Draft Programmatic Environmental Impact Statement for the Marine Mammal Health and Stranding Response Program

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APPENDIX E

BIOLOGICAL RESOURCES TABLES

Table E-1. Protected and Sensitive Habitats on the U.S. Atlantic Coast

Protected and Sensitive Habitat	Type	State/ Territory
Acadia National Park	NP	ME
Alligator River National Wildlife Refuge	NWR	NC
Anagansett National Wildlife Refuge	NWR	NY
Archie Carr National Wildlife Refuge	NWR	FL
Ashepoo Combahee Edisto Basin National Estuarine Research Reserve	NERR	SC
Assateague Island National Seashore	NS	MD-VA
Back Bay National Wildlife Refuge	NWR	VA
Biscayne National Park	NP	FL
Blackbeard Island National Wildlife Refuge	NWR	GA
Blackbeard Island Wilderness	W	GA
Blackwater National Wildlife Refuge	NWR	MD
Block Island National Wildlife Refuge	NWR	RI
Bombay Hook National Wildlife Refuge	NWR	DE
Brigantine Wilderness	W	NJ
Buck Island Reef National Wildlife Refuge	NWR	VI
Cabo Rojo National Wildlife Refuge	NWR	PR
Canaveral National Seashore	NS	FL
Cape Cod Bay Northern Right Whale Critical Habitat	CH	MA
Cape Cod National Seashore	NS	MA
Cape Hatteras National Seashore	NS	NC
Cape Lookout National Seashore	NS	NC
Cape May National Wildlife Refuge	NWR	NJ
Cape Romain National Wildlife Refuge	NWR	SC
Cape Romain Wilderness	W	SC
Cedar Island National Wildlife Refuge	NWR	NC
Chesapeake Bay (MD) National Estuarine Research Reserve	NERR	MD
Chesapeake Bay (VA) National Estuarine Research Reserve	NERR	VA
Chincoteague National Wildlife Refuge	NWR	VA
Conscience Point National Wildlife Refuge	NWR	NY
Crocodile Lake National Wildlife Refuge	NWR	FL
Cross Island National Wildlife Refuge	NWR	ME
Culebra National Wildlife Refuge	NWR	PR
Cumberland Island National Seashore	NS	GA
Cumberland Island Wilderness	W	GA
Currituck National Wildlife Refuge	NWR	NC
Delaware National Estuarine Research Reserve	NERR	DE
Desecheo National Wildlife Refuge	NWR	PR
Dry Tortugas National Park	NP	FL

Table E-1. Protected and Sensitive Habitats on the U.S. Atlantic Coast (continued)

Protected and Sensitive Habitat	Type	State/ Territory
E.A. Morton National Wildlife Refuge	NWR	NY
E.B. Forsythe National Wildlife Refuge	NWR	NJ
Eastern Shore Virginia National Wildlife Refuge	NWR	VA
Everglades National Park	NP	FL
Fire Island National Seashore	NS	NY
Fisherman Island National Wildlife Refuge	NWR	VA
Florida Keys National Marine Sanctuary	NMS	FL
Florida Keys Wilderness	W	FL
Franklin Island National Wildlife Refuge	NWR	ME
Gray's Reef National Marine Sanctuary	NMS	GA
Great Bay National Estuarine Research Reserve	NERR	ME
Great Bay National Wildlife Refuge	NWR	NH
Great South Channel Northern Right Whale Critical Habitat	CH	MA
Great White Heron National Wildlife Refuge	NWR	FL
Green Cay National Wildlife Refuge	NWR	VI
Green Sea Turtle Critical Habitat	CH	PR
Guana Tolomato Matanzas National Estuarine Research Reserve	NERR	FL
Harris Neck National Wildlife Refuge	NWR	GA
Hawksbill Sea Turtle Critical Habitat	CH	PR
Hobe Sound National Wildlife Refuge	NWR	FL
Hudson River National Estuarine Research Reserve	NERR	NY
J. H. Chafee National Wildlife Refuge	NWR	RI
Jacques Cousteau National Estuarine Research Reserve	NERR	NJ
Johnson’s Seagrass Critical Habitat	CH	FL
Key West National Wildlife Refuge	NWR	FL
Leatherback Sea Turtle Critical Habitat	CH	VI
Mackay Island National Wildlife Refuge	NWR	VA
Mackay Island National Wildlife Refuge	NWR	NC
Marjory Stoneman Douglas Wilderness	W	FL
Martin National Wildlife Refuge	NWR	MD
Mashpee National Wildlife Refuge	NWR	MA
Merritt Island National Wildlife Refuge	NWR	FL
Monitor National Marine Sanctuary	NMS	NC
Monomoy National Wildlife Refuge	NWR	MA
Monomoy Wilderness	W	MA
Moosehorn National Wildlife Refuge	NWR	ME
Nantucket National Wildlife Refuge	NWR	MA
Narragansett Bay National Estuarine Research Reserve	NERR	RI

Table E-1. Protected and Sensitive Habitats on the U.S. Atlantic Coast (continued)

Protected and Sensitive Habitat	Type	State/ Territory
Navassa Island National Wildlife Refuge	NWR	PR
Ninigret National Wildlife Refuge	NWR	RI
Nomans Land Island National Wildlife Refuge	NWR	MA
North Carolina National Estuarine Research Reserve	NERR	NC
North Inlet-Winyah Bay National Estuarine Research Reserve	NERR	SC
Oyster Bay National Wildlife Refuge	NWR	NY
Parker River National Wildlife Refuge	NWR	MA
Pea Island National Wildlife Refuge	NWR	NC
Pelican Island National Wildlife Refuge	NWR	FL
Pelican Island Wilderness	W	FL
Petit Manan National Wildlife Refuge	NWR	ME
Pinckney Island National Wildlife Refuge	NWR	SC
Piping Plover Critical Habitat	CH	NC-FL
Plum Tree Island National Wildlife Refuge	NWR	VA
Pond Island National Wildlife Refuge	NWR	ME
Prime Hook National Wildlife Refuge	NWR	DE
Rachel Carson National Wildlife Refuge	NWR	ME
S.B. McKinney National Wildlife Refuge	NWR	CT
Sachuest National Wildlife Refuge	NWR	RI
Salt River Bay National Historic Park and Ecological Preserve	Preserve	VI
Sandy Point National Wildlife Refuge	NWR	VI
Sapelo Island National Estuarine Research Reserve	NERR	GA
Savannah National Wildlife Refuge	NWR	SC
Seal Island National Wildlife Refuge	NWR	ME
Seatuck National Wildlife Refuge	NWR	NY
Southeastern Right Whale Critical Habitat	CH	GA-FL
Stellwagen Bank National Marine Sanctuary	NMS	MA
Swanquarter National Wildlife Refuge	NWR	NC
Swanquarter Wilderness	W	NC
Thatches National Wildlife Refuge	NWR	MA
Trustom Pond National Wildlife Refuge	NWR	RI
Tybee National Wildlife Refuge	NWR	SC
Vieques National Wildlife Refuge	NWR	PR
Virgin Islands National Park	NP	VI
Waccamaw National Wildlife Refuge	NWR	SC
Wallops Island National Wildlife Refuge	NWR	VA
Waquoit Bay National Estuarine Research Reserve	NERR	MA
Wassaw National Wildlife Refuge	NWR	GA

Table E-1. Protected and Sensitive Habitats on the U.S. Atlantic Coast (continued)

Protected and Sensitive Habitat	Type	State/ Territory
Wells National Estuarine Research Reserve	NERR	ME
Wertheim National Wildlife Refuge	NWR	NY
West Indian Manatee Critical Habitat	CH	FL
Wolf Island National Wildlife Refuge	NWR	GA
Wolf Island Wilderness	W	GA
Yellow-shouldered Blackbird Critical Habitat	CH	PR

Source: DOC/NOAA and DOI 2006, Wilderness.net 2006

Notes: CH – Critical Habitat
NERR – National Estuarine Research Reserve
NP – National Park
NS – National Seashore
NWR – National Wildlife Refuge
W – Wilderness

Table E-2. Protected and Sensitive Habitats in the Gulf of Mexico

Protected and Sensitive Habitat	Type	State
Anahuac National Wildlife Refuge	NWR	TX
Apalachicola National Estuarine Research Reserve	NERR	FL
Aransas National Wildlife Refuge	NWR	TX
Bayou Sauvage National Wildlife Refuge	NWR	LA
Big Boggy National Wildlife Refuge	NWR	TX
Big Branch Marsh National Wildlife Refuge	NWR	LA
Bon Secour National Wildlife Refuge	NWR	AL
Brazoria National Wildlife Refuge	NWR	TX
Breton National Wildlife Refuge	NWR	LA
Cedar Keys National Wildlife Refuge	NWR	FL
Cedar Keys Wilderness	W	FL
Chassahowitzka National Wildlife Refuge	NWR	FL
Chassahowitzka Wilderness	W	FL
Crystal River National Wildlife Refuge	NWR	FL
Delta National Wildlife Refuge	NWR	LA
Egmont Key National Wildlife Refuge	NWR	FL
Everglades National Park	NP	FL
Flower Garden Banks National Marine Sanctuary	NMS	TX
Grand Bay National Estuarine Research Reserve	NERR	AL-MS
Grand Bay National Wildlife Refuge	NWR	AL-MS
Gulf Islands National Seashore	NS	FL-MS
Gulf Sturgeon Critical Habitat	CH	FL-LA
Island Bay National Wildlife Refuge	NWR	FL
Island Bay Wilderness	W	FL
J.N. “Ding” Darling National Wildlife Refuge	NWR	FL
J.N. “Ding” Darling Wilderness	W	FL
Laguna Atascosa National Wildlife Refuge	NWR	TX
Lower Suwanee National Wildlife Refuge	NWR	TX
Mandalay National Wildlife Refuge	NWR	LA
Marjory Stoneman Douglas Wilderness	W	FL
Matlacha Pass National Wildlife Refuge	NWR	FL
McFaddin National Wildlife Refuge	NWR	TX
Mission-Aransas National Estuarine Research Reserve	NERR	TX
Moody National Wildlife Refuge	NWR	TX
Padre Island National Seashore	NS	TX
Passage Key National Wildlife Refuge	NWR	FL
Passage Key Wilderness	W	FL
Pine Island National Wildlife Refuge	NWR	FL

Table E-2. Protected and Sensitive Habitats in the Gulf of Mexico (continued)

Protected and Sensitive Habitat	Type	State
Pinellas National Wildlife Refuge	NWR	FL
Piping Plover Critical Habitat	CH	FL-TX
Rookery Bay National Estuarine Research Reserve	NERR	FL
Sabine National Wildlife Refuge	NWR	LA
San Bernard National Wildlife Refuge	NWR	TX
Shell Keys National Wildlife Refuge	NWR	LA
St. Marks National Wildlife Refuge	NWR	FL
St. Marks Wilderness	W	FL
St. Vincent National Wildlife Refuge	NWR	FL
Ten Thousand Islands National Wildlife Refuge	NWR	FL
Texas Point National Wildlife Refuge	NWR	TX
Weeks Bay National Estuarine Research Reserve	NERR	AL
West Indian Manatee Critical Habitat	CH	FL
Whooping Crane Critical Habitat	CH	TX

Source: DOC/NOAA and DOI 2006, Wilderness.net 2006

Notes: CH – Critical Habitat
NERR – National Estuarine Research Reserve
NMS – National Marine Sanctuary
NP – National Park
NS – National Seashore
NWR – National Wildlife Refuge
W – Wilderness

Table E-3. Protected and Sensitive Habitats on the U.S. Pacific Coast

Protected and Sensitive Habitat	Type	State
Admiralty Island National Monument	NM	AK
Alaska Maritime National Wildlife Refuge	NWR	AK
Alaska Peninsula National Wildlife Refuge	NWR	AK
Aleutian Islands Wilderness	W	AK
Aniakchak National Monument and Preserve	NM	AK
Bandon Marsh National Wildlife Refuge	NWR	OR
Becharof National Wildlife Refuge	NWR	AK
Becharof Wilderness	W	AK
Bogoslof Wilderness	W	AK
California Coastal Chinook Salmon ESU Critical Habitat	CH	CA
California Coastal National Monument	NM	CA
Cape Krusenstern National Monument	NM	AK
Cape Meares National Wildlife Refuge	NWR	OR
Castle Rock National Wildlife Refuge	NWR	CA
Central California Coast Coho Salmon ESU Critical Habitat	CH	CA
Central California Steelhead ESU Critical Habitat	CH	CA
Central Valley Spring-run Chinook Salmon ESU Critical Habitat	CH	CA
Channel Islands National Marine Sanctuary	NMS	CA
Chuck River Wilderness	W	AK
Chugach National Forest	NF	AK
Coastal California Gnatcatcher Critical Habitat	CH	CA
Columbia River Chum Salmon ESU Critical Habitat	CH	OR/WA
Copalis National Wildlife Refuge	NWR	WA
Cordell Bank National Marine Sanctuary	NMS	CA
Coronation Island Wilderness	W	AK
D.E. San Francisco Bay National Wildlife Refuge	NWR	CA
Dungeness National Wildlife Refuge	NWR	WA
Elkhorn Slough National Estuarine Research Reserve	NERR	CA
Ellicott Slough National Wildlife Refuge	NWR	CA
Farallon Wilderness	W	CA
Flattery Rocks National Wildlife Refuge	NWR	WA
Forrester Island Wilderness	W	AK
Glacier Bay National Park	NP	AK
Glacier Bay Wilderness	W	AK

Table E-3. Protected and Sensitive Habitats on the U.S. Pacific Coast (continued)

Protected and Sensitive Habitat	Type	State
Grays Harbor National Wildlife Refuge	NWR	WA
Guadalupe-Nipomo Dunes National Wildlife Refuge	NWR	CA
Gulf of the Farallones National Marine Sanctuary	NMS	CA
Hazy Island Wilderness	W	AK
Hood Canal Summer-run Chum Salmon ESU Critical Habitat	CH	WA
Humboldt Bay National Wildlife Refuge	NWR	CA
Izembeck National Wildlife Refuge	NWR	AK
Izembeck Wilderness	W	AK
Kachemak Bay National Estuarine Research Reserve	NERR	AK
Katmai National Park and Reserve	NP	AK
Katmai Wilderness	W	AK
Kenai Fjords National Park	NP	AK
Kenai National Wildlife Refuge	NWR	AK
Kenai Wilderness	W	AK
Kootzoonoo Wilderness	W	AK
Kuiu Wilderness	W	AK
Lewis and Clark National Wildlife Refuge	NWR	OR
Los Padres National Forest	NF	CA
Lower Columbia River Chinook Salmon ESU Critical Habitat	CH	OR/WA
Marbled Murrelet Critical Habitat	CH	AK
Marin Islands National Wildlife Refuge	NWR	CA
Maurille Island Wilderness	W	AK
Misty Fjords National Monument	NM	AK
Mollie Beattie Wilderness	W	AK
Monterey National Marine Sanctuary	NMS	CA
Nestucca Bay National Wildlife Refuge	NWR	OR
Nisqually National Wildlife Refuge	NWR	WA
Northern California Steelhead ESU Critical Habitat	CH	CA
North Pacific Right Whale Critical Habitat	CH	AK
Nunivak Wilderness	W	AK
Olympic Coast National Marine Sanctuary	NMS	WA
Olympic National Forest	NF	WA
Olympic Wilderness	W	WA
Oregon Islands National Wildlife Refuge	NWR	OR

Table E-3. Protected and Sensitive Habitats on the U.S. Pacific Coast (continued)

Protected and Sensitive Habitat	Type	State
Oregon Islands Wilderness	W	OR
Padilla Bay National Estuarine Research Reserve	NERR	WA
Petersburg Creek-Duncan Salt Chuck Wilderness	W	AK
Point Reyes National Seashore	NS	CA
Protection Island National Wildlife Refuge	NWR	WA
Puget Sound Chinook Salmon ESU Critical Habitat	CH	WA
Quillayute Needles National Wildlife Refuge	NWR	WA
Russell Fjord Wilderness	W	AK
Sacramento River Winter-run Chinook Salmon ESU Critical Habitat	CH	CA
Salinas River National Wildlife Refuge	NWR	CA
San Diego National Wildlife Refuge	NWR	CA
San Francisco Bay National Estuarine Research Reserve	NERR	CA
San Juan Islands National Wildlife Refuge	NWR	WA
San Pablo Bay National Wildlife Refuge	NWR	CA
Seal Beach National Wildlife Refuge	NWR	CA
Semidi Wilderness	W	AK
Siletz Bay National Wildlife Refuge	NWR	OR
Simeonof Islands Wilderness	W	AK
Sinuslaw National Forest	NF	OR
South Baranof Wilderness	W	AK
South Etolin Wilderness	W	AK
South Prince of Wales Wilderness	W	AK
South Slough National Estuarine Research Reserve	NERR	OR
South-Central California Coast Steelhead ESU Critical Habitat	CH	CA
Southern California Steelhead ESU Critical Habitat	CH	CA
Southern Oregon/Northern California Coasts Coho Salmon ESU Critical Habitat	CH	CA/OR
Southern Resident Killer Whale DPS Critical Habitat	CH	WA
Spectacled Eider Critical Habitat	CH	AK
Steller Sea Lion Conservation Area	Conservation Area	AK
Steller Sea Lion Critical Habitat	CH	CA/OR/AK
Steller's Eider Critical Habitat	CH	AK

Table E-3. Protected and Sensitive Habitats on the U.S. Pacific Coast (continued)

Protected and Sensitive Habitat	Type	State
Stikine-LeConte Wilderness	W	AK
Sweetwater Marsh National Wildlife Refuge	NWR	CA
Three Arch Rocks National Wildlife Refuge	NWR	OR
Tidewater Goby Critical Habitat	CH	CA
Tijuana River National Estuarine Research Reserve	NERR	CA
Tijuana Slough National Wildlife Refuge	NWR	CA
Tebenkof Bay Wilderness	W	AK
Togiak National Wildlife Refuge	NWR	AK
Tongass National Forest	NF	AK
Tracy Arm-Fords Terror Wilderness	W	AK
Unimak Wilderness	W	AK
Warren Island Wilderness	W	AK
Washington Islands Wilderness	W	WA
West Chichagof-Yakobi Wilderness	W	AK
Western Snowy Plover Critical Habitat	CH	CA-WA
Willapa National Wildlife Refuge	NWR	WA
Wrangell-St. Elias Wilderness	W	AK

Source: DOC/NOAA and DOI 2006, 50 CFR 226.204, 226.205, 226.210, and 226.212, Wilderness.net 2006

Notes: CH – Critical Habitat
NERR – National Estuarine Research Reserve
NF – National Forest
NM – National Monument
NMS – National Marine Sanctuary
NP – National Park
NS – National Seashore
W – Wilderness

Table E-4. Protected and Sensitive Habitats in the Pacific Islands

Protected and Sensitive Habitat	Type	State/Territory
Bird Island Marine Sanctuary	Marine Sanctuary	CNMI
Hawaiian Monk Seal Critical Habitat	CH	HI
Fagatele Bay National Marine Sanctuary	NMS	AS
Guam National Wildlife Refuge	NWR	GU
Hawaiian Islands National Wildlife Refuge	NWR	HI
Forbidden Island Marine Sanctuary	Marine Sanctuary	CNMI
Kilauea Point National Wildlife Refuge	NWR	HI
Midway Atoll National Wildlife Refuge	NWR	HI
National Park of American Samoa	NP	AS
Northwestern Hawaiian Islands Marine National Monument	NM	HI
Hawaii Volcanoes Wilderness	W	HI
Hawaiian Islands Humpback Whale National Marine Sanctuary	NMS	HI

Source: DOC/NOAA and DOI 2006, Wilderness.net 2006

Notes: AS– American Samoa
CH – Critical Habitat
CNMI– Commonwealth of the Northern Mariana Islands
GU – Guam
NM – National Monument
NMS – National Marine Sanctuary
NP – National Park
NWR – National Wildlife Refuge
W – Wilderness

Table E-5. Protected Invertebrates and Plants Inhabiting the ROI

Common Name	Scientific Name	Federal Status under ESA	ROI Occurrence
White abalone	*Haliotis sorenseni*	E	CA
Elkhorn coral	*Acropora palmate*	T	FL, PR, VI
Staghorn coral	*Acropora cervicornis*	T	FL, PR, VI
Johnson's seagrass	*Halophila johnsonii*	T/CH	FL

Source: NMFS 2006, USFWS 2006

Notes: CH – Critical Habitat
E – Federally listed as endangered
PR – Puerto Rico
T – Federally listed as threatened
VI – U.S. Virgin Islands

Table E-6. Sea Turtles Inhabiting the ROI

Common Name	Scientific Name	Federal Status under ESA	ROI Occurrence
Green	*Chelonia mydas*	T*/CH	Entire
Hawksbill	*Eretmochelys imbricate*	E/CH	South Atlantic Coast, Gulf of Mexico, Pacific Area Islands
Kemp's ridley	*Lepidochelys kempii*	E	Atlantic Coast
Leatherback	*Dermochelvs coriacea schlegelii*	E/CH	Entire
Loggerhead	*Caretta caretta gigas*	T	Entire
Olive ridley	*Lepidochelys olivacea*	T	South Atlantic Coast, Pacific Coast (rare in OR, WA, AK), Pacific Islands

Source: USFWS 2006

Notes: CH ─ Critical habitat in a ROI
E ─ Federally listed as endangered
T ─ Federally listed as threatened
* ─ Florida nesting population listed as endangered

Table E-7. Protected Fisheries Resources on the U.S. Atlantic Coast

Common Name	Scientific Name	Federal Status under ESA	Occurrence
Atlantic salmon (Gulf of Maine DPS)	*Salmo salar*	E	ME
Smalltooth sawfish	*Pristis pectinata*	E	NC-FL
Shortnose sturgeon	*Acipenser brevirostrum*	E	Entire Atlantic Coast

Source: USFWS 2006
Notes: E – Federally listed as endangered

Table E-8. Protected Fisheries Resources in the Gulf of Mexico

Common Name	Scientific Name	Federal Status under ESA	Occurrence
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T/CH	FL-LA
Smalltooth sawfish	*Pristis pectinata*	E	Entire Gulf of Mexico

Source: USFWS 2006
Notes: CH – Critical Habitat
E – Federally listed as endangered
T – Federally listed as threatened

Table E-9. Protected Fisheries Resources on the U.S. Pacific Coast

Common Name	Scientific Name	Federal Status under ESA
Chinook salmon	*Oncorhynchus tshawytscha*	E/T/CH
Chinook salmon ESUs:	California Coastal ESU	T/CH
	Central Valley spring-run ESU	T/CH
	Lower Columbia River ESU	T/CH
	Puget Sound ESU	T/CH
	Sacramento River winter-run ESU	E/CH
Chum salmon	*Oncorhynchus keta*	E/T/CH
Chum salmon ESUs:	Hood Canal summer-run ESU	T/CH
	Columbia River ESU	T/CH
Coho salmon	*Oncorhynchus kisutch*	E/T/CH
Coho salmon ESUs:	Southern Oregon/Northern California Coasts ESU	T/CH
	Central California Coast ESU	E/CH
Green sturgeon (Southern DPS)	*Acipenser medirostris*	T
Sockeye salmon	*Oncorhynchus nerka*	E/T
Steelhead	*Oncorhynchus mykiss*	E/T/CN/CH
Steelhead ESUs:	Northern California ESU	T/CH
	Central California ESU	T/CH
	South-Central California Coast ESU	T/CH
	Southern California ESU	E/CH
Tidewater goby	*Eucyclogobius newberryi*	E/CH
White abalone	*Haliostis sorenseni*	E

Source: 50 CFR 226.204, 226.205, 226.210, and 226.212

Notes: CH – Critical habitat
CN – Candidate species
E – Federally listed as endangered
T – Federally listed as threatened

Table E-10. Protected Birds of the U.S. Atlantic Coast

Common Name	Scientific Name	Federal Status under ESA	Distribution	Migration Pattern
Bald eagle	*Haliaeetus leucocephalus*	T/AD	Locally throughout most of North America, including coasts	Occurs year-round in many coastal areas. Breeds in spring, and some individuals migrate south during winter, while many remain in the northeast year-round.
Piping plover	*Charadrius melodus*	T/CH	Atlantic coast, Great Lakes, Northern Great Plains, Gulf coast, and Caribbean. Critical habitat for wintering populations from North Carolina south to Florida.	Breeds on sandy beaches in isolated colonies on the northeast coast and Great Lakes region from March to September, where they spend the summer. Winters along southeastern coast.
Roseate tern	*Sterna dougallii dougallii*	E	Atlantic coast and Caribbean	Breeds on islands and protected sand spits. Occurs on northeast coast during spring and summer and migrates south as far as the Caribbean during fall and winter.
Whooping crane	*Grus Americana*	NEP	Virginia to Florida	Winters in the Gulf coast of Texas October to April, when they migrate north to Canada.
Wood stork	*Mycteria americana*	E	South Carolina to Florida	Breeds in Alabama, Florida, Georgia, and South Carolina.
Yellow-shouldered blackbird	*Agelains xanthomus*	E/CH	Critical habitat areas in southwest Puerto Rico and Isla Mona	Resident species in Puerto Rico and Isla Mona. Nesting season April to October.

Source: USFWS 2006

Notes: AD – Proposed Delisting
CH – Critical Habitat in the ROI
E – Federally listed as endangered
NEP – Non-essential population
T – Federally listed as threatened

Table E-11. Protected Birds of the Gulf of Mexico

Common Name	Scientific Name	Federal Status under ESA	Distribution	Migration Pattern
Bald eagle	*Haliaeetus leucocephalus*	T/AD	Locally throughout most of North America, including coasts	Winters along central and southeast coast and Texas coast with year-round populations in Florida and Gulf coasts east of Texas.
Brown pelican	*Pelecanus occidentalis*	E	Texas to Mississippi	Year-round resident in the southeast.
Piping plover	*Charadrius melodus*	T/CH	Atlantic coast, Great Lakes, Northern Great Plains, Gulf of Mexico. Critical habitat for wintering populations entire Gulf Coast.	Winters on the southeast and Gulf coasts and the Caribbean October to March. Breeding: Atlantic coast, Great Lakes, and Northern Great Plains.
Whooping crane	*Grus Americana*	E/CH	Critical habitat is on Texas coast	Winters in the Gulf coast of Texas October to April, when they migrate north to Canada.
Wood stork	*Mycteria americana*	E	Alabama (Mississippi Valley)	Breeds in Alabama, Florida, Georgia, and South Carolina.

Source: USFWS 2006

Notes: AD – Proposed Delisting
CH – Critical Habitat in the ROI
E – Federally listed as endangered
T – Federally listed as threatened

Table E-12. Protected Birds of the U.S. Pacific Coast

Common Name	Scientific Name	Federal Status under ESA	Distribution	Migration Pattern
Bald eagle	*Haliaeetus leucocephalus*	T/AD	Locally throughout most of North America, including coasts	Year-round resident and breeds in most Pacific continental coastal areas. Some migration occurs from northern California and Oregon to southern California coast, where small population spends the summer.
Brown pelican	*Pelecanus occidentalis*	E	Pacific coast	Breeds in southern California March to April and is found from southern Mexico to central California and occasionally from northern California to Washington.
California Condor	*Gymnogyps californianus*	E	Condors reintroduced into mountains of Los Angeles, vicinity of Big Sur, and Arizona	On coast of California.
California clapper rail	*Rallus longirostris obsoletus*	E	San Francisco Bay area, California	Year-round resident on central and southern California coast.
California least tern	*Sterna antillarum browni*	E	Central and southern coast of California	Breeds and spends spring and summer on southern and central California coasts. Migrates to Central America and south in fall for the winter.
Coastal California Gnatcatcher	*Poliioptila californica californica*	T/CH	Southern California coast. Critical habitat in Southern California.	Non-migratory inhabiting coastal sage scrub from Los Angeles county south to Baja California, Mexico.
Light-footed clapper rail	*Rallus longirostris levipes*	E	Southern California coast	Year-round resident on central and southern California coast.

Table E-12. Protected Birds of the U.S. Pacific Coast (continued)

Common Name	Scientific Name	Federal Status under ESA	Distribution	Migration Pattern
Marbled murrelet	*Brachyrampus marmoratus marmoratus*	T/CH	Alaska coast south to California coast. Critical habitat in Alaska.	Breeds from northern Washington to San Francisco coast. Winters along entire Pacific coast. Summers from Kenai Peninsula, Barren Islands, and Aleutian Islands south along the coast of North America.
San Clemente loggerhead shrike	*Lanius ludovicianus mearnsi*	E	San Clemente Island, California	Year-round resident on San Clemente Island.
San Clemente sage sparrow	*Amphispiza belli clementeae*	T	San Clemente Island, California	Year-round resident on San Clemente Island.
Short-tailed albatross	*Phoebastria albatrus*	E	Open Pacific Ocean from Alaska to California	Found most commonly in summer and fall. Breeds in Japan, Midway, and Hawaii and migrates north for summer and south for winter.
Spectacled eider	*Somateria fisheri*	T/CH	Coast of Alaska	Breeds on the coast of Alaska on the Bering Sea and the Arctic Ocean. Migrates south for the winter but winter range is unknown.
Steller's eider	*Polysticta stelleri*	T/CH	Alaska Coast, accidental south to California. Critical habitat in Alaska.	Accidental in summer in Pacific waters. Breeds on eastern Arctic coast and migrates to Aleutian Islands and western coast of Alaska.
Western snowy plover	*Charadrius alexandrinus nivosus*	T/CH	Washington to California. Critical habitat in California, Oregon, and Washington.	Summers along Pacific coast and migrates south to Mexico and South America during winter.

Source: USFWS 2006

Notes: AD – Proposed Delisting
CH – Critical Habitat in the ROI
E – Federally listed as endangered
T – Federally listed as threatened

Table E-13. Protected Birds of the Pacific Islands

Common Name	Scientific Name	Federal Status under ESA	Distribution	Migration Pattern
Guam bridled white-eye	*Zosterops conspicillatus conspicillatus*	E	Guam	Year-round resident, habitat includes beach strand.
Hawaiian Coot	*Fulica americana alai*	E	Hawaii coasts	Year-round resident Hawaiian Islands.
Hawaiian dark-rumped petrel	*Pterodroma phaeopygia sandwichensis*	E	Pacific Ocean around Hawaii	Found on the Hawaiian Islands from May to mid-November during breeding; central Pacific from mid-November through April.
Hawaiian duck	*Anas wyvilliana*	E	Pearl Harbor, Hawaii	Year-round resident on selected Hawaiian Islands.
Hawaiian stilt	*Himantopus mexicanus knudseni*	E	Hawaii coasts	Year-round resident Hawaiian Islands.
Laysan duck	*Anas laysanensis*	E	Laysan, Hawaii	Year-round resident Laysan Atoll, Hawaii.
Laysan finch	*Telespyza cantans*	E	Laysan, Pearl, and Hermes atolls, Hawaii	Year-round resident Laysan, Pearl, and Hermes atolls, Hawaii.
Mariana crow	*Corvus kubaryii*	E	Guam	Year-round resident, habitat includes beach strand.
Newell's Townsend's shearwater	*Puffinus auricularis newelli*	E	Pacific Ocean around Hawaii	Found on the island of Kauai April through September during breeding. On the open ocean from October to April.
Nihoa finch	*Telespyza ultima*	E	Nihoa Island, Hawaii	Year-round resident Nihoa Island, Hawaii.
Short-tailed albatross	*Phoebastria albatrus*	E	Open Pacific Ocean from Alaska to California	Most common in summer and fall. Breeds in Midway and Hawaii.

Source: USFWS 2006

Notes: E – Federally listed as endangered

Table E-14. Marine Mammals Common in the NMFS Northeast Region

Common Name	Scientific Name	Federal Status under ESA	Distribution
Phocids (true or earless seals)			
Bearded seal	*Erignathus barbatus*	*	Unusual
Gray seal	*Halichoens griseus*	*	Year-round resident
Harbor seal	*Phoca vitulina*	*	Year-round resident
Harp seal	*Phoca groenlandica*	*	More common in winter
Hooded seal	*Cystophora cristata*	*	More common in winter
Ringed seal	*Phoca hispida*	*	More common in winter
Mysticetes (baleen whales)			
Blue whale	*Balaenoptera musculus*	E	Population highest in spring/summer due to northward migration from subtropics
Bryde's whale	*Balaenoptera edeni*	*	Located in southern part of ROI
Fin whale	*Balaenoptera physalus*	E	Year-round resident, peak from April to October, visits coastal waters in many areas
Minke whale	*Balaenoptera. acutorostrata*	*	Abundant from April to November; frequent coastal regions, bays, offshore banks
Humpback whale	*Megaptera novaeangliae*	E	Migratory population, with peak abundance mainly during summer but also in autumn; coastal distribution in the summer. Breeds in the Caribbean within 8–16 km of shore
North Atlantic right whale	*Eubalaena glacialis*	E/CH	Population highest in spring/summer
Sei whale	*Balaenoptera borealis*	E	Range from ME to VA
Odontocetes (toothed whales and dolphins)			
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	*	Common inshore spring through autumn, uncommon from DE to VA
Atlantic spotted dolphin	*Stenella frontalis*	*	Occur in southern part of ROI, generally pelagic
Blainville's beaked whale	*Mesoplodon densirostris*	*	Pelagic habitat
Clymene dolphin	*Stenella clymene*	*	Occur in southern ROI, pelagic
Cuvier's beaked whale	*Ziphius cavirostris*	*	Common in summer

Table E-14. Marine Mammals Common in the NMFS Northeast Region (continued)

Common Name	Scientific Name	Federal Status under ESA	Distribution
Dwarf sperm whale	*Kogia sima*	*	Occur from DE to VA
False killer whale	*Pseudorca crassidens*	*	Occur from DE to VA
Gervais' beaked whale	*Mesoplodon europaeus*	*	Oceanic habitat
Killer whale	*Orcinus orca*	*	Occasional visitor
Long-finned pilot whale	*Globicephala melas*	*	Pelagic, moves inshore late summer and fall
Northern bottlenose whale	*Hyperoodon ampullatus*	*	Occasional, seen in fall and winter
Pantropical spotted dolphin	*Stenella attenuata*	*	Uncommon
Pygmy sperm whale	*Kogia breviceps*	*	Rare north of Cape Cod, MA
Risso's dolphin	*Grampus griseus*	*	Uncommon north of Cape Cod, MA
Rough-toothed dolphin	*Steno bredanensis*	*	Pelagic habitat
Short-finned pilot whale	*Globicephala macrorhynchus*	*	Generally pelagic, occurs in southern ROI (DE to VA) in the summer
Sowerby's beaked whale	*Mesoplodon bidens*	*	Pelagic habitat
Sperm whale	*Physeter macrocephalus*	E	Mainly in deep waters, migrates to shallower waters from ME to NC
Spinner dolphin	*Stenella longirostris*	*	Occurs in southern ROI (DE to VA)
Striped dolphin	*Stenella coeruleoalba*	*	Common, pelagic habitat
True's beaked whale	*Mesoplodon mirus*	*	Pelagic habitat
Beluga whale	*Delphinapterus leucas*	*	Occasional strays, seen in winter
Short-beaked common dolphin	*Delphinus delphis*	*	Generally pelagic, common
Bottlenose dolphin	*Tursiops truncatus*	*	Seen in summer offshore, uncommon
White-beaked dolphin	*Lagenorhynchus albirostris*	*	Occur from November to June

Table E-14. Marine Mammals Common in the NMFS Northeast Region (continued)

Common Name	Scientific Name	Federal Status under ESA	Distribution
Harbor porpoise	*Phocoena phocoena*	*	Common in inshore areas from April to October; strandings reported in Florida; sometimes enters bays and river mouths

Source: Geraci and Lounsbury 2005

Notes: CH – Critical Habitat in the ROI
E – Federally listed as endangered
T –Federally listed as threatened
* – only protected under MMPA

Table E-15. Marine Mammals Common in the NMFS Southeast Region

Common Name	Scientific Name	Federal Status under ESA	Distribution
Phocids (true or earless seals)			
Harbor seal	*Phoca vitulina*	*	Occasional
Mysticetes (baleen whales)			
Blue whale	*Balaenoptera musculus*	E	Population highest in spring/summer due to northward migration from subtropics
Bryde's whale	*Balaenoptera edeni*	*	Common
Fin whale	*Balaenoptera physalus*	E	Year-round resident, visits coastal waters in many areas
Minke whale	*Balaenoptera acutorostrata*	*	Uncommon in Gulf of Mexico, occur in other waters of the ROI; frequent coastal regions, bays, offshore banks
Humpback whale	*Megaptera novaeangliae*	E	Migratory population moves along the southeastern U.S. on the way to its wintering grounds, occur January through May
North Atlantic right whale	*Eubalaena glacialis*	E/CH	Wintering and calving grounds are along Georgia and Florida, occur December through March, nearshore
Sei whale	*Balaenoptera borealis*	E	Southern portion of range during spring/summer
Odontocetes (toothed whales and dolphins)			
Atlantic spotted dolphin	*Stenella frontalis*	*	Generally pelagic
Blainville's beaked whale	*Mesoplodon densirostris*	*	Pelagic
Bottlenose dolphin	*Tursiops truncatus*	*	Both coastal and offshore variety are common in this ROI, frequents bays and estuaries
Clymene dolphin	*Stenella clymene*	*	Pelagic
Cuvier's beaked whale	*Ziphius cavirostris*	*	Pelagic
Dwarf sperm whale	*Kogia sima*	*	Pelagic
Gervais' beaked whale	*Mesoplodon europaeus*	*	Oceanic

Table E-15. Marine Mammals Common in the NMFS Southeast Region (continued)

Common Name	Scientific Name	Federal Status under ESA	Distribution
Harbor porpoise	*Phocoena phocoena*	*	Rare in southeast Atlantic, not in Gulf of Mexico/Caribbean
False killer whale	*Pseudorca crassidens*	*	Pelagic
Fraser's dolphin	*Lagenodelphis hosei*	*	Rare in southeast Atlantic and Gulf of Mexico, occurs in Caribbean, pelagic
Killer whale	*Orcinus orca*	*	Uncommon
Long-finned pilot whale	*Glodicephala melas*	*	Northern part of southeast Atlantic, rare, pelagic
Melon-headed whale	*Peponocephala electra*	*	Rare in southeast Atlantic, occur in Gulf of Mexico, pelagic
Pantropical spotted dolphin	*Stenella attenuata*	*	Offshore and coastal groups
Pygmy killer whale	*Feresa attenuata*	*	Pelagic
Pygmy sperm whale	*Kogia breviceps*	*	Pelagic
Risso's dolphin	*Grampus griseus*	*	Pelagic
Rough-toothed dolphin	*Steno bredanensis*	*	Pelagic
Short-finned pilot whale	*Globicephala macrorhynchus*	*	Pelagic
Sperm whale	*Physeter macrocephalus*	E	Generally pelagic
Spinner dolphin	*Stenella longirostris*	*	Common, pelagic and coastal, daytime in shallow bays
Striped dolphin	*Stenella coeruleoalba*	*	Pelagic
True's beaked whale	*Mesoplodon mirus*	*	Pelagic
Short-beaked common dolphin	*Delphinus delphis*	*	Pelagic
Trichechids (manatees)			
West Indian manatee	*Trichechus manatus*	E/CH	Resident in rivers and coastal waters of peninsular Florida and southern Georgia; previous records in Carolinas and Texas

Source: Geraci and Lounsbury 2005

Notes: CH – Critical Habitat in the ROI

E – Federally listed as endangered

* – only protected under MMPA

Table E-16. Marine Mammals Common in the NMFS Southwest Region

Common Name	Scientific Name	Federal Status under ESA	Distribution
Otarrids (eared seals or sea lions)			
California sea lion	*Zalophus californianus*	*	Year-round resident
Guadalupe fur seal	*Arctocephalus townsendi*	T	Breeds off Baja California
Northern elephant seal	*Mirounga angustirostris*	*	Year-round resident
Northern fur seal	*Callorhinus ursinus*	*	Year-round resident
Steller sea lion	*Eumetopias jubatas*	T/CH	Visitor to area from southern breeding grounds, coastal to pelagic
Phocids (true or earless seals)			
Harbor seal	*Phoca vitulina*	*	Year-round resident
Mysticetes			
Blue whale	*Balaenoptera musculus*	E	Population highest in spring due to northward migration from subtropics
Bryde's whale	*Balaenoptera edeni*	*	Rare in southern California
Fin whale	*Balaenoptera physalus*	E	Common in summer, visits coastal waters in many areas, migratory
Gray whale	*Eschrichtius robustus*	*	Migration population, with peak abundance in winter and spring
Humpback whale	*Megaptera novaeangliae*	E	Migratory population, with peak abundance mainly during summer but also in autumn
Minke whale	*Balaenoptera acutorostrata*	*	Year-round resident, frequent coastal regions, bays, offshore banks
North Pacific right whale	*Eubalaena japonica*	E	Only two sightings in southern California
Sei whale	*Balaenoptera borealis*	E	Seen in summer/fall during migration, pelagic
Odontocetes (toothed whales and dolphins)			
Baird's beaked whale	*Berardius bairdii*	*	Peak June-October, pelagic
Blainville's beaked whale	*Mesoplodon densirostris*	*	Pelagic
Bottlenose dolphin	*Tursiops truncatus*	*	Year-round resident; frequents bays and estuaries in southern regions

Table E-16. Marine Mammals Common in the NMFS Southwest Region (continued)

Common Name	Scientific Name	Federal Status under ESA	Distribution
Cuvier's beaked whale	*Ziphius cavirostris*	*	Pelagic
Dall's porpoise	*Phocoenoides dalli*	*	Year-round resident, nearshore in deep water, pelagic
Dwarf sperm whale	*Kogia sima*	*	Rare further north, pelagic
Ginkgo-toothed beaked whale	*Mesoplodon ginkgodens*	*	Rare, pelagic
False killer whale	*Pseudorca crassidens*	*	Occasional, pelagic
Harbor porpoise	*Phocoena phocoena*	*	Coastal in bays, estuaries, and rivers; frequent offshore banks
Hubb's beaked whale	*Mesoplodon carlhubbsi*	*	Pelagic
Killer whale	*Orcinus orca*	*	Incidental accounts of transients in area, most likely from northern latitudes; common inshore visitors
Long-beaked common dolphin	*Delphinus capensis*	*	Occur in southern California, prefer shallow, warm waters
Northern right whale dolphin	*Lissodelphis borealis*	*	Inshore winter through spring, pelagic
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	*	Year-round resident, peak winter through spring, pelagic
Perrin's beaked whale	*Mesoplodon perrini*	*	Pelagic
Pygmy sperm whale	*Kogia breviceps*	*	Pelagic
Risso's dolphin	*Grampus griseus*	*	Year-round resident, pelagic
Rough-toothed dolphin	*Steno bredanensis*	*	Uncommon, pelagic
Short-beaked common dolphin	*Delphinus delphis*	*	Year-round resident, pelagic
Short-finned pilot whale	*Globicephala macrorhynchus*	*	Small year-round population, peak late winter/early spring
Sperm whale	*Physeter macrocephalus*	E	Peak from November-April, generally pelagic
Stejneger's beaked whale	*Mesoplodon stejnegeri*	*	Pelagic
Striped dolphin	*Stenella coeruleoalba*	*	Pelagic

Table E-16. Marine Mammals Common in the NMFS Southwest Region (continued)

Common Name	Scientific Name	Federal Status under ESA	Distribution
Southern sea otter	*Enhydra lutris nereis*	T	Year-round resident

