To: The Nature Conservancy (TNC)
Fr: Kate Quigley, Cap Log Group, LLC (CapLog)
Dt: October 20, 2012
Re: Introduction to Economic Model and Summary of Monitoring Concepts for the West Coast Groundfish IFQ Program

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In September 2012, CapLog was asked to work with The Nature Conservancy (TNC) and an advisory group of fishing representatives from multiple fishing communities, as well as other NGOs to complete two tasks:

(1) Develop a simple tool that will help stakeholders assess the potential impact on individual groundfish fishing businesses and their communities as the fishing industry takes responsibility for paying for 100% on-board monitoring and other fishery management costs.

(2) Present a short summary of monitoring tools that have been used in other fisheries to reach monitoring goals comparable to the West Coast Groundfish IFQ Program (the "IFQ Program").

Economic Model and Findings

CapLog solicited 2011 economic data from twelve groundfish fishing businesses in several communities in California and Oregon. The businesses approached included two gear types: trawl and pots/traps. The average per trip (groundfish) landings for these vessels ranged from 2,000 to 35,000 pounds. Their cost and landings information allowed CapLog to build a model that can be refined and shared with West Coast fishing operations and communities. In addition, this model has provided individuals volunteering data a detailed snapshot of both their current financial performance and the potential financial impact on their businesses of increased responsibility for covering monitoring and management costs. Find below summary findings from the participating vessels, as well as an explanation of the model intended for vessels, their communities and other industry stakeholders. *CapLog does not intend for the summary information provided below to be considered actual projections; rather we view this paper and the associated model as a tool to contribute to thinking about the impact of different decisions on the financial viability of both vessels and communities of vessels.* Copies of the model will be available to interested parties on-line at: http://www.caploggroup.com/Cap_Log_Group/Tools.html

Monitoring Standards and Tools

CapLog worked with a team of advisors that included persons with significant experience in the West Coast Groundfish IFQ Program, as well as international experts to: (a) Summarize recent and existing studies of monitoring tools; (b)Outline possible monitoring objectives that would support the goals of the IFQ Program; and (c) Collate a few examples of monitoring tools that have been used in similar fisheries within and outside of the US. *CapLog does not seek to provide a comprehensive review or analysis of such tools; as documented in the first section, such work is already underway with regards to electronic monitoring in this fishery. Rather, CapLog seeks to identify practices and tools that are being tested or have been used in other multispecies trawl fisheries with bycatch concerns in order to help others explore useful monitoring approaches and tools used elsewhere.*

Economic Model and Findings

The financial viability of groundfish fishing businesses will be impacted when the industry becomes responsible for paying for 100% on-board observer coverage and other fishery management fees. While some businesses may continue to operate their vessels for reasons unrelated to the financial viability of groundfish fishing (e.g., in order to provide work for crew outside of other fishing seasons), the increased costs associated with covering monitoring will potentially make their groundfish fishing businesses less viable. Persons knowledgeable and active in the fishery will likely not be surprised by this statement.

Summary of Economic Findings from Participating Vessels

Twelve vessels provided some level of data (e.g., costs, landings, revenue). This data was used to build an economic model for individual and multiple vessels. For purposes of showing how the model might be used, below we present data from five vessels that provided the most complete data and agreed to share this information with the public. **These vessels may or may not be a representative sample of the over 100 active vessels in the fishery. Readers should NOT assume that the information presented below can be extrapolated across the fleet.** That said, the analysis suggests that the viability of various fishing communities will likely be affected to different degrees by the shift to industry-paid observer coverage.

Sample Use of Model to Understand Changes in Cost for Vessels or Communities

The model can show how the shift in responsibility for paying for 100% on-board observer coverage and other scheduled management fees may affect a group of vessels. The tables below were generated using the model; they show the impact of the projected increase in costs resulting from monitoring and managements costs being shifted to industry.

