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Availability of PCFG whales by region  
during the migratory and feeding season:  
update with data through 2014

Jonathan Scordino, John Calambokidis



INTERNATIONAL  
WHALING COMMISSION

# Availability of PCFG whales by region during the migratory and feeding season: update with data through 2014

JONATHAN J. SCORDINO<sup>1</sup> AND JOHN CALAMBOKIDIS

Contact email: [jonathan.scordino@makah.com](mailto:jonathan.scordino@makah.com)

## ABSTRACT

The IWC is currently modeling the range-wide structure and status of gray whales. An important component of this modeling effort is to know the availability of Pacific Coast Feeding Group gray whales compared to other gray whales in regions where gray whales experience human caused mortality through hunting, ship strikes, and fisheries bycatch. This paper updates previous assessments of the availability of PCFG whales by region for both the migratory (December through May) and feeding (June through November) seasons. The paper also presents a monthly evaluation of availability of PCFG gray whales in the usual and accustomed hunting grounds of the Makah Tribe for both the feeding and migratory season.

## INTRODUCTION

The International Whaling Commission (IWC) Scientific Committee (SC) concluded the implementation review for evaluating the impacts of hunting on Eastern North Pacific (ENP) gray whales with an emphasis on the impacts of the Makah Tribe's hunt impacts on Pacific Coast Feeding Group (PCFG) whales in 2013 (IWC 2014). The SC concluded that the proposed Makah hunt management plan meets the conservation objectives of the IWC but that continued monitoring is needed on the availability of PCFG whales in the proposed hunt area and time. In response to this need the Makah Tribe has submitted updates on the availability of PCFG whales (Scordino et al. 2013, Scordino et al. 2014)

The IWC sponsored workshops to evaluate the range-wide population structure and status of North Pacific gray whales in 2014 and 2015 (IWC 2015). Efforts to model the impacts of human activities such as hunting, ship strikes, and fisheries bycatch made it clear that the model needed inclusion of parameters on the availability of PCFG by location and season. Scordino et al. (2014) presented an evaluation of the availability of PCFG whales by season and region as informed by an evaluation of the sighting database of gray whales maintained by Cascadia Research Collective.

The objective of this paper was to update the reported availabilities of PCFG whales in Scordino et al. (2014) for two reasons. First, we have two additional years of data to inform the estimates of availability. Second, an error was made in calculating the availabilities of PCFG whales by season and area in the previous assessment. The error was that duplicate sightings of uniquely identified individuals in the same day were included in the assessment and the update addresses this error.

## METHODS

Cascadia Research Collective compared gray whale photographs provided to them from a large number of collaborative researchers to a catalogue they keep of identifiable gray whales. The researchers collected photographs throughout the year from Southern California through

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<sup>1</sup> Makah Fisheries Management, Makah Tribe, Neah Bay, Washington, USA

Kodiak Island, Alaska. The majority of effort was focused during the summer and fall feeding season on gray whales from Northern California through Northern British Columbia (41°N to 52°N). The information for each sighting of gray whales was maintained by Cascadia Research Collective and includes the catalogue number of each identified whale, the sighting location, sighting date, research group, and other important data. The database used for this analysis included sightings from 1983 through 2014.

The first step in analyzing the database was to determine which whales meet the IWC definition of a PCFG whale. The IWC defines PCFG gray whales as gray whales that have been observed between 41°N to 52°N (excluding sightings in Puget Sound) in the months of June through November. A list was made of all PCFG whales based on the sighting data. Once the list was made, we classified every whale sighted as either a PCFG or non-PCFG whale. Next we removed all sightings that occurred of the same catalogued whale in a single day to produce a list of observations to analyze. Last, the data were divided by region and season. The regions used for the analysis were Kodiak Island, Southeast Alaska, PCFG range (41°N to 52°N), Puget Sound, and Central and Southern California. We also divided out the Northern Washington coast and the Strait of Juan de Fuca for further analysis because these regions are within the usual and accustomed fishing grounds of the Makah Tribe and may have hunting effort.