Source: Geraci and Lounsbury 2005

Notes: CH – Critical Habitat in the ROI

E – Federally listed as endangered

T – Federally listed as threatened

* – only protected under MMPA

Table E-17. Marine Mammals Common in the NMFS Northwest Region

Common Name	Scientific Name	Federal Status under ESA	Distribution
Otarrids (earred seals or sea lions)			
Northern elephant seal	*Mirounga angustirostris*	*	Year-round resident
California sea lion	*Zalophus californianus*	*	Year-round resident
Steller sea lion	*Eumetopias jubatas*	T/CH	Visitor to area from southern breeding grounds, coastal to pelagic
Northern fur seal	*Callorhinus ursinus*	*	Year-round resident
Phocids (true or earless seals)			
Harbor seal	*Phoca vitulina*	*	Year-round resident
Mysticetes (baleen whales)			
Blue whale	*Balaenoptera musculus*	E	Occur spring-fall; pelagic but may frequent coastal waters and shallow banks
Gray whale	*Eschrichtius robustus*	*	Found March-May, October-December, few in summer
Fin whale	*Balaenoptera physalus*	E	Occur in summer, generally pelagic, visits coastal waters in many areas, migratory
Humpback whale	*Megaptera novaeangliae*	E	Migratory population, with peak abundance mainly during summer but also in autumn
Minke whale	*Balaenoptera acutorostrata*	*	Year-round resident; frequents coastal regions, bays, and offshore banks
North Pacific right whale	*Eubalaena japonica*	E	Uncommon
Sei whale	*Balaenoptera borealis*	E	Seen in summer and fall
Odontocetes (toothed whales and dolphins)			
Baird's beaked whale	*Berardius bairdii*	*	Occur April-October, pelagic
Cuvier's beaked whale	*Ziphius cavirostris*	*	Pelagic
False killer whale	*Pseudorca crassidens*	*	Occasional, pelagic
Hubb's beaked whale	*Mesoplodon carlhubbsi*	*	Pelagic

Table E-17. Marine Mammals Common in the NMFS Northwest Region (continued)

Common Name	Scientific Name	Federal Status under ESA	Distribution
Killer whale	*Orcinus orca*	*/E	Southern Resident population listed as endangered. Inshore year-round.
Stejneger's beaked whale	*Mesoplodon stejnegeri*	*	Pelagic
Sperm whale	*Physeter macrocephalus*	E	Seen spring-fall, generally pelagic
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	*	Year-round resident, generally pelagic, nearshore in deep water
Pygmy sperm whale	*Kogia breviceps*	*	Pelagic
Northern right whale dolphin	*Lissodelphis borealis*	*	Uncommon
Risso's dolphin	*Grampus griseus*	*	Occur spring-fall, pelagic
Short-finned pilot whale	*Globicephala macrorhynchus*	*	Uncommon
Short-beaked common dolphin	*Delphinus delphis*	*	Rare, pelagic
Striped dolphin	*Stenella coeruleoalba*	*	Rare, pelagic
Dall's porpoise	*Phocoenoides dalli*	*	Year-round resident, pelagic; nearshore in deep water
Harbor porpoise	*Phocoena phocoena*	*	Coastal in bays, estuaries, and rivers; frequent offshore banks
Mustelid (otters)			
Northern sea otter	*Enhydra lutris kenyoni*	T	Year-round resident

Source: Geraci and Lounsbury 2005

Notes: CH – Critical Habitat in the ROI
E – Federally listed as endangered
T – Federally listed as threatened
* – only protected under MMPA

Table E-18. Marine Mammals Common in the NMFS Alaska Region

Common Name	Scientific Name	Federal Status under ESA	Distribution
Otarrids (eared seals or sea lions)			
Bearded seal	*Erignathus barbatus*	*	Occur along continental shelf of Beaufort, Chukchi, and Bering Seas
Northern fur seal	*Callorhinus ursinus*	*	Found in Pribilof Islands and San Miguel Island, breeding areas, occur summer-fall
Steller sea lion	*Eumetopias jubatas*	T/E/CH	Distributed around North Pacific rim, northward to Bering Sea and along eastern shore of Kamchatka Peninsula, Gulf of Alaska, and Aleutian Islands
Phocids (true or earless seals)			
Harbor seal	*Phoca vitulina*	*	Year-round resident, northern extent is Bristol Bay/Kuskokwim Bay area
Northern elephant seal	*Mirounga angustirostris*	*	Males feed near eastern Aleutian Islands, and in Gulf of Alaska
Ribbon seal	*Histriophoca fasciata*	*	Found in Bering and Chukchi seas; winter-spring, offshore along ice front; summer range unknown; breeds along ice front
Ringed seal	*Phoca hispida*	*	Found in southern Bering Sea
Spotted seal	*Phoca largha*	*	Occur along continental shelf of Beaufort, Chukchi, and Bering Seas
Odobenids (walrus)			
Walrus	*Odobenus rosmarus divergens*	*	Found in shallow water areas, close to ice or land; geographic range encircles the Polar Basin
Mysticetes (baleen whales)			
Blue whale	*Balaenoptera musculus*	E	Occur from the Gulf of Alaska to the Aleutian Islands, pelagic, may frequent coastal waters and shallow banks
Bowhead whale	*Balaena mysticetus*	E	Occur in the coastal and offshore regions, mostly along ice fronts and leads, migratory
Fin whale	*B. physalus*	E	Common in summer, generally pelagic, visits coastal waters in many areas, migratory
Gray whale	*Eschrichtius robustus*	*	Migrate along the Alaskan coast in winter and early spring; inhabit the eastern Alaskan waters during summer; occur in both the Bering and Chukchi seas

Table E-18. Marine Mammals Common in the NMFS Alaska Region (continued)

Common Name	Scientific Name	Federal Status under ESA	Distribution
Humpback whale	*Megaptera novaeangliae*	E	Common in summer, coastal in many areas, migratory
Minke whale	*B. acutorostrata*	*	Common in summer, frequent coastal regions, bays, and offshore banks
North Pacific right whale	*Eubalaena japonica*	E	Occur in Gulf of Alaska and Bering Sea
Sei whale	*Balaenoptera borealis*	E	Occur in southern Alaska during summer and fall, pelagic
Odontocetes (toothed whales and dolphins)			
Baird's beaked whale	*Berardius bairdii*	*	Occur in southern part of Alaska during winter, pelagic
Beluga whale	*Delphinapterus leucas*	*	Coastal in bays, estuaries, and rivers; migratory along leads; winter offshore in pack ice
Cuvier's beaked whale	*Ziphius cavirostris*	*	Occur in the Aleutian islands, pelagic
Killer whale	*Orcinus orca*	*	Common, inhabit coastal waters throughout SE Alaska, Gulf of Alaska, and Aleutian Islands
Dall's porpoise	*Phocoenoides dalii*	*	Occur south of the Bering Strait, pelagic, nearshore in deep water, found frequently in inside waters of SE Alaska
Harbor porpoise	*Phocoena phocoena*	*	Occur year-round in SE Alaska; coastal in bays, estuaries, and rivers; frequent offshore banks
Narwhal	*Monodon monoceros*	*	Rare, usually associated with pack ice and deep water
Pacific White-sided dolphin	*Lagenorynchus obliquidens*	*	Common in Aleutian Islands in summer, pelagic, nearshore in deep water
Stejneger's beaked whale	*Mesoplodon stejnegeri*	*	Pelagic
Sperm whale	*Physeter macrocephalus*	E	Common in summer, mostly males, generally pelagic
Mustelids (otters)			
Northern sea otter	*Enhydra lutris keyoni*	T	Lives in shallow water areas along the shores of the North Pacific

Source: Geraci and Lounsbury 2005

Notes: CH – Critical Habitat in the ROI
E – Federally listed as endangered
T – Federally listed as threatened
* – only protected under MMPA

Table E-19. Marine Mammals Common in the NMFS Pacific Islands Region

Common Name	Scientific Name	Federal Status under ESA	Distribution
Phocids (true or earless seals)			
Hawaiian Monk seal	*Monachus schauinslandi*	E/CH	Most common northwest of the main seven-island chain
Mysticetes (baleen whales)			
Blue whale	*Balaenoptera musculus*	E	Population thought to occur in deeper offshore waters
Bryde's whale	*Balaenoptera edensi*	*	Occurs throughout the main seven island chain January through April
Fin whale	*Balaenoptera physalus*	E	Occurs in winter
Humpback whale	*Megaptera novaeangliae*	E	Occurs throughout the main seven island chain January through April
Minke whale	*Balaenoptera acutorostrata*	*	Occurs near Leeward Island
North Pacific right whale	*Eubalaena japonica*	*	Rare, most likely stray individuals from more northern populations
Sei whale	*Balaenoptera borealis*	E	In eastern North Pacific, population is migratory transient from coast of Mexico to Gulf of Alaska
Odontocetes (toothed whales and dolphins)			
Blainville's beaked whale	*Mesoplodon densirostris*	*	Pelagic
Bottlenose dolphin	*Tursiops truncatus*	*	Common along the coastlines
Cuvier's beaked whale	*Ziphius cavirostris*	*	Rare
Dwarf sperm whale	*Kogia sima*	*	Pelagic
False killer whale	*Pseudorca crassidens*	*	Occasionally seen between the main Hawaiian islands, pelagic
Fin whale	*Balaenoptera physalus*	E	Common in winter, visits coastal waters in many areas, migratory
Fraser's dolphin	*Lagenodelphis hosei*	*	Pelagic
Killer whale	*Orcinus orca*	*	Rare
Melon-headed whale	*Peponocephala electra*	*	Occasionally seen between the main Hawaiian islands, pelagic
Pantropical spotted dolphin	*Stenella attenuata*	*	Common along the coastlines
Pygmy killer whale	*Feresa attenuata*	*	Occasionally seen between the main Hawaiian islands, pelagic

Table E-19. Marine Mammals Common in the NMFS Pacific Islands Region (continued)

Common Name	Scientific Name	Federal Status under ESA	Distribution
Pygmy sperm whale	*Kogia breviceps*	*	Pelagic
Rough-toothed dolphin	*Steno bredanensis*	*	Pelagic
Short-finned pilot whale	*Globicephala macrorhynchus*	*	Occasionally between the main Hawaiian islands, pelagic
Sperm whale	*Physeter macrocephalus*	E	In deeper waters off Hawaii, year-round resident
Striped dolphin	*Stenella coeruleoalba*	*	Pelagic
Spinner dolphin	*Stenella longirostris*	*	Pelagic and coastal, daytime in shallow bays

Source: Geraci and Lounsbury 2005

Notes: CH – Critical Habitat in the ROI

E – Federally listed as endangered

* – only protected under MMPA

APPENDIX F

NATIONAL MARINE MAMMAL STRANDING NETWORK AND DISENTANGLEMENT NETWORK MEMBERS

Marine Mammal Stranding Network

Organization/Individual	Location	Authority	Rehabilitation (NMFS Species)
NMFS Northeast Region			
Allied Whale, College of the Atlantic	Bar Harbor, ME	SA	N/A
Marine Animal Lifeline	Portland, ME	SA	Pinnipeds
Maine Department of Marine Resources	Boothbay Harbor, ME	109h	N/A
University of New England	Biddeford, ME	SA	Pinnipeds, Small Cetaceans
The Whale Center of New England	Gloucester, MA	SA	N/A
New England Aquarium	Boston, MA	SA	Pinnipeds, Small Cetaceans
Cape Cod Stranding Network	Buzzards Bay, MA	SA	N/A
Mystic Aquarium	Mystic, CT	SA	Pinnipeds, Small Cetaceans
Riverhead Foundation for Marine Research	Riverhead, NY	SA	Pinnipeds, Small Cetaceans
Marine Mammal Stranding Center	Brigantine, NJ	SA	Pinnipeds
MERR Institute, Inc.	Nassau, DE	Designee of Delaware DNREC	N/A
Maryland Department of Natural Resources, Cooperative Oxford Laboratory	Oxford, MD	109h	N/A
National Aquarium in Baltimore	Baltimore, MD	SA	Pinnipeds, Small Cetaceans
Smithsonian Institute, National Museum of Natural History	Washington, D.C.	SA	N/A
Virginia Aquarium and Marine Science Center	Virginia Beach, VA	SA	Pinnipeds
Virginia Institute of Marine Science, College of William and Mary	Gloucester Point, VA	SA	N/A
NMFS Southeast Region			
Duke University Marine Laboratory	Beaufort, NC	Designee of UNCW	N/A
NMFS, SEFSC Beaufort Laboratory	Beaufort, NC	109h	Pinnipeds, Small Cetaceans
University of North Carolina at Wilmington (UNCW), Biological Sciences	Wilmington, NC	SA	N/A
National Ocean Service (NOS) Charleston Laboratory	Charleston, SC	109h	N/A
South Carolina Wildlife and Marine Resources Division	Charleston, SC	109h	N/A
Georgia Department of Natural Resources, Non-Game Endangered Wildlife Program	Brunswick, GA	109h and SA	N/A
Clearwater Marine Aquarium	Clearwater, FL	SA	Small Cetaceans
Dynamac Corporation DYN-2	Kennedy Space Center, FL	SA	N/A

Organization/Individual	Location	Authority	Rehabilitation (NMFS Species)
NMFS Southeast Region (continued)			
Florida Keys Marine Mammal Rescue Team	Cudjoe Key, FL	SA	Small Cetaceans
FWC Apalachicola National Reserve	Eastpoint, FL	109h	N/A
Gulf Islands National Seashore	Gulf Breeze, FL	109h	N/A
Gulf World Marine Park	Panama City Beach, FL	SA	Small Cetaceans
Harbor Branch Oceanographic Institute, Inc.	Fort Pierce, FL	SA	Small Cetaceans
Hubbs-SeaWorld Research Institute	Orlando, FL	SA	N/A
Marine Animal Rescue Society	Miami, FL	SA	Small Cetaceans
Marine Mammal Conservancy, Inc.	Key Largo, FL	SA	Small Cetaceans
Marine Mammal Stranding Network-Southwest Region	Cape Coral, FL	SA	N/A
Mote Marine Laboratory	Sarasota, FL	SA	Small Cetaceans
NMFS, SEFSC Miami Laboratory	Miami, FL	109h	N/A
NMFS, SEFSC Panama City Laboratory	Panama City, FL	109h	N/A
SeaWorld Orlando	Orlando, FL	SA	Small Cetaceans
The Florida Aquarium	Tampa, FL	SA	N/A
The Stranding Center, Inc.	Pensacola Beach, FL	SA	N/A
Marterra Foundation, Inc.	Mobile, AL	SA	N/A
Gulf Islands National Seashore	Ocean Springs, MS	109h	N/A
Institute for Marine Mammal Studies	Gulfport, MS	SA	Small Cetaceans
Mississippi Department of Marine Resources	Biloxi, MS	109h	N/A
NMFS, SEFSC Pascagoula Laboratory	Pascagoula, MS	109h	N/A
NMFS, SEFSC Galveston Laboratory	Galveston, TX	109h	N/A
Texas Marine Mammal Stranding Network (TMMSN)	Galveston, TX	SA	Small Cetaceans
Texas State Aquarium	Corpus Christi, TX	Designee of TMMSN	N/A
Puerto Rico Department of Natural and Environmental Resources	San Juan, PR	109h/SA	Small Cetaceans
NMFS Southwest Region			
Northcoast Marine Mammal Center	Crescent City, CA	SA	Pinnipeds
The Marine Mammal Center	Sausalito, CA	SA	Pinnipeds, Small Cetaceans
Long Marine Laboratory, University of California at Santa Cruz	Santa Cruz, CA	SA	Pinnipeds, Small Cetaceans
Long Beach Animal Control	Long Beach, CA	109h	N/A
Santa Barbara Marine Mammal Center	Santa Barbara, CA	SA	Pinnipeds
Santa Barbara Museum of Natural History	Santa Barbara, CA	SA	N/A
Fort MacArthur Marine Mammal Care Center	San Pedro, CA	SA	Pinnipeds
Pacific Marine Mammal Center	Laguna Beach, CA	SA	Pinnipeds

Organization/Individual	Location	Authority	Rehabilitation (NMFS Species)
NMFS Southwest Region (continued)			
SeaWorld San Diego	San Diego, CA	SA	Pinnipeds
Los Angeles County Museum of Natural History	Los Angeles, CA	SA	N/A
Moss Landing Marine Laboratories	Moss Landing, CA	SA	N/A
California Academy of Sciences, Department of Ornithology & Mammalogy	San Francisco, CA	SA	N/A
Humboldt State University, Vertebrate Museum	Arcata, CA	SA	N/A
California Wildlife Center	Malibu, CA	109h	N/A
Whale Rescue Team	El Segundo, CA	109h	N/A
Wildrescue	Malibu, CA	109h	N/A
NMFS Northwest Region			
Cascadia Research Collective	Olympia, WA	Contingency Plan	N/A
Central Puget Sound Marine Mammal Stranding Network	Greenbank, WA	SA	N/A
Dungeness National Wildlife Refuge	Port Angeles, WA	109h	N/A
Edmonds Animal Control	Edmonds, WA	109h	N/A
Makah Tribe	Neah Bay, WA	Contingency Plan/Designee (NMFS, NWR)	N/A
NMFS, Northwest Regional Office	Seattle, WA	109h	N/A
NMFS, Northwest Fisheries Science Center	Seattle, WA	109h	N/A
Olympic Coast National Marine Sanctuary	Port Angeles, WA	109h	N/A
Olympic Coast National Park	Port Angeles, WA	109h	N/A
Point Defiance Zoo and Aquarium	Tacoma, WA	Contingency Plan	Pinnipeds
Port Townsend Marine Science Center	Port Townsend, WA	Designee (NMFS, NWR)	N/A
Progressive Animal Welfare Society	Lynwood, WA	Contingency Plan	Pinnipeds
Seattle Animal Control	Seattle, WA	109h	N/A
The Whale Museum	Friday Harbor, WA	SA	N/A
U.S. Fish and Wildlife Service	Lacey, WA	109h	N/A
Washington Department of Fish and Wildlife	Olympia, WA	109h	N/A
Whatcom County Volunteers		Designee (NMFS, NWR)	N/A
Wolf Hollow Wildlife Rehabilitation Center	Friday Harbor, WA	Contingency Plan	Pinnipeds
Free Flight Wildlife Rehabilitation Center	Bandon, OR	Designee (NMFS, NWR)	Pinnipeds

Organization/Individual	Location	Authority	Rehabilitation (NMFS Species)
NMFS Northwest Region (continued)			
Oregon Coast Aquarium	Newport, OR	Designee (NMFS, NWR)	Pinnipeds, Small Cetaceans
Oregon Department of Fish and Wildlife	Salem, OR	109h	N/A
Oregon Institute of Marine Biology	Charleston, OR	SA	N/A
Oregon State University	Newport, OR	SA	N/A
Portland State University	Portland, OR	SA	N/A
NMFS Alaska Region			
Alaska SeaLife Center	Seward, AK	SA	Pinnipeds, Small Cetaceans
Aleut Community of St. Paul Island Tribal Government	St. Paul Island, AK	SA	N/A
Alaska Sea Otter and Stellar Sea Lion Commission	Anchorage, AK	SA	N/A
Alaska Whale Foundation	Petersburg, AK	SA	N/A
Alaska Zoo	Anchorage, AK	SA (not active)	N/A
University of Alaska Museum	Fairbanks, AK	SA	N/A
Mr. Andy Aderman, Togiak National Wildlife Refuge	Dillingham, AK	109h	N/A
Ms. Kimberly Beckman, Alaska Department of Fish and Game	Fairbanks, AK	109h	N/A
Reid Brewer, University of Alaska, Fairbanks/Sea Grant	Dutch Harbor, AK	Affiliate with Kate Wynne's SA	N/A
Dr. Kathy Burek	Eagle River, AK	Affiliate w/ASLC's SA	N/A
Ms. Angela Doroff, USFWS	Anchorage, AK	109h	N/A
Mr. Gary Frietag	Ketchikan, AK	SA	N/A
Chris Gabriele, National Park Service, Glacier Bay National Park	Glacier Bay, AK	109h/SA	N/A
Ms. Verena Gill, USFWS	Anchorage, AK	109h	N/A
Ms. Eileen Henniger, Yakutat Tribe	Yakutat, AK	109h	N/A
Ms. Lauri Jemison, Alaska Department of Fish and Game	Juneau, AK	109h	N/A
North Gulf Oceanic Society	Homer, AK	SA	N/A
Ms. Lori Quakenbush, Alaska Department of Fish and Game	Fairbanks, AK	109h	N/A
Gay Sheffield, Alaska Department of Fish and Game	Fairbanks, AK	109h	N/A
Ms. Jan Straley, University of AK, Southeast, Sitka Campus	Sitka, AK	SA	N/A
Jamie Womble, National Park Service, Glacier Bay National Park	Juneau, AK Glacier Bay, AK	109h	N/A
Ms. Kate Wynne, University of Alaska, Fairbanks/Sea Grant	Kodiak, AK	SA	N/A

Organization/Individual	Location	Authority	Rehabilitation (NMFS Species)
NMFS Pacific Islands Region			
Sea Life Park by Dolphin Discovery	Waimanalo, HI	SA	Small Cetaceans
NMFS Pacific Islands Fisheries Science Center	Honolulu, HI	109h	Pinnipeds

Marine Mammal Disentanglement Network

Individual	Organization	Location	Responder Level
NMFS Northeast Region			
Dr. Sean Todd	Allied Whale, College of the Atlantic	Bar Harbor, ME	3
Mr. Jamison Smith	NMFS, Northeast Regional Office, Protected Resources Division	Gloucester, MA	4
Dr. Charles Mayo	Provincetown Center for Coastal Studies	Provincetown, MA	5
Mr. Scott Landry	Provincetown Center for Coastal Studies	Provincetown, MA	5
Mr. David Morin	Provincetown Center for Coastal Studies	Provincetown, MA	5
Ms. Jooke Robbins	Provincetown Center for Coastal Studies	Provincetown, MA	3
Mr. Bob Bowman	Provincetown Center for Coastal Studies	Provincetown, MA	3
Ms. Amy Kennedy	Provincetown Center for Coastal Studies	Provincetown, MA	3
Mr. Brian Sharp	Provincetown Center for Coastal Studies	Provincetown, MA	3
Mr. Gregory Krutzikowsky	Provincetown Center for Coastal Studies	Provincetown, MA	3
Mr. David Osterberg	Provincetown Center for Coastal Studies	Provincetown, MA	2
Mr. Mackie Greene	Campobello Whale Rescue Team	Campobello Island, New Brunswick, Canada	4
Dr. Moira Brown	New England Aquarium	Boston, MA	3
Ms. Lisa Conger	New England Aquarium	Boston, MA	3
Mr. Chris Slay	New England Aquarium	Boston, MA	4
Ms. Amy Knowlton	New England Aquarium	Boston, MA	3
Ms. Monica Zani	New England Aquarium	Boston, MA	3
Mr. Scott Kraus	New England Aquarium	Boston, MA	3
Mr. Phil Hamilton	New England Aquarium	Boston, MA	3
Mr. Timothy Cole	NMFS, Northeast Fisheries Science Center	Woods Hole, MA	3
Mr. Fred Wenzel	NMFS, Northeast Fisheries Science Center	Woods Hole, MA	3
Mr. Glenn Salvador	NMFS, Northeast Regional Office	Belle Haven, VA	3
Mr. Mark Swingle	Virginia Aquarium and Marine Science Center	Virginia Beach, VA	3
Ms. Susan Barco	Virginia Aquarium and Marine Science Center	Virginia Beach, VA	3
NMFS Southeast Region			
Mr. William McLellan	Biological Sciences and Center for Marine Science, University of North Carolina, Wilmington	Wilmington, NC	3
Dr. Andrew Read	Duke University Marine Laboratory	Beaufort, NC	3

Individual	Organization	Location	Responder Level
NMFS Southeast Region (continued)			
Mr. Andrew Westgate	Duke University Marine Laboratory	Beaufort, NC	3
Mr. Keith Rittmaster	North Carolina Maritime Museum	Beaufort, NC	3
Mr. Bruce Ferrier		Outer Banks, NC	2
Mr. Wayne McFee	NOAA/NOS/NCCOS	Charleston, SC	2
Mr. Eric Zolman	NOAA/NOS/NCCOS	Charleston, SC	2
Mr. Clay George	Georgia Department of Natural Resources	Brunswick, GA	3
Mr. Mark Dodd	Georgia Department of Natural Resources	Brunswick, GA	3
Ms. Leigh Youngner	Georgia Department of Natural Resources	Brunswick, GA	2
Mr. Adam MacKinnon	Georgia Department of Natural Resources	Brunswick, GA	3
Mr. Brad Winn	Georgia Department of Natural Resources	Brunswick, GA	3
Mr. Tom Pitchford	Florida Fish and Wildlife Conservation Commission	Jacksonville, FL	3
Mr. Andy Garrett	Florida Fish and Wildlife Conservation Commission	Jacksonville, FL	3
Mr. Alex Costidis	Florida Fish and Wildlife Conservation Commission	St. Petersburg, FL	2
Mr. Arthur Wong	Florida Fish and Wildlife Conservation Commission	Jacksonville, FL	2
Ms. Katie Jackson	Florida Fish and Wildlife Conservation Commission	Jacksonville, FL	2
Ms. Barb Zoodsma	NMFS, Southeast Regional Office, Protected Resources Division	Fernandina Beach, FL	3
Mr. Anthony Martinez	NMFS, Southeast Fisheries Science Center	Miami, FL	3
Ms. Alicia Windham-Reid	U.S. Geological Survey	Gainesville, FL	3
Mr. Bill Foster			3
Mr. Jeff Thompson			3
Mr. John Pieno			3
Mr. Lou Browning			3
Mr. Michael Neelon			3
Mr. Steve Brown			3
Mr. Steve Robbins			3
Mr. Tom Fernald			3
Ms. Tricia Naessig			2
NMFS Southwest Region			
Dr. Jim Harvey	Moss Landing Marine Laboratories	Moss Landing, CA	3
Mr. Scott Benson	Moss Landing Marine Laboratories	Moss Landing, CA	3
Mr. John Douglas	Moss Landing Marine Laboratories	Moss Landing, CA	2
Ms. Karin Forney	NMFS, Southwest Fisheries Science Center, Protected Resources Division	Santa Cruz, CA	2
Dr. Frances Gulland	The Marine Mammal Center	Sausalito, CA	3
Ms. Shelbi Stoudt	The Marine Mammal Center	Sausalito, CA	2
Ms. Erin Brodie	The Marine Mammal Center	Sausalito, CA	2

Individual	Organization	Location	Responder Level
NMFS Southwest Region (continued)			
Ms. Lauren De Maio	The Marine Mammal Center	Sausalito, CA	2
Ms. Sue Andrews	The Marine Mammal Center	Sausalito, CA	2
Mr. David Casper	Long Marine Laboratory, University of California, Santa Cruz	Santa Cruz, CA	3
Teri Sigler	Long Marine Laboratory, University of California, Santa Cruz	Santa Cruz	3
Traci Fink	Long Marine Laboratory, University of California, Santa Cruz	Santa Cruz	2
Mr. Steve Clabuesch	Long Marine Laboratory, University of California, Santa Cruz	Santa Cruz	2
Mr. Pete Dal Ferro	Long Marine Laboratory, University of California, Santa Cruz	Santa Cruz	2
Dr. Robin Dunkin	Long Marine Laboratory, University of California, Santa Cruz	Santa Cruz	2
Mr. Bob Yerena	NOAA Office of Enforcement	Monterey, CA	2
Mr. Dave Minard	Monterey Bay NMS	Monterey Bay, CA	2
Ms. Deirdre Hall	Monterey Bay NMS	Monterey Bay, CA	2
Mr. Jean de Marignac	Monterey Bay NMS	Monterey Bay, CA	2
Mr. Jamie Hall	Gulf of Farallones NMS	San Francisco, CA	2
Mr. Mick Menigoz	Gulf of Farallones NMS	San Francisco, CA	2
Mr. Bob Pucinelli	CA Fish and Game/ Skipper for Yerena	San Francisco, CA	2
Mr. Sean Van Sommerman	Pelagic Shark Foundation	Santa Cruz, CA	2
Mr. Pieter Folkens	Alaska Whale Foundation	San Francisco, CA	3
Mr. Sean Hanser	Alaska Whale Foundation		3
Ms. Kathy Koontz	Alaska Whale Foundation		2
Mr. Keith Yip	SeaWorld	San Diego, CA	3
Ms. Jody Westberg	SeaWorld	San Diego, CA	3
Mr. Joel Gitezon	Los Angeles County Lifeguards	Los Angeles, CA	2
Mr. Jonas Russell	Los Angeles County Lifeguards	Los Angeles, CA	2
Mr. Nathan Stebor	Santa Barbara Marine Mammal Center	Santa Barbara, CA	2
Ms. Evonne Risdall	Santa Barbara Marine Mammal Center	Santa Barbara, CA	2
Ms. Dave Risdall	Santa Barbara Marine Mammal Center	Santa Barbara, CA	2
Mr. Terrance Shinn	CINMS	Santa Barbara, CA	2
Mr. Ed Stetson	Santa Barbara Harbor Patrol	Santa Barbara, CA	2
Mr. Peter Howorth	SBMMC Santa Barbara Marine Mammal Center	Santa Barbara, CA	4
Ms. Sara Graef	AK Whale Foundation	Los Angeles, CA	3
Mr. Joe Cordaro	NMFS Southwest Regional Office, Protected Resources Division	Los Angeles, CA	2

Individual	Organization	Location	Responder Level
NMFS Alaska Region			
Ms. Kate Wynne	University of Alaska Fairbanks/Sea Grant	Kodiak, AK	4
Ms. Bree Witteveen	University of Alaska Fairbanks/Sea Grant	Kodiak, AK	3
Ms. Annie Fiske	University of Alaska Fairbanks	Kodiak, AK	2
Mr. Bob Foy	University of Alaska Fairbanks	Kodiak, AK	3
Ms. Cathy Foy	University of Alaska Fairbanks	Kodiak, AK	2
Mr. Mark Witteveen	Alaska Department of Fish and Game	Kodiak, AK	3
Mr. Ken Hansen	NMFS Office of Law Enforcement	Kodiak, AK	2
Mr. Jim Wisher	NMFS Office of Law Enforcement	Homer, AK	3
Mr. Dennis Thaute	NMFS Office of Law Enforcement	Homer, AK	
Cy St-Amand	NGOS	Homer, AK	2
L.A. Holmes	NGOS	Homer, AK	2
Mr. Scott Adams	NMFS Office of Law Enforcement	Homer, AK	2
Ms. Barbara Mahoney	NMFS Alaska Regional Office, Protected Resources Division	Anchorage, AK	2
Mr. Dan Vos	NMFS Alaska Regional Office, Protected Resources Division	Anchorage, AK	2
Mr. Matt Clark	NMFS Office of Law Enforcement	Anchorage, AK	2
Mr. Matt Eagleton	NMFS Alaska Regional Office, Habitat Division	Anchorage, AK	2
Mr. Jonathan Taylor	NMFS Alaska Regional Office, Habitat Division	Anchorage, AK	2
Mr. Brad Smith	NMFS Office of Law Enforcement	Anchorage, AK	
Mr. Tim Lebling	Alaska Sea Life Center	Seward, AK	3
Lee Kellar	Alaska Sea Life Center	Seward, AK	2
Ms. Carrie Goertz	Alaska Sea Life Center	Seward, AK	2
Ms. Elizabeth Moundalexis	Alaska Sea Life Center	Seward, AK	2
Mr. Brett Long	Alaska Sea Life Center	Seward, AK	2
Ms. Aleria Jensen	NMFS Alaska Regional Office, Protected Resources Division	Juneau, AK	3
Ms. Kaja Brix	NMFS Alaska Regional Office, Protected Resources Division	Juneau, AK	3
Mr. Flip Nicklin	Whale Trust	Juneau, AK	2
Ms. Linda Nicklin	Whale Trust	Juneau, AK	2
Jamie Womble	National Park Service	Juneau, AK	
Mr. Ron Antaya	NMFS Office of Law Enforcement	Juneau, AK	
NMFS Pacific Islands Region			
Mr. Edward Lyman	Hawaiian Islands Humpback Whale National Marine Sanctuary, National Ocean Service	Kihei, Maui, HI	5
Dr. David Mattila	Hawaiian Islands Humpback Whale National Marine Sanctuary, National Ocean Service	Kihei, Maui, HI	5
Chris Gabriele	Hawaiian Marine Mammal Consortium	Hawaii, HI	4
Mr. Manny Andrade	Hawaii Department of Land and Natural Resources	Kauai, HI	3

Individual	Organization	Location	Responder Level
NMFS Pacific Islands Region (continued)			
Mr. Joe Arcenaux	NOAA, Pacific Islands Regional Office	Oahu, HI	3
Dr. Robert Braun	N/A	Oahu, HI	3
Mr. Brent Carman	Hawaii Department of Land and Natural Resources	Hawaii, HI	3
Mr. Mark Deakos	Hawaii Marine Mammal Research	Maui, HI	3
Mr. Skippy Hau	Hawaii Department of Land and Natural Resources	Maui, HI	3
Mr. David Johnston	NOAA, Pacific Island Fisheries Science Center	Oahu, HI	3
Mr. Greg Levine	N/A	Oahu, HI	3
Mr. Steve Lewis	Hawaiian Marine Mammal Consortium	Hawaii, HI	3
Mr. Allan Ligon	Hawaiian Islands Humpback Whale National Marine Sanctuary, National Ocean Service	Maui, HI	3
Mr. David Nichols	Hawaii Department of Land and Natural Resources	Oahu, HI	3
Mr. David Schofield	NMFS, Pacific Islands Regional Office	Oahu, HI	3
Mr. Russell Sparks	Hawaii Department of Land and Natural Resources	Maui, HI	3
Mr. Vaughan Tyndzik	Hawaii Department of Land and Natural Resources	Kauai, HI	3
Mr. Justin Viezebicke	Hawaiian Islands Humpback Whale National Marine Sanctuary, National Ocean Service	Hawaii, HI	3
Mr. Bill Walsh	Hawaii Department of Land and Natural Resources	Hawaii, HI	3
Mr. Jeff Walters	Hawaii Department of Land and Natural Resources	Oahu, HI	3
Mr. Paul Wong	Hawaiian Islands Humpback Whale National Marine Sanctuary, National Ocean Service	Oahu, HI	3
Ms. Suzanne Yin	Hawaiian Marine Mammal Consortium	Hawaii, HI	3
Mr. Chad Yoshinago	NOAA, Pacific Islands Fisheries Science Center	Oahu, HI	3
Mr. Rob Bradbury	N/A	Kauai HI	2
Mr. John Burger	Pacific Islands Missile Reserve	Kauai, HI	2
Mr. Steve Cotton	Hawaii Department of Land and Natural Resources	Hawaii, HI	2
Ms. Amanda Cummin	Hawaiian Islands Humpback Whale National Marine Sanctuary, National Ocean Service	Maui, HI	2
Ms. Debbie Ferrari	Center for Whale Studies	Maui, HI	2
Mr. Mark Ferrari	Center for Whale Studies	Maui, HI	2
Mr. Joe Fell-McDonald	Hawaii Department of Land and Natural Resources	Maui, HI	2

Individual	Organization	Location	Responder Level
NMFS Pacific Islands Region (continued)			
Mr. Norm Garon	Hawaiian Islands Humpback Whale National Marine Sanctuary, National Ocean Service	Oahu, HI	2
Siri Hakala	N/A	Oahu, HI	2
Ms. Tara Leota	N/A	Kauai, HI	2
Mr. John Mitchell	Hawaii Department of Land and Natural Resources	Maui, HI	2
Mr. Flip Nicklin	Whale Trust	Maui, HI	2
Ms. Mimi Olry	Hawaii Department of Land and Natural Resources	Kauai, HI	2
Mr. Adam Pack	The Dolphin Institute	Maui, HI	2
Ms. Susan Rickards	Hawaiian Marine Mammal Consortium	Hawaii, HI	2
Mr. Dan Salden	Hawaii Whale Research	Maui, HI	2
Ms. Jean Souza	Hawaiian Islands Humpback Whale National Marine Sanctuary, National Ocean Service	Kauai, HI	2
Mr. Kosta Stamoulis	Hawaii Department of Land and Natural Resources	Hawaii, HI	2
Mr. Don Thornburg	N/A	Kauai, HI	2
Ms. Lisa Van Atta	NMFS, Pacific Islands Regional Office	Oahu, HI	2
Mr. Lewis Van Fossen	NMFS, Pacific Islands Regional Office	Oahu, HI	2
Mr. Chris Yates	NMFS, Pacific Islands Regional Office	Oahu, HI	2
Ms. Brenda Zaun	Hawaii Fish and Wildlife Service	Kauai, HI	2

APPENDIX G

NMFS PERMIT NO. 932-1489-08

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

JUN 29 2005

Teri Rowles, D.V.M., Ph.D.
National Coordinator, MMHSRP
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910

Dear Dr. Rowles:

Enclosed is a major amendment to Permit No. 932-1489-07. The permit has been amended to (1) extend the expiration date from June 30, 2005, to June 30, 2007; (2) authorize aerial surveys; (3) authorize harassment of marine mammals (including endangered species) under NMFS jurisdiction incidental to other Marine Mammal Health and Stranding Response Program (MMHSRP) activities on land authorized by the permit; and (3) authorize the development of cell lines for research. The permit amendment is reflected in the new Permit No. 932-1489-08, and changes appear in bold typeface. Note that this amended permit supercedes all previous versions.

As a reminder, this permit allows the MMHSRP National Coordinator to take all species of the Orders Cetacea and Pinnipedia (except walrus) in two Projects: Project 1 authorizes collection, analyses, archival, possession and importation/exportation (worldwide) of specimens obtained from specified sources; and Project II authorizes take of live marine mammals and endangered species that are stranded, entangled, disentangled, trapped out of habitat, in peril (e.g., in vicinity of an oil spill), and nuisance animals. Please note that this permit does not authorize takes of marine mammal species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS). However, this permit allows you to receive fluid and tissue samples of species under USFWS jurisdiction provided the samples were collected legally under permits or authorizations issued by the USFWS.

The importation and exportation of species listed on the Appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) require a valid CITES Permit. For further information regarding CITES requirements please contact Ms. Lisa Lierheimer, U.S. Fish and Wildlife Service, Office of Management Authority, 4401 N. Fairfax Drive, Arlington, VA 22203 (1-800-358-2104).

Please note that this permit amendment is not valid until our office receives a signed copy of the signature page. Please review the enclosed amended permit to ensure that it accurately reflects

what you requested and that you understand what is authorized. Please sign and date both the original and the "file copy" of the signature page. Return the signature page marked "file copy" to this office. If you have any questions, please contact Ruth Johnson or Amy Sloan (301/713-2289).

Sincerely,

Stephen L. Leathery
Chief, Permits, Conservation and
Education Division
Office of Protected Resources

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

NMFS Permit No. **932-1489-08**
Expiration Date: **June 30, 2007**

SCIENTIFIC RESEARCH and ENHANCEMENT PERMIT TO TAKE MARINE MAMMALS
Amendment No. 8

Authorization

The Marine Mammal Health and Stranding Response Program, Office of Protected Resources, National Marine Fisheries Service (NMFS) [Coordinator and Principal Investigator (PI): Dr. Teri Rowles], is hereby authorized to take marine mammals in the manner specified below for the purpose of scientific research and enhancement, subject to the provisions of the Marine Mammal Protection Act of 1972 (16 U.S.C 1361 *et seq.*), the Regulations Governing the Taking and Importing of Marine Mammals (50 CFR part 216), the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*), the Regulations Governing the Taking, Importing, and Exporting of Endangered and Threatened Fish and Wildlife (50 CFR parts 222-226), the Fur Seal Act of 1966, as amended (16 U.S.C. 1151 *et seq.*), and the Terms and Conditions hereinafter set out. **This Permit, as amended, supersedes all previous versions.**

Abstract

The purposes of the authorized activities, as stated in the application, are to: (1) collect, preserve, label, and transport all species of the Orders Cetacea, Pinnipedia (except walrus), cadavers for tissue and fluid samples for physical, chemical, or biological analyses, import, and export; (2) take stranded or distressed marine mammals and endangered or threatened species; (3) salvage specimens from dead marine mammals and endangered or threatened species; **(4) conduct aerial surveys to locate imperiled marine mammals or survey the extent of disease outbreaks or die-offs; (5) harass marine mammals on land incidental to other MMHSRP activities authorized by this permit; and (6) develop and maintain cell lines from species under NMFS jurisdiction.**

A. Number and Kind(s) of Marine Mammals and Location(s) [50 CFR 217.36(a)(i)]

1 PROJECT I - SPECIMEN COLLECTION: MARINE MAMMAL AND ENDANGERED OR THREATENED SPECIES

a. At any time of the year, the Holder/PI may, subject to the conditions herein, collect, analyze, archive, and import/export (worldwide), unlimited numbers and kinds of specimens, **including cell lines**, from the following marine mammal and endangered or threatened species:

1) Order Cetacea; and

2) Order Pinnipedia (except walrus).

b. The specimens authorized in A.1.a. may be taken from any of the following sources:

1) On-going live animal capture/release programs as authorized under Part A.2.

2) Live animal capture/release as part of a disease, emergency response or die-off investigation;

3) Live animals stranded or in rehabilitation (specimens may include biopsies);

4) Captive animals when sampling is beyond the scope of normal husbandry;

5) Directly taken in fisheries for such animals in countries and situations where such taking is legal;

6) Killed during subsistence harvests by native communities;

7) Killed incidental to commercial fishing operations.

8) Killed incidental to other human activities (*e.g.* ship strikes, blasting, etc.);

9) Found dead on the beach or at sea;

Found dead as part of NOAA investigations (*e.g.* hazmat spills, oil spills, harmful algal blooms, etc.);

Found on the beach or on land within 1/4 mile of the ocean (bones, teeth or ivory of any dead animal); or

12) Soft parts sloughed, excreted, or discharged provided animals in the wild are not harassed during collection.

The Holder/PI or CIs may receive/possess samples taken from species of the Order Sirenia, polar bear (*Ursus maritimus*), sea otter (*Enhydra lutris*), and marine otter (*Lontra felina*).

PROJECT II - ENHANCEMENT ACTIVITIES: MARINE MAMMALS AND ENDANGERED OR THREATENED SPECIES

a. The Holder may "take", as defined in the MMPA and ESA[1], live marine mammals that are stranded, entangled, disentangled, trapped out of habitat, in peril (e.g., in vicinity of an oil spill), extra-limital and nuisance marine mammals and endangered or threatened species by the following activities:

   1) Capture/release or if capture is not necessary, use means available (as approved by the Holder/PI or designee) to lure trapped or nuisance animals out to sea or deter them away from an area of imminent danger;

   2) Treat distressed condition, including temporary captivity in an adequate treatment or rehabilitation facility;

   3) Disentangle from gear, ropes or other such man-made material which may be adversely affecting the animal;

   4) Transport for rehabilitation or return to wild;

   5) Attach tags to and/or biopsy stranded, entangled, disentangled, trapped out of habitat, in peril (e.g., in vicinity of an oil spill), extra-limital and nuisance animals; conduct auditory brainstem response and auditory evoked potential procedures, or

   6) Euthanize animals for humane or medical reasons approved by the Holder/PI or NMFS stranding coordinator (see B.2.b.).

b. The Holder may harass marine mammals during aerial surveys to locate imperiled marine mammals or to survey the extent of a disease outbreak or die-off.

c. The Holder may harass marine mammals on land incidental to other MMHSRP activities authorized by this permit.

