AGENDA D-1(b)
DECEMBER 2007

MEMORANDUM

TO: Council, SSC and AP Members

FROM: Chris Oliver
Executive Director

DATE: November 26, 2007

ESTIMATED TIME
8 HOURS
(all D-1 items)

SUBJECT: VMS requirement for vessels using dinglebar gear

ACTION REQUIRED

Receive staff discussion paper, and take action as necessary.

BACKGROUND

An operable vessel monitoring system (VMS) is required on all federally permitted vessels in the Gulf of Alaska with mobile bottom contact gear onboard. Mobile bottom contact gear is defined as nonpelagic trawl, dredge, and dinglebar gear. The VMS requirement was implemented as part of a suite of measures to conserve and protect essential fish habitat, including a prohibition on fishing with mobile contact gear in the GOA Coral Habitat Protection Areas.

In April 2007, the Council requested a discussion paper that reviews the impacts of the VMS requirement on the dinglebar fishery for lingcod. The VMS requirement has been questioned because of the small numbers of operators, the small size of the vessels, the short period of the fishery, and the relatively small revenues generated. The paper (attached as Item D-1(b)(i)) reviews the history of the VMS requirement in the dinglebar fishery, describes the fishery, describes the usefulness of the VMS requirement, and provides cost estimates of the requirement.

At this meeting, the Council will review the discussion paper, and decide whether or not to proceed with development of a regulatory amendment analysis.

Vessel Monitoring System Requirements in the GOA Dinglebar Fishery for Lingcod

Discussion paper prepared for the North Pacific Fishery Management Council

December 2007

(This page is blank.)

Table of Contents

(This page left blank)

Executive Summary

Introduction

In April 2007 the North Pacific Fishery Management Council (Council) requested a discussion paper reviewing the impact of the vessel monitoring system (VMS) requirement on the dinglebar fishery for lingcod in the Gulf of Alaska (GOA). Dinglebar gear is a variant of troll gear, and has a long, heavy, iron bar attached to the line to keep the hooks close to the bottom.

A VMS requirement had been imposed on vessels with Federal Fishing Permits using dinglebar gear as part of a suite of measures meant to protect vulnerable bottom habitat features. The requirement has been controversial because of the small numbers of operators, the small size of the vessels, the short period of the fishery, and the relatively small revenues generated. This paper reviews the history of the VMS requirement in the dinglebar fishery, describes the fishery, describes the usefulness of the VMS requirement, and provides estimates of the costs of the requirement.

History of, and reason for, the requirement

VMS requirements were imposed on vessels with Federal fishing permits (FFPs) in the dinglebar fishery for lingcod in the GOA beginning July 28, 2006, to help enforce measures being adopted to protect certain categories of bottom habitat from gear damage under the Essential Fish Habitat (EFH) provisions of the Magnuson Stevens Fishery Conservation and Management Act. Dinglebar gear was believed to be capable of damaging bottom habitat because it is mobile and the heavy iron bar makes the gear contact the bottom.

Under EFH provisions, Habitat Areas of Particular Concern (HAPC) were identified in Southeast Alaska. Four of these areas are located in Southeast Alaska near the area where the dinglebar lingcod fishery takes place. These HAPCs are now considered the GOA Coral Habitat Protection Areas where all federally permitted vessels are prohibited from anchoring or fishing with bottom contact gear. The areas near the Fairweather Grounds and off Cape Ommaney cover a total area of 13.5 square nautical miles. Dense thickets of *Primnoa* sp. coral have been identified in these areas by NMFS and the Alaska Department of Fish and Game (ADF&G) during survey work using submersible dives. These living habitat structures grow very slowly, are sensitive to disturbance by any bottom contact gear and anchoring, and have long recovery times.

These fishing restrictions involve relatively small areas dispersed over a large section of the exclusive economic zone (EEZ), making surveillance by enforcement vessels or aviation patrols difficult with existing resources. Because of this, VMS is very helpful in enforcing management regulations designed to limit transit or fishing in defined areas. Tracking the location of fishing vessels by VMS facilitates enforcement of the EFH and HAPC management measures.

Lingcod is not a species covered in the Fishery Management Plan for Groundfish of the Gulf of Alaska (FMP). This fishery is managed by the State of Alaska. An FFP is not required to fish for lingcod. However, rockfish are caught and retained as bycatch in lingcod fisheries, and rockfish are covered under the GOA groundfish FMP. Rockfish are the primary source of bycatch in this fishery. An FFP is required to harvest and retain rockfish. Moreover, State and Federal regulations require the retention of certain types of rockfish, including demersal shelf rockfish.

State regulations (5AAC 28.010 and 5AAC 28.171) require the full retention of demersal shelf rockfish and black rockfish for Alaska's Commercial Fishery Entry Commission (CFEC) permit

holders fishing for groundfish in the Southeast District. The demersal shelf rockfish assemblage includes yelloweye, quillback, canary, tiger, copper, china, and rosethorn rockfish. A permit holder fishing for groundfish must retain, weigh, and report all demersal shelf rockfish and black rockfish taken. The Southeast District includes waters in the EEZ as well as state waters (ADF&G, news release)[1].

The fishery

The lingcod fishery takes place primarily in May and June each year. Fishermen typically fish for only one or two weeks. There is relatively little bycatch in this fishery; most bycatch is rockfish. Most vessels have Southeast Alaska home ports, although a few originate in Washington. Sitka appears to be the most important home port. Lingcod fishing is a relatively minor, but not trivial, source of annual revenue for these operations. In recent years participation in the fishery has ranged between six and twelve vessels. Vessels appear to be in the range of 40 to 50 ft length overall. There is high turnover among the vessels in the fishery. From 2001 to 2007, most vessels appear to have been active in only one or two years. Only two vessels operated in all seven years. Average revenues in 2007 were about $15,900 for participating vessels; median revenues were about $12,400.

An examination of landings records and VMS tracks indicates that eight vessels fished for lingcod with dinglebar gear in Federal waters off of Southeast Alaska in 2007. All of these carried transmitting VMS units. None of these appear to have been required to carry VMS units to comply with other regulations, thus the presence of VMS on these vessels can be attributed to their participation in this fishery. All of these vessels have applied for and received, or indicated an intention to apply for, reimbursements for the unit purchase costs.

Costs of the VMS requirement in 2007

The average cost of acquiring a VMS unit is estimated to be $2,068 per vessel. This includes the costs of purchase and freight, installation, brackets, sales tax, initiation fees with satellite providers, and initialization costs with NMFS. Annual operating costs are estimated to be $188 for vessels in this fleet. This covers a month of transmissions, plus repairs and maintenance. Vessels buying VMS to comply with this regulation are eligible for a reimbursement of the purchase costs from the Pacific States Marine Fisheries Commission (PSMFC). The PSMFC was ready to reimburse Alaska fishermen for purchase costs up to $1,750. Based on a preliminary and partial review of reimbursement records, actual reimbursements are estimated to be about $1,500.

The total costs of the VMS requirement in 2007 to the fishing operations subject to the regulation, after accounting for reimbursements, are estimated to be between $6,800 and $9,000. This includes the costs to persons buying and using the VMS, and the cost to persons who may have shifted out of the fishery due to the costs of the VMS requirement. Average costs for operations acquiring VMS and participating in the fishery were about $756 and the average costs for vessels shifting to another fishery to avoid the requirement were a maximum of about $756 per vessel. A

[1] Under Federal regulations (50 CFR 679.20(j)), the operator of a catcher vessel that is required to have a Federal fisheries permit, or that harvests individual fishing quota (IFQ) halibut with hook and line or jig gear, must retain and land all demersal shelf rockfish that is caught while fishing for groundfish or IFQ halibut in the Southeast Outside District. However, this does not appear to apply to a vessel that only retains lingcod, since this is not a groundfish covered under the FMP, and an FFP is not required to fish for it.

significant part of the costs for vessels with VMS was composed of acquisition costs, which would not recur every year. Thus average costs in future years are expected to be lower. Average revenues from the dinglebar ling cod fishery were about $15,900 in 2007; median revenues were about $12,400.

The total social costs of the regulation in 2007 were estimated to be between $17,900 and $20,200. The total social costs differ from the costs to the fishing operations themselves, because the units reimbursed by the PSMFC are a real social cost, and the sales tax paid by the fishermen is a transfer payment and not a real social cost.

Longer term costs for dinglebar operations

VMS is a permanent requirement in this fishery. Fishermen subject to the requirement would incur transmission and maintenance costs every year, and new acquisition costs as existing units wore out or became obsolete. The estimated present value of the requirement to a single vessel owner over a 20 year horizon was estimated to be about $9,000 (this assumes the first purchase of a unit would be reimbursed, but that there would be no reimbursement for later unit purchases).

(Blank page)

Introduction

Vessel monitoring system (VMS) requirements were imposed on vessels with Federal fishing permits (FFPs) in the dinglebar fishery for lingcod in the Gulf of Alaska, effective July 28, 2006, to help enforce measures being adopted to protect certain categories of bottom habitat from gear damage. VMS requirements make it possible to track vessel positions in real time with a high degree of accuracy. Because of this, they are very helpful in enforcing management regulations designed to limit transit or fishing in defined areas. However, this VMS requirement is controversial because of the small scale of this fishery. In April 2007 the North Pacific Fishery Management Council (Council) requested a discussion paper reviewing the impact of the VMS requirement on this fishery. This report responds to that request.

History of this action

In February 2005 the Council adopted amendments revising five FMPs by identifying essential fish habitat (EFH) and habitat areas of particular concern (HAPCs) and authorizing protection measures. These amendments to the groundfish, scallop, crab, and salmon FMPs were implemented July 28, 2006[2] (71 FR 36694; June 28, 2006).

The Council's action incorporated three elements that protected different classes of areas in the Gulf of Alaska (GOA). First, EFH amendments established ten GOA Slope Habitat Conservation Areas where fishing for groundfish by federally permitted vessels with nonpelagic trawl gear would be prohibited. These areas were identified based on the likely occurrence of high relief corals and rockfish in these lightly fished areas. As noted in the proposed rule for this action, the EFH environmental impact statement indicated that nonpelagic trawl gear has the largest impact on this habitat (71 FR 14473; March 22, 2006).

The second element identifies and manages HAPCs within EFH. Anchoring and fishing with bottom contact gear is prohibited in fifteen Alaska Seamount Habitat Protection Areas. Fourteen of these areas are located in the GOA. These areas were identified for this level of protection by NMFS, industry representatives, and environmental organizations during the HAPC identification process. Bottom contact gear and anchoring restrictions for these areas are needed because the areas contain especially diverse and fragile living habitat structures that are particularly sensitive to the impacts of bottom contact gear and anchoring, and have long recovery times once damaged. Seamounts contain unique oceanographic and living habitat features that are important habitat for fish (71 FR 14473; March 22, 2006).

Neither of these first two elements requires restrictions on dinglebar fishing. They either deal with non-pelagic trawling, or they restrict operations on the seamounts, where dinglebar fishing does not take place. However, the third element established the GOA Coral Habitat Protection Areas where all federally permitted vessels are prohibited from anchoring or fishing with bottom contact gear. Four of these areas are located on the Fairweather Grounds and one is located off Cape Ommaney (see Figures 9 and 10 for maps of these areas). They cover a total area of 13.5 square nautical miles. Dense thickets of *Primnoa* sp. coral have been identified in these areas by

[2] The specific amendments and FMPs were Amendments 78 and 65 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Areas, Amendments 73 and 65 to the FMP for Groundfish of the Gulf of Alaska, Amendments 16 and 12 to the FMP for Bering Sea/Aleutian Islands King and Tanner Crabs, Amendments 7 and 9 to the FMP for the Scallop Fishery off Alaska, and Amendments 7 and 8 to the FMP for Salmon Fisheries in the Exclusive Economic Zone off the Coast of Alaska.

NMFS and the Alaska Department of Fish and Game during survey work using submersible dives. These living habitat structures grow very slowly, are sensitive to disturbance by any bottom contact gear and anchoring, and have long recovery times. Restricting bottom contact gear and anchoring ensures that the living structures are protected from fishing activities that may adversely impact the habitat. (71 FR 14473; March 22, 2006) It was this action that necessitated the vessel monitoring system (VMS) requirement for vessels targeting lingcod with dinglebar gear. These vessels use bottom contact gear in the vicinity of these protected areas.

Many of the proposed fishing restrictions involve relatively small areas dispersed over a large section of the exclusive economic zone off Alaska (EEZ), making surveillance by enforcement vessels or aviation patrols difficult with existing resources. Tracking the location of fishing vessels by VMS facilitates enforcement of the EFH and HAPC management measures. In February 2005, the Council recommended the adoption of VMS requirement for all federally permitted vessels operating in the Aleutian Islands to facilitate enforcement of the EFH protection measures (71 FR 14473; March 22, 2006).