Availability was defined simply as the number of observations of whales identified as PCFG whales divided by the total number of whale observations for each season and region combination. For the migratory season (December through May) we used all available data to determine the availability of PCFG whales. For the feeding season (June through November) we used data through 2012 to allow whales two years to be observed in the PCFG range and counted as a PCFG whale.

## RESULTS

The availability of PCFG whales was dependent on season and region. As was expected, the availability of PCFG whales was greatest during the feeding season in the PCFG range. Around half of the whales seen in the regions of Southeast Alaska and Central and Southern California were PCFG whales. These two regions are not considered part of the PCFG range by the IWC and sightings of whales in these regions are not used for estimating the abundance of the PCFG. During the migratory season roughly a third of the available whales were PCFG whales in Northern Washington. The availability of PCFG whales off N Washington was roughly half the observed availability within the entire PCFG range during the migratory season (Table 1). This could be because effort in some areas of the PCFG range may disproportionately sample PCFG whales during the migratory season or sample in areas of feeding whales more likely to be PCFG whales.

Table 1: Availability of PCFG whales by region for the feeding (June through November) and migratory (December through May) seasons.

Regions	Feeding Season (Data through 2012)			Migratory Season (Data through 2014)		
	Total Observations	Observations of PCFG	Availability	Total Observations	Observations of PCFG	Availability
Kodiak	174	38	0.218	2	0	N/A
Southeast Alaska	34	19	0.559	0	0	N/A
Puget Sound	67	4	0.060	802	4	0.005
PCFG range (41°N to 52°N)	14489	13783	0.951	2159	1279	0.592
Northern Washington	836	790	0.945	230	78	0.339
Central and Southern California	36	17	0.472			

Analysis of availability of PCFG in the Makah usual and accustomed fishing grounds supports the management decision of the Tribe to limit the hunt to the Northern Washington coast. The availability of PCFG whales in Strait of Juan de Fuca is 0.25 greater than in the Northern Washington coast. This result is largely driven by the high observed availability of PCFG whales in April and May (Table 2).

Table 2: Availability of PCFG whales along the Northern Washington coast and the Strait of Juan de Fuca by month and in total.

	Month	Strait of Juan de Fuca		Northern Washington Coast	
		Observations	Availability	Observations	Availability
Migratory season	Dec	1	0.000	6	0.000
	Jan	1	0.000	5	0.200
	Feb	5	0.200	26	0.077
	Mar	24	0.417	70	0.357
	Apr	64	0.609	122	0.402
	May	17	0.941	1	1.000
	<b>Total</b>	<b>112</b>	<b>0.589</b>	<b>230</b>	<b>0.339</b>
Feeding Season	Jun	62	0.855	99	0.788
	Jul	115	0.852	157	0.949
	Aug	133	0.910	269	0.974
	Sep	219	0.950	198	0.955
	Oct	241	0.834	106	0.991
	Nov	105	0.848	7	1.000
	<b>Total</b>	<b>875</b>	<b>0.880</b>	<b>836</b>	<b>0.945</b>

## DISCUSSION

The availability of PCFG whales in each of the survey regions largely agrees with previous assessments (Calambokidis et al. 2010, Calambokidis et al. 2012, Scordino et al. 2013,

Scordino et al. 2014). Some changes in availability were noted between Scordino et al. (2014) and this study that were driven by increased sampling effort in 2013 and 2014 and the removal of duplicate sightings in the same day for whales observed prior to 2013.

The implementation review by the IWC used the availability of PCFG in the Northern Washington area as a proxy for the availability of PCFG whales in the entire PCFG range during the migratory season. In some survey regions within the PCFG range sampling efforts may disproportionally sample PCFG whales especially in areas where effort targets feeding whales rather than whales in the migratory corridor. In Northern Washington the survey design is to photograph all observed whales and to survey in a saw-toothed pattern from the coast out to 8 nautical miles when the weather permits. The survey design increases the probability that the calculated availability is more accurate than for studies that target what are assumed to be PCFG whales. As such, we suggest that the IWC utilizes the availability of PCFG whales in the Northern Washington survey region as the best estimate of availability of PCFG in the PCFG range during the migratory season for future assessments.

## ACKNOWLEDGMENTS

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