USA Progress report on cetacean research, May 2009 to April 2010, with statistical data for the *calendar year* 2007

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*reports from the SEFSC have been delayed due to the Gulf of Mexico oil spill.		

USA – ATLANTIC WATERS

1. SPECIES AND STOCKS STUDIED

Common name	IWC recommended scientific name	Area/stock(s)	Items referred to
Atlantic spotted dolphin	*Stenella frontalis*	Atlantic	2.1, 4.1, 8
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Atlantic	2.1, 4.1, 4.2, 4.3, 7.3.2, 8
Bottlenose dolphin	*Tursiops truncatus*	Atlantic	2.1, 4.1, 4.3, 8
Common dolphin	*Delphinus delphis*	Atlantic	2.1, 4.2, 4.3, 7.3, 8
Cuvier's beaked whale	*Ziphius cavirostris*	Atlantic	8
Dwarf sperm whale	*Kogis simus*	Atlantic	8
Fin whale	*Balaenoptera physalus*	Atlantic	2.1, 4.3, 6.3, 8
Gervais' beaked whale	*Mesoplodon europaeus*	Atlantic	8
Harbour porpoise	*Phocoena phocoena*	Atlantic	2.1, 4.2, 4.3, 7.3, 8
Humpback whale	*Megaptera novaeangliae*	Atlantic	2.1, 3.1, 4.3, 6.3, 8
Killer whale	*Orcinus orca*	Atlantic	2.1
Melon-headed whale	*Peponocephala electra*	Atlantic	8
Minke whale	*Balaenoptera acutorostrata*	Atlantic	2.1, 4.3, 6.3, 8
North Atlantic right whale	*Eublaena glacialis*	Atlantic	2.1, 3.1, 4.1, 4.3, 6.3
Pilot whales	*Globicephala sp.*	Atlantic	2.1, 4.2, 4.3, 7.3, 8
Pygmy sperm whale	*Kogia breviceps*	Atlantic	4.3, 8
Risso's dolphin	*Grampus griseus*	Atlantic	2.1, 4.3, 8
Sei whale	*Balaenoptera borealis*	Atlantic	2.1, 6.3
Striped dolphin	*Stenella coeruleoalba*	Atlantic	2.1, 4.3, 8
Sowerby's beaked whale	*Mesoplodon bidens*	Atlantic	4.3
White-beaked dolphin	*Lagenorhynchus albirostris*	Atlantic	8

2. SIGHTINGS DATA

2.1 Field work

2.1.1 Systematic

NEFSC

During 18 June-7 July, 2009, a survey was conducted aboard the NOAA R/V Delaware II. The objective of this cruise was to collect skin samples from various odontocetes for purposes of informing stock definitions. The primary target was white-sided dolphins throughout the Gulf of Maine and along the Scotian shelf. Secondary targets included offshore odontocetes in warmer offshore waters south of Georges Bank such as striped, spotted and offshore bottlenose dolphins.

A baleen whale acoustic ecology and habitat sampling cruise was conducted on the NOAA R/V Delaware II between 13 and 30 July 2009. The primary survey area was the Stellwagen Bank National Marine Sanctuary (SBNMS) with additional survey lines and acoustic sampling work in the larger Gulf of Maine. The primary objectives were to 1) determine day and night time spatial distribution of baleen whales and their prey throughout the National Oceanographic Partnership Program (NOPP - http://www.nopp.org/) acoustic array, located in the Southwest portion of the SBNMS, 2) deploy, calibrate and synchronize the NOPP acoustic array, for acoustic localization purposes, 3) collect visual sightings of baleen whales on anchor stations within the NOPP acoustic array to inform and validate acoustic recordings, and 4) collect photo ID, acoustic recordings and biopsies of baleen whale groups in the larger Gulf of Maine. Primary target species were minke whales with sei and fin whales as secondary target species.

During August 3-17, 2009, the NEFSC conducted a shakedown cruise on the *NOAA Ship Henry B. Bigelow* to prepare for a 60-day 2010 abundance survey for marine mammals, sea turtles, and sea birds. The 2009 study area included the region within the US Exclusive Economic Zone north of 37°N latitude, to the southern flank of Georges Bank, about 41°N, and between approximately the 100 m depth contour and the Gulf Stream. During daylight hours while travelling at about 11 knots during good weather (less than Beaufort sea state 5) approximately 1010 nmi of track lines were completed. During this time, data were collected on the following:

visually detected marine mammals and sea turtles from two independent teams; acoustically detected animals from a passive acoustic hydrophone array that was trailed behind the ship; hydrographic features such as sea surface temperature and depth that were continuously recorded from the ship's onboard sensors and from sampling stations where a CTD was deployed to about 500 m depth; and plankton which were collected from bongo tows that were deployed up to three times a day. From one visual team, the following numbers of animals were detected: 73 striped dolphins (*Stenella coeruleoalba*), 16 beaked whales (Mesoplodon spp or Ziphius spp), 396 bottlenose dolphins (*Tursiops truncatus)*, 367 Risso's dolphins (*Grampus griseus*), 6 killer whales (*Orcinus orca*), 6 leatherback turtles (*Dermochelys coriacea*), 5 loggerhead turtles (*Caretta caretta*), 57 common dolphins (*Delphinus delphis*), 147 pilot whales (Globicephala spp) , 16 fin whales (*Balaenoptera physalus*), 1 sei whale (*Balaenoptera borealis*) , 4 fin or sei whales, 47 sperm whales (*Physeter macrocephalus*), 1183 Atlantic striped dolphins (*Stenella frontalis*), and 37 white-sided dolphins (*Lagenorhynchus acutus*). During night time hours, additional plankton data were collected from the active acoustic EK60, a neuston net, and a Visual Plankton Recorder (VPR) that was deployed on the same track lines that were surveyed during the daytime by the marine mammal teams. A total of 11 vertical CTD profiles, 25 double oblique CTD with bongo hauls, 8 CTD with neuston net hauls, and 24 CTD with VPR hauls were conducted.

During August 4-15, 2009, the NEFSC conducted an aerial distribution survey and an experiment on the NOAA aircraft Twin Otter where sea turtles and coastal bottlenose dolphins were the target species, though all detected marine mammals were recorded. The plane flew at 600 feet altitude at about 110 knots. The study area was the mid-Atlantic coastal waters between New York (41° 30'N) and North Carolina (36° 30'N) and between the coast line and the 50 m depth contour (about 20-25 nmi offshore), where most of the effort was within 6 nmi of the shore line. The objective of the experiment was to determine the minimum sized turtle that can easily be detected during an aerial abundance survey at various distances from the track line. This was accomplished in Long Island Sound by setting out floating cut outs of pictures of various sized turtles at various distances from a track line that the plane flew over. During about 13 hours of experimental flights, it was determined that turtles that were greater than 40 cm diameter could easily be detected, though some animals smaller than this were detected. The objective of the abundance survey was to describe the spatial distribution of different sized turtles in Mid-Atlantic coastal waters in state versus federal waters using two independent teams of observers in the plane. In about 3400 nmi of track lines, from one team the following was detected: 336 loggerhead turtles (*Caretta caretta*), 61 green turtles (*Chelonia mydas*), 3 Kemp's Ridley turtles (*Lepidochelys kempii*), 7 leatherback turtles (*Dermochelys coriacea*), and 1376 bottlenose dolphins (*Tursiops truncatus)*.

The North Atlantic Right Whale Sighting Survey (NARWSS) is a NMFS program dedicated to identifying and documenting the locations of right whales off the northeastern United States. All NARWSS flights conducted in 2009 were systematic surveys and followed track lines within nine survey blocks: Cashes Ledge, Franklin Basin, Georges Basin, Georges Shoal, Great South Channel, Howell Swell, Jeffreys Ledge, Jordan Basin, and Stellwagen Bank. During 2009, 66 flights that involved 330 flight hours were conducted in these survey blocks. In addition, there was one directed flight to relocate a whale carcass. The total number of right whales seen on the aerial surveys (tally of estimated group size, not the number of unique individuals identified from photographs) was 584.

2.1.2 Opportunistic, platforms of opportunity

The following U.S. organizations responded to a request for information on their use of "platforms of opportunity" (especially commercial whale watching vessels) to collect cetacean data in 2009. This list represents the minimum use of such platforms.

NORTH ATLANTIC

Primary species studied	Other species*	US region	Data type**	Collected by	Platform type	Regional Archive***	Contact/Institution
Humpback whale Fin whale	CDGHI	NE	1,3,4,7	Naturalist, dedicated observer	Whale watch	Yes	Allied Whale, College of the Atlantic, ME
Humpback whale Fin whale	CDEFGHI	NE	1,3,4,7	Naturalist, dedicated observer	Whale watch	Yes	Blue Ocean Society, NH
Humpback whale	BCGH	NE	1,2,3,4,5,7	Interns	Whale watch	No	Cape Ann Whale Watch
Humpback whale Fin whale	CDGIKMOP	NE	1,3,4	Naturalist, trained volunteers	Whale watch,	Yes	Coastal Research & Education Society of Long Island, NJ

					fishing vessel		
Humpback whale Fin whale	CDFGHI	NE	1,2,3,4,5,7	Naturalist, dedicated observer	Whale watch	Yes	Dolphin Fleet, MA
Humpback whale	BCG	NE	1,3,4	Naturalist	Whale watch	No	New England Aquarium Whale Watch, MA
Humpback whale Fin whale	CDGHI	NE	1,3,4,7	Naturalist	Whale watch	Yes	New England Coastal Wildlife Alliance/Bridgewater State College, MA
Humpback whale Fin whale	CDFGHI	NE	1,2,3,4,5,6,7	Naturalist, dedicated observer	Whale watch, ferry	Yes	Whale Center of New England, MA
Humpback whale Fin whale	CDGHIO	NE	1,3,4,5,7	Naturalist, dedicated observer	Whale watch	Yes	Whale and Dolphin Conservation Society, MA

***Other species codes**: A) *Megaptera novaeangliae*, B) *Balaenoptera physalus*, C) *Balaenoptera acutorostra*, D) *Eubalaena glacialis*, E) *Balenoptera musculus*, F) *Balaenoptera borealis*, G) *Lagenorhynchus acutus*, H) *Phocoena phocoena*, I), *Globicephala melas*, J) *Ziphiidae* spp. K) *Physeter macrocephalus*, L) *Stenella longirostris*, M) *Tursiops truncatus*, N) *Stenella attenuata*, O) *Delphinus delphis*, P) *Grampus griseus*, R) unspecified odontocete species, S) Orcinus orca, T) *Stenella coeruleoalba,* U) *Globicephala macrorhynchus,* V) *Feresa attenuata*

****Data types**: 1) cetacean sighting data, 2) survey effort data (varied from general location to logged positions), 3) animal behavior, 4), photo-ID (for at least one listed species), 5) management-oriented data (fisheries interactions, ship strike, harassment), 6) scat/prey collection, 7) environmental data

*****Archives:** Data for one or more listed species were contributed to another archive or catalog. Responders reported contributing data to the following institutions: ALLIED WHALE, MINGAN ISLAND CETACEAN STUDY (CANADA), NORTH ATLANTIC RIGHT WHALE CONSORTIUM DATABASE, PROVINCETOWN CENTER FOR COASTAL STUDIES OR THE WHALE CENTER NEW ENGLAND.

2.2 Analyses/development of techniques
None.

3. MARKING DATA

3.1 Field work

3.1.1 Natural marking data2009

Species	Feature	Area/stock	No. photo-id'd	Catalogue (Y/N)	Catalogue total	Contact person/institute; refs
Humpback whale	Fluke	W.N. Atlantic	43	Y	NA	Richard Pace/NEFSC
North Atlantic right whale	callosities	W.N. Atlantic	99	Y	NA	Richard Pace/NEFSC

3.1.2. Artificial marking data
None.

3.1.3 Telemetry data
None.

3.2 Analyses/development of techniques
None.

4. TISSUE/BIOLOGICAL SAMPLES COLLECTED

4.1 Biopsy samples (summary only) 2009
NEFSC

Species	Area/stock	Calendar year/ season - no. collected	Archived (Y/N)	No. analysed	Total holdings	Contact person/institute

N. Atl, right whale	Western Atlantic	2009/37	Y	NA	NA	Richard Pace/NEFSC
Atlantic white-sided dolphin	N. Atlantic	2009/21	Y	NA	NA	Richard Pace/NEFSC
Pilot whale	N. Atlantic	2009/4	Y	NA	NA	Richard Pace/NEFSC
Spotted dolphin	N. Atlantic	2009/4	Y	NA	NA	Richard Pace/NEFSC
Bottlenose dolphin	offshore	2009/3	Y	NA	NA	Richard Pace/NEFSC

4.2 Samples from directed catches (commercial, aboriginal and scientific permits) or bycatches 2007
NEFSC

Species	Area/stock	Tissue type(s)	No. collected	Archived (Y/N)	No. analysed	Contact person/institute
Harbor porpoise	N. Atlantic	Skin	14	Y	unk	Fred Wenzel/NEFSC
Harbor porpoise	N. Atlantic	Head	2	Y	unk	Fred Wenzel/NEFSC
Harbor porpoise	N. Atlantic	Whole	8	Y	unk	Fred Wenzel/NEFSC
Harbor porpoise	N. Atlantic	Blubber	3	Y	unk	Fred Wenzel/NEFSC
Common dolphin	N. Atlantic	Skin	3	Y	unk	Fred Wenzel/NEFSC
Common dolphin	N. Atlantic	Head	1	Y	unk	Fred Wenzel/NEFSC
Pilot whale spp.	N. Atlantic	Skin	2	Y	unk	Fred Wenzel/NEFSC
Atlantic white-sided dolphin	N. Atlantic	Muscle	1	Y	unk	Fred Wenzel/NEFSC
Atlantic white-sided dolphin	N. Atlantic	Skin	5	Y	unk	Fred Wenzel/NEFSC
Atlantic white-sided dolphin	N. Atlantic	Blubber	5	Y	unk	Fred Wenzel/NEFSC
Atlantic white-sided dolphin	N. Atlantic	Whole	2	Y	unk	Fred Wenzel/NEFSC
Atlantic white-sided dolphin	N. Atlantic	Head	1	Y	unk	Fred Wenzel/NEFSC

4.3 Samples from stranded animals 2009
NEFSC

species	Area/stock	Tissue type(s)[b]	No. collected	Archived (Y/N)	No. analysed[c]	Contact person/institute
Atlantic white-sided dolphin	N. Atlantic		55	Y	NA	Mendy Garron, NER Stranding Network
Bottlenose dolphin	N. Atlantic		188	Y	NA	Mendy Garron, NER Stranding Network
Fin whale	N. Atlantic		26	Y	NA	Mendy Garron, NER Stranding Network
Gervais beaked whale	N. Atlantic		4	Y	NA	Mendy Garron, NER Stranding Network
Harbor porpoise	N. Atlantic		51	Y	NA	Mendy Garron, NER Stranding Network
Humpback whale	N. Atlantic		11	Y	NA	Mendy Garron, NER Stranding Network
Long-finned pilot whale	N. Atlantic		37	Y	NA	Mendy Garron, NER Stranding Network
Minke whale	N. Atlantic		1	Y	NA	Mendy Garron, NER Stranding Network
North Atlantic right whale	N. Atlantic		2	Y	NA	Mendy Garron, NER Stranding Network
Pygmy sperm whale	N. Atlantic		10	Y	NA	Mendy Garron, NER Stranding Network
Risso's dolphin	N. Atlantic		8	Y	NA	Mendy Garron, NER Stranding Network

Common dolphin	N. Atlantic		198	Y	NA	Mendy Garron, NER Stranding Network
Sowerby's beaked whale	N. Atlantic		7	Y	NA	Mendy Garron, NER Stranding Network
Striped dolphin	N. Atlantic		9	Y	NA	Mendy Garron, NER Stranding Network
Unidentified cetacean	N. Atlantic		1	Y	NA	Mendy Garron, NER Stranding Network
Unidentified whale	N. Atlantic		1	Y	NA	Mendy Garron, NER Stranding Network

a. Data are entered as represented by the NOAA Fisheries NER Stranding Network and have not been formally reviewed by NOAA Fisheries.

b. Samples include some or all of the following: hard parts (i.e. teeth, jaw, skull, baleen, entire skeleton, etc) and/or soft parts (i.e. skin, gonads, muscle, blubber, blood, organs, etc).

c. Samples are sent to various educational and scientific collections and number analyzed is unknown.

