



An Evaluation of Charter Fishing Logbook Reporting Compliance

Glacier Bay National Park, 2009-2011

Natural Resource Technical Report NPS/GLBA/NRTR—2013/688



ON THE COVER

Four charter fishing vessels anchored and fishing in Glacier Bay National Park.
Photograph by: GLBA Employee, Glacier Bay National Park

An Evaluation of Charter Fishing Logbook Reporting Compliance

Glacier Bay National Park, 2009-2011

Natural Resource Technical Report NPS/GLBA/NRTR—2013/688

Craig C. Murdoch, Chad R. Soiseth

National Park Service
Glacier Bay National Park
P.O. Box 140
Gustavus, Alaska 99826

February 2013

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Technical Report Series is used to disseminate results of scientific studies in the physical, biological, and social sciences for both the advancement of science and the achievement of the National Park Service mission. The series provides contributors with a forum for displaying comprehensive data that are often deleted from journals because of page limitations.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available from Glacier Bay National Park and Preserve (<http://www.nps.gov/glba/index.htm>) and the Natural Resource Publications Management website (<http://www.nature.nps.gov/publications/nrpn/>).

Please cite this publication as:

Murdoch, C. C., C. R. Soiseth. 2013. An evaluation of charter fishing logbook reporting compliance: Glacier Bay National Park, 2009-2011. Natural Resource Technical Report NPS/GLBA/NRTR—2013/688. National Park Service, Fort Collins, Colorado.

Contents

	Page
Figures.....	v
Tables.....	vii
Appendices.....	ix
Executive Summary	xi
Acknowledgments.....	xiii
List of Acronyms	xiii
Introduction.....	1
A summary of charter fishing in Glacier Bay National Park.....	2
Study Area	5
Methods.....	7
Primary (Direct) Surveys	8
Aerial Surveys.....	8
Vessel-Based Surveys.....	9
Secondary (Indirect) Self-Reported Results	11
Creel Surveys	11
Visitor Information Station (VIS) Radio Contact Log	11
Results and Discussion	13
Aerial Surveys.....	13
Vessel-Based Surveys.....	17
Creel Surveys	18
VIS Radio Contact Logs	20
Reporting Compliance by Geographic Location	20
Conclusions.....	25

Contents (continued)

	Page
Significance of Findings	25
Defining the Management Application	27
Recommendations:.....	28
Communication.....	28
Recommendations:.....	29
Verification and Enforcement.....	29
Recommendations:.....	30
Literature Cited	32

Figures

	Page
Figure 1. The annual number of charter fishing businesses and vessels reporting fishing activity in Glacier Bay National Park (GBNP logbook data).	3
Figure 2. 2007-2010 Southeast Alaska charter halibut harvest per square kilometer for each of the seven regional statistical areas (SWHS).	4
Figure 3. Study area map of Glacier Bay National Park’s boundary and marine waters.	6
Figure 4. Approximation of primary aerial survey flight path (yellow)	8
Figure 5. An example aerial photograph of a charter fishing vessel anchored and actively fishing in GBNP, where anglers are holding rods and the ADF&G guide sticker can be seen below the window on the cabin	9
Figure 6. A typical photograph from a vessel based survey where the vessel of interest is easily identifiable as a charter fishing boat and anglers are actively fishing	10
Figure 7. Generalized polygon delineating area of coverage for vessel-based NPS charter vessel surveys	10
Figure 8. Aggregated percentage of charter fishing vessels that we documented fishing in park waters, but that did not report each year by survey method.	14
Figure 9. Non-reporting by straight line distance from Bartlett Cove	21
Figure 10. Glacier Bay National Park boundary and Alaska Department of Fish and Game (ADFG) logbook statistical area map	23
Figure 11A and B. A) The number of halibut reported harvested by charter operators at three different levels of non-reporting. B) The number of reported fishing hours by charter operators.....	26

Tables

	Page
Table 1. Completed flight survey schedule and summary detailing observer tide information and the number of successfully identified charter vessels	13
Table 2. Survey statistics by year and combined years for each survey method... ..	14
Table 3. Summary of annual vessel-based survey effort and charter vessel detection by survey team	17
Table 4. Number of charter vessels surveyed at Gustavus and Bartlett Cove docks and effect of creel survey location on subsequent logbook reporting.. ..	19
Table 5. Charter fishing logbook non-reporting by geographic area and straight line distance from Bartlett Cove	21
Table 6. Aerial, vessel and creel survey data combined by boundary type.	22

Appendices

	Page
Appendix A: Public Law 105-391 [excerpt].....	34
Appendix B: Glacier Bay National Park CUA Permit Stipulations	37
Appendix C: Glacier Bay National Park Charter Fishing Survey Logbook Form.....	39
Appendix D: Vessel Survey Data	43

Executive Summary

National Park Service (NPS) Concessions Management Public Law 105-391, Sec. 418 (Commercial Use Authorizations) states that the NPS may only authorize commercial services that “will have minimal impact on resources and values of the unit of the National Park System and are consistent with the purpose for which the unit was established and with all applicable management plans and park policies and regulations” (NPS 1998) (Appendix A). Charter fishing businesses operating under a Commercial Use Authorization (CUA) or a Charter Concessions (CC) contract in Glacier Bay National Park (GBNP) have been required to report fishing effort and harvest “anywhere within park waters” as a condition of their business permits since 1995. Monitoring charter fishing activity and fisheries resource extraction is a critical tool for evaluating whether this commercial activity complies with these guidelines. Poor reporting compliance inhibits adequate evaluation and management of this activity. Misreporting, including both under-reporting and non-reporting, of fishing activity and harvest in park waters has long been a park management concern.

We used multiple survey methods (aerial, vessel, creel and radio contact logs) to document charter fishing trips in park waters in order to verify compliance with self-reported NPS sportfishing logbook reporting. The objective of this study was to assess charter fishing logbook reporting compliance of both CUA and CC permitted charter fishing vessels. With our most robust sampling method we estimate that non-reporting was 49% for the years 2009-2011 ($n = 131$; Table 2, Figure 8). We found that non-reporting was lowest in 2010. This was likely the result of letters and meetings in 2010 where park managers expressed the importance of accurate and timely reporting to CUA and CC businesses. Further, data suggest that non-reporting is highest in the Icy Strait region (Figure 9). This is likely the result of inconsistency between state and park reporting requirements, reporting area misalignment and lack of repercussions for non-reporting.

This high proportion of non-reporting indicates that previous estimates of charter fishing effort and harvest are largely under estimated and likely inadequate in terms of documenting and quantifying true charter fisheries harvest. The charter fishing logbook is the only tool the park currently possesses to monitor charter fishing effort and harvest. Because the logbook is designed to be a census, it is critical that reporting compliance is high. This study demonstrates that the collection of self-reported data such as GBNP Charter Fishing Logbooks or Commercial Use Activity Reports must incorporate verification if the data are to have management utility. With no measure of data accuracy, relevant management of this extractive activity is unlikely.

We recommend a variety of management actions that, if implemented, would likely improve reporting compliance and management of this activity within GBNP. The establishment of clear thresholds at which fish harvest or fishing effort is limited would help bring the park in line with current NPS management directives, while also guiding any monitoring efforts. We recommend the park have more interaction with charter fishing businesses. An annual meeting or orientation would likely help on numerous fronts. Further, continuing to verify non-reporting while increasing enforcement interactions with charter fishing vessels across the park would also likely help improve compliance and the overall management of this activity.

Acknowledgments

This survey work could not have been completed without support from many dedicated and hardworking Glacier Bay National Park Service employees. We would like to thank and acknowledge the very helpful assistance from Visitor Information, Law Enforcement, Administrative, Concessions and Resource Management staff for making this work possible. We give particular thanks to Glacier Bay National Park staff: Todd Bruno, Patrick Reimann, Erica Francis, Rachael Chunn, Kevin Fraley, Mike Lehmann, Justin Smith and Marilyn Trump for their integral parts in this 3 year study. Additionally, thoughtful review from Chris Sergeant, Karl Brookins, and Lisa Etherington considerably improved this report. We also wish to give thanks to the pilots that flew us safely on 22 surveys over 3 thousand miles. Air Excursions Pilots Van Swanson and Cable Wells and Chuck Schroth from Fjord Flying provided us with outstanding and safe flight surveys.

List of Acronyms

ADFG	Alaska Department of Fish and Game
CPFVs	Commercial Passenger Fishing Vessels
CC	Concessions Contract
CUA	Commercial Use Authorization
GBNP	Glacier Bay National Park
GBP	Glacier Bay Proper
NPS	National Park Service
SWHS	Statewide Harvest Survey
VIS	Visitor Information Station

Introduction

Many state and federal fishery management agencies use mandatory logbooks to help manage fisheries. In concept, logbooks are advantageous over other surveys because they provide a census, can be provided quickly, have little or no recall bias, and are generally more credible with stakeholders leery of sub-sampling and estimation. But, since logbook data are fishery dependent or “self-reported,” data must be verified regularly, especially if there are incentives for over or under-reporting (Meyer and Powers 2009).

Glacier Bay National Park CUA and CC stipulations have required all permit holders to report fishing activity within park waters since 1995 (Appendix B). Charter guides are required to report the number of anglers, location of fishing, hours fished for salmon and ground fish and the number of fish released and harvested (Appendix C). This information allows park managers to assess trends in fishing effort and harvest, which could be used to evaluate levels of impact and set limits on this extractive resource use. A major shortcoming of this data collection method is that it is self-reported and lacks verification (Sampson 2011). Some charter operators are unlikely to report consistently or accurately if the information they provide the park could be used to limit their activity; especially if there are no repercussions for inaccurate, false or non-reporting.

A 1987-91 study along the central California Coast found poor logbook reporting compliance by commercial passenger fishing vessels (CPFVs). Compliance of logbook submission even on CPFVs with onboard observers ranged between 61% - 91%. Compliance on vessels without onboard observers was thought to be even lower (Reily et al. 1993). Past GBNP aerial survey monitoring (Soiseth et al. 2007), in conjunction with information reported in mandatory sportfishing logbook reports and other anecdotal information suggested that some charter fishing operators did not report fishing effort within GBNP waters outside of Glacier Bay proper (GBP), as required.

Misreporting of fishing activity in park waters has long been a concern in the park. Gasper et al. (2005) noted that all Elfin Cove and Gustavus charter fishing vessels (n=7, n=14) observed fishing in park waters during aerial surveys failed to report fishing in the park to dockside creel clerks. This study also found that halibut harvest reported by Gustavus charter fishing operators was approximately 19% lower than estimates generated from a combination of aerial and vessel survey methodologies. Soiseth et al (2007) documented that 34-46% of charter vessels identified during aerial surveys of the Cross Sound/Icy Strait region of GBNP during 2002 and 2003 were operating without a business permit and therefore also failed to report their fishing activity. While charter fishing in the park by unpermitted businesses has apparently declined, no consistent multi-year evaluation of reporting compliance by permitted businesses had ever been conducted until 2009 when we initiated this study.

The objective of this study was to assess charter fishing logbook reporting compliance of both CUA and CC permitted charter fishing vessels. We did not assess the accuracy of reported data, but rather estimated the proportion of charter fishing trips that went unreported. To address this objective we compared observations from aerial, vessel, creel, and radio contact surveys to the logbook records supplied by CUA and CC permitted charter fishing businesses. Through these comparisons we estimate the percent of logbook non-reporting by year. Each of these survey

methods have strengths and weaknesses that we discuss to arrive at a recommendation for future reporting verification. In addition, we make recommendations on how to improve reporting compliance so that future sportfish logbook data is of greater management value. To improve the reader's understanding of charter logbook reporting compliance in context with the activity of charter fishing within GBNP we have included a short summary section on charter fishing.

A summary of charter fishing in Glacier Bay National Park

Clients aboard charter fishing vessels typically fish for Pacific halibut, *Hippoglossus stenolepis* and salmon (primarily Chinook, *Oncorhynchus tshawytscha* and coho, *Oncorhynchus kisutch*). While the range of activities conducted aboard charter fishing vessels runs the gamut from sightseeing and non-fishing, off-vessel activities to focused, day-long fishing charters, a few concessioners and most CUAs are exclusively focused on daily fishing excursions.

The CUA permit allows charter services in park marine waters *outside* GBP and Dundas Bay year round and *inside* GBP and Dundas Bay from September 1 to May 31. Concessions contracts provide operators year round access to all park waters, but vessel quota restrictions during the visitor use season (June 1 – August 31) limit the number of charter vessels in GBP to 6. Historically, CUA charter activity occurred mostly during the visitor use season from June through August. However, CUA fishing effort rapidly expanded into the shoulder seasons of May and September beginning in 2006. In general, most charter fishing during the June through August visitor use season occurs in the Icy Strait, and Cross Sound portion of the park. Charter fishing effort is generally focused on lower Glacier Bay before and after the visitor use season in May and September.

The numbers of charter fishing businesses and the number of vessels used by those companies has varied greatly over the park's 15 year period of record. In general, both doubled after 2006, but declined again in 2011, when NOAA instituted a limited entry regulation to limit the size of the charter fleet in 2C (Southeast Alaska). There were 17, 19, and 13 businesses that reported charter fishing in park waters during 2009, 2010, and 2011, respectively. Most charter trips originated from Bartlett Cove, Gustavus, and Elfin Cove (Figure 3). Charter trips offered by these companies range from day-long to multi-day trips. Most vessels used by charter operators were six passenger vessels ranging in size from 24-32 feet. These businesses reported operating 35, 38, and 25 different charter fishing vessels in 2009, 2010 and 2011 respectively (Figure 1). There are currently no limits on the number of CUA's issued to operate in GBNP.

