

DRAFT ALTERNATIVES FOR GROUND FISH ELECTRONIC MONITORING POLICY
ADVORSY COMMITTEE (GEMPAC) CONSIDERATION

There appears to be three major decisions needed for all elements of an EM program.

1. Is the element of the program one that should be decided by the Council or can it be left to NMFS to determine implementation?
2. If warranting a Council policy decision, should the element be specified in a prescriptive manner or as a performance standard with some criteria to measure if the standard has been met? For example, only certain species may be allowed to be discarded, therefore those species would be prescribed in regulations. An EM hardware and software system that captures the necessary images and data to document discard events may be implemented through a performance standard to provide opportunities for innovation and improvement.
3. If a performance approach is decided, should the Council specify the performance criteria and if so, what should those criteria be?

Section 1 covers major policy decision topics:

1. EM Participation and eligibility
2. Discard monitoring method
3. Species that may be discarded
4. Individual Vessel Monitoring Plans
5. Implementation of an EM program

Section 2 covers more detailed provisions for an EM program. The section titled “Data Capture and Processing” includes options for an EM system (i.e., hardware, data sources, formats) and how the fishery data would be processed (i.e., data transfer, validation, analysis).

Compliance and enforcement considerations will be discussed throughout development of alternatives. After draft alternatives are developed and a reasonable range of alternatives are selected by the Council, a detailed analysis of impacts will be drafted for further Council consideration.

Over Arching Policy Decision

Under the National Policy Environmental Policy Act, a reasonable range of alternatives must be identified for a federal action, and includes the “no-action” alternative or status quo. Prior to moving forward with an EM program, the Council must decide the level of EM use compared to the status quo of 100 percent observer coverage. Three alternatives for compliance monitoring of the trawl rationalization fishery have been identified:

Alternative 1: No Action – 100 percent industry funded observer coverage, no EM program.

Alternative 2: Use industry funded observers and an EM program.

Alternative 3: Use only an EM program.

After this decision is made, all other major policy decisions can be made to develop an EM program.

1. Major Policy Decisions

1.1 EM Participation and Eligibility

Many constituents believe that EM should be an option and not mandatory, and that participants should need to meet certain criteria to be eligible to use EM in lieu of carrying an industry funded observer. Participation in an EM program could either be mandatory or voluntary.

Alternative 1: EM is mandatory

Alternative 2: EM is voluntary

- 1) Participants must be eligible
 - a) Eligibility criteria
 - i) Must have an approved individual vessel monitoring plan (IVMP) to participate
 - ii) Must be in “good standing”. Vessels not in good standing would be required to carry an observer. The requirement to be in good standing would provide administrative incentive for compliance.
 - iii) Criteria for good standing: TO BE SPECIFIED. Need to develop continued eligibility criteria
- 2) Declaration to NMFS for use of EM (i.e., vessel will opt to use EM for a specified period of time within fishing year)
 - a) For the coming year, participants must indicate in which months, if any, it will use EM and in which months, if any, it will use an observer.

Discussion:

If the program is mandatory, the program may lack industry “buy-in”. However, a mandatory program would provide a consistent source of discard data. If participation is voluntary or a privilege, the program would provide operational flexibility that allows participants to choose between a human observer or EM. If it’s a privilege to participate then the need to maintain the privilege may provide incentives for compliance. However, it’s possible that industry funded observer monitoring costs may increase if there is less demand for observers, particularly in smaller ports. Eligibility criteria would need to be developed along with a standard for compliance for operators/owners for continued participation under a voluntary program.

1.2 Monitoring for Discards

A discard monitoring method that would adequately account for discard in each fishery is necessary. One method may not work for all so each fishery will need to be examined. However, the decision will need to incorporate options for which species or species groups may be discarded in a fishery; see section 1.3 Discard Alternatives.

Alternative 1: Self-reporting and Audit Approach

EM system is used to validate the vessel’s account for discards. Harvester reports the catch in a logbook and the EM system is used to verify the logbook information through X% of video review for verification. Electronic logbook data will likely be the sole source for discards. (Initial minimum sampling rate to be specified.)

