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- Darling, J. D., K. E. Keogh, and T. E. Steeves. 1998. Gray whale (*Eschrichtius robustus*) habitat utilization and prey species off Vancouver Island, B.C. Mar. Mammal Sci. 14(4):692-720.
- Dunham, J. S., and D. A. Duffus. 2001. Foraging patterns of gray whales in central Clayoquot Sound, British Columbia, Canada. Mar. Ecol. Prog. Ser. 223:299-310.
- Eberhardt, L. L. 1977. Optimal policies for conservation of large mammals, with special reference to marine ecosystems. Environ. Conserv. 4(3):205-212.
- Ewalt, D. R., J. B. Payeur, B. M. Martin, D. R. Cummins, and W. G. Miller. 1994. Characteristics of a *Brucella* species from a bottlenose dolphin (*Tursiops truncatus*). J. Vet. Diagn. Invest. 6(4):448-452.
- Fowler, C. W. 1984. Density dependence in cetacean populations. Rep. Int. Whaling Comm. (Special Issue 6):373-379.
- Fowler, C. W. 1987. A review of density dependence in populations of large mammals, p. 401-441. In H. H. Genoways (editor), Current mammalogy. Volume 1. Plenum Press, New York. 519 p.
- Geraci, J. R., and V. J. Lounsbury. 1993. Marine mammals ashore: A field guide for strandings. Texas A&M University Sea Grant College Program, Galveston, TX. 305 p.
- Gulland, F. M. D. 1992. The role of nematode parasites in Soay sheep (*Ovis aries* L.) mortality during a population crash. Parasitology 105(3):493-503.
- Gulland, F. M. D., M. Haulena, D. Fauquier, G. Langlois, M. E. Lander, T. Zabka, and R. Duerr. 2002. Domoic acid toxicity in Californian sea lions (*Zalophus californianus*): Clinical signs, treatment and survival. Vet. Rec. 150(15):475-480.



- Heyning, J. E., and M. E. Dahlheim. 1990. Strandings and incidental takes of gray whales. Unpubl. doc. SC/A90/G2 presented to the IWC Scientific Committee Special Meeting on the Assessment of Gray Whales, April 1990, Seattle. 16 p. [Available from International Whaling Commission, The Red House, 135 Station Road, Impington, Cambridge, CB4 9NP, UK.]
- Jones, M. L., and S. L. Swartz. 1984. Demography and phenology of gray whales and evaluation of whale-watching activities in Laguna San Ignacio, Baja California Sur, Mexico, p. 309-374. In M. L. Jones, S. L. Swartz, and S. Leatherwood (editors), The gray whale, *Eschrichtius robustus*. Academic Press, Inc., Orlando. 600 p.
- Krahn, M. M., G. M. Ylitalo, D. G. Burrows, J. Calambokidis, S. E. Moore, M. Gosho, P. Gearin, P. D. Plesha, R. L. Brownell Jr., S. A. Blokhin, K. L. Tilbury, T. Rowles, and J. E. Stein. 2001. Organochlorine contaminant concentrations and lipid profiles in eastern North Pacific gray whales (*Eschrichtius robustus*). *J. Cetacean Res. Manage.* 3(1):19-29.
- Le Boeuf, B. J., H. Pérez-Cortés M., J. Urbán R., B. R. Mate, and F. Ollervides U. 2000. High gray whale mortality and low recruitment in 1999: Potential causes and implications. *J. Cetacean Res. Manage.* 2(2):85-99.
- Manzanilla, S. R. 1989. The 1982-1983 El Niño event recorded in dentinal growth layers in teeth of Peruvian dusky dolphins (*Lagenorhynchus obscurus*). *Can. J. Zool.* 67(9):2120-2125.
- Moore, S. E., D. K. Ljungblad, and D. R. Van Schoik. 1986. Annual patterns of gray whale (*Eschrichtius robustus*) distribution, abundance and behavior in the northern Bering and eastern Chukchi Seas, July 1980-83. *Rep. Int. Whaling Comm. (Special Issue 8):*231-242.