4.4 Analyses/development of techniques
None.

5. POLLUTION STUDIES 2009
None.

6. STATISTICS FOR LARGE CETACEANS

6.1 Corrections to earlier years' statistics for large whales
None.

6.2 Direct catches of large whales (commercial, aboriginal and scientific permits) for the calendar year 2009
None.

6.3 Anthropogenic mortality of large whales for the calendar year 2007

6.3.1 Observed or reported ship strikes of large whales (including non-fatal events)
NEFSC

Whale species	Sex	No.	Date	Location	Vessel type	Speed	Fate	How observed	Contact person/ institute and refs
Humpback whale	F	1	10/5/07	Off Wachapreague, VA	U	U	D	DA	Tim Cole/NEFSC/NEFSC Ref. Doc. 09-04
Humpback whale	M	1	13/5/07	Rockport, MA	U	U	D	DA	Tim Cole/NEFSC/NEFSC Ref. Doc. 09-04
Humpback whale	F	1	24/6/07	Stellwagen Bank	U	U	D	DA	Tim Cole/NEFSC/NEFSC Ref. Doc. 09-04
Fin whale	F	1	25/3/07	Norfolk Harbor, VA	U	U	D	DA	Tim Cole/NEFSC/NEFSC Ref. Doc. 09-04
Fin whale	M	1	24/5/07	Newark Bay, NJ	U	U	D	DA	Tim Cole/NEFSC/NEFSC Ref. Doc. 09-04
Sei whale	F	1	30/5/07	Off Deer Island, MA	U	U	D	DA	Tim Cole/NEFSC/NEFSC Ref. Doc. 09-04

6.3.2 Fishery bycatch of large whales
NEFSC

Whale species	Sex	No.	Date	Location	Fate	Targeted fish species	Gear	How observed?	Source or contact
N. Alt. right whale	M	1	31/3/07	Outer Banks, NC	D	U	U	DA	Tim Cole/NEFSC/ NEFSC Ref. Doc. 09-04
Humpback whale	U	1	27/1/07	Off Haven Beach, NJ	I	U	U	DA	Tim Cole/NEFSC/ NEFSC Ref. Doc. 09-04
Humpback whale	M	1	23/6/07	Wildcat Knoll	I	U	U	DA	Tim Cole/NEFSC/ NEFSC Ref. Doc. 09-04
Humpback whale	M	1	21/12/07	Ocean Sands, NC	D	U	GN?	DA	Tim Cole/NEFSC/ NEFSC Ref. Doc. 09-04
Fin whale	U	1	25/6/07	Great South Channel	I	U	U	DA	Tim Cole/NEFSC/ NEFSC Ref. Doc. 09-04
Fin whale	U	1	11/8/07	Cabot Strait, Nova Scotia	D	U	U	DA	Tim Cole/NEFSC/ NEFSC Ref. Doc. 09-04
Fin whale	M	1	26/9/07	Off Martha's Vineyard, MA	D	U	U	DA	Tim Cole/NEFSC/ NEFSC Ref. Doc. 09-04
Minke whale	U	1	16/7/07	Trescott, ME	I	U	U	DA	Tim Cole/NEFSC/ NEFSC Ref. Doc. 09-04
Minke whale	F	1	5/8/07	Cape Cod Bay, MA	D	U	U	DA	Tim Cole/NEFSC/ NEFSC Ref. Doc. 09-04

7. STATISTICS FOR SMALL CETACEANS

7.1 Corrections to earlier years' statistics for small cetaceans
None.

7.2 Direct catches of small cetaceans for the calendar year 2008
None.

7.3 Anthropogenic mortality of small cetaceans for the calendar year 2007

7.3.1 Observed or reported ship strikes of small cetaceans (including non fatal events)

NEFSC

Species	Sex	No.	Date	Location	Vessel type	Speed	Fate	How observed	Contact person/ institute and refs
Harbor porpoise	U	1	24/4/07	Sandy Hook Bay, NJ	U	U	D*	stranding	Mendy Garron, NER Stranding Network
*Propeller cuts appear to have been made post-mortem									

7.3.2 Fishery bycatch of small cetaceans

NEFSC

Species	Ratio of male to female (if known)	No.	No. extrapolated to fleet total (point estimate)	Range, CI or CV	Date of bycatch	Location (description or lat/long)	FAO statistical area (if known)	FAO area	Fate	Targeted species	Gear	How observed?	Source or contact
Harbour porpoise	U	35	395	0.37	2007	NE US	U	21	D		GNS	F	Amy VanAtten/NEFSC
Harbour porpoise	U	1	58	1.03	2007	Mid-Atlantic US	U	21	D		GN	F	Amy VanAtten/NEFSC
Common dolphin	U	1	11	1.08	2007	NE US	U	21	D		GNS	F	Amy VanAtten/NEFSC
Common dolphin	U	1	3.2	0.70	2007	Mid-Atlantic US	U	21	D		GN	F	Amy VanAtten/NEFSC
Common dolphin	U	3	24	0.28	2007	NE US	U	21	D		TBB	F	Amy VanAtten/NEFSC
Common dolphin	U	0	66	0.27	2007	Mid-Atlantic US	U	21	D		TBB	F	Amy VanAtten/NEFSC
White-sided dolphin	U	1	147	0.35	2007	NE US	U	21	D		TBB	F	Amy VanAtten/NEFSC
White-sided dolphin	U	1	12	0.98	2007	Mid-Atlantic US	U	21	D		TM	F	Amy VanAtten/NEFSC
White-sided dolphin	U	2	21	0.24	2007	Mid-Atlantic US	U	21	D		TBB	F	Amy VanAtten/NEFSC
Pilot-whale	U	0	36	0.38	2007	Mid-Atlantic US	U	21	D		TBB	F	Amy VanAtten/NEFSC
Pilot-whale	U	4	12	0.35	2007	NE US	U	21	D		TBB	F	Amy VanAtten/NEFSC
Pilot-whale	U	0	57	0.65	2007	Mid-Atlantic US	U	21	D		LL	F	Amy VanAtten/NEFSC
Comments:													

8. STRANDINGS 2008

NEFSC

The United States Northeast Regional Stranding network consists of local and regional responders who live and operate from Maine to North Carolina. A NMFS letter of agreement permits these individuals and organizations to approach, handle, and collect stranded, sick, dead, injured and alive marine mammals from both offshore and onshore waters on a year round basis. These permitted individuals and organizations submit a Level A response letter in a timely manner. This Level A report informs NMFS to the level of response, number of animals, number of species involved and collectively assists NMFS in determining any unusual marine mammal mortality events.

Species	No. strandings	No. post mortems	Contact person(s)/ Institute(s)	Contact email address(es)

ATLANTIC WHITE-SIDED DOLPHIN	38	18	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
BOTTLENOSE DOLPHIN	93	70	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
CUVIERS BEAKED WHALE	1	1	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
DWARF SPERM WHALE	2	1	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
FIN WHALE	3	3	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
GERVAIS' BEAKED WHALE	1	1	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
HARBOR PORPOISE	52	17	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
HUMPBACK WHALE	13	3	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
LONG-FINNED PILOT WHALE	7	5	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
MELON-HEADED WHALE	2	2	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
MINKE WHALE	6	1	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
PYGMY SPERM WHALE	3	2	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
RISSO'S DOLPHIN	10	7	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
STRIPED DOLPHIN	10	6	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
UNIDENTIFIED BALEEN WHALE	1	0	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
UNIDENTIFIED CETACEAN	3	0	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
UNIDENTIFIED DELPHINID	3	0	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
UNIDENTIFIED DOLPHIN	1	0	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
UNIDENTIFIED MARINE ANIMAL	3	0	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
UNIDENTIFIED RORQUAL WHALE	1	0	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
UNIDENTIFIED WHALE	4	0	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov
WHITE-BEAKED DOLPHIN	2	2	Mendy Garron, NER Stranding Network	Mendy.Garron@noaa.gov

9. OTHER STUDIES AND ANALYSES 2009

NEFSC

From 2007 to this date and continuing throughout June 2010 NEFSC was involved in an ocean noise project in the Stellwagen Bank National Marine Sanctuary. This project aims to characterize the underwater acoustic environment of the sanctuary and further examine the effects of noise on resident marine animals. The work is carried out in collaboration with NOAA Sanctuaries, Cornell University and Marine Acoustics Inc. Marine autonomous recording units (MARUs) have been deployed in the sanctuary to record low-frequency underwater sound. Information regarding the distribution of anthropogenic and natural sources of underwater noise (including vocally-active whales and fish) and information from ongoing whale tagging efforts are being used to better understand whether and how animals change their behaviors in noisy environments. Parts of this work have recently been published in a Theme Section in Marine Ecology Progress Series (http://www.int-res.com/abstracts/meps/v395/).

Another passive acoustics project initiated in 2008 at the NEFSC is aimed at validating passive acoustic

techniques. This project is in collaboration with the Massachusetts Division of Marine Fisheries and Cornell University. The objective of the program is to understand the acoustic ecology of the marine animal species in the NE region and how animals use sound over different time and regional scales, seasons, individual, sex and behavioral contexts. Aerial and visual survey data are being used to validate and confirm acoustic events, as well as to model and predict call patterns and usage. This information will then be integrated into available sensor capacities including fixed and mobile acoustic sensors which report either in an archival or real time fashion. The last step will allow us to improve management and monitoring sampling regimes so as to utilize passive acoustics to its best capacity.

Other ongoing work includes the deployment of a towed hydrophone system during marine mammal abundance cruises. High-frequency and mid-frequency acoustic data are being collected in order to detect, identify and track groups of marine mammals. Results will be compared to visual data and help in assessments of marine mammal abundance.

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USA – PACIFIC WATERS

1. SPECIES AND STOCKS STUDIED

IWC common name	IWC recommended scientific name	Area/stock(s)	Items referred to
Antarctic minke whale	*Balaenoptera bonarensis*	Antarctic waters	4.1
Beluga whale	*Delphinapterus leucas*	Cook Inlet stock	2.1.1
Blainville's beaked whale	*Mesoplodon densirostris*	Hawaii, Bahamas	2.1, 3.1.1, 3.1.3, 4.1, 5, 9
Blue whale	*Balaenoptera musculus*	Eastern North Pacific	3.1.3, 4.1, 5, 6.3.1, 9
Bottlenose dolphin	*Tursiops truncatus*	Eastern North Pacific, Hawaii, Bahamas	2.1, 3.1.1, 3.1.3, 4.1, 5, 9
Bowhead whale	*Balaena mysticetus*	Bering-Chukchi-Beaufort Stock	2.1.1, 3.1.1, 3.1.3, 4.4
Cuvier's beaked whale	*Ziphius cavirostris*	Hawaii, Eastern North Pacific, Bahamas	3.1.3, 5, 4.1, 9
Dall's Porpoise	*Phocoenoides dalli*	Gulf of Alaska	2.1.1
Dwarf sperm whale	*Kogia sima*	Hawaii	2.1
False killer whale	*Pseudorca crassidens*	Hawaii, High Seas	2.1, 3.1.1, 3.1.3, 4.1, 5, 9
Fin whale	*Balaenoptera physalus*	Eastern North Pacific, Gulf of Alaska	2.1.1, 2.2, 3.1.1, 3.1.3, 4.1, 4.3, 9
Gray whale	*Eschrictius robustus*	Eastern North Pacific	2.1.1, 2.2, 3.1.3, 4.1, 4.3, 6.3.1,
Harbor porpoise	*Phocoena phocoena*	Eastern North Pacific, Gulf of Alaska	2.1.1, 4.3, 5, 7.3.2
Humpback whale	*Megaptera novaeangliae*	Eastern North Pacific, Gulf of Alaska/SE Bering Sea, Antarctic	2.1.1, 2.2, 3.1.3, 4.1, 5, 6.3.1, 9
Irrawaddy dolphin	*Orcaella brevirostris*	Cambodia	5
Killer whale	*Orcinus orca*	Eastern North Pacific (California Current), Gulf of Alaska	2.1.1, 2.2, 3.1.1, 3.1.3, 4.1, 4.3, 4.4, 6.3.2, 5, 9
Killer whale	*Orcinus orca*	Antarctic waters	2.1.1; 3.1.1; 3.1.3
Long-beaked common dolphin	*Delphinus capensis*	Eastern North Pacific	2.1.1; 4.1 ; 4.3; 8
Melon headed whale	*Peponocephala electra*	Hawaii, Guam, Bahamas	2.1, 3.1.1, 3.1.3, 4.1, 9
Mesoplodon beaked whale	*Mesoplodon sp.*	High Seas	2.1
Minke whale	*Balaenoptera acutorostrata*	Eastern North Pacific, Gulf of Alaska	2.1.1. 3.1.3, 4.1, 5, 9
North Pacific right whale	*Eubalaena japonica*	Southeast Bering Sea	2.1.1, 2.2, 3.1, 3.1.3, 4.1
Northern right whale dolphin	*Lissodelphis borealis*	Eastern North Pacific	4.1; 4.2; 7.3.2; 8
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	Gulf of Alaska, Eastern North Pacific	2.1.1, 4.1; 4.2; 4.3; 7.3.2; 8
Pilot whale	*Globicephala macrorhynchus*	Hawaii, Bahamas	2.1, 3.1.1, 3.1.3, 4.1, 8, 9
Pygmy killer whale	*Feresa attenuata*	Hawaii	3.1.3, 5, 9
Risso's dolphin	*Grampus griesius*	Eastern North Pacific	3.1.3, 4.1, 8, 9
Rough-toothed dolphin	*Steno bredanensis*	Hawaii	2.1, 3.1.1
Sei whale	*Balaenoptera borealis*	Hawaii, High Seas, Wake	2.1, 3.1.1, 4.1
Short-beaked common dolphin	*Delphinus delphis*	Eastern North Pacific	4.1; 4.2; 4.3; 7.3.2; 8
Sperm whale	*Physeter macrocephalus*	Eastern North Pacific, Hawaii, High Seas, Guam, CNMI, Gulf of Alaska, Bahamas	2.1, 3.1.1, 3.1.3, 4.1, 5, 6.3.2, 9
Spinner dolphin	*Stenella longirostris*	Hawaii, Guam, CNMI	2.1, 3.1.1, 4.1
Spotted dolphin	*Stenella attenuata*	Hawaii, Guam, CNMI, Eastern North Pacific	2.1, 3.1.1, 4.1
Striped dolphin	*Stenella coeruleoalba*	Hawaii, High Seas	2.1, 4.1, 4.3
Unidentified dolphin		Eastern North Pacific	4.3
White whale	*Delphinapterus leucas*	Eastern North Pacific	5