Alternative 2: Video Census Approach

Only EM system is used to account for discards. All video is reviewed for discard events and weight estimates are applied to get total discard accounting.

Alternative 3: Video Sampling for Expansion Approach

EM system is used to account for discards. Estimate discards by the random viewing of some percentage (e.g., X%) of all fishing events across all trips or within a trip and expanding weight estimate for total discard for all trips or by trip. (Initial minimum sampling rate to be specified.)

Sub Alternative for Alternatives 1 through 3: Spatial Management Alternative

This option could be applied to any of the above approaches. Under this option, fishing activity in areas that are likely to have lower bycatch could be monitored with EM rather than using observers. Vessels would declare their fishing area prior to departure and be required to follow the appropriate fishing protocols for that area.

Discussion:

The choice of a discard monitoring method impacts costs, data and vessel turnaround times (the time required to incorporate discard data into the quota tracking system) and certainty about account status, accuracy of estimates, and degree of compliance incentives.

Cost factors include the need for an electronic logbook system, time reviewing video, fishery policy and enforcement costs, and effects on observer costs (Table 1).

Table 1. Relative costs among EM alternatives for discard monitoring.

	Cost Categories		
	Logbook	Video Review	Fishery Policy, Enforcement, & Observers
Alternative 1 (self report/audit)	Cost of E-logbook system	Cost of sampling	Possible higher per day costs than status quo.
Alternative 2 (census)	No impact	Cost of census	Possible higher per day costs than status quo.
Alternative 3 (sampling w/ expansion)	No impact	Cost of sampling	Possible higher per day costs than status quo.
Sub-Alternative (subareas)	Minor impact if paper logbooks are revised/created	Less overall reliance on EM which may result in higher average costs.	More regulatory complexity, higher enforcement costs, and more reliance on observers at higher per day costs than status quo.

Only Alternative 1 requires an electronic logbook system while Alternatives 2 and 3 rely solely on video review for the estimation of discards. Alternatives 1 and 3 both rely on sampling video and so may entail comparable video review costs which are less than the costs of full census, Alternative 2. The main impact on enforcement costs would be the subalternative which would allow the use of videos in place of observers only when vessels are fishing in certain areas. Such a provision would require the establishment of a set of management lines which may be modified over time, increasing the costs of developing fishery policy and the complexity of the regulations that fishermen would have to understand. The additional regulatory complexity would likely add to enforcement costs as well. Finally the subalternative would likely entail greater continued reliance on observers if areas to fish with EM are limited in scope and vessels choose to fish with an observer outside those areas. This would result in lesser reliance on video review compared to alternative 1. Under all alternatives here, a reduction in total demand for observers could result in higher per observer day costs than under status quo and lesser video review could result in higher average video review costs relative to other EM alternatives.

Data turnaround and vessel turn-around times will vary by alternative and depend on other aspects of policy. Longer lags to process the data may lessen certainty in a vessels' account balance prior to departure on the next trip.

Table 2. Impacts to data processing and vessel turnaround time under each discard monitoring method (alternatives 1 through 3).

	Discard Data Turnaround	Vessel Turnaround	Account Balance Certainty
Alternative 1 (validation)	Shortest - Immediate	Immediate ^{a/}	Greatest
Alternative 2 (census)	Longest - Time required for complete census of video	Immediate ^{a/}	In Between
Alternative 3 (sampling)	In Between - Time required for review of sample of video	Immediate ^{a/}	Least (incentive to mitigate by retaining all fish)

a/ Immediate, assuming continuation of current policy under which vessels are allowed to fish until data shows up in the system showing that they are in deficit.