- Moore, S. E., D. P. DeMaster, and P. K. Dayton. 2000. Cetacean habitat selection in the Alaskan Arctic during summer and autumn. *Arctic* 53(4):432-447.
- Moore, S. E., J. Urbán R., W. L. Perryman, F. Gulland, H. Perez-Cortes M., P. R. Wade, L. Rojas-Bracho, and T. Rowles. 2001. Are gray whales hitting “K” hard? *Mar. Mammal Sci.* 17(4):954-958.
- Moore, S. E., J. M. Grebmeier, and J. R. Davies. 2003. Gray whale distribution relative to forage habitat in the northern Bering Sea: Current conditions and retrospective summary. *Can. J. Zool.* 81(4):734-742.
- Norman, S. A., M. M. Muto, D. J. Rugh, and S. E. Moore. 2000. Gray whale strandings in 1999 and a review of stranding records in 1995-1998. Unpubl. doc. SC/52/AS5 presented to the IWC Scientific Committee, June 2000, Adelaide. 36 p. [Available from International Whaling Commission, The Red House, 135 Station Road, Impington, Cambridge, CB4 9NP, UK.]
- Pérez-Cortés M., H., J. Urbán-Ramírez, F. Ollervides, V. Sánchez S., J. Pettis, P. Loreto C., and M. A. Palmeros. 1999. A preliminary note on the gray whale, *Eschrichtius robustus*, strandings at Baja California Sur, México during the winter 1998/99. Unpubl. doc. SC/51/AS30 presented to the IWC Scientific Committee, May 1999, Grenada. 8 p. [Available from International Whaling Commission, The Red House, 135 Station Road, Impington, Cambridge, CB4 9NP, UK.]
- Perryman, W. L., and M. S. Lynn. 2002. Evaluation of nutritive condition and reproductive status of migrating gray whales (*Eschrichtius robustus*) based on analysis of photogrammetric data. *J. Cetacean Res. Manage.* 4(2):155-164.
- Perryman, W. L., M. A. Donahue, P. C. Perkins, and S. B. Reilly. 2002. Gray whale calf production 1994-2000: Are observed fluctuations related to changes in seasonal ice cover? *Mar. Mammal Sci.* 18(1):121-144.

- Perryman, W. L., G. M. Watters, L. K. Swartz, and R. A. Rowlett. 2004. Preliminary results from shore-based surveys of northbound gray whale calves in 2003 and 2004, with a comparison to predicted numbers based on the distribution of seasonal ice. Unpubl. doc. SC/56/BRG43 presented to the IWC Scientific Committee, June 2004, Sorrento. 7 p. [Available from International Whaling Commission, The Red House, 135 Station Road, Impington, Cambridge, CB4 9NP, UK.]
- Poole, M. M. 1984. Migration corridors of gray whales along the central California coast, 1980-1982, p. 389-407. In M. L. Jones, S. L. Swartz, and S. Leatherwood (editors), The gray whale, *Eschrichtius robustus*. Academic Press, Inc., Orlando. 600 p.
- Rice, D. W., and A. A. Wolman. 1971. The life history and ecology of the gray whale (*Eschrichtius robustus*). American Society of Mammalogists Special Publication No. 3, Stillwater, OK. 142 p.
- Ruelas-Inzunza, J. R., M. Horvat, H. Pérez-Cortés, and F. Páez-Osuna. 2003. Methylmercury and total mercury distribution in tissues of gray whales (*Eschrichtius robustus*) and spinner dolphins (*Stenella longirostris*) stranded along the lower Gulf of California, México. *Ciencias Marinas* 29(1):1-8.
- Rugh, D. J., K. E. W. Shelden, and A. Schulman-Janiger. 2001. Timing of the gray whale southbound migration. *J. Cetacean Res. Manage.* 3(1):31-39.
- Rugh, D. J., J. M. Breiwick, R. C. Hobbs, and J. A. Lerczak. 2002. A preliminary estimate of abundance of the eastern North Pacific stock of gray whales in 2000/01 and 2001/02. Unpubl. doc. SC/54/BRG6 presented to the IWC Scientific Committee, April 2002, Shimonoseki. 14 p. [Available from International Whaling Commission, The Red House, 135 Station Road, Impington, Cambridge, CB4 9NP, UK.]
- Sanchez Pacheco, J. A. 1998. Gray whale mortality at Ojo de Liebre and Guerrero Negro lagoons, Baja California Sur, Mexico: 1984-1995. *Mar. Mammal Sci.* 14(1):149-155.