2. SIGHTINGS DATA

2.1 Field work

2.1.1 Systematic

AFSC

Gray Whales off the Washington Coast

From 22 January to 4 November 2009 vessel surveys for gray whales were conducted along the northern Washington coast and western Strait of Juan de Fuca. The surveys covered 810 nautical miles and represented 61 hours of survey effort. During these surveys, 126 gray whales were sighted and around 109 were photographed for identification. Sixty-four gray whales were sighted along the northern Washington coast and 62 whales were sighted in the western Strait of Juan de Fuca.

Gray Whales off the Oregon Coast

Two surveys were conducted off the Oregon coast on 30 July and 15 September 2009 from the Rogue River jetty to Cape Blanco. The surveys covered 110 nautical miles and required seven hours of survey effort. Two gray whales were sighted and photographed on 30 July; no whales were sighted on 15 September.

Gray Whales off the Northern California Coast

One survey was made on 29 July from Crescent City to Northwest Seal Rock. The survey took three hours and covered 20 nautical miles. Three gray whales were sighted and photographed for future identification. (Contact: M. Gosho, AFSC)

Aerial Surveys of Beluga Whales in Cook Inlet, Alaska, June and August 2009

The National Marine Fisheries Service (NMFS) conducted surveys of the beluga population in Cook Inlet, Alaska, 2-9 June 2009 (39.4 hr) and 11-13 August 2009 (19 hr). The aerial surveys were flown at 244 m altitude and 185 km/hr, consistent with NMFS' surveys of Cook Inlet conducted each year since 1993. As in most years an AeroCommander 680 aircraft was used. The study in June 2009 included one or more surveys of coastal areas (flown 1.4 km offshore) around most of the Inlet and 1,074 km of transects across the inlet, effectively searching 28% of Cook Inlet and 100% of the coastline. Paired, independent observers searched on the coastal side of the plane where virtually all beluga sightings occur, while a single observer and computer operator/data recorder searched on the offshore side of the plane. After finding belugas, multiple passes were made with paired observers counting each beluga group independently for at least four good quality passes. Daily median counts made on seven different days ranged from 116 to 290 belugas in the Susitna delta (between the Beluga and Little Susitna rivers), and 13 to 40 belugas in Chickaloon Bay. Belugas were not observed in lower Cook Inlet, which is typical of annual surveys in recent years. In June 2009, the highest daily median estimate, used here as an index for relative abundance (not corrected for effort nor for estimates of missed whales), was 303 belugas. This is within the range of index counts from previous survey years (305 belugas in 1993, 281 in 1994, 324 in 1995, 307 in 1996, and 264 in 1997, 193 in 1998, 217 in 1999, 184 in 2000, 211 in 2001, 192 in 2002, 174 in 2003, 187 in 2004, 192 in 2005, 153 in 2006, 224 in 2007, and 126 in 2008). (K. Shelden, NMFS/AFSC/NMML)

The study in August 2009 continued the time series of upper inlet age structure studies started in 2005. Surveys covered coastal areas (survey track 1.4 km offshore) and some offshore waters north of Moose Point and the Native Village of Tyonek. The intent of the surveys was to obtain high-resolution video of each beluga group to determine age structure (white relative to gray individuals and dark gray calves) and number of calves. (K. Shelden, NMFS/AFSC/NMML)

Target species	Date	Area	No. of sightings	Contact person/institute and references
Beluga	6/2/2009 to 6/9/2009 and 8/11/2009 to 8/13/2009	Cook Inlet	303 and 212 (median counts)	Kim Shelden/NMML, NMFS, NOAA

Chukchi Offshore Monitoring in Drilling Area (COMIDA) Aerial Surveys

COMIDA is a project conducted by NMML and funded by Minerals Management Service (MMS). The surveys are designed to document marine mammal distribution during the open-water (ice-free) months (mid-June to early November). The surveys take place in the northeastern Chukchi Sea, specifically in the Chukchi Sea Planning Area (CSPA), from the coast out to 169° W, and 68° N to 72° N. The goal of COMIDA is to augment scientific knowledge about the distribution and abundance of marine mammals in the CSPA. Emphasis is placed on the open-water months when various species are making seasonal migrations through the CSPA and when industrial activities are more likely to occur. Surveys are flown in a Twin Otter at a target altitude of 366 m. The intent of this research is to develop information that will facilitate mitigation related to oil and gas development. (Megan Ferguson, NMFS/AFSC/NMML)

Target species	Date	Area	No. of sightings	Contact person/institute and references

Bowhead	6/24/2009 to 10/29/2009	NE Chukchi Sea	52	Megan Ferguson/NMML, NMFS, NOAA

Bowhead Whale Aerial Survey Project (BWASP)
In 2007, NMML received funds from MMS to begin overseeing the BWASP, a survey which has been conducted for approximately 30 years. This study involves north-south transects in survey blocks across the US Beaufort Sea from 157° W to 140° W and from the coast to 72° N. Objectives include monitoring temporal and spatial trends in distribution, abundance, habitat and behaviors of endangered whales, including long term trends and inter-year differences, particularly in relation to offshore oil and gas exploration and production areas. The survey is designed to overlap with the expected migration of bowheads through the Western Beaufort Sea, generally occurring in September and the first half of October. Surveys are flown in a Twin Otter at a target altitude of 458 m. (Megan Ferguson, NMFS/AFSC/NMML)

Target species	Date	Area	No. of sightings	Contact person/institute and references
Bowhead	8/31/2009 to 10/20/2009	Beaufort Sea	78	Megan Ferguson/NMML, NMFS, NOAA

Bowhead Whale Feeding Ecology Study (BOWFEST)
MMS provided NMML funds to conduct a feeding ecology of bowhead whales (BOWFEST) near Barrow, AK. The study is in some ways a continuation with NSF-funded ecology studies in the same area in 2005-2006, and it is currently scheduled to conduct field studies from 2007 to 2011. The program includes oceanography (via Woods Hole Oceanographic Inst. [WHOI], Univ. of Alaska Fairbanks [UAF], and the Univ. of Rhode Island [URI]), tagging (WHOI), aerial surveys for whale distribution (NMML and NOAA's Aircraft Operation Center), aerial photography (NMML) and photogrammetric measurements (LGL), acoustics (NMML, Univ. of Washington, and Oregon State Univ.), boat-based surveys (North Slope Borough Dept of Wildlife Management [NSB]), and examination of stomach samples from whales taken in the subsistent hunt (NSB). Bowhead whales were documented feeding and migrating through the study area northeast of Barrow (between 152°W and 157° W and from the coast north to 72° N). (David Rugh and Julie Mocklin, NMFS/AFSC/NMML)

Target species	Date	Area	No. of sightings	Contact person/institute and references
Bowhead	8/29/2009 to 9/18/2009	NE of Barrow, AK	25	David Rugh or Julie Mocklin/NMML, NMFS, NOAA

North Pacific Right Whale Bering Sea Project
As part of an inter-agency agreement between the National Marine Mammal Laboratory and the Minerals Management Service, a vessel and an aerial survey of the North Aleutian Basin and southeastern Bering Sea were conducted from 15 July to 30 August and 08 July to 30 August 2009, respectively. The primary objectives of this project was to document the occurrence and distribution of North Pacific right whales in the region, and to photo-identify, biopsy-sample and satellite-tag right whales as well as humpback and fin whales. Standard line-transect methods were used together with passive acoustic monitoring using DIFAR sonobuoys. During this study, four satellite tags were deployed (right whales (3) and humpback whales (1)), one suction cup tag was deployed for the foraging ecology component of the study, seven right whales and 55 humpback whales were photo-identified, and biopsy samples were collected from five fin whales and three right whales.

Migratory routes and wintering destinations have not yet been established for the North Pacific right whale. Fieldwork is planned for 2010 (Contact: P. Clapham, AFSC).

Target species	Date	Area	No. of sightings	Contact person/institute and references
Fin Whale	7/8-8/30/09	Southeastern Bering Sea	191	A. S. Kennedy (AFSC/NMML)
Humpback Whale	7/8-8/30/09	Southeastern Bering Sea	56	A. S. Kennedy (AFSC/NMML)
North Pacific Right Whale	7/8-8/30/09	Southeastern Bering Sea	47	A. S. Kennedy (AFSC/NMML)

Gulf of Alaska Line Transect Survey
The United States Navy maintains a maritime training area in the central GoA, east of Kodiak Island, and has requested additional information on marine mammal presence and use of this area. To determine the occurrence and distribution of marine mammals in and around the Navy training area, a line-transect visual and acoustic survey was conducted 10-20 April 2009 from the NOAA R/V *Oscar Dyson*. The primary survey area

encompassed nearshore, shelf and offshore pelagic waters of the central GoA. Survey lines were designed to provide equal coverage of the nearshore and offshore habitat.

During this project, the visual survey covered a total of 760 km (410 nm) on effort while transit and fog effort legs accounted for 553 km (298 nm). There were a total of 96 sightings (453 individuals) of 11 confirmed marine mammal species. Passive acoustic operations were conducted 24 hours/day surveying a total of 3,519 km (1,900 nm) and recorded 49 acoustic detections of sperm whales and killer whales. Photographs of nineteen individual killer whales and four fin whales were obtained on this cruise and compared to existing catalogs.

Density and abundance estimates were calculated for fin and humpback whales by stratum using several models. All results were fairly similar given the constraints of the sample sizes involved. Additional sightings from a previous cruise on a comparable vessel were used for calculating the sighting detection function (distances at which whales were sighted from the transect line). Estimates of abundance in the inshore and offshore strata were 594 (CV=0.29) and 889 (CV=0.57) for fin whales and 219 (CV=0.57) and 56 (CV=0.57) for humpback whales, respectively. A small proportion of large whales were not identified to species but were most likely fin or humpback whales and estimates of these unidentified whales could be assigned to these species based on the proportion of fin and humpback whales identified in each stratum. This raised fin whale estimates of abundance to 666 and 938 (inshore and offshore strata, respectively) and humpback whale estimates to 265 and 63 (inshore and offshore strata).

Target species	Date	Area	No. of sightings	Contact person/institute and references
Minke Whale	4/10-4/20/09	Gulf of Alaska	2	B.K. Rone (AFSC/NMML)
Fin Whale	4/10-4/20/09	Gulf of Alaska	24	B.K. Rone (AFSC/NMML)
Humpback Whale	4/10-4/20/09	Gulf of Alaska	11	B.K. Rone (AFSC/NMML)
Killer Whale	4/10-4/20/09	Gulf of Alaska	6	B.K. Rone (AFSC/NMML)
Harbor Porpoise	4/10-4/20/09	Gulf of Alaska	30	B.K. Rone (AFSC/NMML)
Dall's Porpoise	4/10-4/20/09	Gulf of Alaska	10	B.K. Rone (AFSC/NMML)
Gray Whale	4/10-4/20/09	Gulf of Alaska	3	B.K. Rone (AFSC/NMML)
Pacific white-sided dolphin	4/10-4/20/09	Gulf of Alaska	1	B.K. Rone (AFSC/NMML)

NWFSC

Target species	Date	Area	No. of sightings	Contact person/institute and references
Southern Resident killer whale	23/3/09-8/4/09	West Coast US/Canada	2	Brad Hanson, NWFSC

PIFSC

NEARSHORE CETACEAN SURVEYS – OAHU WEST COAST 2-17 OCTOBER 2009

Small boat surveys were conducted within the nearshore waters of Oahu, off the western and southern coastlines. The objectives included 1) collect photographic and biopsy data on all cetacean species encountered and 2) satellite tag false killer whales (*Pseudorca crassidens*) to look at movements within the Hawaiian Islands.

NOAA RESEARCH VESSEL OSCAR ELTON SETTE- CETACEAN SURVEY, TRANSIT FROM OAHU TO GUAM VIA WAKE 21 JANUARY TO 5 FEBRUARY 2010 (SE 10-01)

Standard line-transect visual and acoustic surveys were conducted within the Hawaiian, Wake, and Guam EEZ waters, as well as high seas waters during a transit from Honolulu, Hawaii to Guam. The objectives included 1) collect photographic and biopsy data on all cetacean species encountered, 2) collect acoustic data continuously during daylight and night time hours, 3) collect oceanographic data (CTD & XBT), 4) collect fisheries acoustic backscatter data.

NEARSHORE CETACEAN SURVEYS – GUAM AND SAIPAN 10 FEBRUARY TO 3 MARCH 2010

Small boat surveys were conducted within the nearshore waters of Guam and Saipan. The objectives were to collect photographic and biopsy data on all cetacean species encountered.

NOAA RESEARCH VESSEL OSCAR ELTON SETTE- CETACEAN SURVEY, TRANSIT FROM GUAM TO OAHU VIA WAKE 19 APRIL TO 4 MAY 2010 (SE 10-04)

Standard line-transect visual and acoustic surveys were conducted within the Hawaiian, Wake, and Guam EEZ waters, as well as high seas waters during a transit from Honolulu, Hawaii to Guam. The objectives included 1)

collect photographic and biopsy data on all cetacean species encountered, 2) collect acoustic data continuously during daylight and night time hours, 3) collect oceanographic data (CTD & XBT), 4) collect fisheries acoustic backscatter data.