Data turnaround times could be the fastest with Alternative 1 under which the primary source of data would be electronic logbooks. Discard data from logbooks could be transmitted immediately upon the end of a trip. Video would be reviewed later to spot check the logbook reports, validating their accuracy. Current policy allows a vessel to keep fishing until information is recorded that indicates it has incurred a deficit. Since discard information comes from observer reports, such information may come in weeks after the completion of a trip. A continuation of this policy would allow vessels to leave on its next trip with greater certainty about its account status than under status quo, assuming that it is reasonable to expect that accurate logs would be validated by video review with no changes. There has been some discussion that under a video system a vessel might not be able to leave port until after the video is reviewed but at this point that has not been recommended for consideration by the committee or the Council.

Using a video census approach (Alternative 2), and assuming a comparable video review capacity, there would be the greatest time lag between completion of a trip and resolution of the vessel account balances.¹ Vessels could maintain their own estimates of discards but there would likely be some differences with the estimates made through cameras, contributing to uncertainty about account balances until video review is completed.

Using a video sampling approach (Alternative 3) there would likely be a lesser time lag in getting discard data into the system than under Alternative 2 but greater than under Alternative 1. As with the other alternatives, the vessel could leave on its next trip immediately but there would be greater uncertainty regarding its account balance. Because vessels would not likely know which events would be expanded as a result of random sampling, this alternative would entail the greatest uncertainty regarding the vessels' eventual account balances. Vessels might attempt to mitigate this uncertainty by keeping fish they might otherwise discard (e.g. a damaged overfished species or fish for which species identification on camera might be less certain).

Alternative 3 would be the least accurate among the alternatives and could adversely impact the remainder of the fleet. If the video sample picked up some less frequent incidental catch species and expanded that result out to the entire trip or across trips, more quota for a species in low supply might be required to cover the trip, resulting in less availability of quota pounds of that species for the remainder of the fleet. The relative accuracy of Alternatives 1 and 2 would depend on the degree of compliance incentive for accurately filling out the e-logbooks. Assuming good-faith compliance, Alternative 1 would provide two estimates as compared to the single estimate provided by the census approach. Inevitably there would likely be some discrepancy between the two and rules would be needed on which estimate to use. Example rules include: the higher of the two, the camera estimate, or the logbook estimate unless the camera estimate was higher by some threshold amount. The third approach might create an incentive for underreporting. Also required would be a rule for the amount of deviation between camera reports and logbook reports that would have to be observed for a vessel to be considered out of compliance and not in good standing for purposes of being classified as an eligible participant in the EM system (see Section 1.0). However, overall the first approach would provide an ongoing assessment of the performance of the video review for upward bias. If over time the cameras consistently overestimated relative to the logbooks it is likely that such overestimation would stimulate complaints and a response to improve accuracy. If there were consistent underestimation, this might also be detected by video reviewers comparing video estimates to logbooks. For Alternative 2, there would be no separate data stream available to indicate possible biases. On the other hand, Alternative 2 would provide an independent census of the entire trip and not rely on expansions. If video review results in unbiased estimates, the results might be more accurate than Alternative 1 but less information would be available to validate the video estimates (compared to Alternative 1).

Under all alternatives there may be some incentive to frustrate the video monitoring system by discarding off camera or otherwise interfering with camera performance. On the other hand, the chances of payoff from discarding off camera would be lower because the review is sampling

¹ Note: There would have to be some higher level of video review capacity than under Alternatives 1 or 3, otherwise video review would constantly fall behind by longer and longer amounts.

rather than census. Under Alternative 1 there would also be an opportunity to under-report some discard events in hopes that they would not be sampled. Under Alternative 3 on the one hand there might be the greatest incentive to do so, in that, if an event is sampled and some reporting of discard is avoided then the payoff would be greater (the reduced discards reported for the expanded estimates) than would be the case for the video census.

Useful information to gather to inform the analysis:

What are the sampling rates of other systems (or is census used)?

Are there any systems that don't also have logbooks and are they e-logbooks?

Cost estimates for video census vs. sample (will be driven by sampling rates).