The capacity of the charter fishing fleet increased vastly throughout Southeast Alaska and the park during the last decade. This increase was fueled largely by favorable economic conditions and burgeoning Alaska tourism of which the Southeast Alaska charter industry was a high-profile component. Coincidentally, NPS management of CUA and concession permit holders changed to allow access to Glacier Bay proper waters during the May and September shoulder seasons. Despite its known inaccuracies (documented in current report), GBNP's charter logbook records suggest a 2-7 fold overall increase in fishing effort over the 1997 through 2007 period that is corroborated by other state fishery monitoring instruments (Soiseth et al. 2013).

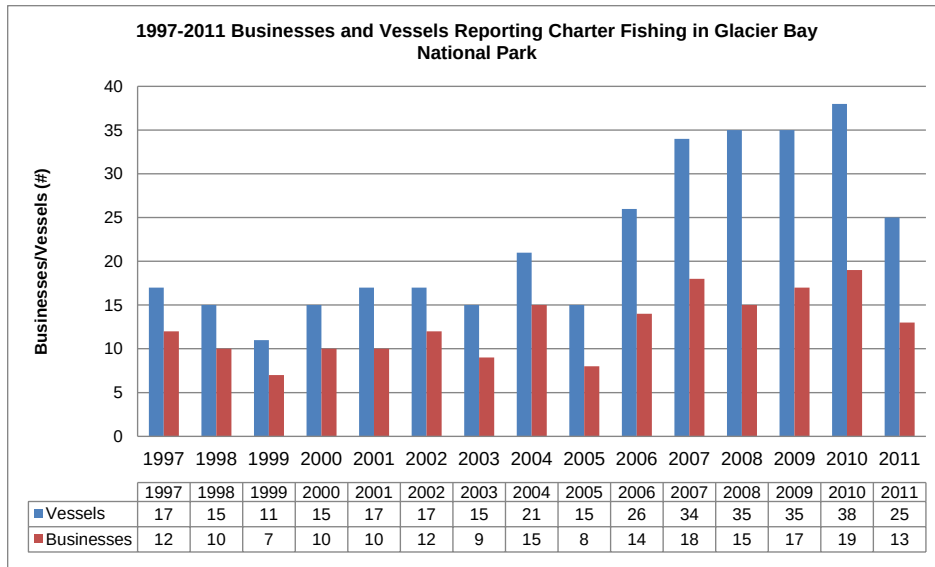


Figure 1. The annual number of charter fishing businesses and vessels reporting fishing activity in Glacier Bay National Park (GBNP logbook data).

According to the ADFG Statewide Harvest Survey (SWHS) in 2007, 2008 and 2009, Area G (Glacier Bay Area) had the highest recreational halibut harvest per square kilometer of marine waters of any of the seven areas in Southeast Alaska (Figure 2). In 2008 and 2009, the number of charter harvested halibut in Area G alone exceeded charter halibut harvest in all other Southeast Alaska statistical areas. In 2008, area G charter harvest was nearly 40% higher than the next highest area of Sitka. Of the 7 statistical areas that make up the Southeast 2C region, area G halibut harvest by weight totaled 30%, 37% and 31% of total 2C harvest between 2007 and 2009 (SWHS). According to ADFG, the great increases in the total recreational harvest of halibut from outer coastal areas since 1987 can be attributed to increased effort by charter anglers (Tersteeg and Jaenicke 2008). These statistics clearly demonstrate the prominence of the Glacier Bay Area as a new mecca for charter fishing. Charter halibut harvest in GBNP has been no exception to the region wide increases (Soiseth et al. 2013).

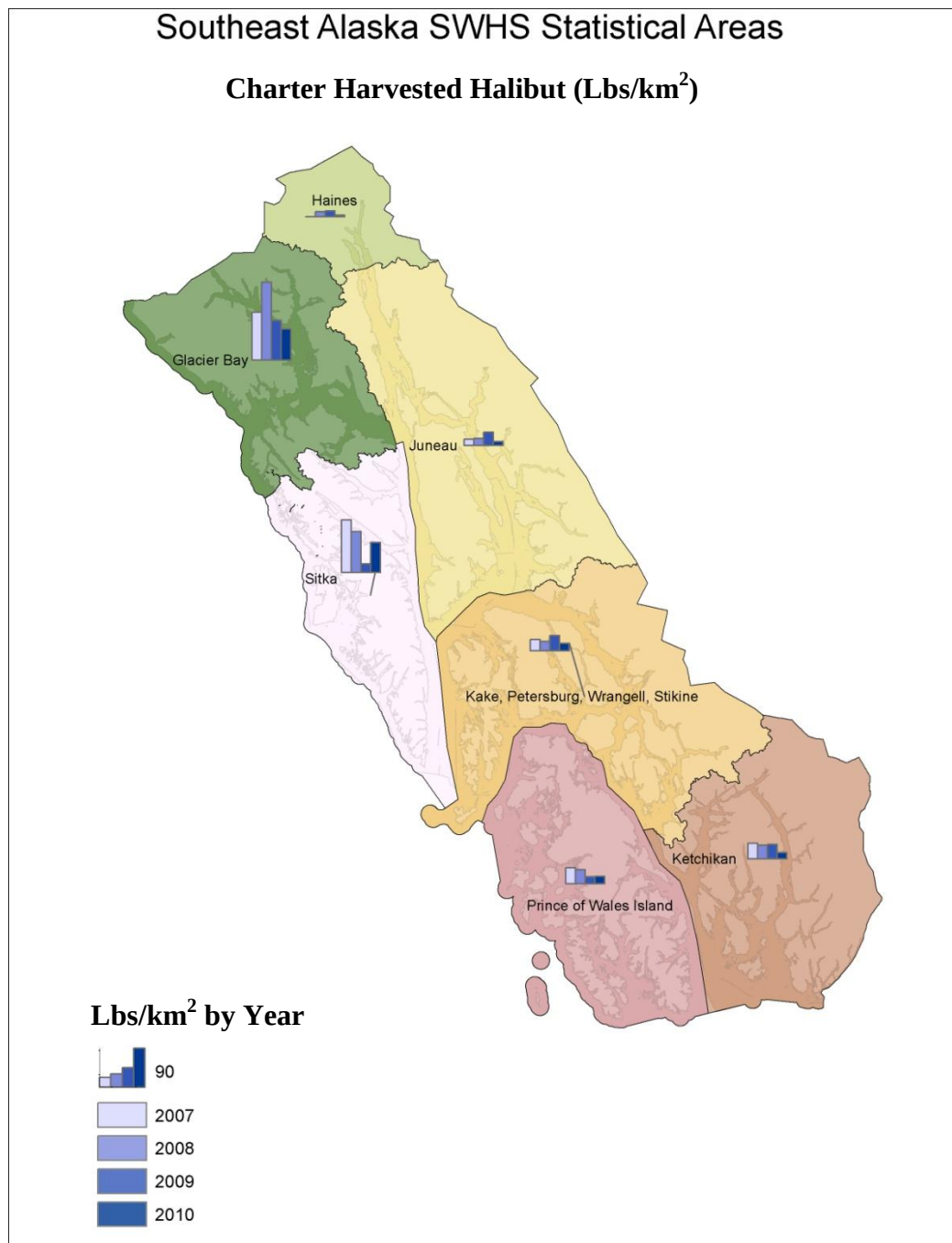


Figure 2. 2007-2010 Southeast Alaska charter halibut harvest per square kilometer for each of the seven regional statistical areas (SWHS).

This recent increase in charter fishing effort and harvest underscores the need for park managers to have access to timely and accurate information on which to base conservation decisions. Continuing the collection of poor information undermines potential management action, jeopardizes park resources, is fiscally wasteful, and potentially alienates charter businesses. This study demonstrates that changes in park management of this activity are necessary.

Study Area

Glacier Bay National Park and Preserve is a World Heritage Site, Biosphere Reserve, and Marine Protected Area that lies along the northern-most end of Alaska's Alexander Archipelago in Southeast Alaska. The Archipelago consists of numerous islands and islets which serve to isolate the inland waterway from the more extreme wind, swell and wave exposed effects of the Gulf of Alaska. The coastline here is steep and rocky with the connection to the Gulf of Alaska via Cross Sound to the west. Glacier Bay National Park and Preserve (11,030 km²) in Southeast Alaska includes GBP as well as Excursion Inlet, Icy Passage, Dundas Bay, Cross Sound, and the Outer Coast from Cape Spencer north to Dry Bay. This study examines reporting compliance of guided sport fishing activity within the bounds of GBP, Excursion Inlet, Icy Passage, North Passage, Dundas Bay, North Inian Pass, Cross Sound and the Outer Coast from Cape Spencer north to Icy Point (Figure 3).

GBP is a recently deglaciated (less than 300 years ago) fjord estuarine system with multiple sills derived from past terminal moraines. High rates of marine productivity in this area are influenced largely by freshwater glacial input from several tidewater glaciers, hundreds of freshwater streams, deep water renewal from outside the bay, and strong tidal mixing (Etherington et al. 2007). While the entry sill near the mouth of Glacier Bay is relatively shallow at 25 m, deep basins of up to 458 m exist within GBP.

GBNP encompasses 243,339 km² of marine waters. Approximately 45% of this area (110,000 km²) exists outside GBP. About 21,558 km² of designated Wilderness waters in Dundas Bay, the Hugh Miller Inlet complex (also includes Charpentier Inlet and Skidmore Bay), Rendu Inlet, Adams Inlet and the Beardslee Islands are closed to motorized vessel traffic for four and a half months (May 1 through September 15) each year. Because NPS regulations prohibit motorized access during summer, Wilderness waters are by default, virtually free from fisheries harvest. However, some light fishing activity undoubtedly occurs by kayakers and visitors aboard sailboats and other non-motorized water craft.

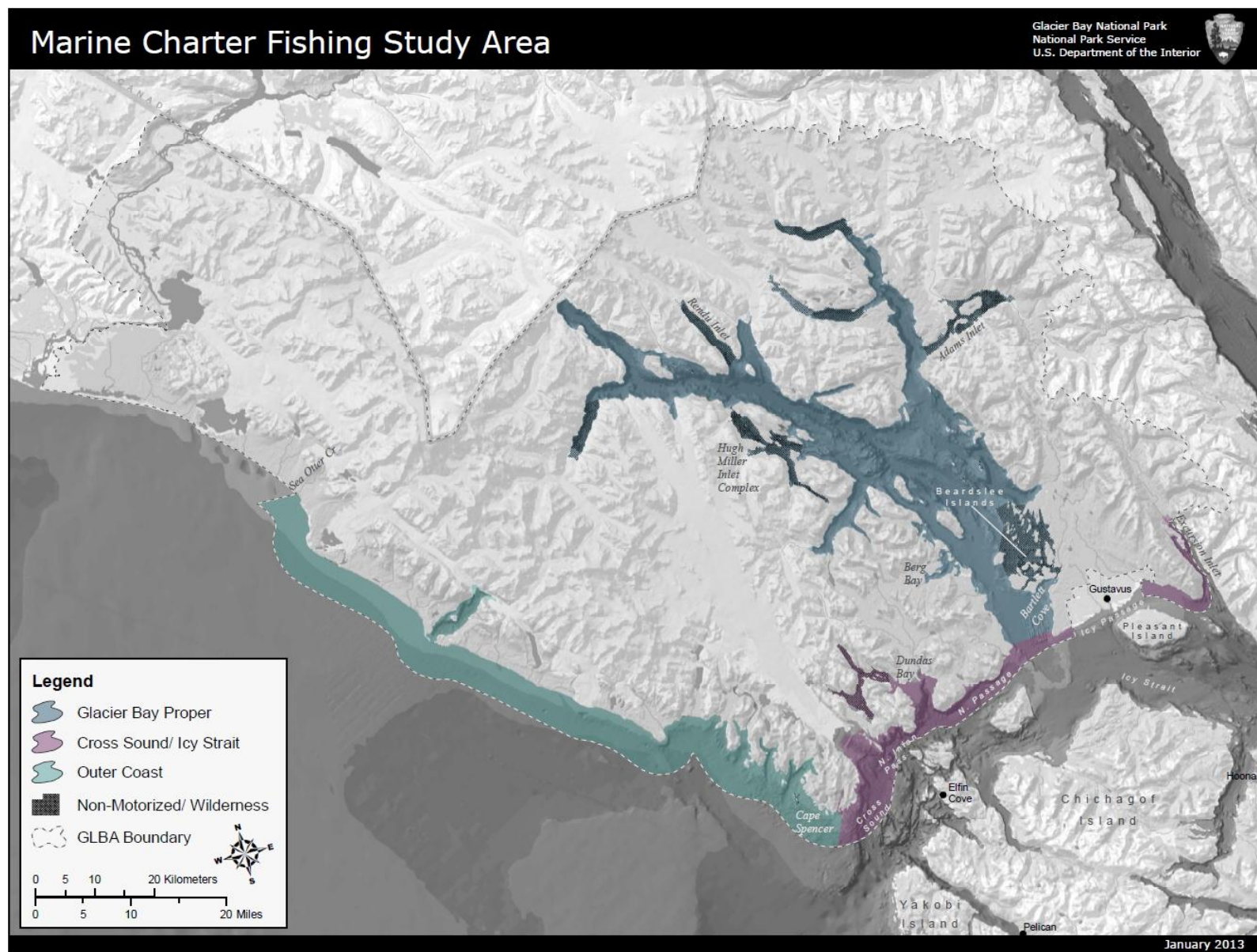


Figure 3. Study area map of Glacier Bay National Park's boundary and marine waters.