3. PROJECT III - IMPORT/EXPORT OF LIVE MARINE MAMMALS (MMPA §109(h))

[1]As defined in the MMPA and promulgating regulations, "take" means to harass, hunt, collect, capture, or kill, or to attempt to harass, hunt, collect capture, or kill any marine mammal; AND as defined in the ESA, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, or collect, or attempt to engage in such conduct.

a. At any time of the year, the Holder may, import/export (worldwide), non-listed marine mammals, for medical treatment, from the following species:

1) Order Cetacea (except endangered or threatened species); and

2) Order Pinnipedia (except walrus and endangered species).

B. Research/Enhancement Conditions [50 CFR 216.36(b)]

1 PROJECT I - SPECIMEN COLLECTION: MARINE MAMMALS AND ENDANGERED OR THREATENED SPECIES

a. The Working Group on Unusual Marine Mammal Mortality Events (WGUMMME) will provide advice on any live animal investigative activities.

b. Only experienced and trained personnel will perform any live animal investigative activities.

c. Samples in A.1.c. may be acquired and possessed only if the samples were taken under authority of a U.S. Fish and Wildlife Service permit or authorization and samples were taken in a humane manner.

d. Soft or hard parts authorized in A.1.b.13) may be collected/salvaged from marine mammals and endangered species provided no animals are harassed as a result of the taking, or the Holder has a scientific research permit to harass that species.

2. PROJECT II - ENHANCEMENT ACTIVITIES: MARINE MAMMALS AND ENDANGERED OR THREATENED SPECIES

a. Tagging

1) Prior to release, the Holder/PI or CIs may tag marine mammals and threatened or endangered species undergoing rehabilitation;

2) Animals entangled in rope or other debris may be tagged and monitored; and

3) Only experienced personnel can apply and deploy tags by an acceptable means.

b. Euthanasia

1) The NMFS National Stranding Coordinator(s) must be consulted and provide approval (verbal or written), in advance, of euthanasia for humane or medical purposes; and

2) Euthanasia must only be performed by an attending, experienced, and licensed veterinarian or other qualified individual.

3. PROJECT III - IMPORT/EXPORT OF LIVE MARINE MAMMALS (MMPA §109(h))

a. The Holder/PI may only import or export non-listed marine mammals for medical treatment, rehabilitation or return to wild (including the return of extra-limital animals).

b. The Convention on International Trade in Endangered Species (CITES) CITES shall apply to imports and exports authorized in this Project.

4. PROJECTS I, II and III

The following individuals may participate in the conduct of the activities authorized herein: Teri Rowles, Ph.D./D.V.M. and Janet Whaley, D.V.M. The Holder/PI or Dr. Whaley may designate individuals to participate as co-investigators, in the conduct of the research and enhancement activities authorized herein. Each CI must receive a letter from the PI or Dr. Whaley confirming his/her status as a CI along with a copy of this Permit. Designation of co-investigators is at the sole discretion of the Holder/PI.

b. The Holder/PI, or an identified CI with approval of the Holder/PI or designee, may designate members of the National Stranding or Disentanglement Network that holds Letters of Agreement, other network participants, and/or other federal, state or local agencies or their employees, and other qualified individuals as agents of the Holder/PI authorized under this Permit to conduct activities authorized herein.

c. Researchers may conduct activities by the means and for the purposes described in the application, as limited by the Terms and Conditions of this Permit, and as otherwise authorized by the Holder/PI or CI(s).

d. For marine mammal and endangered species stranding response activities (including capture/release activities), the Holder must:

1) Notify the Permits, Conservation and Education Division, Office of Protected Resources, prior to any capture/release activities;

2) Only perform capture/release activities as advised by the WGUMMME;

3) Only perform capture/release activities in conjunction with researchers and managers for that stock or species;

4) Process animals in small groups;

5) Minimize handling time;

6) Exercise caution when approaching all animals, particularly female/pup or female/calf pairs;

7) Monitor all biopsy or tagging sites for possible infection;

8) Keep animals cool and wet during triage and/or transport (when appropriate);

9) Use standardized, humane methods for sterilization and sample collection; and

10) Use scientifically reviewed and acceptable tagging and biopsy sampling techniques that are not considered controversial. In no instance will the Holder attempt to biopsy a cetacean anywhere on the front half of the animal.

e. For large whale disentanglements, the Holder must

1) Approach the whales gradually to minimize or avoid any sort of startle response;

2) Use caution when approaching mothers and calves; and

3) For the safety of the Researchers and whales, only use individuals that have been sufficiently trained, to the satisfaction of the Holder/PI, to disentangle animals.

f. The Holder/PI must perform all activities and collect all samples in a humane manner.

g. The Holder/PI must not harass or kill any animal for the express purpose of providing specimens to be obtained and/or imported/exported under this Permit.

h. The Holder/PI will assign a permanent catalogue number, including any prior identification numbers, to all individuals or samples.

5 Import/Export Requirements

a. The Holder/PI must not import specimens into the United States from marine mammals:

Taken illegally in the country of origin or taken in a directed fishery, except where such taking is legal;

2) Taken in any high seas driftnet fishery after December 31, 1992;

3) Taken during any commercial whaling operation or any scientific whaling operation which does not meet the criteria established by the International Whaling Commission at the time of taking; or

4) Deliberately killed for the purposes of fulfilling this Permit or taken through a directed take, except as noted in 1) above.

b. Researchers must comply with the requirements of the CITES for import and export [50 CFR part 23].

c. Marine mammal parts imported under the authority of this permit must be taken imported or exported in a humane manner, and in compliance with the Acts and any applicable foreign law. Importation of marine mammals and marine mammal parts is subject to the provisions of 50 CFR parts 14 and 216.

d. All specimens imported into the United States must be accompanied by documentation giving a description of each animal from which specimen materials were taken including, if possible:

) Identification, age, size, sex, reproductive condition;

2) Date and location of collection;

3) Circumstances causing the death; and

4) The date and port of entry of each location.

e. Any marine mammal part imported under the authority of this scientific research permit must not have been obtained as the result of a lethal taking that would be inconsistent with the Acts, unless specifically authorized in writing by the Office Director.

f. The Holder must maintain records of the types, species, and numbers of specimens imported or exported, the importing or exporting country for each shipment, and circumstances surrounding the specimen acquisition (i.e., stranding, subsistence harvest, etc.).

g. All specimen materials obtained under this authority shall be maintained according to accepted curatorial standards.

h. Designated Ports of Entry: The following Customs ports of entry are designated for the importation or exportation of wildlife and are referred to hereafter as "designated ports" (50 CFR 14.12). Please notify the USFWS wildlife inspectors (list attached) at these ports at least 48 hours prior to import or export.

Designated Ports of Entry			
1)	Anchorage, AK	10)	Louisville, KY
2)	Atlanta, GA	11)	Memphis, TN
3)	Baltimore, MD	12)	Miami, FL
4)	Boston, MA	13)	New Orleans, LA
5)	Chicago, IL	14)	New York, NY
6)	Dallas/Fort Worth, TX,	15)	Newark, NJ
7)	Honolulu, HI	16)	Portland, OR
8)	Houston, TX	17)	San Francisco, CA
9)	Los Angeles, CA	18)	Seattle, WA

To use a port of entry other than the designated ports listed above, the Holder/PI or designee must obtain a Designated Port Exception Permit from the USFWS as required in 50 CFR 14.31 and 14.32. Additional information may be obtained from the USFWS website. http://permits.fws.gov/.

6. Disposition:

a. After completion of initial research goals, the Holder must deposit any remaining samples or specimens into a *bona fide* scientific collection that

meets the minimum standards of collection, curation, and data cataloging as established by the scientific community.

b. The Holder, PI, or designated CI's may dispose of carcasses, skeletal material, and soft parts from marine mammals and endangered species, as deemed appropriate and as limited by the MMPA, ESA, and FSA.

7. Transfer of Specimens - [50 CFR 216.37]: Marine mammal and endangered species parts taken or imported under authority of this Permit may be transferred by the Holder/PI or CI(s) provided:

Under no circumstances may any marine mammal part, **including cell lines**, be bought, sold, or used for commercial purposes.

b. Specimens are transferred for research [including analysis, diagnostics and archival in a laboratory], maintenance in a scientific collection, or for education[2] purposes.

Recipients of marine mammal parts adhere to the terms and conditions of this Permit, regulations at 50 CFR 216.37, and any additional conditions required by the Holder/PI.

d. Recipients of cell lines are designated as Co-investigators under this Permit or are Holders of a special exception permit for scientific research and/or enhancement activities that includes development or research on cell lines, of the same species of marine mammal and /or endangered species.

8. The authority of this Permit will extend from the date of issuance through **June 30, 2007**. The Terms and Conditions of the Permit will remain in effect as long as the Permit Holder/PI, CI(s) or designee(s) maintains the authority and responsibility of the marine mammal specimens imported hereunder. Attached is section 216.37 of the Regulations Governing the Taking and Importing of Marine Mammals that contains additional conditions applicable to maintaining marine mammal parts. These regulations are made a part hereof.

[2]In the case of transfers for educational purposes the recipient must be a museum or educational institution or equivalent that will ensure that the part is available to the public as part of an educational program.

C. Notifications/Coordination [50 CFR 216.36]

1. The Holder must notify the appropriate NMFS Assistant Regional Administrator for Protected Resources regarding events occurring in that Region. This notification must include (when possible) a description of the proposed activity, location, dates, and duration of activities.

2. If the events occur within the boundaries of a National Marine Sanctuary, the Holder must notify the Sanctuary Manager at the appropriate Sanctuary Office on the attached list. When possible, this notification must include specific dates, locations, and participants involved in the activities.

3. Coordination: The Holder must coordinate activities with other researchers conducting the same or similar research in locations authorized herein.

D. Reporting Conditions [50 CFR 216.38]

1 Annual Report:

Each year the permit is valid, the Holder must submit an annual report of research by March 31 of each year. The report shall cover research conducted during the previous year ending December 31 and describe the specific activities that have been conducted. For each marine mammal part taken, imported, exported or otherwise affected pursuant to permitted activities, the annual report must include the following:

a. Carcasses/Parts:

1) A description of the part and its assigned identification number;

2) Source, collector, country of origin, **and authorizing government agency (for imported samples)** for each sample reported;

3) A summary of the research analysis conducted on the samples; and

4) A description of the disposition of any marine mammal parts, including an identification of the part as required §216.37(a)(4) and the manner of disposition.

b. Live animal activities:

A description of the species, numbers of animals, locations of activities, and types of activities for:

Live captures;

2) Stranding response/disentanglement of marine mammals and endangered/threatened species;

3) Specimen collections;

4) Euthanasia (including reason for euthanasia, drugs used, etc.); and

5) **Incidental harassment during aerial surveys and land activities.**

When possible, please also describe the animals' reactions to any of the above activities.

2 Final Report:

Upon completion of the research, the Holder must submit a final report within 180 days of the last annual report. A final report should include information requested in 1 above, and:

a. A summary of research objectives and results of research as it relates to the objectives; and

b. An indication as to when and where the research results will be published

3. The Holder must submit all reports and any papers or manuscripts published as a result of the research authorized herein, to the Director, Office of Protected Resources, National Marine Fisheries Service (NMFS), 1315 East-West Hwy., Silver Spring, Maryland 20910.

E. Photography/Filming Restrictions [50 CFR 216.36]

The Permit Holder and all researchers working under this Permit must obtain prior approval by the NMFS Permits, Conservation and Education Division for the following:

a. Non-research related **(i.e., commercial)** use of photographs, video and/or film that were taken to achieve the research objectives; and

b. All activities not essential to achieving the research objectives (*e.g.* still photography, videotaping, motion picture film making). Such activities must not influence the conduct of research in any way.

2. The Permit Holder and researchers are hereby notified that failure to obtain NMFS approval prior to conducting or facilitating such activities will be considered a violation of the Permit. The Permit Holder and researchers must agree, upon request by NMFS, to make space available on the vessel or aircraft for a NMFS observer during any trips where activities identified in E.1.b. may be conducted.

3. Any commercial/documentary film approved for use must include a credit, acknowledgment, or caption indicating that the research was conducted under a permit issued by NMFS under the authority of the MMPA and/or the ESA.

F. General Conditions [50 CFR 216.35 and 216.36]

1 The Permit Holder is ultimately responsible for all activities of any individual who is operating under the authority of the permit.

Co-investigators (CI): The Principal Investigator (PI) may designate additional co-investigators, provided that a copy of the letter designating the individual to conduct the activities authorized herein, and a copy of the individual's curriculum vitae is provided to the Permits Division by facsimile on the day of designation and confirmed by mail. The PI must ensure that the letter designating the individual(s) contain specific restrictions stated herein or a copy of the Permit is attached to the designation letter.

2. Research Assistants are individuals who work under the direct supervision of the PI or CI(s) and who are authorized to record data and serve as safety observers and boat tenders.

a. Restrictions: With the exception of professional and/or experienced photographers/videographers or licensed and/or experienced boat operators, Research Assistants are NOT authorized to carry out underwater observations and/or photography or to operate vessels. The qualifications and experience of the Research Assistant(s) must be commensurate with his/her assigned responsibilities.

b. Photographer/videographer: A professional and/or experienced videographer/photographer under the direct, on-site supervision of the Researchers [Holder, PI, or CI(s)], may conduct activities requiring underwater observations and/or photography. The Holder, PI, or CI(s) must be present at all times when activities is being conducted.

3. Individuals conducting activities authorized under the permit must possess qualifications commensurate with his/her duties and responsibilities, or must work under the direct supervision of the PI or CI.

4. Persons who require state, Federal, or foreign licenses to conduct activities authorized under the permit must be duly licensed when undertaking such activities.

5 The Permit Holder cannot transfer or assign the Permit to any other person. If the Holder requests authorization to add a person to this permit, the Holder cannot require compensation from the individual, in exchange for this request.

6. The Permit Holder, PI, or CI(s) must possess a copy of the permit when engaged in a permitted activity, when the marine mammal is in transit incidental to such activity, and whenever marine mammals or marine mammal parts are in the possession of the Permit Holder or agent. The Holder must affix a copy of the permit to any container, package, enclosure, or other means of containment, in which the marine mammals or marine mammal parts are placed for purposes of transit, supervision, or care. Any storage facility repositing marine mammal parts must keep a copy of the permit on file.

   Activities conducted by the United States Coast Guard personnel authorized as Co-Investigators, LANTAREA will keep a copy of the Permit on file for reference landside at each of the following in Districts 1, 5, 7, and 8: General Counsel offices, OPCON, each Station/Group/Activities office; and at the Offices of Law Enforcement. LANTAREA will also advise vessels 87' and greater to keep a copy of the Permit on board.

7 Inspection: Upon request by NMFS personnel or agents designated by the Director, Office of Protected Resources, the Permit Holder must make available for inspection, any records collected under authority of this permit.

8. Permit Amendments: The Director, Office of Protected Resources, NMFS, may amend the provisions of this Permit upon reasonable notice.

9. Transferability: The PI and CI(s) cannot transfer or assign the Permit to any other person. The PI may request authorization to add a person to this Permit, but the PI cannot accept any direct or indirect compensation from the individual, in exchange for doing so.

10. No remuneration, either financial or in-kind, may be offered for the taking of animals from the wild. This does not preclude the payment of legitimate collection and transportation expenses (e.g., hiring staff, freight costs). It does, however, apply to paying bounties or incentive pay for the removal of animals from the wild.

11 Any falsification of information pertaining to the permitted activities, including information provided to NOAA personnel, will be considered a violation of the permit.

12. The Permit Holder, in signing this Permit, has accepted and will comply with the provisions of this Permit, applicable Regulations (50 CFR parts 216 and 222-226), and the MMPA, ESA, and FSA.

G. Penalties and Permit Sanctions (50 CFR 216.40)

1 Any person who violates any provision of this permit is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA, ESA and 15 CFR part 904 [Civil Procedures] and 50 CFR part 11.

2 All permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of subpart D [Permit Sanctions and Denials] of 15 CFR part 904 and 50 CFR part 13.

Donna Wieting for

James H. Lecky
Director
Office of Protected Resources
National Marine Fisheries Service

JUN 29 2005
Date

Teri Rowles DVM PhD

Teri Rowles, Ph.D., D.V.M.
Holder/Principal Investigator
Marine Mammal Health and Stranding Response Program
Office of Protected Resources
National Marine Fisheries Service

JUL 05 2005
Date

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Donna Wieting (for)

JUN 29 2005

James H. Lecky
Director
Office of Protected Resources
National Marine Fisheries Service

Date

Teri Rowles DVM PhD

JUL 05 2005

Teri Rowles, Ph.D., D.V.M.
Holder/Principal Investigator
Marine Mammal Health and Stranding Response Program
Office of Protected Resources
National Marine Fisheries Service

Date

FILE COPY

Attachment A

RELEVANT ADDRESSES

NMFS Regional Offices

Brent Norberg, Northwest Region, NMFS, 7600 Sand Point Way NE, BIN C15700, Bldg. 1, Seattle, WA 98115-0700; phone (206)526-6150; fax (206)526-6426;

Assistant Regional Administrator for Protected Resources, Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802-1668; phone (907)586-7235; fax (907)586-7012;

Assistant Regional Administrator for Protected Resources, Southwest Region, NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, CA 90802-4213; phone (562)980-4020; fax (562)980-4027;

Tamra Farris, Assistant Administrator, Pacific Islands Regional Office, NMFS, 1601 Kapiolani Blvd., Suite 1110, Honolulu, HI 96814-4700; phone (808)973-2935; fax (808)973-2941;

Assistant Regional Administrator for Protected Resources, Northeast Region, NMFS, One Blackburn Drive, Gloucester, MA 01930-2298; phone (508)281-9346; fax (508)281-9371; and

Assistant Regional Administrator for Protected Resources, Southeast Region, NMFS, 9721 Executive Center Drive North, St. Petersburg, FL 33702-2432; phone (813)570-5301; fax (813)570-5517.

NOS National Marine Sanctuaries

Channel Islands National Marine Sanctuary, 113 Harbor Way, Santa Barbara, CA 93109 (805/966-7107)

Cordell Bank National Marine Sanctuary, Fort Mason, Building #201, San Francisco, CA 94123 (415/561-6622)

Fagatele Bay National Marine Sanctuary, P.O. Box 4318, Pago Pago, AS 96799 (011-684-633-7354)

Florida Keys National Marine Sanctuary, P.O. Box 500368, Marathon, FL 33050 (305/743-2437)

Florida Keys National Marine Sanctuary (Lower Region), 216 Ann Street, Key West, FL 33040 (305/292-0311)

Florida Keys National Marine Sanctuary (Upper Region), P.O. Box 1083, Key Largo, FL 33037 (305/852-7717)

Flower Garden Banks National Marine Sanctuary, 216 W. 26th Street, Suite 104, Bryan, TX 77803 (409/779-2705)

Gray's Reef National Marine Sanctuary, 10 Ocean Science Circle, Savannah, GA 3141 (912/598-2345)

Gulf of the Farallones and Cordell Bank National Marine Sanctuaries, Fort Mason, Building 201, San Francisco, CA 94123 (415/561-6622)

Hawaiian Islands Humpback Whale National Marine Sanctuary, 726 South Kihei Road, Kihei, HI 96753 (808/879-2818)

Monitor National Marine Sanctuary, The Mariners' Museum, 100 Museum Drive, Newport News, VA 23606-3759 (757/599-3122)

Monterey Bay National Marine Sanctuary, 299 Foam Street, Suite D, Monterey, CA 93940 (408/647-4258)

Olympic Coast National Marine Sanctuary, 138 W. 1st Street, Port Angeles, WA 98362 (360/457-6622)

Stellwagen Bank National Marine Sanctuary, 14 Union Street, Plymouth, MA 02360 (508/747-1691)

US Fish and Wildlife Service

Sirenia (other than Florida manatee) - Office of Management Authority, 4401 N. Fairfax Drive, Arlington, VA 22203 (1-800-358-2104);

Florida manatee - Field Supervisor, Jacksonville Field Office, 6620 South Point Drive South, Suite 310, Jacksonville, FL 32216-0312 [904-232-2580, Fax: 904-232-2404];

Southern sea otter - Field Supervisor, Ventura Field Office, 2493 Portola Road, Suite B, Ventura, CA 93003 [805-644-1766, Fax: 805-644-3958]; and

Northern sea otter, walrus, polar bear - Marine Mammals Management, 1101 E. Tudor Road, Anchorage, AK 99503-6199 [907-786-3800, Fax: 907-786-3816].

U.S. Fish and Wildlife Service
Wildlife Inspectors, Division of Law Enforcement

DESIGNATED PORTS

Anchorage - Designated P.O. Box 190045 Anchorage, Alaska, USA 99519 Phone: (907) 271-6198 Fax: (907) 271-6199	Los Angeles - Designated 370 Amapola Ave. #114 Torrance, California 90501 Phone: (310)328-6307 Fax: (310)328-6399
Atlanta - Designated P.O. Box 45287 Atlanta, Georgia 30320 Phone: (404)763-7959 Fax: (404)763-7560	Miami - Designated 10426 N.W. 31st Terrace Miami, Florida 33172 Phone: (305)526-2610 Fax: (305)526-2695
Baltimore - Designated 40 S. Gay Street, #223 Baltimore, Maryland 21202 Phone: (410)865-2127 Fax: (410)865-2129	New Orleans - Designated 2424 Edenborn, Room 100 Metairie, Louisiana 70001 Phone: (504)219-8870 Fax: (504)219-8868
Boston - Designated 70 Everett Avenue, Suite 315 Chelsea , Massachusetts 02150 Phone: (617)892-6616 Fax: (617)889-1980	New York - Designated 70 E. Sunrise Hwy. #419 Valley Stream, New York 11580 Phone: (516)825-3950 Fax: (516)825-1929 - Inspectors Fax: (516)825-3597 - Special Agents
Chicago - Designated Wildlife Inspection Program P.O. Box 66726 Chicago, Illinois 60666-0726 Phone: (773)894-2910 Fax: (773)894-2916	Newark - Designated 1210 Corbin St. SeaLand Bldg., 2nd Fl. Elizabeth, New Jersey 07201 Phone: (973)645-6171 Fax: (973)645-6533
Dallas/Ft. Worth - Designated 1717 West 23rd, Suite 104 DFW Airport, Texas 75261 Phone: (972)574-3254 Fax: (972)574-4669	Portland - Designated 7000 NE Airport Way, Rm. C2732 Portland, Oregon 97238 Phone: (503)231-6135 Fax: (503)231-6133

Honolulu - Designated 3375 Koapaka St., #F275 Honolulu, Hawaii 96819 Phone: (808)861-8525 Fax: (808)861-8515	San Francisco - Designated 1633 Old Bayshore Hwy., Ste. 248 Burlingame, California 94010 Phone: (650)876-9078 Fax: (650)876-9701
Seattle - Designated 2580 South 156th Street Seattle, Washington 98158 Phone: (206)764-3463 Fax: (206)764-3485	[redacted]
NON-DESIGNATED PORTS[3] U.S. Fish and Wildlife Service, Division of Law Enforcement	
Blaine 9925 Pacific Highway Blaine, Washington 98230 Phone: (360)332-5388 Fax: (360)332-3010	Great Falls 2800 Terminal Dr. Suite #105 Great Falls, Montana, USA 59404 Phone: (406) 453-5790 Fax: (406) 453-3657
Brownsville 1500 E. Elizabeth St. #239 Brownsville, Texas 78520 Phone: (956)504-2035 Fax: (956)504-2289	Nogales 9 N. Grand Avenue #2229 A Nogales, Arizona 85621 Phone: (520)287-4633 Fax: (520)287-3877
Buffalo 405 N. French Road #120 B Amherst, New York 14228 Phone: (716)691-3635 Fax: (716)691-3990	Laredo Convent & Zaragoza Bridge #1, 200.9 Laredo, Texas 78040 Phone: (956)726-2234 Fax: (956)726-3718

[3]The USFWS Law Enforcement Division MUST authorize ALL non-designated port usage. If you prefer to use a non-designated port, please contact the appropriate Law Enforcement Office.

Detroit Bldg. 830 2599 World Gateway Place Detroit Metro Airport, Michigan, USA 48242 Phone: (734) 247-6800 Fax: (734) 247-6805	Puerto Rico 651 FED. Dr. Suite 372-12 Guaynabo, PR 00965 Phone: (787) 749-4338 Fax: (787) 749-4340
Dunsieth RR1, Box 115 Dunseith, North Dakota, USA 58329 Phone: (701) 263-4462 Fax: (701) 263-4463	San Diego 185 West F Street, Room 440 San Diego, California 92101 Phone: (619)557-5794 Fax: (619)557-2997
El Paso Bota, 3600 E. Paisano, #142A El Paso, Texas 79905 Phone: (915) 872-4765 Fax: (915)532-4776	Tampa 9549 Koger Blvd. #111 St. Petersburg, Florida 33702 Phone: (727)570-5398 Fax: (727)570-5450
Guam 415 Chalan San Antonio Road Baltej Pavillion, Suite 209 Tamuning, Guam 96913-3620 Phone: (671) 647-6064 Fax: (671) 647-6068	St. Paul/Minneapolis HHH Terminal 7100 34th Avenue S. Minneapolis, Minnesota 55450 Phone: (612)726-6302 Fax: (612)726-6303

Attachment C

50 CFR §216.37 Marine mammal parts

With respect to marine mammal parts acquired by take or import authorized under a permit issued under this subpart:

(a) Marine mammal parts are transferrable if:

(1) The person transferring the part receives no remuneration of any kind for the marine mammal part;

(2) The person receiving the marine mammal part is:

(i) An employee of NMFS, the U.S. Fish and Wildlife Service, or any other governmental agency with conservation and management responsibilities, who receives the part in the course of their official duties;

(ii) A holder of a special exception permit which authorizes the take, import, or other activity involving the possession of a marine mammal part of the same species as the subject part; or

(iii) In the case of marine mammal parts from a species that is not depleted, endangered or threatened, a person who is authorized under section 112(c) of the MMPA and subpart C of this part to take or import marine mammals or marine mammal parts;

(iv) Any other person specifically authorized by the Regional Director, consistent with the requirements of paragraphs (a)(1) and (a)(3) through (6) of this section.

(3) The marine mammal part is transferred for the purpose of scientific research, maintenance in a properly curated, professionally accredited scientific collection, or education, provided that, for transfers for educational purposes, the recipient is a museum, educational institution or equivalent that will ensure that the part is available to the public as part of an educational program;

(4) A unique number assigned by the permit holder is marked on or affixed to the marine mammal part or container;

(5) The person receiving the marine mammal part agrees that, as a condition of receipt, subsequent transfers may only occur subject to the provisions of paragraph (a) of this section; and

(6) Within 30 days after the transfer, the person transferring the marine mammal part notifies the Regional Director of the transfer, including a description of the part, the person to whom the part was transferred, the purpose of the transfer, certification that the recipient

has agreed to comply with the requirements of paragraph (a) of this section for subsequent transfers, and, if applicable, the recipient's permit number.

(b) Marine mammal parts may be loaned to another person for a purpose described in paragraph (a)(3) of this section and without the agreement and notification required under paragraphs (a)(5) and (6) of this section, if:

(1) A record of the loan is maintained; and

(2) The loan is for not more than one year. Loans for a period greater than 12 months, including loan extensions or renewals, require notification of the Regional Director under paragraph (a)(6).

(c) Unless other disposition is specified in the permit, a holder of a special exception permit may retain marine mammal parts not destroyed or otherwise disposed of during or after a scientific research or enhancement activity, if such marine mammal parts are:

(1) Maintained as part of a properly curated, professionally accredited collection; or

(2) Made available for purposes of scientific research or enhancement at the request of the Office Director.

(d) Marine mammal parts may be exported and subsequently reimported by a permit holder or subsequent authorized recipient, for the purpose of scientific research, maintenance in a properly curated, professionally accredited scientific collection, or education, provided that:

(1) The permit holder or other person receives no remuneration for the marine mammal part;

(2) A unique number assigned by the permit holder is marked on or affixed to the marine mammal specimen or container;

(3) The marine mammal part is exported or reimported in compliance with all applicable domestic and foreign laws;

(4) If exported or reimported for educational purposes, the recipient is a museum, educational institution, or equivalent that will ensure that the part is available to the public as part of an educational program; and

(5) Special reports are submitted within 30 days after both export and reimport as required by the Office Director under §216.38.

APPENDIX H

GENERAL DESCRIPTIONS OF RESEARCH METHODOLOGIES UNDER THE ESA/MMPA PERMIT

1. Current ESA/MMPA Permit Activities

1.1.1 Close Approach

Animals may be taken through close approaches by aircraft for disentanglement, photo-identification, behavioral observation, hazing (during emergency response), and incidental harassment. Animals may be taken through close approaches by vessel for disentanglement, photo-identification, behavioral observation, capture, tagging, marking, biopsy sampling, skin scrapes, swabs, collection of sloughed skin and feces, breath sampling, blood sampling, administration of drugs, video recording, hazing (during emergency response), and incidental harassment. More than one vessel may be involved in close approaches and vessels may approach an animal more than once, in order to complete research tasks. Incidental harassment of non-target animals may occur during close approaches by aircraft or vessel.

1.1.2 Aerial Surveys

Aerial surveys are used to locate imperiled marine mammals; to monitor behavior or disease in a given population or individual; and to survey the extent of disease outbreaks or die-offs. The aircraft type used during emergency response activities depends upon the aircraft available at the time of the response and the logistics of the activity. Aircraft type includes helicopters and fixed-wing aircraft. The frequency of surveys is dependent on the circumstances of the involved stranded or entangled animals, the disease, or the occurrence of a Unusual Mortality Event (UME). Aerial surveys are flown along predetermined transect lines at a set altitude and air speed while observers scan the water for signs of marine mammals. When an animal or group of animals is sighted, the survey aircraft descends and circles over the animal or animals to obtain photographs. The time and altitude of the aircraft depends on the aircraft and the response or research situation. All aerial surveys will be flown according to the National Oceanic and Atmospheric Administration's (NOAA) Aviation Safety Policy (NOAA Administrative Order 209-124), with trained observers and pilots.

1.1.3 Vessel Surveys

Vessel surveys may be conducted to: collect data on animal abundance, to assess animals; locate animals for research activities; and collect research samples. The vessels themselves may be used as a platform for conducting animal sampling. Vessel surveys may be used to monitor animals subsequent to capture-release sampling for assessment, photo-identification, and tracking. For small cetaceans, inshore monitoring surveys are conducted using small (5-7 m) outboard motor powered

boats. Animals are located by having crew members visually search waters as the boat proceeds along a specified route at slow speeds (8-16 km/hr). Animals outfitted with Very High Frequency (VHF) radio tags are located by listening for the appropriate frequency and, after detecting a signal, maneuvering the boat towards the animal using a combination of signal strength and directional bearings. Frequencies and remote sensors may also be monitored. Once a group of animals is located, the boat approaches the group so that crew members can assess their physical and medical condition. Photographs of the dorsal fins of individual animals are taken for later identification and matching to existing dorsal fin catalogs. When an animal is located that has been recently caught for a health evaluation, an attempt is made to photograph the dorsal fin and body to confirm identification, health, position, and behavior. A photography of the dorsal fin would also be used to assess would healing from tag attachment. The area behind and below the posterior aspect of the dorsal fin may also be photographed to assess biopsy wound healing. A telephoto lens would be used for photographs, so vessels would not need to be too close to animals.

Multiple approaches may be required to obtain appropriate quality photographs, particularly if there are multiple individuals within a group. Close approach is terminated and the boat moves away from the group if animals begin to display behavior that indicates undue stress (e.g., significant avoidance behavior such as chuffing [forced exhalation], tail slapping, or erratic surfacing).

1.1.4 Capture and Restraint

Capture of marine mammals may be necessary during research activities to collect specimens, perform an examination, or attach tags or scientific instruments. Capture methods include, but are not limited to, nets, traps, conditioning, anesthesia, and immobilization. For land captures of pinnipeds, net types may include, but are not limited to, circle, hoop, dip, stretcher, and throw nets. Net guns and pole nooses may be used for capture. Typically seals resting onshore are stalked and placed in individual hoop nets. An injectible immobilizing agent, administered remotely by a dart, may be used to subdue older animals. Young pups may be caught and picked up by researchers. Herding boards may be used to maneuver animals into cages. For water captures of pinnipeds, dip nets, large nets, modified gill nets, floating or water nets, and platform traps may be used. Purse seine nets may be used offshore of haul-out sites to capture animals when they stampede into the water (Jeffries *et al.* 1993). Animals become entangled by the net as it is pulled ashore. Once removed from the net, animals are placed head first into individual hoop nets. Pups may be restrained by hand, in a hoop net, or with the inhalation of a gas anesthesia (administered through a mask over their nose). Older

animals may be restrained using gas anesthesia (administered through an endotracheal tube), a fabric restraining wrap, a restraining net, or through sedation.

Capture and restraint of cetaceans occurs during health assessment studies, emergency response, and disentanglement activities. Typical methods currently used during health assessment studies are described below. However, these methods may vary depending on the species and location. All capture and restraint protocols would be approved by NMFS PR1 before their use. The number of animals to be captured and sampled for health evaluations is determined from the sample size analyses that are based on the expected variance in values of designated health endpoints (*e.g.*, contaminant concentrations, seroprevalence of viral titers, prevalence of a given disease state) and information as to what are clinically relevant differences to be detected. Expected variance of endpoint measures are often estimated from available literature, but a pilot study (dart biopsy or small-scale health evaluations) are sometimes required for obtaining the variance estimates needed for determining sample size.

For health assessment studies of small cetaceans, small schools of animals are approached for identification (see description under vessel surveys). If the school contains animals desired for capture, the school is followed until it is in waters that facilitate safe captures (waters outside of boating channels, equal to or less than 1.5 m deep, where currents are minimal). Typically no more than three animals are captured at one time. The animals are encircled with a 600 m long by 4 m deep seine net, deployed at high speed from an 8 m long commercial fishing motor boat. Small (5-7 m) outboard-powered vessels are used to help contain the animals until the net circle is complete. These boats make small, high-speed circles, creating acoustic barriers.

Once the net is completed, about 15-25 handlers are deployed around the outside of the corral to correct net overlays and aid any animals that may become entangled in the net. The remaining 10-20 or more team members prepare for sampling and data collection and begin the process of isolating the first individual. Isolation is accomplished by pinching the net corral into several smaller corrals. Handlers are usually able to put their arms around the selected animal as it bobs in place or swims slowly around the restricted enclosure. However, a few animals may strike the net and become entangled. After animals are restrained by handlers, an initial evaluation is performed by a trained veterinarian. Once cleared by the veterinarian, the animal is transported to the processing boat via a navy mat and/or a sling. A sling is also used to place an animal back in the water for release.

In some cases, animals may need to be captured in deep waters. A break-away hoop-net is used to capture individuals as they ride at the bow of the boat. When they surface to breathe, the hoop is placed over their head and they move through the hoop, releasing the net. The additional drag of the net slows the animals substantially, but the design allows the animal to still use its flukes to reach the surface to breathe. The net is attached to a tether and large float, and the animal is retrieved, maneuvered into a sling and brought onboard the capture boat. All other procedures are the same for animals capture using either technique.

With both capture techniques, following restraint, animals are generally placed on foam pads on the deck of a boat, either solid hulled or inflatable, or another safe platform. The animal is shaded by a canvas top. The animal's respirations and behavior are monitored and recorded by one researcher. Another team member is responsible for ensuring that the animal's eyes are shaded from direct sunlight. Two to four personnel are positioned around the animal for restraint, as necessary, and to keep the animal wet and cool using buckets of water and sponges.

There are animals that do not acclimate well to being on the platform; for these individuals the assessment is conducted in the water. Animals that appear to be pregnant (but not in the late 2^{nd} or 3^{rd} trimester) and young animals may also be worked up in the water when this is considered to be in the dolphin's best interest. In addition, for animals that have been caught in previous years a reduced sampling protocol may be employed, reducing the need for the animal to be removed from the water.

For emergency response, small cetaceans in shallow water may be caught using a net deployed from a boat with methods similar to those described above. In rivers and canals, responders may use their bodies to herd an animal and then hand catch it. In deep water, hoop net may be used to capture animals.

For large whale disentanglement activities, the animal may be either physically or chemically restrained. Physical restraint of the animal is accomplished by attaching control lines, floats, and buoys to the entangling gear with a grappling hook or by attaching new gear to the animal to hold it. Responders use control lines to pull themselves up to the whale. Floats and buoys are used to slow the animal down by increasing drag. Response to entangled small cetaceans typically requires in-water capture of free-swimming animals. Entangled pinnipeds are typically captured on land when they are hauled out. These capture methods are described above.

1.1.5 Transport

Vehicles, boats, or aircraft are used to transport marine mammals to rehabilitation facilities or release sites. Cetaceans may be transported on stretchers, foam pads, or air mattresses. For short-term transport, closed-cell foam pads are preferred because they are rigid and do not absorb water. Open cell foam is typically used for long-term transport of cetaceans because it can contour to the animal's form. Boxes may be constructed to transport the animal upright in a stretcher. Cetaceans must be protected from exhaust fumes, sun, heat, cold, and wind, as transport often occurs on the flatbed of a truck. Animals are kept moist and cool, to avoid overheating (Geraci and Lounsbury 2005).

Small pinnipeds are typically transported in plastic kennel cages. Cages are large enough for animals to turn around, stretch out, and raise their heads. Cages should prevent animal contact with waste and allow proper air circulation. As with cetaceans, pinnipeds traveling by vehicle must be protected from the sun, heat, cold, wind, and exhaust fumes. Pinnipeds may overheat during transit and wetting the animal helps to prevent hyperthermia (Geraci and Lounsbury 2005). Large pinnipeds may need to be sedated during transport.

Commercial vehicle transport procedures for marine mammals under U.S. jurisdiction should comply with the Animal and Plant Health Inspection Service's "Specifications for the Humane Handling, Care, Treatment, and Transportation of Marine Mammals" (9 CFR Ch 1, Subpart E). The "Live Animal Regulations" published by the International Air Transport Association (IATA), and accepted by the Convention on International Trade in Endangered Species of Wild Fauna and Flora, are followed for the air transport of animals under foreign jurisdiction (IATA 2006). Both sets of standards have specifications for containers, food and water requirements, methods of handling, and care during transit.

1.1.6 Tagging/Attachment of Scientific Instruments

Tagging of marine mammals may be used to monitor an animal's movements after immediate release (from a stranding site), release after rehabilitation, or release after research activities. Other tags or scientific instruments may be used to obtain data on dive depth, dive time, water temperature, light levels, and animal and other underwater sounds. A variety tags (including scientific instruments) may be attached to or implanted in an animal. The type of tag and method of attachment depends on the species being tagged and the research or question being addressed. Types of tags that are used include, but are not limited to: roto-tags (cattle tags), button tags, VHF radio tags, satellite tags, Passive Integrated Transponder (PIT) tags, D-tags, code division multiple access tags, pill, time-depth

recorders (TDRs), life history transmitters (LHX tags), and crittercams (video cameras). Tag attachment methods vary with tag type, species, and circumstances. Attachment methods for cetaceans include, but are not limited to: bolt, buoy, punch, harness, suction cup, implant, or ingestion. Pinniped attachment methods include, but are not limited to: glue, bolt, punch, harness, suction cup, surgical implant, or ingestion. Specific tags and methods of attachment will be evaluated for each situation.

Tags are generally attached to free-swimming cetaceans by crossbow, compound bow, rifles, spear guns, slingshot (or throwing device), pole or jab spears. Attachments are temporary and occur via a suction cup device or implant. Scientific instruments attached to suction cups include, but are not limited to D-tags, TDRs, VHF tags, satellite tags, and crittercams. Large, slow moving whales may be tagged via suction cups using a pole delivery system, cantilevered on the bow of a boat. Bow-riding animals may be tagged using a hand held pole. Crossbows are the preferred method for tagging fast-moving toothed whales. Tags are attached on the dorsal surface of the animal behind the blowhole, closer to the dorsal fin. Tag placement ensures that the tag will not cover or obstruct the whale's blowhole, even if the cup migrates after placement (movement would be toward the tail).

Implantable tags may be attached in free-swimming animals by mounting the instrument on an arrow tip or other device designed to penetrate the skin of the animal. Tags would typically be attached by crossbow and may include, but not limited to satellite tags, VHF tags, and TDRs. Buoys are used to attach VHF or satellite tags to gear on entangled whales. Buoys may also be attached to increase drag in an attempt to slow the whale for disentanglement.

For animals in hand, tags may be attached for longer deployments. Roto-tags may be attached to cetaceans with a plastic pin to the trailing edge of the dorsal fin. Button tags are plastic disks attached with a bolt through the dorsal fin. VHF tags (roto-radio tags) may also be bolted through the trailing edge of the dorsal fin. The bolts on each type of tag are held in place by corrodible nuts, so that the tag will eventually be released.

Satellite or VHF tags can be mounted on a molded plastic or fabric saddle that would be bolted through the dorsal fin (Geraci and Lounsbury 2005) or dorsal ridge. Plastic saddles would be padded on the inside to reduce skin irritation. Saddles would be attached to the dorsal fin with two or three Delrin pins secured with magnesium nuts. The nuts would corrode in seawater, allowing the package to be released within a few days or weeks.

Dorsal ridge “spider tags” are currently used on beluga whales (NMFS Permit No. 782-1719) (Litzky et al. 2001). Up to four holes are bored in the region of the anterior terminus of the dorsal ridge using a coring device (trochar) with a diameter of no more than 1 cm. Each insertion and exit point for the trochars would be prepared by cleaning with an antiseptic wipe, or equivalent. Rods of nylon or other non-reactive material, not greater than 1 cm in diameter and 50 cm in length, would then be pushed through the holes and attached to the wire cables or fabric flange or straps of the satellite tags or through bolt holes in the tag. The wire cables would be tightened to hold the tag against the back of the animal to minimize tag movement and drag, but would not be put under significant tension to avoid pressure necrosis around the pin insertion points. The other attachment systems would be manipulated to achieve the best possible fit depending on their design. Excess rod would then be cut off. All equipment would be sterilized in cold sterile solution, alcohol, or equivalent, and kept in air- and water-tight containers prior to use. Trochars and rods would be coated with antiseptic gel prior to insertion and each trochar would only be used for one hole before it is cleaned, sharpened, and re-sterilized. Where more than one instrument is to be attached, the number of pins would be limited to four.

A fast drying epoxy adhesive is used to glue scientific instruments to pinnipeds. Instruments may be attached to the dorsal surface, head, or flippers and will release when the animal molts. A harness can be used to attach scientific instruments. Roto-tags can be attached to flippers using a single plastic pin. Tags can also be surgically implanted into the body cavity or muscle of pinnipeds. Implanted tags include PIT and LHX tags.

A PIT tag is a glass-encapsulated microchip, which is programmed with a unique identification code. When scanned with an appropriate device, the microchip transmits the code to the scanner, enabling the used to determine the exact identity of the tagged animal. PIT tags are biologically inert and are designed for SQ injection using a syringe or similar injecting device. The technology is well established for use in fish and is being used successfully on sea otters (Thomas et al. 1987), manatees (Wright et al. 1997), and southern elephant seals (Galimberti et al. 2000). PIT tags are also commonly used to identify domestic animals. PIT tags may be injected just below the blubber in the lumbar area, approximately 5 inches lateral to the dorsal midline and approximately 5 inches anterior to the base of the tail. Tags may also be injected at alternative sites on a pinniped’s posterior, but only after veterinary consultation. The injection area would be cleansed with Betadine (or equivalent) and alcohol prior to PIT tag injection. PIT tags are currently being used in Hawaiian monk seals (NMFS Permit No. 848-1695).

