

SC/A17/GW/04

Sightings and follow-up of mothers and calves in the PCFG and implications for internal recruitment

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INTERNATIONAL
WHALING COMMISSION

Internal recruitment to the PCFG from births to PCFG mothers

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ABSTRACT

We document the occurrence of mothers and calves in the PCFG area over a more than 20-year period. Over the course of the study 62 moms were documented with 102 calves with a high proportion of these seen in recent years (11 to 18 per year in each of the last four years, 2012-15). This appeared to be a combination of higher number of calves in recent years and greater focus on accurately documenting mothers with calves in more recent years. Overall 59 of 91 (65%) calves documented through 2014 were resighted in a year subsequent to their birth year and indicates a higher degree of internal recruitment to the PCFG than had been suggested by previous less complete data. Average weaning date appeared to be around 1 August, a date earlier than the initial encounters with some whales and indicates how especially in past years with more limited effort, the number of calves would have been underestimated.

INTRODUCTION

The Pacific Coast Feeding Group (PCFG) consists of several hundred gray whales that primarily feeding through the summer and fall in the Pacific Northwest from northern California through British Columbia (Calambokidis et al. 2002, 2015). Past research has documented the occurrence of whales in this region extending well past the migration and photo-identification studies have shown that a core group of individuals returns annually (Darling 1984, Calambokidis et al. 2014). Genetic studies have found significant differences in proportions of mtDNA haplotypes between the PCFG and feeding areas to the north (Frasier et al. 2011, Lang et al. 2014). One important question regarding the status of the PCFG as a distinct demographic unit has been how whales get recruited to this group especially because the feeding area used lies on the migration path of the larger gray whale population. A long-term collaborative study of PCFG gray whales had only documented a low proportion of calves raising the question of how much internal recruitment was occurring (Calambokidis et al. 2012).

We examine the proportion of mothers and calves in the PCFG from annual collaborative effort conducted through 2015 (Calambokidis et al. 2017) and evidence that calves born into the PCFG represent a major source of recruitment to this group.

METHODS

The large scale collaboration that generated the mother and calf data has been gathered over many years by numerous collaborators and is described in more detail in our paper on the overall PCFG abundance estimates (Calambokidis et al. 2017). For this paper we compiled information from these surveys and examined all sightings of animals identified in one or more sightings as potential mothers and calves. Starting in the early 2010s, collaborators were made more aware of the importance of noting mothers and calves (Calambokidis et al. 2014). While after this mothers

and calves were identified more reliably by contributors but these assessments should be taken as minimums for several reasons: 1) a lot of effort is conducted late in the summer and into fall when many calves would have been weaned, 2) larger calves even when with mothers may not be considered calves since sometimes views are limited and this may not be clear especially as the calves get larger.

RESULTS AND DISCUSSION

Over the course of the study 62 moms were documented with 102 calves with a high proportion seen in recent years (Table 1). Between 11 and 18 calves were identified in each of the last four years (2012-15), more than had been seen in any previous year (Table 1). This appeared to be a combination of higher number of calves but was also facilitated by the greater focus on accurately reporting and identifying mothers with calves when encountered.

An increasing number of PCFG whales are individuals known to have been born to PCFG mothers and now return to this region to feed. In 2015, 45 of the individuals identified using the study area were calves known to be born to PCFG mothers in past years (excluding the additional 11 calves born in 2015). Overall 59 of 91 (65%) calves documented through 2014 were resighted in a year subsequent to their birth year, a not unreasonable proportion considering survival for calves post their initial encounter and the potential some of these recently born calves have been missed. This high proportion of calves documented becoming PCFG whales indicates a higher degree of internal recruitment than had been suggested by previous less complete data. The high rate of births and internal recruitment in recent years is consistent with the increasing estimates of the PCFG abundance in recent years (Calambokidis et al. 2017).

Due to so many of the births having been documented only in more recent years, some longer term follow-up on mothers and calves is only starting to become available (Tables 1-3). For example, only one mother (CRC-242) was known as a calf as well as a mom. She was born in 1998 to a known to PCFG mother (CRC-232 who has given birth to five documented calves) but was not documented herself with a calf until 2013 when she was 15 years old. She may have given birth earlier than this because there were four years in that period where she was not seen including the three years previous to when she was documented with a calf.

Among the 62 mothers documented during the study, most were seen with only one calf though one female was documented with five calves (CRC-232) in the nine years she was seen between 1998 to 2015 (Table 2). Among the four calves she had prior to 2015, two were never seen in a subsequent year, and two are PCFG regulars one (CRC-242) seen 167 times during 13 years encountered, and the other (CRC-786), seen 219 times in 13 years. Another mother (CRC-67) was documented with four different calves during encounters in 13 years from 1992 to 2014 and all four of these were regular PCFG whales seen in a combined 39 out of a possible 42 years (among the four) subsequent to the year they were a calf.

We could document a period when weaning appeared to have occurred based on sightings of the mother and calf together then one or both of them separated later in the year. For 61 mothers and calves the average weaning date appeared to be 1 August (based on the date half way between when they were seen together and separated).