Methods

We employed vessel-based surveys, creel surveys and Visitor Information Station (VIS) radio contact logs to assess charter business and captain logbook reporting compliance from 2009 through 2011. In 2010 and 2011, we also conducted fixed wing aerial surveys in order to increase efficiency and the geographic extent of our inference. Although there was considerable spatial and temporal variation in the coverage of the survey methods, most survey effort was concentrated in and around the lower reaches and mouth of GBP near North Passage and western Icy Strait, from the beginning of May through the end of September. For analysis purposes we divided these different survey methods into primary (vessel and aerial) and secondary survey (creel and VIS radio contacts) groups. Primary methods directly observed fishing from charter fishing vessels, while secondary methods did not.

Charter fishing vessels were readily identified by the oval, green and yellow decal on each side of the vessel as required by law for state charter vessel registration (5 AAC 75.077(b)(1)) or by a combination of vessel size and configuration, fishing gear and rod-holder presence and configuration, and number and activity of associated passengers. Sportfishing activity was identified by visual confirmation of deployed fishing gear.

We evaluated compliance of self-reported logbook data by determining the percent of observed fishing trips that subsequently went unreported in each survey day and year using a variety of primary and secondary survey methods. We defined a fishing trip unreported if a logbook record was not received by November of the same year. Survey days are defined as a day for which a primary or secondary survey source indicated the presence of a charter fishing vessel fishing in park waters. Days when no actively fishing charter vessels were observed were recorded, but not used in estimates of non-reporting. With the exception of the VIS radio logs, direct visual or self-reported (by charter captains) observations documented fishing activity within the park. Some overlap between survey methods occurred such that a given vessel could have been sampled by more than a single survey method. These events were so rare we decided not to analyze potential bias. Multiple survey methods were used on only 10% of survey days.

Each observation (visual or self-reported) of clients aboard a charter vessel engaged in sportfishing activity constituted a “trip” for that particular vessel on that survey day which was then compared to the number of self-reported trips as indicated from sportfishing logbooks submitted by individual vessel captains. We assumed all charter fishing vessels were conducting charter fishing, though some unknown proportion of these trips may have been private. Charter fishing vessels are not exclusively used for charter fishing. Sportfishing logbooks are required to be submitted on a monthly basis to the NPS by permitted charter fishing businesses by the 5th of the following month. In all documented cases of observed primary or reported secondary fishing activity, we verified the presence or absence of sportfishing logbook records for the observed vessel’s fishing trip on that date.

We calculated the percentage of unreported trips per year as the number of unreported trips divided by the sum of unreported and reported trips. We report the percentage of non-reporting by

year for each survey type. Due to small sample sizes and nonparametric distributions of our data, we limited statistical analysis to the percent of non-reporting fishing trips by survey years.

Primary (Direct) Surveys

Aerial Surveys

We randomly selected 14 days between June and September in 2010 and 2011 to conduct aerial surveys of charter vessels operating in park waters. We stratified sampling dates between AM and PM and selected flight times as near as possible to slack tides to increase our chances of observing halibut fishing activity. Generally, halibut fishing occurs around slack tide, when currents are not as strong. Aerial surveys were coordinated between protection and fisheries staff (Table 1). We chartered a single engine Cessna 206, 206 amphib or 207 for survey flights. Each survey covered the same flight path as weather and conditions allowed (Figure 4). Surveys conducted at a speed of 80-120 kts. along the 200-250 -mile long flight path generally lasted between 1 and 2 hours. On each flight, surveyors collected a flight path track using a Garmin GPS, model 76CSx with external antenna set to collect location information every 2 seconds.



Figure 4. Approximation of primary aerial survey flight path (yellow). Surveys in September (orange) deviated from this flight route, because charter vessels had entered GBP to fish.

During September, the route covered lower Glacier Bay from Beartrack Cove and Berg Bay south. Pictures during surveys were typically taken at an altitude between 500 and 1200 feet. Pilots would descend and slow the plane when charter vessels were observed. We used a Nikon D90, 12.9 mega pixel camera with a 450 mm Nikkor 1:4 autofocus lens to photograph charter fishing vessels. The camera was set to shoot high speed continuous photos with ISO priority of 800. We

typically obtained 3-20 photos of each vessel. At the end of each trip, a photo was taken of the time displayed on the GPS receiver while in track log mode so that each photo could be geo referenced with GPS Photolink software. This enabled us to determine the geographic location of the plane at the time each photograph was obtained (Figure 5).



Figure 5. An example aerial photograph of a charter fishing vessel anchored and actively fishing in GBNP, where anglers are holding rods and the ADF&G guide sticker can be seen below the window on the cabin. GPS Photolink software marks each photo with position, elevation, date and time.

Images (4-5 MB JPEG format) were immediately downloaded to the Bartlett Cove network subsequent to each survey and labeled and archived by survey date. One to two of the best images for each encountered vessel and the date, time, location and activity characteristics were recorded and summarized in a spreadsheet.

Vessel-Based Surveys

We coordinated with the Protection Division staff, and core Resource Management staff to obtain images and/or vessel identities, activity and geographic information for charter vessels operating in park waters primarily in the lower bay or just outside Glacier Bay proper. Digital images of vessels were obtained for most vessels by core Resource Management staff using a Nikon D90, 12.9 mega pixel digital camera and 450 mm lens similar to that used for aerial surveys. Most vessels were approached to a distance of approximately 200-500 m (Figure 6). These surveys were opportunistic and of lower relative priority to other primary program duties. As a rule, Protection Division staff typically documented (without boarding) encountered charter vessels and boarded some component of these, while core Resource Management staff photographed charter vessels from a distance.

Vessel-based surveys were more spatially focused than aerial surveys, because most survey effort was focused in the lower reaches of GBP from Strawberry Island and the entrance to Berg Bay to the mouth of Glacier Bay near Point Carolus and Ancon (Figure 7) where numerous charter boats consistently fish for halibut along the terminal, submarine moraine.



Figure 6. A typical photograph from a vessel based survey where the vessel of interest is easily identifiable as a charter fishing boat and anglers are actively fishing.



Figure 7. Generalized polygon delineating area of coverage for vessel-based NPS charter vessel surveys. Note that only those vessels encountered within the green NPS boundary were

documented. The yellow polygon represents the extent of core Resource Management staff's coverage and the blue line represents that of the Protection Division. The primary area of overlap is at the mouth and in the lower reaches of GBP.

We subsequently verified the identity of all field-identified vessels using the digital images where available. Some vessels for which identity was not immediately obvious (i.e. vessel name not visible) were cross referenced against a collection of images for known charter vessels. All image file names corresponded to date, photographer and frame. Images were sorted and saved by business and vessel name.

We used Microsoft Excel to create a table of associated vessel characteristics including date, time, activity, vessel name, observer name and the associated digital image file name for both survey methods. Activity was characterized as "fishing, in transit, drifting or anchored." All vessel activity indicated as "fishing" was typically defined as such when anglers were visibly present and one or more fishing rods were deployed over the side. Data were summarized by date, vessel and activity. Only observations of vessels where "fishing" activity was clearly observed were used for reporting compliance verification purposes and each record represented an observation for a given charter vessel with unique spatial and temporal characteristics.

Secondary (Indirect) Self-Reported Results

In contrast with direct visual observations of fishing activity, we also used secondary or indirect, self-reported results based on observations from dock based creel surveys and from charter operator radio contacts with the VIS. These observations provide a potentially biased but valid means for inferring reporting compliance beyond direct observations.

Creel Surveys

The creel survey was not designed to assess compliance of charter operator reporting, but we determined that separate self-reported fishing information was useful as an additional reporting compliance check. A uniformed creel clerk was present at either the Bartlett Cove or Gustavus dock on pre-selected days from September 1-23, 2009-2011, between 1200-1900 h daily. Creel clerks interviewed charter vessel captains regarding fishing location in the park as they arrived at the dock during the survey period at the end of their fishing trip.

Visitor Information Station (VIS) Radio Contact Log

The VIS' radio contact logs are an existing data source with which to compare charter fishing logbook reports. Seasonal vessel access restrictions to GBP in accordance with 36 CFR 13.1160 are lifted after August 31 resulting in a significant increase in CUA permitted charter fishing activity during September. Vessels entering GBP are required to notify the VIS by radio 48 h in advance or immediately upon entry (36 CFR 13.1154 (c)). The VIS logs these contacts. Although these contacts do not always indicate fishing activity, the majority of charter use in GBP during May and September is likely oriented towards fishing. Some unknown proportion of VIS charter contacts may have been from charter vessels entering Glacier Bay to fuel, anchor, pickup clients or view wildlife. We looked specifically at VIS logs for charter radio contacts during May and September in 2009, 2010 and 2011.

Results and Discussion

Aerial Surveys

Due to poor weather conditions and time constraints we were only able to conduct 13 of the 14 and 9 of 14 aerial surveys we had planned in 2010 and 2011 respectively. We sampled 8% and 5% of the 153 day period from May through September in 2010 and 2011, respectively. In 2010, 6 staff members conducted the surveys. Inadequate camera operation or operator error contributed to unusable photos on three of these 13 flights. Three staff conducted the flight surveys in 2011 (Table 1).

Table 1. Completed flight survey schedule and summary detailing observer, tide information, and the number of successfully identified charter vessels. The “Other Observations” column details the lack or low number of photos on some surveys. Tidal information is for Lemesurier Island from Tides & Currents for Windows, Vers. 2.0a.

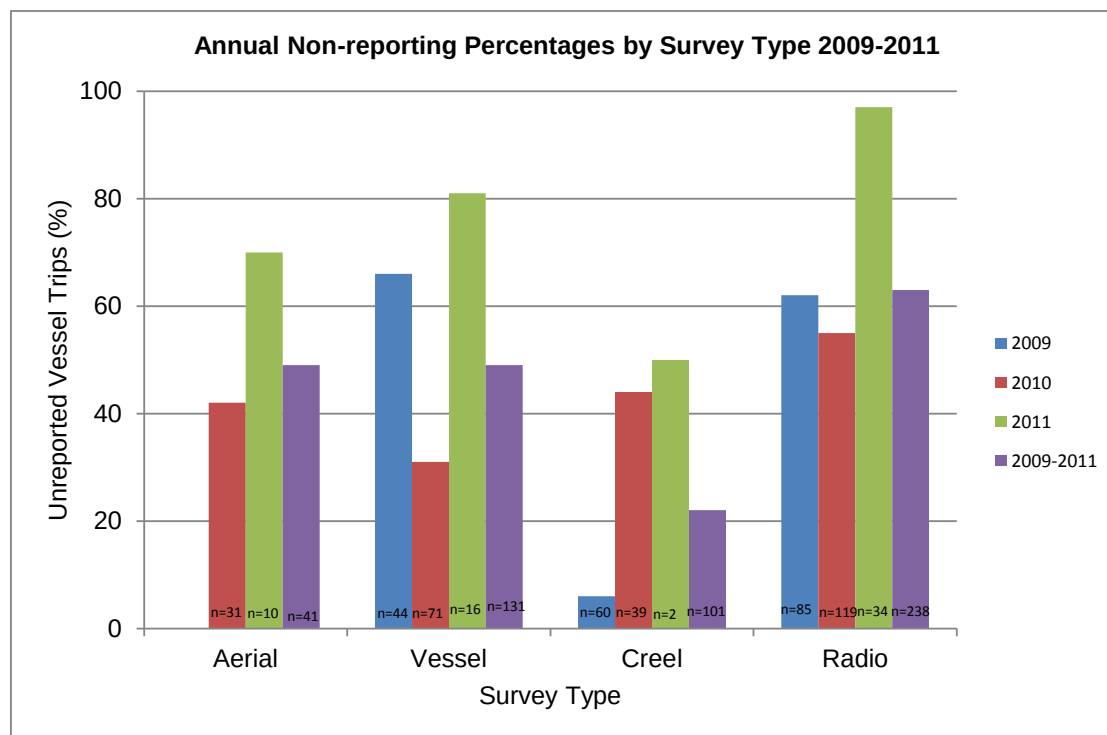
Survey Date	Survey Start		Observer	Peak Tide Time	Tide Magnitude & Elevation (ft)		Tide Stage During Survey	Unique Charter Vessel Images (#)	Other Observations
	Time	Day			AM/PM				
7/7/2010	14:00	Wed	Craig Murdoch	15:34	PM	Small (12.5)	Low (falling)	5	
7/11/2010	7:30	Sun	Chad Soiseth	7:34	AM	Large (15.9)	Low (slack)	0	Poor Weather, No Vessels
7/13/2010	13:00	Tues	Erica Francis	15:25	PM	Large (14.9)	High (rising)	4	
7/15/2010	10:20	Thurs	Todd Bruno	10:24	AM	Large (14.2)	High (slack)	0	No charters encountered
7/26/2010	13:45	Mon	Craig Murdoch	14:41	PM	Large (13.4)	High (slack)	2	
8/12/2010	14:00	Thurs	Patty Bean	15:30	PM	Large (15.0)	High (slack)	0	Unusable; Excessive Camera Blur
8/21/2010	13:40	Sat	Todd Bruno	12:38	PM	Small (10.5)	High (falling)	0	Couldn't find extra batt.
8/25/2010	14:00	Wed	Craig Murdoch	14:28	PM	Small (12.4)	High (slack)	8	
8/28/2010	10:00	Sat	Pat Reimann	9:35	AM	Large (11.3)	Low (slack)	5	
9/2/2010	15:15	Thurs	Chad Soiseth	13:02	PM	Small (7.2)	Low (rising)	0	No charters encountered
9/4/2010	11:00	Sat	Todd Bruno	10:58	PM	Small (9.5)	High (slack)	0	Unusable; Excessive Camera Blur
9/7/2010	14:10	Tues	Craig Murdoch	13:01	PM	Small (12.7)	High (falling)	3	
9/9/2010	11:00	Thurs	Craig Murdoch	14:16	AM	Large (15.3)	Low (rising)	4	
6/14/2011	13:15	Tues	Craig Murdoch	13:30	PM	Large (13.2)	High (slack)	0	No charters encountered
6/16/2011	8:50	Thurs	Craig Murdoch	8:16	AM	Large (16.4)	Low (slack)	4	
6/21/2011	11:20	Tues	Chad Soiseth	11:38	AM	Small (10.7)	Low (slack)	0	
6/29/2011	13:45	Tues	Chad Soiseth	13:17	PM	Small (10.9)	High (slack)	2	
7/6/2011	12:00	Wed	Mike Lehmann	11:18	AM	Small (12.6)	Low (slack)	1	
7/12/2011	12:15	Tues	Mike Lehmann	11:14	AM	Small (10.3)	High (falling)	0	
7/21/2011	10:50	Thurs	Craig Murdoch	11:37	AM	Small (11.6)	Low (slack)	0	
8/25/2011	12:15	Thurs	Chad Soiseth	11:38	AM	Small (10.1)	High (slack)	3	
9/8/2011	14:00	Thurs	Craig Murdoch	11:45	AM	Small (10.5)	High (falling)	0	Poor weather conditions