The Council did not originally recommend a VMS requirement for vessels operating in the GOA. In April 2005, during staff tasking, the Council scheduled a review and comment on the proposed rule for EFH for its June 2005 meeting. The Council expressed an interest in potential VMS requirements for GOA vessels relative to the EFH/HAPC closure areas, including review of the supplemental analyses for such VMS requirements by the Science and Statistical Committee, Advisory Panel, and Enforcement Committee (Council, April 2005 Newsletter).

In June 2005, the Council discussed potential VMS requirements for GOA vessels relative to the proposed EFH/HAPC closure areas. The Council recommended VMS requirements for vessels operating in the GOA with mobile bottom contact gear; however, the Council requested that NMFS not require VMS for fixed gear vessels, with the clarification that this recommendation not affect existing requirements promulgated as part of the Steller sea lion protection measures. Mobile bottom contact fishing gears were believed to have the greatest potential for adverse effects on sensitive sea floor habitat features (71 FR 14473; Council, June 2005 Newsletter).

The rules implementing the EFH/HAPC protection measures became effective on July 28, 2006 (71 FR 36694; June 28, 2006). The effective date for these measures was after the 2006 May-June dinglebar fishery for lingcod had ended, so dinglebar fishermen were not required to carry VMS units until the May-June 2007 fishery. The requirements in the *Code of Federal Regulations* read as follows[3]:

> 50 CFR 679.7(c)(22):
>
> ...it is unlawful for any person to do any of the following:
>
> Operate a federally permitted vessel in the GOA with mobile bottom contact gear on board without an operable VMS and without complying with the requirements at § 679.28.
>
> 50 CFR 679.28(f)(6):
>
> Your vessel's transmitter must be transmitting if...

[3] This has been modified by a subsequent regulatory amendment to correct and clarify certain parts of the original final rule effective December 10, 2007 (72 FR 63500; November 9, 2007).

(iii) You operate a federally permitted vessel in the GOA and have mobile bottom contact gear on board;

Definitions pertaining to Federal fishing regulations are at § 679.2. The definition for "operate" means "...for purposes of VMS that the fishing vessel is: (1) Offloading or processing fish; (2) in transit to, from, or between the fishing areas; or (3) Fishing or conducting operations in support of fishing." "Mobile bottom contact gear" is defined as nonpelagic trawl, dredge, and dinglebar gear.

Under 50 CFR part 679.4(b), if a vessel is used to fish in the EEZ of the GOA or Bering Sea and Aleutian Islands (BSAI) management areas, and is required to retain any groundfish caught in the EEZ, the vessel must have an FFP. If the vessel catches and retains any groundfish in the EEZ, it is also considered to be fishing for groundfish, and even if it wasn't required to retain the groundfish, it also must carry an FFP (NMFS 2007b).

Lingcod is not a species covered in the GOA groundfish FMP. This fishery is managed by the State of Alaska. An FFP is not required to fish for lingcod. However, rockfish are caught and retained as bycatch in lingcod fisheries, and rockfish are covered under the GOA groundfish FMP. Rockfish are the primary source of bycatch in this fishery. An FFP is required to harvest and retain rockfish. Moreover, State and Federal regulations require the retention of certain types of rockfish, including demersal shelf rockfish (DSR).

State regulations (5AAC 28.010 and 5AAC 28.171) require the full retention of DSR and black rockfish for Alaska's Commercial Fishery Entry Commission (CFEC) permit holders fishing for groundfish in the Southeast District. The DSR assemblage includes yelloweye, quillback, canary, tiger, copper, china, and rosethorn rockfish. A permit holder fishing for groundfish must retain, weigh, and report all DSR and black rockfish taken. This district includes waters in the EEZ as well as state waters (ADF&G, news release)[4].

The extension of the VMS requirement to dinglebar gear used to fish for lingcod is controversial because of the small numbers of operators, the small size of the vessels, the short period during which the fishery takes place, and the relatively small revenues generated. In June 2005, at the time it recommended the use of VMS on vessels with mobile bottom contact gear, but not on vessels with fixed gear, the Council requested an examination of a comprehensive approach to implementing VMS requirements in federally managed fisheries in the GOA and BSAI to address enforcement, monitoring, and safety concerns. The Council initially adopted a set of alternatives in December 2005 and modified them in April 2006 (NMFS 2007a).

In October 2006, the Council received an initial review draft of an environmental assessment/ regulatory impact review/ initial regulatory flexibility analysis (EA/RIR/IRFA) on this issue. The Council did not release the draft for public review, but instead requested the analysis of additional options, and scheduled a second review of the analysis for February 2007. One of the new options would have provided an exemption for vessels deploying dinglebar gear (NMFS 2007a).

[4] Under Federal regulations (50 CFR 679.20(j)), the operator of a catcher vessel that is required to have a Federal fisheries permit, or that harvests individual fishing quota (IFQ) halibut with hook and line or jig gear, must retain and land all DSR that is caught while fishing for groundfish or IFQ halibut in the Southeast Outside District. However, this does not appear to apply to a vessel that only retains lingcod, since this is not a groundfish within the meaning of the FMP, and an FFP is not required to fish for it.

In February, 2007, the Council received a preliminary initial review draft for the action. This document was not a complete EA/RIR/IRFA, but provided a status report on the work which had been completed on the analysis since the October meeting. This document included a section examining the impact of the dinglebar VMS requirement. This analysis examined the lingcod fishery in 2004, made estimates of the cost of the VMS requirement to the fishery under the conditions prevailing that year, and compared the costs to various measures of individual vessel production (NMFS 2007a).

At the February 2007 meeting, the Council decided to postpone indefinitely any further work on a comprehensive VMS program. The Council noted that other tools may be available to address specific problems or enforcement needs for different circumstances, and a comprehensive solution may not be optimal (Council, February 2007 newsletter). When this occurred, further analytical work was suspended on all the alternatives and options, including the proposal to exempt dinglebar vessels from the VMS requirement.

At its April 2007 meeting, the Council requested a discussion paper on VMS requirements in the dinglebar fishery for its October 2007 meeting. Council staff subsequently rescheduled delivery of the discussion paper for the Council's December 2007 meeting. Staff did so because of an existing heavy workload for the October meeting, and because it recognized that, should the Council decide to adopt a problem statement and alternatives and request a preliminary analysis in October, NMFS could not realistically have regulations in place to modify the VMS requirement prior to the May and June fishery in 2008. Thus, a delay in delivery of the discussion paper until December would not delay potential implementation of a repeal of the VMS requirement.

At its December meeting, the Council may decide to request an analysis of an action to repeal the VMS requirement on dinglebar vessels. On the most optimistic assumptions about the Council time line for taking final action, and the time required for a regulatory change, it would not be possible to repeal the requirement prior to the 2008 fishery in May and June.

What is a VMS unit?

VMS in Alaska is a relatively simple system involving a tamperproof VMS unit, set to report a vessel identification and location at fixed 30 minute intervals to the NOAA Fisheries Office of Law Enforcement (OLE). Some of these units allow OLE to communicate with the unit and modify the reporting frequency. The Alaska system is relatively simple, because it doesn't require the range of functions that are required for VMS in other regions of the United States. Moreover, the Alaska system doesn't require the VMS unit to report on the status of other vessel sensors (in addition to the GPS units).

VMS units on a vessel have the following components:

- A power source and power cabling
- A GPS antenna to pick up satellite signals
- The VMS itself – a box about the size of a car radio containing a GPS and VHF radio
- A VHF antenna to transmit the report to a satellite
- A battery
- Cabling between the VMS and both antennas

Some people with VMS units add optional equipment by connecting an onboard computer to the VMS unit. This can significantly enhance communications, and the potential for onboard use of information collected by the VMS. It is, however, not needed to comply with Alaska's VMS standard.

Fishing firms must use VMS units supplied by vendors approved by OLE. Approval is required to ensure integration of privately supplied VMS units and OLE data processing capabilities. VMS transceiver units approved by NMFS are referred to as type-approved models. A list of approved VMS units is available from the OLE (website at http://www.nmfs.noaa.gov/ole/ak_faqs.html).

VMS units transmit position information to a communications satellite. From the communications satellite, the vessel's position is transmitted to a land-earth station operated by a communications service company. From the land-earth station, the position is transmitted to the OLE processing center. At the center, the information is validated and analyzed before being disseminated for surveillance, enforcement purposes, and fisheries management. Figure 1 provides a schematic of the generic VMS data path.

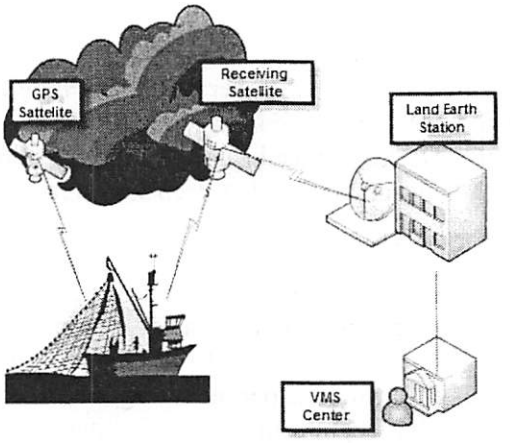


Figure 1. Generic VMS data path. Details vary among service providers.

From the VMS data server, the rate at which VMS units send signals can be remotely programmed or altered. Some units in Alaska are programmed to report every half hour but can be reprogrammed in response to pre-defined criteria. For example, a vessel can be monitored more frequently. Obviously, more frequent reports mean more data and therefore a more accurate picture of the vessel's activity. OLE may sometimes program a VMS to report a vessel's position more frequently, for example, if it appears to be operating near a no transit or fishing zone.

Position data is received and stored by NMFS. This data is also sent out to field offices for analysis of vessel activity. VMS data is reviewed and analysed daily, using a range of manual and automated checks. These checks identify such anomalies as vessels failing to send VMS signals or entering closed waters. Manual checks are completed by an operator monitoring the vessel movements on a computer screen. The operator examines vessel tracks, which are overlaid on digitized maps. Automated checks are run at various times over a 24-hour period. They detect instances of possible non-compliance and highlight them for later follow-up by VMS personnel.

When an instance of non-compliance is detected, it is referred to field agents or officers for follow-up after assuring all components are functioning properly.

Access to VMS data is gained through a secure, web-based system and viewable on a color chart on a computer monitor. OLE Special Agents and Enforcement Officers can monitor vessel activity from their computers. In Alaska, there are also two Enforcement Technicians who are tasked with monitoring vessel activity using VMS. In-season managers in the NMFS Alaska Region Sustainable Fisheries Division and the USCG also have access to the VMS data. Information collected under a VMS program is considered confidential and is subject to the confidentiality protection of Section 402 of the Magnuson Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act.

Confidential data are only disclosed to Federal employees and Council employees who are responsible for management plan development and resource monitoring, and State fisheries enforcement and fishery management employees when there is a confidentiality agreement that prevents public disclosure of the identity or business of any person. Confidential data can only be disclosed to the general public when required by the Freedom of Information Act (FOIA), 5 U.S.C. 552, the Privacy Act, 5 U.S.C. 552a, or by court order. (NMFS n.d.; Magnuson-Stevens Act, Sections 311 and 402).

Lingcod

Lingcod (*Ophiodon elongatus*) are the largest member of the greenling family (Family Hexagrammidae), and are related to sculpins and scorpion fish. They are not true cod. They range from Baja California to the Alaska Peninsula and are most commonly found in waters from 10 to 100 meters deep (although they can be found as deep as 300 meters) (Gordon 1994; Vincent-Lang 1994).

The lingcod life cycle can last 25 years (the maximum reported age). Spawning starts in December, and peaks between mid-January and mid-March. Eggs are deposited and fertilized in nests, which are guarded by adult males for the 5 to 11 weeks it takes for them to hatch. Most of the eggs have hatched by mid-May. During this period, the eggs are very vulnerable to predation. Larval lingcod are initially pelagic, but begin using bottom habitats by mid-summer of their first year. Males begin to become sexually mature at two years (at about 20 inches), and females mature at three to five years (at 24 to 30 inches). Adults can weigh up to 80 pounds (35 kg) and grow up to 60 inches (150 cm) in length. (Vincent-Lang 1994)

The dinglebar fishery operates in a West Coast and International marketplace. Lingcod are harvested as bycatch and in directed fisheries off of the U.S. West Coast, British Columbia, and Alaska. Primary markets are in the United States, Japan, and Canada. Lingcod have a white flaky flesh when cooked, and a review of market websites suggests that lingcod, halibut, and other white fleshed species are substitutes for one another. Lingcod may be taken as bycatch in trawl and longline fisheries, and as directed catch in jig or dinglebar fisheries. The highest quality lingcod is taken in hook-and-line fisheries that bleed and ice the fish immediately and deliver a fresh product. Fresh fish may last a week, frozen up to a year. They are also the subject of small live fish fisheries (Pacific Seafood Group 2002).