Table 1: Estimated Current Monitoring and Management Fees for IFQ Program

Based on actual vessel 2011 data and on current industry payment responsibilities

Monitoring Regime	Gross Revenue from Groundfish Trips	Trawl Buyback Fee (5%)		IFQ Cost Recovery Fee (3%)		Groundfish Trip Monitoring Costs (recurring)		First Receiver Catch Monitoring Costs (recurring)		Total Management and Monitoring Costs	
		Cost	% of Rev	Cost	% of Rev	Cost	% of Rev	Cost	% of Rev	Cost	% of Rev
Vessel One	$ 660,000	$ 33,000	5.0%	$ -	0.0%	$ 26,015	3.9%	$ -	0.0%	$ 59,015	8.9%
Vessel Two	$ 350,000	$ 17,500	5.0%	$ -	0.0%	$ 10,080	2.9%	$ -	0.0%	$ 27,580	7.9%
Vessel Three	$ 308,000	$ 15,400	5.0%	$ -	0.0%	$ 7,344	2.4%	$ -	0.0%	$ 22,744	7.4%
Vessel Four	$ 276,000	$ 13,800	5.0%	$ -	0.0%	$ 5,124	1.9%	$ -	0.0%	$ 18,924	6.9%
Vessel Five	$ 352,000	$ 17,600	5.0%	$ -	0.0%	$ 6,100	1.7%	$ -	0.0%	$ 23,700	6.7%

Table 2: Estimated Future Monitoring and Management Fees for IFQ Program

Based on actual vessel 2011 data and on planned industry payment responsibilities

Monitoring Regime	Gross Revenue from Groundfish Trips	Trawl Buyback Fee (5%)		IFQ Cost Recovery Fee (3%)		Groundfish Trip Monitoring Costs (recurring)		First Receiver Catch Monitoring Costs (recurring)		Total Management and Monitoring Costs	
		Cost	% of Rev	Cost	% of Rev	Cost	% of Rev	Cost	% of Rev	Cost	% of Rev
Vessel One	$ 660,000	$ 33,000	5.0%	$ 19,800	3.0%	$ 75,625	11.5%	$ 4,582	0.7%	$ 133,007	20.2%
Vessel Two	$ 350,000	$ 17,500	5.0%	$ 10,500	3.0%	$ 56,000	16.0%	$ 1,575	0.5%	$ 85,575	24.5%
Vessel Three	$ 308,000	$ 15,400	5.0%	$ 9,240	3.0%	$ 40,800	13.2%	$ 2,039	0.7%	$ 67,479	21.9%
Vessel Four	$ 276,000	$ 13,800	5.0%	$ 8,280	3.0%	$ 18,900	6.8%	$ 1,260	0.5%	$ 42,240	15.3%
Vessel Five	$ 352,000	$ 17,600	5.0%	$ 10,560	3.0%	$ 22,500	6.4%	$ 2,250	0.6%	$ 52,910	15.0%

The vessel data analyzed on the previous page validates a concern voiced by many of the groundfish fishermen that additional monitoring cots will negatively impact the fishing fleet. The primary reasons include:

a. *The cost of observers varies across the fishery.* The cost of observers is not constant across vessels or communities. The cost to the vessel varies based on the provider(s) available in your region and the number of trips the vessel takes or the vessels in the community take. Costs to the vessel currently can vary from about $61.50 to $290.00 per sea day ($390 to $620 without NMFS financial assistance), depending on how many trips are taken in a month. As such, certain communities of vessels with higher sea day costs actually pay more now and will continue to do so in the future. This finding is reflected in the difference in costs currently borne by different vessels in the sample (for example, Vessel One currently pays a higher amount per day of on-board monitoring than Vessel Three).

b. *The observer companies may not be sufficiently profitable in many locations in the fishery to continue to provide consistent observer coverage at current rates.* There are indications that observer providers may be unable to supply observers to many locations at the current prices. If observer providers are not profitable at current prices, they will either have to increase their rates for observer coverage or decrease service offerings in certain areas; both outcomes would exacerbate the financial impact to certain vessels. Further discussions with observer companies may be warranted to inquire about likely future sea day prices for different communities, as well as to identify possible ways to structure contracts to ensure the profitability needed to provide such coverage.

