percent) had average errors within 1 percent of the platform scale results.

About 48 percent of the flow scale tests[8] (2,522 out of 5,239) had errors that were greater than or less than the range from -1 percent to 1 percent. About 13 percent (687 out of 5,239) had errors that were greater than or less than the range from -2 percent to 2 percent.

Focusing more specifically on test results that had negative error values, about thirty-three percent of the tests (1,723 out of 5,239) had negative errors that exceeded -1 percent, and about 8 percent (443 out of 5,239) had negative errors that exceeded -2 percent.

How would vessel operators respond if the vessel MPE were reduced? If the MPE was lowered from the current 3 percent to either 2 percent or 1 percent, there would be an increase in the number of failed scale tests. In the absence of fraud, vessel operators are likely to increase retesting, in many cases until random fluctuations in test results allow the flow scale to pass the test. However, in this case, there is a likelihood of reversion to the mean of the test results once actual fishing and weighing of fish begins, and a tendency to underestimate catch based on subsequent flow scale weights.

In the absence of fraud, more trips would be truncated by the need to return to port for maintenance of the flow scales. While in most cases it would be possible to recalibrate or retest the scale, there are limited adjustments that a user is authorized to make to the scale electronics and some percentage of the failed tests would require a return to port for scale repair. This would increase the costs of harvesting vessel quotas and may lead to increased transfers of unfishable vessel quota from vessels failing tests to vessels with more reliable scales. Given the length of trips, the vessel size, and the often large number of crew, even a small number of added trips could impose a significant cost on industry. In the long run, these costs should create an incentive for the development of improved and more precise flow scales and weighing procedures, but the change in precision and time frame over which this would occur are uncertain.

The increased costs of operating without fraud will increase vessel operator incentives to manipulate the tests. Thus, the value of the other options of the action alternative would increase if the MPE were reduced. The greater the reduction in the MPE, the more important all these considerations are, however, this is an ordinal ranking, available information is not enough to make predictions about the absolute or relative sizes of the changes in vessel responses to either the 2 percent or 1 percent MPE proposals.

The discussion so far deals primarily with negative percentage errors (since more errors appear to be of this type, and vessels have an incentive to make them). On the other hand, there is no incentive for a vessel to have a positive error and it is reasonable to assume that positive errors are the result of factors outside the vessel's immediate control. Even if only tests where scale errors were positive are considered, there would have been

[8] Tests as opposed to vessel averages (the previous paragraph discussed vessel averages).

an additional 244 failed scale tests if the MPE were reduced to 2 percent and 799 if the MPE were reduced to 1 percent.

In summary, the costs of these options are the cost of increased retesting during the daily testing process, and the increased costs of harvesting any given fishery quota, as vessels are forced to truncate their trips more often. The benefit would be more precise estimates of catches by individual vessels, which would facilitate cooperative operations, in-season management, and the determinations of OFLs and ABCs. More precise harvest estimates may permit the Council and NMFS to use less conservative tiers and procedures for setting OLFs and ABCs in the specifications process. However, even in the absence of fraud, it is possible that increased retesting, as described above, may lead to errors in catch estimation that exceed the formal 2 percent or 1 percent thresholds under consideration (as discussed above).

B. Calibration and fault logs

Current regulations require that adjustments to the scale be recorded in the form of an audit trail that can only be cleared by NMFS or other authorized personnel. Scales are not required to record when they are in a fault state, or not running, nor are they required to record the time and magnitude of routine marine calibrations. NMFS believes that an enhanced audit trail will assist in preventing scale fraud as well as increase the amount of useful diagnostic information available to scale technicians and NMFS staff.

Marine scales require frequent calibration (see technical background on page 14). Because calibrations must be performed multiple times each day, independently of scale tests, it is possible for the scale user to miscalibrate the scale following the daily scale test, and properly calibrate it prior to the daily scale test. If the time, magnitude and direction of each marine calibration were automatically recorded by tamper-proof scale software, NMFS investigators would be able to determine if there was a pattern of improper scale calibration.