On 7 of the 13 flights in 2010 (54% of surveys) and 4 of the 9 flights in 2011 (44% of surveys) we documented vessel trips that were not reported by charter captains. These statistics may have been higher if images on 3 of the surveys had been useable in 2010. The park did not receive charter logbooks for 13 or 42% of these 31 trips in 2010 and 7 or 70% of the 10 charter fishing trips we identified in aerial surveys in 2011 (Table 2, Figure 8).

Table 2. Survey statistics by year and combined years for each survey method. Compliance metrics describe days and vessel trips surveyed.

Compliance Metric	Aerial				Vessel				Creel				Radio			
Days	2009	2010	2011	10-11	2009	2010	2011	09-11	2009	2010	2011	09-11	2009	2010	2011	09-11
Surveyed ¹	NA	13	9	22	24	33	14	71	17	15	12	44	30	34	25	89
Surveyed with Unreported Fishing	NA	7	4	11	15	14	10	39	4	10	1	15	27	31	24	82
% Surveyed with Unreported Fishing	NA	54	44	50	63	42	71	55	24	67	8	34	90	91	96	92
Vessel Trips																
Surveyed (Ts)	NA	31	10	41	44	71	16	131	60	39	2	101	85	119	34	238
Unreported (Tu)	NA	13	7	20	29	22	13	64	4	17	1	22	53	65	33	151
% Unreported (Tu/Ts)	NA	42	70	49	66	31	81	49	6	44	50	22	62	55	97	63

¹Surveyed days includes all days surveyed with or without observed actively fishing charter vessels.

**Figure 8.** Aggregated percentage of charter fishing vessels that we documented fishing in park waters, but that did not report each year by survey method.

We observed fewer charter fishing trips in 2011, likely due to the new charter halibut regulation which prohibited harvest of halibut larger than 37 inches. Captains most probably shifted their effort to other species or locations outside park waters where smaller halibut are more easily caught.

We assumed with aerial and vessel-based surveys that when fishing activity aboard a charter fishing vessel is identified it is a charter fishing trip. This may be an erroneous assumption because charter fishing vessels are also occasionally used for private or non-revenue trips. In past years when the park encountered the issue of non-reporting this was often used as a fallback explanation by permit holders that we are rarely able to refute. According to ADFG logbook reports of the 965, 996, and 786 charter fishing trips reported in statistical area 114232 (NW Icy Strait including park waters at the mouth of GBP) only 22 (1.3%), 12 (1.0%), and 3 (0.3%) had one or more non-revenue anglers from 2009-2011 respectively. This provides some indication that few charter fishing trips have non-revenue anglers, but it does not indicate how often charter fishing vessels are used for completely private trips. If there are no paying customers, and the guide is not being compensated in any way there is no state reporting obligation. It is likely that some small number of the charter vessel trips we observed were not conducting charter fishing.

Though our aerial survey method provided greater spatial inference and a more statistically sound survey approach than the opportunistic vessel surveys it had a number of short comings. The monetary cost of flying enough surveys given the relatively diffuse and fluid character of charter fishing to statistically characterize non-reporting is prohibitive. The cost of flight time has doubled in the last year to approximately \$600 an hour. Further, Southeast Alaska's relatively inclement weather also made flight surveys difficult. Poor flying weather regularly prevented flights, limited the spatial extent of flights and made taking photos of vessels very challenging. Ideal, calm and sunny weather was not very common. For these reasons we found vessel based surveys were better suited for verifying reporting compliance of charter fishing vessels than aerial surveys. Under other circumstances or with different research questions aerial surveys could be the best approach. We provide some limited recommendations for improving future aerial survey work in the following section.

Future aerial survey recommendations:

1. A well developed and peer reviewed study plan should be in place before survey work commences.
2. Surveyors should be well trained and demonstrate adequate proficiency with the camera and photography protocols. This would require a smaller group (2 or 3 individuals) of well-trained and experienced staff.
3. Surveyors must use the high speed continuous photo setting to obtain useable images. It is often very difficult to take useable images in which vessel identity can be discerned with a telephoto lens in a small aircraft. Lighting conditions, subject position relative to light source, aircraft speed and turbulence can all influence image quality. One to even 5 images may not be adequate to allow definitive vessel identification. If a surveyor continuously deploys the shutter release, holding it down

for multiple bouts of three to five second intervals, an acceptable number of useable images are generally obtained. More images from multiple angles improve the likelihood of acceptable imagery.

4. Charter businesses should be contacted and asked what their operating schedules are prior to future surveys. We found that the biggest operators tended to have a day or even two days when they conducted no fishing during each week on account of shifting clientele. These were typically the days when lodge clients ended their visit and the gap before the next group of clients arrived. Avoiding these days would reduce survey variability.
5. Surveyors should avoid circling vessels in order to obtain better images. A relatively straight line fly-by is preferable because savvy captains may be more inclined to report their fishing activity if they know they are being observed.
6. Fishing activity reporting compliance could be more accurately assessed if charter fishing vessels conducting non-revenue trips were required to fly a “non-charter”, “Private” or “off duty” flag when operating within park waters.
7. Survey design should strive to obtain a larger sample size of charter vessels actively fishing. Ideally, to achieve a 95% confidence interval with a 10% margin of error 61 days of actively fishing charter vessels need to be observed each year.
8. Survey design should consider shorter more frequent flights to highly fished areas, such as the mouth of Glacier Bay. This would undoubtedly increase the total number of observations, but limit inference relative to the spatial extent of the estimate.

Vessel-Based Surveys

NPS personnel observed charter vessels during 24, 33 and 14 days of total survey effort in 2009, 2010 and 2011 (Table 2). This was 16%, 22% and 10% of total days annually over the 5 month (153 d) period in each of the respective years from 2009 -2011, respectively. This effort, although opportunistic, was more than three times what we expended for aerial surveys. The spatial extent of our coverage was much narrower (Fig. 4 vs Fig. 7).

We obtained survey data for charter vessels for which fishing activity was documented during 22, 26, and 13 days between the beginning of May and the end of September for 2009, 2010, 2011, respectively. We documented unreported trips on 63%, 42% and 71% of survey days for 2009, 2010, 2011, respectively (Table 2). Two survey groups conducted marine based surveys on the same day on 4 different dates. Total effort was difficult to quantify because surveys were opportunistic and sometimes overlapped spatially. However, in these cases, very few of the same vessels were observed by both survey groups. On the few days where there were two separate surveys conducted, survey data was summed and treated as a single survey day for simplicity.

Table 3. Summary of annual vessel-based survey effort and charter vessel detection by survey team. Additionally, this table displays the total number of boarded vessels. For a more detailed summary of survey and tide timing, surveyor identity, project priorities, encountered vessel location and the number of observed and documented vessels see Appendix D.

Survey Team	2009			2010			2011			2009 -2011			
	Sum of		Sum of	Sum of		Sum of	Sum of		Sum of	Total of	Total of	Total of	Total
	Survey	Fishing		Survey	Fishing		Survey	Fishing					
	Days	(#)	Vessels	Days	(#)	Vessels	Days	(#)	Vessels	Days	Fishing	Vessels	boarded
Law Enforcement	2	3	3	9	16	19	3	3	3	14	22	25	12
RM (other)	3	7	8	3	2	5		0	0	6	9	13	NA
Core RM Staff	19	34	55	21	53	63	11	13	15	51	100	133	NA
Grand Total	24	44	66	33	71	87	14	16	18	71	131	171	12

Vessel based surveys identified 44, 71 and 16 charter fishing vessel trips actively fishing in park waters in each of the respective years over the period of record. By comparing these observations to what charter fishing business reported to the park in sportfish logbooks we found that 66%, 31% and 81% of these trips went unreported in each year, respectively (Table 2, Figure 8). Using opportunistic observations from park vessels allowed for 2 to 3 times the number of sample days than were feasible by flying. Reporting compliance in 2010 likely varied from 2009 and 2011 because of multiple NPS meetings with charter fishing businesses as well as letters to them stressing the importance of reporting fishing activity in park waters. These NPS efforts likely improved reporting compliance in 2010.

Ten different NPS staff members were involved in the vessel-based surveys. The majority (73%) of documented vessels were documented by the core Resource Management staff. The Protection Division provided 20% of vessel documentation. Other Resource Management staff contributed approximately 6% (9 vessel sightings). Protection Division staff reportedly boarded one third (12/32) of charter vessels they encountered over the 3 year period of study. Four (25%) of the boarded vessels failed to report fishing in park waters on those days, while 56 of 119 (47%) unboarded vessels failed to report. Protection Division boardings and obtrusive interactions with encountered vessels (*i.e.*, close approach, radio hailing) are likely to bias the outcome in terms of charter captains reporting their fishing activity in the park. However, fewer than 10% of total encountered vessels (12/171) were actually boarded (Table 3). Further, it is

striking that 25% of the vessels boarded by law enforcement officers failed to fill out park sportfish reports. This suggests that charter guides don't perceive any negative consequences for not reporting their fishing activity even when they are boarded by law enforcement officers, or alternatively, that they don't understand the conditions of the permit and their reporting responsibilities.

We found that obtaining records of charter fishing in park waters by vessel proved the most advantageous method we utilized. Though vessel surveys were more spatially limited than aerial surveys, their opportunistic nature made them more efficient than aerial surveys. We were able to obtain many more records of charter fishing activity than with flight surveys at no additional monetary cost or resource impacts. The downside of utilizing other projects or divisions that are already on the water for separate projects or administrative purposes is that it inhibits the use of a consistent survey design where survey effort is easily quantifiable. This may be problematic if greater statistical inference is necessary. In this case we are satisfied that this opportunistic approach provides adequate inference into charter logbook reporting compliance for a focused area of the park.

Future vessel-based survey recommendations:

1. A well developed and peer reviewed study plan should be in place before survey work commences.
2. Maximum survey effectiveness (*i.e.*, greater sample size) is realized by documenting encountered vessels through digital images. Not only do digital images provide ready verification of survey results but they are far less likely to influence the reporting outcome in comparison with boardings. Moreover, greater numbers of vessel can be encountered and documented during each survey period.
3. Similar to overhead circling during aerial surveys, encounter methods that are likely to influence reporting compliance (*i.e.*, boardings, close or obvious photographs) can impart significant bias and must be minimized or avoided.
4. Survey effort should be well documented in order to enable comparisons among surveyors and survey types both within and between years.
5. Survey design should focus on obtaining a larger sample size of actively fishing charter vessels. To obtain an estimate of mean non-reporting with a 95% confidence interval within a 10% margin of error 47 days of actively fishing charter vessels need to be observed each year.

Creel Surveys

From 2009 through 2011, a creel clerk surveyed charter vessels at the Bartlett Cove and Gustavus docks 17, 15, and 12 days each September, 2009, 2010, 2011, respectively. This survey effort represents 8-11% of all possible survey dates from the beginning of May to the end of September. While in 2009 and 2010 charter vessels were encountered on each survey day, charter vessels were encountered and interviewed on only 2 days in September 2011. Again, this

is likely a direct result of a new regulation in 2011 that limited charter anglers to harvesting one 37" or smaller halibut. Many businesses reportedly operated fewer days in September than in previous years.

We analyzed 2010 data for reporting bias associated with survey location (Gustavus or Bartlett Cove). Creel survey location had no effect on logbook reporting likelihood (Table 4). Forty percent of charter vessel trips documented by our creel clerk at each survey venue were not reported in sportfishing logbooks. We did not investigate this in either 2009 or 2011 data sets. Sampling was only conducted in Bartlett Cove in 2009 and the 2011 data set is too small.