LHX tags are satellite linked, delayed transmission life history transmitters. The tag allows continuous monitoring from up to five built in sensors. The tag is implanted into the abdominal cavity of a pinniped. When the animal dies, the tag is released from the body and transmits the data to a satellite. The battery life of an LHX tag is well over five years. LHX tags are being evaluated under current NMFS PR1 research permits (Permit No.1034-1685 [California sea lions] and No. 881-1668 [Steller sea lions]).

1.1.7 Marking

Marking methods for marine mammals during research activities include, but are not limited to: bleach, crayon, zinc oxide, paint ball, notching, and freeze branding. Crayons, zinc oxide, and paint balls can be used on cetaceans and pinnipeds for temporary, short-term marking. Bleach or dye (human hair dye) markings can be used on pinnipeds. The marks are temporary, with the length of time dependent on molting. Notching can be used to permanently mark cetaceans by cutting a piece from the trailing edge of the dorsal fin. Notching in pinnipeds removes a piece of skin from the hind flipper of phocids (true or earless seals) and the foreflipper of otariids (sea lions and fur seals).

Cetaceans can be marked using freeze branding, typically on both sides of the dorsal fin or just below the dorsal fin. Freeze branding is used during health assessment studies to mark all animals for post-release monitoring. Freeze branding uses liquid nitrogen to destroy the pigment producing cells in skin. Each brand (typically 2" numerals) is supercooled in liquid nitrogen and applied to the dorsal fin for 15-20 seconds. After the brand is removed, the area is wetted to return the skin temperature to normal. Brands will eventually re-pigment, but may remain readable for five years or more. Freeze brands provide long-term markings that may be important during subsequent observations for distinguishing between two animals with similar fin shapes of natural markings. Freeze branding may be used to produce two types of marks on pinnipeds. Short contact by the branding iron destroys pigment producing cells, leaving an unpigmented brand. Longer contact with the brand destroys these cells and the hair, leaving a bald brand (Merrick *et al.* 1996). During health assessments, each animal is photographed and videotaped to record the locations of freeze brands. Freeze bands are photographed as they are applied, as they rapidly disappear following application.

1.1.8 Sample Collection and Analysis

Specimens would be taken from the Order Cetacea and the Order Pinnipedia (except walrus), this includes threatened and endangered species. Specimen materials may include, but are not necessarily limited to: earplugs, teeth, bone, tympanic bullae, ear ossicles, baleen, eyes, muscle, skin, blubber,

internal organs and tissues, reproductive organs, mammary glands, milk or colostrums, serum or plasma, urine, tears, blood or blood cells, cells for culture, bile, fetuses, internal and external parasites, stomach and/ or intestines and their contents, feces, air exhalate, flippers, fins, flukes, head and skull, and whole carcasses. Specimens may be acquired opportunistically with ongoing studies or prospective design plans; therefore specific numbers and kinds of specimens cannot be predetermined. Because all specimens will be acquired opportunistically, the MMHSRP will have minimal control over the age, size, sex, or reproductive condition of any animals that are sampled. Specific methods for biopsies, blood, breath, ultrasound, and other sampling are described below under the corresponding section.

Marine mammal specimens collected for analysis or archiving would be legally obtained from the following sources:

1. On-going live animal capture/release programs;
2. Live animal capture/release as part of a disease, emergency response, or die-off investigation;
3. Live animals stranded or in rehabilitation;
4. Captive animals, when sampling is beyond the scope of normal husbandry
5. Animals found dead on the beach or at sea;
6. Animals directly taken in fisheries in countries where taking of such animals is legal;
7. Animals killed during subsistence harvests by native communities;
8. Animals killed incidental to recreational and commercial fishing operations;
9. Animals killed incidental to other human activities;
10. Animals found dead as part of NOAA investigations (*e.g.* harmful algal blooms, oil spills, etc.);
11. Soft parts sloughed, excreted, or discharged by live animals (including blowhole exudate);
12. Live animals during surveillance
13. Bones, teeth, or ivory found on the beach or on land within ¼ mile of the ocean;
14. Confiscated animals (*e.g.*, as part of enforcement action); or
15. Animals legally taken in other permitted research activities in the U.S. or abroad.

Specimen and data collection from marine mammal carcasses may follow the necropsy protocols for pinnipeds (Dierauf 1994), right whales (and other large cetaceans) (McLellan *et al.* 2004), and killer whales (Raverty and Gaydos 2004). These include how samples would be stored, transported, and

analyzed. During live animal response or research, specimen and data collection protocols would depend on the samples being collected and the intended analyses.

1.1.9 Biopsy Sampling

Biopsy sampling would be conducted to collect skin, blubber, or other tissue samples. Sampling may occur on free ranging animals, animals captured for health assessment studies, and animals in rehabilitation. Skin and blubber biopsy sampling from a vessel may be conducted using crossbows, compound bows, dart guns, or pole spears. A crossbow would be used to collect a sample from animals within approximately 5 to 30 m of the bow of the vessel. The depth of the biopsy tip penetration would vary depending on the species being sampled and the depth of their blubber layer. For small cetaceans, such as bottlenose dolphins, the biopsy tip used to collect blubber for contaminant analysis penetrates to a depth of approximately 1.0-2.5 cm. Shorter tips may be used when only skin sampling is required. Sloughed skin can aggregate in the wake behind a moving animal, the slick "footprint" after a whale submerges, or in the water following surface active behaviors, such as breaching. This skin may be collected for analyses. Skin may also be collected from the suction cup used to temporarily attach scientific instruments to cetaceans.

Blubber biopsy samples may be taken during health assessment studies. These samples are necessary for the analyses of environmental contaminants, biotoxins, and fatty acids. An elliptical wedge biopsy is obtained from each animal. The sampling site is located on the left side of the dolphin, just below the posterior insertion of the dorsal fin. Local anesthetic (typically Lidocaine) is injected in an L-block at the biopsy site. A veterinarian then uses a clean scalpel to obtain a sample that is approximately 5 cm long and 3 cm wide, through nearly the full depth of blubber (approximately 1.5-2.0 cm). A cotton plug soaked with ferric subsulfate is inserted into the site once the sample is removed in order to stop bleeding. The sample is then partitioned into separate containers for each project. Skin obtained with the blubber biopsy is used for genetic analyses. Skin scrapings, biopsy samples, or needle aspirates will be collected for clinical diagnoses from sites of suspected lesion. These samples are processed by various diagnostic laboratories and a subsample is sent to the National Marine Mammal Tissue Bank (NMMTB).

1.1.10 Blood Sampling

Blood sampling in cetaceans may be collected from the dorsal fin, caudal peduncle, pectoral flipper, or flukes. Sampling at any of these sites would be done using an 18- gauge 4-cm needle, with a scaled down needle bore for calves, Dall's porpoise, and harbor porpoise. Blood samples in both phocids

and otariids may be collected through the bilaterally divided extradural vein, which overlies the spinal cord. Otariids may also be sampled using the caudal gluteal vein. Sampling would be done with a 20-gauge, 4-cm needle for small animals and an 18-gauge, 4-cm needle for larger animals. Phocids may be sampled by inserting a needle into the metatarsal region of the hind flipper (Geraci and Lounsbury 2005).

Blood sampling during health assessment studies may occur in the water prior to coming aboard the vessel, or once aboard the vessel. Typically, the blood sample is drawn from a blood vessel on the ventral side of the fluke, using an 18-20 gauge ¾" catheter. Approximately 200-350 cubic centimeters (cc) of blood are removed from each individual. The samples are placed in a variety of Vacutainers and other containers specific to the analyses, and are stored in a cooler until they are transported to a laboratory. Some samples may be processed on deck with a portable centrifuge system. Samples are separated and prepared for: standard chemistry, hematology, and hormonal analysis; contaminant analyses; immune function studies; aliquots for culturing for assessment of pathogens; and other preparations as necessary. All sample analyses occur at various diagnostic laboratories.

1.1.11 Breath Sampling

Breath sampling would be conducted on cetaceans or pinnipeds to assess their nutritional status and health. A specially designed vacuum cylinder would be used to collect breath samples. The system has previously been used on several cetacean species and elephants. Samples would be collected from free ranging cetaceans by positioning a funnel at the end of a pole (which is connected to the vacuum cylinder via plastic tubing) over the blowhole of the surfacing animal. The cylinder valve would be manually opened during exhalation. An algal culture plate inside the funnel would be used for bacterial cultures of the breath. The culture plate would be sealed and transported to a laboratory for analysis. The equipment typically would not touch the animal, although in some instances there may be brief (less than 10 seconds) contact. An individual animal may be approached up to three times to obtain a sample. Samples may also be collected during health assessments or on any live captured animal. The samples will then be examined using gas chromatography-mass spectrometry for volatile compounds to evaluate respiratory disease, nutritional status, and physical condition.

1.1.12 Ultrasound Sampling

Ultrasound sampling may be conducted on free ranging animals and animals captured during emergency response or research studies. Ultrasound may be used to evaluate blubber thickness, wounds, lesions, the presence of lesions, pregnancy, reproductive organs, and blood vessels.

During health assessment studies, a diagnostic ultrasound is used to examine the condition of the internal organs and to measure testis length and diameter to assess male maturity. Females are also examined by a veterinarian during the initial evaluation for pregnancy and the presence of developing follicles. Females determined to be in late-term pregnancy (late 2^{nd} and 3^{rd} trimester) are tagged with a roto-tag so they can be avoided in subsequent sets, and then immediately released. The ultrasound operates at a frequency of about 2.5-5.0 MHz, well above the dolphin's hearing. The examinations are recorded on video and audio tape, and thermal prints are made of features of interest. In addition, digital video thermography is used to measure skin temperature.

1.1.13 Other Sampling

Other sampling includes tooth extraction, urine, blowhole, fecal, milk, and sperm. Colonic temperature measurements may also be conducted. Most of these samples are collected during health assessment studies.

During health assessment studies, the age determination of animals is conducted using the deposition of growth layer groups in teeth. A tooth is extracted from the animal by a veterinarian trained in this procedure. The tissue surrounding the tooth (usually #15 in the lower left jaw) is infiltrated with Lidocaine without epinephrine (or equivalent local anesthetic), applied through a standard, high-pressure, 30 gauge needle dental injection system. Once the area is anesthetized, the tooth is elevated and extracted using dental extraction tools. A cotton plug soaked in Betadine, or equivalent, solution is inserted into the alveolus (pit where the tooth was) as a local antibiotic and to stop bleeding. This plug is removed prior to release. This procedure is modified from that described by Ridgway *et al.* (1975), wherein the entire mandible was anesthetized. The revised procedure has been used in captivity and in live capture and release sampling for many years. Extracted teeth are sectioned, stained, and growth layer groups are counted.

Urine analyses are diagnostically useful to evaluate the urinary system (kidneys, ureters, bladder, and urethra). Important diagnoses can be made by determining the color, pH, turbidity, chemical constituents, presence or absence of blood, and by identifying any bacteria or yeast present in the

urine. These diagnoses would likely be missed without such an examination. During health assessment studies, urine may be collected opportunistically, by holding an open sterile container in the urine stream. Samples may also be collected using urinary catheterization. A veterinarian experienced with cetaceans and a qualified veterinary technician perform the catheterization procedure. The dolphin would be lying on its side on the foam-covered deck of the boat serving as the veterinary laboratory. Wearing sterile surgical gloves, the assistant gently retracts the folds of the genital slit to allow visualization of the urethral orifice. The veterinarian (wearing sterile gloves) carefully inserts a sterile urinary catheter, lubricated with sterile lubricating gel, into the bladder via the urethra. A 50 ml collection tube without additive is used to aseptically collect the urine as it flows from the catheter. The catheter is removed after the urine is collected.

Swab samples from the blowhole and rectum are collected from each individual. A sterile swab is inserted into the blowhole during a breath, gently swabbed along the wall of the blowhole, and removed during the next breath. Fecal samples are obtained either from a small catheter inserted about 10 cm into the colon or from a sterile swab of the rectum. Cetacean feces may also be collected in the water column either from a vessel or a diver in the water. Pinniped feces may be collected directly from haul-out or rookery sites. The samples are sent to a diagnostic laboratory for culturing and species identification.

Milk samples are collected to measure the levels of lipophilic organic contaminants and to determine composition. All adult females are checked for lactation and milk samples are collected from all lactating females. A “breast-pump” apparatus is used to obtain the sample. Milk is expressed with gentle manual pressure exerted on the mammary gland while suction is provided by a 60 cc syringe attached by tubing to another 12 cc syringe placed over the nipple. Samples of up to 30-50 ml may be collected.

A potential impact of environmental contaminants on animal health is the reduction of reproductive capabilities. This may be measured indirectly in males through ultrasonic examination, measurement of testes, and measurement of testosterone concentrations. Collection and examination of sperm samples would be a more direct measurement of male reproductive function. If possible, ejaculate samples would be collected through manual manipulation of the penis. Samples are examined for sperm count, motility, and condition.

Colonic temperature is collected to understand vascular cooling and reproductive status (Rommel *et al.*1992, 1994). Temperature measurements are obtained with a linear array of thermal probes

interfaced to a laptop computer. The probes are housed in a 3 mm flexible plastic tube. The probe is sterilized, lubricated, and then inserted into the colon through the anus to a depth of 0.25-0.40 m, depending on the size of the animal. Temperature is continuously monitored.

Skin biopsies may be obtained from individuals displaying indications of skin disease. Gastric samples may be obtained using a standard stomach tube to evaluate health and evidence of brevetoxin exposure. Standard length and girth measurements may be taken and a series of ultrasonic measurements of blubber layer thickness may be obtained (the larger the animal, the more measurements).

1.1.14 Administration of Drugs and Euthanasia

Drugs may be administered for sedation/chemical restraint during stranding response and disentanglement activities. Anesthetics and analgesics may be used during research before performing biopsies, tooth extractions, and other procedures. Antibiotics, antifungals, and other medicines may be administered during response and rehabilitation. Drugs may be administered orally or through injection, intubation, or inhalation. Orally administered medications are typically hidden in fish but may also be given via stomach tube.

Subcutaneous (SQ), intravenous (IV), intramuscular (IM), and intraperitoneal (IP) injections may be used to deliver drugs. All of these methods would require some level of animal restraint. SQ injections are made in the interface between the blubber layer and the skeletal muscle layer. Animals must be maintained in a certain position for prolonged periods of time. The most common site for SQ injections in pinnipeds is the craniodorsal thorax between the scapulae. SQ injections would not be used in cetaceans.

In general, IV injections are complicated and rarely used in marine mammals. In cetaceans, medications may be injected in the fluke vessel if the volume is low and the medicine is not harmful if delivered perivascularly. An indwelling catheter may be used if repeated administration or slow infusion occurs (McBain 2001).

IM drug injections require longer needles because of the thickness of skin and blubber. Caution is taken to avoid accidental injection into the blubber, which may cause sterile abscess formation or poor absorption (Gulland *et al.* 2001). Injection into the blubber also has different drug-partitioning properties than muscle. This may result in the failure to activate a systemic distribution of highly lipid soluble medications (Stoskopf *et al.* 2001). Injection sites for phocids are the muscles

surrounding the pelvis, femur, and tibia. These sites, as well as the large muscles overlying the scapulae, are appropriate for otariids (Gulland *et al.* 2001). IM injections in cetaceans may be made off the midline, slightly anterior to, parallel to, or just posterior to the dorsal fin. Caution is taken to avoid the thoracic cavity if the injection is anterior to the dorsal fin (McBain 2001). Multiple injection sites may be used and the volume per site should be reasonable depending on the animal.

IP injections deliver medications into the abdominal cavity. Non-irritating drugs may be delivered by this method. During injection, caution must be taken to avoid damaging major organs. A contaminated needle or puncturing the gastrointestinal tract could introduce bacteria into the abdominal cavity (Gulland *et al.* 2001).

Euthanasia may be conducted if: an animal had an irreversibly poor condition and rehabilitation would not be possible; rescue would be impossible; or no rehabilitation facility is available. Euthanasia may occur at a rehabilitation facility when an animal is deemed unreleasable and cannot be placed in permanent captivity. Humane euthanasia procedures would only be carried out by an attending, experienced, and licensed veterinarian or other qualified individual. Sedation may precede the administration of euthanasia drugs. Pinnipeds are typically euthanized using a lethal injection of barbiturates or other agent normally used to euthanize domestic species. Smaller cetaceans can be euthanized by injecting barbiturates or other lethal agent into a vein of the flippers, dorsal fin, flukes, or caudal peduncle. It may also be injected directly into the heart of abdominal cavity using an in-dwelling catheter. A small cetacean may be sedated before injection occurred. For large cetaceans, a method is currently being developed to sedate the animal via IM injection and then deliver euthanasia agents via IV. Large cetaceans may be euthanized by lethal injection directly into the heart. Injection into a vein of the flippers or flukes would likely be unsuccessful. Large whales may also be euthanized by using ballistics (shooting) or by exsanguination (Geraci and Lounsbury 2005).

1.1.15 Auditory Brainstem Response /Auditory Evoked Potential

Auditory Brainstem Response (ABR) and Auditory Evoked Potential (AEP) procedures may be conducted as a method to evaluate the hearing abilities of individual animals or species. Procedures may be conducted on stranded animals, animals in rehabilitation, or on animals captured during studies. SQ electrodes are used for obtaining evoked potential signals in pinnipeds. Procedures on odontocetes are non-invasive and can be conducted in short time frames. An animal may be resting at the surface or may be physically restrained (held by researchers) during the procedure. For odontocetes, sounds are presented through a jawphone attached to the lower jaw via suction cup.

Recording, ground, and reference suction cup electrodes are attached along the dorsal midline, starting approximately 6 cm behind the blowhole. Evoked potentials are recorded from the electrodes. Frequencies used for testing range from 5 to 120 kHz and the maximum sound pressure level is less than 160 decibels re μPa.. Procedures would only be conducted on odontocetes and pinnipeds. NMFS PR1 currently does not permit the use of AEP procedures on any mysticetes. All AEP procedures performed on stranded and rehabilitating odontocetes and pinnipeds will follow NMFS PR1 policies and protocols.

1.1.16 Import and Export of Marine Mammals or Marine Mammal Parts

Export of marine mammal parts is necessary for the MMHSRP to provide specimens to the international scientific community for analyses or as control/standard reference materials. The MMHSRP imports specimens legally obtained outside the U.S. for archival in the NMMTB or for real time analyses. Imported samples would be legally obtained from:

- Any marine mammal directly taken in fisheries for such animals in countries and situations where such taking is legal;
- Any marine mammal killed in subsistence harvest by native communities;
- Any marine mammal killed incidental to commercial fishing operations;
- Any marine mammal stranded live; and
- Captive animals, when sampling is beyond the scope of normal husbandry practices.

An unlimited number and kinds of marine mammal specimens, including cell lines, would be imported and/or exported (worldwide) at any time during the year. Specimens would be taken from the Order Cetacean and the Order Pinnipedia (except walrus), including threatened and endangered species. Specimen materials may include, but are not limited to: earplugs; teeth; bone; tympanic bullae; ear ossicles; baleen; eyes; muscle; skin; blubber; internal organs and tissues; reproductive organs; mammary glands; milk or colostrums; serum or plasma; urine; tears; blood or blood cells; cells for culture; bile; fetuses; internal and external parasites; stomach and/or intestines and their contents; feces; flippers; fins; flukes; head and skull; and whole carcasses. Specimens are acquired opportunistically; therefore specific numbers and kinds of specimens, the countries of exportation, and the countries of origin cannot be predetermined.

All marine mammals under NMFS jurisdiction, including ESA-listed species, may be imported or exported for medical treatment. Transport methods would be the same as those described in Section 1.1.5.

2. Future ESA/MMPA Permit Activities

2.1.1 Blood Sampling

Currently, no procedures exist to remotely collect blood from free-swimming animals. However, if blood sampling procedures are developed and approved within the timeframe of the permit (five years), the MMHSRP would use these to conduct research. All protocols (including species) would be provided to NMFS PR1 for approval prior to any research activity.

2.1.2 Health Assessment Studies

In addition to the current health assessment studies on bottlenose dolphins, future studies would be conducted on other cetacean species. New tagging, tracking, and telemetry packages would also be used. All species and methods would be provided to NMFS PR1 for approval before any activities occurred.

2.1.3 Acoustics

Currently, the use of AEP procedures on any mysticete is not permitted by NMFS PR1. However, if mysticete procedures are approved within the timeframe of the permit (five years), the MMHSRP would use these to conduct research. All protocols (including species) would be provided to NMFS PR1 for approval prior to any research activity.

Passive acoustic recording would involve the used of a hydrophone (underwater microphone). A hydrophone would be placed in the water directly off of a vessel, and sounds would be recorded and taped via an apparatus on the vessel.

Active acoustic playbacks would be used to expose cetaceans and pinnipeds to playbacks of pre-recorded songs, social sounds, and feeding calls of that species. Sounds and songs would be projected from an underwater speaker hung over the side of a small vessel. Sounds or songs would be projected from the speaker at a volume and quality as close to a real sound/song as possible. The playback system would be calibrated so precise levels of sound can be projected. The reaction of the animals to the sounds and songs would be measured, often through behavioral observation and photo-identification/video recording of the subject animal(s) from a second vessel.

2.1.4 Vaccination Program

[Section not completed.]

The pinniped vaccination program would use information from the Final Report of the Workshop to Evaluate the Potential for Use of *Morbillivirus* Vaccination in Hawaiian Monk Seals and from the vaccine trial subcommittee that was started at this workshop (HSWRI 2006). The pinniped vaccine study would include the use of harbor seals, northern elephant seals, and Hawaiian monk seals. The vaccine would be used to protect individual monk seals and prevent the spread of *Morbillivirus*. A vaccine would only be used if there was a threat of an epidemic.

A vaccination program would include a plan for vaccine trials in a laboratory and field setting and a vaccination plan for wild seals. Vaccine testing and implementation would proceed slowly and in a stepwise fashion. Laboratory and field trials with Hawaiian monk seals would not be conducted until protocols and safety and efficacy concerns have been addressed in at least one model species (see below for description). Trials in model species would provide more information on safety than efficacy. Some in vitro measures may be developed, but there would be no way to evaluate efficacy without a disease challenge.

Before beginning a vaccine trial, a method would be in place to allow expert review of the results at each testing stage and to ensure that the review occurs before continuing with the next stage. Samples sizes for vaccine trials would be constrained by the availability of animals for testing. Drug companies that produce vaccines could be contacted to provide guidance on ideal or recommended sample sizes for vaccine trials.

Harbor seals would be used as a model for Hawaiian monk seals. There is a relatively large sample size of harbor seals in captivity that could be considered for vaccine trials. Vaccine trials have already been conducted in the United Kingdom (UK) on harbor seals. Some information from these trials is available with regard to issues such as post-vaccination monitoring protocols. Harbor seals have also shown susceptibility to wild strains of the virus and some protection from a vaccine in limited UK trials.

Elephant seals may also be used as a model species because they are more closely related to Hawaiian monk seals. If elephant seals in rehabilitation are used as trial subjects, they could be declared non-releasable (e.g., if they are shedding a virus) after a vaccine trial. Animals that are likely to be euthanized for other reasons could be possible trial subjects. Post-mortem exams could be conducted on the animals that were vaccinated and then euthanized, allowing for careful examination of the lymph nodes (for evidence of immunosuppression) and target organs like the brain.

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4. Acronyms

ABR	Auditory Brainstem Response
AEP	Auditory Evoked Potential
APHIS	Animal and Plant Health Inspection Service
cc	Cubic centimeter
ESA	Endangered Species Act
HSWRI	Hubbs-SeaWorld Research Institute
IATA	International Air Transport Association
IM	Intramuscular
IP	Intraperitoneal
IV	Intravenous
LHX	Life History transmitter
m	Meter
MMHSRP	Marine Mammal Health and Stranding Response Program
MMPA	Marine Mammal Protection Act
NMFS PR1	National Marine Fisheries Service, Office of Protected Resources, Permits, Conservation and Education Division
NMMTB	National Marine Mammal Tissue Bank
NOAA	National Oceanic and Atmospheric Administration
PIT	Passive Integrated Transponder
SQ	Subcutaneous
TDR	Time-depth Recorder
UME	Unusual Mortality Event
VHF	Very High Frequency

APPENDIX I

REQUIRED TAKE TABLES FOR THE ESA/MMPA PERMIT APPLICATION

Table 1. Proposed activities over a specified period								
Species	**Life Stage**	**Sex**	**Expected Take or Import/Export**	**Number of Takes per Individual**	**Take Action**	**Transport**	**Location**	**Dates/Time Period**
Project 1: Emergency Response Activities								
All Cetacea, all Pinnipedia, sea otter, manatee, polar bear	All	M/F	Unlimited	Unlimited	Close approach, aerial and vessel surveys, disentanglement, capture, restraint, handling, tagging, sample collection, sample analysis, import/export of samples or animals, transport, relocation, rehabilitation, release, necropsy, carcass disposal	Live animals may be transported to rehabilitation facilities; carcasses may be transported to disposal sites or laboratories; analytical and diagnostic samples may be transported, imported or exported as needed to laboratories	Beaches and Coastal waters of the US, US EEZ, international (for import/export)	All/continuous
Project 2: Prospective Health Assessment Activities								
Pinnipedia	All except YOY	M/F	Up to 100 annually	5	Close approach, aerial and vessel surveys, capture (net or hand), restraint, handling, tagging, sample collection, release		Coastal waters of the US, US EEZ, international waters	All
Pinnipedia	All except YOY	M/F	3 annually	1	Accidental mortality during capture activities		Coastal waters of the US, US EEZ, international waters	All
Small Cetacea (*Tursiops, Stenella, Steno, Delphinus, Lagenorhynchus Lagenodelphis, Lissodelphis, Grampus, Peponocephala, Feresa, Pseudorca, Orcinus, Globicephala, Phocoena, Phocoenoides*)	All except YOY	M/F	Up to 50 annually	5	Close approach, aerial and vessel surveys, capture (net or hand), restraint, handling, tagging, sample collection, release		Coastal waters of the US, US EEZ, international waters	All

Table 1. Proposed activities over a specified period (continued)								
Species	**Life Stage**	**Sex**	**Expected Take or Import/Export**	**Number of Takes per Individual**	**Take Action**	**Transport**	**Location**	**Dates/Time Period**
Project 2: Prospective Health Assessment Activities (continued)								
Small Cetacea (see above)	All except YOY	M/F	3 annually	1	Accidental mortality during capture activities		Coastal waters of the US, US EEZ, international waters	All
Large Whales (gray, right, humpback, fin, blue, Bryde's, minke, sperm, and all beaked whales)	All except YOY	M/F	Up to 50 annually	5	Close approach, aerial and vessel surveys, tagging, sample collection	None	Coastal waters of the US, US EEZ, international waters	All
Large Whales (gray, right, humpback, fin, blue, Bryde's, minke, sperm, and all beaked whales)	All except YOY	M/F	1 annually	1	Accidental mortality during research activities			
Project 3: Pinniped Vaccine Study								
Phoca vitulina	Adult/ Juvenile	M/F	Up to 50	5	Restraint, handling, sample collection	none	Animals currently in permanent captivity (public display or research) or in a rehabilitation facility	Over 2 years
Mirounga angustirostris	Adult/ Juvenile	M/F	Up to 50	5	Restraint, handling, sample collection	None	Animals currently in permanent captivity (public display or research) or in a rehabilitation facility	Over 3 years
Monachus schauinslandi	All	M/F	Up to 50	5	Capture, restraint, handling, sample collection	None	Captive animals throughout the US, wild animals from Hawaii	Over 5 years

Table 1. Proposed activities over a specified period (continued)								
Species	**Life Stage**	**Sex**	**Expected Take or Import/Export**	**Number of Takes per Individual**	**Take Action**	**Transport**	**Location**	**Dates/Time Period**
Project 3: Pinniped Vaccine Study (continued)								
All species	All	M/F	10	1	Accidental mortality during research activities.	None	All	Over 5 years

APPENDIX J

CARCASS DISPOSAL INFORMATION

PERSISTENT CONTAMINANTS IN SELECTED SPECIES OF MARINE MAMMALS IN US WATERS: A REVIEW OF THE LITERATURE FROM 1995 THROUGH 2005

A report prepared for the
National Oceanic and Atmospheric Administration,
National Marine Fisheries Service, Office of Protected Resources
Marine Mammal Health and Stranding Response Program
Purchase Order: DG133F03SE1139

by
Victoria M. Woshner, DVM, PhD

August 21, 2006

REPORT OUTLINE:

I. INTRODUCTION

II. ENVIRONMENTAL CONTAMINANTS IN SELECTED MARINE MAMMAL SPECIES IN US WATERS

A. Contaminant classes—background information
1. Persistent organic pollutants (POPs)
1. Polychlorinated biphenyls (PCBs)
2. Polychlorinated dibenzo-p-dioxins and furans (PCDD/Fs)
3. DDT (1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane)
4. Chlordanes (including heptachlor and heptachlor epoxide)
5. Hexachlorobenzene (HCB)
6. Hexachlorocyclohexanes (HCHs)
2. Toxic metals
1. Cadmium
2. Lead
3. Mercury
4. Organotins
3. Miscellaneous contaminants
1. Polybrominated diphenyl ethers (PBDEs)
2. Polyfluoroalkyls (PFAs)

B. Concentrations of environmental contaminants in selected species of marine mammals in US waters
1. Species addressed
2. Databases reviewed, including time period examined and search terms used.
3. Overview of tissue contaminant concentrations: Literature review summary
0. General comments upon format of tables and appendices
1. Persistent organic pollutants (POPs)
2. Toxic metals
3. Miscellaneous contaminants

C. Conclusions and comments regarding the nature and adequacy of the available literature database

III. LITERATURE CITED

IV. TABLES AND APPENDICES (ACCOMPANYING EXCEL FILE)

Table 1. Summary Data for Some Persistent Organic Pollutants, Including PCBs, DDTs, Chlordanes, Mirex, Dieldrin, HCHs and HCB in Blubber of Selected Marine Mammal Species from US Waters, Reported 1994 through 2005.

I. INTRODUCTION

As charismatic megafauna, marine mammals are beloved and revered by people around the world. Consequently, mortality events and scientific research involving marine mammals are often of a high public profile. Widely publicized reports of high levels of anthropogenic contaminants in some whale species have incited concern that the carcasses of the whales themselves may constitute a toxicological hazard. This literature review was initiated with a view to gathering the collective data pertaining to levels of persistent contaminants in that subset of marine mammal species in US waters that tends to strand most frequently, so that the potential toxicological hazard generated by carcasses of these animals might be assessed.

II. ENVIRONMENTAL CONTAMINANTS IN SELECTED MARINE MAMMAL SPECIES IN US WATERS

A. Contaminant classes—background information

II.A.1. Persistent organic pollutants (POPs)

II.A.1.*1*. Polychlorinated biphenyls (PCBs) are complex mixtures of synthetic chlorinated compounds produced in the US until 1977 for use as insulators, coolants and lubricants, particularly in transformers and other electrical equipment (ATSDR, 2000). The basic structure of PCBs consists of a biphenyl backbone with 1 to 10 chlorine atoms, yielding 209 possible PCB congeners. Position and degree of chlorination are important determinants of congener toxicity, with more highly chlorinated and coplanar (dioxin-like) PCBs exhibiting greater toxicity than less chlorinated and non-planar congeners. A greater degree of chlorination also confers longer environmental persistence, which can range from months to years (ATSDR, 2000). The highly lipophilic nature of PCBs allows them to accumulate in fatty tissues of organisms or to associate with organic components of sediments in environmental samples. In animals and humans, PCBs are toxic to integumentary, immune, endocrine, reproductive, and nervous systems. At high doses, PCBs have been associated with liver and kidney damage in laboratory animals. PCBs are a known animal carcinogen and considered a probable human carcinogen by the US Environmental Protection Agency (USEPA) and other agencies (ATSDR, 2000), although no increased risk of cancer has been detected in studies of individuals occupationally exposed to PCBs (Ross, 2004). PCBs also have been implicated as environmental endocrine disruptors in wildlife species (Chiu et al., 2000), although this link is controversial (Ross, 2004). While PCBs can persist in the environment for many years, they are susceptible to both anaerobic and aerobic microbial degradation via metabolism of congeners with higher or lower degrees of chlorination, respectively (Abraham et al., 2002).

II.A.1.*2*. Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzo-p-furans (PCDFs) are chlorinated hydrocarbon compounds produced by combustion of waste and organic materials, or as contaminants in chemical manufacturing processes. Both compound classes consist of two benzene rings joined by either one (PCDFs) or two

(PCDDs) oxygen atoms. Like PCBs, PCDDs/PCDFs are environmentally persistent compounds that associate with particulate matter and that are highly lipophilic and prone to biomagnify in the food chain. The most toxic PCDD, 2,3,7,8 tetrachlorodibenzo-*p*-dioxin (TCDD) serves as a standard for comparison of other dioxins and dioxin-like PCBs, the toxicity of which is sometimes expressed in "toxic equivalency factors" (TEQs) of TCDD (ATSDR, 1998). TCDD can cause dermal and hepatic toxicity, and is classified as a human carcinogen. Other PCDDs/PCDFs may cause similar effects, depending upon their structure (ATSDR, 1998).

II.A.1.*3*. DDT (1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane) is an organochlorine pesticide banned in the US in 1972, but still used in many parts of the world for control of malaria-transmitting mosquitoes. Technical grade DDT is a mixture of *p,p'*-, *o,p'*-D, and *o,o'*-DDT isomers and may also contain DDE (1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene) and DDD (1,1-dichloro-2,2-bis(p-chlorophenyl)ethane) as contaminants. The latter two compounds may also be produced via metabolism by some organisms, including microbes in the environment. In temperate regions, soil half-life of DDT is approximately 5 years, but may be up to 4 to 6 times as long, depending on the environmental conditions (ATSDR, 2002a). Like other organochlorines, DDT, DDE and DDD are extremely lipid soluble, tending to biomagnify and to associate with organic matter (soils and sediments) in the environment. At extremely high doses, DDT may be neurotoxic (ATSDR, 2002a). DDT and its metabolites are carcinogens and may also act as endocrine disruptors, although studies on estrogenic effects of DDT have been equivocal (Turusov et al., 2002).

II.A.1.*4*. Chlordane is an organochlorine pesticide used in the US until 1988 (ATSDR, 1994). It is a complex mixture of various chlordane isomers and other compounds, the fractions of which vary depending upon the purity of the preparation. The predominant components identified in technical chlordane were *cis*-chlordane, *trans*-chlordane, *trans*-nonachlor, octachlordane, heptachlor, and *cis*-nonachlor (Dearth and Hites, 1991). Chlordane may persist for decades in the environment and is highly lipid soluble, with oxychlordane comprising the major metabolite that bioaccumulates in fatty tissues (USEPA, 1997). A component of chlordane, heptachlor was also produced and used as a pesticide in its own right. Heptachlor epoxide may be produced by degradation or metabolism of heptachlor (ATSDR, 1993). Chlordane and the related compounds heptachlor and heptachlor epoxide are lipophilic and environmentally persistent (ATSDR, 1994 and 1993). At high doses, chlordane may cause toxic effects in the liver, digestive tract and nervous system (ATSDR, 1994). While data are limited, heptachlor and heptachlor epoxide also have been associated with toxic effects to the nervous and reproductive systems, as well as to liver and kidney in humans or animals, with the epoxide metabolite being more toxic than its parent compound (ATSDR, 1993). Evidence as to carcinogenicity of chlordane is inconclusive (ATSDR, 1994; USEPA, 1997). Heptachlor and heptachlor epoxide are considered possible human carcinogens by the USEPA, while the International Agency for Research on Cancer (IARC) determined that the two compounds are not classifiable with respect to human carcinogenicity (ATSDR, 1993).

II.A.1.*5*. Hexachlorobenzene (HCB) was produced in the US until 1970s, although it continued to be used as a fungicide until 1984. Also, some HCB is formed as a by-product in the manufacture of other chlorinated compounds as well as during incineration of garbage (McGovern, 2004). HCB is ubiquitous and persistent in the environment, with a half-life of up to approximately 6 years in soil, air and surface water, while in groundwater the half-life may be almost twice as long. Like other organochlorines, HCB is insoluble in water, but highly soluble in organic solvents and lipid allowing it to bioaccumulate readily in fatty tissues. HCB is toxic to virtually all organ systems, with the central nervous system, ovary and liver comprising the most vulnerable target organs. The USEPA classifies HCB as a probable human carcinogen based on data from animal studies (ATSDR, 2002b).

II.A.1.*6*. Technical grade hexachlorocyclohexane (HCH), which contains α, β, γ, δ, and ε isomers, was produced in the US until 1983 for use as an insecticide. While other forms of HCH are now banned, γ-HCH (also known as lindane) is still imported for use as an insecticide and topical treatment for lice (Research Triangle Institute, 1999). At high doses, HCHs can result in neural, musculoskeletal and reproductive toxicity. Abnormalities in developmental, endocrine, hepatic, renal, immunologic and hematopoieitic indices associated with HCH exposure also have been documented in humans or animals. Some animal studies have found increased incidence of liver cancer in rodents following chronic oral exposure to HCHs, leading the Department of Health and Human Services to extrapolate that HCHs may be a possible human carcinogen (Research Triangle Institute, 1999).

II.A.2. Toxic metals

1. *Cadmium*
2. *Lead*
3. *Mercury*
4. *Organotins*

Toxic metals are a unique class of environmental contaminants in that they occur naturally, although human activities have allowed them to become more pervasive and accessible to biotic cycles. However, because they are innate to the environment, it is difficult to distinguish “pollutant” from “natural” sources. Moreover, metals are not degraded via microbial or physical action, but may merely metamorphose by alterations in oxidation state and/or in the other elements to which they are bound in compounds.

II.A.2.*1*. Cadmium is a heavy metal often released as a by-product during refining of zinc, copper and lead, and has some industrial uses, such as in batteries and electrical components. There also are natural releases of cadmium to the environment through events such as volcanic eruptions and forest fires. Compared to other metals, cadmium is somewhat unique in that it is taken up and may accumulate to appreciable levels in some plants. In animals, cadmium is sequestered in the kidney and liver. The target organ of cadmium is the kidney; in addition, it is toxic to a number of other organs, including liver, bone and blood vessels. While data are scant, cadmium may be carcinogenic as well (ATSDR, 1999a). Various marine mammals are exposed to or bioaccumulate high levels of cadmium compared to terrestrial species (Woshner et al., 2001a; 2001b).

Although no physiologic requirement can be demonstrated for cadmium in the majority of organisms, some researchers recently have characterized a cadmium-containing enzyme in a marine diatom, refuting the long-held belief that cadmium was not only universally toxic but also functionless in living creatures (Lane et al., 2005).

II.A.2.*2*. Lead is ubiquitous in the environment, both as a result of natural geologic distribution and because of wide industrial applications, including former usage as a gasoline and paint additive. It is also released by combustion of fossil fuels and waste incineration. Lead is believed to be universally toxic, even at very low levels, with no organisms known to date demonstrating a physiologic requirement for lead. Generally, ingested lead is not well absorbed; however, because it is chemically similar to calcium, it may be assimilated and accumulated in tissues in lieu of calcium, particularly in growing organisms that are calcium limited. Although the nervous system (particularly the developing brain) is considered the "target organ" of lead, this metal is toxic to virtually all body systems, including the hematopoietic, cardiovascular, reproductive, immune, gastrointestinal, and musculoskeletal systems. Lead is carcinogenic in laboratory species, but has not been established as a human carcinogen (ATSDR, 1999b).

II.A.2.*3*. Mercury (Hg) is another metal that is apparently toxic to all organisms, even at low levels. Relative toxicity of mercury depends largely on the form of the metal (organic versus inorganic), and as is the case for all toxicants, the route by which exposure occurs. Ingested elemental mercury is not well-absorbed and hence of low toxicity, while exposure to methylmercury by this route is highly toxic, as it is almost completely absorbed. Like other toxic metals, mercury enters the environment from natural sources, such as volcanoes and degassing of the earth's crust. However, anthropogenic activity has dramatically increased mercury emissions, primarily through burning of fossil fuels, as well as through mining and other industrial applications. While mercury is toxic to virtually all body systems, the nervous system and kidney are the primary target organs for organic and inorganic mercury, respectively (ATSDR, 1999c).

II.A.2.*4*. In its inorganic form, tin (Sn) is non-toxic. However, organic forms of tin may be highly toxic. Organotins have a variety of industrial applications, including use of mono- and di-substituted organotins as catalysts and stabilizers in PVC plastics (Appel, 2004). Tributyl tin (TBT) compounds have been widely used as pesticides, particularly in antifouling paints on ships. As such, TBTs are ubiquitous in the aquatic environment, even as their use is being phased out due to concerns with respect to their ecotoxicity (Rüdel, 2003). As with many other toxicants, organotins adsorb onto organic particulates, such that an increase in dissolved organic matter decreases bioavailability of organotins. Also, speciation of organotins is pH-dependent; hence, increasing pH is associated with formation of organotin hydroxides, which are lipophilic and therefore predisposed to bioaccumulate (Fent, 2003). Organotins, especially TBT and triphenyltin (TPT) have been associated with tumorigenicity of the adenohypophysis, developmental toxicity, reproductive toxicity, neurotoxicity and most especially immunotoxicity, with thyrotoxicity apparently consitituting the most sensitive toxic endpoint in mammals (Rüdel, 2003). Gastropods are exceptionally vulnerable to toxic effects of TBT, which disrupts steroid metabolism leading to development of imposex at even minute

concentrations. In the environment, organotins undergo aerobic degradation, but can persist for years in anoxic sediments (Fent, 2004).

II.A.3. Miscellaneous contaminants

1. *Polybrominated diphenyl ethers (PBDEs)*
2. *Polyfluoroalkyls (PFAs)*

II.A.3.*1*. Polybrominated diphenyl ethers (PBDEs) are one group of brominated flame retardants that are currently in wide usage. These compounds are added to plastics, particularly those comprising plastic components of computers and televisions as well as to plastic foams and textiles (ATSDR, 2002c; Darnerud et al., 2001). While over 200 PBDE congeners are possible, forms with fewer than four bromine atoms generally are not employed in commercial applications. Release of PBDEs into the environment is believed to occur primarily through incineration and volatilization; leaching from landfills may also serve as a source of PBDE contamination, although studies are lacking to verify this (Darnerud et al., 2001). Like other persistent organic pollutants, PBDEs are resistant to environmental and biotic degradation. Although research is limited, uptake from the environment appears to occur mainly through oral exposure, with absorption efficiency inversely related to degree of bromination (ATSDR, 2002c). PBDEs are lipophilic, and appear to have potential for both bioaccumulation and biomagnification (ATSDR, 2002c). The extent to which PBDEs are metabolized and excreted appears to vary with species and degree of congener bromination (Darnerud et al., 2001). In laboratory studies, effects of PBDEs range from immunotoxicity and thyrotoxicity, to hormone disruption, neurobehavioral abnormalities and developmental toxicity. The limited evidence available to date suggests that PBDEs do not have teratogenic or genotoxic potential. (ATSDR, 2002c).