Target species	Date	Area	Methods/effort	Parameters/ factors measured	Contact person/institute; refs
Striped dolphin	10/6/2009; 1/25/2010	Hawaii; High Seas	Small-boat survey; Line transect survey	Distribution; sighting frequency	E. Oleson/PIFSC; SE 10-01
Spinner dolphin	2-17/10/2009; 2/10-3/3/2010	Hawaii; Guam; CNMI	Small-boat survey	Distribution; sighting frequency	E. Oleson/PIFSC
Pantropical spotted dolphin	2-17/10/2009 4/19/2010	Hawaii Guam	Small-boat survey Line transect survey	Distribution; sighting frequency	E. Oleson/PIFSC; SE 10-04
Bottlenose dolphin	2-17/10/2009	Hawaii	Small-boat survey	Distribution; sighting frequency	E. Oleson/PIFSC
Rough-toothed dolphin	2-17/10/2009	Hawaii	Small-boat survey	Distribution; sighting frequency	E. Oleson/PIFSC
False killer whale	2-17/10/2009; 2/3/2010; 4/28/2010	Hawaii; High Seas	Small-boat survey; Satellite tagging; Line transect survey	Movements; Distribution; sighting frequency	E. Oleson/PIFSC; SE 10-01; SE 10-04
Short-finned pilot whale	2-17/10/2009	Hawaii	Small-boat survey	Distribution; sighting frequency	E. Oleson/PIFSC
Melon-headed whale	2-17/10/2009; 2/5/2010	Hawaii; Guam	Small-boat survey; Line transect survey	Distribution; sighting frequency	E. Oleson/PIFSC; SE 10-01
Blainville's beaked whale	2-17/10/2009	Hawaii	Small-boat survey	Distribution; sighting frequency	E. Oleson/PIFSC
Mesoplodon beaked whale	2/3/2010	High Seas	Line transect survey	Distribution; sighting frequency	E. Oleson/PIFSC; SE 10-01
Dwarf sperm whale	10/7/2010	Hawaii	Small-boat survey	Distribution; sighting frequency	E. Oleson/PIFSC
Sperm whale	1/21/2010; 2/01/2010; 2/18;/2010; 2/25/2010	Hawaii; High Seas; Guam; CNMI	Line transect survey; Small boat survey	Distribution; sighting frequency	E. Oleson/PIFSC; SE 10-01
Sei whale	1/30/2010; 2/2/2010	HighSeas; Wake	Line transect survey	Distribution; sighting frequency	E. Oleson/PIFSC; SE 10-01

SWFSC

Ecosystem Survey of *Delphinus* Species- The Southwest Fisheries Science Center (SWFSC) completed the Ecosystem Survey of Delphinus species off central and southern California, USA and Baja California, Mexico in December 2009. The objectives for the three-month survey were to better assess the status of the two species of common dolphins that occur in this area, enabling the SWFSC Protected Resources Division (PRD) to better meet the mandates of the Marine Mammal Protection Act. The data collected on the cruise, including 3.3k nmi of line transect effort and 1,458 biopsy samples, will allow us to resolve stock structure and to estimate abundance and reproductive rates for long- and short-beaked common dolphins in the Southern California Bight and off Baja California, Mexico.

California Coastal Tursiops Project- The goal of this project is to measure baseline level of contaminants (persistent organic pollutants and mercury) and then analyze the relationship between the levels of these contaminants and the likelihood of reproductive success. Researchers from SWFSC approach groups of coastal bottlenose dolphins for biopsy sampling from a small boat platform. The area covered for this study ranges from Encinitas, CA down to San Diego, CA.

Target species	Date	Area	No. of sightings	Contact person/institute and references
Long-beaked common dolphin	9/7-12/6 2009	California Current, Eastern North Pacific	911	S. J. Chivers (SWFSC)

Antarctic killer whale project – This ongoing project is assessing the ecosystem role of killer whales in the Antarctic and Southern Ocean. In January / February 2009, Researchers from SWFSC accompanied a film crew

from the BBC Natural History unit, and used a 65ft sailboat as a platform to deploy satellite tags, take identification photographs and collect biopsy samples from killer whales and their cetacean prey.

Target species	Date	Area	No. of sightings	Contact person/institute and references
Killer whale	1/08-2/05 2009	Antarctic Peninsula	23	J. Durban, R. Pitman (SWFSC)
Gray whale	March 2009	Off Vancouver	1	J. Durban, R. Pitman (SWFSC)

Eastern North Pacific gray whale tagging – In March 2009, SWFSC undertook a collaborative project with the Canadian Department of Fisheries and Oceans and the Vancouver Aquarium Marine Science Center to deploy satellite tags on migrating gray whales. One tag was deployed during this pilot study, which used small boat platforms to located gray whales off the west coast of Vancouver Island.

Bahamas odontocete tagging – SWFSC scientists partnered with the Bahamas Marine Mammal Research Organization to deploy satellite tags on odontocete cetaceans in the Bahamas. This project specifically aimed to monitor the movements of odontocetes relative to sonar exercises at the US Navy's Atlantic Test and Evaluation Center (AUTEC). Tags were deployed from small boat platforms during May and November 2009.

2.1.2 Opportunistic, platforms of opportunity

The following U.S. organizations responded to a request for information on their use of platforms of opportunity" (especially commercial whale watching vessels) to collect cetacean data in 2009. This list represents the minimum use of such platforms.

NORTH PACIFIC							
Primary species studied	**Other species***	**US region**	**Data type****	**Collected by**	**Platform type**	**Regional Archive*****	**Institution**
Gray whale	AB	SW	1,2,3,4	Naturalist	Whale watch	Planned	Birch Aquarium/Scripps Inst. Of Oceanography
Gray whale Humpback whale Blue whale	BCFHMOPQSZ	SW	1,2,3,4,5	Naturalist, dedicated observer	Whale watch	Yes	Channel Island National Marine Sanctuary Naturalist Corps, CA
Humpback whale		HI	1,2,3,4	Naturalist, videographer	Whale watch	No	Maui-Molokai Sea Cruises
Humpback whale Blue whale		SW	1,4	Naturalist, dedicated observer	Whale watch	Yes	Monterey Bay Whale Watch, CA****
Humpback whale Blue whale		SW	1,4	Naturalist, dedicated observer	Whale watch	Yes	Oceanic Society, CA****
Gray whale Blue whale	ABCMOPZ	SW	1,4	Naturalist, captain	Whale watch	No	Pacific Naturalists, CA
Humpback whale	LMNY	HI	1,2,3,4	Captain, Naturalist	Whale watch	No	Pacific Whale Foundation, HI
Sperm whale	ABCSW	NW	1,4,5	Captain, crew	Fishing vessels, Boaters	Yes	Univ. of Alaska SE, AK
Killer whale	ACHRW	NW	1,3,4	Naturalist, captain, crew	Whale watch, Boaters	Yes	The Whale Museum, WA

***Other species**: A) *Megaptera novaeangliae*, B) *Balaenoptera physalus*, C) *Balaenoptera acutorostra*, D) *Eubalaena glacialis*, E) *Balenoptera musculus*, F) *Balaenoptera borealis*, G) *Lagenorhynchus acutus*, H) *Phocoena phocoena*, I), *Globicephala melas*, J) *Ziphiidae* spp. K) *Physeter macrocephalus*, L) *Stenella longirostris*, M) *Tursiops truncatus*, N) *Stenella attenuata*, O) *Delphinus delphis*, P) *Grampus griseus*, R) unspecified odontocete species, S) *Orcinus orca*, T) *Stenella coeruleoalba,* U) *Globicephala macrorhynchus,* V) *Feresa attenuata,* W*) Eschrichtius robustus,* X) *Steno bredanensis* Y) *Pseudorca crassidens,* Z) *Lagenorhynchus obliquidens*

****Data types**: 1) cetacean sighting data, 2) survey effort data (varied from general location to logged positions), 3) animal behavior, 4), photo-ID (for at least one listed species), 5) management-oriented data (fisheries interactions, ship strike, harassment), 6) scat/prey collection, 7) environmental data

*** **Archives:** Data for one or more listed species were contributed to another archive or catalog. Responders reported contributing data to the following institutions: CASCADIA RESEARCH (WA), NATIONAL BIOLOGICAL INFORMATION INFRASTRUCTURE, NATIONAL MARINE MAMMAL LABORATORY (WA), NOAA PROTECTED RESOURCES DIVISION, NW FISHERIES SCIENCE CENTER, SCRIPPS INSTITUTE OF OCEANOGRAPHY (CA)

****Reported by Cascadia Research

2.2 Analyses/development of techniques

AKFSCC

Eastern North Pacific gray whales

From 1967-2007, 23 seasons of shore-based counts of the Eastern North Pacific (ENP) stock of gray whales were conducted throughout all or most of the southbound migration near Carmel, California. Population estimates have been derived from these surveys using a variety of techniques that were adapted as the data collection protocol evolved. The subsequent time series of estimates have been used to evaluate trend and population status to conclude that the population is no longer endangered and has achieved its Optimum Sustainable Population (OSP) level. Laake et al. (2009) re-evaluated the data from all of the surveys using a common estimation procedure and an improved method for treatment of error in pod size estimation. The new series of abundance estimates differ from the past series in terms of trend, but not in terms of conclusions regarding the population status. From this same data set, Punt and Wade (2010) provided an age- and sex-structured population dynamics model fitted using Bayesian methods. The prior distributions used for these analyses incorporate revised estimates of abundance for ENP gray whales and account explicitly for the drop in abundance caused by the 1999-2000 mortality event. A series of analyses were conducted to evaluate the sensitivity of the results to different assumptions. The baseline analysis estimates the ENP gray whale population to be above the maximum net productivity level (MNPL), because the posterior mean for the ratio of 2009 abundance to MNPL, termed the optimal sustainable population ratio, is 1.29 (with a posterior median of 1.37 and a 90% probability interval of 0.68-1.51), indicating the population is estimated to be well above MNPL. The baseline analysis estimates a probability of 0.884 that the population is above its MNPL, which means there is a 0.884 probability that it is at its optimum sustainable population size as defined by the U.S. Marine Mammal Protection Act. These results are consistent across all the model runs. The baseline model also estimates the 2009 ENP gray whale population size (posterior mean of 21,911) to be at 85% of its carrying capacity (posterior mean of 25,808), and this is also consistent across all the model runs.

Target species	Date	Area	Methods/effort	Parameters/ factors measured	Contact person/institute; refs
Gray whale	2009	NE Pacific Ocean	Reanalysis of abundance estimates since 1967		Jeff Laake/NMML, NMFS (Laake et al. 2009)

North Pacific Right Whale Bering Sea Project

First abundance estimates were produced and photo-identification analysis was completed for the North Pacific right whale.

Target species	Date	Area	Methods/effort	Parameters/ factors measured	Contact person/institute; refs
North Pacific Right Whale	7/08-8/30/2009	Southeastern Bering Sea	Systematic Line Transect; Sattelite Tagging; Photo Identification	Distribution, movements, and habitat use.	A. S. Kennedy (AFSC/NMML)

Gulf of Alaska Line Transect Survey

Density estimates for fin and humpback whales were produced and photo-identification analysis of killer whales and fin whales were completed.

Target species	Date	Area	Methods/effort	Parameters/ factors	Contact

				measured	person/institute; refs
Humpback Whale	4/10-4/20/2009	Gulf of Alaska	Systematic Line Transect; Photo Identification	Distribution and density estimates	B.K. Rone (AFSC/NMML)
Fin Whale	4/10-4/20/2009	Gulf of Alaska	Systematic Line Transect; Photo Identification	Distribution, density estimates, and habitat use.	B.K. Rone (AFSC/NMML)
Killer Whale	4/10-4/20/2009	Gulf of Alaska	Systematic Line Transect; Photo Identification	Habitat Use	B.K. Rone (AFSC/NMML)

NWFSC, PIFSC
None.

SWFSC
A modified camera-mounted laser system (Durban and Parsons, 2006) was deployed during SWFSC's *Ecosystem Survey of* Delphinus *Species* cruise. Over 60,000 images were taken of bowriding delphinids with a focus on both *Delphinus* species. Animals in these images are being measured using the parallel lasers of known width as a size standard. The resulting length distribution of bowriding animals are being compared to length distributions generated from aerial images of the animals when the ship is not present in efforts to assess potential demographic selectivity resulting from biopsying bowriding individuals.

3. MARKING DATA

3.1 Field work

AKFSC

Species	Feature	Area/stock	No. photo-id'd	Catalogue (Y/N)	Catalogue total	Contact person/institute; refs
North Pacific Right Whale	Head	Southeastern Bering Sea	7	Y	47	A. S. Kennedy/B.K. Rone (AFSC/NMML)
Humpback Whale	Fluke	Southeastern Bering Sea	55	Y	NA	A. S. Kennedy/B.K. Rone (AFSC/NMML)
Fin Whale	Dorsal	Gulf of Alaska	4	N	NA	B.K. Rone (AFSC/NMML)
Killer Whale	Dorsal/saddle patch	Gulf of Alaska	19	Y	1069	B.K. Rone (AFSC/NMML)
Bowhead	Dorsal surface	Bering-Chukchi-Beaufort	63	Y	17,000	Julie Mocklin/NMML, NMFS (Rugh, 2010)

NWFSC
None.

PIFSC

Species	Feature	Area/stock	No. photo-id'd*	Catalogue (Y/N)	Catalogue total	Contact person/institute; refs
Striped dolphin	Dorsal fin; Body	Hawaii	147	In progress	N/A	E. Oleson/PIFSC
Spinner dolphin	Dorsal fin; Body	Hawaii; Guam; CNMI	4197	In progress	N/A	E. Oleson/PIFSC
Pantropical spotted dolphin	Dorsal fin; Body	Hawaii, Guam	973	In progress	N/A	E. Oleson/PIFSC
Rough-toothed dolphin	Dorsal fin; Body	Hawaii	3251	In progress	N/A	E. Oleson/PIFSC
Bottlenose dolphin	Dorsal fin; Body	Hawaii	784	In progress	N/A	E. Oleson/PIFSC
Melon-headed whale	Dorsal fin; Body	Hawaii; Guam	8269	In progress	N/A	E. Oleson/PIFSC
False killer whale	Dorsal fin; Body	Hawaii; High Seas	7420	In progress	N/A	E. Oleson/PIFSC
Pilot whale	Dorsal fin; Body	Hawaii	6629	In progress	N/A	E. Oleson/PIFSC
Blainville's beaked whale	Dorsal fin; Body	Hawaii	319	In progress	N/A	E. Oleson/PIFSC

Sperm whale	Flukes; Body	High Seas; CNMI	711	In progress	N/A	E. Oleson/PIFSC
Sei whale	Flukes; Dorsal fin; Body	High Seas; Wake	284	In progress	N/A	E. Oleson/PIFSC

*Number of photos taken to be used for photo-identification

SWFSC

Species	Feature	Area/stock	No. photo-id'd	Catalogue (Y/N)	Catalogue total	Contact person/institute; refs
Killer whale	Dorsal fin	Antarctic peninsula	150	Y	400+	R. Pitman, J. Durban (SWFSC)
Bottlenose dolphin	Dorsal fin	Coastal CA	200	Y		

3.1.2. Artificial marking data

None.