Table 4. Number of charter vessels surveyed at Gustavus and Bartlett Cove docks and effect of creel survey location on subsequent logbook reporting.

Creel Trip Reported in Logbook?	Gustavus	Bartlett Cove	Total
Yes	18	6	24
No	12(40%)	4 (40%)	16
Total	30	10	40

Creel surveys from 2009 through 2011 documented 60, 39 and 2 charter vessel trips in park waters during each respective year. Of these charter fishing trips, we found that 4 (6%), 17 (39%) and 1 (50%) went unreported in the park's sportfish logbooks (Table 2, Figure 8).

Similar to captains whose vessels were boarded by park rangers, captains who were surveyed by a park creel clerk are generally more compliant with reporting than the other survey methods. This suggests that compliance may improve with greater NPS interaction with charter fishing vessels. Greater compliance for creel surveyed charter fishing trips may also be explained geographically in terms of where the fishing trip took place in September. Generally, the charter fishing fleet directs most of its fishing effort in GBP in September, because visitor season vessel quotas and restrictions are lifted after August 31st.

If captains are cribbing (copying) from their state logbooks to fill out NPS logbooks, it may be difficult for them to determine if trips in Icy Strait or Cross Sound took place in park waters, while any trip recorded in GBP in state logbooks should be recognized as a park trip and thus get recorded in the NPS sportfish logbook. In contrast, both aerial and vessel surveys sampled a large portion of vessels in Icy Strait and Cross Sound where charter captains very likely had a difficult time accurately recording where fishing occurred. Especially since NPS logbooks are due weeks after captains typically report to the state.

We do not recommend using creel surveys as a primary method for estimating reporting compliance of charter fishing vessels. Although creel clerks are able to directly verify reported harvest, much of the reported information regarding fishing location and effort is self-reported by charter captains and is not verifiable. Dockside creel surveys are useful for checking compliance because charter captains self-report fishing activity within park waters to the dockside creel clerk which can subsequently be verified against their self-reported charter logbooks. This self-reported information is likely to be biased low because the creel clerk wears an NPS uniform, and some charter captains are likely to realize misreporting could be detected. Past experience

has indicated that charter captains sometimes fail to report fishing activity within park waters in sportfishing logs despite reporting this information to a creel clerk in NPS uniform. But many operators may realize the utility of the creel survey data to cross check self-reporting in logbooks. This survey method is therefore likely to include significant bias and would tend to underestimate the level of misreporting.

VIS Radio Contact Logs

The VIS documented radio contacts with charter fishing vessels on 30, 34 and 25 days in May and September during 2009, 2010 and 2011 respectively. On these days in each respective year, VIS staff logged 85, 119 and 34 vessels that reported activity within GBP. We did not receive charter fishing logbook reports from 53 (62%), 65 (55%), and 33 (97%) of these VIS contacted vessels (Table 2, Figure 8). This survey method produced the highest estimates of non-reporting, though it is the most tenuous of the different survey methods.

Although we assumed that all VIS logged radio contacts represented charter vessels engaged in fishing activity we anticipate that a small percentage of these vessels were not fishing. This assumption would tend to overestimate vessels engaged in this activity. In contrast, however, some small percentage of CUA permitted charter vessels engaged in fishing activity likely did not make radio contact with the VIS and went undocumented. This presumed underestimated bias may counter any bias overestimated to some unknown degree.

Without visual or verbal confirmation of fishing activity we do not feel confident in the accuracy of this information to assess reporting compliance. This data source is likely the least accurate because it is not an unbiased estimate of fishing activity. This data source also only measures activity reported in GBP in May and September. This data source could be slightly more useful in the future, if VIS staff ask the hailing charter captain whether they are conducting or planning to conduct charter fishing activity within the park. Regardless, this data would continue to be self-reported, and thus is not our preferred method for assessing reporting compliance in the future.

Reporting Compliance by Geographic Location

We analyzed reporting compliance by geographic region to assess potential reasons for non-reporting. We found that the proportion of non-reporting generally increases the farther away charter fishing activity is from Bartlett Cove. We grouped all observations of charter fishing from aerial, vessel and creel surveys across all three years into discrete geographic areas (Table 5). Within each area we calculated non-reporting percentages.

Non-compliance by geographic region was 67%, 48% and 22% for the Outer Coast, Icy Strait and Glacier Bay respectively over the period of record (Table 5). The non-reporting percentages are plotted versus the straight line distance from Bartlett Cove (Figure 9). Of the 265 observations of charter fishing activity 52%, 44%, 2% and 1% were from Icy Strait, Glacier Bay, Outer Coast and all other areas (Dundas Bay and Excursion Inlet), respectively. The sample sizes from the Outer Coast, Excursion Inlet and Dundas Bay are too small to draw any definitive conclusions about distance from Bartlett Cove and reporting compliance. Non-reporting percentages from Icy Strait and Glacier Bay indicate that charter fishing activity is reported less often in Icy Strait than in Glacier Bay.

Table 5. Charter fishing logbook non-reporting by geographic area and straight line distance from Bartlett Cove. Compliance was low in Icy Strait and the Outer Coast compared to Glacier Bay.

Geographic Area	Total Observed Vessels Fishing	Reported Fishing	No Report of Fishing	%Non Reporting	Distance (km)
Dundas Bay	2	2	0	0	30
Excursion Inlet	1	1	0	0	20
Glacier Bay	117	91	26	22	8
Icy Strait	139	72	67	48	15
Outer Coast	6	2	4	67	55
Grand Total	265	168	97	37 (mean)	NA

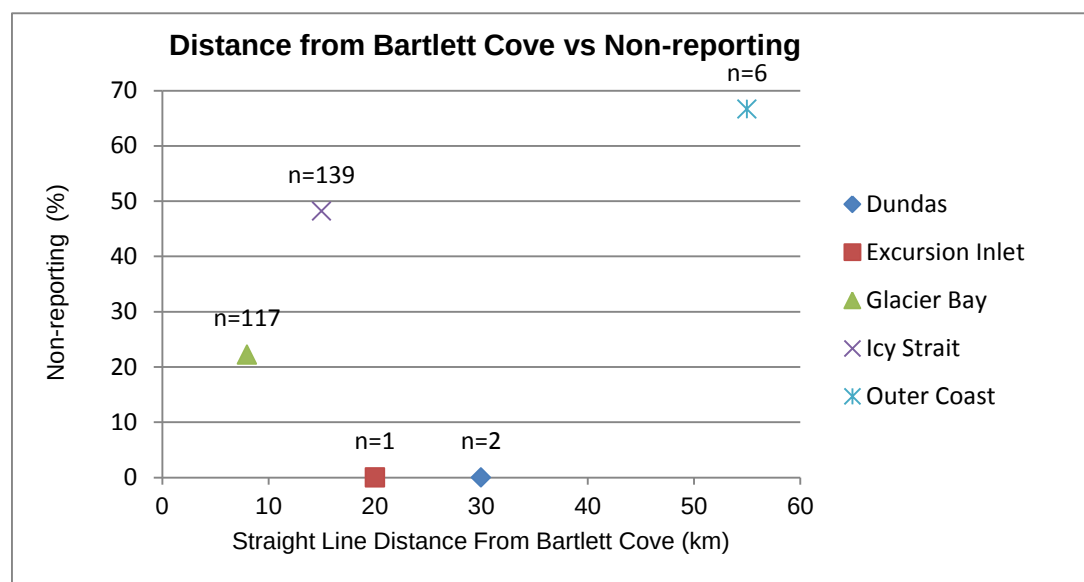


Figure 9. Non-reporting by straight line distance from Bartlett Cove. Non-reporting generally increased with distance from Bartlett Cove, but sample sizes beyond Glacier Bay and Icy Strait were too small to provide conclusive results.

This pattern may indicate two different non-reporting behaviors among charter captains. Charter captains may report less often farther away from Bartlett Cove because they have the perception that they're less likely to be observed by park staff at greater distances from park headquarters. Park boundaries outside of Glacier Bay may also be less well known or observed by charter captains outside GBP. In the spring of 2010 some captains claimed they were unaware that the CUA and CC permits obligated them to report activity outside GBP (anecdotal info from 2010 NPS charter meeting). This does not explain the relatively high proportion of non-reporting observed in 2010 and 2011.

Non-reporting is most likely a function of charter captains cribbing from state logbooks some considerable time later, particularly in areas where the park boundary bisects a state statistical area. State statistical areas do not align well with park boundaries outside GBP. For example, the mouth of Glacier Bay is only a small part of the larger state statistical area 114232 that includes the north eastern portion of Icy Strait (Figure 10). It is unlikely that a captain cribbing information from his state logbook some considerable time later would recall if fishing took place within the park section of area 114232. This area may be particularly problematic for accurate park specific charter fishing statistics, because a large portion of charter fishing takes place there.

Gasper et al. (2005) estimated that in 2003 Gustavus charter anglers harvested 70% of their halibut east of Lemesurier Island between Point Carolus and Point Gustavus. Ultimately, this may explain a large portion of unreported trips within park waters. Additionally, state law requires that only one statistical area be reported per charter fishing trip, despite that often more than one statistical area is fished in a single trip. The state also requires that guides turn in their logbook entries in on a weekly basis. NPS logbooks require reporting at each location fished and logbooks are submitted on a monthly basis. These incongruities likely contribute to poor compliance with NPS logbook reporting. If this is the case, we would expect to see better reporting compliance in areas of the park that align well with state statistical boundaries such as GBP and the Outer Coast and poorer compliance in areas such as Icy Strait and Cross Sound, where park boundaries do not align well with state statistical areas.

We investigated this possibility by grouping all observations by whether the location was exclusively in the park and within one entire state statistical area (Exclusive: GBP) or within the park, but bisecting a state statistical area (Shared: Icy Strait). We did not have enough samples in areas outside of GBP and Icy Strait to test this relationship. We found that non-reporting was twice as great for the areas where the park boundary bisects a state statistical area (48%) than areas where the park boundary encompasses an entire state statistical area (22%) (Table 6). This further supports our hypothesis that a large amount of the non-reporting is not intentional, but rather a function of not being required to record park specific fishing activity on a daily basis. This likely results in captains cribbing from their less specific state logbooks and ultimately leads to poor compliance with park reporting requirements.

Table 6. Aerial, vessel and creel survey data combined by boundary type.

Boundary Type	Total Observed Vessels	Vessels with No Report	%Non-reporting
Exclusive ¹	117	26	22
Shared ²	139	67	48

1. Exclusive - observations refer to areas where the park boundary fully encompasses state statistical areas (Glacier Bay).

2. Shared - observations are those where the park boundary bisects one or more state statistical areas (Icy Strait)

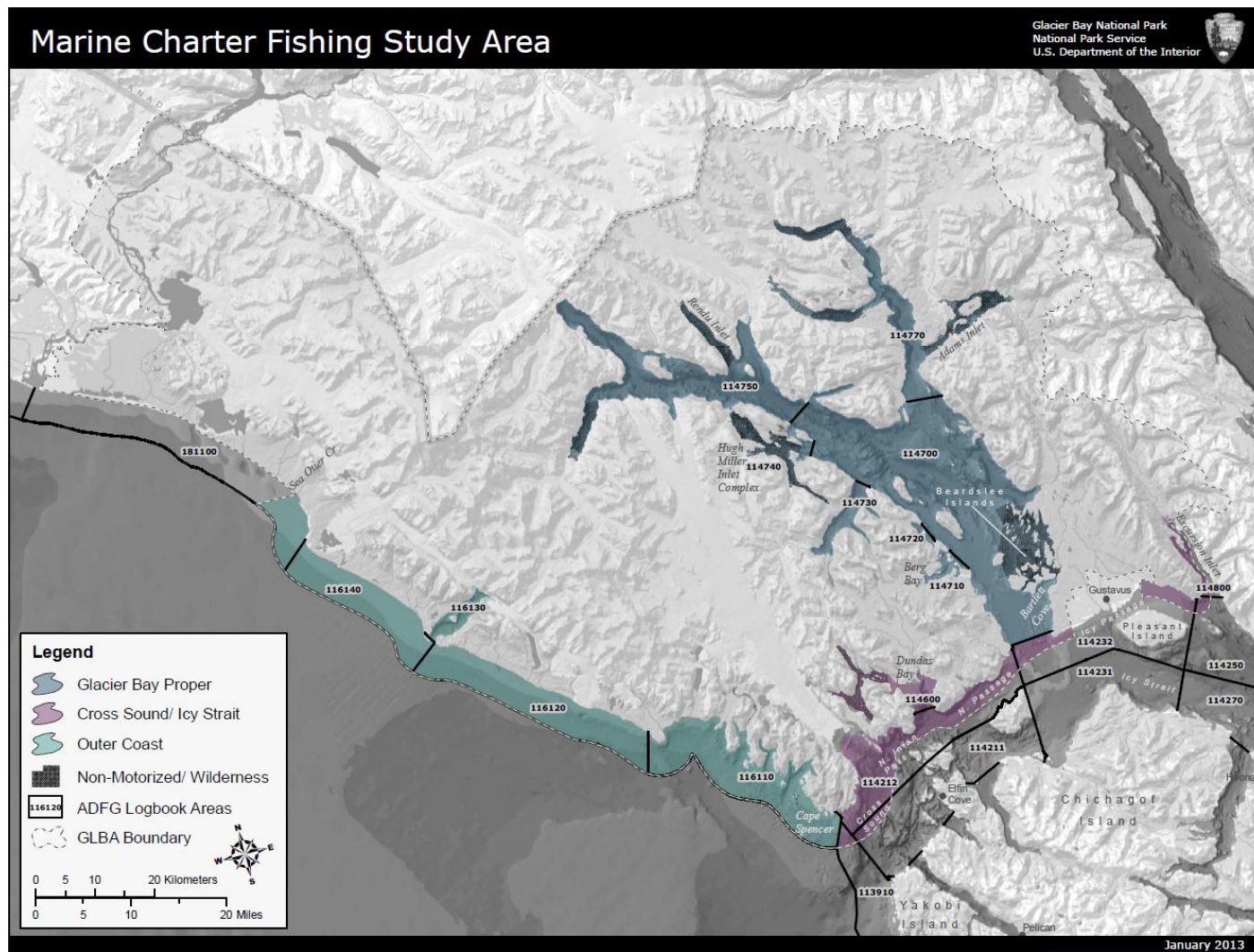


Figure 10. Glacier Bay National Park boundary and Alaska Department of Fish and Game (ADFG) logbook statistical area map. This map demonstrates the poor alignment between park boundaries and state statistical area boundaries. This likely contributes non-reporting if captains are cribbing from their state logbook records to fulfill park reporting obligations weeks after the date fishing occurred.