- Swartz, S. L. 1986. Gray whale migratory, social and breeding behavior. *Rep. Int. Whaling Comm.* (Special Issue 8):207-229.
- Tilbury, K. L., J. E. Stein, C. A. Krone, R. L. Brownell Jr., S. A. Blokhin, J. L. Bolton, and D. W. Ernest. 2002. Chemical contaminants in juvenile gray whales (*Eschrichtius robustus*) from a subsistence harvest in Arctic feeding grounds. *Chemosphere* 47(6):555-564.
- Tougaard, S., and C. C. Kinze (editors). 1999. Proceedings from the workshop on sperm whale strandings in the North Sea: The event – the action – the aftermath, Rømø, Denmark, 26-27 May 1998. Esbjerg, Fiskeri- og Søfartsmuseets [Fisheries and Maritime Museum] Forlag, Esbjerg, Denmark. 50 p.
- Truelove J., and F. Iverson. 1994. Serum domoic acid clearance and clinical observations in the cynomolgus monkey and Sprague-Dawley rat following a single IV dose. *Bull. Environ. Contam. Toxicol.* 52(4):479-486.
- Urbán R., J., A. Gómez-Gallardo U., and S. Ludwig. 2003a. Abundance and mortality of gray whales at Laguna San Ignacio, Mexico, during the 1997-98 El Niño and the 1998-99 La Niña. *Geofísica Internacional* 42(3):439-446.
- Urbán R., J., L. Rojas-Bracho, H. Pérez-Cortés, A. Gómez-Gallardo, S. L. Swartz, S. Ludwig, and R. L. Brownell Jr. 2003b. A review of gray whales (*Eschrichtius robustus*) on their wintering grounds in Mexican waters. *J. Cetacean Res. Manage.* 5(3):281-295.
- Wade, P. R. 2002. A Bayesian stock assessment of the eastern Pacific gray whale using abundance and harvest data from 1967-1996. *J. Cetacean Res. Manage.* 4(1):85-98.
- Wade, P. R., and D. P. DeMaster. 1996. A Bayesian analysis of eastern Pacific gray whale population dynamics. Unpubl. doc. SC/48/AS3 presented to the IWC Scientific Committee, June 1996, Aberdeen. 21 p. [Available from International Whaling Commission, The Red House, 135 Station Road, Impington, Cambridge, CB4 9NP, UK.]

Willetto, C., T. O'Hara, and T. Rowles. 2002. Bowhead whale health and physiology workshop 2001: Summary for the International Whaling Commission (IWC) Scientific Committee. Unpubl. doc. SC/54/BRG1 presented to the IWC Scientific Committee, April 2002, Shimonoseki. 14 p. [Available from International Whaling Commission, The Red House, 135 Station Road, Impington, Cambridge, CB4 9NP, UK.]

Williams, E. 1982. Brucellosis. Practitioner 226(1371):1507-1517.

Table 1.--Gray whale stranding reports by month and region, 1995-2002.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Unknown	Total
<b>1995</b>														
Mexico													13	13
California	1	1	4	3	1		1	1						12
Oregon	1								1	1				4
Washington			2	1	2		1	1						7
Canada					1		1							2
Alaska				1										1
Total	2	1	6	5	4	0	2	1	3	0	1	1	13	39
<b>1996</b>														
Mexico	1	1	1											3
California	2	1	3	4	4	1				1	1			13
Oregon	1		1	1	1									3
Washington				1	1									2
Canada														0
Alaska														0
Total	4	2	2	4	6	1	0	0	0	0	1	1	0	21
<b>1997</b>														
Mexico	6	1	3	2	1								15	22
California	4					1								10
Oregon	1											1		3
Washington				2					1					3
Canada				1	1	1			1	1				5
Alaska				1	1			1						3
Total	4	7	4	6	2	2	0	2	1	1	1	1	15	46
<b>1998</b>														
Mexico	2	1										2	12	17
California	12	2	3	6	2		1			2	2			30
Oregon														0
Washington			1		2							1		4
Canada				1			1							2
Alaska					1	1		1						3
Total	14	3	4	7	5	1	1	1	1	0	2	5	12	56

