

**Gray Whale Photographic Identification
In Laguna San Ignacio and Bahía Magdalena
Baja California Sur, Mexico: 2005-2020**



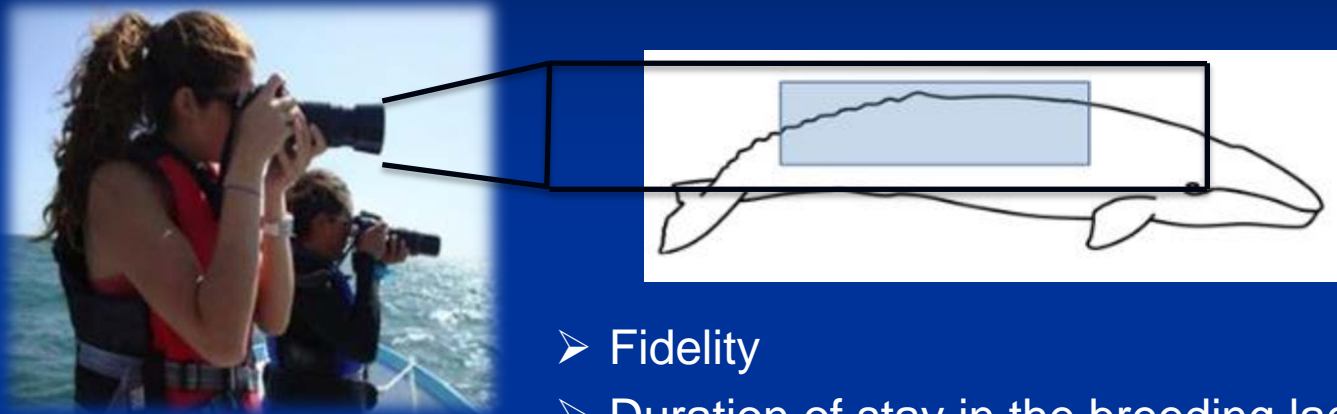
Photograph by Sergio Martínez A.



**Laguna San Ignacio
Ecosystem Science Program**

A Project of the Ocean Foundation in Baja California Sur, Mexico

Photographic Identification: What we learn from photographs



- Fidelity
- Duration of stay in the breeding lagoons
- Minimum Age
- Calving interval
- Movements among areas



Number of Gray Whales Photo-Identified

Year	Right Side Identifications		
	Singles	Females-Calf Pairs	Adults
2005	287	117	404
2006	194	54	248
2007	279	75	354
2008	154	90	244
2009	449	75	524
2010	525	38	563
2011	322	188	510
2012	333	214	547
2013	294	185	479
2014	455	199	654
2015	234	279	513
2016	357	221	578
2017	427	218	645
2018	597	86	683
2019	747	41	788
2020	696	57	753
TOTAL	6350	2137	8487



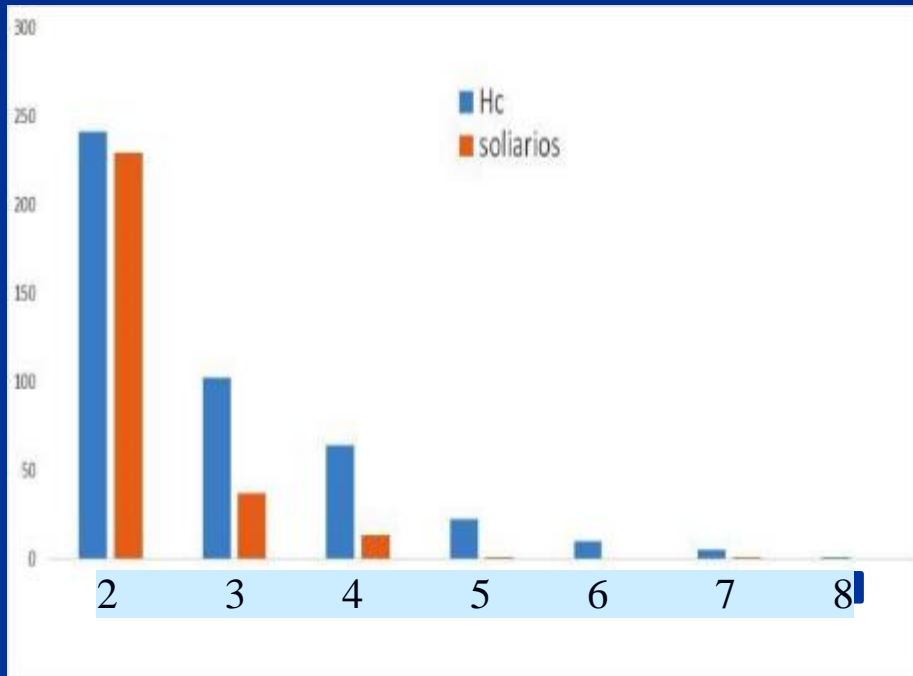
Photograph by Sergio Martínez A.