In addition, many events can cause a scale to go into a fault state. If the speed the belt is traveling changes rapidly, or if the scale is not able to find a zero when nothing is on the belt, the scale display will indicate that a fault is occurring. At the time a scale is first started, the display will indicate a fault state until it is able to determine the speed of the belt and to find a zero. In most cases, a fault does not prevent the scale from weighing; it simply indicates that the weight may be incorrect. However, some faults will actually cause the scale to stop weighing.

On vessels where an observer is on duty whenever fish are being processed, a faulting scale is often noticed fairly quickly. Unfortunately, even if an observer is on duty, his other duties may take him away from the scale, and not all vessels that are required to have scales have an observer always on duty.

Based on preliminary review of video data from vessels required to weigh catch, NMFS believes that operating the scale while it is a fault state is a frequent problem. To the extent that operating the scale while it is in fault mode results in incorrect weights, our estimation of catch could be incorrect as well.

This option revises regulations concerning scale electronic audit trails to require that they contain: (1) a record of the magnitude, direction and time of all marine calibrations, and (2) an electronic log that gives the time each fault starts, the time it stops, and the nature of the fault. The fault log would also be required to contain the start and stop time of the scale.

At this time only Marel hf makes flow scales that are approved by NMFS for catch weighing. There are two generations of Marel scale electronics. The older M2000 electronics cannot be easily programed and the manufacturer has indicated that it will not be possible to retrofit these electronics with software that meets the requirements of the preferred alternative. The newer, M2200 electronics can be reprogramed and Marel has indicated that it can reprogram the newer generation M2200 electronics to meet these requirements.

Nineteen vessels are currently using the older generation M2000 electronics. According to representatives from Marel Hf (Johanneson pers. comm.), these electronics will no longer be sold by the company and they are recommending that they be replaced. The company anticipates that ten of the vessels with M2000 electronics will upgrade prior to the start of the 2014 fishing season.

Flow scales made by Skanvaegt hf are also approved for use at-sea and could not be upgraded to meet our new requirements. However, Skanvaegt marine scales are no longer sold and, at this time, only a single vessel is using one. Because it is difficult or impossible to find parts, the owners of this vessel have indicated that they will replace it with a Marel scale prior to 2014.

Marel has estimated that the charge for the revised software will be approximately $2,000 per vessel. Given that there are 68 vessels regulated by this action, the aggregate estimated software cost of this requirement is about $136,000.

Marel has also estimated that the charge for new hardware (which will include and electrical cabinet housing components, a scale display, spare parts for the electrical cabinet, installation, and training) will be $30,400 per flow scale. As noted above, 10 of the directly regulated vessels are currently using the older hardware and have not indicated that they plan to replace it before the effective date of this rule. These vessels would incur a cost associated with replacement of the flow scale electronic hardware earlier than they had intended. This cost would be equal to the difference between the cost of replacement today, and the present value of replacement at the time they would have chosen. NMFS does not have information on the expected replacement schedules for these scale electronics. Assuming for the sake of illustration that these electronics would otherwise have had five years of additional life, the difference between the cost of replacement today and the present value of replacement in five years would be about

$4,100 per unit, or about $41,000 for 10 units.[9] If the existing scales would have been used less than five years if this action did not take place, the cost would be less; if they would have been used more than five years, the cost would be more.

Vessel owners or operators will not be required to print copies of the proposed calibration or fault logs as these would be stored in memory on the scale electronics themselves. Thus, this alternative will not further burden vessel personnel.

Administrative costs associated with this action will be small. NMFS is currently (Fall 2013) working with Marel hf to implement the log procedures in the flow scale software. The costs to NMFS are currently being incurred, are not contingent on the decision with respect to the action alternative, and are thus not relevant to the decision.

Subsequent costs are those of acquiring the log information and analysis by NOAA Office of Law Enforcement (OLE). Because of the potential of the logs to deter tampering, and because of their utility to NOAA OLE in forensic analysis, there is not a reason to expect this will lead to an increase in agency expenses.