II.A.3.*2*. Polyfluoroalkyls (PFAs) are a group of compounds comprised chiefly by fluorotelomer alcohols and perfluoroalkyl sulfonamide alcohols (as well as their breakdown products), that were used in a variety of commodities, including surface protectants, paper, insecticides, surfactants, and fire-retardants (Olsen et al., 2003; Seacat et al., 2002). Because of their toxicity and environmental persistence, some PFAs have been banned (Olsen e al., 2003; Seacat et al., 2002). Through metabolism or environmental degradation, fluorotelomer alcohols appear to form carboxylic acids, fluorotelomer carboxylic acids (FTCA), and fluorotelomer unsaturated carboxylic acids (FTUCA) (Houde et al., 2005). Degradation of perfluoroalkyl sulfonamide alcohols yields sulfonic acids (PFSAs) such as perfluorooctane sulfonate (PFOS)—a stable, bioaccumulative, toxic end product that has been found among diverse species from widely different environments (Giesy and Kannan, 2001). Toxicity of PFOS is related primarily to effects on the liver, including hepatocellular hypertrophy and altered lipid metabolism, including decreased cholesterol (Olsen et al., 2003). Some PFAs have been found to act as hepatic peroxisome proliferators or to provoke developmental and neuroendocrine toxicity (Houde et al., 2005).

II.B. Concentrations of environmental contaminants in selected species of marine mammals in US waters

II.B.1. Species addressed

Twelve species of marine mammals are included in this review, based upon the frequency and patterns with which they strand (T. Rowles and J. Whaley, pers. comm.). Species that tend to strand as individuals include: pygmy and dwarf sperm whales (*Kogia breviceps* and *K. simus*, respectively); common bottlenose dolphin (*Tursiops truncatus*); California sea lion (*Zalophus californianus*); harbor seal (*Phoca vitulina*); and elephant seal (*Mirounga angustirostris*). Species that tend to strand *en masse* are represented by: long and short-finned pilot whales (*Globicephala melas and G. macrorhynchus*, respectively); rough-toothed dolphin (*Steno bredanensis*); and white-sided dolphin (*Lagenorhynchus acutus*). Large whale species considered are the gray and humpback whales (*Eschrichtius robustus* and *Megaptera novaeangliae*, respectively).

II.B.2. Databases reviewed, including time period examined and search terms used

The online databases Biological Abstracts, PubMed, and Toxline were searched, using an exhaustive list of key words, including (but not limited to): *Kogia*, *Tursiops*, *Zalophus*, *Phoca*, *Mirounga*, *Globicephala*, *Steno*, *Lagenorhynchus*, *Eschrichtius robustus*, *Megaptera*, elephant seal, dolphin, marine mammal, pinniped, whale, cetacean, polychlorinated biphenyls, PCB, DDT, persistent organic pollutants, pollutant, contaminant, heavy metal, mercury, hexachlorocyclohexane, HCB, chlordane, heptachlor, dieldrin, aldrin, and organochlorine(s). Reports on marine mammals considered for inclusion in this review were confined to those published in peer-reviewed journals from 1995 through 2005 that addressed any of the twelve species designated above in US waters. A few ancillary studies that were either published prior to 1995, or that dealt with marine mammals in non-US waters, were included when those waters were contiguous with US waters, and when other US-based studies for those particular species were lacking. For example, Varanasi et al., 1994, was published outside of the timeframe used as a criterion for inclusion in this review. Nevertheless, I incorporated this study, as well as a few other studies (Tilbury et al., 2002; De Luna and Rosales-Hoz, 2004; Ruelas-Inzunza et al., 2002; Mendez et al., 2002) that addressed contaminants in *E. robustus* from Russian (Bering Sea) and Mexican waters, because contaminant studies for gray whales were limited. Also, because gray whales migrate long distances, whales studied in Mexican or Russian waters likely navigate US waters as well, where they may strand or die and present a carcass disposal problem.

II.B.3. Overview of tissue contaminant concentrations: Literature review summary

II.B.3.*0. General comments upon format of tables and appendices*

This review covers studies done by multiple scientists who were in various geographic locations, attempting to answer different research questions, and using diverse techniques and laboratories. Consequently the data are quite disparate and difficult to harmonize. For

this reason, and to make this report as pertinent as possible for future applications, I have compiled as much data as feasible directly from the source papers. However, whenever possible, I attempted to give contaminant concentrations on a wet weight basis (since that is the state of the carcass presented for disposal) and to standardize the units in which data were given, presenting the persistent organic pollutants, PCDD/Fs, PBDEs, and PFAs in ng/g and metals in ug/g. I converted values from ng/g lipid weight to ng/g wet weight for Shaw et al, 2005, Struntz et al., 2004, She et al., 2002 and Gautier et al., 1997. All tables and appendices (in the accompanying Excel file) contain extensive footnotes to accurately characterize the data. In addition, species designations are color-coded in a consistent manner throughout the tables and appendices, to allow for easy location and comparison of text with respect to a given species.

II.B.3.*1. Persistent organic pollutants (POPs), including PCBs, PCDD/Fs, DDTs, Chlordanes, HCB, and HCHs*

Because organochlorines, as a class, are lipophilic compounds that might be expected to reach highest concentrations in fat (Norstrom, 2002), blubber represents the tissue where maximum organochlorine concentrations are likely. Blubber is also the tissue for which the most data have been generated pertaining to organochlorine contaminants in marine mammals. Reported levels of major persistent organic pollutants (i.e., PCBs, DDTs, chlordanes, mirex, dieldrin, aldrin, endrin, HCHs, HCB, and endosulfans) in the selected cetacean and pinniped species from US waters are provided in Appendices I and II, respectively, and summarized in Table 1, while metadata for studies addressing major persistent organic contaminants in the chosen marine mammals is presented in Table 2. Twenty-one papers focused on organochlorine contaminants in the cetacean species under consideration, while 16 studies examined organochlorines in pinniped species. For all contaminant classes combined, the number of studies and the collective number of individuals sampled for each cetacean species were as follows: *T. truncatus,* 9 studies (two of which, by Reddy et al. dealt with the same animals), 218 sampled; *K. breviceps*, 1 study, 2 sampled; *L. acutus,* 3 studies (two of which, by Tuerk et al., dealt with the same animals), 53 sampled; *G. melas*, 4 studies, 60 sampled (with some overlap between studies and animals, so this number is likely somewhat inflated); *S. bredanensis*, 2 studies (both of which dealt with the same animals), 15 sampled; *E. robustus*, 3 studies, 101 sampled (again, there appears to be some overlap between studies and animals, so this number likely overstates the true number of animals represented); *M. novaeangliae*, 2 studies, 32 sampled. For pinniped species, the number of studies and maximum total number of animals sampled were: *Z. californianus*, 6 studies (Le Boeuf et al., 2002 and Kannan et al., 2004 consider the same animals), 148 sampled; *P. vitulina*, 10 studies, 201 sampled; *M. angustirostris,* 4 studies, 13 sampled (Table 2). I found no studies addressing organochlorine contaminants in *K. simus* or *G. macrorhynchus* in my review of the literature.

Among the species addressed, mean total PCB levels were highest in blubber of *T. truncatus* (240,000 ng/g lipid weight; n=6), which also had the highest single observed concentration of total PCBs, at 1,120,000 ng/g lipid weight. *P. vitulina* had the lowest mean concentration of total PCBs (1.7 ng/g wet weight, n=10). Compared to other

species targeted in this review, California seal lions had by far the highest mean blubber concentrations of sum DDTs (143,000 ng/g lipid wgt.; n=36) and sum HCHs (780 ng/g lipid wgt.; n=36), as well as the highest single observed concentration of these contaminants in blubber (1,400,000 and 2,240 ng/g lipid wgt. for sum DDTs and sum HCHs, respectively, with the latter value obtained by adding the standard deviation to the corresponding mean). Compared to other species, *E. robustus* (n=38) and *K. breviceps* (n=2) had low blubber concentrations of sum DDTs (means of 130 and 540 ng/g wet weight, respectively). K. breviceps also had the lowest documented levels of HCHs (1.1 ng/g wet weight), although little significance can be imparted to a sample consisting of two individuals. *L. acutus* displayed both highest mean and overall blubber concentrations of sum chlordanes (8,800 ng/g wet weight; n=23, and 23,900 ng/g wet weight, respectively) and dieldrin (1,810 ng/g wet weight; n=23, and 3,940 ng/g wet weight, respectively). *Tursiops* had the lowest mean and overall blubber concentration of dieldrin (non-detectable) observed, while the lowest mean blubber concentration of sum chlordanes occurred in *K. breviceps*, followed by *E. robustus* (50 and 140 ng/g wet weight, respectively). The highest mean blubber concentrations of mirex (32,000 ng/g wet weight; n=8) and HCB (4,700 ng/g wet weight; n=8) were found in *P. vitulina*, which also had the highest overall blubber concentrations of these two contaminants (60,000 ng/g wet weight and 8,500 ng/g wet weight for mirex and HCB, respectively). Overall, among the species and data represented in this review of the literature, the bottlenose dolphin appears to be the cetacean species most contaminated by persistent organic pollutants, followed by *L. acutus*, while among pinnipeds the California sea lion represents the most contaminated species, followed by harbor seals. A cursory examination of Table 1 reveals that, among the selected cetacean species, *E. robustus*, *K. breviceps* (represented by only two individuals) and *M. novaeangliae* appear the least contaminated with persistent organic pollutants. Such a perfunctorily apparent inference cannot be made with respect to the three pinniped species, however; while blubber concentrations of none of the persistent organic pollutants in *M. angustirostris* exceeds the levels in the other two species, neither are they consistently lower than concentrations observed in *P. vitulina* or *Z. californianus*.

Collectively, four studies have measured PCDD/Fs in blubber from three of the species included in this review (Table 3). For all studies combined, the total number of individuals for each species is: *E. robustus* (n=2), *M. angustirostris* (n=6), and *P. vitulina* (n=75). Two studies, Jarman et al., 1996 and Lake et al., 1995, found no detectable levels of PCDD/Fs in blubber of *E. robustus* (n=2) or *P. vitulina* (n=15), respectively. The highest reported mean concentrations of sum PCDDs and sum PCDFs were 0.279 ng/g lipid weight (n=38) and 0.026 ng/g lipid weight=5), respectively, both of which were in seals from British Columbia, Canada.

II.B.3.*2. Toxic metals, including Hg, Cd, Pb, and Sn*

Twelve studies examined one or more of the toxic metals, Hg, Cd, Pb and Sn, in the cetacean species addressed in this review, while only three studies evaluated one or more of the metals in question in the selected pinniped species. For all metal contaminants combined, the number of studies and the maximum collective number of individuals

sampled for each cetacean species were as follows: *T. truncatus*, 5 studies, 148 sampled; *K. breviceps*, 1 study, 3 sampled; *L. acutus*, 1 study, 4 sampled; *G. melas*, 1 study, 9 sampled; *S. bredanensis*, 1 study, 15 sampled; and *E. robustus*, 5 studies, 35 sampled. Similarly for pinniped species, the number of studies and total number of animals sampled were: *Z. californianus*, 1 study, 10 sampled; *P. vitulina*, 2 studies, 13 sampled; *M. angustirostris*, 2 studies, 6 sampled. No studies were found that addressed levels of the specified metal contaminants in *G. macrorhynchus*, *M. novaeangliae*, or *K. sima* between 1995 and 2006 in US waters. Metadata describing studies pertaining to the potentially toxic metals Hg, Cd, Pb and Sn are summarized in Table 4, while reported levels of these metals in the given species over the publication timeframe under consideration are given in Appendix III.

It is difficult to make any generalizations or to draw any meaningful comparisons about the four potentially toxic metals covered by this literature review, because reported data is quite limited and methodologies between studies vary. Overall, ten studies report values on a wet weight basis, while the remaining five present metal concentrations on a dry weight basis, and since raw data generally are not provided, the reader cannot convert data from one form to the other.

II.B.3.*3*. Miscellaneous contaminants: *PBDEs* and *PFAs*

Within the geographic and temporal confines of this review, 6 studies have evaluated concentrations of PBDEs in the selected species of marine mammals (Table 5). Four studies examined PBDEs in blubber of *Tursiops*, *L. acutus*, *S. bredanensis* and *P. vitulina*, while the remaining two studies addressed PBDE levels in *P. vitulina* blood. Among the species in these studies, adult male *Tursiops* demonstrated the highest PBDE contamination, with a mean concentration of 3,110 ng/g wet weight in blubber (range: 126–16300, n=9).

As for PBDEs, PFAs have been assessed in a limited number of individuals and species (Table 6). Kannan et al., 2001 analyzed hepatic concentrations of PFOS in the following species: *K. breviceps* (n=2), *S. bredananensis* (n=2), *T. truncatus* (n=20), *Z. califonianus* (n=6), *M. angustirostris* (n=5), *P. vitulina* (n=3). Houde et al. (2005) conducted a more extensive study of various PFA compounds in *Tursiops* blubber and found concentrations of mean sum PFAs ranging from 778 (n=42) to 1738 (n=47) ng/g wet weight between geographic locations on the eastern US coast.

II.C. Conclusions and comments regarding the nature and adequacy of the available literature database

The studies encompassed by this literature review were conducted to determine concentrations of specific environmental contaminants in various given marine mammal species. Such monitoring investigations generally are undertaken to learn how environmental contaminants may be impacting individual or population health, as well as to indicate whether environmental contaminants might be implicated as a causative factor in stranding events. Tursiops is, by far, the species for which the most comprehensive

data exist pertaining to contaminants, and among those contaminants, PCBs have been the most widely analyzed in this species. Of nine studies that sampled a combined total of 218 bottlenose dolphins for PCBs, seven studies evaluated PCBs in blubber, with a combined total sample size of 210 animals. Of these 210 dolphin blubber samples, 129 appear to have been obtained via biopsy, while 81 were apparently from stranded animals. Eighty-one of the 210 blubber samples were taken from dolphins in the Gulf of Mexico, off the FL (including Sarasota Bay), TX, or AL coasts. Sixty-two blubber samples were from Atlantic dolphins, generally from three sites: Beaufort, NC, (n=40) Charleston Bay, SC, (n=11) and Indian River Lagoon, FL (n=17). The remaining 14 blubber samples were from dolphins in San Diego Bay, CA. The blubber PCB data reported among the seven studies is in a variety of formats. Hansen et al., (2004) reported the geometric means of their data, while Wells et al., (2005) did not report means at all. Other studies reported arithmetic means. The number of PCB congeners which comprise "sum PCBs" among these seven studies also vary widely, from ten to eighty-seven congeners, while three studies did not report the identity or number of congeners analyzed. All seven studies report PCB concentrations on a lipid weight basis. However, if the concern is not the consequences of PCB contamination on the dolphin itself, but rather the dispersion of the PCBs contained within the blubber throughout the environment during carcass decomposition or scavenging, the entity of interest is the level of contamination expressed on a wet weight basis. Because individual animal data including blubber percent lipid are not specified in any of these seven studies, conversion of concentration data to a wet weight basis is not possible.

Sampling techniques also influence the levels of organochlorines measured in blubber. Of the seven studies that quantified blubber PCBs, only two (Salata et al., 1995 and Finklea et al., 2000) stipulated that full-thickness blubber samples were obtained. Kuehl and Haebler (1995) and Johnson-Restrepo (2005) did not specify how blubber samples were taken. The remaining three research teams employed biopsy methods, including remote dart (Hansen et al., 2004), punch (Reddy et al., 2001) and wedge (Wells et al., 2005) biopsy. All of these biopsy techniques are inherently biased towards collection of the outermost portion of the blubber. However, Aguilar and Borrell (1991) and Severinsen et al., (2000) documented that organochlorines are not homogenously distributed throughout this tissue in species of two baleen whales and a phocid seal, respectively, but rather stratified such that contaminant levels in the outermost blubber are significantly greater than that of the innermost blubber layer. Moreover, this difference was not attributable merely to variation in lipid content (Severinsen et al., 2000). Struntz et al., 2004 noted the heterogeneous morphological and histological structure of *Tursiops* blubber. Consequently, it would be imprudent to assume that PCBs or other organochlorine contaminants are homogenously dispersed throughout blubber of bottlenose dolphins. Rather, contaminants concentrations obtained from blubber biopsy specimens likely overestimate blubber contaminant burdens, and should be interpreted with caution.

The above summary briefly illustrates the extremely limited nature of the database for the most thoroughly studied species and contaminant combination (*Tursiops* and PCBs) among those considered by this review. For other contaminants and species, the data are

even scantier. Certain generalizations might be made about the distribution of particular contaminants within tissues, and among individuals in a given population. For example, it is generally understood that species higher trophic species such as dolphins are more prone to bioaccumulating higher levels of some contaminants than species that feed at lower trophic levels, such as baleen whales. Also, lipophilic contaminants such as PCBs tend to be at highest levels in blubber of adult males, because contaminant levels increase with age, and because females can depurate some of their acquired contaminant load through transfer to offspring (Wells et al., 2005). This latter phenomenon accounts for the observation that immature animals may have higher blubber PCB concentrations than adults, when levels are evaluated on a lipid weight basis. Despite such documented patterns of PCB accumulation within *Tursiops*, overall the data are quite limited with respect to samples sizes, tissues analyzed and geographic locations represented.

Contaminant monitoring studies tend to focus on tissues that represent target organs of a given toxicant or are sites of bioaccumulation. Because few tissues are assayed, there is generally insufficient information to infer the total body burden of a given contaminant for an individual in a given population. Moreover, patterns of contaminant accumulation will vary based upon exposures. Individuals from highly contaminated areas will not serve to represent animals from less contaminated regions, and vice versa. The heterogeneous nature of contaminants data published for the selected marine mammals in US waters encompassed by this review make it difficult to compare between studies, much less to unify this disparate research into an assemblage with utility for other applications such as the evaluation of the potential toxicological environmental hazards posed by decomposing carcass. At current, the database for the contaminants in the species encompassed by this review is inadequate to support such an assessment.

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Table 1. Summary of Concentrations of Major Organochlorine Contaminant Classes in Blubber of Selected Marine Mammal Species from US Waters as Reported in Literature from 1994-2005

Table 1. Summary Data for Some Persistent Organic Pollutants, Including PCBs, DDTs, Chlordanes, Mirex, Dieldrin, HCHs and HCB in Blubber of Selected Marine Mammal Species from US Waters, Reported 1994 through 2005.
For each species, the lowest and highest overall means among reported studies are given, followed by the corresponding sample size, as well as overall ranges for animals in all studies combined.

CETACEANS	Analyte (ng/g)	Lipid (%)	∑ PCBs	∑ DDTs	∑ chlordanes	mirex	dieldrin	∑ HCHs	HCB
T. truncatus[a]	Lowest mean (n)	19.9 (4)	5644 (6)	3988 (6)	548 (6)	20.3 (2)	ND (2)	109 (33)	ND (9[b])
	Highest mean (n)	39.4 (9)	240000 (6)	51906 (5)	7022 (5)	663 (4)	1550 (5)	234 (14)	3360 (5)
	Overall range	1.2 - 82.8	420 - 1120000	428 - 87281	195 - 10553	ND - 6540	ND - 3120	9 - 354	ND - 5730
K. breviceps[c]	Mean (n)	3.4 (2)	560 (2)	540 (2)	50 (2)	NA	NA	1.1 (2)	5.5 (2)
	Overall range	2.6 - 4.1	290 - 830	400 - 680	27 - 73	NA	NA	1.1 - 1.1	1.4 - 9.7
L. acutus[c]	Lowest mean (n)	43.8 (6)	9410 (9)	4090 (9)	2200 (9)	40.4 (9)	293 (9)	91 (9)	50.6 (9)
	Highest mean (n)	43.8 (6)	29400 (23)	15900 (23)	8800 (23)	73.7 (15)	1810 (23)	301 (23)	237 (23)
	Overall range	17.2[f]	490 - 62700	498 - 43300	285 - 23900	18.4 - 112	62.6 - 3940	50.4 - 821	11[d] - 606
G. melas[c]	Lowest mean (n)	39 (16)	4172 (11)	6000 (16)	1221 (11)	27 (11)	262 (7)	57.5 (11)	200 (16)
	Highest mean (n)	75 (16)	12000 (6)	18336[a] (16)	3000 (6)	56[a] (16)	441 (11)	104[a] (16)	370 (6)
	Overall range	17.7[d] - 88	1087[d] - 25000	ND[a,d] - 42046[a,e]	55[a,d] - 5800	ND[c,d] - 90[a,e]	56.8 - 674[e]	ND[c,d] - 157[a,e]	ND[a,d] - 620
S. bredanensis[c]	Mean (n)	53 (15)	18392 (15)	9285.5 (15)	3825 (15)	269.3 (15)	233.8 (15)	26.0 (15)	28.8 (15)
	Overall range	38 - 73.3	643 - 43301	146 - 23139	74.1 - 2093	16.4 - 664	9.03 - 1220	2.6 - 177	0.4 - 67.4
E. robustus[c]	Lowest mean (n)	8.5 (22)	220 (38)	130 (38)	140 (17)	NA	NA	NA	100 (38)
	Highest mean (n)	48 (17)	1600 (22)	444 (22)	340 (22)	NA	160 (22)	NA	510 (24)
	Overall range	0.6 - 73	120 - 10000	11 - 2940	13 - 2200	ND - 100	4 - 1600	NA	17 - 2900
M. novaeangliae[c]	Lowest mean (n)	NA	897[a] (12)	NA	NA	1.8 (6)	308 (6)	104 (6)	73.4 (6)
	Highest mean (n)	44.9 (7)	1153 (7)	NA	385.6 (6)	7.2[a] (12)	363.4[a] (13)	108.1[a] (12)	172.2[a] (13)
	Overall range	27 - 63	301[a,d] - 2958	NA	125.6 - 728.3	ND - 11.1[a,e]	52.7 - 777	33.8 - 242	15.8 - 293.1[a,e]
PINNIPEDS									
Z. californianus[c]	Lowest mean (n)	4.2 (9)	1300 (5)	13947 (9)	457 (9)	NA	NA	57 (9)	ND[g]
	Highest mean (n)	50 (36)	48158 (12)	143000[a,h] (36)	3420[a] (36)	NA	190[a] (36)	780[a] (36)	ND[g]
	Overall range	1 - 88	ND - 410000[a]	456 - 1400000[a]	17 - 9450	NA	220[f]	6.5 - 2240[a,e]	ND[g]
M. angustirostris[c]	Lowest mean (n)	74 (4)	550 (6)	11000[a] (2)	1095[a] (2)	NA	NA	122[a] (2)	30 (4)
	Highest mean (n)	85 (2)	6979 (4)	12418 (4)	1118 (4)	NA	28[a] (2)	184 (4)	32.5[a] (2)
	Overall range	18 - 93	460[d] - 10440	3000[a] - 19800	290[a] - 1900[a]	NA	19[a] - 37[a]	44[a] - 279	14.8 - 43[a]
P. vitulina[c]	Lowest mean (n)	40 (3)	1.7 (10)	314 (5)	205 (5)	4.9 (3)	5 (5)	33[a] (2)	5.3 (9)
	Highest mean (n)	89 (2)	40376 (3)	8790 (3)	4015 (3)	32000 (8)	364[a] (4)	220[a] (4)	4700 (8)
	Overall range	16 - 95	ND - 78474	130 - 13612	80 - 8938	1.2 - 60000	3 - 1060[a]	22.4[a] - 425[a]	2.79[d] - 8500

Abbreviations: ND, the analyte was not detected above the limit of detection; NA, not available
[a]ng/g lipid weight
[b]Largest sample with this mean
[c]ng/g wet weight
[d]Value obtained by subtracting the SD from the corresponding mean
[e]Value obtained by adding the SD to the corresponding mean
[f]Standard deviation of mean above
[g]ND in either of two studies that address this analyte
[h]∑DDTs refers to p,p' forms of DDE, DDD and DDT only

Table 2. Metadata for Persistent Organic Pollutants, Including PCBs, DDTs, Chlordanes, HCHs and HDB in Selected Marine Mammal Species from US Waters, Reported 1994 through 2005.
An "X" in a given contaminant column denotes that contaminant was analyzed.

Source	Species	Contaminant Classes Analyzed									
		PCBs (# of congeners)	DDTs	Chlordanes*	HCHs	HCB	Tissue (n)	Date Sampled	Event	Location	Source data characterization Arith.(A) or Geo. (G) Mean; lw or ww; % lipid given?; individual animal data provided?
CETACEANS											
Hansen et al., 2004	T. truncatus	X (15)	X	X		X	blubber (62)	1995-2000	B	NC, SC, FL	G; lw; yes; no
Reddy et al., 2001; 1998	T. truncatus	X (10)	X	X	X	X	blubber (14) blood (16)	1994	B	CA	NR; lw; no; yes
Salata et al., 1995	T. truncatus	X (NR)	X	X	X	X	blubber (33)	NR	S	TX, FL	A; lw; no; no
Kuehl & Haebler, 1995	T. truncatus	X (NR)	X[a]	X		X	blubber (24)	1990	S	TX, FL	A; lw; no; no
Finklea et al., 2000	T. truncatus	X (87)					blubber (10)	1990	S	TX	A; lw; no; yes
Johnson-Restrepo et al., 2005	T. truncatus	X (NR)					blubber (20)	1991-2004	S & B[d]	FL	A; lw; yes; no
Wells et al., 2005	T. truncatus	X (22)					blubber (47) blood (NR) milk (NR)	2000-2001	B	FL	NR[f]; lw; no; no
Watanabe et al., 2000	T. truncatus	X (35)	X[a]	X	X	X	liver (6)	1989-94	S	FL	A; ww; yes; yes
	K. breviceps	X (35)	X[a]	X	X	X	liver (2)	1991-92	S	FL	A; ww; yes; yes
Tuerk et al., 2005a,b	L. acutus	X(55)	X	X	X	X	blubber (47)	1993-2000	S	MA	A;ww; no; no
Weisbrod et al., 2001	L. acutus	X (27)	X	X	X	X	blubber (6) skin (6) liver (6) lung (2) kidney (2)	1994-96	S	MA, NY	A; ww; yes; no
	G. melas	X (27)	X	X	X	X	blubber (11) skin (3) liver (8) heart (4) muscle (6) kidney (3) testis (1)	1990-96	S	MA, NY	A; ww; yes; no
Weisbrod et al., 2000	G. melas	X (27)	X	X	X	X	blubber (16) liver (17)	1990-96	S	MA	A; lw; yes; no
Becker et al., 1997	G. melas	X (33)	X	X		X	blubber (7)	NR[b]	NR[b]	MA	A; ww; no; no
Tilbury et al., 1999	G. melas[b]	X (17)	X	X		X	blubber (22) liver (25) kidney (9) brain (8) ovary (2)	1986-90	S	MA	A; ww; yes; no
Struntz et al., 2004; Tuerk et al., 2005a	S. bredanensis	X (33)	X	X	X	X	blubber (15)	1997	S	FL	A; lw; yes; yes
Varanasi et al., 1994	E. robustus	X (NR)	X	X		X	blubber (22) liver (10) brain (1)	1988-91	S	CA, WA & AK	A[c]; ww; yes; no
Tilbury et al., 2002	E. robustus	X (17)	X	X		X	blubber (17) liver (14) kidney (6) brain (6) muscle (3)	1994	H	Russia (Western Bering Sea)	A; ww; yes; no
Krahn et al., 2001	E. robustus[b]	X (17)	X	X		X	blubber (62)	1996 & '99	B & S	WA	A; ww; yes; no
Metcalfe et al., 2004	M. novaeangliae	X (25)	X[a]	X	X	X	blubber (25)	1993-99	B	Canada	A; lw; no; no
Gauthier et al., 1997	M. novaeangliae	X (19)	X[a]	X	X	X	blubber (7)	1991	B	Canada	A; lw; yes; yes
PINNIPEDS											
Lieberg-Clark et al., 1995	Z. californianus	---	X[a]				blubber (7)	1988-92	S	CA	G; ww; no; no
Hayteas & Duffield, 1997	Z. californianus	X (NR)	X[a]				blubber (5)	1991-95	S	OR	G; ww; no; yes
	P. vitulina	X (NR)					blubber (10)	1991-95	S	OR	G; ww; no; yes
	M. angustirostris	X (NR)					blubber (1)	1991-95	S	OR	G; ww; no; yes
Kajiwara et al., 2001	Z. californianus	X (NR)	X[a]	X	X	X	blubber (12) liver (9)	1991-97	S	CA	A; ww; yes; yes
	P. vitulina	X (NR)	X[a]	X	X	X	liver (10)	1991-97	S	CA	A; ww; yes; yes
	M. angustirostris	X (NR)	X[a]	X	X	X	blubber (4)	1991-94	S	CA	A; ww; yes; yes
Kannan et al., 2004; Le Boeuf et al., 2002	Z. californianus	X (NR)	X[a]	X	X		blubber (36)	2000	S	CA	A; lw; yes; no
	M. angustirostris	X (NR)	X[a]	X	X	X	blubber (2)	2000	S	CA	A; lw; yes; no
Lake et al., 1995	P. vitulina	X (18)	X[a]	X		X	blubber (9) liver (9)	1990-92	S	NY, MA	A; ww; no; no
Young et al., 1998	P. vitulina	X (20)					blood (16)	1990	S	CA	A; ww; no; no
Hong et al., 1996	P. vitulina	X (73) X (54)	X[a]			X	blubber (8) liver (8)	1990	S	WA	A; ww; no; no
Krahn et al., 1997	P. vitulina	X (17)	X	X		X	blubber (15)	1992-93	S & H	WA, OR, AK	A[f]; ww; yes; no[f]
Ross et al., 2004	P. vitulina	X (109)					blubber (60)	1996-97	B	Canada; WA	A; lw; no; no
Neale et al., 2005a	P. vitulina	X (10)	X[e]				blood (17)	2001-02	B	CA	A; ww & lw, no, no
Neale et al., 2005b	P. vitulina	X (11)	X[e]				blood (35)	2001-02	B	CA	NR; ww & lw; no; no
Shaw et al., 2005	P. vitulina	X (20)	X	X	X	X	blubber (30)	2001-02	S	MA, ME, NH, NY	A; lw; yes; yes
Debier et al., 2005a	M. angustirostris	X (141)					blubber (6)	2002	B	CA	A; lw & ww; yes; no
Debier et al., 2005b	Z. californianus	X (NR)	X				serum (12)	2002	B	CA	A; ww & lw; yes; no
Ylitalo et al., 2005	Z. californianus	X (17)	X				blubber (76)	1993-2003	S	CA	A; ww & lw; yes; no

Abbreviations: NR, not reported; S, stranded; B, biopsied; H, subsistence harvest; A, arithmetic mean; G. geometric mean; lw, reported on a lipid weight basis; ww, reported on a wet weight basis

*Number of chlordane isomers analyzed varied between studies

[a]Only *p,p'* isomers of DDT, DDE and DDD were analyzed; in some studies, not all three *p',p'* isomers were analyzed.

[b]In Appendix I, see footnotes "g," "h" and "j" for Becker et al.(1997),Tilbury et al.(1999) and Krahn et al. (2001), respectively, regarding study overlap

[c]Means exclude values below limit of detection

[d]From archived samples; from source text it appears that 14 are from stranded dolphins and the remaining 6 were biopsies

[e]4,4' DDE only

[f]Ranges only were given for data (except for some data subsets in Wells); data provided in graphic format only

Table 3. Polychlorinated dibenzo-p-dioxins and -furans (PCDD/Fs) Contaminants in Tissues of Selected Marine Mammal Species from US Waters, Reported 1995 through 2005.

	Source: Jarman et al., 1996 Event: Stranding			Source: Ross et al., 2004 Event: Biopsy									Source: Lake et al., 1995 Event: Stranding			Source: Debier et al., 2005a Event: Biopsy		
	Location: British Columbia, Canada (Vancouver Is. & Denman Is.)			Location: BC, Canada (Queen Charlotte Strait)			Location BC, Canada (Strait of Georgia)			Location: WA (Puget Sound)			Location: NY & MA			Location: CA (Ano Nuevo Is.)		
	Date Sampled: 1987-88 Species: *Eschrichtius robustus* Tissue: Blubber			Date Sampled: 1996-97 Species: *Phoca vitulina* Tissue: Blubber			Date Sampled: 1996-97 Species: *Phoca vitulina* Tissue: Blubber			Date Sampled: 1996-97 Species: *Phoca vitulina* Tissue: Blubber			Date Sampled: 1990-92 Species: *Phoca vitulina* Tissue: Blubber			Date Sampled: 2002 Species: *Mirounga angustirostris* Tissue: Blubber		
Analyte (ng/g wet weight)	n	Mean	LOD[b]	n	Mean[a,c]	SE	n	Mean[c]	SE	n	Mean[c]	SE	n			n	Mean[c]	SD
2,3,7,8-TCDD	2	ND	<2										15[d]					
1,2,3,7,8-PnCDD	2	ND	<5										15[d]					
1,2,3,4,7,8-HxCDD													15[d]					
1,2,3,6,7,8-HxCDD	2		<8										15[d]			6	0.007	NR
1,2,3,7,8,9-HxCDD	2	ND	<8										15[d]					
1,2,3,4,6,7,9-HpCDD	2	ND	<10															
1,2,3,4,6,7,8-HpCDD	2	ND	<10										15[d]			6	0.008	NR
OCDD	2	ND	<20										15[d]			6	0.017	NR
∑ 2,3,7,8-PCDDs				5	0.072	0.006	38	0.256	0.031	17	0.119	0.011						
∑ PCDDs				5	0.096	0.01	38	0.279	0.032	17	0.119	0.016				6	0.032[e]	0.023
2,3,7,8-TCDF	2	ND	3										15[d]					
1,2,4,7,8-PnCDF	2	ND	<5															
1,2,3,7,8-PnCDF													15[d]					
2,3,4,7,8-PnCDF	2	ND	<5										15[d]			6	0.007	NR
1,2,4,8,9-PnCDF	2	ND	<5															
1,2,4,6,8,9-HxCDF	2	ND	<8															
1,2,3,4,7,8-HxCDF													15[d]					
1,2,3,6,7,8-HxCDF													15[d]					
1,2,3,7,8,9-HxCDF													15[d]					
2,3,4,6,7,8-HxCDF													15[d]					
1,2,3,4,6,9-/1,2,3,6,8,9-HxC	2	ND	<8															
1,2,3,4,6,8,9-HpCDF	2	ND	<10															
1,2,3,4,6,7,8-HpCDF													15[d]					
1,2,3,4,7,8,9-HpCDF													15[d]					
OCDF													15[d]			6	0.01	NR
∑ 2,3,7,8-PCDFs				5	0.022	0.002	38	0.016	0.002	17	0.01	0.001						
∑ PCDFs				5	0.026	0.004	38	0.025	0.013	17	0.01	0.001				6	0.017[e]	0.005

Abbreviations: ND, the analyte was not detected above the limit of detection; SE, standard error of the mean; SD, standard deviation; NR, not reported

[a]Arithmetic

[b]LOD-limits of detection for individual PCDD/F congeners

[c]ng/g lipid weight

[d]All samples were near or below limits of detection (3-5 pg/g).

[e]On a wet weight basis means (SD) were: 0.025(0.017) and 0.014(0.004) for∑ PCDDs and ∑ PCDFs, respectively.

Table 4. Metadata for Toxic Metal Pollutants, Including Mercury (Hg), Cadmium (Cd), Lead (Pb) and Tin (Sn) in Selected Marine Mammal Species from US Waters, Reported 1994 through 2005.
An "X" in a given metal contaminant column denotes that metal was analyzed.

		Metal Contaminant Analyzed								
Source	**Species**	**Mercury**	**Cadmium**	**Lead**	**Tin**	**Tissue (n)**	**Date Sampled**	**Event**	**Location**	**Comments**
CETACEANS										
Ruelas-Inzunza et al., 2002	*E. robustus*	X (THg & MeHg)	X	X		Kidney (4) Liver (4) Muscle (4)	1999	S	Mexico (Gulf of California)	DW
Tilbury et al., 2002	*E. robustus*	X (THg)	X	X		Brain (6) Kidney (6) Liver (5)	1994	H	Russia (NW Bering Sea)	WW
Varanasi et al., 1994	*E. robustus*	X (THg)	X	X	X[a]	Brain (1) Kidney (10) Liver (10)	1988-1991	S	CA, WA & AK	WW
De Luna & Rosales-Hoz, 2004	*E. robustus*			X		Bone (8) Epidermis (8) Kidney (2) Muscle (8)	1999	S	Mexico (Ojo de Liebre Lagoon)	DW
Mendez et al., 2002	*E. robustus*		X	X		Blubber (5) Heart (7) Kidney (5) Liver (5) Lung (7) Muscle (5)	1999	S	Mexico (Sinaloa & Baja California Sur)	DW
Mackey et al., 1995	*G. melas*	X (THg)	X			Liver (9)	1990-1990	S	MA	WW
	L. acutus	X (THg)	X			Liver (4)	1993	S	MA	WW
Beck et al., 1997	*T. truncatus*	X (THg)	X	X		Liver (34)	NR	S	SC	WW
Kuehl & Haebler, 1995	*T. truncatus*	X (THg)	X	X		Liver (24)	1990	S	TX & AL (Gulf of Mexico)	WW
Meador et al., 1999	*T. truncatus*	X (THg & MeHg)	X[c]	X[c]		Blubber (4) Kidney (30[b]) Liver (30[b])	1990-1991	S	TX	DW[f]
	T. truncatus	X (THg & MeHg)	X[c]	X[c]		Kidney (13[b]) Liver (14[b])	1990-1991	S	FL	DW
Wood & Van Vleet, 1996	*T. truncatus*		X			Kidney (21) Liver (29) Muscle (21)	1990-1994	S	FL	DW
Kannan et al., 1997	*T. truncatus*				X[d]	Blubber (1) Brain (1) Heart (1) Liver (16) Kidney (17) Melon (1) Muscle (11)	1989-1994	S	FL	WW
	K. breviceps				X[d]	Kidney (2) Liver (3) Muscle (2)	1989-1994	S	FL	WW
Mackey et al., 2003	*S. bredanensis*	X (THg)	X		X[e]	Kidney (15) Liver (15)	1997	S	FL (Gulf of Mexico)	WW
PINNIPEDS										
Lake et al., 1995	*P. vitulina*	X (THg)				Liver (7)	1990-1992	S	NY & MA	WW
Owen & Flegal, 1998	*M. angustirostris*			X		Blood (4)	1994-1995	B	CA	WW
Kajiwara et al., 2001	*M. angustirostris*				X[d]	Liver (2)	1991-1994	S	CA	WW
	P. vitulina				X[d]	Liver (6)	1991-1997	S	CA	WW
	Z. californianus				X[d]	Liver (10)	1991-1997	S	CA	WW

Abbreviations: THg, Total mercury; MeHg, organic (methyl) mercury; NR, not reported; S, stranded; B, biopsied; H, subsistence harvest; WW, reported on a wet weight basis; DW, reported on a dry weight basis

[a]Total tin was analyzed in kidney and liver of seven animals
[b]Maximum analyzed for this tissue at this location
[c]Analyzed in kidney and liver only
[d]Sum of butyltins, including mono-, di- and tri-butyltin
[e]Total tin
[f]Except for blubber, which was reported as WW

Appendix III. Mercury, Cadmium, Lead and Tin in Tissues of Selected Marine Mammal Species from US Waters, Reported 1994 through 2005. All concentrations are reported on a wet weight basis, except where noted otherwise by an asterisk*.