1.3 Discard Alternatives

The Council will need to decide which species will be allowed for discard with an understanding that those approved for discard are accurately accounted for or verified through video review under the appropriate discard monitoring method. Currently, under the trawl rationalization program each fishery may discard or is required to discard certain species. Under an EM program, discard events will be documented with video however it may be difficult to identify some species or differentiate between species. There are four alternatives identified that allow for discard (Table 3); they range from full retention (no discard allowed) to discard at will (discard any species). Table 3 provides the species that may potentially be discarded under each alternative. The discard species are grouped by catch share groundfish species, non-catch share groundfish species, non-groundfish species, prohibited species (halibut, salmon and dungeness crab), and ESA/MMPA protected species (turtles, marine mammals, seabirds, etc). The alternatives reference discards of catch share and non-catch share species. These species lists are different for the IFQ and mothership co-op fisheries. Tables 4 and 5 identify which species are considered catch share and non-catch share species for each of these fisheries. Table 6 contains ESA-listed species that may be found in the area of operation for groundfish fisheries.

Discard events are categorized as selective (intentional discard) and non-selective (discard that was not intentional). Under each alternative, different options may be selected for different gear groups; therefore, *options* to selectively discard certain species or species groups, and *requirements* to selectively discard certain species are noted in the table.

Alternative 1: Full retention

1. No selective discard. Retain all catch share species and non-catch share groundfish species for the IFQ and co-op fisheries (see Table 4 and 5, respectively); non-groundfish species; prohibited species; ESA species (Table 6); and MMPA species.
2. No non-selective discard.

Alternative 2: Maximize Retention

1. No selective discard for catch share species, non-catch share groundfish species
2. No selective discard for non-groundfish species (excluding species on the prohibited species or protected species lists.
3. Allow selective discard of trash, mud coral, etc.

4. No selective discards of prohibited species except when midwater trawl IFQ vessels sort at sea; MS processors must discard prohibited species.
5. Require selective discards of ESA and MMPA species (protected species).
6. Allow non-selective discards for safety, "bleeding net", zipper accidentally opened, or fish came off hook. Non-Selective discards will be debited from IFQ vessel accounts and co-op allocations where appropriate (fish gilled in the net are not currently counted in observer estimates).

Alternative 3: Retention of Catch Share Species With Options.

1. No selective discard for catch share species with options that allow selective discard of some catch share species; options not mutually exclusive. There must be adequate camera species identification and weight estimates for discard of catch share species. Proposed selective discard list for groundfish (sub-options are noted):
 - a) Catch share species
 - Option a – Allow discard of flatfish
 - Option b – Allow discard of lingcod and sablefish
 - Option c – Allow discard of all non-rockfish groundfish (full retention of rockfish only)
 - b) Non-catch share groundfish species
2. No selective discard for non-groundfish (excluding prohibited or protected species)
 - Option d – Allow discard of all non-groundfish species
2. Allow selective discards of trash, mud, coral, etc.
3. Require selective discards of prohibited species except when midwater trawl IFQ vessels do not sort at sea; MS processors must discard prohibited species.
4. Require selective discards of ESA and MMPA species.
5. Allow non-selective discards for safety, "bleeding net", zipper accidentally opened, or fish came off hook or gilled in net. Non-Selective discards will be debited from IFQ vessel accounts and co-op allocations where appropriate (fish gilled in the net are not currently counted in observer estimates).

Alternative 4: Discard At Will (Status Quo)

1. May discard catch share species, non-catch share species (e.g., at-sea whiting set-asides)
2. May discard non-groundfish (excluding prohibited or protected species).
3. Allow selective discard of trash, mud coral, etc.
4. Require selective discards of prohibited species except when midwater trawl IFQ vessels do not sort at sea; MS processors must discard prohibited species.
5. Require discards of ESA and MMPA species (protected species).
6. Allow non-selective for safety, "bleeding net", zipper accidentally opened, or fish came off hook or gilled in net. Non-Selective discards will be debited from IFQ vessel accounts and co-op allocations where appropriate (fish gilled in the net are not currently counted in observer estimates).

Table 3. Selective species discard alternatives for catcher vessels only. Key - White: No Discard/must retain species; Gray: May Discard; Black: Discard Required; Crosshatch: No discard with exceptions or options.