Singles = Adults without calves; Adults = Singles + Females with calves

Annual Returns to laguna San Ignacio

16.3% of the total number of whales photographed, were re-photographed in different years.

Number of Individuals



Inter-annual Recaptures

	Individuals with ≥ 2 recaptures
Females with calves	445 of 1308 (34%)
Singles	281 of 3146 (9%)



Length of Stay* in Laguna San Ignacio

* Length of stay = number of days between the first and last photograph of each individual whale each year.

<u>Year</u>	Females with Calves		Single Whales	
	<u>Ave. Days</u>	<u>Maximum Days</u>	<u>Ave. Days</u>	<u>Maximum Days</u>
2005	(n=10) 19.7	68	(n=18) 12	34
2006	(n=14) 12.9	24	(n=5) 3.6	7
2007	(n=73) 17.1	38	(n=14) 2.9	9
2008	(n=39) 18.3	48	(n=11) 8.4	41
2009	(n=54) 32.4	73	(n=50) 5.7	18
2010	(n=33) 31.9	73	(n=73) 7.0	20
2011	(n=123) 38.6	84	(n=30) 16.3	72
2012	(n=138) 37.5	81	(n=48) 10.9	67
2013	(n=118) 35.1	80	(n=25) 9.1	56
2014	(n=139) 35.8	89	(n=45) 7.5	34
2015	(n=212) 31.2	82	(n=50) 9.8	68
2016	(n=171) 28.8	80	(n=41) 8.1	31
2017	(n=153) 32.7	74	(n=55) 10.8	68
2018	(n=64) 43.4	80	(n=34) 5.2	22
2019	(n=37) 31.7	60	(n=105) 6.4	34
2020	(n=57) 22.9	62	(n= 124) 6.7	44
Average:	32.0 days	89	7.2 days	72

2019 sighting

HEMBRA / FEMALE



Minimum Age Estimation

Right

SI770400-0001CCL

SI780122-0002

SI790210-0002CCR

SI800200-0005R

SI810119-0001CCR / L

SI820210-0001R

Left

SI830329-0001CCL

42 años/
years + (6-8)
48 - 50

1977	1978	1979	1980	1981	1982	1983	2008	2010	2012	2013	2015	2018	2019
Mc	S	Mc	S	Mc	S	Mc	Mc	S	S	Mc	S	S	S