C. Video Monitoring of Scale Area

Under this option, vessels required to weigh catch at-sea would be required to provide video monitoring of fish entering, moving across, and leaving the weighing platform of the scale. The option also requires video monitoring of all access panels allowing adjustments to the scale, and of crew activities in these areas. The scale display head and the light showing when the scale is in fault mode would need to be within the camera view.

Video monitoring of the scale and its components (display head and fault light), as well as any crew activities around the scale, will allow NMFS OLE to verify that all catch is being weighed, that no one is tampering with the scale, and that scale is functioning correctly. The video, in conjunction with the new daily scale test reporting requirements and the new calibration and fault logs, will increase the efficiency of NMFS OLE in reviewing potential scale fraud cases. Video may serve as a deterrent to tampering with

[9] Because future costs are projected on the basis of costs circa 2013, future costs are measured in real, rather than nominal terms. Thus, a real interest rate has been used for this analysis. The rate for corporate bonds rated Baa by Moodys in October 2013 (5.31 percent) was used as an estimate of the appropriate nominal interest rate, to approximate the level of risk for the affected fishing firms. Expected inflation (1.37 percent per year) was estimated by subtracting the October 2013 rate for 30 year Treasury Inflation Protected Securities (TIPS) from the October 2013 rate for 30 year U.S. Treasury bonds (estimated inflation = 3.68 percent – 1.37 percent). The real interest rate (2.93 percent) was estimated using a standard formula: $r = (i-m)/(1+m)$, where r is the real interest rate, i is the nominal rate, and m is expected inflation. All interest rates were obtained from the St. Louis Federal Reserve Bank's FRED data base. The methodology follows an approach in Boardman et al. (pages 148-149). The present value of $30,400 in five years, with a discount rate of 2.28 percent, is about $26,300. The difference per vessel is therefore $30,400-$26,300, or $4,100.

the scale or allowing the scale to run continuously while in fault mode. With video NMFS OLE may not have to rely only on reports from NMFS staff or other authorized personnel of potential tampering issues and may be able to use video to verify these reports.

The video monitoring system required by this alternative would have one or more color cameras, a digital video recorder (DVR) for storing the video, a monitor for reviewing the video, power sources, and cables to connect the different elements. The system must be operating when the vessel is on the fishing grounds (no matter the intended target species). The system must meet the following technical specifications:

- The system must have sufficient data storage capacity to store all video data from an entire trip. Each frame of stored video data must record a time/date stamp in Alaska local time (A.l.t.). The system must record from the beginning of the first trip of the year until the end of the final haul or set for the year.
- The system must include at least one external USB (1.1 or 2.0) port or other removable storage device approved by NMFS.
- The system must use commercially available software that allows for conversion to an open source format such as mpeg.
- Color cameras must have a minimum 470 TV lines of resolution, auto-iris capabilities, and output color video to the recording device with the ability to revert to black and white video output when light levels become too low for color recognition.
- The video data must be maintained and made available to NMFS staff, or any individual authorized by NMFS, upon request. These data must be retained onboard the vessel for no less than 120 days after the date the video is recorded, unless NMFS has notified the vessel operator that the video data may be retained for less than this 120-day period.
- The system must record at a speed of no less than 5 frames per second
- NMFS staff, or any individual authorized by NMFS, must be able to view any footage from any point in the trip using a 16-bit or better color monitor that can display all cameras simultaneously and must be assisted by crew knowledgeable in the operation of the system

These requirements are similar to those currently described in in §679.28(j) (§679.28(j))[10] (NMFS, 2009: 195-196), which apply to video monitoring of Chinook salmon PSC on American Fisheries Act pollock vessels and §679.28(k), which apply to freezer longliners targeting Pacific cod in the BSAI. Thus, many vessels required to weigh catch at-sea are already required to use video monitoring as a compliance tool:

[10] A related requirement implemented in the American Fisheries Act pollock fishery as a part of recent Chinook salmon PSC measures under Amendment 91 required a waterproof or water-resistant monitor to be located at the observer sampling station, operating at all times when fish were flowing through the sorting area, or when salmon were in holding tanks. This requirement is not necessary for this action. A monitor must be available on board, permitting NMFS or NOAA OLE staff to view video footage, but this monitor need not be located at the observer sampling station, and consequently does not have to be waterproof or on continuously. (Watson, pers. comm., July 22, 2011)

