Availability of Pacific Coast Feeding Group gray whales during the gray whale migratory season in the Makah Usual and Accustomed Fishing Grounds

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ABSTRACT

In 2011, the Makah Tribe presented a proposed whaling management plan to the IWC that allowed whaling while minimizing impacts on Pacific Coast Feeding Group (PCFG) gray whales. In 2012, the IWC completed an implementation review on gray whales that focused on PCFG whales and concluded: (1) SLA variant 2 performed acceptably and met the Commission's conservation objectives for conservation while allowing limited hunting; and (2) SLA variant 1 performed acceptably for nearly all the trials and could be considered to meet the Commission's conservation objectives provided that it is accompanied by a photo-identification program to monitor the relative probability of harvesting PCFG whales in the Makah usual and accustomed fishing grounds. Based on survey effort from 1996 to 2011, we found that 31% of whales photographed in the ocean and 56% photographed in the Strait of Juan de Fuca were identified as PCFG whales during the proposed December through May hunting season of the Makah Tribe. The Strait of Juan de Fuca is closed to hunting in the proposed Makah whaling management plan. The availability of PCFG gray whales along the outer coast of NW Washington has not changed appreciably with the addition of sighting data collected in 2011 as compared to 30% availability used in the implementation review.

KEYWORDS: ABORIGINAL WHALING; MANAGEMENT PROCEDURE; NORTH PACIFIC; GRAY WHALES; PHOTO-ID

INTRODUCTION

In 2011, the Makah Tribe presented a proposed management plan to the International Whaling Commission's Scientific Committee (SC) (Makah 2011) that provides opportunities for Makah whalers to meet the needs of the Tribe while minimizing impacts on Pacific Coast Feeding Group (PCFG) whales. Provisions included in the management plan include a closure during the gray whale feeding season (June 1 to November 30) to focus the hunt on migrating whales, and spatial closures to limit hunting to the Pacific Ocean portion of the Tribe's usual and accustomed fishing grounds (Figure 1), where a lower availability of PCFG whales has been observed in the migratory season (Calambokidis et al. 2010, 2011). Despite these time and area restrictions, there is still a risk that the Makah hunt will harvest non-targeted PCFG whales. To ensure that any impacts to PCFG whales from the hunt are consistent with the IWC's conservation objectives, the Tribe will stop whaling in any year when an allowable PCFG limit (APL) is reached. The conservative APL is calculated based on the current abundance of gray whales photo-identified between Oregon and Southern Vancouver Island (see Calambokidis et al 2012). All landed whales will be photographed and the photographs will be compared to the catalogue of PCFG whales. If a landed whale matches a whale in the catalogue it will count against the APL. Struck and lost whales in the month of May are also counted against the APL.

The impacts to the PCFG from the Makah Tribe's proposed whaling management plan was evaluated in the implementation review of Eastern North Pacific gray whales conducted in 2011-2012. During the implementation review, a question arose about the specific timing of strikes during the course of the Tribe's hunt, *i.e.* how many strikes would occur from December through April (when struck and lost whales will not count against the APL) and how many strikes will occur in the month of May (when all

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struck and lost whales will count against the APL). Rather than make assumptions about the number of strikes that would occur from December through April and the number of strikes that would occur in May, the SC decided to bookend the range of possible strike timing by modeling SLA variant 1 with the hunt occurring entirely in the months of December through April, when no struck and lost whales count against the APL, and SLA variant 2 with the hunt occurring entirely in May, when all struck and lost whales count against the APL. In 2012, the IWC completed the implementation review and concluded: (1) SLA variant 2 performed acceptably and met the Commission's conservation objectives for conservation while allowing limited hunting; and (2) SLA variant 1 performed acceptably for nearly all the trials and could be considered to meet the Commission's conservation objectives provided that it is accompanied by a photo-identification program to monitor the relative probability of harvesting PCFG whales in the Makah U&A and that the results will be presented to the Scientific Committee for evaluation each year (IWC/64/Rep1 Annex E).

Pursuant to the IWC's request, this document updates previous estimates of the availability of PCFG whales during the migratory season.