3.1.3 Telemetry data

AKFSC

None.

NWFSC

Species	Tag type	No. successfully deployed	Maximum time transmitting	Contact person/institute; refs
Killer whale	Satellite	6	86	Brad Hanson, NWFSC
Blainville's Beaked whale	Satellite	3	40	Brad Hanson, NWFSC
Blue whale	Satellite	2	133	Brad Hanson, NWFSC
Pygmy killer whale	Satellite	2	22	Brad Hanson, NWFSC
Fin whale	Satellite	10	159	Brad Hanson, NWFSC
Humpback whale	Satellite	1	6	Brad Hanson, NWFSC
Melon headed whale	Satellite	2	25	Brad Hanson, NWFSC
Pilot whale	Satellite	12	109	Brad Hanson, NWFSC
False killer whale	Satellite	11	109	Brad Hanson, NWFSC
Risso's dolphin	Satellite	2	19	Brad Hanson, NWFSC
Sperm whale	Satellite	6	158	Brad Hanson, NWFSC
Bottlenose dolphin	Satellite	1	6	Brad Hanson, NWFSC
Cuvier's beaked whale	Satellite	3	42	Brad Hanson, NWFSC

PIFSC

Species	Tag type	No. successfully deployed	Maximum time transmitting	Contact person/institute; refs
False killer whale	Satellite	4	3 months	E. Oleson/PIFSC; R. Baird/CRC

SWFSC

Species	Tag type	No. successfully deployed	Maximum time transmitting	Contact person/institute; refs

Killer whale	Satellite	6	21 days	J. Durban / SWFSC
Gray whale	Satellite	1	12 days	J. Durban / SWFSC
Sperm whale	Satellite	4	14 days	J. Durban / SWFSC
Blainville's beaked whale	Satellite	2	25 days	J. Durban / SWFSC
Cuvier's beaked whale	Satellite	1	15 days	J. Durban / SWFSC
Short-finned pilot whale	Satellite	6	28 days	J. Durban / SWFSC

3.2 Analyses/development of techniques
None.

4. TISSUE/BIOLOGICAL SAMPLES COLLECTED

4.1 Biopsy samples (summary only) *2009*
AKFSC

Species	Area/stock	Calendar year/ season - no. collected	Archived (Y/N)	No. analysed	Total holdings	Contact person/institute
Fin Whale	Southeastern Bering Sea	5	Y	0	5	A. S. Kennedy (AFSC/NMML)
North Pacific Right Whale	Southeastern Bering Sea	3	Y	0	4	A. S. Kennedy (AFSC/NMML)

NWFSC

Species	Area/stock	Calendar year/ season - no. collected	Archived (Y/N)	No. analysed	Total holdings	Contact person/institute
Killer whale	NE Pacific/ Southern resident	2009/summer -3 winter/spring -3	Y	5	1	Gina Ylitalo/NWFSC
Minke whale	NE Pacific	2009/summer - 1	Y	0	1	Gina Ylitalo/NWFSC

PIFSC

Species	Area/stock	Calendar year/ season - no. collected	Archived (Y/N)	No. analysed	Total holdings	Contact person/institute
Spinner dolphin	Guam; CNMI	2010 - 10	Y	0	10	E. Oleson/PIFSC
Spotted dolphin	Hawaii	2009 - 1	Y	0	1	E. Oleson/PIFSC
Bottlenose dolphin	Hawaii	2009 - 4	Y	0	29	E. Oleson/PIFSC
Melon-headed whale	Hawaii	2009 - 7	Y	0	12	E. Oleson/PIFSC
False killer whale	Hawaii	2009 - 5	Y	0	5	E. Oleson/PIFSC
Short-finned pilot whale	Hawaii	2009 - 7	Y	0	28	E. Oleson/PIFSC
Sperm whale	Guam; CNMI	2010 - 5	Y	0	5	E. Oleson/PIFSC
Sei whale	Wake	2010 - 1	Y	0	1	E Oleson/PIFSC

SWFSC

Species	Area/stock	Calendar year/ season - no. collected	Archived (Y/N)	No. analysed	Total holdings	Contact person/institute
Blue whale	North Pacific	4	Y	0	1039	Gabriela Serra-Valente, SWFSC

Fin whale	North Pacific	3	Y	3	599	Gabriela Serra-Valente, SWFSC
Minke whale	North Pacific	1	Y	0	91	Gabriela Serra-Valente, SWFSC
Long-beaked common dolphin	North Pacific	697	Y	50	1196	Gabriela Serra-Valente, SWFSC
Short-beaked common dolphin	North Pacific	666	Y	0	2458	Gabriela Serra-Valente, SWFSC
Gray whale	North Pacific	2	Y	0	734	Gabriela Serra-Valente, SWFSC
Risso's dolphin	North Pacific	4	Y	0	145	Gabriela Serra-Valente, SWFSC
Short-finned pilot whale	North Pacific	2	Y	0	614	Gabriela Serra-Valente, SWFSC
Northern right whale dolphin	North Pacific	4	Y	0	240	Gabriela Serra-Valente, SWFSC
Pacific white sided dolphin	North Pacific	21	Y	0	322	Gabriela Serra-Valente, SWFSC
Killer whale	North Pacific	16	Y	5	857	Gabriela Serra-Valente, SWFSC
Sperm whale	North Pacific	9	Y	0	1938	Gabriela Serra-Valente, SWFSC
Spotted dolphin	North Pacific	1	Y	0	1556	Gabriela Serra-Valente, SWFSC
Striped dolphin	North Pacific	1	Y	0	579	Gabriela Serra-Valente, SWFSC
Spinner dolphin	North Pacific	2	Y	0	193	Gabriela Serra-Valente, SWFSC
Bottlenose dolphin	North Pacific	129	Y	100	2629	Gabriela Serra-Valente, SWFSC
Cuvier's beaked whale	North Pacific	2	Y	0	105	Gabriela Serra-Valente, SWFSC
Cuvier's beaked whale	Bahamas	6	Y	0	105	Gabriela Serra-Valente, SWFSC
Short-finned pilot whale	Bahamas	9	Y	0	614	Gabriela Serra-Valente, SWFSC
Blainville's beaked whale	Bahamas	10	Y	0	46	Gabriela Serra-Valente, SWFSC
Melon-headed whale	Bahamas	2	Y	0	2	Gabriela Serra-Valente, SWFSC
Sperm whale	Bahamas	26	Y	0	1938	Gabriela Serra-Valente, SWFSC
Bottlenose dolphin	Bahamas	3	Y	0	2629	Gabriela Serra-Valente, SWFSC
Humpback whale	Antarctica	5	Y	0	404	Gabriela Serra-Valente, SWFSC
Killer whale	Antarctica	8	Y	0	857	Gabriela Serra-Valente, SWFSC
Antarctic minke whale	Antarctica	4	Y	0	5	Gabriela Serra-Valente, SWFSC

4.2 Samples from directed catches (commercial, aboriginal and scientific permits) or bycatches

AKFSC, NWFSC, PIFSC

None.

SWFSC

Species	Area/stock	Tissue type(s)*	No. collected	Archived (Y/N)	No. analysed	Contact person/institute
Short-beaked common dolphin	E.N. Pacific	Skin, blubber, muscle, gonads, teeth, head	6	Y	6	Kerri Danil, SWFSC
Short-beaked common dolphin	E.N. Pacific	Skin, blubber	2	Y	2	Kerri Danil, SWFSC

Northern right whale dolphin	E.N. Pacific	Skin, blubber, muscle, gonads, teeth, head	1	Y	1	Kerri Danil, SWFSC
Pacific white-sided dolphin	E.N. Pacific	Skin, blubber, muscle, gonads, teeth, head	1	Y	1	Kerri Danil, SWFSC

4.3 Samples from stranded animals *2009*

AKFSC

None.

NWFSC

Species	Area/stock	Tissue type(s)*	No. collected	Archived (Y/N)	No. analysed	Contact person/institute
Harbor porpoise	Eastern North Pacific/ Georgia Basin	Muscle (*longissimus dorsi* – neonate, sub-adult, adult)	5	Y	0	Dawn Noren, NWFSC
Killer whale	Eastern North Pacific, California	Muscle (*longissimus dorsi* – adult)/ blubber, skin	1	Y	0	Dawn Noren, NWFSC Brad Hanson, NWFSC
Cuvier's beaked whale	Eastern North Pacific, Alaska	blubber, skin	1	Y	0	Brad Hanson, NWFSC
Fin whale	Eastern North Pacific, Washington	blubber, skin	1	Y	0	Brad Hanson, NWFSC

*e.g. liver, skin, blubber etc.

PIFSC

None.

SWFSC

Species	Area/stock	Tissue type(s)*	No. collected	Archived (Y/N)	No. analysed	Contact person/institute
Bottlenose dolphin	E.N. Pacific	Skin, blubber, gonad, teeth, etc	7	Y	7	Kerri Danil, SWFSC
Fin whale	E.N. Pacific	Skin, blubber	2	Y	2	Kerri Danil, SWFSC
Gray whale	E.N. Pacific	Skin	1	Y	0	Kerri Danil, SWFSC
Long-beaked common dolphin	E.N. Pacific	Skin, blubber, gonad, teeth, etc	13	Y	13	Kerri Danil, SWFSC
Pacific white-sided dolphin	E.N. Pacific	Skin, blubber, gonad, teeth, etc	2	Y	2	Kerri Danil, SWFSC
Short-beaked common dolplhin	E.N. Pacific	Skin, blubber, gonad, teeth, etc	3	Y	3	Kerri Danil, SWFSC
Striped dolphin	E.N. Pacific	Skin, blubber, gonad, teeth, etc	1	Y	1	Kerri Danil, SWFSC
Unidentified common dolphin	E.N. Pacific	Skin, blubber, gonad, teeth, etc	1	Y	1	Kerri Danil, SWFSC

4.4 Analyses/development of techniques

AKFSC, NWFSC, PIFSC

None.

SWFSC

At the 2007 IWC scientific meetings, Phil Morin and colleagues presented analysis of bowhead microsatellite data indicating that small numbers of genotyping errors could result in inference of population structure where none exists. An analysis method was developed to help identify these types of errors, and the method was published in 2009 (Morin *et al.* 2009a)

At the same IWC meeting in 2007, Morin and colleagues presented the first analysis of a new type of genetic marker called single nucleotide polymorphisms (SNPs), for analysis of bowhead whale population structure. Along with preliminary results from the bowhead populations, they presented theoretical analysis of the statistical power of SNPs to detect population structure, relative to existing microsatellite data. An elaboration of those statistical power analyses was published in 2009 in (Morin *et al.* 2009b). A paper describing the 42 SNP

markers developed for use in bowhead whales is currently in press in the journal Marine Mammal Science (Morin *et al.* 2010c)

With the introduction of the data use policy requiring the sharing of data for certain IWC focal species, the issue of data quality analysis and reporting became a topic of discussion and several working committees at IWC in 2007 and 2008. Some recommendations from those working committees were made, and Morin and colleagues used these as a starting point for an invited perspective paper in the Journal of Heredity, describing genetic data quality control and quality analysis methods, and data reporting standards to facilitate the use of genetics in management decisions (Morin *et al.* 2010b)

New DNA sequencing technologies are rapidly expanding our ability to obtain large amounts of sequence data for phylogenetic and population genetic studies. Morin and colleagues have applied these highly parallel sequencing methods to a study of global killer whale phylogeography to help resolve evolutionary relationships of killer whale ecotypes and regional populations. Results will be published in June, 2010 in the journal Genome Research (Morin *et al.* 2010a), describing phylogenetic relationships of 8 named ecotypes from the North Pacific, Antarctic, and North Atlantic, and indicating that at least 3 of these ecotypes should be elevated to species status, and the remaining ecotypes may also be subspecies or species, but further research is needed.

SWFSC researcher Nicholas Kellar developed and validated an assay that uses blubber androgens as indicators of male sexual maturation and reproductive seasonality. This work was published in Marine Mammal Science (Kellar *et al*. 2009). In addition, using similar techniques, Nick and co-investigator Marisa Trego have been developing an assay to measure corticosteroids from blubber samples to assess generalized stress response from free-ranging cetaceans.

5. POLLUTION STUDIES

AKFSC, PIFSC

None.

NWFSC

Emergence of algal toxins in marine mammals as an indicator of marine climate change

Researchers at NWFSC are currently involved in an effort to establish a baseline data set for the presence of algal toxins in marine mammals along the west coast from Alaska to California by measuring algal toxins (domoic acid and paralytic shellfish poisoning toxins) in fecal, urine and stomach content samples using commercially available ELISA kits for screening and LC/MS for confirmation of positive results. We receive samples from stranded/dead animals collected by members of several regional stranding networks and marine mammal centers. We are particularly interested in the emergence of domoic acid in marine mammals in Alaskan waters in the context of global climate change. This year we analyzed 46 samples from 35 individual animals of the following species: blue whale (2), humpback whale (1), gray whale (2), Minke whale (1) sperm whale (2), pygmy sperm whale (1), beluga whale (9), Cuvier's beaked whale (1), and harbor porpoise (16). Nine of the 35 whales were positive for domoic acid. The highest measurements were from a gray whale from Yakutat, AK (53 ng/g, fecal sample), a blue whale from central California (41.0 ng/g, fecal sample), and a sperm whale from central CA (35.8 ng/g, fecal sample). While these toxin levels are well below those seen in acutely affected animals, the fact that domoic acid is present in measurable quantities is of interest. Results from toxin analysis were reported to the researchers who provided samples. (Contact: Elizabeth Frame, NWFSC)

Southern resident killer whale feeding ecology studies

''Southern Resident'' killer whales include three ''pods'' (J, K and L) that reside primarily in Puget Sound/Georgia Basin during the spring, summer and fall. This population was listed as ''endangered'' in the US and Canada following a 20% decline between 1996 and 2001. The current study, using blubber/epidermis biopsy samples, contributes contemporary information about potential factors (i.e., levels of pollutants or changes in diet) that could adversely affect Southern Residents. Results obtained for carbon and nitrogen stable isotopes (SIs) as well as persistent organic pollutants (POPs) in these tissues were described in our previous progress report for biopsy samples collected and analyzed prior to March 2008. Since that time additional biopsy samples ($n=9$) have been collected from individual southern resident killer whales in the late summer months of 2008 and their tissues also analyzed for SIs, POPs, and fatty acids (FAs). Five additional biopsy samples were collected 2009, but analyses of these FY09 whales will not be completed in time for inclusion in this report. Data for the newly acquired FY08 samples were concatenated with all previously acquired samples ($n=22$) and the results of these analyses have been statistically evaluated to help describe differences in: (1) likely prey preferences, (2) foraging habitat, and (3) population structure of these whales at the pod and sub-pod matrilineal level.