- All freezer longliners that have chosen to have a flow scale aboard in lieu of an additional observer are required to have video monitoring of all areas where catch is sorted and weighed. These vessels are also a required to have a monitor available for use by NMFS staff, but do not have to have monitor in the observer sampling station.
- AFA catcher/processors are required to have video monitoring showing all areas where salmon are sorted from catch as well as the location where the salmon are stored. While this regulation does not specifically require that the flow scale be visible, sorting generally takes place immediately down-stream from the flow scale and in some cases the scale is at least partially visible in the video. For these vessels camera lenses may be changed to potentially provide wider views of the area, changing camera angles may be required, or additional cameras could be needed. An additional monitor that NMFS staff could use to review the video would also be required. However, as all these vessels have multiple monitors the cable runs to these monitors may already be in place aboard some vessels.
- Catcher/processors participating in Amendment 80 or Rockfish program fisheries may choose video monitoring of the inside of fish-bins as one method of ensuring that catch is not selectively sorted inside the bins prior to observer sampling. This video rarely shows the flow scale, but wiring to accommodate additional cameras and monitors where the video can be reviewed may already be in place on these boats.

DVRs with the necessary software to meet the requirements typically cost between $1000 and $3500. Most vessels with video systems aboard now carry one to two hard drives with a capacity of 1 terabyte of data. Based on internet research, these hard drives cost between $100 and $200. Many vessels already have computer monitors that meet the requirements and would not have to purchase one, but if a new monitor was purchased that was dedicated to the video system, it would cost about $100 based on current market prices. Depending on the type of cameras the vessels decide to use, their cost could range between $400 and $2500 per camera. Some cameras available to the fleet come with stainless steel housing and high grade protective lenses. Other cameras simply meet the basic requirements and do not offer the protective housing. While either type of camera is acceptable for use it is likely that the less expensive camera will need to be replaced more often, so the estimate of a spare parts package would likely be higher for vessels that chose this option. One estimate is that installation would likely cost between $2,000 and $5,000 (although, some firms may seek to hold down the installation costs by doing work themselves). An equipment failure that cannot be fixed at sea could lead to a significant loss of revenues if a vessel had to stop fishing and return to port. As insurance against this, vessels are likely to choose to carry spare parts. A spare parts package might run $3,500. (NMFS, 2012). Also, typically included in the video monitoring system are power supply for the cameras that run between $100 and $500 and an uninterruptible power supply (UPS) for the DVR that can cost between $100 and $650.[11]

[11] These cost estimates have been summarized from the RIR prepared for the Freezer Longline monitoring and enforcement regulatory action of 2012 (NMFS, 2012). They are based on personal interviews with David Pratt, President, Fusion Marine Technology, LLC. Seattle, Washington and with

Costs may be small for vessels that have existing monitoring systems since an additional camera may be added to an existing system at minimal cost. However, for vessels that do not have approved video monitoring systems, the costs would be higher (see Table 3 for a breakdown of system costs).

Table 3. Cost of video monitoring components

Item	Number required	Cost
DVR	1	$1,000 to $1,500
Installation and wiring for cameras near existing cameras	1	$1,500
Installation & wiring for cameras not near existing systems	1	$2,000 to $5,000
Installation & wiring for new systems	1	$2000 to $5000
Monitor	1	$100 to $400
Hard drive	1	$100 to $200
Camera	1.5	$600 to $3,750
Power Supply for Camera	1.5	$150 to $750
UPS for DVR	1	$100 to $650
Annual maintenance	1	$0 to $1,000
Spare Parts Package	1	$0 to $3,500
Total Cost for System		$5,550 to $21750

Vessels subject to the video requirements will likely fall in the 4 categories: (1) those vessels that already have systems in place that will not need to add cameras or additional equipment; (2) vessels that have cameras near the scale and may only need additional cameras and storage space; (3) vessels that have video systems but the cameras are not near the scale, and; (4) vessels that do not currently have any video systems aboard.