METHODS

The Strait of Juan de Fuca and the Pacific Ocean within and adjacent to the Makah Tribe's Usual and Accustomed fishing grounds (U&A; Figure 1) were surveyed from 20-24 foot motor vessels from 1996 through 2011. Surveys were generally conducted within five kilometers of shore because whale sightings were not common outside three miles, ocean conditions were more compatible with small vessel surveys, and other research objectives, such as Steller sea lion studies, could be accomplished. Starting in 2009 a greater proportion of survey effort was conducted out to eight to ten kilometers offshore.

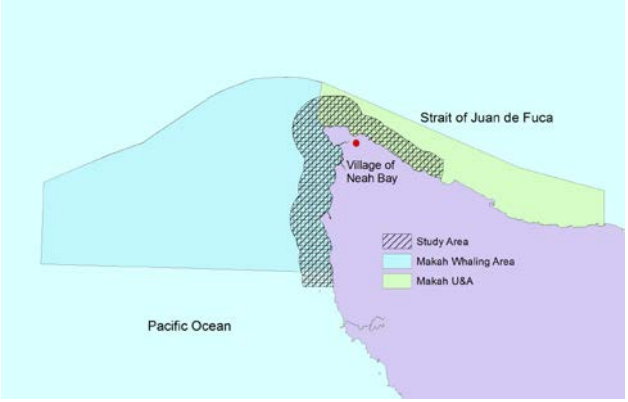

Figure 1: Map of Makah usual and accustomed fishing grounds (U&A), the proposed whaling area in the Pacific Ocean, and the study area. Note that the Makah U&A extends as far west and south and Makah whaling area.

Attempts were made to photograph the lateral flank on both sides of sighted gray whales with a digital SLR camera with a 70-300 mm lens. Data collected during sightings included position, depth, and whale behaviors (i.e. feeding or traveling). All photographs were sent to Cascadia Research Collective (CRC) for comparison to its catalogue of PCFG whales. Biologists at CRC sorted all photographs based on their quality for identification (e.g. clarity, position of whale, glare, etc.). Photographs suitable for identification were evaluated to determine if pigmentation and knuckle patterns matched known whales in the catalogue. If whale photographs were not found to match whales in the catalogue, and were of suitable quality then the whale was assigned a new identification number and included in the catalogue (see Calambokidis et al. 2012 for more detail).

We followed the methods of Calambokidis et al. (2010, 2012) to determine if an identified whale was a member of the PCFG. Explicitly stated, we reviewed the sighting history of gray whales in the CRC catalogue and if a gray whale was seen in more than one year from 1996 through 2011 between 41° N and 52° N (excluding whales seen in Puget Sound and Hood Canal, Washington) during the months of June to November, then it was counted as a PCFG whale.

The numbers of gray whales identified as PCFG or non-PCFG were tabulated by month for both the Strait of Juan de Fuca and the outer coast of NW Washington. The availability of PCFG whales was

calculated as the number of PCFG whales divided by the total number of whales identified. Results were tabulated by month and survey area for analysis. Fisher's exact test was used to test if the availability of PCFG whales was different 1) between the Strait of Juan de Fuca and the outer coast, and 2) between months within the outer coast.

RESULTS

Surveys were conducted by CRC, the National Marine Mammal Laboratory (NMML), and Makah Fisheries Management (MFM) from 1996 through 2011. In total, the three research groups collected 211 identifications of gray whales during the migratory season; some whales were observed on more than one occasion (Table 1). Survey effort was divided into five regions for analysis because surveys did not always enter all regions. The survey regions were broadly defined as: East Strait (Sekiu Point to Third Beach), Neah Bay (Third Beach to Waadah Island), West Strait (Waadah Island to Cape Flattery), North Ocean (Cape Flattery to Cape Alava), and South Ocean (Cape Alava to Sea Lion Rock) (Figure 2). Survey effort from 2000 to 2011 was greatest in April and May when weather conditions were generally more favorable for surveys with less effort in other months of the migratory season (Table 2); CRC survey effort was not included in the analysis but will be in the future.

Table 1: Tally of whale identifications collected by research group per year and across years.