Species Discarded	Alt 1. Full Retention					Alt 2. Maximize Retention					Alt 3. Retention of Catch Share Species with suboptions					Alt 4. Discard at will				
	MS CVs MWT CO-OP	IFQ Program Fisheries				MS CVs MWT CO-OP	IFQ Program Fisheries				MS CVs MWT CO-OP	IFQ Program Fisheries				MS CVs MWT CO-OP	IFQ Program Fisheries			
SS MWT (whiting and Non-whiting) ^{a/}		BTW	Fixed Gear (LL)	Fixed Gear (POT)	SS MWT (whiting and Non-whiting) ^{a/}		BTW	Fixed Gear (LL)	Fixed Gear (POT)	SS MWT (whiting and Non-whiting) ^{a/}		BTW	Fixed Gear (LL)	Fixed Gear (POT)	SS MWT (whiting and Non-whiting) ^{a/}		BTW	Fixed Gear (LL)	Fixed Gear (POT)	
Catch share species										See Option c	See Option a, b, e	See Option a, b, e	See Option a, b, c	See Option a, b, e						
Non-catch share species										Option a, b, c	Option e	Option a	Option c	Option e						
Non-FMP/Not Prohibited										Option d	Option d	Option d	Option d	Option d						
Other (trash, mud, coral)																				
Prohibited: Halibut					1,5	1,6				3	4				2	4				
Prohibited: Salmon, Dungeness crab OR/WA					1,5	1,6				3	4				2	4				
ESA/MMPA																				
Exceptions					1, 6	1,6	1, 6	1,6	1,6	1,5,6	1,5,6	1,5,6	1,5,6	1,5,6	1,2,6	1,2,6	1,2,6	1,2,6	1,2,6	

a/ No regulatory distinction between non-whiting and whiting MWT trips. For example chaffing gear regulations in the MWT fishery apply to both types of activity.

Exceptions:

1. Non-selective discard for safety, "bleeding net", zipper accidentally opened, fish came off hook, gilled in net
2. Unmarketable (e.g., small size, damage, sand fleas)
3. MS CVs must retain halibut, salmon, and crab and MS must discard
4. SS midwater trawl IFQ trip must discard halibut, salmon, and crab if sorting at sea.
5. SS IFQ may discard minor amounts of catch
6. There may be exceptions to retain marine mammals, seabirds, and turtles for necropsy.

Options: (not mutually exclusive)

- a. Allow discard of flatfish
- b. Allow discard of lingcod and sablefish
- c. Allow discard of all non-rockfish groundfish
- d. Allow discard of all nongroundfish species

Table 4. IFQ program and Non-IFQ groundfish species groups that are noted in Table 3 as potential discards. Source regulations are noted in each list.

Catch share species (IFQ program groundfish species, From: 660.140(c)(1))	Non-catch share species (Non-IFQ Groundfish Species From: Table 1 and 2 to Part 660, Subpart D -- Limited Entry Trawl Rockfish Conservation Areas and Landing Allowances for non-IFQ Species and Pacific Whiting North and South of 40°10' N. Lat.)
<p>ROUNDFISH Lingcod N. of 40°10' N. lat. Lingcod S. of 40°10' N. lat. Pacific cod Pacific whiting</p> <p>Sablefish N. of 36° N. lat. Sablefish S. of 36° N. lat.</p> <p>FLATFISH Arrowtooth flounder Dover sole English sole Other flatfish stock complex Petrale sole Starry flounder Pacific halibut (IBQ) N. of 40°10' N. lat.</p> <p>ROCKFISH Bocaccio S. of 40°10' N. lat. Canary rockfish Chilipepper S. of 40°10' N. lat. Cowcod S. of 40°10' N. lat. Darkblotched rockfish Longspine thornyhead N. of 34°27' N. lat. Minor shelf rockfish complex N. of 40°10' N. lat. Minor shelf rockfish complex S. of 40°10' N. lat. Minor slope rockfish complex N. of 40°10' N. lat. Minor slope rockfish complex S. of 40°10' N. lat. Pacific ocean perch N. of 40°10' N. lat. Shortspine thornyhead N. of 34°27' N. lat. Shortspine thornyhead S. of 34°27' N. lat. Splitnose rockfish S. of 40°10' N. lat. Widow rockfish Yelloweye rockfish Yellowtail rockfish N. of 40°10' N. lat.</p>	<p>Minor nearshore rockfish & Black rockfish Cabezon Shortbelly Spiny dogfish Longnose skate Other Fish (sharks (except spiny dogfish), skates (except longnose skate), ratfish, morids, grenadiers, and kelp greenling). Longspine thornyhead South of 34°27' N. lat. Minor nearshore rockfish & Black rockfish California scorpionfish</p>