Based on a staff review of existing video systems on vessels required to weigh catch at-sea NMFS estimates that 7 will require complete systems, 34 will need to add one or more cameras to existing systems, and 27 will not need to purchase additional equipment, but may need to adjust camera positions or locations. It should be noted that the assumptions about which vessels fall into these categories could change, but cannot be determined until the time of the inspection. Table 4 shows the categories into which these vessels fall, by fishery.

Erik Sundholm of Harris Electric, Inc. Seattle, Washington conducted in the summer of 2011. Technological change may have reduced costs since that time, while inflation may have increased costs. Reviewed and updated by David Pratt in November 2013.

Table 4 Impacted Vessels by Fishery and Video Monitoring Components Required

Fishery	No additional components needed	Additional Camera(s) near existing camera	Additional camera(s) not near existing cameras	New System
Amendment 80/Rockfish	0	0	12	7
Freezer Longliner	23	7	0	0
AFA	4	15	0	0
Source: AKRO SF staff estimates.				

When projecting costs, we assumed that vessels requiring additional cameras would generally require only a single additional camera, but that a portion may require two cameras. We also assumed that the additional camera(s) would increase the need for hard drives to store the extra data. So for analytical purposes we estimated that these vessels would require an average of 1.5 extra cameras and one extra hard drive. For vessels where existing video systems show activities near the scale, we have assumed that there would be a cost of $1500 to wire the extra camera(s) and connect them to the existing system. For vessels where existing video systems do not show activities near the scale, we estimated that installation and wiring costs would be $2,500 to $5,000(Pratt, Fusion Marine, email comms.11/12/13).

Table 5 below shows estimates of the range of potential costs of video installation and upgrades for individual vessels in each of the vessel classes discussed. Table 6 provides estimates of the range of potential costs in aggregate for each of the vessel classes and for all covered vessels as a whole. The endpoints of the range were estimated by assuming that all vessels in the class either incurred the minimum, or incurred the maximum, costs. Because these conditions are not expected to be met, these endpoints are believed to significantly understate and to significantly overstate the likely actual costs of this action. For this reason, a "Medium cost" estimate, which simply splits the difference between high and low estimates has been provided. Precise estimates of costs are not possible because of the diversity of vessels and the limited information available on installation costs specific to individual vessels. The estimates provided are believed to provide a reasonable guide to the order of magnitude of the costs.

Table 5. Estimated Cost for Individual Vessels by Category

Required installation	Low cost	Medium cost	High cost
No additional components needed.	$0	$2,500	$5,000
Additional camera(s) near existing cameras	$2,000	$6,000	$10,000
Additional camera(s) not near existing cameras	$3,000	$8,000	$13,000
New system	$4,000	$10,500	$17,000
Note: Medium costs are mid-points between high and low. Low and high rounded to nearest $1,000, medium rounded to nearest $500.			

Table 6. Estimated Aggregate Costs for All Directly Impacted Vessels

Required installation	Number of vessels	Low cost estimate	Medium cost estimate	High cost estimate
No additional components needed.	27	$0	$67,500	$135,000
Additional camera(s) near existing cameras	22	$44,000	$132,000	$220,000
Additional camera(s) not near existing cameras	12	$36,000	$96,000	$156,000
New system	7	$28,000	$73,500	$119,000
Total	68	$108,000	$369,000	$630,000
Note: Medium cost estimates are mid-points between high and low. Low and high rounded to nearest $1,000, medium rounded to nearest $500.				

The addition of video monitoring requirements will increase the agency workload and costs. It is expected that the inspection process will be incorporated with other inspections such as the annual flow scale inspection or the annual observer sampling station inspection. Based on experience gained with the annual inspection process for video monitoring (which involves review of actual video recordings), it is expected that the time each NMFS inspector will spend on each of the 38 non-longline vessels[12] will increase by between two to four hours. In addition, NMFS staff expects to review video from each of the vessels during the fishing year to insure images and camera set ups are functioning as intended. This is expected to increase agency workload by about 0.5 hours for each non-longline vessel.