Mercury (Hg)									
Species	**Tissue**	**Mean ug/g**	**Min.**	**Max.**	**n**	**Location**	**Date Sampled**	**Event**	**Reference**
E. robustus	kidney[a]	277*	140[j]	NR	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza et al., 2002
E. robustus	kidney[b]	51*	22[j]	NR	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza et al., 2002
E. robustus	liver[a]	185*	82[j]	NR	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza et al., 2002
E. robustus	liver[b]	42*	34[j]	NR	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza et al., 2002
E. robustus	muscle[a]	145*	82[j]	NR	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza et al., 2002
E. robustus	muscle[b]	109*	40[j]	NR	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza et al., 2002
E. robustus	brain[a]	0.022	0.002[h]	NR	6[g]	Russia (NW Bering Sea)	1994	Subsistence harvest	Tilbury et al., 2002[i]
E. robustus	kidney[a]	0.034	0.001[h]	NR	6[g]	Russia (NW Bering Sea)	1994	Subsistence harvest	Tilbury et al., 2002[i]
E. robustus	liver[a]	0.16	0.061[h]	NR	5[g]	Russia (NW Bering Sea)	1994	Subsistence harvest	Tilbury et al., 2002[i]
E. robustus	brain[a]	ND	ND	ND	1	CA, WA & AK	1988-91	Stranding	Varanasi et al., 1994
E. robustus	kidney[a]	0.034	ND	0.06	10	CA, WA & AK	1988-91	Stranding	Varanasi et al., 1994
E. robustus	liver[a]	0.056	0.009	0.12	10	CA, WA & AK	1988-91	Stranding	Varanasi et al., 1994
G. melas	liver[a]	40.3	1.00	112.0	9	MA	1990-91	Stranding	Mackey et al., 1995
L. acutus	liver[a]	10.36	1.00	22.70	4	MA	1993	Stranding	Mackey et al., 1995
S. bredanensis	kidney[a]	5.8	0.9	15	15	FL (Gulf of Mexico)	1997	Stranding	Mackey et al., 2003
S. bredanensis	liver[a]	70	3.4	235	15	FL (Gulf of Mexico)	1997	Stranding	Mackey et al., 2003
T. truncatus	liver[a]	17.8	<0.5	146.5	34	SC	NR	Stranding	Beck et al., 1997
T. truncatus	liver[a]	0.96	0.15	2.23	5[o]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	liver[a]	4.39	1.72	8.36	5[g]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	liver[a]	45.5	5.1	87.8	9[p]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	liver[a]	25.9	6.1	48.7	5[q]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	blubber[b]	0.6	0.4	0.7	4	FL	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	kidney[a]	33*	1.0	89	29	TX	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	kidney[a]	68*	11.2	110	12	FL	1991-92	Stranding	Meador et al., 1999[c,d]

Mercury (Hg) (continued)

Species	Tissue	Mean ug/g	Min.	Max.	n	Location	Date Sampled	Event	Reference
T. truncatus	kidney[b]	4.5*	1.3	10.4	23	TX	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	kidney[b]	9.9*	1.4	19	13	FL	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	liver[a]	212*	8.3	1404	30	TX	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	liver[a]	304*	18	1312	13	FL	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	liver[b]	6*	0.9	23	24	TX	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	liver[b]	11*	2.5	24	14	FL	1991-92	Stranding	Meador et al., 1999[c,d]
P. vitulina	liver[a]	38.5	31.6	49.3	4	NY & MA	1990-92	Stranding	Lake et al., 1995
P. vitulina	liver[a]	69.9	16.0	138	3	NY & MA	1990-92	Stranding	Lake et al., 1995

Cadmium (Cd)

Species	Tissue	Mean ug/g	Min.	Max.	n	Location	Date Sampled	Event	Reference
E. robustus	blubber	0.16*	ND	0.16	5[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	heart	0.68*	0.16	1.81	7[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	kidney	15.4*	1.93	35.1	5[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	liver	1.77*	0.81	3.62	5[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	lung	1.16*	0.1	5.26	7[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	muscle	0.86*	0.05	2.34	5[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	kidney	5.7*	1.4[j]	8.0	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza & Paez-Osuna, 2002
E. robustus	liver	1.1*	1.0[j]	NR	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza & Paez-Osuna, 2002
E. robustus	muscle	0.4*	0.2[j]	NR	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza & Paez-Osuna, 2002
E. robustus	brain	0.1	0.01[h]	NR	6[g]	Russia (NW Bering Sea)	1994	Subsistence harvest	Tilbury et al., 2002[i]

Cadmium (Cd) (continued)

Species	Tissue	Mean ug/g	Min.	Max.	n	Location	Date Sampled	Event	Reference
E. robustus	kidney	0.59	0.11[h]	NR	6[g]	Russia (NW Bering Sea)	1994	Subsistence harvest	Tilbury et al., 2002[i]
E. robustus	liver	0.21	0.04[h]	NR	5[g]	Russia (NW Bering Sea)	1994	Subsistence harvest	Tilbury et al., 2002[i]
E. robustus	brain	0.02	0.02	0.02	1	CA, WA & AK	1988-91	Stranding	Varanasi et al., 1994
E. robustus	kidney	4.1	0.14	6.1	10	CA, WA & AK	1988-91	Stranding	Varanasi et al., 1994
E. robustus	liver	4.3	0.06	6.2	10	CA, WA & AK	1988-91	Stranding	Varanasi et al., 1994
G. melas	liver	7.88	2.8	14.3	9	MA	1990-91	Stranding	Mackey et al., 1995
L. acutus	liver	0.42	0.24	0.86	4	MA	1993	Stranding	Mackey et al., 1995
S. bredanensis	kidney	1.73	0.05	3.94	15	FL (Gulf of Mexico)	1997	Stranding	Mackey et al., 2003
S. bredanensis	liver	0.54	0.01	1.02	15	FL (Gulf of Mexico)	1997	Stranding	Mackey et al., 2003
T. truncatus	liver	0.051	0.009	0.27	34	SC	NR	Stranding	Beck et al., 1997
T. truncatus	liver	0.06	0.01	0.08	5[o]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	liver	0.11	0.08	0.16	5[g]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	liver	0.43	0.10	1.34	9[p]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	liver	0.31	0.11	0.64	5[q]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	kidney	1.9*	ND	4.2	30 (11 ND)	TX	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	kidney	4.4*	ND	5.2	13 (5 ND)	FL	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	liver	0.32*	ND	0.7	14 (8 ND)	TX	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	liver	1.6*	ND	1.6	11 (10 ND)	FL	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	kidney	1.3*	ND	6.4	21	FL	1990-94	Stranding	Wood & Van Vleet, 1996
T. truncatus	liver	0.2*	ND	1.7	29	FL	1990-94	Stranding	Wood & Van Vleet, 1996
T. truncatus	muscle	ND	ND	ND	21	FL	1990-94	Stranding	Wood & Van Vleet, 1996

Lead (Pb)

Species	Tissue	Mean ug/g	Min.	Max.	n	Location	Date Sampled	Event	Reference
E. robustus	bone	50*[k]	NR	NR	2[l]	Mexico (Ojo de Liebre Lagoon)	1999	Stranding	De Luna & Rosales-Hoz, 2004
E. robustus	bone	20*[k]	NR	NR	3[g]	Mexico (Ojo de Liebre Lagoon)	1999	Stranding	De Luna & Rosales-Hoz, 2004
E. robustus	bone	30*[k]	NR	NR	3[m]	Mexico (Ojo de Liebre Lagoon)	1999	Stranding	De Luna & Rosales-Hoz, 2004
E. robustus	epidermis	15*[k]	NR	NR	8	Mexico (Ojo de Liebre Lagoon)	1999	Stranding	De Luna & Rosales-Hoz, 2004
E. robustus	kidney	30*[k]	NR	NR	2[l]	Mexico (Ojo de Liebre Lagoon)	1999	Stranding	De Luna & Rosales-Hoz, 2004
E. robustus	muscle	15*[k]	NR	NR	2[l]	Mexico (Ojo de Liebre Lagoon)	1999	Stranding	De Luna & Rosales-Hoz, 2004
E. robustus	muscle	22*[k]	NR	NR	3[g]	Mexico (Ojo de Liebre Lagoon)	1999	Stranding	De Luna & Rosales-Hoz, 2004
E. robustus	muscle	18*[k]	NR	NR	3[m]	Mexico (Ojo de Liebre Lagoon)	1999	Stranding	De Luna & Rosales-Hoz, 2004
E. robustus	blubber	1.06*	0.33	1.78	5[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	heart	2.31*	1.28	3.4	7[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	kidney	2.09*	0.34	6.12	5[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	liver	2.06*	0.78	3.62	5[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	lung	1.21*	0.36	4.40	7[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	muscle	1.11*	0.42	1.8	5[g]	Mexico (Sinaloa & Baja California Sur)	1999	Stranding	Mendez et al., 2002
E. robustus	kidney	0.6*	0.3[j]	NR	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza & Paez-Osuna, 2002
E. robustus	liver	0.9*	0.8[j]	0.9	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza & Paez-Osuna, 2002
E. robustus	muscle	0.6*	0.4[j]	NR	4	Mexico (Gulf of California)	1999	Stranding	Ruelas-Inzunza & Paez-Osuna, 2002

Lead (Pb) (continued)

Species	Tissue	Mean ug/g	Min.	Max.	n	Location	Date Sampled	Event	Reference
E. robustus	brain	0.014	0.003[h]	NR	6[g]	Russia (NW Bering Sea)	1994	Subsistence harvest	Tilbury et al., 2002
E. robustus	kidney	0.028	0.005[h]	NR	6[g]	Russia (NW Bering Sea)	1994	Subsistence harvest	Tilbury et al., 2002
E. robustus	liver	0.06	0.013[h]	NR	5[g]	Russia (NW Bering Sea)	1994	Subsistence harvest	Tilbury et al., 2002
E. robustus	brain	0.06	0.06	0.06	1	CA, WA & AK	1988-91	Stranding	Varanasi et al., 1994
E. robustus	kidney	0.053	ND	0.10	10	CA, WA & AK	1988-91	Stranding	Varanasi et al., 1994
E. robustus	liver	0.12	0.02	0.27	10	CA, WA & AK	1988-91	Stranding	Varanasi et al., 1994
T. truncatus	liver	<0.10	NR	NR	34	SC	NR	Stranding	Beck et al., 1997
T. truncatus	liver	0.45	0.08	1.47	5[o]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	liver	0.26	0.04	0.88	5[g]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	liver	0.68	0.2	2.12	9[p]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	liver	0.48	0.09	1.20	5[q]	TX & AL (Gulf of Mexico)	1990	Stranding	Kuehl & Haebler, 1995
T. truncatus	kidney	0.17*	ND	1.6	30 (11 ND)	TX	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	kidney	0.08*	ND	0.14	13 (11 ND)	FL	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	liver	0.3*	ND	2.6	30 (11 ND)	TX	1991-92	Stranding	Meador et al., 1999[c,d]
T. truncatus	liver	0.09*	ND	0.2	13 (10 ND)	FL	1991-92	Stranding	Meador et al., 1999[c,d]
M. angustirostris	blood	0.13[n]	0.071[n]	0.21[n]	4[o]	CA	1994-95	live animal collection	Owen & Flegal, 1998

Tin (Sn)

Species	Tissue	Mean ug/g	Min.	Max.	n	Location	Date Sampled	Event	Reference
E. robustus	kidney	0.04[r]	ND	0.05	7	CA, WA & AK	1988-91	Stranding	Varanasi et al., 1994
E. robustus	liver	0.04[r]	ND	0.04	7	CA, WA & AK	1988-91	Stranding	Varanasi et al., 1994
K. breviceps	kidney	0.062[e]	0.059	0.065	2	FL	1989-94	Stranding	Kannan et al., 1997
K. breviceps	liver	0.39[e]	0.35	0.41	3	FL	1989-94	Stranding	Kannan et al., 1997
K. breviceps	muscle	0.021[e]	0.016	0.026	2	FL	1989-94	Stranding	Kannan et al., 1997
S. bredanensis	kidney	0.053[r]	0.01	0.14	15	FL (Gulf of Mexico)	1997	Stranding	Mackey et al., 2003
S. bredanensis	liver	5.4[r]	3.8	7.3	15	FL (Gulf of Mexico)	1997	Stranding	Mackey et al., 2003
T. truncatus	blubber	0.63[e]	0.63	0.63	1	FL	1989-94	Stranding	Kannan et al., 1997
T. truncatus	brain	0.11[e]	0.11	0.11	1	FL	1989-94	Stranding	Kannan et al., 1997
T. truncatus	heart	0.05[e]	0.05	0.05	1	FL	1989-94	Stranding	Kannan et al., 1997
T. truncatus	kidney	0.20[e]	0.025	0.67	16	FL	1989-94	Stranding	Kannan et al., 1997
T. truncatus	liver	1.4[e]	0.11	11.34	17	FL	1989-94	Stranding	Kannan et al., 1997
T. truncatus	melon	0.19[e]	0.19	0.19	1	FL	1989-94	Stranding	Kannan et al., 1997
T. truncatus	muscle	0.041[e]	0.013	0.11	11	FL	1989-94	Stranding	Kannan et al., 1997
M. augustirostris	liver	0.08[e]	0.06	0.099	2[f]	CA	1991-94	Stranding	Kajiwara et al., 2001
P. vitulina	liver	0.034[e]	0.002	0.091	6[f]	CA	1991-97	Stranding	Kajiwara et al., 2001
Z. californianus	liver	0.045[e]	0.024	0.087	10[f]	CA	1991-97	Stranding	Kajiwara et al., 2001

Abbreviations: ND, the analyte was not detected above the limit of detection; NR, not reported

*dry weight

[a]Total Hg

[b]Organic (i.e., methyl) Hg

[c]Mean ratios of dry to wet weight were 0.26 and 0.22 for TX liver and kidney, respectively (n=31), and 0.29 (n=14) and 0.23 (n=13) for FL liver and kidney, respectively.
[d]Means for analytes with data below detection limits (ND) were determined with maximum likelihood method for censored data. Means with no ND values were estimated following the procedure of Gilbert (1987) for lognormally-distributed data.

[e]Sum of butyltins, including mono-, di- and tri-butyltin
[f]Data for individual animals and organotins given in cited source.

[g]Juveniles

[h]Standard error of the mean
[i]For values below the limit of detection (LOD), one-half the LOD was used to calculate the mean

[j]Standard deviation

[k]Value extrapolated from graph

[l]Calves

[m]Adults (both sexes)

[n]ug/dl
[o]sucklings (live, for Owen & Flegal, 1998; stranded, for Kuehl & Haebler, 1995)

[p]Adult males

[q]Adult females

[r]Total Sn

Euthanasia Questionnaire Response Summary

Responder	Species	Stranding Type*	Frequency (or #) of Euthanasia in past year	Euthanasia Agent & Route	Induction Agent & Route	Adverse Reactions?	Disposal Methods	Comments
MarMamCenter, CA	*Zalophus californianus* *Mirounga angustirostrus* *Phoca vitulina*	I	96/796	pentobarb IV, IC	tiletamine/zolazepam IM	No	Renderer	no disposal problems
HBOI, FL	*Tursiops truncatus* *Kogia breviceps* *Kogia simus*	I	4	pentobarb +-phenytoin IC, IP	---	No	Beach burial Landfill	no disposal problems
Nat'l Aquarium, MD	*Phoca vitulina* *Pagophilus groenlandicus* *Tursiops truncatus* *Phocoena phocoena*	I	1 in 2003 avg. 1.9/yr (11 yrs)	pentobarb.+ phenytoin	tiletamine/zolazepam diazepam	Yes - lack of sedation	not indicated	generally not problematic
C. Harms, NCSU	*Tursiops truncatus* *Kogia breviceps* *Kogia simus* *Grampus griseus*	I	done 3-4	pentobarb +-phenytoin IV, IC	xylazine, acepromazine	Yes - hyperexcitability in G. gri. with xylazine or metomidate	Beach burial (if drugs admin.) disposal at sea (no drugs)	no disposal problems
W. McFee, NOS, SC	*Kogia breviceps* *Kogia simus* *Ziphius cavirostris*	I, P	~60% 1 in past yr.	pentobarb IV, IC	---	Yes - excitability in K. bre.	Burial	no disposal problems
Mote Mar Lab, FL	*Tursiops truncatus* *Kogia breviceps* *Kogia simus* *Globicephala macrorhynchus* *Lagenodelphis hosei*	I, M (Kogia & Glob.)	1-3/yr.	pentobarb. IV	xylazine	No	not indicated	Disposal problematic, did not elaborate
Cape Cod SN, MA	*Lagenorhynchus acutus* *Phocoena phocoena* *Delphinus delphis* *Globicephala melas*	I, M	179/403 over 5 yr period	pentobarb.+-phenytoin	---	Yes - hyperexcitability in cetaceans (T. tru., L. acu., D. del., G. mel.)	truck off Cape to landfill tow to sea & sink	Disposal very problematic, no rendering service avail., landfill won't accept, perception that whale remains contain contaminants, high cost
VA Marine Sc. Museum, VA	*Phoca vitulina* *Delphinus delphis* *Kogia breviceps*	I	7 in 2003	pentob. +-phenytoin	xylazine diazepam	Yes, Observed violent death throes in D. delphis w/ or w/o induction agent, and appeared to have violent rx to acepromazine also, slight excitability in Grampus w/ xylazine	commercial carcass dispo. co. to transport to landfill burial landfill	Difficulty procuring heavy eqp't.

Euthanasia Questionnaire Response Summary

Responder	Species	Stranding Type*	Frequency (or #) of Euthanasia in past year	Euthanasia Agent & Route	Induction Agent & Route	Adverse Reactions?	Disposal Methods	Comments
Litz, NOAA Fisheries SER, Southeast US, PR & Virgin Is	*Tursiops truncatus* *Kogia spp.* *Steno bredanensis* *Globicephala spp.*	I, P, M	68/474 from 1995-2000 (may be more-do not keep these stats.)	pentobarb. IV, IC	---	---	landfill	Disposal very problematic in mass strandings or with large cetaceans
George, GA DNR	*Feresa attenuata* *Kogia breviceps*		5 Kogia breviceps (3 adults/2 calves) 1 Feresa attenuata in 2004	Euthasol (390mg/mL) Gunshot	Xylazine (100mg/mL)	Yes- "Convulsions" prior to death seen with xylazine alone	left on beach buried on site landfill	Disposal in remote areas where removal of the carcass isn't possible precluding use of barbituates for euthanasia due to relay toxicosis concerns.

*I = individuals
P = pairs
M = mass

APPENDIX K

PRESCOTT GRANT PROGRAM

Prescott Overview FY01-07

						Running Total:	
Year	**Applications**	**Awards**	**Amount**	**Recipients**	**States**	**Awards**	**Amount**
2001-2002	84	68	$5,781,494	49	21	68	$5,781,494
2003	53	48	$4,465,343	40	19	116	$10,246,837
2004	35	31	$2,663,983	28	15	147	$12,910,820
2005	97	40	$3,620,154	38	19	187	$16,530,974
2006	74	42	$3,654,271	37	15	229	**$20,185,245**
2007 (to date)	80						

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2002	AK	Alaska Sealife Center	Alaska Sealife Center Rescue and Rehabilitation Program	$99,993
2002	AK	Aleut Community of St Paul Island	Assessment of northern fur seal entanglement in marine debris on the Pribilof Islands	$95,945
2002	AK	Seward Association for the Advancement of Marine Science	Improved rehabilitation techniques through monitoring of nutrition and growth rates in free-ranging and rehabilitated harbor seal pups	$100,000
2002	AK	University of Alaska Anchorage	Cellular and subcellular structure of the adrenal medulla of the Atlantic bottlenose dolphin (Tursiops Ttruncatus) in relation to physiological stress.	$33,591
2002	AK	University of Alaska Fairbanks	Marine mammal tissue and specimen archives - University of Alaska Museum	$100,000
2002	AL	Spring Hill College	Enhancement of Data Collection	$45,785
2002	CA	California Department of Fish and Game	Marine mammal pathology service for the central California coast	$99,935
2002	CA	Marine Animal Rescue Rehabilitation and Release	Diagnostic and Surgery Center (at the Marine Mammal Care Center at Fort MacArthur)	$70,000
2002	CA	Marine Mammal Center	Advancement of clinical care of stranded marine mammals at the Marine Mammal Center	$100,000
2002	CA	Marine Mammal Center	Development of a biomonitoring program to detect novel diseases and changes in prevalence of known diseases in pinnipeds stranded along the central California coast	$100,000
2002	CA	Northcoast Marine Mammal Center	Obtain operating funds to improve rehabilitation facility and provide more advanced and comprehensive diagnostic abilities.	$100,000
2002	CA	Regents of the University of California/UCSC Stranding Network	UCSC Long Marine Lab Stranding Network upgrade of Information Management Systems and capabilities to improve or allow access to the National Database.	$2,500
2002	CA	San Jose State Univ. Foundation	Movements, Dive Behavior and Survival of Post Release CA Sea Lions after Rehabilitation for Domoic Acid Toxicity	$95,019
2002	CA	San Jose State Univ. Foundation	Gray whale and other large whale stranding investigations: A collaboration of marine mammal stranding participants in central California	$95,680
2002	CA	Sea World, San Diego	Improved care and monitoring of beached marine mammals in Southern California	$100,000
2002	CT	Mystic Aquarium	Marine mammal stranding program support for Mystic Aquarium	$100,000

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2002	CT	Mystic Aquarium/Sea Research Foundation	Prognostic indicators for rehabilitation and survival of stranded harp and hooded seals	$99,924
2002	DE	DE Dep't. of Natural Resources and Environmental Conservation	Renovation of a Seal Holding Facility	$27,000
2002	FL	Clearwater Marine Aquarium	Transportation, rehabilitation facilities, and technology for marine mammal stranding events	$94,175
2002	FL	Dynamac Corporation	Marine mammal rescue and stranding program on Florida's space coast	$16,732
2002	FL	Florida Fish and Wildlife Conservation Commission	Development of standardized protocols for stranding networks in Florida	$96,498
2002	FL	Florida Keys Marine Mammal Rescue Team	South Florida cetacean rescue triage and necropsy facility and response enhancement project	$57,430
2002	FL	Gulf World Inc	To upgrade the quality of Gulf World Marine Park's existing stranding facility, improve response time and capabilities.	$100,000
2002	FL	Harbor Branch Oceanographic Institution	Marine Mammal Necropsy Facility Ehancement	$69,811
2002	FL	Hubbs-SeaWorld Research Institute	Life history and stranding patterns of pygmy and dwarf sperm whales (genus Kogia) as critical tools in interpreting health assessment trends in wild populations	$98,240
2002	FL	Hubbs-SeaWorld Research Institute	Comprehensive stranding enhancement along the central east coast of Florida	$76,339
2002	FL	Marine Animal Rescue Society	Upgrade MARS from a Short-Term Critical Care Facility to a Long-Term Rehabilitation Center	$99,579
2002	FL	Mote Marine Laboratory	Mortality Patterns of Cetaceans Stranded on the Central West Coast of Florida	$100,000
2002	FL	Mote Marine Laboratory	Facility, staff and equipment upgrades for the dolphin and whale hospital	$100,000
2002	FL	SeaWorld (Orlando)	Enhancement of live stranding response capabilities and necropsy of code 2 animals in Northeast and east-central Florida: SeaWorld Florida equipment upgrades	$98,946
2002	FL	University of Florida, College of Veterinary Medicine	Marine Mammal Microbiology Diagnostic and Support Laboratory	$100,000
2002	GA	Georgia Depart. Natural Resources	Implement Marine Mammal Stranding Network in Georgia	$43,000
2002	HI	Hawaiian Islands Stranding Response Group	Cooperative partnerships in Hawaii which upgrade the capacity of the region's stranding ntework, detect, and dtermine the cause of marine mammal morbidity/mortalities	$99,830

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2002	HI	Robert C. Braun	Incidence of disease and health evaluation of Hawaiian Monk Seals (Monachus schauinslandi)in the Main Hawaiian Islands	$99,650
2002	MA	Cape Cod Stranding Network	Enhanced mass stranding response on Cape Cod: Success through preparation, protocols and cooperation	$100,000
2002	MA	Cape Cod Stranding Network	Health assessment of stranded marine mammals: Interpretation and field applications of blood and tissue analyses	$100,000
2002	MA	New England Aquarium Corporation	Marine Mammal Stranding Response, Rescue and Rehabilitation at the New England Aquarium in Support of the National Marine Fisheries Service under the Marine Protection Act	$98,671
2002	MA	New England Aquarium Corporation	An Analysis of the Spacial Patterns and Genetic Characteristics of the Harp and Hooded Seals Along the United States Eastern Coast	$99,996
2002	MA	Whale Center of New England	A Program to Respond to Stranded Marine Mammals in Northeastern Massachusetts-Evaluation, Rescue, Data Collection, and Public Education	$90,262
2002	MA	Woods Hole Oceanographic Institution	Necropsy enhancement for stranded marine mammals on Cape Cod	$93,897
2002	MD	Maryland Depart Natural Resources	Marine Mammal Stranding Response in Maryland	$47,002
2002	MD	National Aquarium in Baltimore	Enhanced Operations: Hospital pool restoration and satellite tags. Marine animal rescue program of the National Aquarium in Baltimore	$99,850
2002	MD	National Aquarium in Baltimore	Stranded Marine Animal Education and Outreach for professionals and the Public Marine Animal Rescue Program of the National Aquarium in Baltimore	$98,425
2002	ME	College of the Atlantic	Enhancement of the marine mammal stranding response and rescue program for the Maine coastal region, Rockland (ME) east, by creation of a new personnel position, network expansion, equipment upgrades, and acquisitions, and facility improvements	$72,750
2002	ME	College of the Atlantic	Use of stable isotope analysis to determine individual population and ecosystem health of Gulf of Maine Balaenopterids	$63,850
2002	ME	Marine Animal Lifeline	Enhancing seal rehabilitation care through improved isolation and the implementation of dedicated areas for veterinary treatments and necropsy	$87,015

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2002	ME	Marine Animal Lifeline	Development and use of a Geographic Information System for analysis of harp, hooded and harbor seal sightings/stranding locations: Adding a spatial dimension to strandings	$30,400
2002	MS	Institute for Marine Mammal Studies/Marine Life Oceanarium	Enhancement and Refurbishment of a Pre-Existing Stranding Facility and Development of First Response Capability Including Equipment and Training for Marine Mammal Live Response	$100,000
2002	NC	University of North Carolina, Wilmington	Enhanced evaluation of human interaction with bottlenose dolphins (*Tursiops truncatus*) in North Carolina and Virginia	$74,240
2002	NC	University of North Carolina, Wilmington	Enhance tissue collection and health monitoring of stranded of marine mammals in NC	$100,000
2002	NJ	Marine Mammal Stranding Center	To provide safe water and land transport of marine mammals	$71,250
2002	NJ	Marine Mammal Stranding Center	Operational expenses to support and enhance marine mammal and sea turtle rehabilitation	$100,000
2002	NY	Riverhead Foundation for Marine Research and Preservation	Request for operational support to upgrade facilities for the New York State Marine Mammal and Sea Turtle Stranding Program	$81,190
2002	NY	Riverhead Foundation for Marine Research and Preservation	Characterization of ice seal movements and evaluation of existing treatment protocols employed in the rehabilitation and field assessment through the uses of satellite telemetry and video documentation of stranded pinnipeds	$59,181
2002	OK	Oklahoma State University	A comprehensive two-year study of the viral, bacterial, mycologic and toxicologic conditions associated with marine mammal strandings in the Gulf coast of the US	$100,000
2002	OR	Oregon State University	Enhancing the capabilities of the Oregon Marine Mammal Stranding Network	$100,000
2002	PA	Trustees of the University of Pennsylvania	Toxicological and Pathoanatomic Stranding response and post-mortem evaluation of stranded marine mammals in San Juan Couny Washington	$75,206
2002	TX	Texas Marine Mammal Stranding Network	Improved recovery and rehabilitation of stranded marine mammals	$99,936
2002	TX	Texas Marine Mammal Stranding Network	Improved data collection from living and dead marine mammal strandings	$99,904
2002	VA	Virginia Marine Science Museum	Improving Triage and Treatment of Live Stranded Marine Mammals in Virginia	$82,850

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2002	VA	Virginia Marine Science Museum	Improving response to and assessments of dead marine mammal stranding in Virginia	$99,000
2002	WA	Cascadia Research Collective	Trends, spatial distribution, health effects of contaminants in Washington harbor seals from stranded animals	$98,968
2002	WA	Cascadia Research Collective	Strandings of large whales in Washington state and examination of contaminant accumulation	$99,461
2002	WA	WA Depart. Fish and Wildlife	Investigation of health parameters and causes of mortality in marine mammals from Washington waters	$100,000
2002	WA	Whale Museum	Stranding response and post-mortem evaluation of stranded marine mammals in San Juan Couny Washington	$89,123
2002	WA	Wolf Hollow Wildlife Rehabilitation Center	Enhancement and Support of Marine Mammal Treatment Facility	$75,053
2002	WA	Wolf Hollow Wildlife Rehabilitation Center	Upgrade of Life Support System for Marine Mammal Holding Pools	$99,400
2003	AK	University of AK Anchorage	The effects of acute and chronic stress on the Atlantic bottlenose dolphin (Tursiops Truncatus) Adrenal gland.	$74,619
2003	CA	City of Malibu	Consistency and improvement in marine mammal stranding response for the City of Malibu coastline	$100,000
2003	CA	Friends of the Seal Lion Marine Mammal Center	Pathology enhancement and database development	$97,975
2003	CA	Marine Mammal Care Center	Veterinary Fellowship Program at the Marine Mammal Care Center at Fort MacArthur	$100,000
2003	CA	Marine Mammal Center	Continuation of a biomonitoring program to detect novel diseases and changes in prevalence of know diseases in pinnipeds stranded along the central California coast	$100,000
2003	CA	Marine Mammal Center	Advancement of clinical care of stranded marine mammals, especially those intoxicated with the algal toxin domoic acid	$100,000
2003	CA	Natural History Museum of Los Angeles County	Development of an Improved Protocol for Examining Stranded Cetaceans: Combining Museum-based Science and Veterinary Medicine	$95,000
2003	CA	Regents of the University of CA	Cancer in stranded CA sea lions: answering questions about the role of contaminants, genetics, and diagnostic of herpes virus infection and early cancers	$100,000

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2003	CA	Regents of the University of CA	Enhancement of Stranding Response at the University of CA Santa Cruz Long Marine Lab	$49,703
2003	CA	San Jose State University Foundation	Improving the Response to Marine Mammal Strandings by Moss Landing Marine Laboratories in Central CA	$99,716
2003	CA	Santa Barbara Museum of Natural History	Enhancement of Facility, Equipment and Supplies to Recover and Archive Dead, Stranded Cetaceans	$99,989
2003	CA	Sea World, San Diego	Improving response, care and diagnostic for stranded marine mammal in Southern CA	$100,000
2003	CA	Sea World, San Diego	Enhancement and integration of southern CA stranded marine mammal post-mortem evaluations and materials archives	$100,000
2003	CT	Mystic Aquarium	Support for the Marine Mammal Stranding Program at Mystic Aquarium	$100,000
2003	CT	Mystic Aquarium	Application and refinement of a prognostic index to evaluate the health, nutritional status, and cause of stranding of stranded harp seals and hooded seals in the Northeastern U.S., with particular emphasis on a disease with epizootic potential	$99,997
2003	CT	University of Connecticut	Evaluation of immune functions are potential diagnostic and prognostic tools in stranded marine mammals	$95,744
2003	DC	Smithsonian Institution	Enhancement and Maintenance of the Smithsonian Institution's Cetacean Distributional Database and Research Collection's (1 Year)	$97,580
2003	DE	Delaware DNR	Outfitting a necropsy lab to improve acquisition, analysis and storage of levels A, B and C data from stranded marine mammals in coastal Delaware and it's inland waterways	$100,000
2003	FL	FL Fish & Wildlife Conservation Commission	Facilities of Southwest Florida Cetaceans Rescue and Recovery	$90,800
2003	FL	Gulf World, Inc.	Request for equipment to help facilities large animals and to make moving of all animals easier, safer and faster and for financial assistance with stranding facility operations	$45,675
2003	FL	Hubbs-Sea World Research Institute	Enhancing live animal stranding response, necropsy procedures and tissue archiving capabilities along the central and northeast coast of FL	$96,826

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2003	FL	Marine Animal Rescue Society (MARS)	Improve MARS' impact on live stranding events in South FL, while nurturing existing outreach channels with a better presence	$99,952
2003	FL	Mote Marine Lab	Facility expansion for the Dolphin and Whale Hospital	$100,000
2003	FL	University of Florida	Poxvirus Infections in North American Pinnipeds	$38,181
2003	LA	Audubon Nature Institute, Inc.	Enhancement of data collection from stranded marine mammals by the Louisiana Marine Mammal Rescue Program	$74,940
2003	MA	Cape Cod Stranding Network, Inc.	Enhanced stranding response and investigation on Cape Cod: assessment, data, collection, sampling, and disposal	$100,000
2003	MA	New England Aquarium Corporation	Improved field diagnostic and post release monitoring of mass stranded cetaceans	$99,958
2003	MA	New England Aquarium Corporation	Improving marine mammal stranding response and rehabilitation in Massachusetts, New Hampshire, and Southern Maine	$100,000
2003	MA	Woods Hole Oceanographic Institution	2003 Necropsy Enhancement for Stranded Marine Mammals	$99,267
2003	MD	Maryland DNR	Improving Response to and Assessment of Dead Stranded Marine Mammals in Maryland	$99,997
2003	MD	National Aquarium in Baltimore	Enhanced operations of Marine Animal Stranding Rescue and Rehabilitation through the procurement of medical/rescue equipment and a centralized storage facility.	$99,030
2003	ME	College of the Atlantic	A medium-range response vessel to enhance the Marine Mammal Stranding Response Program (MMSRP) for Mid-coast/Downeast Maine	$80,000
2003	ME	Marine Animal Lifeline	Improved veterinary care and marine mammal rehabilitation program support	$98,401
2003	ME	Marine Animal Lifeline	Enhancing and supporting marine mammal rescue response and stabilization procedures	$99,734
2003	ME	University of Southern Maine	Establishing a national resource of marine mammal cell lines for toxicological, infectious disease, and other biomedical research	$100,000
2003	MS	Institute for Marine Mammal Studies, Inc.	Evaluation of trends and possible causes of marine mammal strandings in the Mississippi sound and adjacent waters	$100,000
2003	NC	University of North Carolina, Wilmington	Enhancing response to and necropsy of stranded large whales in North Carolina and Virginia	$93,262

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2003	NC	University of North Carolina, Wilmington	Enhanced tissue collection and health monitoring of stranded marine mammal's in North Carolina and Virginia	$94,046
2003	NJ	Marine Mammal Stranding Center (MMSC)	To ensure and support MMSC staffing requirements	$100,000
2003	NY	Mount Sinai School of Medicine	Atlas of mysticete anatomy	$92,181
2003	NY	Riverhead Foundation for Marine Research and Preservation	Facility upgrade to enhance access to veterinary care for marine mammals while collecting valuable supplemental data	$99,711
2003	OR	Oregon State University	Enhancing the capabilities of the Oregon marine mammal stranding network	$99,967
2003	SC	South Carolina DNR	Continuation of South Carolina's Marine Mammal Strandings Network	$86,690
2003	TX	Texas Marine Mammal Stranding Network (TMMSN)	Improved Recovery and Treatment of Live Stranded Animals--Rescue, Rehabilitation and Release	$99,649
2003	TX	Texas Marine Mammal Stranding Network (TMMSN)	Improved data collection from living and dead marine mammal strandings	$99,319
2003	VA	Virginia Marine Science Museum	Supporting response to dead marine mammal strandings in Virginia	$100,000
2003	WA	Washington Department of Fish & Wildlife	Investigations of marine mammals health parameters and causes of mortality in marine mammals from Washington waters	$72,256
2003	WA	Whale Museum	Stranding response and post-mortem evaluation of stranded marine mammals in San Juan County, Washington	$95,178
2004	AK	Aleut Community of St Paul Island	Assessment of northern fur seal entanglement in marine debris on the Pribilof Islands.	$100,000
2004	AK	Seward Association for the Advancement of Marine Science	Rescue and Rehabilitation of Pinnipeds and Cetaceans in AK	$99,815
2004	AK	University of AK Fairbanks	Morbidity and mortality of marine mammals on the north coast of Alaska Peninsula	$99,908
2004	AL	Marterra Foundation, Inc.	Enhancement of data collection Phase 2	$99,924
2004	CA	Marine Mammal Care Center	Enhanced Veterinary Medical Program at the Marine Mammal Care Center at Fort MacArthur	$100,000
2004	CA	Northcoast Marine Mammal Center	Enhance diagnostic and treatment abilities, improve facilities for stranded marine mammals; continue employment of facility manager and primary investigating veterinarian to accomplish goals and objectives	$100,000
2004	CA	Regents of the University of CA	Marine Mammal Pathology for the Central CA	$99,980

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2004	CA	San Jose State University Foundation	Movements, Dive Behavior and Survival of Post Release CA Sea Lions after Rehabilitation for Domoic Acid Toxicity	$97,322
2004	CA	Santa Barbara Marine Mammal Center	Pinniped Rescue Capture Techniques Training Program	$32,000
2004	DC	Smithsonian Institution	Enhancement and Maintenance of the Smithsonian Institution's Cetacean Distributional Database and Research Collection's (Year 2)	$97,467
2004	FL	Dynamac Corporation	Marine Mammal Stranding Program on Florida's Space Coast: Upgrade Rescue and Data Collection	$43,198
2004	FL	Harbor Branch Oceanographic Institution	Diagnostic Equipment Purchase	$54,964
2004	FL	Harbor Branch Oceanographic Institution	Stranding Center Pool Enhancement	$97,763
2004	FL	Hubbs-Sea World Research Institute	Cetacean stranding response and the development of a photographic stranding atlas for network education and training	$94,720
2004	FL	Marine Animal Rescue Society (MARS)	Improve MARS' impact on live stranding events in South FL, while nurturing existing outreach channels with a better presence (2nd Year Funding)	$32,602
2004	FL	Mote Marine Laboratory	Enhancement of marine mammal rescue and stranding program for central west FL	$100,000
2004	HI	Hawaiian Islands Stranding Response Group	Collect consistent level A data throughout the jurisdiction, including remote areas, and collect level B and C data from stranding of dead marine mammals	$100,000
2004	HI	Hawaiian Islands Stranding Response Group	Collect consistent level A data throughout the jurisdiction, including remote areas, and collect level B and C data from stranding of dead marine mammals (2nd Year Funding)	$100,000
2004	LA	Audubon Nature Institute, Inc.	Enhancement of data collection from stranded marine mammals by the Louisiana Marine Mammal Rescue Program	$32,740
2004	MA	Cape Cod Stranding Network, Inc.	The science of stranding response: supporting data collection from live and dead stranded marine mammals on Cape Cod	$100,000
2004	MA	Whale Center of New England	A project to increase the breadth and efficiency of marine mammal stranding response on Massachusetts' North Shore	$86,658

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2004	MD	National Aquarium in Baltimore	Enhanced operations of Marine Animal Stranding Rescue and Rehabilitation through the procurement of medical/rescue equipment (2nd Year Funding)	$71,344
2004	ME	College of the Atlantic	Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Mid-coast/Downeast Maine	$66,058
2004	NC	North Carolina State University	Improving live marine mammal stranding response in North Carolina through rapid diagnostic capability and short-term holding capacity	$83,195
2004	NJ	Marine Mammal Stranding Center (MMSC)	To ensure and support MMSC staffing requirements (2nd Year Funding)	$100,000
2004	NY	Riverhead Foundation for Marine Research and Preservation	Evaluation of current rescue response protocols and post-rehabilitation monitoring of marine mammals through the enhancement of data collection, satellite and radio tracking, and data on the prevalence of morbilli and herpes in pinnipeds in the northwest	$100,000
2004	VA	Virginia Marine Science Museum	Recovery and treatment of Live Stranded Marine Mammals in Virginia	$100,000
2004	WA	Cascadia Research Collective	Cetacean stranding response in Washington with special attention to gray whales and harbor porpoise	$83,595
2004	WA	Cascadia Research Collective	Trends, spatial distribution, health effects of contaminants in Washington pinnipeds	$96,372
2004	WA	Whale Museum	Stranding response and post-mortem evaluation of stranded marine mammals in San Juan County, Washington (2nd Year Funding)	$94,378
2004	WA	Wolf Hollow Wildlife Rehabilitation Center	Advancement of Marine Mammal Rehabilitation Program, Facilities, Techniques, Training and Research	$99,980
2005	AK	Seward Association for the Advancement of Marine Science	Alaska Region Stranding Network coordination and development project	$97,837
2005	AK	University of Alaska - Fairbanks	Salvaging beach-dead marine mammals - collaborative effort between UAM, volunteer salvage crews and NOAA	$89,718
2005	CA	Hubbs-SeaWorld Research Institution (CA)	Post-release monitoring of rehabilitated marine mammals in southern California through the use of VHF and UHF (satellite-linked) radio telemetry	$96,093
2005	CA	Marine Mammal Care Center at Fort MacArthur	Support and upgrade of the Veterinary Medical Program at the Marine Mammal Care Center at Fort MacArthur	$100,000

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2005	CA	Pacific Marine Mammal Center	Enhancing diagnostic applications for stranded marine mammals and improving operational capabilities	$69,566
2005	CA	San Jose State University Foundation	Body burden assessments of total mercury in stranded Pacific harbor seals, *Phoca vitulina richardii* , in central California	$98,814
2005	CA	Sea World San Diego	Equipment and personnel for improving response and care for live stranded marine mammals in southern California	$76,108
2005	CA	The Marine Mammal Center	Development of a biomonitoring program to detect novel diseases and changes in prevalence of known diseases in pinnipeds stranded along the central California coast - year 3	$100,000
2005	CA	The Regents of the University of California	Enhancement of stranding response at University of California Santa Cruz Long Marine Lab	$37,581
2005	CA	The Regents of the University of California	Marine Mammal Pathology Service for the central California coast, Part 3	$99,980
2005	CT	Mystic Aquarium	Support and enhancement for the Marine Mammal Stranding Program at Mystic Aquarium	$100,000
2005	DC	Smithsonian Institution	Enhancement of Level A, B and C Cetacean Data: Improving data quality and access to the Smithsonian Institution's Cetacean Distributional Database	$88,685
2005	DE	Delaware Department of Natural Resources	Support staffing and operational needs to facilitate improved stranding response for marine mammals occurring along the Delaware coast and its waterways	$100,000
2005	FL	Dynamac Corporation	Marine Mammal Stranding Program on Florida's space coast	$36,961
2005	FL	Florida Fish and Wildlife Conservation Commission - Jacksonville	Equipping the Northeast Florida Stranding Network for response to cetacean strandings	$65,116
2005	FL	Harbor Branch Oceanographic Institution	Research project on cardiomyopathy of dwarf and pygmy sperm whales	$99,706
2005	FL	Hubbs-Sea World Research Institute	An evaluation of demographic and health related factors of the Indian River Lagoon dolphin population following an Unusual Mortality Event	$76,540
2005	FL	Marine Animal Rescue Society	Improve MARS' impact on live stranding events in South Florida, while nurturing existing outreach channels with a better presence	$99,996
2005	FL	Mote Marine Laboratory	Support for operation with the increased capacity of the Dolphin and Whale Hospital	$84,169

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2005	FL	Mote Marine Laboratory	Enhancement of the marine mammal stranding program and post-release monitoring of rehabilitated cetaceans for central west Florida	$100,000
2005	HI	Robert C. Braun, D.V.M.	Hawaiian monk seal health trend surveillance and captive care response	$100,000
2005	LA	Audubon Nature Institute, Inc.	Enhancement and maintenance of data collection from stranded marine mammals by the Louisiana Marine Mammal Rescue Program: Phase 2	$99,900
2005	MA	Cape Cod Stranding Network	Pursuing excellence in marine mammal stranding response: support for basic operational needs and innovative solutions to stranding challenges	$100,000
2005	MA	New England Aquarium	Strengthening marine mammal stranding response and rehabilitation at the New England Aquarium	$88,246
2005	MA	The Whale Center of New England	Marine mammal stranding response on Massachusetts' north shore: Continuation and expansion of data collection and assistance to stranded animals	$73,377
2005	MA	Woods Hole Oceanographic Institution	Development of necropsy, anatomy, and pathology training materials from stranded marine mammals	$99,969
2005	MD	Maryland Department of Natural Resources	Enhancing the quality and quantity of data collection from dead stranded marine mammals in Maryland	$88,387
2005	ME	College of the Atlantic	Maintenance and enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the midcoast/downeast region of Maine, 2005-2006	$77,388
2005	ME	University of New England	The enhancement of pinniped rehabilitation at Marine Animal Rehabilitation Center	$85,615
2005	ME	University of Southern Maine	Establishing a national resource of marine mammal cell lines for toxicological, infectious disease, and other biomedical research	$100,000
2005	MS	Institute for Marine Mammal Studies	Evaluation of trends and possible causes of Atlantic bottlenose dolphin (*Tursiops truncatus*) strandings in the Mississippi Sound and adjacent waters (continuation study)	$100,000
2005	NC	University of North Carolina - Wilmington	Enhanced tissue collection and health monitoring of stranded marine mammals in North Carolina and Virginia	$98,587
2005	NJ	Marine Mammal Stranding Center	To enhance and support basic needs for volunteer training and response, treatment and data collection of live and dead stranded marine mammals in New Jersey	$100,000

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2005	NY	The Riverhead Foundation for Marine Research	Facility upgrade to enhance operational support and response to live marine mammal strandings while collecting valuable supplemental data	$100,000
2005	OR	Oregon State University	Enhancing the capabilities of the Oregon Marine Mammal Stranding Network	$99,201
2005	OR	Portland State University	Implementation of an archival system for cetacean tissue and anatomical specimens collected during 10 years of stranding network activity	$76,462
2005	TX	Texas Marine Mammal Stranding Network	Response, treatment and data collection from living and dead stranded marine mammals	$99,905
2005	VA	Virginia Aquarium Foundation	Enhancing response to live marine mammal strandings in Virginia	$100,000
2005	WA	Washington Department of Fish and Wildlife	Investigations of marine mammal health parameters and causes of mortality in Washington state	$94,655
2005	WA	Wolf Hollow Wildlife Rehabilitation Center	Advancement of marine mammal rehabilitation program, operations, facilities, training and research	$88,068
2006	AK	Aleut Community of St. Paul Island	Assessment of northern fur seal (*Callorhinus ursinus*) entanglement in marine debris on the Pribilof Islands	99,083
2006	AK	University of Alaska Fairbanks	Improvements to marine mammal data and specimen archives at UAM	100,000
2006	AK	University of Alaska Fairbanks	Morbidity and mortality of marine mammals on the north coast of the Alaska Peninsula	100,000
2006	CA	City of Malibu	Advancement of marine mammal stranding response for the city of Malibu coastline	87,698
2006	CA	Marine Mammal Care Center at Fort MacArthur	Staffing resources upgrade at the Marine Mammal Care Center at Fort MacArthur	83,200
2006	CA	Northcoast Marine Mammal Center	Enhance response, rescue and rehabilitation on Northern California's remote coastline	100,000
2006	CA	Pacific Marine Mammal Center	Enclosure renovation and pool construction project	58,539
2006	CA	Regents of the University of California	Marine Mammmal Pathology Service for the Central California Coast, Part 4	99,946
2006	CA	Regents of the University of California	Enhancement of Stranding Response at University of California Santa Cruz Long Marine Lab	48,389
2006	CA	Santa Barbara Museum of Natural History	Support for and enhancement of data collection from Dead-Stranded cetaceans	63,756
2006	CA	Sea World San Diego	Personnel for improving stranded animal response in Southern California	100,000
2006	CA	The Marine Mammal Center	Development of diagnostic assays to detect lungworm (Otostrongylus circumlitus) infection in stranded northern elephant and Pacific harbor seals	99,550

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2006	CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Support and Enhancement for the Marine Mammal Stranding Program at Mystic Aquarium	99,310
2006	CT	University of Connecticut	Evaluation of immune functions as potential diagnostic and prognostic tools in stranded marine mammal, a regional approach.	100,000
2006	FL	Florida Fish and Wildlife Conservation Commission	Stranding and Necropsy Training For Increasing Quality of Level A, B, and C Data Collection by the Florida Cetacean Stranding Network	99,913
2006	FL	Hubbs-SeaWorld Research Institute	Enhancing live animal stranding response, assessing cetacean health trends, and evaluating neonatal mortality trends of the bottlenose dolphin (Tursiops truncatus) along the east coast of Florida	99,479
2006	FL	Hubbs-SeaWorld Research Institute	Validation of historic marine mammal stranding data from the southeastern United States	64,474
2006	FL	Marine Animal Rescue Society (MARS)	Improve MARS' mass stranding response capability (immediate triage and necropsy support) and post-rehabilitation monitoring preparedness for the SEUS stranding region	64,296
2006	FL	Mote Marine Laboratory	Investigating brevetoxin-induced mortality in bottlenose dolphins stranded in central west Florida	100,000
2006	FL	Nova Southeastern University	An Analysis of Kogia Stranding Data Collected by the Southeast Region Marine Mammal Stranding Network	29,177
2006	FL	University of Florida	Clinical Pathology and Histopathologic Processing and Analysis of Cetaceans in Northern and Central Florida	99,955
2006	GA	GA Dept. of Natural Resources	Enhance Georgia Marine Mammal Stranding Network	55,848
2006	MA	Cape Cod Stranding Network	The Next Step: Operational Support to Enhance Stranding Response Capabilities and Promote Data Analysis and Publication	100,000
2006	MA	New England Aquarium Corporation	Advancement of Clinical Care, Data Collection, and Pathology Training for Marine Mammal Stranding Response	99,954
2006	MA	The Whale Center of New England	Marine mammal stranding response on Massachusetts' North Shore: Timely assistance for living animals and comprehensive regional data collection	85,062
2006	MA	Woods Hole Oceanographic Institution	2006 Necropsy of Fresh and Human-Impacted Marine Mammal Strandings in SE Massachusetts and Cape Cod	98,714

YEAR	STATE	APPLICANT	TITLE	FEDERAL AMOUNT
2006	MD	National Aquarium in Baltimore	2006 National Aquarium in Baltimore, Marine Animal Rescue Program Operations	46,800
2006	ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Mid-coast/Downeast Region of Maine, 2006-2007	82,890
2006	ME	Marine Animal Lifeline	Veterinary care staffing and rehabilitation supply expense support for the marine mammal rehabilitation program	100,000
2006	ME	University of New England	The Enhancement of Cetacean Response, Treatment and Data Collection in Southern Maine	93,596
2006	ME	University of New England	Composting as a Disposal Option	60,025
2006	NC	North Carolina State University	Improving live marine mammal stranding response in North Carolina through a rapid diagnostic capability and short-term holding capacity	56,930
2006	NC	University of North Carolina Wilmington	Enhancing response to and necropsy of large whales in North Carolina, Virginia and South Carolina	92,830
2006	NC	University of North Carolina Wilmington	Enhanced tissue collection and health monitoring of stranded marine mammals in North Carolina and Virginia	99,986
2006	NJ	Marine Mammal Stranding Center	To enhance and support Marine Mammal Stranding Center staffing requirements	100,000
2006	NY	Riverhead Foundation for Marine Research and Preservation	Facility Upgrade to Enhance Operational Support and Response to Marine Mammal Strandings	100,000
2006	OR	Oregon State University	Enhancing the capabilities of the Oregon Marine Mammal Stranding Network	99,931
2006	TX	Texas Marine Mammal Stranding Network	Response, treatment and data collection from living and dead stranded marine mammals	99,998
2006	VA	Virginia Aquarium and Marine Science Center Foundation	Continuing Investigation of Dead Marine Mammal Strandings in Virginia	100,000
2006	WA	Orca Network	Stranding response and post-mortem examination of stranded marine mammals in Central Puget Sound, Washington	99,772
2006	WA	Washington Department of Fish and Wildlife	Response to stranded marine mammals and investigating causes of mortality in Washington waters	99,532
2006	WA	Wolf Hollow Wildlife Rehabilitation Center	Care of Live Stranded Harbor Seals in the Northwest Region: Treatment, Data Management, Research, and Training	85,638

APPENDIX L

MARINE MAMMAL OIL SPILL RESPONSE GUIDELINES

MARINE MAMMAL HEALTH AND STRANDING RESPONSE PROGRAM

Marine Mammal Oil Spill Response Guidelines

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Protected Resources
Marine Mammal Health and Stranding Response Program

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MARINE MAMMAL HEALTH AND STRANDING RESPONSE PROGRAM

Marine Mammal Oil Spill Response Guidelines

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U.S. DEPARTMENT OF COMMERCE
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Many individuals and organizations helped make this publication possible through the generous contributions of their time and effort and we offer our sincere thanks to everyone involved.