It is apparent that we may have missed documenting many of the mother-calves just by looking at the dates of some of the initial encounters with these known mothers in years they were not seen with a calf. For example, two whales documented as mothers for the first time in 2015 (CRC 141 and 525) had long previous histories going back to 1990 (CRC-141) and 2000 (CRC-525) with a combined 32 encounter years (out of a possible 40) prior to 2015. Initial encounters with these whales, however was often not until August or even September in many years (Table 3) well after they might have weaned their calf.

There also appeared to be a high proportion of documented mothers that were also seen in Alaska outside the normal PCFG range. In total 13 of the 68 known PCFG moms have been sighted in AK waters in one year or another (IDs: 126, 141, 232, 566, 612, 684, 691, 760, 815, 893, 918, 993). All but one of these had a pretty sparse history of resightings in the PCFG area and these whales could represent whales that often feed north of the PCFG but when with a calf come through later than in other years and are more likely to be seen in the PCFG after 1 June.

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Table 2. Mothers of calves identified in the PCFG since 1993. Years prior to 1998 when more regular effort began are only listed if a calf was documented. Year an animals was seen are listed (0 without and 1 with calf).

Mother ID	1993	1994	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	# of Calves	Yrs seen	
43	0	1	0	0	0	0	1	0	0	0	0	0	0	0								2	13	
65			0															1		0			1	3
67			1	0	0		0	1		1		0	0	0			1		0	0	0	4	13	
79	0	0	0	0		0	0	1	0	0	0	0	0									1	12	
80	0	0	0	0		0	0	1	0	0	1	0	0									2	12	
81	1	0	0		0	0	1	0	1	0	0	0	0	0	1				0		0	4	16	
86	0	0	0			0	0	0		0	0	0		0	0	0			1	0	0	1	16	
91	0					0		1	0	0	0		0		0	0			0			1	10	
92	0			0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	3	19	
93	0			0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	16	
94	0	0				0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	2	18	
101		0	0	0		0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2	19	
105		1				0	0	0	0	0	0	0	0	0	0							1	11	
120							1			0	0							0				1	5	
126		0			0	0			0			0	0			0		1		0		1	9	
127				0	0	0	0	0	0	0	0	0	0		0		0	0	0	1	0	1	14	
138		0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	18	
141	0		0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	18	
143						0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2	15	
144						0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	3	16	
175			0	0	0	0	0	0	1	0	0	0	0	0	0							1	13	
178			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		1	2	17	
192			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	18	
193		0		0	0	0			0	0	0	0	0	0	0	0	0	1	0	1	0	2	15	
196				0				0		0	0		0	0	0	0	0	1	0	0	0	1	13	
216				0	0	0	0	1	0	0	0		0									1	9	
204				0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1	0	1	17	
232				1		0	1	0	1	0	0						1		0	0	1	5	11	
234					0	0	0	0	0	0	0	0	0			0	0	0	1		1	2	14	
237					0	0	0	0	1	0	0											1	7	
238			0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	16	
242						0	0	0	0	0	0	0	0	0	0	0	0	0	1		0	1	13	
280						0			0	0	0			0	0	0	0	0	1	0	0	1	10	
281							0	1	0	0	0	0	0	1	0	0	0					2	11	
312				1		0			0							1		0				2	5	
321				1	0	0																1	3	
324			0		0	0	0	0		0	0	0	0			0		1	0	0	1	2	14	
330					0	0				0		0					0	1	0	0	1	2	8	
364							0	0		0			0		0		0	1	0	1	0	2	10	
372							0	0		1	0	0	0	0	0		0	0	1	0	1	3	13	
396						0	0	0	0	0	0			0	0	0	0	0	1			1	12	
525							0	0	0	0	0	0	0	0	0	0	0	0	0	1		1	12	
554					0		0	0	0	0	0			0	0	0	0	0	0	1	0	1	14	
566								0		0		0				1		0				1	7	
575							1		0													1	2	
581							1		0		1	0	0	0	0				1	0	0	3	10	
596							1		0	0												1	3	
612							1	0	0	0	0	0	0	0						0	0	1	10	
668									0		0				0	1		0		1		2	6	
684								1		0	0											1	3	
691								1		0	0	0	0			0						1	6	
717								1		0								1		0		2	4	
719									0	0			0	0	0	0	0	0	0	0	1	1	11	
760								0	0	0	0						1		0			1	6	
815								1		0						0						1	3	
827										0							0	0	0	0	1	1	6	
860											0	0	0	0	0	0	0	0	0	1	0	1	11	
872													0	0	0						1	1	4	
893																		1		1	0	2	4	
918																		1		0	0	1	4	
973													1		0							1	3	
974															0				1		0	1	3	
993													1	0	0				0			1	4	
995															0				1		1	2	3	
1111																	1	0	0	0	0	1	5	
1172																	0		1	0	0	1	4	
1778																				1		1	1	
1789																				1		1	1	
Total calves	1	2	1	3	0	0	8	10	5	5	3	0	3	1	1	4	4	11	13	16	12	103	672	
Mother seen	10	10	13	16	21	33	36	38	36	48	40	41	42	33	32	32	34	38	38	41	40	672		
Proportion	10%	20%	8%	19%	0%	0%	22%	26%	14%	10%	8%	0%	7%	3%	3%	13%	12%	29%	34%	39%	30%	15%		