Table 5. Co-op program groundfish species lists noted in Table 3 as potential discards.

Catch share species (Co-op groundfish species formally allocated, From: MS Co-op program species, 660.150(c)(1)(i))	
Pacific whiting	Pacific Ocean perch
Canary rockfish	Widow rockfish
Darkblotched rockfish	
Non-catch share species (At-Sea Whiting Fishery Annual Set-Asides, 2013, From Table 1d. To Part 660, Subpart C)	
Arrowtooth Flounder	Minor Slope Rockfish, N. of 40°10 N. lat.
BOCACCIO, S. of 40°10 N. lat.	Minor Slope Rockfish, S. of 40°10 N. lat.
Chilipepper, S. of 40°10 N. lat.	Other Fish, Coastwide
COWCOD, S. of 40°10 N. lat.	Other Flatfish, Coastwide
Dover Sole, Coastwide	Pacific Cod, Coastwide
English Sole, Coastwide	Pacific Halibut, Coastwide
Lingcod, N. of 40°10 N. lat. 15	Petrable Sole, Coastwide
Lingcod, S. of 40°10 N. lat.	Sablefish, N. of 36° N. lat.
Longnose Skate, Coastwide	Sablefish, S. of 36° N. lat.
Longspine Thornyhead, N. of 34°27 N. lat.	Shortspine Thornyhead, N. of 34°27 N. lat.
Longspine Thornyhead, S. of 34°27 N. lat.	Shortspine Thornyhead, S. of 34°27 N. lat.
Minor Nearshore Rockfish, N. of 40°10 N. lat.	Starry Flounder, Coastwide
Minor Nearshore Rockfish, S. of 40°10 N. lat.	YELLOWEYE, Coastwide
Minor Shelf Rockfish, N. of 40°10 N. lat.	Yellowtail, N. of 40°10 N. lat.
Minor Shelf Rockfish, S. of 40°10 N. lat.	

Table 6. ESA-listed species that may be found in the area of operation for groundfish fisheries.

ESA Species	
Green sturgeon (<i>Acipenser medirostris</i>)	Southern Resident killer whales (<i>Orcinus orca</i>)
Eulachon (<i>Thaleichthys pacificus</i>)	Guadalupe fur seals (<i>Arctocephalus townsendi</i>)
Humpback whales (<i>Megaptera novaeangliae</i>)	Green sea turtles (<i>Chelonia mydas</i>)
Steller sea lions (<i>Eumetopias jubatus</i>)	Olive ridley sea turtles (<i>Lepidochelys olivacea</i>)
Leatherback sea turtles (<i>Dermochelys coriacea</i>)	Loggerhead sea turtles (<i>Carretta carretta</i>)
Sei whales (<i>Balaenoptera borealis</i>)	Short-tailed albatross (<i>Phoebastria albatnfs</i>)
North Pacific Right whales (<i>Eubalaenajaponica</i>)	Marbled murrelet (<i>Brachyramphus marmoratus</i>)
Blue whales (<i>Balaenoptera musculus</i>)	Southern sea otter (<i>Enhydra lutris nereis</i>)
Fin whales (<i>Balaenoptera physalus</i>)	California least tern (<i>Sterna antil/arum browni</i>)
Sperm whales (<i>Physter macrocephalus</i>)	

Discussion

Key aspects of the decision the species for which discards will be allowed include the camera's ability to capture required information, impacts on video review costs, and impacts on the collection of biological information.