Table of Contents

Internet Resources

NOAA Fisheries, Marine Mammal Health and Stranding Response Program
http://www.nmfs.noaa.gov/pr/health/

NOAA, Damage Assessment and Restoration Program (DARP):
http://www.darp.noaa.gov/

U.S. Coast Guard Oil Spill Response: http://www.uscg.mil/hq/g-m/nmc/response/index.htm

U.S. Coast Guard Area Contingency Plans: http://www.uscg.mil/vrp/acp/acp.shtml

U.S. National Response Team: http://www.nrt.org/

Wildlife Health Center, UC Davis: http://www.vetmed.ucdavis.edu/whc/

Oiled Wildlife Care Network: http://www.vetmed.ucdavis.edu/owcn/

Introduction

Marine Mammals and Oil: A Brief Overview

In comparison to marine birds, marine mammals are infrequently affected by oil spill incidents. The number of individuals and species affected, as well as the degree of pathological impact of such exposure, will depend on many variables, such as the location and size of the spill, the characteristics of the oil, weather and water conditions, types of habitats affected, the time of year the spill occurs, as well as the behavior and physiology of the marine mammal. Information on the effects of oil on marine mammals is sparse, and is mostly a result of the *Exxon Valdez* oil spill in Alaska in 1989 and a limited number of exposure experiments on a narrow range of species exposed to relatively low doses of oil (Geraci and St. Aubin, 1990).

The sensitivity of marine mammals to spilled oil is highly variable and appears to be most directly related to the relative importance of fur and blubber to thermoregulation. In those species with relatively sparse fat stores, direct contact with oil impairs the thermal insulative value of fur thus resulting in hypothermia. External exposure can also result in dermal injury and conjunctivitis. Internal exposure of oil by ingestion (either by direct ingestion or indirect through food and water sources) can result in gastrointestinal ulcers and liver and kidney damage. Inhalation of volatile hydrocarbons can result in central nervous system and pulmonary damage and behavioral abnormalities. Depending upon the extent of external exposure, the toxicity of the petroleum product, the volume ingested or inhaled, the presenting clinical signs, and the species affected, some marine mammals exposed to oil may not need rehabilitation. Oil spill responders must consider that such procedures involving capturing, holding, treating, and releasing the wild animals places stress on the animal, and the consequences of capture and captivity may be a greater risk to its well being than contacting oil. Exceptions may include abandoned or moribund young pups of any species and species that rely on fur for thermal insulation. These animals will most likely require rehabilitation when oiled due to the physical and toxicological effects of petroleum exposure.

Pathological Effects of Petroleum Exposure

Documented clinical and histopathological effects of oil in pinnipeds and sea otters include ambulatory restrictions, thermoregulatory imbalance, central nervous system depression, interstitial pulmonary emphysema, aspiration pneumonia, anemia, conjunctivitis and corneal edema, gastrointestinal irritation, and hepatic and renal tubular necrosis/lipiosis, and adrenal gland dysfunction (Davis and Anderson, 1976; Geraci and Smith, 1976; Engelhardt et al., 1977; Engelhardt, 1985; Geraci and St. Aubin, 1988; Geraci and Williams, 1990; St. Aubin, 1990; Lipscomb et al., 1993). Small laboratory studies on the effects of oil have been conducted on ringed and harp seals (Smith and Geraci, 1975; Geraci and Smith, 1976); however most studies have been unable to correlate the degree of oiling with the type of effect and many of these lesions may be related to captivity stress or other underlying factors. Changes in acute phase proteins and cytokines (e.g. elevated IL-6, haptoglobin and creatine kinase) have been correlated with probable petroleum exposure in river otters (Duffy et al., 1993; Duffy et al., 1994). Oiled sea otters displayed evidence of hepatic and renal dysfunction as well as anemia in their blood parameters (Williams et al., 1995).

Heavy oiling did not appear to interfere with seal locomotion during the *Exxon Valdez* oil spill (Lowry et al., 1994), but in previous spills seal pups encased in oil have drowned due to their inability to swim (Davis and Anderson, 1976). During *Exxon Valdez*, harbor seals were observed exhibiting abnormally tame or lethargic behavior. These observations are most likely explained by midbrain nerve damage found in oiled harbor seals and Steller sea lions (Spraker et al., 1994). In addition to the acute mortalities associated with the loss of thermoregulation and buoyancy, many physiological and behavioral problems have been attributed to internal exposure to petroleum and polycyclic aromatic hydrocarbon (PAH) compounds in sea otters. However, many of these conditions have been difficult to differentiate from lesions attributed to, or compounded by, shock and chronic stress associated with capture and the rehabilitation process (Williams and Davis, 1995). It has become clear that animals captured during oil spill responses undergo additional stressors that may or may not be offset by the medical care they receive.

Background

The purpose of the Marine Mammal Oil Spill Response Guidelines (Guidelines) is to provide a foundation for coordination and communication between the National Marine Mammal Health and Stranding Response Program participants and other state and federal governmental agencies involved in oil spill response and marine mammal conservation and protection. The National Oceanic and Atmospheric Administration (NOAA) Fisheries, Office of Protected Resources, Marine Mammal Health and Stranding Response Program (MMHSRP) enlisted the University of California (UC) Davis, Wildlife Health Center to assist in the development of these Guidelines with input and assistance from NOAA's National Ocean Service, Office of Protected Resources, Damage Assessment and Restoration Program (DARP) and NOAA Fisheries, Office of Law Enforcement (OLE). The UC Davis, Wildlife Health Center, through its Oiled Wildlife Care Network (OWCN) program is among the world's leading experts on oiled wildlife response methods and standards. The primary purpose of the document is to: outline appropriate standardized data collection techniques for response activities and damage assessment; define chain-of-custody protocols for animal collection, necropsy and sampling; provide recommendations for protection of human health and oil spill safety training for responders; and present guidelines for best achievable care of oiled marine mammals. Standardization of this information between and among oiled marine mammal responders should allow for more accurate collection of data for analysis, which then may yield better information on the effects of oil on marine mammals and further improvements in oil spill response involving marine mammals. These Guidelines by their design do not address overall marine mammal husbandry methods in detail, but are intended to provide basic information on oil spill specific issues (such as search and collection, transport, emergency care and stabilization), and procedures specific to oil spill response. For more information on general marine mammal rescue and rehabilitation, the reader should consult references such as Marine Mammals Ashore (Geraci and Lounsbury, 1993) and the CRC Handbook of Marine Mammal Medicine (Dierauf and Gulland, 2001).

Intended Uses

These Guidelines are intended for use by the NOAA Fisheries MMHSRP, other natural resource management agencies, marine mammal stranding networks and rehabilitators, On-Site Coordinators, and Potentially Responsible Parties (PRPs) as a guide in:

- Developing appropriate sections of Area Contingency Plans (ACPs)
- Stimulating communication and documentation coordination between interested parties
- Caring for oiled marine mammals
- Evaluating marine mammal rehabilitation center capabilities for oil spill response
- Collecting evidence for assessment of impacts on marine mammals
- Making informed choices during spill responses

Responses to spills impacting marine mammal will depend upon factors including the size of the spill, species involved, type of product spilled, time of year, and location. It is important that spill responders and pre-spill planners recognize that the variability in degree of effort and complexity in marine mammal response can be significant when comparing small and large events.

This document is not intended for use as a training manual. Nor is this document an exhaustive list of techniques in this field, in which practical knowledge is being continuously refined and developed. It is to serve as guidance for acquiring the best achievable care and data collection during an oil spill response and should be periodically reviewed and updated.

Organizational Structure

Organizational Structure of Wildlife Response

Actions taken to protect wildlife resources follow an organized and agreed-upon cascade of agency notifications and activities. All activities of the oil spill response are coordinated through the Unified Command (UC) and follow an Incident Command System (ICS) structure as standardized by the National Interagency Incident Management System (NIIMS) and modified for oil and hazardous substance spill response by the National Response Team (Figure 1., NRT 2004). The UC is the governing body ultimately responsible for all decision making processes during the spill response, and is made up of a Federal On-Scene Coordinator (FOSC) (usually a Coast Guard Captain of the Port for the affected area), a State Incident Commander (IC) or On-Scene Coordinator (SOSC), and a qualified individual from the Responsible Party (RP), if known. When appropriate, local government representatives can be included in the UC. The FOSC has the ultimate responsibility for directing the oil spill response if a consensus cannot be reached among the members of the UC. Wildlife response activities usually exist within the Operations Section of the ICS, though some wildlife actions (primarily baseline assessment and planning) also occur with the Environmental Unit of the Planning Section. The Wildlife Branch within the Operations Section coordinates and initiates wildlife response activities. Guidance for dealing with oiled wildlife is not specifically provided in the National Contingency Plan, therefore the Wildlife Branch operational plan is developed uniquely within each Regional and Area Contingency Plan based on the specific resources and agency involvement.

Early but prudent initiation of a wildlife response plan and the previous development of the Wildlife Branch ensure timely mobilization of dedicated staff, equipment, and volunteers. This structure allows for effective lines of communication, making the response effort much more efficient. The degree of the wildlife response effort is designed to be flexible and scalable to the size of the oil spill - only those positions necessary and appropriate for a specific spill incident are filled.

Trustee Organizations

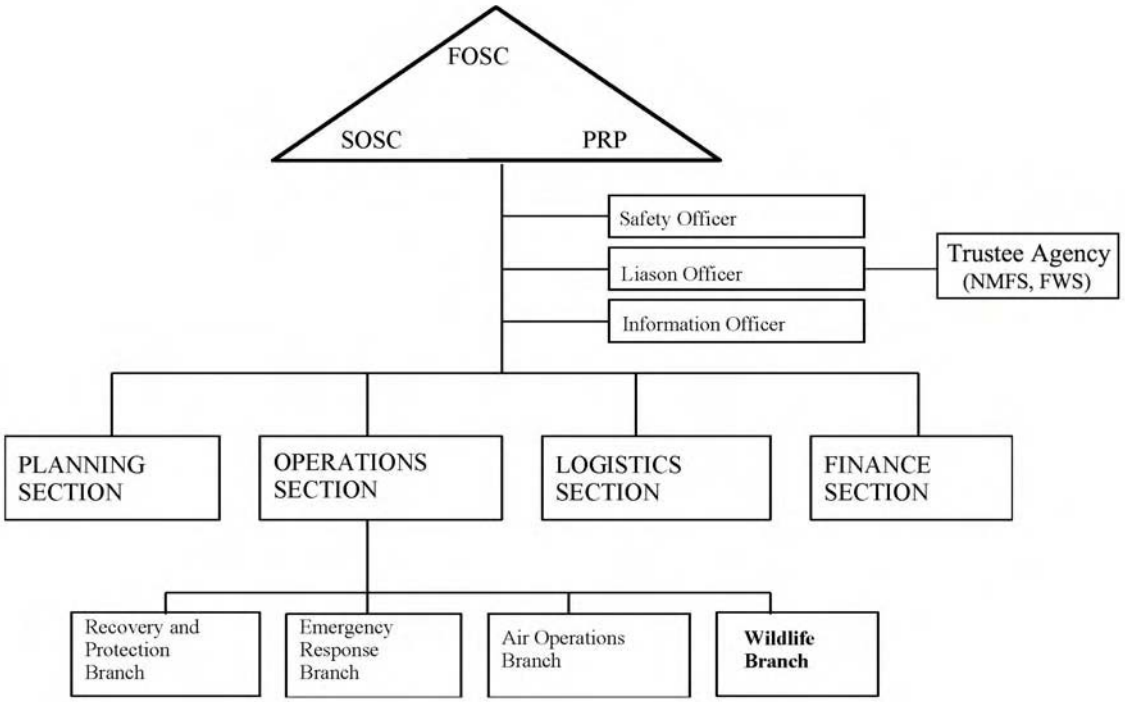
Under federal statutes, NOAA Fisheries, National Marine Fisheries Service (NMFS) has responsibility for managing and protecting all cetaceans and pinnipeds in U.S. waters, except walruses; U.S. Fish and Wildlife Service (FWS) has responsibility for managing and protecting manatees, walruses, sea otters, and polar bears. NOAA Fisheries is responsible for the administration of the Endangered Species Act (ESA) as it applies to certain cetaceans and pinnipeds and the FWS is responsible for the administration of the ESA as it applies to remaining marine mammals and terrestrial mammal and bird species. Following an oil spill, specific information on wildlife resources at risk and appropriate wildlife response actions are made available to the Federal On-Site Coordinator (FOSC) and other members of the Unified Command (UC) through representatives of appropriate wildlife resource managers. Therefore, the UC must immediately consult with FWS or NMFS whenever a response may affect these resources. The Marine Mammal Protection Act (MMPA) prohibits the "take" of sea otters, seals, sea lions, walruses, whales, dolphins, and porpoises, which includes harassing or disturbing these animals as well as actual harming or killing; however, Section 109(h) of the MMPA allows take by

Federal, State, or local governmental officials, during their official duties, provided the take is for the welfare and protection of the animal or public health. Accordingly, the FOSC/UC is authorized to take marine mammals during an oil-spill response if to protect the welfare of the animal. Section 12(c) of the MMPA allows NMFS to enter into cooperative agreements (e.g. Stranding Agreements) that allow stranding network participants marine mammal take in order to carry out the purposes of the MMPA. The ESA and its implementing regulations provide special provisions for consultations during emergencies (such as oil spills) with FWS and/or NMFS for making recommendations to the FOSC to avoid the taking of listed species or to otherwise reduce response-related impacts. In some State statutes, management and protection of wildlife resources are joint responsibilities between NMFS, FWS and the State. Because of these shared trust responsibilities, both federal and state agencies are required to respond to spills, or potential spills, that may impact marine mammals. To facilitate efficient and effective coordination during an oil spill response, federal and state agencies may consider developing Memorandums of Agreement (MOA's) or Memorandums of Understanding (MOU's) that pre-designate regional primary points of contact, establish lead representatives, and define roles for natural resource emergency situations.

In the wake of the *Exxon Valdez* spill, Congress passed the Oil Pollution Act of 1990 (OPA 90). OPA 90 sets forth an extensive liability scheme that is designed to ensure that, in the event of a spill or release of oil or other hazardous substance, the responsible parties are liable for the removal costs and damages that result from the incident. A responsible party may be liable for removal costs and damages to natural resources, real or personal property, subsistence use, revenues, profits and earning capacity, and public services. OPA 90 also set aside a significant trust fund that can be utilized quickly to implement a spill response prior to establishment of liability.

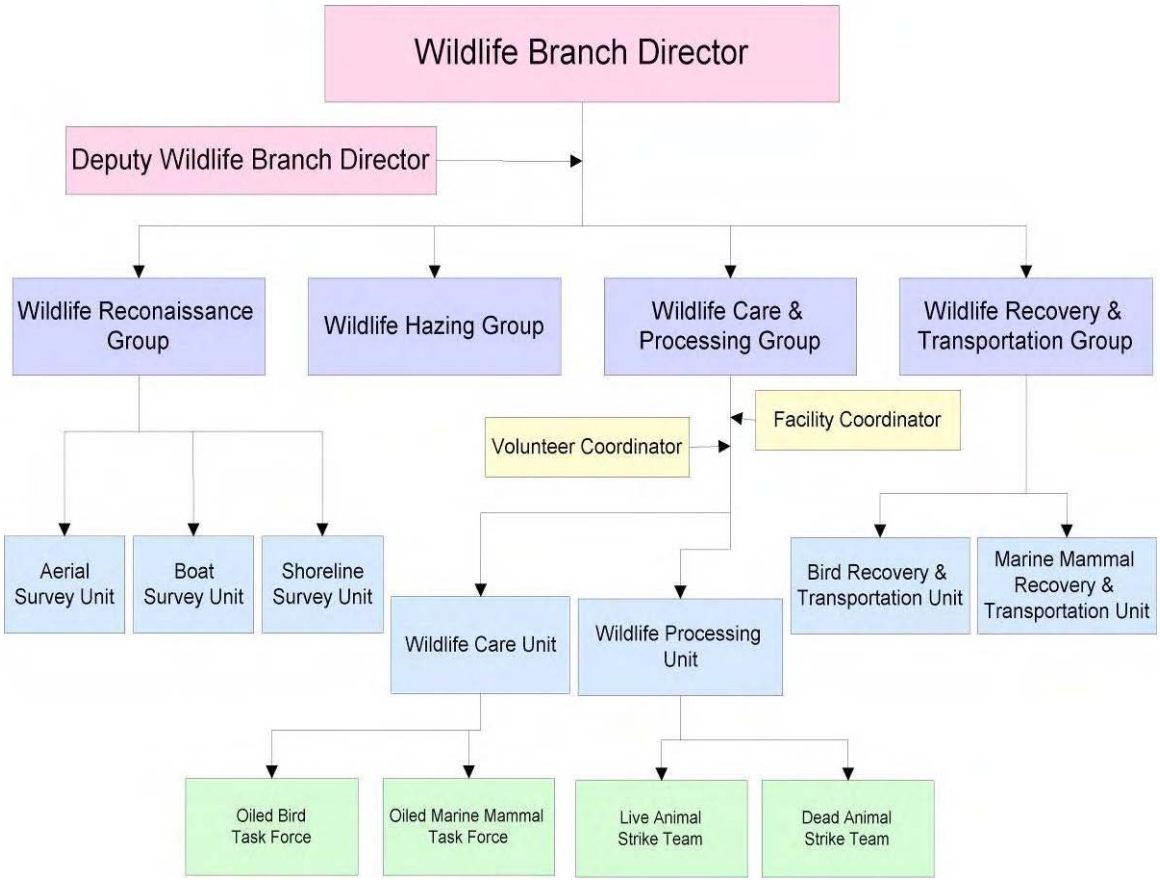
OPA 90 directs the appointed trustees to conduct natural resource damage assessments (NRDAs) and develop and implement plans to restore, rehabilitate, or replace damaged natural resources. Authority to claim damages to natural resources also stems from Clean Water Act (CWA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Under the CWA, federal and state agencies with diverse jurisdictions and missions are directed to combine their response and planning efforts in the event of an oil spill or release of another hazardous substance under the aegis of a National Contingency Plan (NPC) or an Area Contingency Plan (ACP). An Area Contingency Plan must provide for efficient, coordinated, and effective action to minimize damage from oil and hazardous substance discharges. In so doing, an ACP assigns duties and responsibilities to various federal and state agencies, provides for maintenance of necessary equipment and supplies, and establishes Coast Guard strike teams with specialized training in oil and hazardous substance control. In addition, an ACP is designed to provide for surveillance and notification systems to detect oil spills as early as possible. Further, an Area Contingency Plan is to provide for a specific fish and wildlife response plan, developed with the advice of expert agencies, to minimize disruptions to fish and wildlife and their habitat. Regional and Area Contingency Plans can be located at the U.S. National Response Team website (www.nrt.org) and the USCG website: (http://www.uscg.mil/vrp/acp/acp.shtml).

Figure 1: Incident Command Structure for Oil Spill Response (NRT 2004)



Once the FOSC activates the Wildlife Branch, several components of oiled wildlife response can be initiated, including reconnaissance to determine species and areas to focus operations, hazing of animals to prevent oiling, search and collection for live and dead animals in the spill area, treatment and rehabilitation of oiled animals, and release and monitoring of recovered animals. The agencies, organizations, and individuals responsible for these functions should be outlined in the Area Contingency Plan. An example of Wildlife Branch organization is shown in Figure 2.

Figure 2: Wildlife Branch Organization (State of California, Wildlife Response Plan, 2004)



Under the direction of the Wildlife Branch Director (WBD), the principal objectives of Wildlife Operations during spill response and cleanup are to:

- Provide the best achievable care to impacted and/or threatened wildlife
- Document for the Unified Command the immediate impacts of the oil spill to wildlife
- Minimize injuries to wildlife
- Protect wildlife and habitats from adverse effects of wildlife recovery

To ensure these objectives are achieved with maximum efficiency, the WBD (in coordination with the Environmental Unit) manages the activities of the federal, state, and local agencies along with commercial and non-profit organizations responsible for wildlife protection and management who fall under the authority of the Unified Command during spill response

Stranding Network and Facility Requirements

Wildlife Operation plans should include (where available and appropriate) properly trained regional Stranding Network Participants because of their experience with live animal stranding response and rehabilitation for the local area. In order for Stranding Network Participants to contribute during wildlife response, they must hold a Stranding Agreement or Letter of Authorization (MMPA, Section 112(c)) with NMFS/FWS and have received specific oil spill training and meet facility requirements for oiled marine mammal rehabilitation. NOAA Fisheries, Office of Protected Resources, may include oil spill response authorization in the Stranding Agreement with the Participant when it is determined that the Stranding Network Participant meets these criteria. Authorized marine mammal rehabilitation organizations should make efforts to become engaged in the development of their Area Contingency Plans to ensure their involvement during oil spill response.

Criteria for Evaluating Marine Mammal Rehabilitation Groups

The following criteria can be used when considering and evaluating marine mammal rehabilitators for conducting oil spill response.

- Holds all necessary permits, Stranding Agreements (NMFS) and Letter of Authorizations (FWS) for marine mammal stranding and response activities.
- Experience in the capture, treatment, and care of oiled marine mammals
- Knowledge of conducting marine mammal response activities within an Incident Command System structure including appropriate communication and notification procedures
- Sufficiently trained (health/safety and animal care), equipped, and experienced supervisory staff
- Ability to train and equip personnel and volunteers for marine mammal response during an emergency oil spill response
- Ability to quickly mobilize to perform marine mammal capture, field evaluation, stabilization and transport (including to remote locations if necessary)
- Access to appropriate facilities for treating and housing oiled marine mammals (including adequate animal care, hazardous waste, and personnel infrastructure)
    - Ability to establish and operate marine mammal intake, holding, and isolation areas within 12-24 hours of wildlife response activation.

  - Ability to establish and operate marine mammal cleaning and pre-release areas within 72 hours of wildlife response activation.

- Agreement with a licensed veterinarian experienced in the treatment of oiled marine mammals to provide necessary medical care

- Use of best practices as outlined in the remainder of this document

Facility Requirements for Marine Mammal Oil Spill Rehabilitation

General Considerations

The size of the spill, its location, and the number and species of animals oiled will help determine the type and location of a facility that can meet the required need. Not all spill responses will be in the vicinity of a permanent rehabilitation facility. Temporary facilities that can care for oiled marine mammals in the short or long-term can be established in local, fixed structures, or mobile units can be brought to a spill location to set up as a temporary facility. However, it is critical that spill responders and pre-spill planners recognize the degree of effort, the unique requirements of oiled wildlife care and the complexity required to implement and establish an adequate facility. Pre-spill planning is strongly encouraged to achieve wildlife response systems that will adequately address the needs of small as well as large rescue efforts as rapidly as possible during a spill.

There are published standards for the design of facilities housing marine mammals in captivity. In the United States, these standards are published by the Department of Agriculture, Animal and Plant Health Inspection Service (APHIS, www.aphis.usda.gov/ac/cfr/9cfr3.html) and are a requirement for facilities that wish to display animals to the public. They include such items as haul-out requirements, pool size and depth, water quality, number of animals to be kept in a particular environment, and strict standards for food preparation areas and medications. The USDA standards are useful guidelines but may not be appropriate for animals that require constant medical attention and handling, or for facilities that only keep animals for a short period of time. NMFS is in the process of developing specific marine mammal rehabilitation facility guidelines (NMFS/FWS Best Practices for Marine Mammal Stranding Response, Rehabilitation, and Release: Pinniped and Cetacean Rehabilitation Facility Guidelines).

Facility design for rehabilitation centers is an ongoing area of study and no perfect facilities exist to suit all needs for each species and age class of marine mammal. Notwithstanding, certain principles should be kept in mind when designing an oil spill response facility or when attempting to house oiled marine mammals in an existing facility (Davis and Davis, 1995). An ideal facility should include: intake/physical exam/evidence processing area; a veterinary hospital with isolation capabilities; indoor wildlife housing/caging areas; food storage and preparation facilities; animal washing and rinsing areas; drying areas; outdoor pool and pen areas; pathology facilities; volunteer training and eating areas (with restrooms); administrative offices with multiple phone/fax lines and conference space; storage; and access to a large parking area.

Minimizing stressors is an important aspect of creating a good rehabilitation environment. Specific animal needs must be taken into account when trying to provide adequate housing for animals during an oil spill. These needs may be affected by such factors as the animal's species, age, physical condition, degree of oiling, and nature of the product with which it was oiled.

Housing Requirements and Considerations

Indoor and outdoor housing should maximize safety to humans and the animals, provide an escape-proof enclosure, and minimize visual stress and human traffic. Within an oil spill response facility, housing should be set up so that there are appropriate areas for holding animals prior to intake, pre-wash assessment and stabilization, post-wash, quarantine, and longer term housing. These areas will differ in the amount of access to the animals that is required, the space that each animal requires, the degree to which the environmental temperature can be controlled, and type (if any) of water requirements (fresh versus salt). Ideally, all of these areas should have separate filtration systems. Separate systems are required for pre- and post-wash animals to prevent oil contamination of animals that have already been washed.

Environmental Control: A finer degree of environmental temperature control is required for newly admitted animals, neonates, and animals that are more compromised due to poor nutritional state, greater extent of secondary effects, or underlying disease. Animals that are compromised require easy or limited access to water, haul-out areas, and heat sources such as heating pads and lamps, but may need frequent observation to ensure that severely debilitated animals are able to move away from heat sources to prevent hyperthermia and burns. Some animals may require more frequent handling for monitoring, sample collection, feeding or medicating. Housing should minimize stress but maximize accessibility and ease of monitoring (Tuomi et al., 1995)

Ventilation: Adequate ventilation is an extremely important factor for maintaining marine mammals in captivity and is more important in oil spill situations to protect against the toxic effects of volatile agents and prevent the spread of infectious agents between animals. Ten to fifteen air changes per hour has been recommended as adequate for inside animal holding (NIH, 1985) and these standards should be adhered to if at all possible. Outdoor housing is ideal for maintaining ventilation but drawbacks include lack of environmental control, discomfort for personnel working with the animals, and more challenging access control by staff.

Quarantine: The potential for the spread of disease is an important issue to consider for marine mammals in captivity. Captured animals, staff and volunteers may carry infectious agents without showing signs of disease and could pose a threat to oiled animals. Staff should use effective quarantine protocols including foot baths containing appropriate antimicrobial solutions between housing areas, cleaning/disinfecting or changing protective clothing between animals, designating separate feeding and cleaning equipment for different areas, and minimizing movement of animals and personnel between areas. Extra care must be taken in areas where animals with infectious diseases are kept and when handling immunocompromised animals.

Water Supply: Oiled wildlife care facilities require large quantities of water to provide all areas simultaneously (e.g., wash/rinse area, pool area, laundry). The quantity should be sufficient to provide at a minimum a continuous flow of 4 gallons/minute to all indoor valves and additional supply to fill, operate filtration and ozonation equipment, and provide overflows for pools. Washing and rinsing areas require temperature-controlled hot water (98-108°F) with water hardness of 2-5 grains per gallon at pressure of 40-60 psi.

Waste Water: Facilities must dispose of all oil and animal wastewater in accordance with appropriate Federal, State, and municipal regulations. Oil contaminated water often must be contained in separate holding tanks and not released in normal sewer system.

Data Collection

Data Collection and Chain-of-Custody Procedures

Systematic search and recovery, transportation, processing, and treatment of all oil-affected wildlife are critical for guiding response actions and gaining an understanding of the short-term and long-term consequences of oil spills to wildlife populations. In addition, these data can be used after the emergency response for natural resource damage assessment activities. In order to track the samples and collect data during oiled wildlife response, the trustee agencies and response organizations must adhere to pre-established chain-of-custody and animal identification procedures. For tracking purposes, data on oiled animals are compiled on standard data log forms (Appendix 2-3). During large-scale responses, pre-identified wildlife agency personnel or their agents will complete log forms; however, field and rehabilitation responders should be familiar with the forms and their completion for smaller-scale responses and for individual oiled animals that present to participating facilities independent of a spill response. In addition to the tracking of live animal data, all samples (carcasses, samples, photos, records) that may be used in legal cases must be tracked and secured at all times.

Quality assurance (QA) procedures are necessary to ensure that data are collected in a scientifically valid manner. It is important throughout any sampling and analysis program to maintain integrity of the sample from the time of collection, through the point of data reporting, to the final sample disposition. Proper chain-of-custody procedures allow the possession and handling of samples traced from collection to final disposition. Documents needed to maintain proper chain-of-custody include:

Field Logbook: All pertinent information on field activities and sampling efforts should be recorded in a field logbook. The logbook should enable someone else to completely reconstruct the field activity without relying on the memory of the field crew. All entries should be made in indelible ink (preferably ballpoint), with each page signed and dated by the author, and a line drawn through the remainder of any page. All corrections should consist of permanent line-out deletions that are initialed. An example of a Search Effort Log is presented in Appendix 1. For tracking and chain-of-custody purposes, all live and dead animals recovered should be identified (tagged/marked) in the field and the identification noted on the Search Effort Log. Permanent tags will then be applied and logged at the processing facility.

Animal Logs: At admittance to a wildlife care and processing facility, the animal must be logged into the Live Marine Mammal Data Log or Dead Marine Mammal Data Log (Appendix 2-3) and all of the boxes on these forms must be completed. All animals collected dead or alive should be given a unique log number and identifier (e.g. tag), as well as a Level A data field number, in order to track the individual animals through the capture/collection, processing, and for live animals the rehabilitation and release process.

Sample Collection and Label: It is necessary to collect an oil sample from each individual animal. A detailed protocol for the collection of evidence is provided in Appendix 6. Each sample must be identified with a waterproof label that is securely attached to the outside of each sample container. Labels must contain the oil spill name, date, species, intake log number and Level A data field number of that animal, animal capture location, and flipper tag color and number and then sealed with evidence tape or custody seals. Custody seals are used to detect unauthorized tampering with the samples. Samples and photo must be properly stored in a secure location that has limited and controlled access.

Intake Form: For live animals, the Oiled Marine Mammal Intake Form (Appendix 4) must be completed for each animal. This form contains important questions about the extent of oiling, location and depth of oiling, as well as a place for documenting physical examination findings. For evidence documentation, a photo of the animal and oil sample must be taken during intake and admission into the wildlife care and processing centers (see Intake and Admission Procedures). During rehabilitation, each animal must have individual records documenting the treatment and care of that animal. Authorization for cleaning and later release must be documented on the Oiled Marine Mammal Intake Form and signed by the authorizing authority (i.e. attending veterinarian). For resource damage assessment purposes, a photo of the animal with identification (i.e. card with animal log number and date) must be taken prior to release.

Chain-of-Custody Forms: A chain-of-custody record must accompany every sample that is removed from the secured location in the wildlife processing and care facilities. The chain-of-custody form should be supplied by the managing agency (NMFS, USFWS) representative that is acquiring the sample. Both the person relinquishing custody of the sample(s) and the person receiving the sample(s) must sign the form and ensure that the samples and records are not left unattended unless secured properly. An example chain of custody form can be found in Appendix 10.

Tissue Sampling: Tissue samples are collected for either chemical or histological analysis. Only after authority is given by the appropriate trustee agency and the Unified Command can necropsies be performed by qualified veterinarians and pathologists to collect tissue samples and determine cause of death on collected carcasses and mortalities that occurred during rehabilitation. Each animal should be photographed prior to sampling and samples collected following the sample collection protocols described in Appendix 6.

Safety and Human Health

Worker health and safety are of primary importance in any oiled marine mammal rescue and rehabilitation effort. The earliest phases of an oil spill are generally the most hazardous to human health and safety. Thus, safe practices during field collection of marine mammals must be a priority. Rescue programs should not be initiated unless personnel can conduct activities safely.

As with all spill response activities, the marine mammal rescue and rehabilitation effort needs to be coordinated and monitored by the spill response command center operations, safety, and medical staffs. A written Site Safety Plan (SSP) must be developed and approved by the spill's Safety Officer for the rehabilitation facility. If field activities are on-going for marine mammal response, the site safety plan needs to be expanded to include these activities including any specialized equipment that will be used. All staff and volunteers working on the spill must be familiar with and sign the SSP prior to work.

Training for Marine Mammal Rescue/Rehabilitation Personnel

In addition to mastering specific marine mammal rescue and rehabilitation tasks, personnel must be trained to recognize and minimize risk of injuries from oil-related and physical hazards associated with oil spill response operations prior to being allowed to participate in on-site activities. Elements of required and recommended training will vary depending on the tasks of the individuals involved in the response. Training-hour requirements and specific courses vary with level of involvement, agency policy, and OSHA and state regulations.

Required Training

Personnel involved in oil spill response activities must comply with all applicable worker health and safety laws and regulations. The primary Federal regulations are the Occupational Safety and Health Administration (OSHA) standards for Hazardous Waste Operations and Emergency Response (HAZWOPER) published by the U.S. Department of Labor in Title 29 of the Code of Federal Regulations (CFR), section 1910.120 (www.osha.gov). Oiled marine mammal responders and rehabilitation centers are not specifically addressed by HAZWOPER and training to address risks associated with marine mammal stranding and oil spill response personnel may fall within the scope and application of the Hazard Communication Standard ("HAZCOM", 29 CFR 1910.1200(h)). The OSHA field compliance or Safety Officer should be contacted to ascertain the worker training requirements and develop an implementation plan to minimize the hazards of exposure to workers involved in cleanup operations. For maximum protection of the environment, OSHA has recognized the need to quickly clean-up spilled oil and has empowered the OSHA Regional Response Team representative to reduce the training requirements for responders engaged in post-emergency response operations as directed by OSHA Instructions CPL 2-2.51 (www.osha.gov). State requirements which are more restrictive will preempt Federal requirements. Marine mammal stranding network participants are responsible for training and certifying their employees and volunteers.

Recommended Training

In addition to the training required by Federal regulations, further training is highly recommended for safe and efficient operations during a spill response. This guidance is considered a minimum

essential training for marine mammal rehabilitators in accordance with the goal of establishing best practices.

Search and collection and transport personnel

- General oil spill response training
- HAZWOPER 24hr training
- Aircraft/boating/ all-terrain vehicle safety
- First aid/CPR
- Local geographical knowledge
- Marine mammal identification and capture techniques

Rehabilitation Facility Management

- Marine mammal oil spill response training
- Incident Command System
- HAZWOPER 24hr training
- Crisis management
- First aid / CPR
- Media relations

Rehabilitation/Stranding Network Facility Workers and Volunteers (Live and Dead Animal Handling)

- General oiled marine mammal training
- HAZCOM - Hazardous Communication training
- First aid / CPR

Personal Protective Equipment

Personal protective equipment (PPE) must be used to protect wildlife response personnel from exposure to hazardous substances and dangers associated with animal care activities. To guard against injury from marine mammals, all workers should wear approved personal protective equipment appropriate to their task.

Recommended PPE

Full eye protection, i.e., goggles, safety glasses, or face shield
Oil resistant rain gear or oil protective clothing (coated Tyvek, Saranex, etc.)
Gloves (neoprene or nitrile) that are oil resistant and waterproof
Non-skid shoes/boots that are oil resistant and waterproof
Ear protection (muff or ear plug type) when using pyrotechnic devices or operating machinery
Personal flotation device when working on or near water

Respiratory protection from organic vapor hazards may also be required for some operations. If respirators are used, training and fit testing are required. All workers must be trained on the proper use and limitations of all personal protective equipment prior to using the equipment.

Hazardous Substances

Rescue and rehabilitation workers may be exposed to spilled oil, and must be so informed. Prior to handling a contaminated marine mammal, the Material Safety Data Sheet (MSDS) for the

spilled material should be reviewed and all recommended precautions followed. Workers and the rehabilitation facility shall be periodically monitored, using calibrated instruments and devices to determine exposure. Ventilation in all work areas should prevent the buildup of airborne contaminants.

A portion of the rehabilitation facility should be designated for the storage of contaminated clothing, equipment, and medical waste until the items can be decontaminated or disposed of properly in accordance with the site safety plan.

Volunteers

Wildlife response programs regularly use volunteers, particularly at the rehabilitation facility. Wildlife response managers need to ensure that volunteers are appropriately trained, supervised, and informed of all hazards. A comprehensive volunteer management program is an essential component of an efficient wildlife response. This management program needs to address, at a minimum, volunteer safety, training, supervision, scheduling, and liability.

Wildlife Recovery and Transportation

Agency Oversight

Wildlife Recovery and Transportation involves the collection/capture of dead and live oiled wildlife and their transport to processing centers. Under the proposed ICS Wildlife Operation structure presented in Figure 2, these activities are performed by the Wildlife Recovery and Transportation Group, in close coordination with the UC and the state and federal trustee agencies. Marine mammal collection by any agency or organization must be done under the direction of the UC and under the agreements/permits from the appropriate management agencies (i.e., NMFS, FWS). Recovery and Transportation usually include personnel from state and federal trustee agencies, approved contractors, and marine mammal stranding network and rehabilitation organizations. Trained, qualified volunteers can be used utilized as long as OSHA and other training requirements are met and adhered to.

Search and Collection Guidelines

Rescue Team: Teamwork is essential to safe, efficient collection of oiled marine mammals. Each team should consist of at least two people, and should be outfitted with the resources and equipment necessary to complete its assignment. A plan of action should be developed and discussed among all search and collection personnel and approved by the Wildlife Branch Director prior to entering the search area. Each capture site should be evaluated and strategies developed to suit the terrain and species involved. Capture of affected animals should not be attempted if adverse weather, sea conditions, cliffs, or other physical and chemical hazards in the "hot zone" are present. Communication between the Rescue and Transportation Group and the reconnaissance personnel (within the Operation Section or the Environmental Unit) is important to maximize the success of search effort.

Equipment: Prior to a response, ensure that all equipment is ready and in working condition. Capture materials should include communication equipment (portable phone or radio), specialized vehicles (4-wheel drive with lifting tailgate or crane, adequate floor space, easily cleaned, and good ventilation), boats (capture vessel and support vessel), aircraft (fixed wing or helicopter), SCUBA gear, nets (type varies by species and location of capture), cages and transport boxes (type varies by species), herding boards, personal protection equipment (PPE) and a first aid kit for humans. Any injuries to staff or volunteers should be treated immediately and reported to the site safety officer. In addition to PPE required by the Safety Officer to protect personnel from oil exposure, appropriate attire for capture teams includes closed-toed shoes or boots, long-sleeve shirts, long pants, rain gear, coveralls, and organizational identification (e.g., clothing labeled with insignia or logo).

Procedures: Record the details of the beach search effort on the appropriate Form (Search Effort Log, Appendix 1) and include data on the start and end of a search segment, observations of oiled animals, and detailed info on the stranding and/or collection (location of capture, GPS decimal degree coordinates, reason for capture). If oil or medical samples are collected from the animal prior to reaching the intake facility, make sure they are labeled properly with a unique field

identification number for each animal. For further details on oil sample collection consult Appendix 6, Evidence Collection Protocol.