In general, stable isotope results (both $\delta^{15}N$ and $\delta^{13}C$) for the newly acquired FY08 samples did not differ substantially from samples collected in late summer of previous years with the exception of a slight decrease in $\delta^{13}C$ observed for the L-pod whales sampled in FY08 relative to those sampled over the same time period of

FY07. Hence, there is no evidence at present that the primary prey of these whales in the summer months is changing significantly with time (*annually*). Similarly, the dietary FA results of these FY08 whales did not differ significantly between sampling years. Although there were some small differences in individual dietary FAs among the three pods, the differences in the patterns of dietary FAs observed among the three pods were not statistically significant with the J-pod animals perhaps being very slightly offset from the K-pod and L-pod animals, suggesting highly similar diets among all members of this population. However, one of the more interesting findings in our chemical marker data is the observation that when these animals are grouped by their known matrilines (Center for Whale Research, 2008; Plater 2002) our chemical marker data (SIs, dietary FAs, and selected POP ratios) indicate that there are some small discernable differences between matrilines of the same pod. Although the n-numbers are very small at this time, if these observations can be substantiated by further sampling and analysis, these results suggest that prey sharing among individuals may largely occur along matrilineal lines. Of broader practical significance is the possibility that chemical tracers found present in the blubber/epidermis tissues of these whales may be capable of revealing an aspect of foraging stock sub-structure that cannot be elucidated by other means. (Contact: David Herman, NWFSC)

Southern Alaska resident killer whale feeding ecology studies

In the spring/summer months of 2006, 2007, and 2008, thirty-two blubber/epidermis biopsy samples were collected (Craig Matkin, North Gulf Oceanic Society, NGOS) from southern Alaskan resident killer whales (SAKW/R) whose primary habitat ranges in the northwest from the Shumagin Islands to the southern-most end of southeast Alaska. These samples were shipped to NWFSC and analyzed between July 2008 and June 2009 for the same three chemical markers outlined above in the Puget Sound southern resident killer whale studies, specifically SIs, FAs, and POPs. An additional 24 whales were biopsy sampled in the summer of 2009, but at present, only FA results are currently available for these FY09 samples. These data were combined with analogous data from forty-seven SAKW/R whales biopsied from this same population in previous years (2003-2005). Hence, the combined dataset now contains FA information on a total of 79 killer whales split among 11 pods and 21 known matrilines and information on SIs and POPs for a total of 55 whales. The focus of this study (*ongoing*) is to determine if our chemical marker results can provide some preliminary corroborate evidence: (1) to support surface observational and fish scale results (obtained during SAKW/R foraging events by NGOS researchers) suggesting that this population of whales feed predominantly on chinook salmon in the early spring then transition in early summer to chum and thereafter in the late summer to coho salmon, (2) that animals genetically determined to be of the NR mitochondrial haplotype feed dissimilarly to whales of the SR haplotype, and (3) that results from these chemical markers can be used to detect differences in preferred prey among pods and/or among matrilines within a single pod thus potentially enabling their sub-pod foraging stock structure to be elucidated.

Although blubber/epidermis chemical marker results can not directly predict the specific prey of these whales for reasons described in Herman *et al.* (2005) and Krahn *et al*. (2007), observed differences in these chemical markers between individual whales (or groups of individuals) can be evaluated and shown to be qualitatively consistent (*or not*) with chemical marker results obtained in representative samples of their likely prey (in this specific example with adult returning chinook, chum, and coho salmon). In general, our initial SI and FA results are consistent with the hypothesis that this population of killer whales transition from chinook in early spring to chum and/or coho salmon in summer as evidenced by a slight drop in $\delta^{15}N$ values from spring to summer for the AE and AK pods of killer whales biopsy sampled in 2007 (this result should be viewed as being entirely tentative until that time in which SI data for the FY09 whales have been finalized) as well as an increase in specific omega-6 and omega-3 dietary fatty acids as the season progresses (most notable in the FY09 whales).

With respect to differences in chemical markers between the NR and SR haplotypes our results indicated that: (1) there were no statistically significant differences in our FY03-FY08 nitrogen or carbon epidermis stable isotope results, (2) there were no statistically significant differences detected in lipid-normalized POP contaminant concentrations, and (3) there were some slight differences in some specific dietary fatty acids (e.g., C18:2n6 and C18:3n3) but only the results for C18:2n6 was statistically significant at the 95% confidence level. Hence, although it is generally accepted that the NR haplotype whales feed more off-shore than the near-shore SR haplotypes, our present chemical marker data indicate that the prey preferences of these two haplotypes are probably largely similar.

When these whales were grouped by pod and by their known matrilines, our chemical marker results revealed some very interesting and unexpected results. For example, animals from pods AE, AG, AX, and AY were observed to be somewhat elevated in $\delta^{15}N$ relative to the other four pods for which multiple, within-pod individual SI results currently exist. Similarly, the two individual essential dietary FAs (C18:2n6 and C18:3n3) which are widely believed to likely be the single best indicators of diet were substantially lower in these same four pods relative to all others. Although we cannot provide any definitive explanation for this apparent similarity of chemical markers in these four specific pods, one plausible explanation is greater overall consumption of chinook salmon relative to the other four primary species of salmon which have been previously shown (Wade *et al*. 2006) to have lower $\delta^{15}N$ values and higher dietary omega-6 and omega-3 fatty acids than chinook salmon in the Gulf of Alaska. Finally, and most surprisingly, not only did we detect some discernable differences in epidermis SI and blubber dietary FA results among pods for this population, but we also have

some initial indications that these two chemical markers differ among matrilines from the same pod. The most notable example of differences in these chemical markers among matrilines was for the AE pod whales wherein the mean $\delta^{15}N$ value for the AE[05] (*n=3*) matriline whales were observed to be significantly lower than the AE[07] (*n=2*) and AE[08] (*n=2*) matriline animals. In a completely analogous fashion, the mean sum omega-6 dietary FAs were observed to be significantly lower in the AE[05] (*n=3*) matriline whales relative to the AE[07] (*n=2*) and AE[08] (*n=4*) matriline animals. The significance of this observation is that (similar to what was noted in our discussion of our southern resident killer whale results above) we now have some preliminary evidence to suggest that chemical tracers detected and measured in the blubber/epidermis tissues of these whales (and perhaps also other cetacean species) may be capable of revealing foraging stock structure for small assemblages of whales that can not be obtained by other means, most notably genetics. (Contact: David Herman, NWFSC)

Cook Inlet beluga whale feeding ecology study

In the fall of 2006 a single stranded Cook Inlet (CI) beluga whale carcass was recovered and blubber/epidermis tissues retained for chemical analysis. Two additional strandings occurred in the summer and fall of 2007 and tissue samples from these two CI whales were also collected and archived for analysis. In addition to these whale tissue samples, representative samples of the likely whole-body prey of these whales (sockeye, *n=6*; pink salmon, *n=5*; coho, *n=4*; Pacific herring, *n=6*; starry flounder, *n=1*) were also collected from Cook Inlet and all of these samples analyzed in June 2008 for their SI, FA, and POPs compositions. Data obtained from these predator/prey samples were combined with results obtained for samples acquired and analyzed in previous years (2001-2005). In total, we now have chemical marker data for eighteen individual CI beluga whales and ten different species of fish hypothesized to be their most likely putative prey. The primary goal of this project was to use this combined chemical marker data to help infer the predominant prey of these whales. In particular, these FA and SI data were combined into a single multilinear regression model and the contribution of each prey species to the diet of these whales enumerated using an iterative GRC-2 algorithm to solve the over-determined set of linear simultaneous equations describing all of these data. Among the 10 CI fish prey species collected and analyzed, salmon appear to have FA and SI combined results that are most consistent with those measured in the blubber/epidermis tissues of CI beluga whales collected during summer with chum, sockeye, and coho being the most prevalent. Eulachon, Dolly Varden, pink salmon, 3-spine stickleback, and chinook salmon were also predicted by these models to contribute to the diet of these whales, but in lesser quantities. All of these data were described in much greater detail in an interim progress report memorandum and shared with our principal collaborators on the project (Rod Hobbs, F/AKC4; Barbara Mahoney, F/AKR3X1; and Kathy Burek Alaska Veterinary Pathology Services). (Contact: David Herman, NWFSC)

Bahamas beaked whale foraging ecology and population structuring project

In 2009 the Environmental Assessment Program at NWFSC entered into a collaborative research project with Diane Claridge at the Bahamas Marine Mammal Research Organisation to study the distribution, abundance, feeding ecology, and population structuring of three species of beaked whales (Blainville's, Cuvier's, and Gervais') inhabiting the Great Bahamas Canyon area. This research study was funded by the Office of Naval Research (ONR) under grant ONR N000140710120. The role of NWFSC in this project was to analyze the blubber/epidermis tissues of these whales for SIs, FAs, and POPs and use these data to help infer their relative trophic positions and apparent foraging habitats in this region. In total, forty-eight blubber biopsy samples were collected between the spring of 2007 and 2009 and all of these tissues analyzed for all three above-listed chemical markers. Some of the more interesting findings brought to light by these results were: (1) the three species of beaked whales studied as part of this project appeared to have largely dissimilar diets as evidenced by significant differences in the patterns of dietary FAs measured in their blubber tissues, as well as differences in their stable isotopes ratios with higher δ15N isotope values and lower δ13C isotope values found in Blainville's than in Cuvier's beaked whales ($p<0.05$), suggesting that Cuvier's whales not only feed upon prey that is different from the Blainville's whales, but also feed in different habitat, possibly greater depths, (2) differences in all three chemical markers were found among the five specific foraging areas sampled within the region suggesting that these whales feed repeatedly within localized areas rather than foraging throughout the entire Great Bahama Canyon study area, and (3) the lipid-normalized POP concentrations measured in these whales were similar in value to those we measured in central Aleutian Island Baird's beaked whales as well as Gulf of Alaska resident killer whales suggesting that the level of POPs contamination in the Northern Bahamas is moderately low and comparable to an area generally thought to represent a relatively pristine environment. An interim progress report describing our findings in much greater detail was submitted to ONR in Nov 2009. (Contact: David Herman, NWFSC).

North Pacific humpback whale population structure via chemical tracers in tissues

The SPLASH Project, an international cooperative effort to understand the population structure of humpback whales in the North Pacific and to assess the status, trends, and potential human impacts to this population, began in 2004 and is currently ongoing. Specifically, blubber/epidermis biopsy samples for a very large number of humpback whales from among 8 breeding grounds and 10 feeding grounds have been collected from the

North Pacific and genetically analyzed by other researchers for their mitochondrial and nuclear DNA (Baker *et al.* 2009) as well as their nitrogen and carbon SIs (Witteveen *et al.* 2009a,b).

A much smaller subset of these samples, specifically adult male humpback whales known to originate from the Hawaiian breeding stock but known to forage in California (CA), Washington (WA), Southeast Alaska (SEAK), northern Gulf of Alaska (NGOA), western Gulf of Alaska (WGOA), eastern Aleutian Islands (EAI), and the Bering Sea (BS) have also been analyzed at the NWFSC for their blubber POP compositions, and more recently for their blubber FA compositions. The contaminant distribution patterns of Sum PCBs, DDTs, HCHs, chlordanes, and PBDEs in these samples were compared among the seven above-listed foraging regions and these summary POP concentration results described in a recent publication by Elfes *et al.* (2009).

More recent efforts have focused on combining the POPs and FA results generated at NWFSC with SI results reported by Witteveen *et al.* (2009a,b) to determine if these chemical markers (alone or in combination) could provide some unique information on the population structure (in particular, the feeding stock structure) of this sub-group of whales that could not be obtained through genetics. In order to assess the efficacy of SIs, POPs, and FAs in elucidating the foraging stock structure of these whales, data from each of these chemical markers were statistically analyzed by discriminant function analysis and/or random forest modeling (individually and in combination) to determine how well each of these markers could separate these whales into their known foraging groups (i.e., their seven above-listed foraging areas). The relative ability of each of these three chemical markers to individually correctly classify each of these whales into their correct foraging groups (expressed in units of % misclassified) were 46.8%, 22.4%, and 20.7%, respectively. In contrast, when all three chemical markers were instead combined into a single random forest model, the misclassification rate dropped to 14.3%. One of the most remarkable finding based on this combined random forest model is that these results demonstrated that whales biopsy sampled in the Bering Sea were significantly different in their pattern of POPs and FAs from those measured in the eastern Aleutian Island group thus allowing us to conclude that these two groups represent two distinct foraging stocks even though their apparent primary foraging habitats in mid-summer are separated on average by less than 30 miles distance. This result is most noteworthy because a different conclusion was attained through genetic analyses of these same whales where the BS and EAI groups were found to be statistically indistinguishable from one another, and hence the researchers conducting these genetic analyses concluded that these two groups instead constitute a single eco-/foraging-stock. Hence, this is the first example of an instance where it appears that chemical marker data may be able to identify humpback whale foraging stocks with greater resolution than that afforded by traditional genetic stock assessment methods. Future studies are planned to obtain blubber/epidermis samples from animals biopsied instead on their Hawaiian breeding grounds (rather than in their individual feeding areas as was done in the current study) in order to determine if our chemical marker data can also correctly identify the foraging habits of this population of humpback whales from biopsy samples collected in winter while on their breeding grounds. (Contact: David Herman, NWFSC)

Persistent organic pollutants and lipids in Irrawaddy dolphins from Cambodia
We are analyzing additional blubber samples from 10 additional Irrawaddy dolphins collected in Cambodia between 2004 and 2006, to supplement the analyses completed in 2007. These necropsy samples were obtained by the Wildlife Conservation Society (Contact: Martin Gilbert) and sent to NWFSC by Stephen Raverty of the B.C. Animal Health Service, Canada. Samples will analyzed for persistent organic pollutants (including PBDEs), and for total lipid and lipid classes in blubber. (Contact: Gina Ylitalo, NWFSC)

Retrospective study on PBDEs in north Pacific gray whales
Blubber samples collected from gray whales as part of the 1994 and 2001 Russian native subsistence hunts, which were analyzed previously for PCBs and organochlorine pesticides, were re-analyzed for POPs including a more extensive list of organochlorines and for PBDEs. These data will help establish a historical baseline for PBDEs in this species, as contaminant exposures may change over time with changes in PBDE use and with potential effects of climate change. (Contact: Gina Ylitalo, NWFSC)

Persistent organic in island-associated false killer whales from Hawaii
The current study is the first to report blubber concentrations of POPs, including PBDEs, in free-ranging false killer whales, and the first for any free-ranging cetaceans from the Hawaiian Islands. Wide ranges of POP concentrations were measured in these animals, with DDTs and PCBs being the most abundant. Similar to previous cetacean studies, age class and sex influenced the levels of POPs measured in the whales. Interestingly, subadult false killer whales had higher levels of some classes of POPs (e.g., sumPBDEs, dieldrin, HCB) compared to the other sampled animals. Although the POP concentrations measured in the false killer whales in the current study were generally equal to or lower than those reported for false killer whales that stranded in British Columbia or concentrations measured in fish-eating marine mammals from the west coast of North America, some of the animals in the current study were exposed to PCB levels that could potentially affect their health. Due to the small size of this whale population and their life history strategies (e.g., long-lived, time to maturation), continued monitoring of POPs is essential in assessing the health and viability of these animals. These findings were published in the December 2009 issue of Marine Pollution Bulletin. (Contact: Gina Ylitalo, NWFSC).