There is a directed dinglebar fishery in southeast Alaska. Directed fishing is also allowed with mechanical jigging gear and with hand troll gear in Southeast Alaska as well as elsewhere in the state. Lingcod are also taken as bycatch in longline fisheries for groundfish and halibut (Vincent-Lang, 1994).

Lingcod are aggressive and good eating; therefore they've become a popular sport fish target (Vincent-Lang 1994).

Management authority and the VMS requirement

A fishery not explicitly covered by the Council's FMPs or their implementing regulations may be regulated by the State of Alaska as authorized by the Magnuson-Stevens Act under Section 306(a) in the following circumstances. First, Magnuson-Stevens Act Section 306(a)(3)(A) provides for State regulation of a fishing vessel outside State boundaries if the vessel is registered with the State and there is no FMP or other applicable Federal regulations for the fishery in which the vessel is operating. If there is an FMP, this section also provides for State regulation of fishing outside State boundaries if the State's laws and regulations are consistent with the FMP and applicable Federal regulations for the fishery in which the vessel is operating. Second, Magnuson-Stevens Act Section 306(a)(3)(B) provides for State management when an FMP specifically delegates that management authority and the State's laws and regulations are consistent with that FMP. The third circumstance is applicable to fishing vessels that are not registered under the law of the State of Alaska and operate in a fishery in the EEZ for which there was no FMP in place on August 1, 1996. In this case, if the Council and the Secretary of Commerce find a legitimate interest of the State in the conservation and management of such a fishery, then the State may regulate fishing until an FMP is approved and implemented (Wilson 2007).

There is no FMP which covers lingcod fishing in Federal waters of the GOA. Under these circumstances, the State of Alaska has exercised its regulatory authority over commercial fishing for lingcod in Federal waters.

The regulations governing the VMS requirement specifically apply to a "federally permitted vessel." Thus, if a vessel was not required to carry, or did not voluntarily carry, an FFP, the VMS requirement would not apply. Because there is no FMP governing lingcod fishing in Federal waters of the GOA, a Federal fishing permit (FFP) is not required to fish for lingcod in these waters.

However, according to Federal requirements for groundfish federal fishing permits at 50 CFR part 679.4(b), if a vessel is used to fish in the EEZ of the GOA or the BSAI management areas and is required to retain any groundfish caught in the EEZ, the vessel must have an FFP. For purposes of this regulation, groundfish means Atka mackerel, flatfish except for Pacific halibut, octopus, Pacific cod, pollock, rockfish, sablefish, sculpins, sharks, skates, or squid (See Table 2a to CFR part 679).

State regulations require permits issued by the Commercial Fisheries Entry Commission (CFEC) for participation in the dinglebar fishery for lingcod. State regulations further require CFEC permit holders to retain all demersal shelf rockfish (DSR) and black rockfish taken as bycatch in the lingcod fishery. An FFP and associated VMS have been requirements for participation in the lingcod fishery because these rockfish are groundfish covered by the FMP, they are taken as bycatch in the fishery, and no fisherman can be confident of avoiding the bycatch.

State management

There are currently no accurate estimates for the abundance of lingcod in Alaska. Moreover, lingcod are believed to be vulnerable to overfishing and stocks take a long time to recover. Some stocks on the West Coast are believed to have been over harvested. For these reasons, the State of Alaska pursues what it believes to be a very conservative management regime (ADF&G n.d.).

The State has adopted a management approach that uses the following measures to assure there are enough lingcod in the spawning population to ensure future recruitment (Vincent-Lang 1994):

> 1) It protects spawning and nest-guarding fish. In many areas, sport and commercial fisheries are closed during the spawning and nest-guarding periods.
>
> 2) It allows fish to spawn at least once before being subject to harvest. Minimum size limits are established for both sport and commercial fisheries.
>
> 3) It restricts catch. In many areas, the sport fishery is restricted by daily bag and possession limits. Commercial fisheries are restricted by catch and bycatch quotas.

Specifically, the State of Alaska's management regime in Southeast Alaska currently includes the following components:

- Spatial protection for the stocks off of Southeast Alaska, by dividing the Southeast into seven lingcod management areas. The seven areas are (1) Northern Southeast Inside (NSEI), (2) Southern Southeast Internal Waters (SSEIW), (3) Northern Southeast Outside (NSEO), (4) Central Southeast Outside (CSEO), (5) Southern Southeast Outer Coast (SSEOC), (6) Icy Bay Sector (IBS), and (7) East Yakutat (EYKT). Figure 2 shows the state management areas for lingcod off of Southeast Alaska. Detailed descriptions of Management Area boundaries may be found at 5AAC 28.105.
- Prohibition of directed fishing in the inside districts, NSEI and SSEIW, and in the waters of the CSEO between latitudes 56 55.5' N. and 56 57.0' N. and longitudes 135 54' W. and 135 57' W. (the Pinnacle area) and waters of Sitka Sound.
- *Annual harvest quotas for the different areas.* In 2007, the directed lingcod quota was allocated as follows: (1) Icy Bay Sector 66,660 round pounds, (2) East Yakutat 111,000 pounds, (3) Central Southeast Outside 86,400 pounds, (4) Northern Southeast Outside 17,200 pounds, and (5) Southern Southeast Outer Coast 50,100 pounds.
- *Temporal protection*, especially during the spawning and nesting season. The directed fishery normally opens in mid-May.
- *Gear limitations.* Lingcod may be taken in a directed lingcod fishery only by mechanical jigging machines, dinglebar troll gear, and hand troll gear.
- *Vessel identification requirements.* Vessels fishing for groundfish with dinglebar troll gear must display the letter "D" and vessels fishing for groundfish with mechanical jigging machines must display the letter "M" (5AAC 28.135).
- *Prior registration with ADF&G.* The vessel owner or the owner's agent must register the vessel with the department prior to directed fishing for lingcod.
- *Super exclusive registration.* The IBS directed fishery is a super exclusive registration area and has its own registration form. A CFEC permit holder who participates in the directed commercial taking of lingcod in the Icy Bay Subdistrict may not participate or have participated in the directed commercial taking of lingcod as a CFEC permit holder in any other registration area or portion of a registration area during that calendar year.

- *Bycatch.* Full retention of DSR or black rockfish first sentence needs clarification that if the DSR overage is taken in federal waters, it may be retained for personal use or donated but may not be sold or enter commerce. This is different from DSR overage in state waters in which proceeds from the sale would go to the state.
- Bycatch retention limits expressed as percentages of the round weight of lingcod aboard: (1) 10% demersal shelf rockfish, (2) 5% all other rockfish and thornyheads in aggregate, (3) 20% Pacific cod, (4) 20% Spiny dogfish, (5) 20% other groundfish in aggregate.
- Lingcod logbooks are required and a copy of the logbook pages detailing a landing must be attached to the fish ticket documenting the landing.
- All lingcod harvested must be a minimum of 27 inches in length. Undersized lingcod that are tagged may be retained as long as the tag is not removed from the fish.

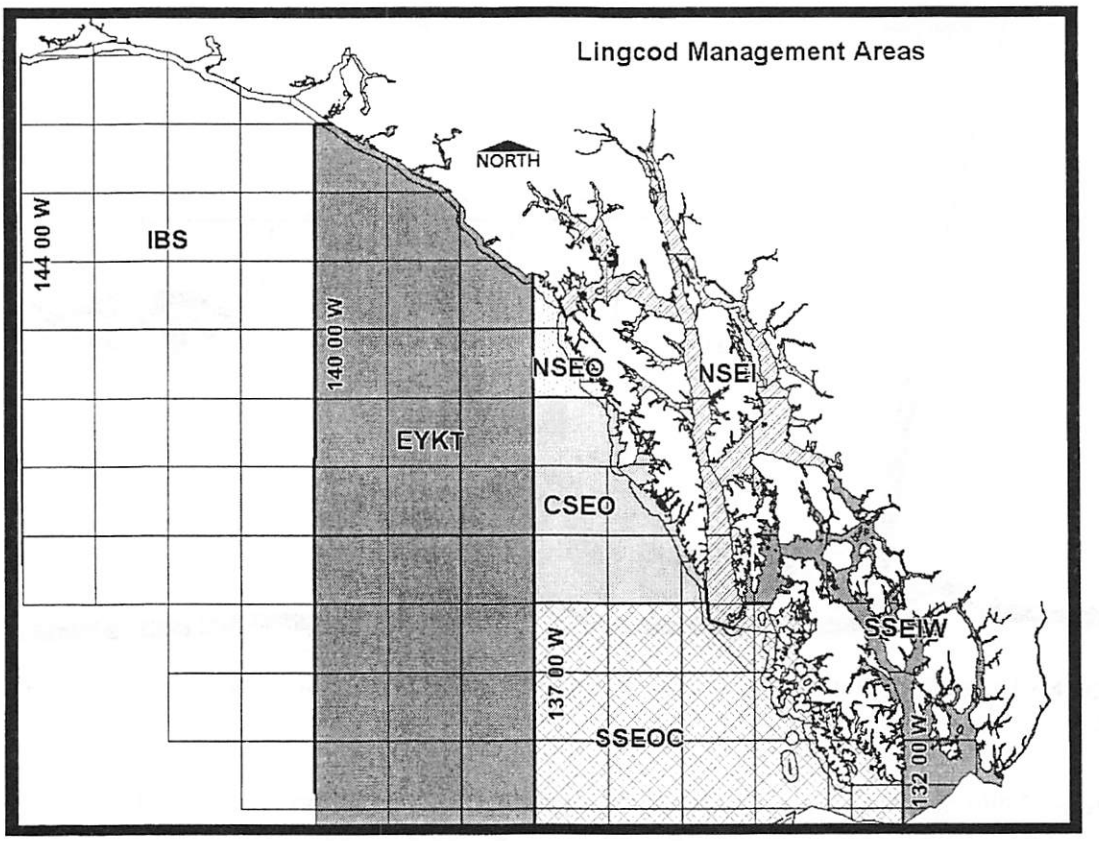


Figure 2. State of Alaska lingcod management areas

Dinglebar fishing

Dinglebar gear

Dinglebar gear is salmon troll gear with the addition of a heavy metal bar. The weight of the bar keeps the hooks close to the bottom. Gordon (1994) describes the fishing method as follows:

Most vessels participating in the directed fishery for lingcod are salmon trollers < 13 m in length that use dinglebar gear trolled at slow speeds. Salmon trollers are easily adapted to this fishery. Dinglebar gear is configured as a single horizontal spread of up to 13 lead-headed jigs extending from an attachment about 1 m above a 1- to 3-m steel bar weighing 13.6-34 kg... The troll wire is run directly into the water off a block and, unlike troll gear, is not tagged to a trolling pole. This allows the fisher to keep a hand on the wire and feel if the gear is hitting bottom or if fish are biting. For this reason a person can effectively fish only 1 line....

Figure 3 taken from Gordon, shows the dinglebar configuration.