Conclusions

Significance of Findings

Survey data from 2009-2011 clearly demonstrate there is a widespread lack of charter fishing NPS logbook reporting. Our best estimate of reporting compliance suggests that 49% of charter fishing activity in park waters went unreported during 2009-2011. Non-reporting in Icy Strait and Cross Sound, where most charter fishing in park waters occurs, was twice as great as in GBP. This is likely in part a function of incongruities between park and state statistical areas and respective logbook reporting requirements. Efforts to improve reporting in 2010 suggest that communication with operators can improve reporting compliance.

Collecting self-reported census data without any evaluation of accuracy creates false perceptions about the legitimacy of data upon which managers must make decisions. In the case of charter fishing logbook data, managers may choose not to act when there is actually a need for management action. When non-reporting occurs, potentially significant amounts of harvest and effort go unaccounted. For example in 2010, charter businesses reported harvesting 1195 halibut, when what may have been harvested was twice that amount (Figure 11A). This assumes the same harvest rate for non-reported and reported trips. Similarly, by extrapolating the non-reporting proportion to the total fishing effort (hours) reported in logbooks there may have been more than 20,000 hours of charter fishing effort expended instead of the reported 10,000 hours in 2010 (Figure 11B).

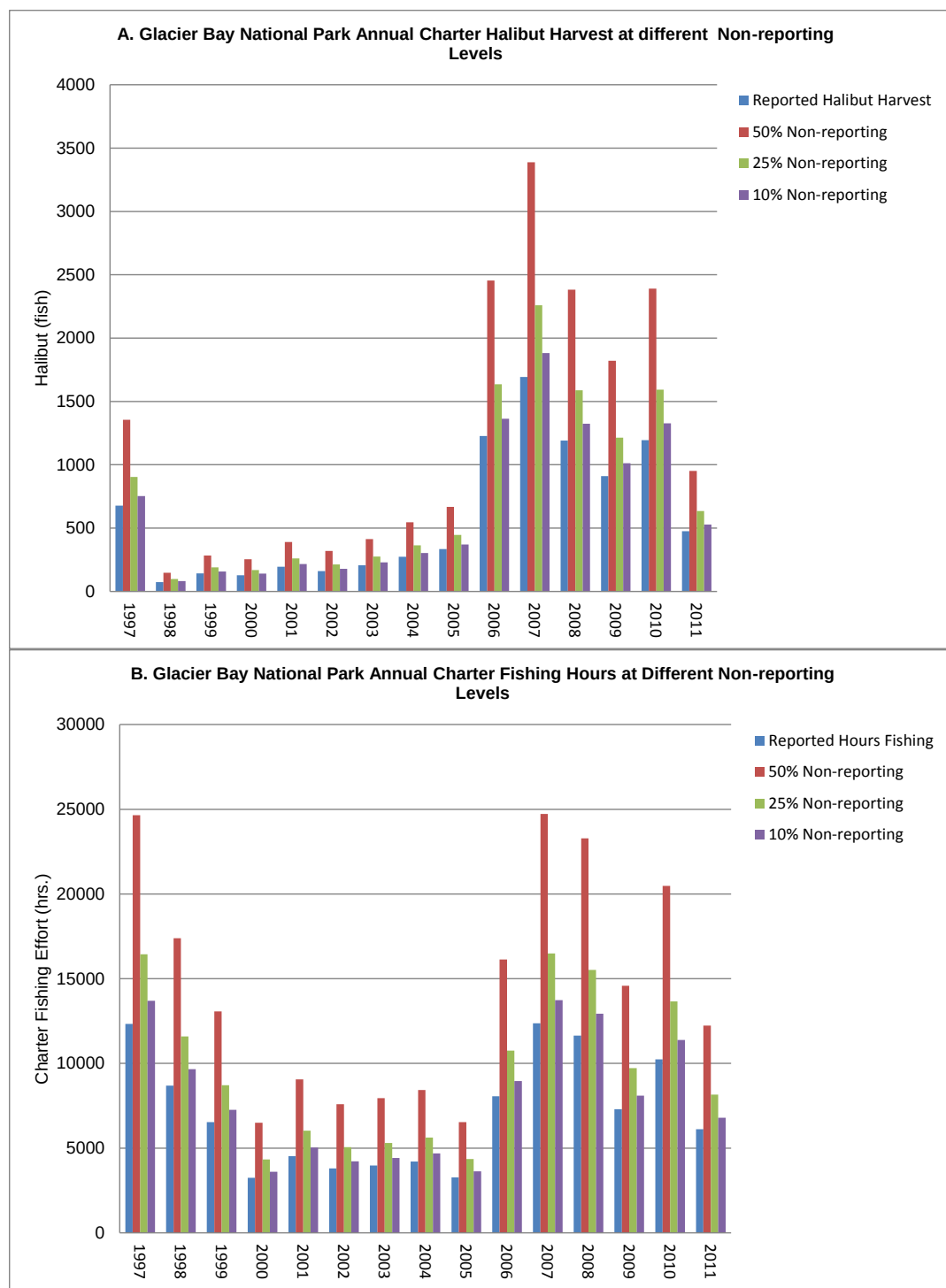
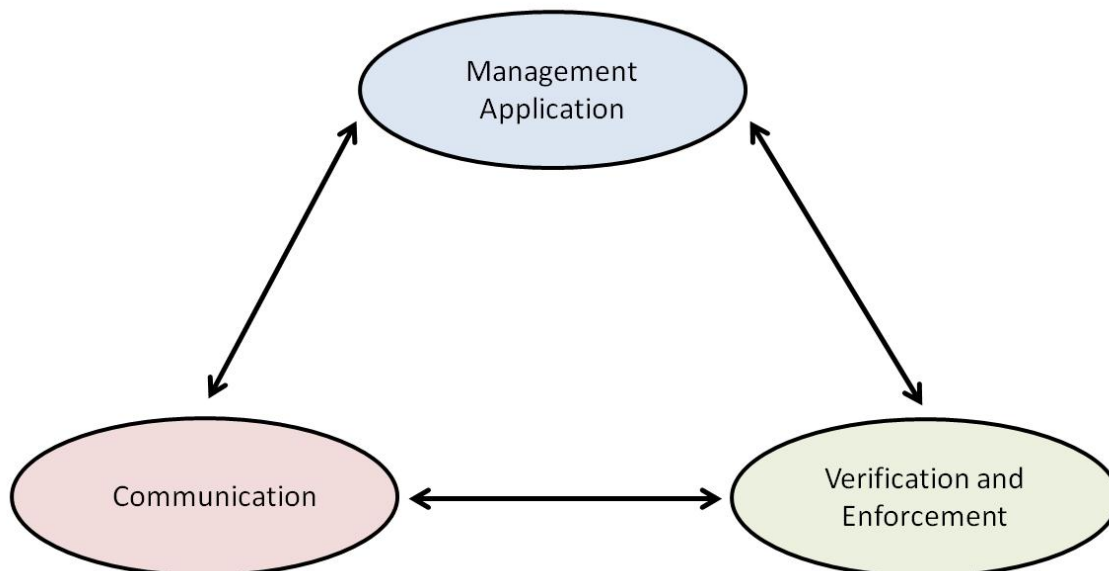


Figure 11A and B. A) The number of halibut reported harvested by charter operators along with harvest estimates at three different levels of non-reporting. B) The number of reported fishing hours by charter operators along with fishing hour estimates at three different levels of non-reporting.

Park managers need to be able have an accurate picture of charter fishing if they are to assess and manage the true impacts of this activity. This is especially true because the activity is extractive in nature and also has potential negative impacts to listed endangered species, such as humpback

whales and Steller sea lions (i.e., vessel whale collisions, behavioral changes, hooking injury, etc.) and visitor experience. Spatial and temporal information on fishing effort could be useful for assessing these potential impacts, but only if it is accurate. Unfortunately, because of associated accuracy concerns, the utility of the 12 years (1997-2008) of unverified charter fishing data is even more limited than verified charter reports (2009-2011). Further, some charter operators fishing within park waters during these earlier years went unpermitted by NPS and their harvest was not reported. No unpermitted charter operators were observed during this study.

Currently there is no park specific management plan for recreational fishing. We have identified three overarching areas of charter fishing management that if improved would likely lead to more accurate reporting and better management of this activity. The three areas are: 1) Defining the management application for monitoring; 2) Communication; and 3) Verification and enforcement. Each is equally important in successfully managing this activity. The desired result of better management is ultimately to: diminish the risk of unacceptable impacts to natural and cultural resources and park values; encourage a charter fishing business model that is more consistent with park values; and improve the overall visitor experience.



Defining the Management Application

The intended management application for fishing effort and harvest monitoring is to annually evaluate and assess activity impact levels given the extractive nature of this activity. According to 2006 NPS management policies “commercial use authorizations may be issued only to authorize services that (1) are determined to be an appropriate use of the park; (2) will have minimal impact on park resources and values; and (3) are consistent with all applicable management plans and park policies and regulations.” Natural Resources Management guidelines (NPS-77) further state that “Authorizations of commercially guided sport fishing operations, and monitoring of such operations should be scrutinized closely” because “These types of operations will likely have different effects on fishery resources than independent sport fishing.” Moreover, Sec. 418 regarding Commercial Use Authorizations in Title IV of the 1998

NPS Concessions Management Improvement Act (PL 105-391) mandates that a “minimal impact” determination constitute a criterion for CUA authorization (Appendix A).

The recent growth of focused charter halibut fishing within park waters further highlights the need to define this “minimal impact” standard and establish an appropriate threshold. Park managers must define and establish the threshold above which charter fishing activities or harvest would clearly exceed “minimal impact.” Managers won’t be able to effectively utilize monitoring information to determine when unacceptable impacts have occurred without any set thresholds or a management framework for evaluating the activity of charter fishing.

Defining a management application that is based on predetermined thresholds will drive what data is necessary to monitor charter fishing. The information currently collected may not be the most appropriate information to assess impacts from this activity. A well-defined management application will also allow the park to better justify the need for requesting information from constituents. This would likely improve CUAs and CCs cooperation by not only making data collection more efficient, but also by improving understanding about why the data are collected.

Establishing thresholds could be achieved using a variety of approaches including marine spatial planning (Ban *et al.* 2012, White *et al.* 2012), an ecosystem based approach (Curtin and Prellezo 2010, Kittinger *et al.* 2010, Lester *et al.* 2010, Pikitch *et al.* 2004), precautionary principles (Gonzalez-Laxe 2004), a structured decision making framework (SDM) (Dorazio and Johnson 2003), or even historical harvest or effort levels. Charter fishing CUAs could be managed through implementation of business and vessel limitations as necessary, given establishment of species harvest thresholds or desired future conditions.

The only regulatory difference between park and state waters for charter fishing businesses in this region is currently the NPS permitting requirement and vessel entry limitations for GBP during the June through August visitor use season. CUA and CC permits and especially activity and harvest reporting stipulations are important management tools that GBNP can utilize to evaluate resource impacts. Permit stipulations and the competitive nature of concessions permits can also specify business practices that are consistent with NPS mandates for conservation. These management tools need to be formed and supported by a well-defined management application.

Recommendations:

1. Clearly define a management application. This would take the form of a minimal impact determination where thresholds for this activity are predefined. This would likely be a subsection of a larger management plan that would describe in detail the park’s approach to managing the activity of recreational fishing, including unguided and guided (charter) fishing in park waters.

Communication

In the past, charter businesses and/or captains have professed ignorance of the need to report fishing activity in all park waters (especially outside GBP) or claim that they were engaged in a non-revenue (unguided) trip which voids the reporting requirement. Clearly, there are several ineffective links in the NPS-charter business communication chain. The park may not articulate

expectations effectively, business owners may not always effectively communicate information to their employees (charter guides) and charter guides may be unaware or choose to disregard the reporting requirements. If communication between the park and CUAs and CCs improves, so will reporting compliance.