With respect to camera ability, for non-IFQ species discards the key is the ability to differentiate the non-IFQ species discards from IFQ species in order to ensure that IFQ species are properly

accounted for. For non-IFQ species, further speciation (beyond ensuring that the discard is a non-IFQ species), weights, or other measures would not be required. For IFQ species, the camera system would need to identify the exact species and also generate a video image with enough quality to estimate weight using a video reviewer or through length weight relationships (but other technologies may develop over time).

The more species are discarded, the more events will likely require more careful video review, possibly increasing costs. The degree of cost increase will depend on the technologies that develop over time to automate the video review and species identification/measurement process.

With full retention, an opportunity is generated for the shoreside collection of biological information which is currently collected by at-sea observers. As the scope of allowed discards increases, the opportunity for shoreside collection of biological data decreases. Such reductions might be inversely related to the amount of biological observer coverage required under the program. Evaluation of this potential impact will require input from the West Coast Groundfish Observer Program.

1.4 Individual Vessel Monitoring Plans (IVMP)

A major policy question is whether to have IVMPs as part of the EM program and, if so, the duration of effectiveness of such plans. It's likely that these plans will be required to facilitate an effective program and serve as a clear plan for discard documentation, installation and maintenance an EM system, protocols for data storage and transfer, among other things. Each vessel operator/owner would be responsible for developing an IVMP for the vessel and acquiring the needed approval. It's likely that NMFS would approve the plan and determine when and how long it would be effective. Vessel specific fish handling protocols may need to be developed to provide clear visuals of species discarded. A general list of the categories to be included in the IVMP is provided here but specifics for these elements and the criteria to be met for approval would be specified in Section 2, Data Capture and Processing.

- 1) Approval of plans:
 - a) Approved by NMFS based on criteria specified in regulation

- 2) Duration of Effectiveness:
 - a) Plan modification provisions
 - b) Monthly, annual, quarterly plan, etc
 - c) Specified by NMFS or IVMP is set between fisher and provider

- 3) Categories of information in an IVMP (specifics identified in Section 2):
 - a) Type of system
 - b) Hardware
 - c) Software
 - d) Emergency protocols
 - e) Back-up equipment use protocols
 - f) Catch handling protocols
 - g) Layout of vessel
 - h) Screen shots of all camera views
 - i) Number of cameras needed with placement specifications

- j) Care and maintenance of the EM system
- k) Types of sensors and data for sensors to capture
- l) Download/maintenance schedule
- m) Logbook format (electronic or paper)

1.5 Implementation

Implementation of an EM program could be done for all fisheries at one time through regulation. However, there may be other options. Implementation of an EM program could be done through a pilot program using an Exempted Fishing Permit (EFP). For example, an EM program may be developed for a fishery then implemented on a temporary basis through an EFP to identify issues and improve the program before it is implemented full scale for a particular fishery or all fisheries. It could also be done through a “phased-in” approach. For example, if development of an EM monitoring program (i.e., regulations, camera system, EM providers, review process, accounting protocols, enforcement, etc.) is ready for use in the midwater trawl fishery then NMFS could implement the program by regulation before other EM programs are fully developed for use in other fisheries such as the bottom trawl. Phasing in could be organized in a number of ways.

Alternative 1: Implement EM program for all fisheries at one time

Alternative 2: Phase in with a pilot program with EFPs

Alternative 3: Phase in by sector/gear

2. Data Capture and Processing

The success of an EM program relies on the ability to capture the data and process it in a timely manner. There are multiple ways to set up a system and many details are absent here; however, some general topics are listed here to begin development of a system.

2.1 Vessel Hardware and Data Maintenance Onboard

1) Data formats:

Alternative 1: Specific format(s)?

Alternative 2: Open source format to utilize the video images using a range of commercially available viewers, without having to purchase licenses from vendors who collected the data. NMFS policy encourages the use of open source code or standards that facilitate data integration and offer long-term cost savings rather than becoming dependent on proprietary software.