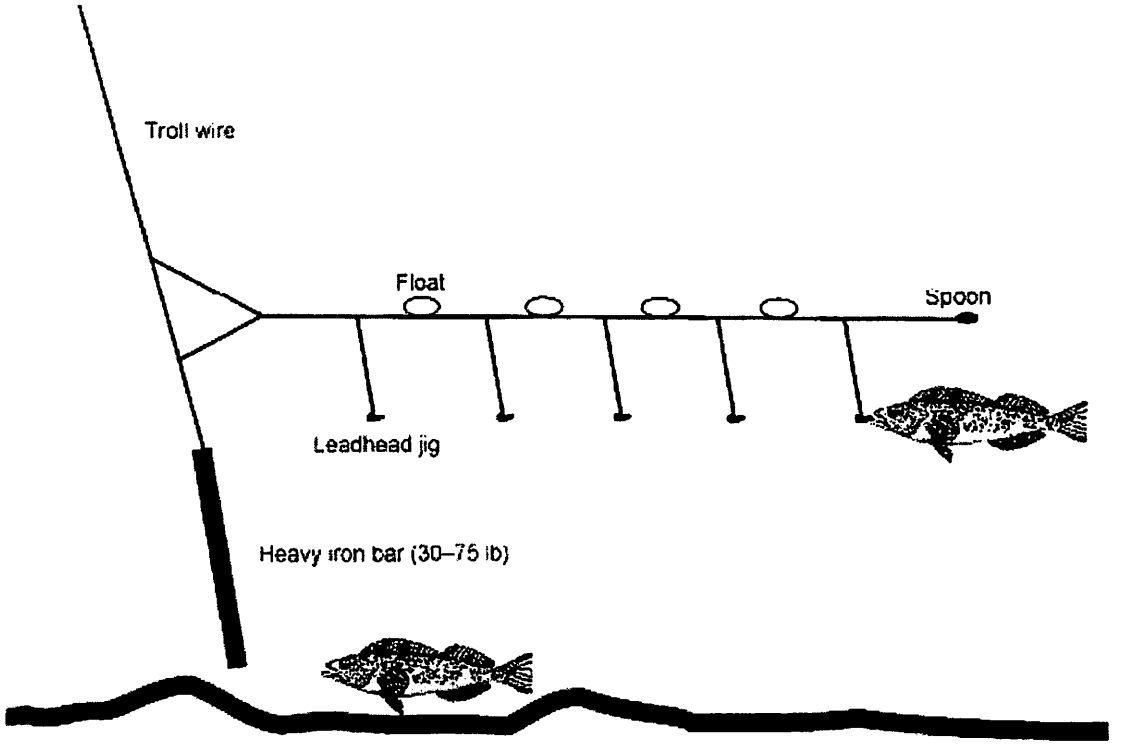


Figure 3 Diagram of dinglebar gear used to fish for lingcod in Southeast Alaska (from Gordon 1994)

Seltzer (2006) describes the technique as it was practiced off of California in the early 1990s:

I fished commercially for lingcod aboard the vessels Anna B., Duwam, Margie Mae, and Serenade II. Under one of the original masters, I learned an obscure and secretive, but highly effective, method called "dinglebar" trolling. This guy was so good he was practically worshipped any time we arrived in a new port. They often called him "Bruce the Ling-slayer." Those days, we actually hid our gear from sight so that it wouldn't get copied. The basic formula involved a lot of 8-oz. leadhead jigs, tuna cord, a few empty 12-oz. glass soda bottles, and the dinglebar, which is a 50 to 60-pound bar, typically made out of discarded sash weights originally used to counter-weight large hung windows. We would troll the dinglebar on the end of a steel cable very close to the bottom, sometimes along the bottom, which is tricky, since the bottom tends to grab your gear... and keep it! Up the cable a couple of feet there's a long cord tied on that trails way out behind the boat, with several leadered jigs tied on at intervals along the cord.

After every third jig, one of the empty sealed soda bottles is fastened to the cord to provide buoyancy. You roam around until you start to catch fish, then you set the boat on a tack and start pulling them up....

Elsewhere Seltzer indicates that, on this vessel, the crew – apparently of two – operated two sets of dinglebar gear from hydraulic salmon gurdies at the same time, one person setting as the other was hauling back. This operation fished for a live market, returning after two day trips with the live lingcod in a holding tank. The lingcod were marketed to customers at dockside; customers stood on the dock above the boat and pointed to the fish they wanted. This was retrieved from the holding tank, bludgeoned to death on the deck, and hoisted up to the customer in a paper sack (Seltzer 2006) Alaska's dinglebar fishermen, in contrast, are supplying a fresh market. Vessels make short trips, and ship a partly processed product by air to the lower 48 United States (Gordon 1994).

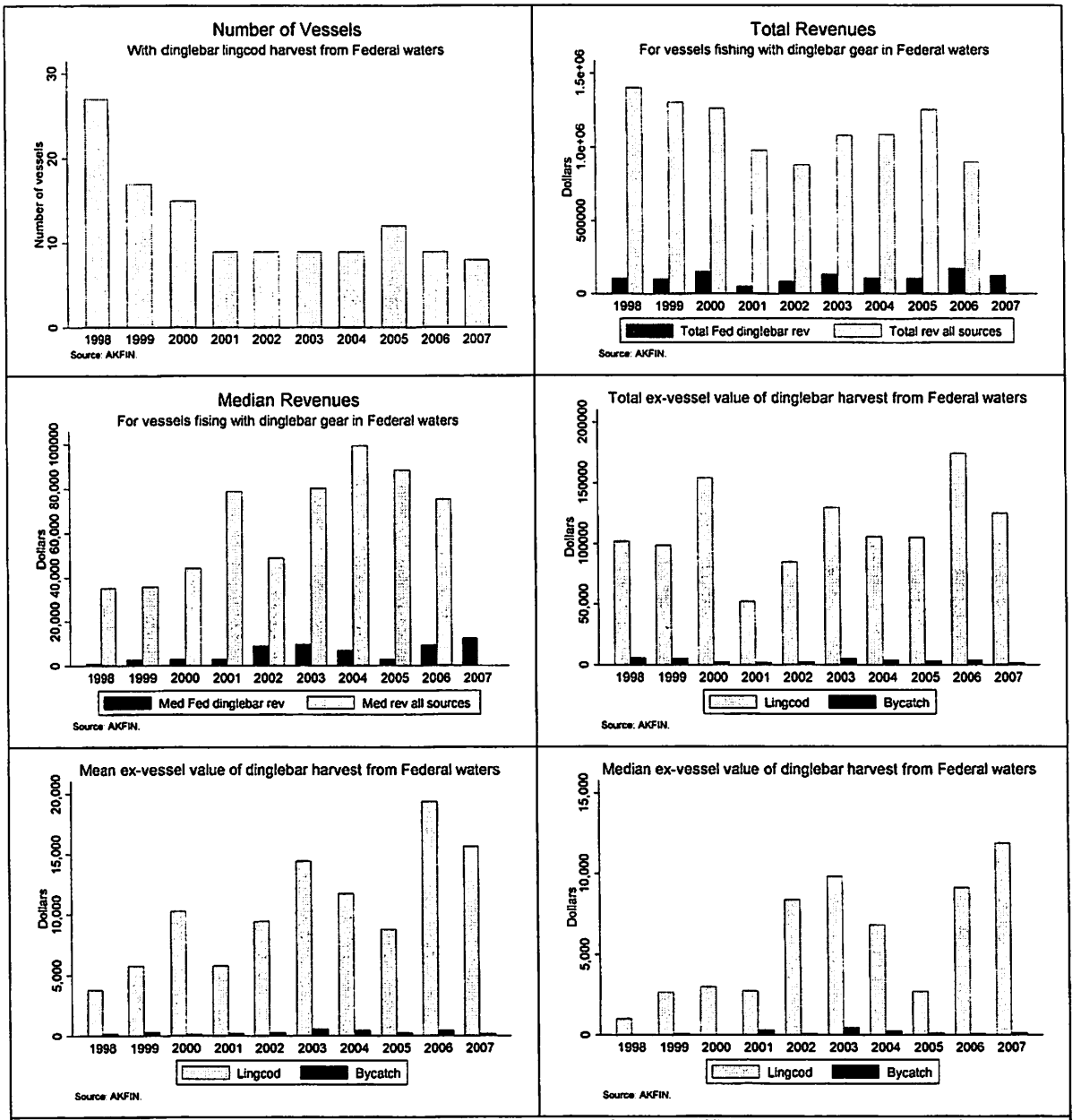
The fishery in Federal waters off Alaska[5]

Activity in Federal waters

As shown in Figure 4 below, the number of vessels active in this fishery since 1998 has ranged widely, but has tended to decline. In 2007, there were fewer active vessels than in any of the other years. Fleet revenues from the dinglebar lingcod fishery have tended to be a small, but not a trivial, proportion of fleet revenues from all fisheries. Fleet revenues from the bycatch of other species (primarily rockfish) in the Federal dinglebar fishery have tended to be a small proportion of overall dinglebar fishing revenues.

Figure 4 also shows a long term increase in average lingcod gross revenues for those fishing in Federal waters. Average harvest value in 2006 and 2007 was between $15,000 and $20,000. Median revenues show a different pattern, jumping up from low levels in 1998-2001 to higher levels (except for 2005) in the period 2002-2007. Neither the mean or median summaries suggest that bycatch was an important source of revenues from fishing dinglebar gear in Federal waters.

[5] The vessel count, vessel description, and harvest and revenue estimates described in this section are based on fish ticket reporting records as summarized by the Alaska Fisheries Information Network (AKFIN). The vessel count and other information for 2007 is based on AKFIN records showing six vessels made landings in Federal waters in 2007. VMS information was only received from four of these vessels. It is not clear whether or not the other two vessels should have carried VMS units. For example, they may have made all their landings in State waters and there may have been a statistical area reporting or transcription error at some point. In addition, one vessel that did not report landings from Federal waters, only from State waters, did carry and transmit with a VMS unit.



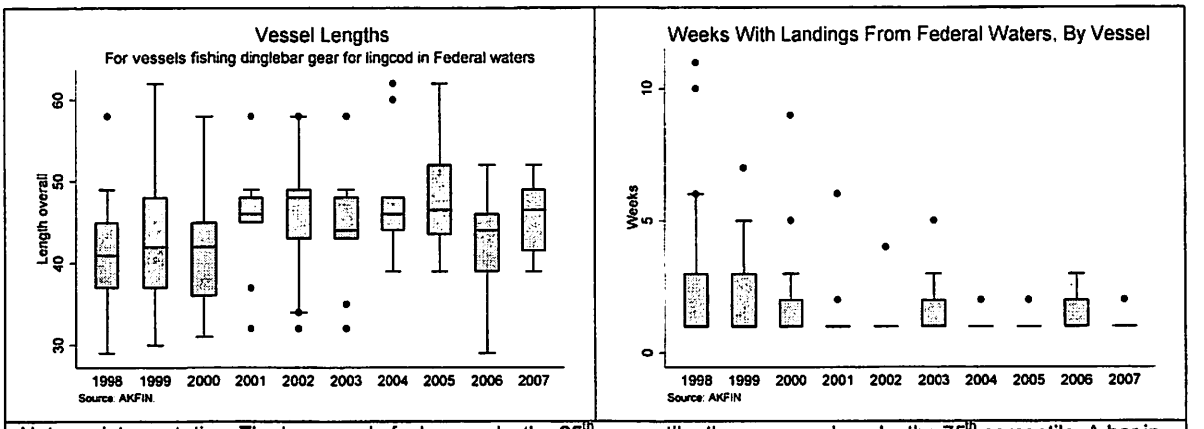
Note: 2007 revenue estimates are based on partial and preliminary information. The 2007 revenue estimates for the dinglebar fishery are probably reasonably accurate, but estimates of 2007 revenues from all sources may be misleading and have not bee reported. In one instance ex-vessel prices from other vessels were used to impute ex-vessel prices for an operation.

Figure 4. Number of vessels with Federal lingcod harvests, with median and total revenues, and value 1998-2007.

Vessels and their characteristics

Figure 5 shows the distribution of vessels by vessel length overall (LOA) and the distribution of vessels by the number of separate weeks during which landings were made in a season. In recent years, the median vessel length appears to have been between 45 and 50 ft LOA. Vessels appear

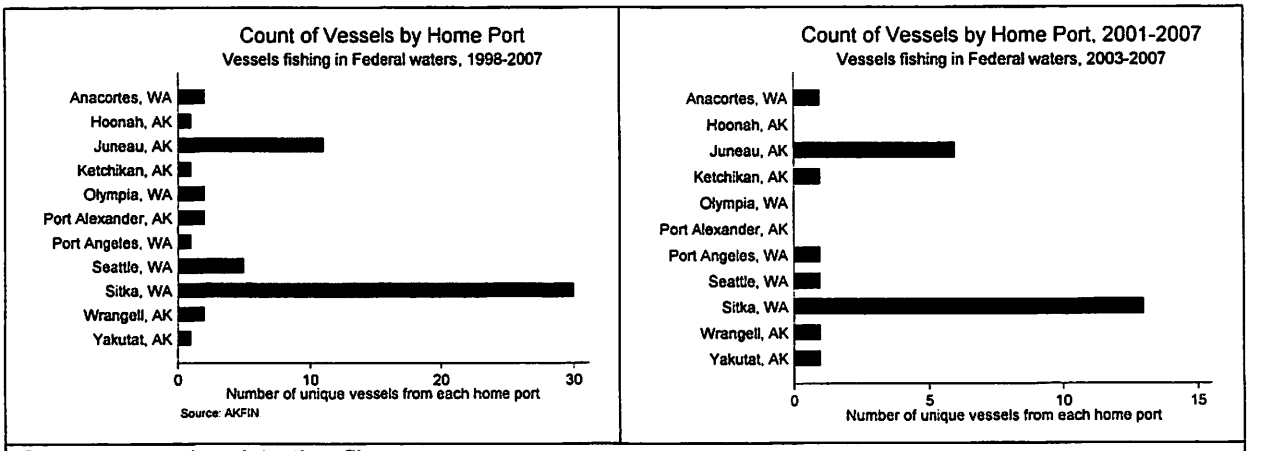
to have been somewhat shorter in the earlier years in this time series (note that the targeted commercial fishery goes back to the 1980s), but increased in length abruptly between the 2000 and 2001 seasons. During this time, the median vessel appears to have made landings from Federal waters in only one week per year. The most active vessels tended to make landings in fewer weeks as time passed.