<u>Using Model to Estimate Impact on Financial Viability of Groundfish Fishing Businesses</u>
In addition to understanding the relative cost of monitoring and management fees now and in the future, the model is built to allow users to consider the potential impact of this shift on the financial viability of groundfish fishing businesses on a vessel level or within a particular community. It does so by allowing the user to consider three separate but related income streams associated with the IFQ Program: quota leasing, groundfish fishing operations and groundfish labor (captains and crew).[1] This allows users to make reasonable assumptions and use real data from groundfish fishing businesses on landings, revenue and operating costs to understand impact on their fishing businesses or a community of fishing businesses. They can compare the business' net income with an opportunity cost (adjusted for the number of days fishing for groundfish) to suggest a likelihood of continued participation in the West Coast Groundfish IFQ Program. The model allows them to enter such data and assumptions and then explore the impact of the change from current responsibilities for paying for monitoring and other management fees to planned future responsibilities for the 100% on-board monitoring program and the IFQ Cost Recovery Fee.

[1] Although there is overlap between each (e.g., business owners owning QS, vessel captains owning fishing businesses), in order to understand the financial viability of groundfish fishing businesses and fishing communities supported by those businesses, it is helpful to consider these separate income streams. For example, a viable groundfish fishing business ultimately needs to generate sufficient revenue to pay for the full costs of participating in the fishery and operating its business. These full costs include both leasing all of the QP required to land groundfish (from affiliated or unaffiliated entities) as well as paying a captain and crew (even if it may own QP and have an owner-captain that does not receive a crew share). If such cost factors are not included, the groundfish business may be subsidized by either the owner of the QS or by the captain and crew.

The model may be helpful in exploring the differential impact in particular communities of the shift in responsibilities for paying for these fees. In doing so, it is important to recognize that some vessels may choose to remain active in the fishery for non-economic reasons that are not fully considered by this tool.

Using Model to Estimate the Effect of Other Monitoring Approaches on Groundfish Fishing Vessels Businesses

In addition to understanding the potential economic impact (both on individual vessels and communities of vessels) of the shift in payment for the 100% on-board monitoring program, the model allows users to begin to explore how alternative monitoring tools, such as electronic monitoring, might affect the costs and the subsequent financial viability of vessels and communities. The model classifies both one-time (investment) and recurring costs for electronic monitoring, based on assumptions entered by users.

Table 3 below uses an estimate of $165 per day for the recurring electronic monitoring costs and assumes 100% electronic monitoring and no on-board monitoring for the sample vessels. It holds all of the other data and assumptions constant. The example highlights how a reduction in one of the programmatic costs associated with groundfish fishing could affect the profitability of a particular vessel or a group of vessels.

Table 3: Estimated Future Monitoring and Management Fees for IFQ Program with 100% Electronic Monitoring (rather than 100% On-board Monitoring)

Based on actual vessel 2011 data and on planned industry payment responsibilities

Monitoring Regime	Gross Revenue from Groundfish Trips	Trawl Buyback Fee (5%)		IFQ Cost Recovery Fee (3%)		Groundfish Trip Monitoring Costs (recurring)		First Receiver Catch Monitoring Costs (recurring)		Total Management and Monitoring Costs	
		Cost	% of Rev	Cost	% of Rev	Cost	% of Rev	Cost	% of Rev	Cost	% of Rev
Vessel One	$ 660,000	$ 33,000	5.0%	$ 19,800	3.0%	$ 24,956	3.8%	$ 4,582	0.7%	$ 82,339	12.5%
Vessel Two	$ 350,000	$ 17,500	5.0%	$ 10,500	3.0%	$ 23,100	6.6%	$ 1,575	0.5%	$ 52,675	15.1%
Vessel Three	$ 308,000	$ 15,400	5.0%	$ 9,240	3.0%	$ 16,830	5.5%	$ 2,039	0.7%	$ 43,509	14.1%
Vessel Four	$ 276,000	$ 13,800	5.0%	$ 8,280	3.0%	$ 6,930	2.5%	$ 1,260	0.5%	$ 30,270	11.0%
Vessel Five	$ 352,000	$ 17,600	5.0%	$ 10,560	3.0%	$ 8,250	2.3%	$ 2,250	0.6%	$ 38,660	11.0%