Total mercury levels in tissues from Pacific Northwest cetaceans

Using a simple and rapid method for analysis of total mercury, we were able to obtain baseline levels of this metal in free-ranging and stranded cetaceans from the Pacific Northwest. Analyses were conducted on Southern Resident killer whale (*Orcinus orca*) samples obtained non-lethally via live-remote biopsy in 2007 and 2008 and on samples from harbor porpoise (*Phocoena phocoena*) that stranded in Puget Sound, WA in 2003 and 2005. Total mercury was measured in skin samples of all animals and in liver, kidney and muscle from harbor porpoise. Measurement of total mercury was conducted on a direct mercury analyzer (LECO AMA254) using combustion atomic absorption spectrometry (AAS). We were able to optimize and reliably measure total mercury in very small masses of skin tissue (< 10 mg), similar to those that are routinely available from live-remote biopsies. In addition measurement in different tissues from the harbor porpoise allowed for comparison of mercury accumulation in different compartments of the same animal. Results for the killer whale skin showed an age-dependent accumulation of total mercury with slightly higher levels overall in the L-Pod animals than J-Pod, likely due to differences in feeding strategy and/or age of animals sampled within each pod. Mercury levels in the skin of harbor porpoise showed a size-dependent accumulation (likely related to age) and among the different tissues analyzed, the rank order was generally liver > kidney > muscle > skin. These measurements provided the opportunity to obtain valuable contemporary baseline metal data for the cetaceans in this region, where few data are available. In addition, this initial data will allow us to begin to examine the utility of mercury levels in individuals as a possible ecological tracer to distinguish such characteristics as ecotypes, age class and geographic areas of residency. (Contact: Bernadita Anulacion, NWFSC)

SWFSC

Fifty of the bottlenose dolphin samples listed above in Section 4.1 will be used for contaminant analyses. Analyses are underway.

6. STATISTICS FOR LARGE CETACEANS

6.1 Corrections to earlier years' statistics for large whales

None.

6.2 Direct catches of large whales (commercial, aboriginal and scientific permits) for the calendar year

NA

6.3 Anthropogenic mortality of large whales for the calendar year 2007

6.3.1 Observed or reported ship strikes of large whales (including non-fatal events)

AKFSC, NWFSC

None.

PIFSC

Whale species	Sex	No.	Date	Location	Vessel type	Speed	Fate	How observed	Contact person/ institute and refs
Humpback whale	U	1	2/07/2007	Maui, Hawaii	O	20 knots	I*	U	Ed Lyman/HIHWNMS/ MMD0792Mn-107
*Comments: Animal struck by vessel while traversing between Lanai and Lahaina at 20 kts. Blood seen in water, but animal itself not observed.									
Humpback whale	U	1	2/13/2007	Maui, Hawaii	O	U	U*	U	Ed Lyman/HIHWNMS/ MMD0794Mn-109
*Comments: Possible ship-strike.									
Humpback whale	U	1	3/06/2007	Maui, Hawaii	PC	U	X*	Crew	Ed Lyman/HIHWNMS/ MMD07108Mn-124
*Comments: 30-foot RHI vessel captain noticed a fluke print of a whale off the bow. Captain immediately stopped vessel and on stop a subadult humpback broke the surface and made contact with the hull. Did not observe any signs of injuries (no blood) or distress. Crew also assessed hull and found no damage.									
Humpback whale	U	1	4/01/2007	Kauai, Hawaii	PC	10 knots	X*	Crew	Ed Lyman/HIHWNMS/ MMD07121Mn-139
*Comments: Tour vessel felt contact possibly from a juvenile humpback, which surfaced 20 yds behind boat soon after contact. No injuries or blood seen. Depth was 60 feet.									
Humpback whale	U	1	4/13/2007	Lanai, Hawaii	PC	18 knots	I*	Crew	Ed Lyman/HIHWNMS/ MMD07123Mn-141
*Comments: Vessel captain felt strike, did not see animal, but one passenger did just prior to strike. Captain noticed blood in the water. Injured calf observed soon after. Capt. and crew observed animal for some time and were able to get photo documentation. Inspected vessel and headed back to Lahaina. On return to Lahaina called USCG to report incident.									

SWFSC

Species	Sex	No.	Date	Location	Vessel type	Speed	Fate	How observed	Contact person/ institute and refs
Gray whale	U	1	01/6/07	Marin County, California	U	U	D	Post mortem	Joe.Cordaro@noaa.gov, NOAA NMFS Southwest Regional Office
Blue whale	U	1	08/9/07	Long Beach Harbor, California	U	U	D	Post mortem	Joe.Cordaro@noaa.gov, NOAA NMFS Southwest Regional Office
Blue whale	U	1	13/9/07	Ventura, California	U	U	D	Post mortem	Joe.Cordaro@noaa.gov, NOAA NMFS Southwest Regional Office
Blue whale	U	1	19/9/07	Santa Barbara, California	U	U	D	Post mortem	Joe.Cordaro@noaa.gov, NOAA NMFS Southwest Regional Office
Humpback whale	U	1	13/10/07	Marin County, California	U	U	D	Post mortem	Joe.Cordaro@noaa.gov, NOAA NMFS Southwest Regional Office
Blue whale	U	1	30/11/07	San Miguel Island, California	U	U	D	Post mortem	Joe.Cordaro@noaa.gov, NOAA NMFS Southwest Regional Office
Humpback whale	F*	2	09/5/07	Sacramento River, California	U	U	X	Direct observation	Joe.Cordaro@noaa.gov, NOAA NMFS Southwest Regional Office
*Cow/calf pair in Sacramento River for several days, propeller wounds on back of adult female, non-fatal injury.									

6.3.2 Fishery bycatch of large whales

AKFSC

Whale species	Sex	No.	Date	Location	Fate	Targeted fish species	Gear	How observed?	Source or contact
Killer whale	U	1	06-24-2007	Bering Sea (59^{O} 51', 178^{O} 53')	R	Greenland turbot	LL	F	J.Breiwick (AFSC)
Sperm whale	M	1	05-13-2007	Gulf of Alaska (56º 46', 135º 57')	R	Sablefish	LL	F	J.Breiwick (AFSC)

NWFSC

None.

PIFSC

Whale species	Sex	No.	Date	Location	Fate	Targeted fish species	Gear	How observed?	Source or contact
Humpback whale	U	1	1/11/07	20º 44.2'N / 156º 28.4' W	R	NK	NK	DA	Ed Lyman/HIHWNMS/MMD0785Mn-100
Comments: Fishing gear (approx. 160 feet (ft)) trailing from mouth, removed over 110 ft., some gear remained.									
Humpback whale	U	1	2/06/2007	20º 02.56'N / 155º 52.4' W	R	NK		DA	Ed Lyman/HIHWNMS/MMD0791Mn-106
Comments: Bundled fishing gear trailing from mouth, removed over 300 ft., some gear remained. Animal biopsy sampled after disentanglement effort.									
Humpback whale	U	1	2/23/1007	20º 48.81'N / 156º 46.94' W	R	NK	NK	DA	Ed Lyman/HIHWNMS/MMD07100Mn-116
Comments: Multiple wraps around tail stock and blades of flukes of fishing line trailing 60 ft and trawl buoys. Line continued in bundle and buoys another 220 ft. Lines wrapping tailstock and blades were tight and dug into flesh several inches. Animal totally disentangled.									
Humpback whale	U	1	3/02/2007	20º 50.94'N / 156º 42.49' W	R	NK	NK	DA	Ed Lyman/HIHWNMS/MMD07105Mn-121
Comments: Heavy gauge fishing line entangled through mouth and trailed under flippers to twist together behind dorsal fin forming a bridle another 40 - 50 ft. with two polyballs attached. Animal totally disentangled. Animal Biopsy sampled after disentanglement effort.									
Humpback whale	U	1	3/17/2007	21º 03.03'N / 156º 40.85' W	R	NK	NK	DA	Ed Lyman/HIHWNMS/MMD07118Mn-136

Comments: Heavy gauge fishing line trailed from whale cutting into tissue, with several pieces of line or cargo netting hanging of wrap. No response possible and there was no re-sightings to date of an animal meeting this description.									
Humpback whale	U	1	12/09/2007	Maui, Hawaii	R	NK	NK	DA	Ed Lyman/HIHWNMS/ MMD07118Mn-136
Comments: Subadult entangled in undetermined amount of monofilament line around tailstock and trailing aft. Not life threatening. No response mounted.									

7. STATISTICS FOR SMALL CETACEANS

7.1 Corrections to earlier years' statistics for small cetaceans

Species	Type of catch	Area/stock	2007 REPORTED	2007 CORRECTED	2008 REPORTED	2008 CORRECTED
Beluga	Aboriginal	Beaufort Sea	40	40	48	49
Beluga	Aboriginal	Chukchi Sea	270	270	74	74
Beluga	Aboriginal	E. Bering Sea	203	200	72	119
Beluga	Aboriginal	Kuskokwim	31	32	0	0
Beluga	Aboriginal	Bristol Bay	17	20	19	19

7.2 Direct catches of small cetaceans for the calendar year 2009

2009-DRAFT data provided by Kathy Frost, ABWC (Alaska Beluga Whale Committee)

Species	Type of catch	Area/stock	Males	Females	Total landed	Struck and lost
Beluga	Aboriginal	Beaufort Sea			16	na
Beluga	Aboriginal	Chukchi Sea			53	na
Beluga	Aboriginal	E. Bering Sea			173	na
Beluga	Aboriginal	Kuskokwim			8	na
Beluga	Aboriginal	Bristol Bay			20	na

7.3 Anthropogenic mortality of small cetaceans for the calendar year 2007

7.3.1 Observed or reported ship strikes of small cetaceans (including non fatal events)

AKFSC, NWFSC, PIFSC, SWFSC

None.

7.3.2 Fishery bycatch of small cetaceans

AKFSC

Species	Ratio of male to female (if known)	No.	No. extrapolated to fleet total (point estimate)	Range, CI or CV	Date of bycatch	Location (description or lat/long)	FAO statistical area (if known)	FAO area	Fate	Targeted species	Gear	How observed?	Source or contact
Harbour porpoise		1	NA	NA	07-17-2007	Bering Sea			D	Flathead sole	Non-pelagic trawl	F	J. Breiwick (AFSC)

NWFSC

None.

PIFSC

Species	Sex	No	Date	Location	Fate	Targeted fish species	Gear	Source or contact
Risso's dolphin	U	1	02/21/2007	N/A	R	Swordfish	LLS	NMFS Observers
Bottlenose dolphin	U	1	02/22/2007	N/A	R	Swordfish	LLS	NMFS Observers
Risso's dolphin	U	1	03/22/2007	N/A	R	Swordfish	LLS	NMFS Observers
Risso's dolphin	U	1	03/24/2007	N/A	R	Swordfish	LLS	NMFS Observers

Bottlenose dolphin	U	1	03/26/2007	N/A	R	Swordfish	LLS	NMFS Observers
Bottlenose dolphin	U	1	03/29/2007	N/A	R	Swordfish	LLS	NMFS Observers
False Killer Whale	U	1	04/19/2007	N/A	R	Tuna	LLD	NMFS Observers
Unidentified Dolphin	U	1	05/06/2007	N/A	R	Tuna	LLD	NMFS Observers
False Killer Whale	U	1	05/23/2007	N/A	R	Tuna	LLD	NMFS Observers
False Killer Whale	U	1	09/16/2007	N/A	R	Tuna	LLD	NMFS Observers
Unidentified Cetacean	U	1	10/31/2007	N/A	R	Tuna	LLD	NMFS Observers
Short-finned Pilot Whale	U	1	11/15/2007	N/A	R	Tuna	LLD	NMFS Observers
False Killer Whale	U	1	12/07/2007	N/A	R	Tuna	LLD	NMFS Observer
Risso's Dolphin	U	1	12/24/2007	N/A	D	Tuna	LLD	NMFS Observers

SWFSC

Species	Ratio of male to female (if known)	No.	No. extrapolated to fleet total (point estimate)	Range, CI or CV	Date of bycatch	Location (description or lat/long)	FAO statistical area (if known)	FAO area	Fate	Targeted species	Gear	How observed?	Source or contact
Common dolphin, short-beaked	3:6	9	54	0.41	January to August	California			D	*Swordfish and Thresher Shark*	GND	F	Jim.Carretta@noaa.gov
Northern right whale dolphin	0:1	1	6	1.00	December	California			D	*Swordfish and Thresher Shark*	GND	F	Jim.Carretta@noaa.gov
Pacific white-sided dolphin	1:0	1	6	1.00	December	California			D	*Swordfish and Thresher Shark*	GND	F	Jim.Carretta@noaa.gov
Comments:													

8. STRANDINGS *2008*

AKFSC, NWFSC

None.