Note on interpretation: The lower end of a box marks the 25th percentile, the upper end marks the 75th percentile. A bar in the center marks the median, or 50th percentile. The range between the 25th and 50th percentiles is called the interquartile range. The ends of the whiskers mark the last observation, if any, that falls within 1.5*IQR of the ends of the box. Circles mark extreme values.

Figure 5. Vessel lengths and numbers of weeks of fishing.

Figure 6 shows that most vessels fishing with dinglebar gear in Federal waters are from Southeast Alaska, especially from Sitka, and to a lesser extent Juneau. This pattern holds up over the longer 1998-2007 time period, and the last five years.



Source: vessel registration files

Figure 6. Vessel counts by home port.

Figure 7 shows the number of years that individual vessels were active in the fishery in Federal waters. The left hand side shows the numbers over the whole period from 1998-2007. The right hand side focuses on the numbers active since the overall annual vessel count stabilized in 2001. Even for the more recent period, a large number of operations were active for only one year. On the other hand, two vessels operated in each of the seven years of the period.

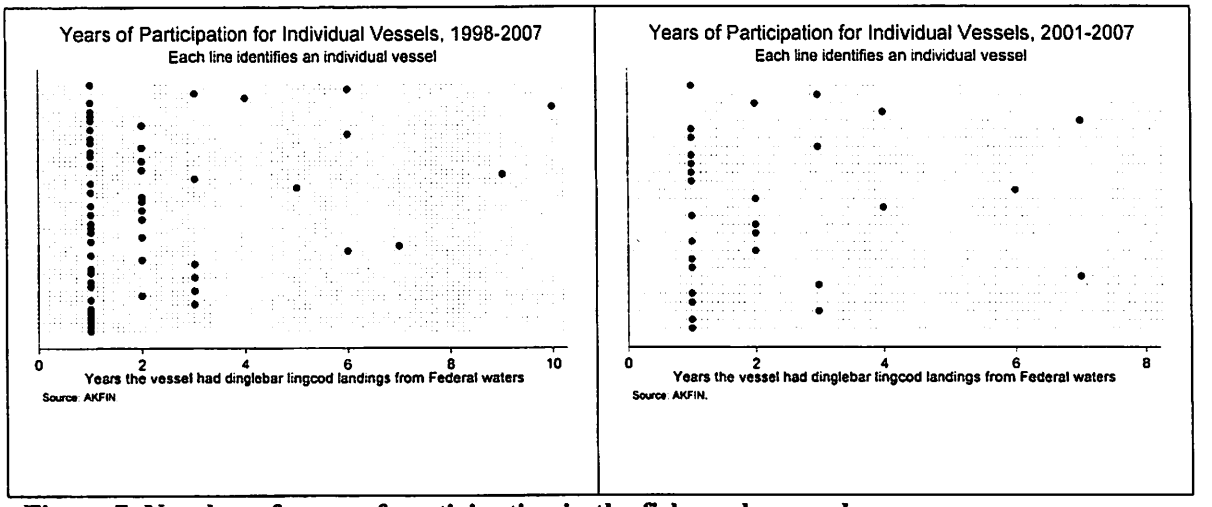


Figure 7. Number of years of participation in the fishery, by vessel.

Diversification

Participants in the dinglebar fishery in Federal waters were active in other fisheries during the year. As shown in Figure 8, dinglebar revenues were a relatively small, but not trivial proportion of their revenues from all sources.

In recent years, vessels taking lingcod with dinglebar gear in Federal waters during a year do not appear to take lingcod with dinglebar gear in State waters, and vice versa. In the early years of the data, from 1998 to 2000, vessels appear to have been more prone to be active in both State and Federal waters, but this pattern disappears from 2000 forward.

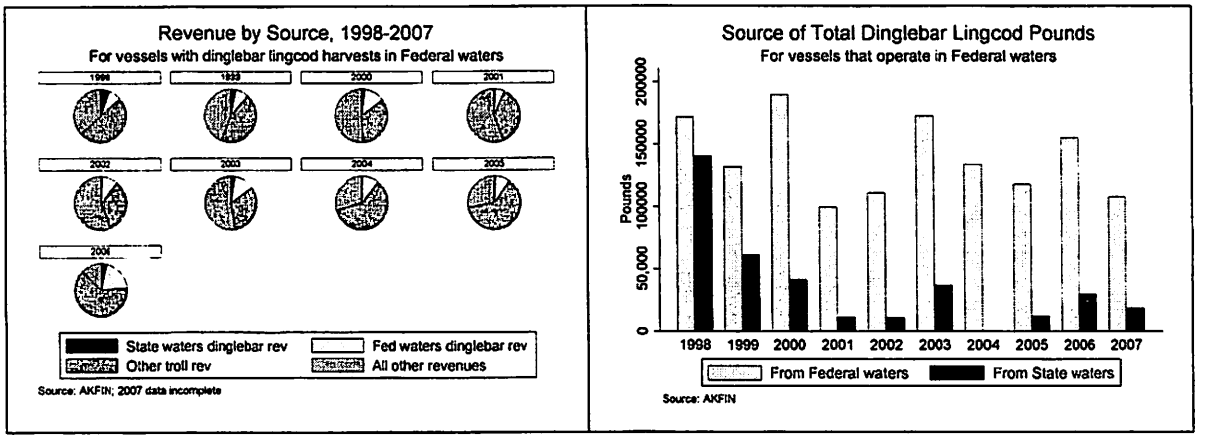


Figure 8 Revenues and pounds by source for vessels fishing for Lingcod with dinglebar gear in Federal waters, 1998-2007.

Reasons for the vessel monitoring system requirement

This section provides a description of the HAPC identified as the Primnoa Coral Marine Reserve. A full description of the HAPC process and methods to evaluate the areas can be reviewed in the

EA/RIR/IRFA (NMFS 2006b). The issues of primary concern with respect to the effects of fishing on the HAPCs are the potential for damage or removal of fragile biota, within each area that are used by fish as habitat and the potential reduction of habitat complexity, benthic biodiversity, and habitat suitability. The vulnerable habitats in the areas are those containing *Primnoa* species of coral.

A habitat profile for *Primnoa* species reported by Cimberg et al. (1981) associates *Primnoa* species with large boulders and exposed bedrock in areas with moderate to high currents and yearly temperatures above 3.7°C. Red tree coral (*Primnoa* sp.) may be the most common gorgonian coral[6] observed in fished areas of the eastern GOA. Concentrations of *Primnoa* sp. are unique and are considered rare in the vast areas of the slope and shelf, and the current efforts that have been taken to located these concentrations. Where *Primnoa* species are found, the high relief structure appears to offer refugia for commercially important demersal fishes (Bizarro 2002).

The overall abundance of high relief hard coral structures in Alaska is unknown. The analysis used the data from documented locations of high relief hard corals sites that have primarily been observed *in situ* by NMFS and ADF&G submersible research. Additional information from bycatch within the commercial fisheries as well as bycatch within NMFS research surveys was used as a supplement where appropriate.

Cape Ommaney Area

The Cape Ommaney HAPC is located in the eastern GOA about 28 km west of Cape Ommaney, Baranof Island, Alaska (Figure 9, Table 1). Common bottom types for Cape Ommaney area include rock, gravel, and cobble (NOAA Chart 17400). However, newer multi-beam survey technology shows that there is almost three times more rock habitat in this area than originally thought (O'Connell et al. 2002). Designation of the Cape Ommaney site as HAPC was based on directed NMFS research that documented boulder and bedrock substrates supporting concentrations of *Primnoa* species coral (red tree coral). Bedrock and large boulders at depths between 201 and 256 m support the concentrations of *Primnoa* species. Several hundred colonies were observed at this site and many were greater than 1 m in height. High *Primnoa* sp. concentrations and associated sedentary invertebrates were also associated with the small pinnacles. A series of small pinnacles also make this area unique.

[6] Gorgonian corals are colonial marine corals with rigid skeletons. There are 18 recognized Gorgonian families, including the *Primnoa* species. University of Alaska Alaska Natural Heritage program Website on Gorgonian corals provides more information: http://aknhp.uaa.alaska.edu/zoology/species_ADFG/ADFG_PDFs/Invertebrates/GorgonianCorals_ADFG_web_060105.pdf

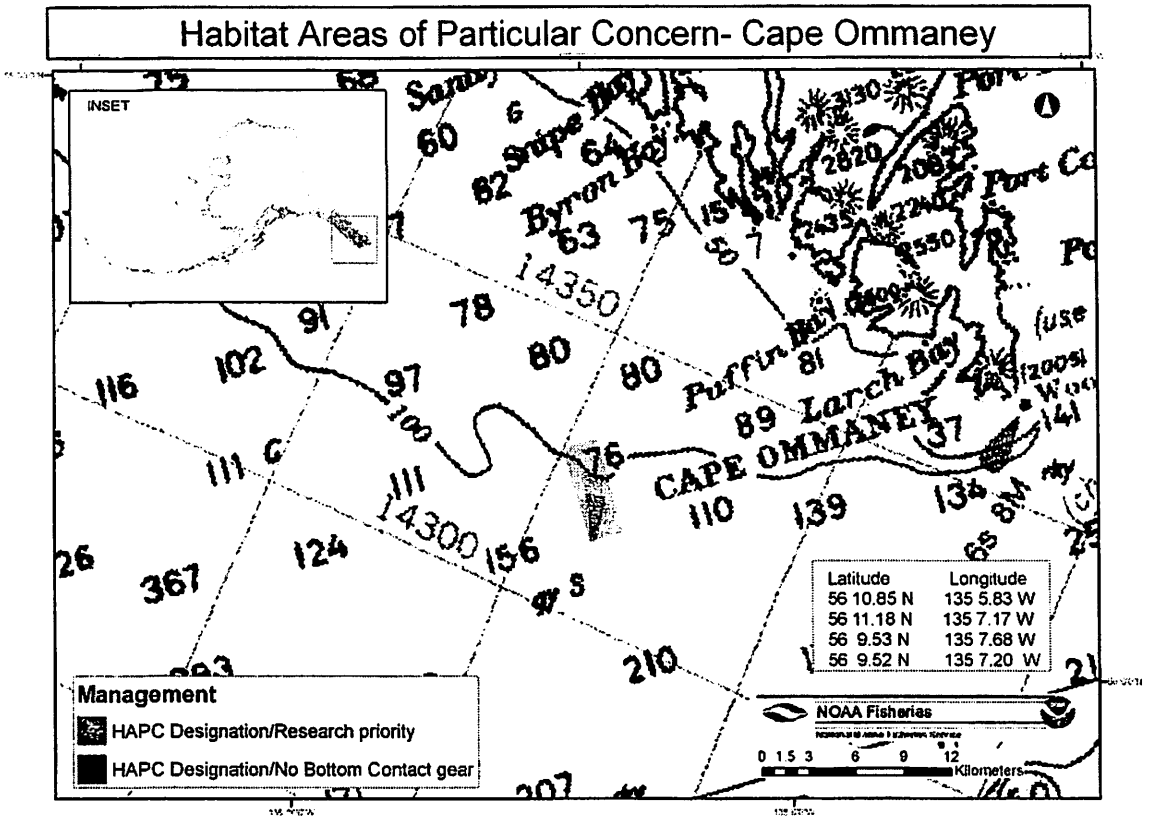


Figure 9 Primnoa Coral Marine Reserve identified as a HAPC near Cape Ommaney.

Fairweather Ground NW/SW Area

Two nearly adjacent HAPCs are located on the Fairweather Ground in the eastern GOA (Figure 10, Table 1). Common bottom types of the Fairweather Ground include bedrock, boulders, cobble, pebble, and gravel (NOAA Chart 16760; Bizzarro 2002), with a considerable amount of rock habitat on the bottom (O'Connell et al. 2002). In 2001, NMFS's Alaska Fisheries Science Center scientists conducted dives with the submersible vehicle *Delta* in areas of the Fairweather Grounds where large catches of *Primnoa* sp. coral were collected as bycatch during triennial groundfish surveys. Submersible observations confirmed the presence of a series of dense *Primnoa* sp. concentrations located along the western flank. Additional submersible research has also noted areas of *Primnoa* species in rocky and boulder substrates. However, these two areas had greater concentrations of *Primnoa* species than other surveyed areas (NPFMC 2004). Bedrock and large boulders at depths between 150 and 200 m support the concentrations of *Primnoa* species. Colonies were observed and distributed throughout the dive transects. Many colonies were greater than 1 m in height.