As stated before, the results from five vessels presented above do not necessarily represent the situation across the entire fishery; that said, further use of models like this one at a fishing community level may be helpful in informing stakeholders of the effects of the increased responsibility for paying for the costs of management and monitoring on vessels active in their communities. Likewise, they can help inform how alternatives to 100% on-board monitoring that meet the necessary monitoring requirements may improve the economic viability of fishing vessels and communities in this fishery.

Monitoring Standards and Tools

Summary of Electronic Monitoring Pilot Studies in the Pacific

Morro Bay

TNC contracted with Archipelago to expand upon a 2008 study in Morro Bay. Six vessels were monitored over a five and a half month period and for a total of 332 hauls, taking place during over 125 days at sea. EM system data collection was 91% overall for all participating vessels and trips and the majority of the lost data was of low risk since it occurred during transit to and from the fishing grounds. Every vessel carried an observer and skippers filled out a haul-by-haul fishing logbook for every trip. The EM data collected was matched up and used for catch assessment comparisons with 97% of all hauls recorded by observer and fishing log.

EM and observer fishing event and catch data were available for over 105,000 total fish catch items and a total of 276 fishing events. EM data had 1% less pieces of catch than observer overall, with high agreement on piece counts of sablefish (1% difference) and grouped rockfish (4% difference), the two most important species groups of this study (for market and conservation reasons, respectively). There were 328 events compared between EM and fishing log data. The total piece comparison between EM and fishing log data was very good, since fishing log data contained 0% different total catch items and 1% more and 4% less items for sablefish and rockfishes respectively. All but one of 329 fishing events captured on video were usable (deck lights failed during a night haul on the one unusable record). While sun glare during the day and backlighting by deck lights during night hauls can adversely affect video quality, determining catch count and composition was essentially unaffected.

Pacific States Marine Fisheries Commission

In conjunction with Archipelago, the PSMFC is testing the use of electronic monitoring to demonstrate the feasibility of using electronic monitoring (EM) for compliance monitoring on selected commercial fishing vessels as an alternative to human observers.

Short Term Goals: (1) Compare EM to the observer data to determine confidence levels; (2) Set up EM review and camera install and maintenance infrastructure; (3) Solve the issues through a collaborative group.

Long Term Goals: (1) Maintain the biological integrity of the existing system; (2) Save some money for the fishermen and taxpayers; (3) Insure the confidence of the landing and discard data; (4) Integrate with electronic logbooks; (5) Look for opportunities to add to stock assessment information.

An update on this pilot program will be provided at the November 2012 Council meeting and is available in the Briefing Book.

Develop Video Monitoring for Full Retention Fisheries (WA, OR)
Grantee: Marine Conservation Alliance Foundation

This project will develop a video-based catch monitoring system and computer-aided video review software. By reducing the number of human observers and reviewers involved in the monitoring of full-retention fisheries, the cost of the observer program should decrease.

Full-retention fisheries or fisheries with minimal discards that do not require observer speciation should benefit from the application of video technologies, as observers often have no duties when not recording catch on deck. In such fisheries, video systems have been tested to allow for more observer coverage at lower costs and on smaller vessels that have difficulty accommodating observer, but video has generally been found to be as costly as live observer coverage, due in part to inefficient review processes. Reducing the video review time should allow for faster data turnaround and greater observer coverage in areas with fixed budgets for observers. This project will collect video from the shoreside whiting fishery off the coast of Washington and Oregon. Movement-recognition algorithms will be developed and used to develop the interface that will allow video reviewers to quickly assess significant on-deck events, eliminate unproductive review time and reduce the cost of implementing video observing programs.