PIFSC

The NOAA Fisheries Pacific Islands Regional Office's (PIRO) Protected Resources Division (PRD) guides the Marine Mammal Response Network, working with various partners and volunteers to respond to live and dead stranded or distressed marine mammals in the main Hawaiian Islands under the authority of the MMPA. The Response Network consists of cetacean and monk seal response in the main Hawaiian Islands, Northwest Hawaiian Islands, Guam, American Samoa, and the Northern Mariana Islands. In Hawaii, two primary entities, the Hawaii Pacific University and the University of Hawaii at Hilo, have NOAA Fisheries authorization to respond to and "take" marine mammals for rescue, rehabilitation, release of live cetaceans, and necropsy and sampling of those that wash ashore dead or those that strand alive but die or are humanely euthanized. Hawaii Pacific University is designated to respond to and sample dead stranded cetaceans. The responsibilities of the stranding network for cetaceans include but are not limited to: responses/investigations of mortality events; biomonitoring; tissue/serum banking; and analytical quality assurance.

Species	No. strandings	No. post mortems	Contact person(s)/ Institute(s)	Contact email address(es)
Humpback whale	2	1	David Schofield/NOAA PIRO	david.schofield@noaa.gov
Spinner dolphin	3	3	David Schofield/NOAA PIRO	david.schofield@noaa.gov
Killer whale	1	1	David Schofield/NOAA PIRO	david.schofield@noaa.gov

Unidentified beaked whale	1	0	David Schofield/NOAA PIRO	david.schofield@noaa.gov

SWFSC

Southwest Fisheries Science Center (SWFSC) responds to dead cetaceans strandings along the San Diego coastline year round, whereas Sea World responds to live pinniped and cetacean strandings. SWFSC receives samples from cetaceans that expire during rehabilitation and those are included in this summary.

Species	No. strandings	No. post mortems	Contact person(s)/ Institute(s)	Contact email address(es)
Bottlenose dolphin	5	2	Kerri Danil, SWFSC	Kerri.Danil@noaa.gov
Long-beaked common dolphin	12	5	Kerri Danil, SWFSC	Kerri.Danil@noaa.gov
Northern right whale dolphin	1	1	Kerri Danil, SWFSC	Kerri.Danil@noaa.gov
Pacific white-sided dolphin	3	3	Kerri Danil, SWFSC	Kerri.Danil@noaa.gov
Risso's dolphin	2	1	Kerri Danil, SWFSC	Kerri.Danil@noaa.gov
Short-beaked common dolphin	2	1	Kerri Danil, SWFSC	Kerri.Danil@noaa.gov
Short-finned pilot whale	1	0	Kerri Danil, SWFSC	Kerri.Danil@noaa.gov

9. OTHER STUDIES AND ANALYSES *2009*

AFSC

Arctic Issues

Passive Acoustic Research

Three passive acoustic recorders were deployed on existing oceanographic moorings in Arctic waters, as part of an International Polar Year (IPY) collaboration with colleagues in Canada (Chukchi Plateau), Germany and Norway (Fram Strait). Two of three recorders deployed in 2008 were recovered and re-deployed in autumn 2009. The overall goal of the study is to acquire baseline data on cetacean calling behaviour, and on Arctic 'soundscapes' (i.e., underwater sound budgets) in advance of anticipated increases in commercial shipping and offshore industrial activities. Provisional results comparing seasonal soundscapes from the Chukchi Plateau to those in Fram Strait suggests that underwater sound in the latter region is roughly 5-10dB louder. These differences are due both to 'natural' differences in seasonal ice cover and to greater levels of anthropogenic sound in the Fram Strait compared to the Chukchi Plateau. (Contact: Sue Moore, NOAA/Fisheries S&T).

Marine Mammals as Sentinels of Arctic Ecosystems in Transition: application to the DBO in the Pacific Arctic

The June 2008 publication of *Marine Mammals as Ecosystem Sentinels* (Moore 2008) precipitated invitations to provide plenary presentation at four conferences in 2009 and to the Marine Mammal Health & Stranding Response Conference (April 2010). The over-arching message is that marine mammals can act as sentinels to ecosystems in transition in response to the rapid climate change now evident in the Arctic. This concept has now been incorporated in the provisional design of the Distributed Biological Observatory (DBO) for the Pacific Arctic region (Grebmieier et al. 2010). It is anticipated that this concept will be applied, as possible, in other Arctic regions via the CAFF/CBMP program (Contact: Sue Moore, NOAA/Fisheries S&T).

Arctic Council

CAFF Circumpolar Biodiversity Monitoring Program (CBMP)

Current Arctic biodiversity monitoring efforts are insufficient to provide an integrated picture of the status and trends in key species, habitat, processes and services. In response the Arctic Council/Conservation of Arctic Flora and Fauna (CAFF) convened two workshops for implementation of the Circumpolar Biodiversity Monitoring Program (CBMP) focused on marine ecosystems (http://cbmp.arcticportal.org). The Marine Expert Monitoring Group (MEMG) has developed a Draft Integrated Monitoring Plan (IMP) for Arctic marine ecosystems. The Draft IMP will be submitted to the Arctic Council for review in June 2010 Contact: Sue Moore, NOAA/Fisheries S&T).

PAME Snow, Water, Ice and Permafrost in the Arctic (SWIPA)

The Arctic Council initiated a Climate Change and Cryosphere project, called SWIPA, under the auspices of the Protection of the Arctic Marine Environment (PAME) working group. Chapter 3 – Biological Impacts of

Changes to Sea Ice in the Arctic of the Draft SWIPA report provides specific recommendations on research needed to investigate the impacts of sea ice loss on Arctic marine mammals including cetaceans. The Draft SWIPA report will be submitted to the Arctic Council for review in June 2010. Contact: Sue Moore, NOAA/ Fisheries S&T

NWFSC

Satellite tagging studies

Movements and habitat use of Pacific Northwest medium sized cetaceans

One of the long-term objectives of our studies of killer whales in the Pacific Northwest was to better define the role of transient killer whales in Puget Sound and eastern North Pacific Ocean ecosystem. In previous years we have deployed suction-cup attached time-depth recorders on transients to better understand their localized habitat use and plan to continue this effort. In addition, understanding this ecotype's long-range movements is needed to assess their role in this ecosystem in response to the recent debate on the true role of this top predator in the North Pacific Ocean. Consequently, using a well–tested technique that has been used extensively on killer whales in Alaska and Antarctica, as well as on several species of cetaceans in Hawaii, we satellite tagged three transient killer whales in Puget Sound and three off the US west coast. We were able monitor the movements of two whales for 86 days. The whales moved as far north as southeast Alaska and as far south as Montery Bay California (Contact: Brad Hanson, NWFSC)

Diving physiology studies

Development of oxygen stores and diving capabilities of Pacific Ocean cetaceans

This study is being conducted to assess the diving capabilities of cetaceans from the Pacific Ocean. Since 2005, muscle samples (*longissimus dorsi*) from stranded, freshly dead harbor porpoise (n=22), Dall's porpoise (n=1), and killer whales (n=3) of all age and sex classes in good to excellent condition have been collected to assess muscle myoglobin content and acid buffering capacity in this important swimming muscle. These data will be used to assess muscle oxygen stores, the ability of the muscle to cope with anaerobic metabolites, and diving duration capabilities. This area of research is important to gaining a better understanding of how limitations in prey availability might impact marine mammals, particularly younger individuals, who may have limited diving capacity. Samples from all age classes, including neonates and juveniles are being collected to assess how diving capabilities improve with age, as has been observed in several pinniped species and one cetacean, the bottlenose dolphin. Limitations in juvenile diving capabilities may have important implications for survival if prey resources are limited. All samples collected through 2007 have been analyzed. Samples collected in 2008 (3 harbor porpoises and 1 killer whale) and 2009 (5 harbor porpoises and 1 killer whale) will be analyzed in fall/winter 2010. At this time, the harbor porpoise data set is the only one of sufficient size to permit statistical and graphical analysis. Preliminary results show that neonates and calves have reduced muscle oxygen stores and acid buffering capacity and are thus at a disadvantage for diving, compared to sub-adult and adult animals. However, harbor porpoise diving capacities do develop at a faster rate than that observed in bottlenose dolphins (Noren *et al.* 2001, Noren 2004). Preliminary results from this work were presented at two scientific conferences in 2008. (Contact: Dawn Noren, NWFSC)

Resident killer whales studies

Prey relationship studies

Energetic needs and prey consumption rates of Southern Resident killer whales

A study was conducted to determine the daily prey energetic needs for the Southern Resident killer whale population. Body mass, daily energy expenditure, and daily prey energetic needs were estimated for all age and sex-classes in the Southern Resident killer whale population. Daily energy expenditure was estimated two ways. First, daily energy expenditure for each member of the Southern Resident killer whale distinct population segment was estimated assuming that field metabolic rates (FMRs) are approximately 5-6 times Kleiber predicted basal metabolic rate values, similar to FMRs of other marine mammals. Second, daily energy expenditure of adult resident killer whales were calculated from the energetic cost of transport at specific swimming speeds (Williams and Noren 2009, see publications in this report) and daily activity budgets for Northern (Ford 1989) and Southern (Noren *et al.* 2009, see publications in this report, and Noren unpublished data) Resident killer whales that included average swimming speeds for various behaviors and the percentage of time whales are engaged in the behaviors (e.g., foraging, travelling, resting, socializing, and beach-rubbing). Estimated daily expenditure values calculated from the two methods were similar. The results were submitted to the NOAA Northwest Regional office to inform biological opinions on salmon fisheries, and a manuscript is in press in Marine Mammal Science (Noren in press, see publications in this report). (Contact: Dawn Noren, NWFSC)

Vessel interactions and noise effects

Energetic impacts of vessel disturbance to Southern Resident killer whales

The main goal of this study was to investigate the energetic costs of behavioral responses to vessel traffic in Southern Resident killer whales. One paper from this study has already been published (Noren *et al.* 2009, see publications in this report). The results presented in this paper show that Southern Resident killer whales perform more surface active behaviors when approached closely (≤ 150m) by boats. Summary statistics and some preliminary statistical analysis of other data from this study were also completed in 2008 and 2009. Preliminary results show that killer whale diving and swimming behaviors change with the number of vessels present within 1000 m. These behavioral changes also vary by gender, year, and potentially activity state. Currently, more advanced models are being used to analyze the data. Concurrent with this study, killer whale group behavior data were collected on 2006 to examine geographic locations where different behavior states (rest, travel, forage, and socialize) occur and how the diving parameters, swim speeds, spatial arrangement (flank, linear, nonlinear), and proximity (contact, tight, loose, spread) of individual whales in a group relate to these behaviors and geographic location. GIS analyses of these data were completed in 2007, and draft papers are being prepared for submission to scientific journals. (Contact: Dawn Noren, NWFSC)

Energetic cost of performing surface active behaviors
A study was conducted in 2005 to measure the energetic cost of surface active behaviors (breaches, tail slaps, etc.) that can be performed in response to vessel disturbance. To accomplish this, oxygen consumption of two trained adult male bottlenose dolphins was measured using flow-through respirometry following bouts of surface active behaviors (tail slaps and breaches) that have been performed by cetaceans in response to disturbance by vessels. In order to assess how the number of successive behaviors performed in a bout affects metabolism, oxygen consumption following both low intensity bouts of breaches (n=5 breaches in a row) and high intensity bouts of breaches (n=10 breaches in a row) were measured. Analysis of respiration rate and respirometry data show that bouts of breaches (n=5 and n=10) are energetically more expensive than bouts of tail slaps, swimming at slow speeds, and resting metabolic rate. The metabolic cost of tail slaps is similar to both resting metabolic rate and the metabolic cost of swimming at slow speeds. Furthermore, for one of the two dolphins, bouts of 10 breaches were energetically more costly than bouts of 5 breaches. These data in combination with behavioral studies of cetacean vessel interactions in the field (e.g., Southern Resident killer whales, from above) will allow us to assess whether cetaceans incur increased energetic costs in the presence of vessels. By knowing the metabolic cost of these behaviors, we will better understand the potential for vessel disturbance to increase energetic requirements (e.g., prey consumption) and impact individuals. The results of this work were presented in a poster at the 2009 Biennial Conference of the Society for Marine Mammalogy and a talk at the 2010 Annual Meeting for the Society of Integrative and Comparative Biology. (Contact: Dawn Noren, NWFSC)

Investigating noise effects on the acoustic signals of Southern Resident killer whales The main goal of this ongoing research project is to determine the effects of sound exposure, particularly from anthropogenic sources, on Southern Resident killer whales. In 2009, vocal compensation was investigated in SRKW calls to determine the degree to which whales compensate for changing levels of background noise. In addition, whale and vessel behavior data were also collected to determine what contribution vessel traffic had on background noise levels and how noise levels influenced whale behavior. Results from the first two seasons (2007 and 2008) including data reported by Holt et al. 2009 illustrate that as background noise levels increased from motorized vessel traffic so too did the call levels of Southern Resident killer whales. We are currently conducting data analysis on data collected in the 2009 season (Contact: Marla Holt, NWFSC).

Annual southern resident killer whale survey
The annual photo-identification survey was conducted to document all individual Southern Resident killer whales present in the population in late spring and early summer each year. This is the continuation of the long-term monitoring effort (since mid-1970s) that reports the presence or absence of individuals for demographic and population dynamics studies. Photo-ID Catalogue is updated annually.(Contact: Ken Balcolmb, Center for Whale Research)

Distribution and habitat of southern resident killer whales
Studies on winter and summer distribution of Southern Resident killer whales were continued in 2009. Additional sightings of killer whales off the U.S. west coast during the winter were obtained through continuation of the coast-wide sighting network. Opportunistic sightings are obtained from fisherman, the general public, fishery observes and other scientists. Southern resident killer whales were sighted in California waters and off the Washington coast in 2006.
Results of passive acoustic recorders deployed in winter 2009 off the Washington coast documented the presence of southern resident killer whales in spring 2009. This study continues in 2010. (Contact: Brad Hanson, NWFSC)

Southern Resident killer whale foraging and prey
Prey remains and fecal samples were collected periodically in the summer and fall range of southern resident killer whales in 2009 in conjunction with behavioural cues of predation events. Of fish remains collected Chinook predominated. This species was also predominate in fecal material collected during this season. Genetic analyses of Chinook identified from scales and tissue were primarily from the Fraser River (Hanson et al. 2010). (Contact: Brad Hanson, NWFSC)

Genetic Studies

A study to investigate the paternity of southern resident killer whales (*Orcinus orca*) was undertaken using biopsy samples and fecal samples from known individuals. To date, very tentative results indicate that breeding within and between pod appears to be occurring. Effective size appears to be very low (~25). Power to assign parents is relative poor. There is genetic substructure even within this small population. However, additional measures of genetic diversity will need to be developed and additional samples from the population will need to be obtained. (Contact: Mike Ford, NWFSC)

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None.