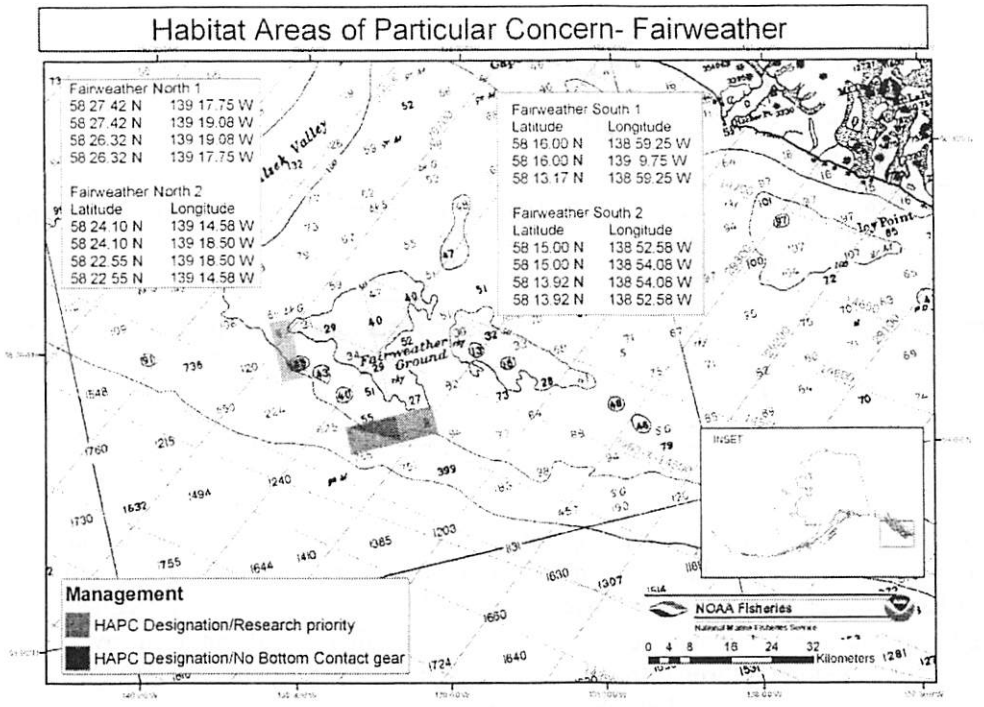


Figure 10. Primnoa Coral Marine Reserve identified as a HAPC near Fairweather ground.

Table 1. Name, location, and area of HAPC sites along the continental slope in the Eastern GOA

Proposed HAPC Area	Latitude	Longitude	Management	NOAA Chart No.	Area
Cape Ommaney	56 12 51 N 56 12 51 N 56 09 32 N 56 09 32 N	135 07 41 W 135 05 30 W 135 05 30 W 135 07 41 W	HAPC Designation	17320	4.0 nm^2
Cape Ommaney	56 11 11 N 56 10 51 N 56 09 31 N 56 09 32 N	135 07 10 W 135 05 50 W 135 07 12 W 135 07 41 W	No bottom contact gear	17320	0.9 nm^2
Fairweather Ground NW Area	58 28 10 N 58 28 10 N 58 22 00N 58 22 00 N	139 19 44 W 139 15 42 W 139 15 42 W 139 19 44 W	HAPC Designation	16760	13.11 nm^2
Fairweather Ground NW Area 1	58 27 25 N 58 27 25 N 58 26 19 N 58 26 19 N	139 19 05 W 139 17 45 W 139 17 45 W 139 17 45 W	No bottom contact gear	16760	0.77 nm^2
Fairweather Ground NW Area 2	58 24 06 N 58 24 06 N 58 22 33 N	139 18 30 W 139 14 35 W 139 14 35 W	No bottom contact gear	16760	13.11 nm^2

	58 22 33 N	139 18 30 W			
Fairweather Ground Southern Area	58 16 00 N 58 16 00 N 58 13 10 N 58 13 10 N	139 09 45 W 138 51 34 W 138 51 34 W 139 09 45 W	HAPC Designation	16760	27.3 nm^2
Fairweather Ground Southern Area 1	58 16 00 N 58 16 00 N 58 13 10 N	139 09 45 W 138 59 15 W 138 59 15 W	No bottom contact gear	16760	7.87 nm^2
Fairweather Ground Southern Area 2	58 15 00 N 58 15 00 N 58 13 55 N 58 13 55 N	138 54 05 W 138 52 35 W 138 52 35 W 138 54 05 W	No bottom contact gear	16760	0.86 nm^2

Only a few studies have been completed in Alaska on the effects of fishing gear on habitat, and none have been done for troll or dinglebar gear, so this discussion is qualitative in nature. Non-pelagic trawl gear has not been utilized in the Eastern Gulf of Alaska since 1998. Consequently the only restricted gear would be dinglebar gear. Trolling with dinglebar gear can occur over many bottom types and anecdotal information suggests the gear has been used in the GOA as deep as about 110 fathoms. Some of the dinglebar fishery occurs near the Fairweather Grounds. In most situations, the gear rarely contacts the ocean bottom; however, the gear is fished in lingcod habitat adjacent to the closure areas.

VMS requirements have clear enforcement benefits.[7] The number of management boundaries, no transit, and no fishing zones used to regulate fishing activity has grown enormously over the years. Many of these boundaries are located in remote places and are difficult to monitor. Moreover, neither the USCG, which has primary responsibility for monitoring boundaries at sea, nor the OLE have received budget increases to enforce these and other additional responsibilities.

Without VMS, closure violations can only be effectively deterred or identified when enforcement agents are physically present, or known to have a realistic capability of being physically present, and can observe the violation in progress. Individually, some of these areas are not unmanageable. However, because of the sheer number and complexity of these areas, the large expanses that must be monitored, and relatively limited resources, many USCG and OLE officials believe they may have been stretched beyond their ability to provide adequate monitoring without the aid of VMS.

If a vessel is carrying VMS, OLE and the USCG have the capability to determine its location at all times. If an area is closed to all transiting, VMS can determine compliance based upon VMS

[7] They may have other benefits. For example, if the data were shared with ADF&G lingcod managers, they may prove useful in monitoring the amount of effort active in the fishery, and in fine-tuning closures so as to neither over or under shoot harvest targets. The units may reduce USCG response times to accidents by allowing it to screen false alarms more rapidly, and to locate the position of vessels in distress more rapidly and accurately. The units may have scientific value and policy value. That has been the case in this analysis, because the VMS requirement has made it possible for analysts to identify 2007 fishing locations with considerable accuracy. Confidentiality rules preclude distribution of this information. Finally, they may have value to fishermen who would not otherwise have installed them, but who find private uses for the units given that the installation and transmission costs are already incurred.

transmissions, eliminating the need for random surface or aerial patrols. Vessels would not have legitimate reasons to be in a no-transit area. VMS reports would provide the key evidence needed for prosecution of a violation.

If an area, otherwise open to vessel transit, is closed to fishing, or to specific types of fishing, or to particular classes of vessels, the situation is more complex. Vessels may have legitimate reasons to transit the area. Some vessels may be allowed to fish in the area, and others may not be. Determining the activity of a vessel (e.g. fishing), based solely on its VMS track, is extremely difficult. These cases require follow-up investigation when the vessel returns to port. VMS does not track the type of fish being brought on board a vessel, so it can not be used to detect a directed fishing violation. Enforcement personnel can use it to monitor a vessel's behavior, its path with respect to closed or restricted areas, or areas known to have stocks of fish species at particular times of year. This information, combined with knowledge about the vessel itself, its size, its processing capacity, the gears it uses, may allow NOAAOLE to identify vessels that are behaving suspiciously. It is then possible to work with the USCG to target a vessel or area for more careful vessel, plane, or helicopter inspection. NOAA OLE can also arrange to follow-up with an inspection of the vessel when it returns to port, and/or to carry out further investigation at a later time.

VMS may provide other enforcement advantages as well. VMS will deter violations because the vessel operators will know NOAA OLE and the USCG have the ability to monitor their activities and to deploy aircraft or enforcement vessels directly on scene if illegal activity is suspected. Moreover, enforcement agencies monitoring VMS reports may be able to prevent illegal setting of gear, which may, for example, destroy sensitive corals and sponges, by calling vessels using radio or telephone if they look like they are working too near closed areas.

Some have suggested that enforcement of the prohibition of dinglebar fishing in the coral habitat protection areas may have little value because dinglebar fishermen are unlikely to fish there. This may be the case if there is little overlap in the depth at which dinglebar gear is fished and the depths included in the areas closed to mobile bottom contact gear. An examination of the bathymetry of the closed areas indicates that these areas are generally at depths greater than 100 fathoms. A preliminary examination of dinglebar fishing logs for 2007 indicates that most vessels reported fishing at depths less than about 45 fathoms. One vessel did report using the gear in significantly deeper waters, but still less than 100 fathoms. Anecdotal information suggests, however, that dinglebar gear has been fished as deeply as 110 fathoms.

Estimated costs of the requirement[8]

VMS costs for operations are expected to fall into the following categories:

- Purchase and freight
- Installation charges
- Initiation fee, if any

[8] These cost estimates were originally prepared in the spring of 2006 for another VMS analysis (NMFS, 2006a). They were spot checked in February 2007 and again in the fall of 2007. Unless otherwise noted, the analysis in this section is based on the earlier document. Refer to that document for detailed background information. The only significant changes introduced for this analysis are (a) an adjustment in the estimated purchase costs which takes account of information on actual reimbursements for unit purchase provided by the Pacific States Marine Fisheries Commission under the program described in this section, and (b) a discussion of the potential impact of costs or residence in a remote community.

- Sales taxes
- OLE notification
- Transmission costs
- Maintenance and repairs
- Lost fishing time due to unforeseen breakdowns
- Replacement cost

There is no statistical information about the extent to which fishermen are paying list price or a negotiated or sales price, the time requirements for installation, the nature of the transmission packages they are buying, or the average number of days or months they are transmitting. Under these circumstances, the individual vessel costs estimated here are rough approximations to plausible average values. The cost estimates used in this analysis are summarized in Table 2 and documented in the remainder of this section. The sections that follow provide estimates of the present value of the cost of the VMS requirement to a typical operation, and estimates of the costs of the requirement in 2007 (the first year in which it was effective).

Table 2. Summary of cost estimates used in this analysis

Purchase and freight	$1,500
Installation	$239
Brackets	$60
Initiation fee (with satellite service provider)	$150
Notify NOAA OLE	$108
Sales taxes	$18
Reimbursement for purchase	$1,500
Total acquisition and installation w/out reimbursement	$2,068
Total acquisition and installation with reimbursement	$568
Transmission costs for one year	$111
Maintenance and repairs for one year	$77
Note: these are estimates of the costs for a "typical" operation that bought and operated a VMS unit to comply with the regulations requiring its use on a vessel with an FFP using dinglebar gear. The reasoning behind the estimates is summarized in the text in this section.	

Purchase and freight[9]

Five VMS units are NMFS type-approved for Alaska. List price estimates are summarized in Table 3. Marine electronics firms in Alaska have been found selling units for more and less than the list price. Prices include freight, but not installation.

Vessel owners purchasing a VMS unit in order to comply with Federal regulations governing dinglebar fishing for lingcod in the GOA are eligible for a reimbursement of the initial purchase cost of the unit. The reimbursement covers the costs of purchase and freight, but not the costs of sales taxes, installation, annual operating expenses, or replacement. The program is operated through the Pacific States Marine Fisheries Commission (PSMFC), which reimburses up to $1,750 for the purchase of a VMS to meet regulatory requirements in the Alaska Region. A review of PSMFC reimbursement payments from the summer of 2007 to five vessel owners using

[9] This section assumes that vessel operators will purchase a single unit. Anecdotal evidence suggests that at least some larger vessels have purchased additional backup units.

their vessels in the dinglebar lingcod fishery suggests that actual unit costs averaged about $1,500. In this analysis, this cost has been used as an estimate of the average cost of purchase and freight to the vessel owners, and of the size of the reimbursement payments.

Table 3 Costs of different VMS units

UNIT	Manufacturer	List Price	Transmission Costs (1)	Activation Fee	Accuracy	Email Capable (2)	Satellite System
T&T 3026-S	Thrane & Thrane	$1,650	$2.88 / Day($86.40 / Month)	None	10 Meters	Yes	Inmarsat
T&T 3026-D	Thrane & Thrane	$1,750	$2.88 / Day($86.40 / Month)	None	10 Meters	Yes	Inmarsat
Stellar ST-2500G	Skymate	$1,599	$55.58 / Month($1.85 / Day)	$149.00	10 Meters	Yes	Orbcomm
Stellar St-2500G	Metocean	$1,599	$69.99/month ($2.25/day)	$99	10 meters	Yes	Orbcomm
Watchdog	Faria	$1,620	$59.95/month	None	10 meters	Yes	Iridium
(1) Transmission costs assuming 1/2 hour reports (30-day month); (2) Requires computer or message terminal; Installation fees have been quoted from $200 - $600 depending on the vessel; Warranty is two years for T&T units. Warranty is one year for Skymate Units. These cost estimates were prepared in early 2006 and modified in late 2007 by the addition of the Faria unit.							