Park concessions managers, fisheries staff and law enforcement must work collaboratively to clearly and consistently articulate to CUAs and CCs their expectation for timely and accurate reporting. We recommend the park hold an annual meeting to better orient CUA and CC businesses to the park's expectations of conducting business within the park. Businesses would have the opportunity to better understand park managers' rationale for permit and contract stipulations. Park managers would similarly have the opportunity to better understand the issues and challenges of conducting business within the park. This would hopefully create a more open and collaborative environment for communication that over time is beneficial to achieving the park's mission. Required attendance and/or training would help ensure that this communication occurs on an annual basis.

The park does a great job of orienting visitors about backcountry camping, kayaking and boating in the park, yet charter captains and charter anglers have no orientation to fishing in the park. Just as campers are instructed in the important ethics of leave no trace camping, charter captains and anglers should be instructed in ways to minimize their impacts on park resources. Advocating for catch and release fishing is an example of one message the park could promote to not only help lessen the resource impacts of this activity but also heighten awareness of the park's mission for conservation and preservation.

Recommendations:

1. Hold an attendance required annual meeting with CUAs and CCs. This will help increase the interaction between CUA and CC businesses and park staff in order to bolster recognition of business permit requirements, increase compliance, and improve the recognition and support of NPS mandates for conservation and preservation of natural and cultural resources. Doing this would also give businesses the opportunity to provide the park feedback and for NPS managers to better understand the challenges facing CUA and CC businesses.
2. Develop and implement a VIS orientation or video for charter fishing captains operating in park waters.

Verification and Enforcement

According to 2006 NPS Management Policy "Superintendents must continually monitor and examine all park uses to ensure that unanticipated and unacceptable impacts do not occur". Assessment of self-reported commercial activity data is not possible unless independent verification is conducted. This survey highlights the importance of incorporating data verification with the collection of data, particularly when the data is self-reported. Meyers et al. (2009), in a recent analysis of state charter logbooks, emphasized the importance of regularly verifying charter fishing logbook records, especially if there are incentives for guides to over- or under-report. Managers must have an understanding of the quality of the data they are provided

for effective management to take place. This is especially critical to the park for commercial activities that are extractive in nature.

We recommend the park continue utilizing opportunistic observations of charter fishing vessels actively fishing by park staff out on the water performing their normal work duties. This opportunistic method minimizes impacts to staff time, and reduces possible impacts to resources or visitors by adding additional surveys by vessels or aircraft, while still providing useful information. Core Resource Management staff have done an outstanding job providing photo documented observations of charter fishing vessels that can be compared to charter operator reports for compliance verification. This compliance information will not only provide managers inference about the accuracy of the data being received by charter fishing CUAs and CCs, but it will also help assess how changes in management of this activity affect reporting compliance over time.

Enforcement of park permitting stipulations through appropriate penalties for inadequate compliance is a necessary component of improving reporting compliance and management of this activity. Administrative and civil penalties can be imposed for inadequate or non-compliance with reporting requirements. Failure to comply with the CUA permit conditions can result in an administrative violation requiring at minimum a written warning (see Alaska Region CUA Revocation Policy). Three violations can result in revocation of a CUA permit.

According to the Alaska Region Conditions for Commercial Use Authorization “any CUA holder either not submitting or submitting late reports will have their CUA suspended until the reports are received. Repeatedly late or non-submission of reports may lead to the revocation of the CUA.”

Park managers should consider using these stipulations as tools to gain better reporting compliance. Lack of repercussions for late reporting, non-reporting and mis-reporting has in the past contributed to an environment where non-compliance is the status quo. With no repercussions or incentives for following the conditions and stipulations of the permit there will be little compliance resulting in poor data quality and inadequate management of this extractive commercial use. The ultimate goal should be to create an environment where businesses understand and actively comply with permit stipulations such that enforcement and penalty for non-compliance is only infrequently necessary.

Recommendations:

1. Require that charter fishing logbooks are filled out on a daily basis and sent in on the same schedule as ADFG charter logbooks. Ideally captains would be required to keep fishing logs up to date or face penalties. This would likely help address our current issues with recall bias and eliminate cribbing from state logbooks.
2. Revise NPS sportfish logbook format to more closely mimic ADFG charter logbooks.
3. Increase NPS on-the-water enforcement/education, especially in areas of high charter fishing use. Enforcement staff should conduct periodic inspections of GBNP charter logbook compliance. Citations for non-compliance should be issued when appropriate.

4. Consider requiring that charter vessels conducting non-revenue trips fly a flag indicating their “unchartered” status. Although this would be difficult to enforce, it may help the park better evaluate non-reporting.
5. Consider licensing boats authorized to operate in park waters under each CUA permit. Require that each permitted vessel has a park supplied sticker that easily identifies the boat as permitted. Require that all fishing from these vessels be reported to the park. Add check boxes to the logbook form (revenue vs non revenue) to indicate the type of fishing trip being conducted.
6. Investigate the possibility of issuing unique and identifiable logbooks to each authorized vessel. Each logbook would contain logbook forms printed with each date (May-September) and the authorized vessel name.
7. Integrate data management of CUA and concession permit holders business information with reported activity and fishing logs such that data flow between the businesses and all divisions of the park is streamlined. Incorporate automatic reporting and verification of opportunistic observations so that CUA and CC activity can be easily available to managers.
8. Require businesses accurately and adequately describe (e.g. digital image) the vessels they will use each season.
9. Ensure that park data collection efforts incorporate effective quality control and quality assurance. We recommend continuing vessel based surveys of charter fishing boats. This method proved the most efficient and effective way of documenting charter fishing activity for compliance purposes.
10. Introduce a May 1 annual reporting deadline on park fishery staff, so that managers are apprised of the previous year’s trends in charter fishing effort and harvest.

Literature Cited

- Ban, N.C., J.E. Cinner, V.M. Adams, M. Mills, G.R. Almany, S.S. Ban, L.J. Mccook and A. White. 2012. Recasting shortfalls of marine protected areas as opportunities through adaptive management. *Aquatic Conservation: Marine and Freshwater Ecosystems* 22(2):262-271.
- Curtin, R., and R. Pallezo. 2010. Understanding marine ecosystem based management: a literature review. *Marine Policy* 34(5):821-830.
- Dorazio, R.M., and F.A. Johnson. 2003. Bayesian inference and decision theory: a framework for decision making in natural resource management. *Ecological Applications* 13: 556-563.
- Etherington, L.L., P.N. Hooge, E.R. Hooge, D.F. Hill. Oceanography of Glacier Bay, Alaska: Implications for biological patterns in a glacial fjord estuary. *Estuaries and Coasts* 30:927-944.
- Gasper, J. , V.F. Gallucci, M.M. Miller, C. Soiseth, D. Johnson and J. Swanson. 2005. Sportfishery information for managing Glacier Bay National Park and Preserve. Vol. 1: Catch, harvest, and effort for the Gustavus and Elfin Cove Sportfishery in the Cross Sound and Icy Strait Region of Northern Southeast Alaska during 2003. U. S. Dept. of Interior, National Park Service Technical Report NPS/PWRUW/NRTR-2005-1.
- Gonzalez-Laxe, F. 2005. The precautionary principle in fisheries management. *Marine Policy* 29(6):495-505.
- Kittinger, J.N., K.N. Duin and B.A. Wilcox. 2010. Commercial fishing, conservation and compatibility in the Northwestern Hawaiian Islands. *Marine Policy* 34(2):208-217.
- Lehmann, M. and C. Soiseth. 2010. Bartlett Cove creel survey: September 2010. Glacier Bay National Park and Preserve. Unpublished report.
- Lester, S.E., K.L. McLeod, H. Tallis, M. Ruckelshaus, B.S. Halpern, P.S. Levin, F.P. Chavez, C. Pomeroy, B.J. McCay, C. Costello, S.D. Gaines, A.J. Mace, J.A. Barth, D.L. Fluharty, and J.K. Parrish. 2010. Science in support of ecosystem-based management for the US West Coast and beyond. *Biological Conservation* 143:576-587.
- Meyer, S.C., R. Powers. 2009. Evaluation of Alaska charter logbook data for 2006-2008: A report to the North Pacific Management Council, October 2009. September, 2009. Alaska Department of Fish and Game, Division of Sport Fish. Anchorage, AK.
- National Park Service (NPS). 1998. National Parks Service Concessions Management Improvement Act of 1998. Title IV, Sections 401-419 of the National Parks Omnibus Management Act of 1998.

- Pikitch, E.K., C. Santora, E.A. Babcock, A. Bakun, R. Bonfil, D.O. Conover, P. Dayton, P. Doukakis, D. Fluharty, B. Heneman, E.E. Houde, J. Link, P.A. Livingston, M. Mangel, M.K. McAllister, J. Pope and K.J. Sainsbury. 2004. Ecosystem-based fishery management. *Science* 305:346-347.
- Reily, P.N., D. Wilson- Vandenberg, D.L. Watters, J.E. Hardwick and D. Short. 1993 On board sampling of the rockfish and lingcod commercial passenger fishing vessel industry in northern and central California, May 1987 to December 1991. *Calif. Dept. Fish and Game , Mar. Resour. Admin. Rep.*93-4. 242 p.
- Sampson, D. 2011. The accuracy of self-reported fisheries data: Oregon trawl logbook fishing locations and retained catches. *Fisheries Research* 112:59-66
- Soiseth, C., J. Kroese, R. Liebermann and S. Bookless. 2007. Vessel use and activity in Glacier Bay National Park. Pp. 172-175 in Piatt, J.F., and S.M. Gende (eds) *Proceedings of the Fourth Glacier Bay Science Symposium: U.S. Geological Survey Scientific Investigations Report 2007.5047*, 246.
- Soiseth, C., C. Murdoch. 2013. Trends in Marine Charter Fishing Activity, Glacier Bay National Park (1997-2007). *Natural Resource Technical Report NPS/XXXX/NRTR—20XX/XXX*. National Park Service, Fort Collins, Colorado.
- Tersteeg, D.L. and M.J. Jaenicke. 2008. Summary data from the sport fishery for Pacific halibut in the IPHC Area 2C portion of Southeast Alaska, 2007. *Alaska Department of Fish and Game, Division of Sport Fish*. Juneau, AK.
- White, C., B. Halpern and C.V. Kappel. 2012. Ecosystem service tradeoff analysis reveals the value of marine spatial planning for multiple ocean uses. *Proceedings of the National Academy of Sciences* 109(12):4696-4701.

Appendix A: Public Law 105-391 [excerpt]

TITLE IV--NATIONAL PARK SERVICE CONCESSIONS MANAGEMENT SEC. 401. SHORT TITLE.

This title may be cited as the ``*National Park Service Concessions Management Improvement Act of 1998*".

SEC. 418. COMMERCIAL USE AUTHORIZATIONS.

(a) In General.--To the extent specified in this section, the Secretary, upon request, may authorize a private person, corporation, or other entity to provide services to visitors to units of the National Park System through a commercial use authorization. Such authorizations shall not be considered as concessions contracts pursuant to this title nor shall other sections of this title be applicable to such authorizations except where expressly so stated.

(b) Criteria for Issuance of Authorizations.—

(1) Required determinations.--The authority of this section may be used only to authorize provision of services that the Secretary determines will have minimal impact on resources and values of the unit of the National Park System and are consistent with the purpose for which the unit was established and with all applicable management plans and park policies and regulations.

(2) Elements of authorization.--The Secretary shall--(A) require payment of a reasonable fee for issuance of an authorization under this section, such fees to remain available without further appropriation to be used, at a minimum, to recover associated management and administrative costs;

(B) require that the provision of services under such an authorization be accomplished in a manner consistent to the highest practicable degree with the preservation and conservation of park resources and values;

(C) take appropriate steps to limit the liability of the United States arising from the provision of services under such an authorization; and

(D) have no authority under this section to issue more authorizations than are consistent with the preservation and proper management of park resources and values, and shall establish such other conditions for issuance of such an authorization as the Secretary determines appropriate for the protection of visitors, provision of adequate and appropriate visitor services, and protection and proper management of the resources and values of the park.

(c) Limitations.--Any authorization issued under this section shall be limited to—

(1) commercial operations with annual gross receipts of not more than \$25,000 resulting from services originating and provided solely within a unit of the National Park System pursuant to such authorization;

(2) the incidental use of resources of the unit by commercial operations which provide services originating and terminating outside of the boundaries of the unit; or

(3) such uses by organized children's camps, outdoor clubs and nonprofit institutions (including back country use) and such other uses as the Secretary determines appropriate.

Nonprofit institutions are not required to obtain commercial use authorizations unless taxable income is derived by the institution from the authorized use.

(d) Prohibition on Construction.--An authorization issued under this section shall not provide for the construction of any structure, fixture, or improvement on federally-owned lands within the boundaries of a unit of the National Park System.

(e) Duration.--The term of any authorization issued under this section shall not exceed 2 years. No preferential right of renewal or similar provisions for renewal shall be granted by the Secretary.

(f) Other Contracts.--A person, corporation, or other entity seeking or obtaining an authorization pursuant to this section shall not be precluded from also submitting proposals for concessions contracts.

Appendix B: Glacier Bay National Park CUA Permit Stipulations

Department of the Interior
National Park Service

Glacier Bay National Park & Preserve
P.O. Box 140
Gustavus, AK 99826
Ph: 907-697-2232 Fax: 907-697-2654

2009 – ATTACHMENT C GLACIER BAY NATIONAL PARK & PRESERVE Park-Specific Provisions

These specific provisions are applicable to those commercial activities and areas authorized on your Commercial Use Authorization.