2) Video Hardware:

Alternative 1: Analog

Alternative 2: Digital

Alternative 3: Both Alternatives 1 or 2 can be used

Alternative 4: Other?

3) Logbook Data Source: It is assumed that electronic logbooks would be required processed by NMFS for quota pound accounting. Without such logs, the time required for video review would expand and likely make the program cost prohibitive. The fields and data format would be specified by NMFS.

4) Data Storage:

Alternative 1: Only harddrives

Alternative 2: Hard drives in combination with cloud storage.

2.2 Data Transfer Processes

Protocols would need to be established for data transfer. Since the data could potentially be used in enforcement actions, data transfer protocols would have to address chain of custody issues.

Data protocols may vary by sector. For example, mothership catcher vessels may seldom return to port. This may not only affect the volume of data that they would have to store but also the data transfer protocols used. If the data transfer processes are to be included in the Council recommended policy then both generic provision (provisions applying to all vessels or all vessels of a certain class) and individual vessel performance criteria should be specified. Protocols may also vary based on the type of data being transferred (video, electronic log, or data logger).

1) Video transfer

- a) Timing of transfers
- b) Channel for data transfer (possibilities include)
 - i) Hard drive removal/replacement
 - (1) Transmission via internet shoreside
 - (2) Physical transfer of hardware to reviewers
 - ii) Other?
- c) Other necessary provisions?

2) Electronic logbook

- a) Timing of transfers
- b) Channel for data transfer (possibilities include)
 - i) Hard drive removal/replacement
 - (1) Transmission via internet shoreside
 - (2) Physical transfer of hardware to reviewers
 - ii) Wifi or cellular transmittals
 - iii) Thumbdrive submission
 - iv) Through VMS
- c) Other necessary provisions?

3) Data loggers

- a) Timing of transfers
- b) Channel for data transfer (possibilities include)
 - i) Hard drive removal/replacement
 - (1) Transmission via internet shoreside
 - (2) Physical transfer of hardware to reviewers
 - ii) Wifi or cellular transmittals
 - iii) Thumbdrive submission
 - iv) Through VMS
- c) Other necessary provisions?

2.3 Data Processing, Validation, and Analysis

EM data processing would likely involve analysis of EM sensor, video data, and electronic logs. The following is an outline of some of the considerations to be taken up under this topic.

- 1) Video review and log comparison
 - a) Potential reviewers
 - i) Alternative 1: Sustainable Fisheries Division
 - ii) Alternative 2: Pacific States Marine Fisheries Commission
 - iii) Alternative 3: Independent contractor
 - b) Review process:
 - i) Percent reviewed (depends on method chosen to monitor discards)
 - (1) Alt 1: X% of all trips are reviewed, (percentage of review may increase if compliance issue)
 - (2) Alt 2: Census of all trips
 - (3) Alt 3: Radom selection of discard
 - ii) Match video segments with logbook discard events; may need to define audit units that match fishing logs units (i.e., fishing events). For some fisheries fishing events are not clearly defined to facilitate an audit.
 - (a) Include sensor data in video to verify time and location of fishing events
 - (b) Use GPS data in logs
 - (c) Use data logger
 - iii) Validation:
 - (1) Use observer data from an EM trip to validate data collected (video and/or logbook)
– on trips for which the biological observers overlap with EM.
 - (2) Species identification capabilities
 - (3) Weight estimation capabilities
 - (4) Protocols for additional video review when non-compliance issues arise;
 - (a) Create incentives to comply (management incentives vs. enforcement action)
 - (a) Look at ways the Alaska co-ops model might be used to implement the program, e.g., self-imposed sanctions within a group or fleet
 - c) Logbooks
 - i) Requirements
 - (1) Require only electronic logs?
 - (2) Option to use either one?
 - ii) Electronic
 - (1) Format
 - (2) Minimum data fields needed (standardize)
 - (3) Submission requirements
 - iii) Paper
 - (1) Minimum data fields needed (standardize)
 - (2) Submission protocol
 - (3) Develop method to enter data and match with video