VMS units are a business expense. Tax deductibility would reduce the costs of these units to fishermen. However in a cost and benefit analysis from a national accounting stance, the tax savings would be a transfer payment and would not affect the costs or the benefits.

Installation

Installation requires placement of the VMS unit itself, placement of GPS and VHF satellite antennae, running of cables between the system components and the power source, and power hookup. Installers may need to add brackets and poles to the cost of the VMS packages during installation.

Buyers can install their own units. Installation services are also available from vendors or electricians. Vendors have indicated that one to two hours of installation time are typical, and that they charged on the order of $90/hour for the service.

Installation time can take more than two hours. Other NMFS estimates have ranged up to four to six hours. Installation may take longer, for example, when a 12 volt DC hookup is not convenient to a location where the VMS unit can be installed.

A "most-likely" cost for installation has been estimated assuming that a normal installation would take about three hours for a self-install[10], or two hours for a professional installation, and that each is equally likely. The cost for a typical installation was estimated to be $239.[11]

VMS units require brackets for installation. The units may be purchased with brackets, or fishermen may be able to obtain brackets elsewhere for installation. Purchase of brackets may be an additional expense, running from about $30 for two brackets and up to $100 or $150 if pipes were needed for antenna placement, in addition to brackets. In this analysis, the distribution of installation costs was approximated by a triangular distribution with a minimum value of zero, a maximum value of $150, and a most likely value of $30. The mean of this distribution was $60, and this value was used to calculate aggregate costs.

VMS failure is discussed later. Conversations with vendors and recent NMFS discussion of VMS both suggest that failure rates may be higher for self-installed units. Problems may occur in the placement of antennas, or in the power hook-up. Thus, installation costs and repair costs may be negatively correlated.

Initialization fee

Skymate units require an initiation fee of about $149 dollars to make them operational, while Metocean units cost about $99. The Thrane & Thrane units do not require an initiation fee. Taken together, the cost of the Skymate unit and its initiation fee are very similar to the price of the Thrane & Thrane 3026-D unit. The initiation fee must be renewed, if a subscription to transmission services is allowed to lapse. Subscriptions can be held open with $5/month drydock fees.

Sales tax

Sales taxes may be applicable to the cost of the unit itself, the costs of brackets, and the costs of installation services. Sales taxes will vary by the jurisdiction within which the VMS unit is bought. Sales taxes in Alaska coastal communities in which fishermen are likely to find marine electronics stores selling VMS units tend to range between 3 and 6 percent. Fishermen may be able to get a VMS from a jurisdiction with no sales tax. A 6 percent rate has been used in this analysis. This is a real cost to the fishermen concerned, however in a cost-benefit analysis, taxes are treated as a transfer payment from one group to another. The sales tax, charged on the brackets and installation, is estimated to be $108 in this analysis.

[10] In the course of preparing this discussion paper NMFS learned of an instance where a self-install took about 10 hours over several days. The estimated cost of this would have fallen within the highend of the range of cost estimates, however.

[11] Assuming that a normal self-install has an opportunity cost of $25/hour and takes three hours, and that a professional installer charges $90/hour for two hours work, and that each approach is equally likely, the estimated weighted average cost for a normal install is $128. A minimum installation cost of two hours of self installation at $25/hour is $50. A maximum installation cost, in a worst case scenario, takes six hours of a professional's time at $90/hour, and comes to $540. In this analysis, the distribution of installation costs was approximated by a triangular distribution with a minimum value of $50, a maximum value of $540, and a most likely value of $128. The mean of this distribution was $239, and this value was used to calculate aggregate costs.The mean of a triangular distribution is equal to the average of the low, high, and most likely values.

OLE Notification

Before participating in a VMS fishery, participants are required to notify OLE that their VMS transmitter is activated. Upon completion of purchase and installation of the VMS units, and at least 72 hours prior to participation in a fishery that requires VMS, the participant must supply power to the transponder and fax a check-in report to OLE. The information on this report will enable NMFS to verify that the VMS system is functioning and that VMS data are being received. NMFS estimates that this would take the vessel operator about 15 minutes and cost $6 for a fax. Total cost is estimated to be $11.

Transmission costs

Vessels that will be expected to acquire VMS under the rule implementing the EFH/HAPC protection measures are assumed to use a transmission package based on the package sold in conjunction with the Skymate unit.[12] The Skymate unit comes with various transmission packages, ranging in cost from about $20 to about $74 per calendar month for different levels of transmission activity. Additional costs are incurred if the monthly transmission level is exceeded. The highest priced package provides for more transmission capacity per month than is necessary to meet NOAA requirements. The packages from this manufacturer offer "dry dock" fees of $5/month to cover months during which the vessel is not expected to transmit (this would allow the fishing firm to avoid paying a new activation fee if it stopped transmitting for a long period).

Vessels that acquired VMS under the EFH/HAPC rule are assumed to see their VMS costs for "active" months billed as follows. Units that will have to acquire VMS, were assumed to purchase a VMS coverage package costing $38.99 a month. This buys the transmission of an estimated 20,000 characters. Transmission every half hour for 31 days requires an estimated 29,760 characters. Under this package, additional characters cost $1.70 per 1,000. Operations were assumed to buy an additional 10,000 characters for $17. Total cost per month of fishing activity was estimated to be about $56. These operators were assumed to pay a "drydock fee" of $5/month for the remaining months. The drydock fee provides for months without transmissions, and allows the fishermen to avoid paying a new activation fee of $150 upon returning to active operation.

Annual transmission costs are the sum of transmission and drydock costs. Some participants in the fishery target only in the EYKT directed fishery. For fishermen acquiring VMS for the this area only in the dinglebar fishery, and who will only use it in one calendar month, total annual transmission costs for a fisherman who operated subject to a VMS requirement for one month and did not make VMS transmissions in the other eleven months, would be estimated to be $111 ($56/month for one month and $5/month for eleven months). This region has the highest participation and is usually closed in 10 to 12 days, so most vessels would only require VMS for 1 month. Moreover, as noted in Figure 5, most vessels made only one week's worth of landings in 2007. It is possible through error or paperwork problems that some fishermen may end up paying for more months of transmissions than they really require to meet regulatory requirements. There are a few landings that usually occur in Federal waters throughout the summer in CSEO and SSEOC so the VMS operation may be necessary for a longer period than one month. The season goes until November 30.

[12] This assumption does not imply NOAA endorsement for the Skymate unit. One of the other units might have been chosen to make this comparison, or some hypothetical unit, with characteristics combined from several units might have been used.

Maintenance and repairs

VMS units require maintenance. Batteries will need to be monitored and replaced periodically. Operators of smaller vessels with limited electrical systems, who may be operating the VMS units off of the unit's rechargeable battery, may have to periodically recharge the battery. This could be done, for instance, off of a car's cigarette lighter. Owners may also have to monitor antenna and power connections for corrosion, and clean them as necessary. In addition, some systems may require software to be updated. Many of the transponders can have their features upgraded by being reloaded/flashed with updated versions. Some vessel owners have found that data from apparently functioning VMS units is not reaching OLE. These cases may require troubleshooting.

A certain number of units will break down each year. Future breakdown rates and associated costs are unknown. OLE experience with the units installed under the Steller sea lion protection program suggests a breakdown rate of about 3 percent to 5 percent per year for those units.

Operations that already have VMS units, or that will acquire them independently of this action, won't incur more breakdowns because of this action. VMS units already operating would face these costs whether or not this action is taken. Breakdown costs will be incurred by operations making new VMS installations because of this action.

As noted earlier many of the problems arising with these units are caused by mistakes made during self-installs. These may occur early in the unit life cycle. Problems mentioned include positioning of antennas, and problems with power supply.

New units will initially be under warranty. Thus a large part of the risk of replacement costs and service charges is transferred from fishermen to vendors. Since cost of the warranty is included in the purchase price, it is similar to the purchase of an insurance policy. Thrane & Thrane units carry a two-year warranty, while Skymate units carry a one-year warranty. Skymate vendors generally address warranty responsibilities by swapping out the defective unit for a new one.

NMFS estimates the time required to maintain the antennas and electrical systems on the vessel operator is estimated to be approximately 2 hours per year. This comes to $50 if done by the vessel's personnel, or $180 if professionally serviced (using the estimates of opportunity costs and professional service used in the installation discussion earlier). Unit failures are assumed to be covered by warranty, and to be infrequent after the first year of operation. Units will be replaced at some point; replacement is discussed below.

The low end cost for maintenance and repairs is expected to be zero in a situation where no repairs and minimal maintenance are needed. The most likely cost is estimated to be two hours of maintenance by the vessel's crew, estimated to be about $50. The high end cost is assumed to be two hours of professional assistance, costing $180. Note that many problems are likely to be dealt with under warranty by switching out an old unit for a new one. In these cases, the replacement should be able to take advantage of the cables and brackets placed for the original installation. In this analysis, the distribution of maintenance and repair costs was approximated by a triangular distribution with a minimum value of zero, a maximum value of $180, and a most likely value of $50. The mean of this distribution was $77, and this value was added to transmission expenses to estimate annual operating costs.

Lost fishing time due to unforeseen breakdowns

Unit breakdown may cause vessel operators to lose fishing time and revenues. A an operator who becomes aware that transmission of automatic position reports has been interrupted, or when notified by NMFS that automatic position reports are not being received, must contact OLE and follow the instructions provided.

OLE handles breakdowns on a case-by-case basis. Their requirements may depend on such considerations as whether or not the vessel is at the dock or is fishing, and if it is fishing, where it is fishing and how much longer it wants to stay out. NMFS does not normally require a vessel to interrupt a fishing trip and return to port when a breakdown is identified. In the twelve months ending in early August 2006, there were about ten instances of VMS reporting failures aboard vessels that were away from port and engaged in some aspect of fishing operations. When this happened, OLE communicated directly with owners or operators and provided direction that usually included the allowance to finish up their operation (e.g., finish pulling their gear) and to obtain service once in port to rectify the VMS reporting issue(s). In a recent instance, OLE directed the vessel to provide periodic position reports until they were back in port and obtaining VMS service/repair. A vessel with a defective VMS unit will have to get it repaired before it begins a new trip.

As noted, experience with the ARGOS VMS units, adopted to enforce the Steller sea lion protection measures, but now being phased out, demonstrated that unit replacement rates were about 3 to 5 percent per year. Because of the low apparent breakdown rate, and OLE's policy for when they do, only a small number of fishing vessels with VMS are expected to experience fishing interruptions because of unit breakdown during a year.

Quantitative estimates of the size of these costs cannot currently be made. Based on OLE experience and practice, it is likely that the costs imposed on fishing operations underway will be small. It is impossible to estimate the potential cost to vessels that must repair a VMS unit before departing to go fishing. These will depend on the numbers of unit breakdowns, the distribution of VMS vendors along in communities along the Alaska coast, on the ease with which repair work can be completed or replacement units supplied.

Replacement cost

The proposed rule would be a permanent change in regulations. Fishermen would have to replace their VMS units as they wear out, as they become technologically obsolete, or as regulatory requirements changes. Thus the initial purchase cost does not represent the full lifetime cost of this requirement for fishermen.

NMFS has had a relatively short period of experience with VMS, and information has not yet been compiled which would permit estimation of typical VMS lifetimes on different classes of vessels under normal working conditions. Based on anecdotal information, NMFS estimates the typical VMS lifetime to be 4-5 years. Because of advances in VMS systems, some models may become obsolete in less than five years. Units may become technologically obsolete, and/or find their OLE type-approval withdrawn. For example, in the case of the ARGOS system, type-approval was withdrawn and new installations were not permitted after early 2004. Fishermen may also retire older units and adopt new ones if the combination of new unit costs and monthly transmission fees would be less expensive for them, or if new features make this attractive. Anecdotal evidence suggests that, in some instances, ARGOS units have been replaced for this reason.

Over the medium to long term, it is likely that technological change and increasing competition will reduce the prices of replacement units. While price indices have not been prepared, some experience bears this out. Despite this long-run expectation of declining prices, prices have been known to increase in the short run, although some of these price increases may have been associated with changes in unit quality.

Only four manufacturers are currently type approved to serve the Alaskan market. In some instances, small numbers of businesses in an industry may be very competitive. However, small numbers, and concentration of sales among a few firms, are often indicators of relatively low levels of competition. It is possible that competitive pressure on vendors to reduce prices is limited.