08-0089-D-LSI-M

10-0658-D-LSI

12-0445-D-LSI

13-0376-D-LSI-M

15-0192-D-LSI

18-0460-I-LSI

19-0547-D-LSI



We have similar minimum age estimations for 27 breeding female whales

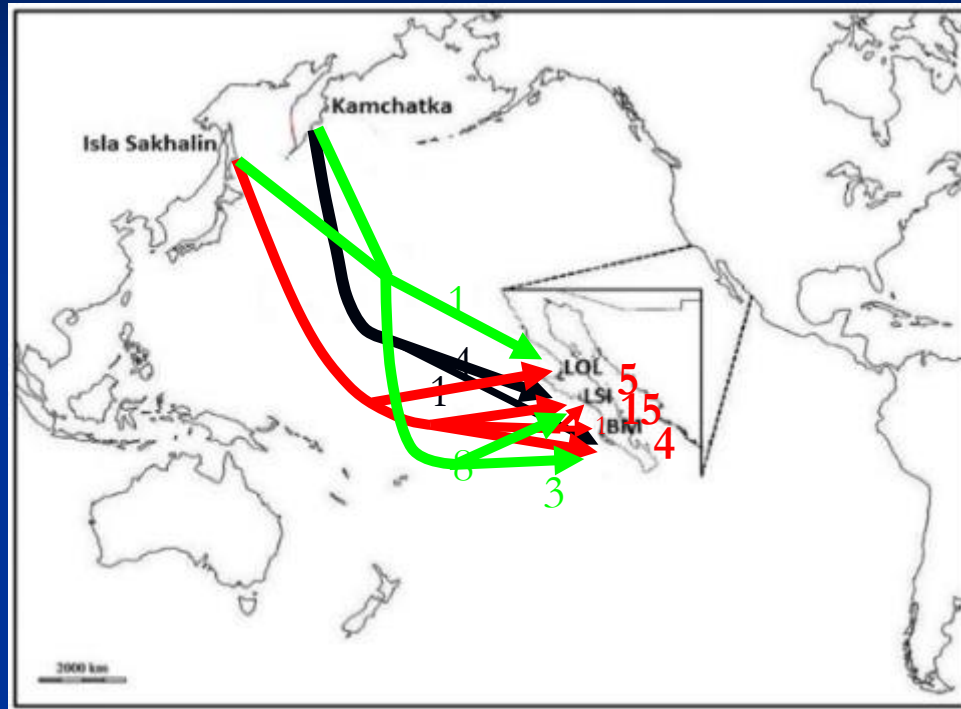
Reproductive Histories



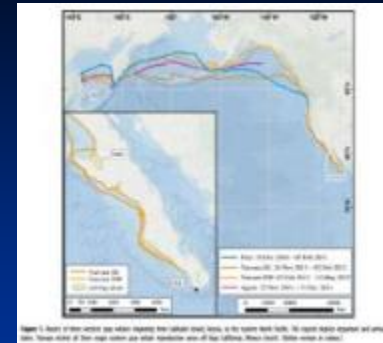
Numer of Whales	Calving Interval (yrs)	Years	1	2	3	4	5
156	2	●	---	●			
18	2	●	○	●			
91	3	●	---	---	●		
4	3	●	○	---	●		
16	3	●	---	○	●		
3	4	●	○	○	---	●	
1	4	●	○	○	○	●	
7	4	●	---	○	---	●	
2	4	●	---	○	○	●	

- Jones, 1990 (1977 to 1982) = 2.25 años n= 60
- Díaz, 2004 (1996 to 2002) = 2.41 años n= 17
- UABCS/LSIESP (2005 to 2017) = 2.39 años n = 365

Movement between Western & Eastern North Pacific populations



As of 2019:
 54 individuals photographically matched between ENP & WNP
 22 individuals were seen with calves = confirmed breeding females



Radio-Tagging:
 Mate et al.,
 2015

Vol. 118, 100–103, 2012
 doi:10.1016/j.csi.2011.09.001

ENDANGERED SPECIES RESEARCH
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Published online September 12, 2012

FEATURE ARTICLE

OPEN ACCESS

Movements of gray whales between the western and eastern North Pacific

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ABSTRACT. The western North Pacific (WNP) population of gray whales *Eschrichtius robustus* is included by the IUCN as Critically Endangered. As part of a long-term study on whales off Sakhalin Island, Russia, photo-catalog comparisons of gray whales in the western and eastern North Pacific (ENP) were undertaken to assess population mixing. These comparisons involved 2 approaches: (1) a systematic comparison of the WNP Sakhalin Catalog to an ENP Pacific Northwest Catalog that consisted of images from the northwest coast of North America and (2) a non-systematic comparison of the WNP Sakhalin Catalog to an ENP Laguna San Ignacio Catalog that consisted of images from coastal Baja California, Mexico. The Sakhalin is Pacific Northwest comparison consisted of 181 and 194 whales, respectively, and resulted in 6 matches (3 males, 2 females, and 1 whale of unknown sex). All sightings of Sakhalin whales in the Pacific Northwest occurred off southern Vancouver Island, British Columbia, Canada. The Sakhalin to Laguna San Ignacio catalog comparison consisted of 181 and 1814 whales, respectively, and resulted in 4 matches (2 males and 2 females). At the Pacific Northwest and Laguna San Ignacio catalog comparison only a small fraction of the total estimated number of individuals in the ENP population (~10,000). It is likely that more WNP/ENP exchange has occurred than was detected by these photo-catalog comparisons. Although these matches provide some evidence of movement between the WNP and ENP, recent observations of gray whales off Japan and China suggest that not all gray whales identified in the WNP share a common wintering ground.

KEY WORDS. Endangered, Pacific Ocean, Movement patterns, Conservation

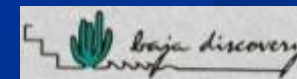
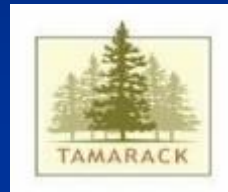
INTRODUCTION

Gray whales *Eschrichtius robustus* are generally recognized as 2 populations in the North Pacific Ocean. Recent genetic studies using both mitochondrial and nuclear markers have demonstrated significant differentiation between the western North

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