Year	CRC	MAKAH	MAKAH-NMML	NMML	Yearly total
1986	20				20
1993	5				5
1997				1	1
1999	45				45
2000	3			9	12
2002				6	6
2003				1	1
2005		11			11
2006		17		3	20
2007		8			8
2008		4		3	7
2009		27	21	3	51
2010	2	4			6
2011	10	3	5		18
Total	85	74	26	26	211

Figure 2: Map of study area showing research area. The five research segments showed on map were used to quantify research effort.

Table 2: Count of gray whale research surveys by MFM and NMML conducted per segment of research area by month for 2000 through 2011. A survey was counted if it entered the research area segment even if the whole survey area was not surveyed.

	East Strait	Neah Bay	West Strait	North Ocean	South Ocean
January	2	5	3	2	2
February	2	8	6	5	3
March	3	10	10	6	1
April	10	28	25	17	6
May	18	48	37	28	20
December	4	6	4	2	2
Total	39	105	85	60	34

The majority of gray whales observed during the migratory period (56%) in the Strait of Juan de Fuca were PCFG whales (Table 3). In the Pacific Ocean, 31% of identified whales were PCFG whales (Table 4). A significantly larger proportion of whales identified in the Strait of Juan de Fuca were PCFG whales as compared to whales sighted in the Pacific Ocean (Fisher's exact test, $p<0.01$).

Table 3: Count of gray whales identified as PCFG whales, identified non-PCFG whales, and the computed PCFG availability by month (1996-2011) in the Strait of Juan de Fuca.

Month	Count of PCFG identifications	Count of non-PCFG identifications	PCFG availability
January		1	0%
February		1	0%
March	1	3	25%
April	5	12	29%
May	23	14	62%
December	11	0	100%
Total	40	31	56%

We observed greater availability of PCFG gray whales in April than May (Table 4), but the difference was not statistically significant (Fisher's exact test, $p=0.24$).

Table 4: Count of gray whales identified as PCFG whales, identified non-PCFG whales, and the computed PCFG availability by month (1996-2011) in the Pacific Ocean.

Month	Count of PCFG identifications	Count of non-PCFG identifications	PCFG availability
January		2	0%
March	2	7	22%
April	19	30	39%
May	22	58	28%
Total	43	97	31%

DISCUSSION

As has been reported in the past (Calambokidis et al 2010, 2012), the availability of PCFG gray whales in the Strait of Juan de Fuca is greater than along the outer coast of NW Washington during the migratory season. The Makah whaling management plan prohibits hunting in the Strait of Juan de Fuca to reduce the probability that the hunt will strike a PCFG whale. Results through 2011 support this hunting

restriction for a hunt conducted in the gray whale migratory season (December through May) as the Tribe has proposed.

The availability of PCFG gray whales in the Pacific Ocean (31%, Table 3) has not changed appreciably with the addition of sighting data collected in 2011 as compared to 30% availability used in the implementation review (IWC 2012).

LITERATURE CITED

Calambokidis, J., J.L. Laake and A. Klimek. 2010. Abundance and population structure of seasonal gray whales in the Pacific Northwest, 1998-2008. Document submitted to the IWC Scientific Committee. 50 pp. Agadir, Morocco, 30 May - 11 June 2010. (SC/62/BRG32)

Calambokidis, J., J. Laake and A. Klimek. 2012. Updated analysis of abundance and population structure of seasonal gray whales in the Pacific Northwest, 1998-2010. Document submitted to IWC SC AWMP Workshop, March 28 to April 1, 2012 in La Jolla, CA. (SC/M12/AWMP2-Rev)

IWC Scientific Committee. 2012. Report of the Scientific Committee 2012: Annex E. IWC Report (IWC/64/Rep1 Annex E)

Makah Tribal Council. 2011. Description of Makah Tribe's proposed whale hunt. Document submitted to IWC SC AWMP Workshop, March 28 to April 1, 2011 in La Jolla, CA. (SC/M11/AWMP6)

Rice, D., & Wolman, A. 1971. The life history and ecology of the gray whale (Eschrichtius robustus). American Society of Mammalogists, Special Publication No. 3, 142.