Table 1.--Continued.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Unknown	Total
<b>1999</b>														
Mexico	6	33	69	3	1							6	6	124
California	4	2	5	10	9	5	2	2	2		1	3		45
Oregon				1	1				1					3
Washington	1	1		8	7	4	6	1						28
Canada				5	2			1	2					10
Alaska					7	13	5	47					1	73
Total	11	36	74	27	27	22	13	51	4	1	1	9	7	283
<b>2000</b>														
Mexico	18	41	57	6									85	207
California	1	2	6	22	14	9	3		1		1	1		59
Oregon				1	1									2
Washington				6	8	7	1	1						23
Canada													22	22
Alaska				1	14	10	15	5	1				9	55
Total	19	43	63	36	36	27	19	6	1	1	0	1	116	368
<b>2001</b>														
Mexico													10	10
California	1	1			1	1						1		5
Oregon														0
Washington					1									1
Canada														0
Alaska					3	3	1							5
Total	1	2	0	0	1	5	1	0	0	0	0	1	10	21
<b>2002</b>														
Mexico	3	3	4										8	15
California	2	2	1	1	2				1					7
Oregon	1	1		2										3
Washington								1						1
Canada														0
Alaska														0
Total	0	6	5	3	2	0	0	1	0	1	0	0	8	26

Table 2.--Proportionate increase in gray whale stranding reports by region in 1999 and 2000 compared to 1995-98.

	Mexico	California	Oregon	Washington	Canada	Alaska
Mean number of strandings, 1995-98	13.75	16.25	2.50	4.00	2.25	1.75
Proportionate increase in 1999	9.02	2.77	1.20	7.00	4.44	41.71
Proportionate increase in 2000	15.05	3.63	0.80	5.75	9.78	31.43

Table 3.--Sex of stranded gray whales by year, 1995-2002.

Year	Male	Female	Percent female*	Unknown	Total
1995	7	6	46.2%	26	39
1996	5	6	54.5%	10	21
1997	9	7	43.8%	30	46
1998	6	16	72.7%	34	56
1999	41	79	65.8%	163	283
2000	135	59	30.4%	174	368
2001	3	1	25.0%	17	21
2002	6	9	60.0%	11	26
Total	212	183	46.3%	465	860

\*Percent of animals of known sex.



Table 4.--Age class of stranded gray whales by year, 1995-2002.

Year	Adult		Subadult		Yearling		Calf		Total
	Number	Percent*	Number	Percent*	Number	Percent*	Number	Percent*	
1995	4	20.0%	7	35.0%	5	25.0%	4	20.0%	39
1996	1	7.1%	4	28.6%	3	21.4%	6	42.9%	21
1997	3	15.0%	3	15.0%	0	0.0%	14	70.0%	46
1998	5	13.5%	4	10.8%	5	13.5%	23	62.2%	56
1999	45	33.8%	50	37.6%	26	19.5%	12	9.0%	283
2000	105	49.3%	81	38.0%	15	7.0%	12	5.6%	368
2001	0	0.0%	3	42.9%	2	28.6%	2	28.6%	21
2002	13	52.0%	4	16.0%	3	12.0%	5	20.0%	26
Total	176	37.5%	156	33.3%	59	12.6%	78	16.6%	860

\*Percent of animals of known age.