Purchase, installation and repair in remote communities

Fishermen operating out of small and remote home ports may face higher costs for purchase, installation, and repair of VMS units. This may also apply to some who live in larger communities, but off the road systems of those communities. Fishermen operating out of these ports may not have access to a local marine electronics shop, may have to order equipment by mail, self-install, or travel to and from a larger port for installation and service. If they tend to self-install proportionately more, they may tend to have a greater frequency of VMS breakdown. Fishermen are likely to address these cost considerations by "piggy-backing" VMS related tasks on top of other activities that take them to larger ports. As shown in Figure 6, in recent years a disproportionate share of active vessels in this fishery have Sitka and Juneau home ports. These issues should not be as serious in these ports. Other vessels have been homeported in Washington State. Since 2003, small numbers of vessels have been homeported in Hoonah, Wrangell, and Yakutat.

Present value of VMS investments

As noted, the VMS requirements under consideration in this analysis are expected to be permanent. After their initial investment in VMS units, fishermen will still be expected to incur annual transmission costs, and to purchase new VMS units as existing units fail, or become technologically obsolete. Thus, VMS units represent a long-term financial commitment by fishermen. The present value of the cost of an individual VMS investment is estimated here for a vessel acquiring a VMS for use only in the dinglebar ling cod fishery in Federal waters. This unit is only expected to be used during one month a year.

As summarized in Table 2, the cost of acquiring and installing a VMS unit is estimated to be $2,068 ($1,500 for purchase and freight, $239 for installation, $60 for brackets, $150 for initiation fees, $108 for additional sales taxes, and $11 to notify NOAA). Of this, $1,500 is assumed to be reimbursable by the Pacific States Marine Fisheries Commission. Annual expenses are estimated to be $56 for one month of transmission costs, $55 for "dry-dock" fees in each of eleven other months, and $77 to maintain the units in working order. Units are assumed to be replaced every four years.

Assuming no decline in the price of VMS units or annual operating costs over this period, and reimbursement for the initial purchase cost of the VMS, the present value of the cost of the VMS requirement over a 20 year period, at an estimated real rate of interest of 3.92 percent[13], would be

[13] Based on an estimated recent real return on Baa bonds.

$9,000. This estimate may be high if VMS prices decline over the 20 year period, or if unit life times are longer than assumed. Shorter unit lifetimes would increase the present values.

Cost Estimates for 2007

An examination of landings records and VMS tracks indicates that eight vessels fished for lingcod with dinglebar gear in Federal waters off of Southeast Alaska in 2007. All of these carried transmitting VMS units. None of these appear to have been required to carry VMS units with other regulations, thus the VMS requirement can be attributed to their participation in this fishery. Five of these vessels appear to have applied for and received reimbursements for the unit purchase costs; the three additional vessel owners have all indicated an intention, or actually begun, to apply for reimbursement.[14]

This section discusses the total costs of implementing the VMS requirement for the 2007 fishery. Two separate perspectives on costs are taken: costs are estimated first from the viewpoint of the fishermen themselves, and second from the viewpoint of society as a whole. These different accounting perspectives generate somewhat different pictures of the costs. The costs to the individual fishermen include the costs to the fishermen who installed and operated the VMS units and went fishing for lingcod in Federal waters, and the costs to the fishermen who might have gone fishing, had they not found that, for them, the additional costs of the VMS units were greater than the benefits of fishing.

Costs to participating fishermen

Total costs of purchase for those who found it cost-effective to buy the units and fish in 2007 are estimated to have been $2,068/boat for eight boats, or about $16,500. It was assumed that PSMFC would reimburse vessel owners the assumed purchase price, or $1,500/boat. All fishermen are assumed to apply for and receive these reimbursements. The total net costs to the fishermen are therefore estimated to be about $4,500. An additional allowance should be made for the additional income tax deduction associated with these business purchases. In addition to acquisition costs, fishermen are estimated to have incurred about $188/year in transmission, repair, and maintenance costs for the units. With eight active units, this suggests a cost of about $1,500. Thus the total costs to these operators in 2007 are estimated to have been about $6,000.

It is possible that some vessels were deterred from fishing for lingcod in Federal waters this year as a result of this requirement. These vessels would have been used in their next best activity. This activity, for example, may have been fishing for lingcod solely in State waters, or fishing for some other species. Vessels may also have been left idle when they would otherwise have been fishing for lingcod in Federal waters. The difference between the profits they might have generated fishing for lingcod and in their next best activity provides an estimate of the potential social loss from this source. Based on activity in recent years (nine vessels in most years since 2001, it seems unlikely that more than one vessel may have been deterred from fishing in Federal waters for this reason. Twelve vessels did operate in 2005, so it is possible that as many as four vessels may have been deterred.

[14] One additional vessel may have fished in Federal waters with dinglebar gear, and carried a transmitting VMS unit, however, this vessel did not record dinglebar catch in Federal waters on landings records. The FFP for this vessel was endorsed for Pacific cod, therefore this vessel may have been carrying the VMS unit to comply with Steller sea lion protection regulations. This vessel has not been included in the cost calculations in this section.

If vessels were deterred, they were deterred because the additional benefits of fishing in Federal waters for dinglebar lingcod (over the benefits of their next best activity) were less than $756 (the value of purchase and installation costs minus PSMFC reimbursement plus annual costs for 2007). Thus, the maximum potential cost to the fishermen from this source is estimated to range from about $800 up to about $3,000 ($756*4).

Thus, total costs of the requirement to the fishermen in 2007 are estimated to be range between $6,800 and $9,000 (the sum of total net purchase costs and installation costs for the eight units, one year of transmission and maintenance, and the cost to vessels which were deterred from fishing for lingcod; the range is generated based on different assumptions about the number of vessels deterred – one or four). The lower end of the range appears more likely given estimated recent participation levels. Moreover, the method used to estimate losses for each of the vessels deterred from fishing generates a maximum total loss, and their actual losses were probably less.

This aggregate cost estimate for the whole fishery implies an average cost of about $756 for fishermen who participated in the 2007 fishery, and a maximum of $756 for fishermen shifting to another 2007 fishery. Average revenues from the dinglebar lingcod fishery were about $15,900 in 2007; median revenues were about $12,400. Average costs are likely to be less in each of the next few years because of the installed VMS capacity in existing vessels. Vessels that enter the dinglebar fishery in future years may have to incur purchase and installation costs if they do not carry VMS already to comply with other Federal regulations.

Total social costs

The social cost accounting is somewhat different. First, the value of the reimbursement payments to the fishermen plus their unreimbursed costs represents the full social cost of the units. On the other hand, sales tax payments represent a transfer, and not an actual cost. Tax considerations represent transfer payments from one party to another, and not the using up of actual labor and capital. Thus, the total social costs of the VMS use in 2007 would be between $17,900 and $20,200, depending on whether one or four vessels were deterred (the cost of eight units plus a year's operating costs, plus the costs imposed on those deterred from fishing, minus sales tax payments). As noted above, an estimate in the lower half of the range may be more likely.

For various reasons, this social cost estimate is believed to be high. The analysis assumes that the costs of the VMS units are equal to their true social marginal cost. If manufacturers can sell them above marginal cost because of the presence of market power in the Alaska market, this approach would overstate the true social costs. This estimate also ignores the costs associated with the reimbursement program. However, the additional costs from this source associated with reimbursing the dinglebar fishermen would be very small. Any overestimate of the costs to vessels deterred from the fishery would also tend to bias this estimate up, and as noted above, this cost estimate may be high.

As noted above, unless catch or market conditions lead a larger number of vessels to desire to enter this fishery, future annual costs, both to the fishermen and to society, are expected to be less than this, since several vessels will already have VMS units each year. A similar result is likely for costs incurred by the lingcod fishermen, unless the reimbursement program ends.

Prepared by

Ben Muse
Sustainable Fisheries Division
National Marine Fisheries Service, Alaska Region

Cathy Coon
North Pacific Fishery Management Council

Data Processing Support

Brandon Andrews
Alaska Fisheries Information Network

Patty Britza, Josh Keaton
Sustainable Fisheries Division
National Marine Fisheries Service, Alaska Region

Persons consulted

John Olson
Habitat Protection Division
National Marine Fisheries Service, Alaska Region

Michael Vaughn, Cleo Brylinski, Kamala Carroll
Commercial Fisheries Division
Alaska Department of Fish and Game, Sitka

Guy Holt
NOAA Office of Law Enforcement, Alaska Region

Tom Meyer
NOAA Office of the Alaska Regional Counsel

Matt Donohoe
Skipper, FV Helen-A
Sitka

Julie Scheurer
Sustainable Fisheries Division
National Marine Fisheries Service, Alaska Region

Kristiana Kronek
Pacific States Marine Fisheries Commission

References

Alaska Department of Fish and Game (ADF&G). n.d. (after 2005). Lingcod Fisheries in Alaska. Accessed on October 1, 2007 at http://www.cf.adfg.state.ak.us/geninfo/finfish/grndfish/lingcod/lingcodhome.php .

Bizzarro, J. 2002. Final Report: Preliminary Video Analysis of Coral, Sponge, and Meteridum Distrubtion from Rockfish Transects made with the Delta Submersible in Southeast Alaska. Subcontract to Moss landing Laboratory NA 16FN1273. Alaska Groundfish Monitoring Demersal Shelf Rockfish Stock Assessment and Submersible Work. Regional Information Report NO. 1J02-38.

Cimberg, R.L., Gerrodette, T., and K. Muzik. 1981. Habitat requirements and expected distribution of Alaska coral. Final Report, Research Unit 601, VTN Oregon, Inc. U.S. Department of Commerce, NOAA, OCSEAP Final Report 54 (1987), 207-308. Office of Marine Pollution Assessment, 701 C. Street, Anchorage, Alaska 99513.

Gordon, D. A. 1994. Lingcod Fishery and Fishery Monitoring in Southeast Alaska. Alaska Fishery Research Bulletin. 1(2):140-146. Winter.

Wilson, W. 2007. Fishery Management Options for the Alaskan EEZ in the Chukchi and Beaufort Seas of the Arctic Ocean – A Revised Discussion Paper. North Pacific Fishery Management Council. May 2007. http://www.fakr.noaa.gov/npfmc/sci_papers/ArcticOceanFMP407.pdf

National Marine Fisheries Service (NMFS) n.d. Expanding Coverage of the Vessel Monitoring System for Monitoring Time-Area Closures in the Pacific Coast Groundfish Fishery. Northwest Region leaflet. Accessed on November 15, 2007 at http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Vessel-Monitoring-System/upload/VMS_Expand_Coverage.pdf .

NMFS 2006a. Draft for Council Review. Extended VMS Coverage in the Alaska Region. Regulatory Impact Review/Initial Regulatory Flexibility Analysis. September 2006.

NMFS 2006b. Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis for Amendments 65/65/12/7/8 to the BSAI Groundfish FMP (#65), GOA Groundfish FMP (#65), BSAI Crab FMP (#12), Scallop FMP (#7), and the Salmon FMP (#8) and regulatory amendments to provide Habitat Areas of Particular Concern. April 2006, U.S. DOC, NOAA, NMFS Alaska Region, P.O. Box 21668, Juneau, AK 99802-1668.

NMFS 2007a. Preliminary Initial Review Draft for Council Review Extended VMS Coverage in the Alaska Region. Results of Analysis Since October 2006. U.S. DOC, NOAA, NMFS Alaska Region, P.O. Box 21668, Juneau, AK 99802-1668

NMFS 2007b. NMFS Reminds Fishing Vessel Owners and Operators of Federal Fisheries Permit Requirements. Information Bulletin 07-42. April 13, 2007. Sustainable Fisheries Division, Alaska Region.

North Pacific Fishery Management Council (NPFMC) 2004. Habitat Areas of Particular Concern Proposal ' Gulf of Alaska High Relief Corals, Primnoa Species' Submitted by NOAA Fisheries, Juneau Alaska. January 2004.

O'Connell V., Brylinsky C., Carlile D. 2002. Demersal Shelf Rockfish Stock Assessment Report for 2003. Regional Information Report No. 1J02-44. 48 p. Alaska Department of Fish and Game. Juneau, AK.

Pacific Seafood Group. 2002. Web page: "Pacific Seafood." Lingcod. Accessed on October 3, 2007 at http://pacseafood.com/products/ling_cod.html .

Seltzer, B. 2006. The Lady and the Lingcod. Trafford Publishing

Vincent-Lang, D. 1994. Lingcod: Wildlife Notebook Series. Alaska Department of Fish and Game. Accessed on October 1, 2007 at http://www.adfg.state.ak.us/pubs/notebook/fish/lingcod.php.