Development and Evaluation of Image Recognition Software (CA)
Grantee: Fishermen's Marketing Association, Inc.

This project will develop and evaluate image recognition software that can be used to screen video images collected onboard commercial fishing boats. It will track discard activities and identify the species of fish being discarded.

Brief Overview of Monitoring Standards and Tools Used in Other Fisheries

CapLog interviewed nine fisheries monitoring experts from the US, British Columbia, Nova Scotia and New Zealand in order to identify practices and tools that have been successfully employed in fisheries with similar profiles to the non-whiting Pacific Groundfish fishery (multispecies trawl gear, constraining species and significant bycatch). CapLog identified the following fisheries as potentially the most comparable to the Pacific IFQ Program:

1) British Columbia Groundfish Trawl – 100% on-board observer coverage
2) Northeast Groundfish Trawl – 25% on-board observer coverage (including 8% on-board coverage by scientific observers)
3) EU North Sea Groundfish (Denmark, England, Scotland) – electronic monitoring
4) Australian Southeast Multispecies Trawl Fishery – 5% on-board observer coverage
5) New Zealand Multispecies Trawl – 0-30% on-board observer coverage depending on vessel size due to cost concerns
6) Nova Scotia Groundfish Fishery – 2-20% on-board observer coverage depending on area
7) Alaska Groundfish Fishery – 30-100% on-board observer coverage depending on vessel size and poundage caught for certain species

The following observations are based on the interviews and available literature:

1) Observer coverage rates (particularly those associated with trawl gear) can fluctuate from year-to-year in each fishery and are not generally available through technical reports or on-line;

2) Monitoring standards are not effectively identified in most of these programs. In many cases, once an IFQ was implemented, the existing programs were expanded without identifying what the monitoring needs were; and

3) Needs faced by each fishery varied widely. In fisheries outside the US, the monitoring frequently focused on recording marine mammal and seabird interactions. Most fisheries outside of the US did not have the depleted stock concerns that exist for West Coast Groundfish IFQ Program.

This brief overview validated the challenge facing the Council and the importance of the on-going work to test electronic monitoring tools and software for the West Coast Groundfish IFQ Program. Experts consistently identified on-board observers for trawl vessels and electronic monitoring for fixed gear vessels as the most established monitoring tools being used. The experts identified a worldwide struggle to find affordable monitoring for fisheries where only a small level of risk is acceptable. Some people have suggested focusing on the trade-offs between the monitoring tool and other options as a way to illustrate the impacts of use. One individual suggested discussing the potential trade-off between the ABC buffer and the level of monitoring used.

In summary, this initial overview highlights that the West Coast Groundfish IFQ Program has an opportunity to take an international leadership role both in establishing clear objectives (standards) for the monitoring program and in identifying and implementing affordable monitoring for a fishery with a low level of risk tolerance. One possible step in

the review of monitoring options might be for the Council to link its requirements for monitoring tools to objectives it has established for the IFQ Program.

Possible core monitoring requirements might include:

1. Documenting species, locations and weights of groundfish (a) to ensure compliance with a vessel's quota pounds and (b) to determine total mortality of groundfish species by collecting weight and species retained.
2. Determining the weight and identification of species discarded at sea.
    a. Estimating the total mortality of halibut.
3. Documenting interactions with protected species.
    a. The species and condition upon release also needs to be recorded.

Additional requirements that may or may not be part of the catch monitoring program include:

4. Collecting information on where fishing activities are occurring and what gears are being fished.
5. Collecting biological samples in order to determine stock structure, fecundity and overall spawning stock biomass estimates.
6. Collecting economic data from fishermen and first receivers in order to calculate relative contributions to both cost recovery and the buyback program and track success of the program.