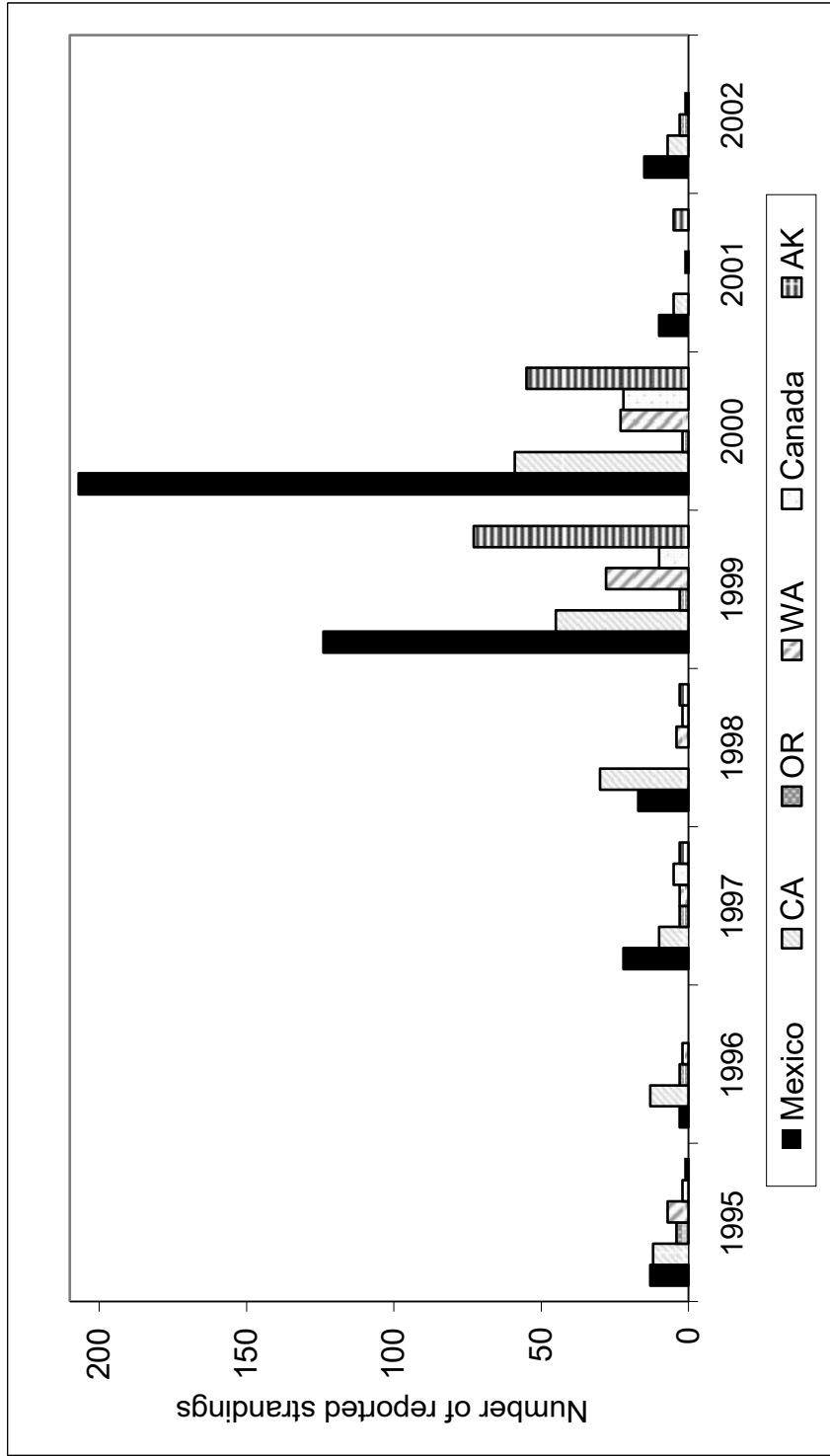
Table 5.--Age class of stranded gray whales by region, 1995-2002.

Area	Adult	Subadult	Yearling	Calf	Unknown	Total
Mexico	95	59	20	24	213	411
California	46	54	20	44	17	181
Oregon	5	3	3	5	2	18
Washington	23	25	12	4	5	69
Canada	0	0	0	0	41	41
Alaska	7	15	4	1	113	140
Total	176	156	59	78	391	860

Table 6.--Lipid composition of stranded gray whales by degree of carcass decomposition, 1999-2000  
(mean  $\pm$  standard error; n = sample size).

Carcass condition	Percent lipid composition					
	Total lipids	Wax esters	Triglycerides	Free fatty acids	Cholesterol	Phospholipids
Fresh (n = 22)	12 $\pm$ 2.8	0.35 $\pm$ 0.2	77.4 $\pm$ 7.2	5.3 $\pm$ 3.6	5.1 $\pm$ 2.7	12.3 $\pm$ 4.9
Slightly decomposed (n = 8)	0.58 $\pm$ 0.3	3.17 $\pm$ 1.6	83.4 $\pm$ 4.3	0.32 $\pm$ 0.26	6.7 $\pm$ 1.9	6.26 $\pm$ 2.9
Moderately decomposed (n = 26)	8.4 $\pm$ 2.2	8.6 $\pm$ 3.8	54 $\pm$ 7.3	11.3 $\pm$ 3.8	6.1 $\pm$ 1.4	20.1 $\pm$ 4.3
Advanced decomposition (n = 8)	2.8 $\pm$ 1.1	3.2 $\pm$ 1.9	16.7 $\pm$ 12	39.3 $\pm$ 11.3	12.3 $\pm$ 4.7	28.4 $\pm$ 9.4

Figure 1.--Annual trends in reports of gray whale strandings by region, 1995-2002.



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