GENERAL TERMS & CONDITIONS

1. The Permittee must submit an activity report and Sportfish Survey on the attached forms. The annual activity report must be received by November 15 of each year. The **Sport Fish Survey form is due at the end of each month** during which sportfishing activities took place. Send the completed forms to: Glacier Bay National Park, Attention Concessions Office, P.O. Box 140, Gustavus, AK 99826 or by fax to: (907) 697-2654, or by email to david_nemeth@nps.gov.

2. Management fees paid for Glacier Bay National Park and Preserve are not refundable, nor will a credit be issued. **Permittees who will not use their permit for any reason (from the effective date of the permit) and want to cancel their permit may obtain a refund or credit of the management fee if the park service is notified by April 1st.** After April 1st, refunds or credits will be issued only under extenuating circumstances and on a case by case basis. Notification can be given via Phone: 907-644-3362, Fax: 907-644-3813 or email: brenda_coleman@nps.gov.

3. All operations shall be conducted in conformance with relevant National Park Service regulations contained in the current printing of the US Code of Federal Regulations, with particular attention to applicable elements of 36 CFR 13.65 and the park compendium. The park compendium is normally revised on an annual basis and includes closures, restrictions and other operating requirements. A current copy is available on the park internet web site at: <http://www.nps.gov/glba/visit/regs.htm> or by contacting the park.

ACTIVITY SPECIFIC TERMS & CONDITIONS

Guided Sportfishing Services

1. Freshwater sportfishing guide services are not authorized in Glacier Bay National Park South and East of Lituya Bay. Guiding is defined as "leading, directing, or advising" sportfishing clients. The Permittee is therefore prohibited from directing or dropping clients ashore for angling purposes at any freshwater body. Furthermore, the Permittee, employees, or their representatives may not accompany, direct, or advise clients during any on-stream fishing activity.

2. Guided salt water sport fishing is authorized subject to the following: the Permittee shall provide all salt water sport fishing clients a copy of the State of Alaska "Guide to Eating Fish" (<http://www.epi.hss.state.ak.us/eh/fish/FishConsumptionCalc.pdf>) and advise them of the hazards associated with consumption of listed species. All Permittee vessels shall have a copy of the State of Alaska Fish Consumption Advice for Alaskans: A Risk Management Strategy to Optimize the Public's Health (http://www.epi.hss.state.ak.us/bulletins/docs/rr2007_04.pdf) available on board.

Appendix C: Glacier Bay National Park Charter Fishing Survey Logbook Form

Page ____ of ____

(Last updated June 2009)

You are required to report fishing effort anywhere within park waterswaters under the terms of your commercial use authorization or charter concession permit. Use one form for each charter trip! Fishing effort, catch and harvest must be apportioned by specific fishing location and by fresh or salt water. Directions for completing this form are on the reverse side of this page. Submit these forms at the end of each month to: Concessions Office, Glacier Bay National Park & Preserve, P.O. Box 140, Gustavus, AK 99826 or by fax (907) 697-2654 or email to David_Nemeth@nps.gov. Call Fisheries Biologist, Chad Soiseth at (907) 697-2659 if you have any comments or questions regarding the survey form or results.

Charter Business Name :	Charter trip starting location:
Vessel name :	Charter trip ending location:
Vessel operator:	Number of crew:

Example

Date mm/dd/yy	Trip Duration (full/ half/ multiday)	Fishing location (be specific) Record only a single location for each row!	No. people fishing	Boat Hours for salmon & trout	Boat hours for bottom fish	Species and number of fish kept	Species and number of fish released
5/26/2009	Full	Point Carolus	4	0	4	Hal - 2	Hal -3

SURVEY LOGBOOK FORM INSTRUCTIONS

Page__ of __ : Indicate page number and total pages (*i.e.*, Page 1 of 2) for each charter trip on each sheet. Use as many pages as needed for each trip.

Charter business name, vessel name, vessel operator and number of crew: Record your charter business name, vessel name, name of the vessel operator and number of crew, if any besides captain. Otherwise record 0.

Charter starting and ending location: Record port or site where trip originates and ends unless same as start location. If same as start location, then record "same".

Date (mm/dd/yy): Record the date fished at each location. Please note that it is important to record fishing effort at each location even if no fish are caught.

Trip Duration (full/half/multiday): Please record whether your charter fishing trip is a full, half day or multiday charter (clients sleep aboard your vessel).

Fishing location (be specific): Record each location fished within the boundaries of Glacier Bay National Park and Preserve. This is *critical* for accurately apportioning effort, catch and harvest. If several marine locations were fished, record effort, fish harvested and released at each location. If a freshwater system or multiple freshwater systems were fished on a given day, record effort, fish kept and released for each stream or watershed. Please provide location

information by water body (e.g., name of bay, inlet, stream or lake, etc.) when available. Use the nearest landmark (*i.e.*, Ancon, Rush Point, Pt. Carolus, etc.) when water body identity is not available.

No. people fishing: Record the number of people fishing at each location. This information will be used to document the number of charter vessel based Park visitors participating in this activity annually and to verify boat hours which are used for calculating catch rates.

Boat hours for salmonids and bottom fish. Record the total number of hours of fishing time for your fishing party by fish species at each location. Detailed information on fishing effort is needed to calculate catch rates for each species (catch per unit effort [CPUE] in number of fish caught per boat). For example, four anglers fishing for four hours at Point Carolus expended four boat hours of effort at that location.

Species and numbers of fish kept: For each fishing location, record the common name of all fish kept and the number of individuals by species for each location.

Species and number of fish released: Please record species and numbers of all fish released for each fishing location, but do not measure released finfish. This will reduce handling impacts and stress to these individuals.

Appendix D: Vessel Survey Data

Survey Date	Time	Day	Obser.	Peak Tide Time	AM/PM	Primary Survey Objective	Location	Observed Vessels (#)	Vessels Fishing (#)	Vessels Boarded (#)
6/5/09	-	Fri	CG	12:59	PM	Core RM	Point Carolus	1	1	NA
6/18/09	1513	Thur	CG	15:27	PM	Core RM	Point Carolus	1	1	NA
6/23/09	1630	Tues	TB	14:48	PM	Law	Point Carolus	2	2	1
6/24/09	0915-0930	Wed	JN	15:35	PM	Core RM	Point Carolus	2	2	NA
6/25/09	0900-0935	Thur	CM	9:50	AM	RM	Mouth of BP	4	4	NA
7/1/09	1210	Wed	JN	9:40	AM	Core RM	Point Carolus	1	1	NA
7/2/09	0853	Thur	KF	10:59	AM	RM	Mouth of BP	2	1	NA
7/6/09	1455	Mon	CG	14:10	PM	Core RM	Point Carolus	2	1	NA
7/7/09	0858 - 1000	Tues	JN	8:09	AM	Core RM	Point Carolus	7	5	NA
7/9/09	1037	Thur	CG	9:14	AM	Core RM	Salt Chuck	5	1	NA
7/15/09	1030-1512	Wed	JN	12:35	PM	Core RM	Mouth of BP	6	2	NA
7/17/09	1531	Fri	CG	15:25	PM	Core RM	Mouth of BP	1	0	NA
7/21/09	0908-0918	Tue	CG	7:15	AM	Core RM	Point Carolus	5	3	NA
7/22/09	1048	Wed	JN	8:02	AM	Core RM	Ripple Cove	1	0	NA
7/24/09	1210-1237	Fri	JN	9:28	AM	Core RM	Point Carolus	6	6	NA
7/29/09	0929-0933	Wed	JN	7:46	AM	Core RM	Mouth of BP	2	2	NA
8/5/09	0900-1558	Wed	CG	14:13	PM	Core RM	Point Carolus	5	3	NA
8/10/09	1157	Mon	CG	10:08	AM	Core RM	Point Carolus	1	1	NA
8/15/09	0845	Sat	TB	9:37	AM	Law	Mouth of BP	1	1	1
8/18/09	1354-1406	Tue	JN	12:40	PM	Core RM	Mouth of BP	2	1	NA
8/21/09	1010-1059	Fri	JN	8:21	AM	Core RM	Point Carolus	5	2	NA
9/4/09	0800-1500	Fri	CM	13:55	PM	RM	Young	2	2	NA
9/9/09	1027	Wed	CG	10:06	AM	Core RM	Sitakaday	1	1	NA
9/15/09	1430	Tues	CM	11:29	AM	Core RM	Barco	1	1	NA
5/28/10	1007-1030	Fri	CG	820	AM	Core RM	Pt. Carolus	2	2	NA
6/7/10	1403-1406	Mon	JN	1606	PM	Core RM	Pt. Carolus	3	3	NA
6/8/10	859	Tue	JN	1123	AM	Core RM	Pt. Carolus	2	2	NA
6/17/10	1245	Thur	CG	1146	AM	Core RM	Mouth of BP	1	0	NA
6/23/10	1248-1253	Wed	TB	1226	PM	Law	Mouth of BP	2	2	2
6/24/10	1425-1456	Thur	CG	1317	PM	Core RM	Mouth of BP	2	1	NA
6/29/10	NA	Tue	TB	NA	NA	Law	Lester Island	1	1	NA
7/1/10	1232-1237	Thur	CG	1103	AM	Core RM	Mouth of BP	5	2	NA
7/6/10	1036-1047	Tue	JN	928	AM	Core RM	Mouth of BP	2	1	NA
7/7/10	1445-1519	Wed	TB	1534	PM	Law	Point Carolus	2	2	2
7/9/10	1247	Fri	Prot	1245	PM	Law	Mouth of BP	1	1	1
7/9/10	1451	Fri	CG	1245	PM	Core RM	Mouth of BP	2	2	NA
7/11/10	1425	Sun	JN	1413	PM	Core RM	Mouth of BP	1	0	NA
7/13/10	1330-1345	Tue	TB	1525	PM	Law	Mouth of BP	4	4	1
7/13/10	0912-0930	Tue	JN	900	AM	Core RM	Mouth of BP	4	4	NA
7/15/10	1304	Thur	Prot	1035	AM	Law	Mouth of BP	1	1	1

7/16/10	1321-1325	Fri	JS	1120	AM	RM	Mouth of BP	3	0	NA
7/19/10	1133	Mon	JS	1406	PM	RM	Mouth of BP	1	1	NA
7/21/10	1004	Wed	CB	1116	AM	RM	Mouth of BP	1	1	NA
7/26/10	1253	Mon	JN	1455	PM	Core RM	Mouth of BP	3	3	NA
7/27/10	1035	Tues	WB	856	AM	Core RM	Mouth of BP	5	5	NA
7/28/10	1321	Wed	JN	1553	PM	Core RM	Mouth of BP	1	0	NA
7/30/10	940	Fri	CG	1026	AM	Core RM	Mouth of BP	2	2	NA
8/17/10	1258-1336	Tue	JN	1336	PM	Core RM	Mouth of BP	6	6	NA
8/18/10	1324-1356	Wed	JN	1501	PM	Core RM	Mouth of BP	4	4	NA
8/19/10	930	Thur	CG	1105	AM	Core RM	Mouth of BP	2	2	NA
8/24/10	934-1012	Tue	JN	758	AM	Core RM	BP/Pt.	9	9	NA
8/27/10	1230	Fri	PR	1538	PM	Law	Pt. Carolus	1	1	NA
8/30/10	918	Mon	JN/CG	1052	AM	Core RM	Pt. Carolus	1	1	NA
9/1/10	1310	Wed	TB	1218	PM	Law	Dundas Bay	1	1	NA
9/3/10	1034	Fri	JN/CG	951	AM	Core RM	Mouth of BP	1	0	NA
9/7/10	1438-1450	Tue	CS	1319	PM	Law	BP/Strawberry	6	3	NA
9/8/10	1047-1427	Wed	CG	1358	PM	Core RM	BP/Strawberry	5	4	NA
6/3/11	9:00	Fri	CG	857	AM	Core RM	Carolus	2	2	NA
6/15/11	9:23	Wed	JN	731	AM	Core RM	Point Carolus	1	1	NA
6/17/11	15:07	Fri	CG	1530	PM	Core RM	Mouth of BP	1	1	NA
6/22/11	9:00	Wed	JN	1218	PM	Core RM	Mouth of BP	1	1	NA
6/24/11	9:20	Fri	CG	813	AM	Core RM	Mouth of BP	1	1	NA
6/29/11	9:00	Wed	JN	646	AM	Core RM	Point Carolus	3	2	NA
7/8/11	12:29	Fri	CG	1257	AM	Core RM	Sitakaday	1	0	NA
7/20/11	16:00	Mon	TB	1719	PM	Law	Mouth of BP	1	1	1
8/8/11	12:57	Mon	CG	1456	AM	Core RM	Point Carolus	1	1	NA
8/12/11	9:00	Fri	CG	704	AM	Core RM	Point Carolus	1	1	NA
8/17/11	13:15	Wed	CG	944	AM	Core RM	Point Carolus	2	2	NA
8/18/11	13:00	Tues	TB	1425	PM	Law	Inlet	1	1	1
8/19/11	12:30	Wed	TB	1041	AM	Law	Berg Bay	1	1	1
9/15/11	13:40	Tue	CG	1510	PM	Core RM	Bartlett Cove	1	1	NA

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 132/119898, February 2013

National Park Service
U.S. Department of the Interior



Natural Resource Stewardship and Science

1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov

EXPERIENCE YOUR AMERICA™