Taking an intermediate time of 3 additional inspection hours to review the video and 0.5 hours for in-season review of video, for each of the 38 non-longline vessels, and using an estimated hourly rate (with benefits) for NMFS staff of $55, the additional cost of this review would be about $7,000.

NMFS OLE may choose to collect and review video as part of an investigation, but these costs are unknown and depend on the individual investigations.

Summary

The analytical results are summarized in Table 7. The benefits from improved accuracy of scale estimates pay off ultimately in improvements in fisheries stock management and in cooperative management that increase the value of the fish stock to society. These ultimate benefits cannot be estimated at this time.

12 Video cameras on longline vessels already monitor the flow scales, and this tape will not need additional review.

Table 7. Summary of costs and benefits (in comparison with status quo baseline)

Action Alternative Option	Costs	Benefits
A1: Use sand bags for tests*	23 vessels (about 1/3 of the regulated vessels) will have to start to use sand bags. Tests may take longer, need to store sand bags, small purchase price.	Improve scale-testing accuracy; eliminate a potential way to manipulate test results; tests can take place when relatively few fish are aboard.
A2: Daily electronic reporting*	Some additional time required to input – into an existing daily electronic report - a small amount of information for each test Some vessels will have to adopt use of electronic logbooks and will incur costs for this.	Reduced potential for fraud and improved ability for NMFS to monitor scale status during the year.
A3: Document failed tests*	Additional record keeping when multiple tests take place.	Less bias in overall test results. Ability to monitor scale results.
A4: Clarify regulations on testing frequency*	Number of tests should not be affected, but a small number of vessels may be required to suspend fishing for testing more often.	Better consistency in reporting through time. Enhanced regulatory clarity.
A5: Change maximum allowable percent error	Costs of changing the maximum permissible error to 2 percent or to 1 percent are difficult to estimate. They could be substantial if vessels are forced to end trips prematurely and return to port for flow scale adjustments or repairs. Costs would be greater for the 1 percent threshold than for the 2 percent threshold.	If catch estimates are made more precise, there would be benefits for stock management and for cooperative management. Benefits would be greater for the 1 percent threshold than for the 2 percent threshold. Benefits may be limited if vessels keep testing until they reach the threshold but actual scale performance reverts to mean during operations.
B: Log calibrations and faults*	The estimated cost of new software for the fleet is about $136,000. Ten vessels may be required to replace existing scales sooner under this action than they otherwise would have done. The new scales are estimated to cost $30,400 each. NMFS does not know when this replacement might have occurred for these vessels in the absence of this regulation. For illustrative purposes, it was assumed that these units could have been used	Automatic recording of flow scale fault conditions and calibrations will enhance the audit trail, provide useful diagnostic information to vessels and NOAA staff, and highlight patterns of improper scale calibration for NOAA investigators.

	for five more years. The total cost to all of these 10 vessels of moving the replacement date forward five years was estimated to be about $41,000.	
C: Require video monitoring of scales*	Costs may vary considerably among vessels, depending on existing video installations. Aggregate fleetwide costs were expected to range between $108,000 and $630,000, with a midpoint estimate of about $369,000. Additional estimated costs of about $7,000 would be incurred for NMFS inspections. Costs for use of the video by NOAA OLE in enforcement cases are unknown.	NMFS will be able to verify that all catch is being weighed, that no one is tampering with the scale, and that the scale is operating correctly.
*This option is included in the preliminary preferred alternative.		

REGULATORY FLEXIBILITY ANALYSIS

NMFS must comply with the statutory requirements of the Regulatory Flexibility Act (RFA) of 1980, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 (5 U.S.C. 601-612).

NMFS is reviewing the size status of vessels directly regulated by this action and will either (a) prepare a certification memo, or (b) prepare an Initial Regulatory Flexibility Analysis (IRFA), depending on whether or not the action is found to have a “significant adverse economic impacts on a substantial number of small entities” (as those terms are defined under RFA).

CONTRIBUTORS

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