Domestic animals should not be permitted near the capture location nor should they come into contact with marine mammals. Domestic animals should not be allowed in the transport vehicle, and if the vehicle has previously been used to transport domestic animals, it should be disinfected and cleaned prior to transporting marine mammals.

Capture: The potential benefits of capture must outweigh potential negative consequences. In general, no rescue should be initiated on free-swimming or beached pinnipeds in the vicinity of an oil spill unless the animal in question is in obvious distress. Also, no rescue should ever be initiated on free-swimming cetaceans in the vicinity of an oil spill, but a rescue should be attempted on a beached cetacean. A decision to capture should consider such factors as sex, age, reproductive state, and size of individual animal, and their location with respect to other marine mammals. Additionally, all captures must be approved by the appropriate trustee agency (NMFS, FWS) prior to initiation.

Capture and transportation of oiled mammals should be performed only by qualified personnel who have received the appropriate safety training as well as marine mammal handling and restraint training. Because recovery and transportation duties vary with each response and may involve more risk than other duties, the Safety Officer will communicate to the Wildlife Branch Director what level of training is appropriate for field response personnel; this training may include a 24-hour HAZWOPER training (Hazardous Waste Operations and Emergency Response), first aid/CPR, water safety, or boat safety courses (see Safety and Human Health).

The method of capture may vary according to species and situation. Captures should generally be considered for isolated individuals on beaches, spits, tide flats or other relatively flat surfaces, using herding boards and nets (brail, breakaway or steel frame pole). Less often, captures may be attempted from rock jetties, piers, docks or even in the water for severely debilitated animals. Long-handled dip nets, floating bag nets, and a net gun have all been used with some success. Depending on the species involved, aquatic captures may use tangle nets, float nets, or Wilson traps.

Unless specifically authorized by appropriate trustee agencies, no non-oiled animals will be collected during spill incidents. Preemptive captures to prevent the oiling of sensitive species may be considered only under dire circumstances at the direction of the UC and trustee agencies and when adequate transport and holding facilities exist. Beached cetaceans should not be pushed back out to sea without first being examined by a NMFS-approved marine mammal veterinarian and the action approved by the NMFS. Prior to being returned to the open ocean, cetaceans should be affixed with a NMFS approved tag or brand.

All wildlife captured during spill responses should if at all possible be retrieved and transported to the wildlife processing and care center(s), regardless of the status and condition (i.e. degree of decomposition, degree of oiling). In addition, all capture-related information (i.e. location, name of captor, GPS decimal degree coordinates, date, and time) must accompany the animal to the facility. The presence of such documentation must be verified when processing centers receive wildlife from the Wildlife Recovery and Transportation Group. All information necessary to

complete either the live or dead mammal log should be collected prior to the animal entering the rehabilitation process or storage respectively.

Transport Procedures

Prior to transport, field stabilization techniques may be used if it will be more than one or two hours until the animal reaches the rehabilitation facility. These techniques may involve assessing the animal for hypo- or hyperthermia and treating accordingly; administering oral electrolyte solution and subcutaneous fluids; removing large amounts of oil from the eyes and nares; and administering emergency medications (under the guidance of a veterinarian).

After capture and field stabilization, the oiled animal should be placed in a well-ventilated area on a stretcher or foam (for small cetaceans) or in a transport box, airline kennel, or cage (depending on pinniped species) for transport. Animals should be staged in a quiet, sheltered area or moved directly into the transport vehicle. The cage should be large enough to allow the animal to lie down in a comfortable position. Only one animal per transport cage is recommended for the safety of the animals and to prevent cross-contamination of oil. Females and their pups are most safely transported in separate cages, although they should be positioned so that they can hear, see, and smell each other. Pinnipeds less than 70 kg (145 lbs) can be transported in large airline sky kennels. Aluminum or other lightweight material is recommended to minimize weight of cages designed for larger animals. Each cage must be firmly tied or otherwise secured in the vehicle.

Sea otter transport kennels should be fitted with a raised bottom grate to avoid additional fur fouling. Shaved ice or any other form of fresh water ice (to combat dehydration) and chew toys (to combat tooth damage, e.g. plastic/rubber dental chews manufactured for large breed dogs) are usually provided for sea otters in transport kennels, but food should be offered if transport time is greater than four or five hours.

Animals must be monitored periodically on transports greater than one hour, as directed by a response veterinarian. In most cases, sedation during transport is not recommended. Critical cases (e.g., unstable, hypo- or hyperthermic animals) may require more frequent monitoring. Personnel transporting animals between the field and the rehabilitation center must maintain contact with their supervisor at all times so that departure and arrival times may be anticipated.

Hyperthermic animals may be sprayed gently with water, or ice cubes may be added to the top of the cage and allowed to drip onto the animal as it melts. In order to prevent inhalation and subsequent drowning by unconscious animals, do not allow water to accumulate in the bottom of transport cages. Hypothermic animals should be placed in a sheltered location out of the wind, although good ventilation must be maintained to prevent animals and humans from inhaling petroleum fumes. Keep in mind that oiled, stressed, or injured seals are not able to regulate their body temperature effectively, and their conditions can change within minutes. Animals are generally transported in either a pick-up truck or an enclosed van-type vehicle. Adequate ventilation must be maintained to protect both humans and animals from inhaling fumes emitted by freshly oiled animals. Unless hypothermia is observed or suspected, keep animals damp and cool. The preferred air temperature for pinniped transport is 50-68°F (10-20°C) but should not exceed 59°F (15°C) for sea otters (Geraci and Lounsbury, 1993; Benz and Britton, 1995). Fur seals or sea otters whose coats are oiled or saturated, neonates of all species, and animals with extensive wounds or severe emaciation may require higher temperatures compared to minimally oiled animals or non-oiled, stranded animals. Keep in mind that human comfort during transport

may not be synonymous with or sufficient for the temperature and ventilation needs of the transported marine mammals.

Beached Carcass Removal

Measures must be taken to ensure that dead animals are appropriately collected, identified, documented, and not disposed of until approved by the trustees. In addition, the prompt removal of disabled and dead oiled and unoiled animals from the environment can be critical to minimize the occurrence of secondary oiling, poisoning of predators and scavengers, and decreasing re-identification of carcasses on subsequent days. Since it is not feasible, reliable, or practical to attempt to discriminate between spill-related and non-spill-related casualties while conducting beach surveys, all carcasses must be collected. For example, scavenged carcasses, animals with dark plumage, wet carcasses, or carcasses with oil sheen or small amounts of oil that may be spill related are not always identifiable in the field as such. Because all carcasses found within a spill area are evidence, they must be handled according to established chain of custody protocols in accordance with spill incident-specific instructions (refer to the Data Collection section of this document). Each carcass must be labeled with the date, time, location, species (if known), and collector's name; taken to a designated morgue location; logged into the Dead Marine Mammal Log form and placed in a refrigerated unit until further processing can be accomplished. If a necropsy cannot be performed within 24hrs the carcass should be frozen (see Disposition Section for necropsy details).

Carcass removal, storage, and disposal expenses are considered a response activity cost that should be reimbursed to the Stranding Network Participant. It is the responsibility of the Participant to notify the Unified Command of current and future carcass storage and disposal expenses during the initial cost assessment of the response activity.

Intake Procedures

Initial Intake Procedures

While completing intake procedures, it is important to perform a thorough evaluation, collect all samples and data, be safe, and minimize the animal handling time. All personnel performing intake procedures should wear appropriate PPE including safety goggles, protective clothing, and nitrile gloves (or nitrile gloves inside leather gloves). It is best to work in teams of at least two (handler, examiner) or three (handler, examiner, recorder) in order to perform the intake in an efficient manner. For larger animals, more than one handler may be required. Physical restraint devices such as squeeze cages, otter restraint boxes, and stuff bags may be needed for larger pinnipeds and sea otters (Geraci and Lounsbury, 1993; Williams and Sawyer, 1995). Some animals (e.g., sea otters, adult sea lions) may require chemical restraint for safe handling and examination (Williams and Sawyer, 1995; Haulena and Heath, 2001).

Several different forms must be completed for every animal captured for rehabilitation during an oil spill. The animal must first be logged into a **Live Marine Mammal Data Log** (example in Appendix 2) and all of the boxes on that form must be completed**.** In addition, an **Oiled Marine Mammal Intake Form** (example in Appendix 4) must be completed for each animal. This form contains important questions about the extent of oiling, location and depth of oiling, as well as a place for documenting physical examination findings. In addition to the intake form, the rehabilitation facility's standard forms for stranded marine mammals can be used to record physical exam findings, laboratory values, treatments, and feedings, provided that all information is clearly documented and assigned to the specific animal.

A brief physical examination is performed upon admission of each individual oiled animal (see below). A veterinarian or animal care specialist should conduct the examination and treat any conditions that are considered to be life threatening. The capture, transport, and intake process is extremely stressful and an oiled animal's condition may be very unstable. The intake area should be as dark and quiet as is practical and animals must be monitored closely during the examination and intake process. If an animal's condition deteriorates and a veterinarian is not participating in the examination, seek veterinary advice immediately.

General Intake Procedure for Oiled Marine Mammals

1. Obtain and Complete Intake Forms
    - Live Mammal Data Log
    - Oiled Marine Mammal Intake Form
2. Physical Examination
3. Flipper tag application
4. Oil sample collection
5. Photograph

Animals need to be identified to species and, when possible, age class (pup, yearling, subadult, adult) and sex should be determined. Consult charts on age estimation for pinnipeds and sea

otters from marine mammal guides such as Geraci and Lounsbury (1993), Reeves et al., (1992) and Ainley et al., (1980) for species and sex identification. All animals should be tagged or marked for individual identification. This can be done with plastic livestock ear tags (e.g., Rototag, Temptag), by applying hair dye, colored livestock markers, and bleach marks to the pelage, or by clipping a small patch of pelage on the flank in a recognizable pattern (phocids and sea lions only). Dye marking and clipping is not advisable for fur seals or sea otters and may be difficult in other species depending on the location and extent of oiling. Sea otters and possibly other species may be identified using a commercially available pet microchip inserted subcutaneously at the inguinal region.

For legal purposes, it is necessary to collect an oil sample from each individual animal. A detailed protocol for the collection of evidence is provided in Appendix 6. Briefly, visible oil should be scraped from the fur with a clean wooden spatula and placed into a chemically cleaned glass jar. For animals with no visible gross oiling, an affected area is rubbed with a 4x4 piece of fiberglass cloth or cotton gauze with forceps or hemostats that have been cleaned with isopropyl alcohol. Precautions must be taken to collect the sample without allowing nitrile gloves to touch the oil sample or the cloth it is collected on. The oil sample should be placed in a glass container and labeled appropriately with the following information: the oil spill name, date, species, intake log number of that animal, animal capture location, and flipper tag color and number and then sealed with evidence tape and placed in secure freezer. Sampling supplies (glass jars and cloth) can be obtained through the trustee agencies.

It is also necessary to take a Polaroid photograph of the oiled animal. The photograph should include the entire animal, the oiled region, and if possible, show the flipper tag numbers. After the photograph develops, it should be labeled with the same information as the oil sample; the oil spill name, date, species, intake log number of that animal, animal capture location, and flipper tag color and number. The photograph and oil sample are both pieces of evidence and should be securely stored. If samples are to be sent for analysis, a completed Chain of Custody form is required and will be provided by the lead trustee agency.

Physical Examination

Animals are to be weighed and measured (standard length and axillary girth, xiphoid girth in sea otters) and their temperature measured with an electronic thermometer with a flexible thermister probe (e.g., Physitemp Model BAT-12 Digital Laboratory Thermometer) inserted 15 cm into the rectum. Standard thermometers can be used in sea otters, but do not accurately measure core temperatures in pinnipeds. Normal core temperature for sea otters is 99.5-100.6 °F (37.5-38.1 °C) and most pinnipeds range from 98-102 °F (Dierauf and Gulland, 2001). If the use of a thermometer is not possible, feel the flippers (e.g., icy cold or dry and hot) and observe the animal's behavior (e.g., shivering, agitation) in order to evaluate abnormally high or low body temperature. If an animal is dry and alert/active prior to the exam, assume it will overheat with handling.

A complete whole body examination should be conducted, making note of the degree and nature of oil contamination. Assess behavior, activity level and alertness; if possible, observe the animal in the transport cage prior to handling to evaluate locomotion and central nervous system status. Evaluate overall body condition and estimate the percent dehydration. Most stranded animals are at least slightly dehydrated (<5%, demonstrated by decreased tear production and subdued behavior). More severely dehydrated animals (5-10%, demonstrated by lack of tear production,

thick ocular mucus, "sunken" or crusty eyes, dry mucous membranes, skin tenting in otariids, curling of the vibrissae in harbor seals, and lethargic or depressed behavior) may need to be treated with fluids prior to continuing the examination and intake procedures; however, it is preferable to obtain blood samples prior to hydration treatments.

Due to the risk of being bitten, a thorough oral exam is possible only in anesthetized, dead, comatose, and young animals, but a visual inspection of the oral cavity is often possible during vocalization in alert animals. Palpate the neck and thorax for evidence of subcutaneous emphysema and the musculoskeletal system for fractures, wounds, or swellings. Subcutaneous emphysema is often found in the neck and axillary area in oiled sea otters and is an indicator of severe pulmonary damage. Palpate the abdomen gently to detect masses, pregnancy, or fluid accumulation and observe the urogenital area for urine, feces, or abnormal discharges.

Routine Blood Sampling

Following the general examination, blood samples should be drawn for hematology (collected in an EDTA anticoagulant, lavender-top tube, LTT) and chemistry panels (collected in a serum separator tube, SST, or red-top tube, RTT) and serum banking. In phocids, blood is generally drawn from the epidural sinus or ventral (plantar) interdigital veins (at the apex of the web between the inner digits) of the hind flippers (e.g., harbor seals, elephant seals). In otariids, the caudal gluteal vein and plantar network (dorsal or ventral surface of the hind flipper just medial to the lateral digit or just lateral to the medial digit) are used for blood collection (sea lions and fur seals). In sea otters, blood may be drawn from the popliteal (saphenous) or femoral vein on a non-anesthetized animal using a restraint box and/or stuff bag. Alternatively, the jugular vein can be used on an anesthetized otariid or sea otter.

Blood samples should be collected at least three times during the rehabilitation process: on admission/intake, immediately prior to washing, and prior to release. Repeat sampling may not be necessary for wash or release procedures, if preformed within 48hrs of previous blood sampling or at the discretion of the response veterinarian. At these times, baseline blood work should include a complete blood count and standard serum chemistry tests. Normal blood values for marine mammal species can be found in Bossart et al. (2001).

Standard Blood Tests

Complete Blood Cell counts (CBC): White cell blood count, red cell blood count, hemoglobin, hematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), mean corpuscular hemoglobin (MCH), a differential cell count, platelet and reticulocyte counts. One full lavender-top tube (EDTA) (1 or 3 ml) should be taken and refrigerated until analysis.

Chemistry Profile: Albumin, alkaline phosphatase, bicarbonate, bilirubin (total and direct), BUN, calcium, chloride, cholesterol, CK, creatinine, globulin, glucose, phosphorus, potassium, total protein, sodium, AST (SGOT), ALT (SGPT), GGT, and ratios of albumin:globulin, BUN:creatinine, and sodium:potassium. Blood should be placed in a serum separator tube or red top tube, allowed to clot, centrifuged, and refrigerated prior to analysis. Excess serum should be saved and banked (frozen) at the rehabilitation facility.

Special Biomedical Sampling Protocols

At times, additional protocols may be used that require additional blood samples for other tests (e.g., PAH estimation, immune function assays, serum protein electrophoresis, plasma chemistries, serological tests for infectious diseases). Other biomedical samples (e.g., urine sample, fecal sample, microbiological swab, blubber biopsy) may also be collected at the discretion of the response veterinarian.

Post-examination Intake Procedures

Initial Treatment

- Fluid therapy: oral, subcutaneous, intravenous
- Activated charcoal (ToxiBan) tubing if oil ingestion suspected

All animals are assumed to be at least 5% dehydrated. Administer isotonic fluids to animals that appear to have not ingested oil orally at a rate of 10-20 ml/kg once either orally (e.g., Pedialyte) or subcutaneously (lactated Ringer's solution, LRS). If the animal is alert and is likely to have ingested oil (e.g., fur seals during grooming, neonates during nursing), administer activated charcoal slurry (ToxiBan, 6 ml/kg) orally.

Animals that are chemically immobilized for intake procedures or are weak and obtunded should not be given oral fluids. Subcutaneous fluids (e.g., lactated Ringer's solution), may be administered instead at 20-40 ml/kg. If ingestion of oil is suspected, ToxiBan slurry (6ml/kg) can be administered via a stomach tube just prior to anesthetic reversal (Williams and Sawyer, 1995). Extreme care must be taken to prevent gastric reflux and aspiration during this procedure. The risks associated with passing a stomach tube must be weighed against the risks associated with continued exposure to ingested petroleum.

Severely depressed animals may require intravenous fluid administration and other medication in addition to isotonic fluids. Additional fluid therapy (maintenance fluids plus correction of fluid deficits) should be determined by the attending veterinarian, based on an evaluation of blood work, concurrent fluid losses, and continuing assessment of the animal's condition. The fluid deficit is calculated by multiplying an animal's mass in kg x 1000 ml fluid/kg x the percent dehydration (e.g., 5% = .05). This should be added to the animal's daily maintenance fluid requirement (at least 40 ml/kg/day) and administered within the first 24 hr if possible.

Monitoring

Animals should be regularly monitored during the rehabilitation process. Clinical observations, feeding observations (food consumption and/or preferences), and behavior should be written on the medical records. Body weight should also be monitored repeatedly during rehabilitation and recorded, at a minimum, upon admission, pre-washing, and prior to release. More extensive body weight monitoring may be required in critical cases. Physical examinations should be performed upon admission, prior to washing, and prior to release with all information recorded on individual medical records. Whenever medications are administered, the name of the drug, dose and route (oral, SQ, IM, IV) should be recorded as well as the initials of the person who administered the medication. Medical records are viewed as potential evidence by the law and should be carefully and completely filled out by animal caretakers.

Animal Washing and Continued Care

General Topics Associated With Cleaning

The facility where oiled animals will be cleaned should be designed to accommodate the variety of species that might be cared for at that facility. Each wash station must have adequate space for the animals, animal handlers, and restraint equipment that might be necessary. Water hardness should be tested before washing animals and adjusted to 3-5 grains of hardness (Clumpner, 1991). Dawn dishwashing liquid is the preferred washing product and has been shown to be safe and effective for removing oil from the coats of sea otters and harbor seals (Rash et al., 1990). Wastewater storage, containment, and removal must meet the requirements of the municipality, city, and county. A minimum team of two or three persons usually wash animals. Fur seals and sea otters may require teams of four or five persons because the density of their fur requires much greater effort. Large animals such as elephant seals may require a washing team with three or four persons to properly restrain the animal. Large animals, aggressive animals, fur seals and sea otters may require sedation and veterinary assistance for washing and cleaning.

General Washing Needs

- Softened water (3-5 gr)
- Temperature controlled warm water (80-98°F, 27-37°C)
- Pressured spray nozzles (30-40 psi)
- Dawn detergent
- Wastewater storage and removal

Pre-Wash Evaluation

Oiled marine mammals will require at least 24 hours of supportive care prior to being washed. Initial care is focused on addressing thermoregulatory problems, rehydration, and providing nutritional sustenance so animals are no longer in a negative metabolic balance. The washing procedure is very stressful; therefore, prior to the procedure, the animal needs to have regained strength. In the case of sea otters, they also need to be able to tolerate anesthesia and start to groom once recovered. A veterinarian should conduct a pre-wash evaluation that includes a physical examination, evaluation of alertness, strength and body condition, and blood parameters. If the animal passes the pre-wash evaluation, it is referred to the washing team.

Removing Tar Patches from Animals

If the oil present on an animal is a tar patch or very weathered, pretreatment may be necessary. This is accomplished by applying warmed (95-98°F or 35°C) olive oil, canola oil, or methyl oleate to the affected region. The pretreatment solution should be manually worked into the tarred areas for up to 30 minutes or until the tar loosens and can be wiped off using an absorptive pad or towel. While pretreating the animal, it is important to monitor the animal's body temperature and be prepared to treat the animal for hyperthermia or hypothermia. Tar removal is necessary for furred marine mammals and non-furred marine mammals if the patch(es) are large, potentially interfering with thermoregulation, or contribute to toxicity and result in clinical symptoms. Clipping away tar patches (with accompanying fur) is recommended unless molt is imminent

because the animal will have a bald patch that could cause reduction of heat retention. This procedure could have serious or life-threatening implications for fur seals, sea otters, or debilitated animals.

Washing Harbor Seals, Elephant Seals, Sea Lions

Sea lions, harbor seals and elephant seals rely on their thick blubber layer for insulation, making them less susceptible to hypothermia when they become externally oiled. These species are washed with Dawn detergent in thermal-neutral (~ 98°F or 37°C) water. Soap is applied and rubbed on the fur until the oil is visibly removed. The detergent can be made into a uniform solution by mixing it with water at a 1:1 ratio prior to applying thus making it easier to work into the hair and oil. Washing pinnipeds takes between 10-30 minutes depending on the extent and type of oil, species and health of the animal, and the proficiency of the staff. An initial quick rinse can be done at the wash station and then completed with the animal unrestrained in its pen using a pressure nozzle. This modified rinse procedure decreases the duration of manual restraint. In general, rinsing should be continued until there is no evidence of oil or detergent in the rinse water. Most pinnipeds are placed directly into their outdoor pens to dry.

General Guidelines for Washing Pinnipeds

1. Thermal neutral water (~ 98°F or 37°C)
2. Dawn detergent rubbed onto fur until oil is removed
3. Pressurized rinse in pen until oil and detergent removed
4. Air dry in pen

Washing Fur Seals

In contrast, fur seals possess a thin subcutaneous fat layer and a thick pelage that thermally insulates these animals (Reidman, 1990). Since they rely more heavily on their fur, fur seals are washed in a similar fashion to otters. Oiling 30% of a fur seal's coat will result in a 50% increase in heat loss (Geraci and St. Aubin, 1990), emphasizing the need for these animals to be closely monitored during the washing procedure. Fur seals are washed using a thermal-neutral (~98°F or 37°C), 5% diluted Dawn dish washing detergent solution. The diluted detergent solution is gently massaged into the fur and, as with other species, the washing duration depends on the extent and type of oil, the strength of the animal, and the proficiency of the staff. Fur seals are rinsed with fresh, soft (3-5 gr) water under moderate pressure (30-40 psi) with a spray nozzle. This process can require up to 40-60 minutes and animals are rinsed until no oil is visible in the rinse water and no petroleum odor is detectable on the fur (Davis and Hunter, 1995). For all pinnipeds, animals may become hyperthermic during washing in which case they may need to be washed and rinsed in cold water.

Fur seals, which depend on their coat for thermoregulation, may need to be placed in a drying enclosure that is warmed with an industrial pet dryer that blows room temperature air (68°F or 20°C). Animals in drying pens must be monitored for dehydration, hyperthermia, hypothermia, and alertness. Once dry and alert, fur seals can be returned to their outdoor pens.

Washing Sea Otters

Sea otters have the densest fur of any mammal, and, unlike most other marine mammals, replace their fur throughout the year instead of undergoing a seasonal molt (Tarasoff, 1974; Williams et al., 1992). Otters have guard hairs and many fine under-hairs that are microscopically interlocked to trap air, thus providing waterproofing, thermal insulation, and buoyancy. Oil contamination

causes fur clumping which leads to a loss of insulation and predisposes otters to hypothermia from the cold ocean water.

General Guidelines for Washing Sea Otters

1. Anesthesia/sedation
2. Diluted Dawn solution
3. Temperature controlled warm water
4. Pressurized rinse (40-60 minutes)
5. Dry with towels and blow dryers
6. Anesthesia reversal

Anesthesia

Due to their aggressive temperament, sea otters generally require sedation or anesthesia to be washed. A variety of anesthetics have been used, however, the current preferred drug combination in adult sea otters for nonsurgical procedures is fentanyl (0.22 mg/kg) and diazepam (0.07 mg/kg) used together intramuscularly. The opioid antagonist naltrexone at 0.44 mg/kg is recommended for reversal, but often 3 - 4 times the total dose of fentanyl administered is needed for complete reversal (Monson et al., 2001). While sedated, supplemental oxygen is routinely provided either via facemask, or, if the sea otter is immobilized enough to tolerate it, via endotracheal tube. During sedation and cleaning, the core temperature of the sea otter must be monitored continuously because otters can become hypothermic or hyperthermic very quickly. Whenever a sea otter is sedated, bags of crushed ice should be readily available and placed under the animal's neck and flippers if hyperthermia occurs.

Washing and Rinsing

Sea otters are washed with multiple applications of diluted (5%) Dawn dishwashing detergent. Ideally, washing tables are equipped with three or four well aerated nozzles dispensing temperature controlled (28-37 °C, 80-98 °F), softened (3-5 gr.) fresh water. The water temperature affects the body temperature and needs to be adjusted according to the otter's body temperature to prevent hyper or hypothermia (Davis and Hunter, 1995; Stoskopf et al., 1997). Four to six people are required per washing table, one (with heavy gloves) specifically to hold the head and forearms. The detergent is gently massaged into the oiled fur and then rinsed off under moderate pressure (30-40 psi) with a spray nozzle. Washing should consist of a wash, rinse, wash, rinse cycle until there is no indication of oil in the rinse water and no petroleum odor on the fur. Depending on the degree of oiling, washing will usually take from 40-60 minutes. A final rinse with a spray nozzle lasting an additional 40 minutes to one hour is essential to thoroughly remove the detergent and restore the furs' water repellency. Otters are initially hand dried with dry, clean, cotton terry cloth towels. Once the bulk of the water has been absorbed, the fur is dried with commercial pet dryers that deliver a high volume of temperature controlled air (Davis and Hunter, 1995). Sea otters become increasingly prone to hyperthermia as their hair is drying and cool (room temperature) air may be necessary for drying as the sea otter's body temperature increases.

Drying

Following drying, each animal is reversed from the anesthetic and placed in a large, slat-floor kennel with a sliding top or other easily accessible dry pen for intensive care monitoring. Animals in dry holding should be closely monitored for hyperthermia and fecal, urine, or food debris must be rinsed away immediately. When fully recovered from anesthesia, otters should be offered small blocks of ice to chew on and food (Davis and Hunter, 1995). Once the animal is stable and medical conditions allow, each otter should be moved to a pool with haulout(s) serviced by

abundant, clean, chlorine-free salt water (if available). Pools must have high seawater flow rates (e.g. 5 gallons per minute for 150 gallon pool) and drain skimmers at water level to collect debris from the pool. Fecal and food contamination of the pool water can cause fur fouling and prevent restoration of water repellency. Sea otters are not waterproof after washing and drying and must reintroduce trapped air into their fur by grooming.

Post-wash monitoring and care

During rehabilitation, sea otters need to be monitored around-the-clock by qualified personnel familiar with normal sea otter behavior and who are able to recognize clinical signs of distress. Sea otters often develop hypothermia post-wash due to lack of air insulation in washed fur and inadequate grooming. Otters that appear hypothermic, having difficulty hauling out, or experiencing seizures should be immediately removed from the water and evaluated by a veterinarian. As health and fur condition improve, otters may be moved to larger pools and/or floating holding pens. All pools should have abundant haul-out space. It will generally take a minimum of seven to ten days for the fur to recover its water repellency (Tuomi et al., 1995).

Common Problems Encountered While Washing Animals

1. Oil is not coming off with Dawn
    - Pretreatment with canola oil, olive oil, or methyl oleate is required.
2. The animal's coat is not clean
    - The animal may not have been washed or rinsed adequately. In either case, the animal may need to be re-washed or re-rinsed.
    - The wash or rinse water is too hard and mineral deposits are forming on the fur. Water hardness should be rechecked to make sure it is 3-5 grains.
    - The holding pool is not clean. Check whether the water is turbid or if there is fish oil or debris floating on the pool surface. Water flow may need to be increased or pool cleaned.

Nutritional Guidelines

The dietary requirements of stranded marine mammals are generally grouped into two categories according to age and nutritional needs: unweaned pups and weaned animals. Pups need special dietary formulas and feeding regimes based on species and age while free-feeding animals are generally fed a diet of good quality fish such as herring. Adult sea otters are usually fed a variety of fish and shellfish depending on their preference. Marine mammals also usually need to receive a supplemental multivitamin, vitamin E, and salt tablets (if housed in fresh water) with amounts based on species and weight. Monitoring fecal production and hydration status is especially important when beginning any formula, switching diets, or weaning animals. Recommended diets change with continued research and experience and stranding network participants should play an important role in the development of dietary protocols for each species and facility. More information can be obtained on marine mammal nutrition and energetics from Worthy (2001), and hand-rearing and artificial milk formulas from Williams and Davis (1995) for sea otters, and Townsend and Gage (2001) and Gage (2002) for pinnipeds.

Disposition

Release

The goal in rehabilitating oiled marine mammals is to release healthy animals back into their natural environment. Rehabilitators, in consultation with designated trustee representatives (NMFS/FWS) must prepare a release plan that is communicated to and authorized by the Unified Command through the Liaison Officer. Certain criteria must be met prior to releasing marine mammals back into wild populations. For those animals that do not meet release criteria, several options are available including additional rehabilitation, euthanasia, or placement in a long-term holding facility.

While little is known about optimal oiled marine mammal release criteria, current recommendations are based on information derived from the *Exxon Valdez* spill and husbandry practices at aquaria and rehabilitation centers in the United States. NMFS and FWS have developed guidance and criteria for release based on optimizing the chances for survival and minimizing the risk to wild populations (Best Practices for Marine Mammal Stranding Response, Rehabilitation, and Release – Standards for Release, http://www.nmfs.noaa.gov/pr/health). The Standards for Release document describes how to characterize and assess animals using several parameters.

Standards for Release

1. Historical Assessment
2. Developmental and Life History Assessment
3. Behavior Assessment and Clearance
4. Medical Assessment and Clearance
5. Release Logistics
6. Post Release Monitoring

Current criteria require that animals show normal species-specific behavior (feeding, swimming, and diving), adequate body weight for age class and species, pelage proven to be in good condition, hematological and serum chemistry values within the normal range, no evidence of infectious diseases, and physical exam findings should be unremarkable. Other ancillary tests (e.g. *Leptospira* titer, morbillivirus titer, microbiological cultures, urinalysis, fecal examinations, etc.) may also be performed on a case-by-case basis depending on individual animal and population level concerns. The Unified Command will decide upon the location of the release with guidance from the trustee agencies

Upon approval for release by UC, an exit photo of each marine mammal must be taken and specifics of the release (location, time, personnel) recorded for Natural Resource Damage Assessment purposes.

Post-release monitoring, if at all possible, should be undertaken during marine mammal releases following oil exposure using radio or satellite telemetry. This effort should focus on survival rates, behavior, and reproductive success following oil contamination and rehabilitation, thus enabling

oiled marine mammal responders to evaluate the efficacy of oiled marine mammal care. Post-release monitoring is not usually considered a response activity expense and must be funded by the stranding network participate, trustee agency or NRDA.

Mortalities

All oiled dead marine mammals should be collected from beaches and taken to a designated morgue. Dead animals should be logged in at the morgue using a Dead Marine Mammal Data Log (example in Appendix 3). Under certain circumstances, an oiled animal may need to be humanely euthanized in order to alleviate suffering. Animals that die during an oil spill response must have this disposition information recorded on their individual animal record as well as on the Live Marine Mammal Data Log (Appendix 2). The carcass should be identified with a written tag including the species name, date of stranding and/or admission, date of death, and the flipper tag (if a tag was affixed prior to death). If a flipper tag is present, it should remain with the carcass until final disposition of the carcass. The carcass should be refrigerated or kept on ice until a necropsy is performed. If a necropsy cannot be performed within 24 hours of death, the carcass needs to be frozen.

Euthanasia

During an oil spill response, there are circumstances under which it may be necessary to humanely euthanize animals. For each spill where marine mammal rehabilitation is undertaken, the rehabilitator must prepare a written euthanasia plan in consultation with the trustee representative. Euthanasia is appropriate for oiled animals with injuries that will render it unable to survive in the wild or unsuitable for use in captivity. If animals are euthanized in the field, they are collected following the procedures outlined in the Recovery and Transportation section of this document. To prevent secondary contamination or poisoning, euthanized carcasses are never left in the field.

Necropsy

Necropsies may be performed concurrent with response activities to identify cause of death in order to differentiate between a natural versus pollution related mortality. Fatalities to apparently un-oiled wildlife may necessitate necropsies to determine if death was caused by human interactions or if sub-apparent oil exposure or ingested petroleum contributed to the mortality. Additionally, captivity-related diseases may necessitate necropsies be performed on animals that die during rehabilitation to identify potential pathogens or husbandry techniques that are detrimental to recovery.

Prior to performing a necropsy on an oiled marine mammal, specific permission must be obtained from Unified Command and the appropriate NMFS/FWS enforcement officer. The spill response veterinarian-of-record should conduct or supervise all necropsies, in consultation with the designated representative FWS or NMFS enforcement officer. In most cases, a veterinary pathologist with specialized training on marine mammals will be asked to perform the necropsy. Necropsy methods and techniques are diverse, but general procedures for marine mammal necropsies can be found in Rowles et al. (2001), Galloway and Ahlquist (1997), and Geraci and Loundsbury (1993). Specific protocols have also been developed for some marine mammals including phocids (Winchell, 1990), Killer whales (Raverty and Gaydos, 2004), Right whales (McLellan et al., 2004), and Hawaiian Monk seals (Yochem et al., 2004). These species specific procedures should be followed whenever possible in order to maintain consistency with previous data. Prior to conducting a necropsy, the trustee agency and veterinarian should agree on which forms to use; which samples to collect; how those samples will be prepared (e.g., formalin or

frozen), stored, and shipped; and where samples will be analyzed. Specific oil spill necropsy information and forms are detailed in Appendix 7-9. Tissue samples for standard histopathology, disease profiling, and petroleum hydrocarbon analysis should be collected. Sampling for oil exposure, must be performed under specific conditions detailed in Appendix 7, in order to prevent contamination of the sample. Necropsy reports are filed and all samples handled and stored using appropriate chain-of-custody protocols, as discussed previously (Data Collection) and provided by the trustee representative.

Laboratories performing the petroleum analysis must be contacted as soon as possible in order to verify that sampling protocols and sample sizes are consistent with that specific laboratory requirement. Considerations in choosing the lab should include details of forensic capabilities (ability to produce legally defensible results), quality assurance and quality control (QA/QC), and consistency with the analysis of other materials from the spill. Results can vary between labs and data should be comparable between the environmental and tissues of the different species sampled. Appendix 8 lists laboratories (not an exhaustive list), with expertise in petroleum hydrocarbon chemistry that can be contacted for oil spill sample collection and analysis information. Petroleum hydrocarbon analysis is a reimbursable response expenses if pre-approved by the UC. However, often the RP (responsible party) assumes ownership of the oil and analysis may not be preformed.

Petroleum and Polycyclic Aromatic Hydrocarbons (PAH) Analysis

In general, all crude oils are mixtures of the same hydrocarbon and non-hydrocarbon compounds, but vary in the percent composition of these compounds. Natural weathering of oil in the environment also results in highly variable compositions. Because of the continual dynamic changes in spilled oil, it can be difficult to identify and quantify all PAHs potentially present in or on an animal in the aftermath of an oil spill. Oil and tissue samples collected from marine mammals can be analyzed to determine the total amount of PAHs in tissues and identify and quantify dangerous PAHs that may have caused clinical and pathological effects. Samples can also be tested to characterize and fingerprint petroleum hydrocarbons to determine their source.

Determining source-dependent petroleum exposure during an oil spill using GC/MS or HPLC techniques on marine mammal tissues requires baseline knowledge of petroleum hydrocarbon levels and composition in the spill area and of the spilled oil. At present there are few data available on PAH levels in marine mammals inhabiting North American coastal waters. Studies have only measured PAH levels in seals and whales from the Eastern Canada (Hellou et al., 1990, Zitko et al., 1998) and Northeastern United States (Lake et al., 1995). Overall, the low concentrations of bioaccumulated PAHs in tissues from these marine mammals are fairly similar to those reported in atmospheric fallout PAHs from combustion sources (Zitko et al., 1998). Alkylated and heterocyclic PAHs are the predominant forms of PAHs in oil and coal products, and can be missed if tissues are tested only for the 16 traditionally-studied, parent PAHs listed as priority pollutants by the Environmental Protection Agency (EPA) and World Health Organization (WHO) (Means 1998). Different members of the isomeric alkylated PAHs exhibit differential toxicity, diffusion, and degradation rates, further emphasizing the importance of compound-specific analysis. With the lack of baseline PAH levels from marine mammals, control samples for comparisons were harvested at the time of *Exxon Valdez* oil spill from animals inhabiting nearby non-oiled areas (Mulcahy and Ballachey, 1994; Frost et al., 1994).

In experimental exposure studies (both immersion and ingestion) involving ringed seals (*Phoca hispida*), differences in detectability of PAHs in various tissues were noted (Engelhardt et al., 1977). In the immersion experiment, PAHs were highest in urine and bile, less elevated in blood and plasma, and lower in tissues (lowest in lung) at 2 days post-immersion. Tissue sampling in the ingestion study was limited with PAHs highest in blood, and higher in liver and blubber compared to muscle. These studies illuminate the importance of selecting appropriate tissues for PAH analysis. Specific tissue collection techniques are provided in Appendix 7.

Records

The importance of recording information cannot be over-emphasized. Record collection enhances individual animal care, response evaluations, and the ability to accurately characterize the best practices for appropriate care. In-house records are maintained at the rehabilitation facility and copies provided to the trustee agency. Final reports, including chain-of-custody and sample collection records, must be delivered to the trustee agency within 30 days of the date the Federal OSC declares the response closed.

Scientific Records

The following types of records are necessary to preserve vital information for scientific study, natural resource damage assessment, and improved rehabilitation practices and techniques:

- Oiled mammal sighting: records and maps for all reports of oiled mammals
- Search Effort Log
- Live Mammal Log
- Dead Mammal Log
- Marine Mammal Intake Form
- Rehabilitation Records: documents care for each animal, including feedings, treatments, medications, normal/abnormal activities.
- Lab Analyses Report: identifies all samples sent to labs, requested analyses, lab results.
- Marine Mammal Stranding Report - Level A Data (NOAA 89-864, OMB #0648-0178)
- Marine Mammal Rehabilitation Disposition Report (NOAA 89-878, OMB #0648-0178)
- Human Interactions Form
- Necropsy Report

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Appendices

1. Search Effort Log
2. LIVE Marine Mammal Data Log Form

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3. DEAD Marine Mammal Data Log Form

3b. DEAD Marine Mammal Data Log Form, page 2

4. Oiled Marine Mammal Intake Form
5. Oiled Marine Mammal Daily Progress Form
6. Oiled Marine Mammal Evidence Collection Protocol
7. Petroleum Hydrocarbon Tissue Sampling Protocol
8. Oil Spill Response Laboratories and Supplies
9. Oiled Marine Mammal Necropsy Form
10. Chain of Custody Form

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Search Effort Log

Please record all beaches searched *even if no animals are found.*

Spill Name: _____ **Date:** _____
Searchers: _____

Note: Time should include all time spent on the beach, even when backtracking. North and south endpoints should be GPS pts. If not, please provide a good description of the area covered. For collected animals, put GPS location here.

	Beach Name	**Start Time**	**End Time**	**North/West Extreme (Lat/Long)**	**South/East Extreme (Lat/Long)**	**Total Distance Searched**	**Method (foot, ATV, scan)**	**Mammals Collected Note: (live/ dead, GPS, ID #)**
A								
B								
C								
D								
E								
F								
G								
H								
I								
J								
K								

Oiled Marine Mammal Data Log: LIVE Animals

Oil Spill Name:				Facility:					
Intake Log Number (L-xxxx)	Date Collected (m/d/y)	Time Coll'ted (24 hr)	First Initial & Last Name of Collector	Beach Search Number	Collection Location (Beach Name)	GPS Coordinates (N) GPS Coordinates (W)	Field Tag #	Date Arrived (m/d/y)	Time Arrived (24 hr)

Front Side of Page _____ of _____

Appendix 2. Live Marine Mammal Data Log

Oiled Marine Mammal Data Log: LIVE Animals (continued from front side)

Oil Spill Name:				Facility:								
Intake Log Number	Date Processed (m/d/y)	Time Processed (24 hr)	First Initial & Last Name of Examiner	Species	Level A Field #	Tag Color/#	% Oiled	Sample/ Photo Taken? (Y/N)	Disposition Date (m/d/y)	Disposition Status (R,D,E,T)	Release Tag #	Morgue ID

Back Side of Page _____ of _____

Oiled Marine Mammal Data Log: DEAD Animals

Oil Spill Name:					Facility:								
Intake Log Number (D-xxxx)	Date Collected (m/d/y)	Time Coll'ted (24 hr)	First Initial & Last Name of Collector	Beach Search #	Collection Location (Beach Name)	GPS Coordinates (N) / (W)	Tag # (Field or Temp w/ Color)	Date Arrived (m/d/y)	Time Arrived (24 hr)	Date Proc'ed (m/d/y)	Time Proc'ed (24 hr)	Name of Processor	Species

Front Side of Page _____ of _____

Appendix 3. Dead Marine Mammal Data Log

Oiled Marine Mammal Data Log: DEAD Animals (continued from front side)

Oil Spill Name:							Facility:								
Intake Log Number (D-xxxx)	Condition	Scavenging	Oiling Signs	% Oiled	Depth Oiled	Sample/ Photo Taken? (Y/N)	Level A Field #	Tag #	Age	Sex	SL (cm)	AG (cm)	Morgue ID	Necropsy (Y/N)	Notes (any other observations, contamination by petroleum products such as plastic or another specimen)

Back Side of Page _____ of _____

Appendix 4. Oiled Marine Mammal Intake Form

Oiled Marine Mammal Intake Form

Spill Name:			Level A Field #:	Log Number:
CAPTURE	Capture Date/Time:		Capture Location:	
	Field Band:		Collector:	
PROCESSING	Intake Date/Time:		Species:	
	Tag Color/#:		Examiner's Signature:	
EXT. OIL ID	Signs of Oiling	Oil Visible Skin Burns Smell	Area Oiled	Head Body Multiple Entire
	Oil Color	Black Brown Clear Other	Depth of Oiling	Deep Moderate Surface
	% Oiled	<2% 2-25% 26-50% 51-75% 76-100%	Samples	Hair Swab Photo
PHYSICAL EXAM	Weight/Temp.	grams °F	Age	Pup Sub-adult Adult Unknown
	Std Length/Girth	cm cm	Sex	Male Female
	Heart Rate	WNL beats/min.	Body Condition	Normal Thin Emaciated
	Resp. Rate	WNL breaths/min.	Attitude	BAR QAR Nonresponsive Seizing
	Dehydration	None Mild Moderate Severe	CRT/mm color	Sec. / Pink Pale White Purple
	Human Interaction	☐ Yes ☐ No Type: Boat Collision, Shot, Fisheries, Other:		
	Neurologic	NSF Other:		
	Head/Mouth	NSF Other:		
	Eyes/Ears	NSF Other:		
	Heart/Lungs	NSF Other:		
	Gastrointestinal	NSF Other:		
	Musculo-skeletal	NSF Other:		
	Integument	NSF Other:		
	Comments			
TX-DX	Blood taken? HCT LTT RTT GTT	Toxiban: yes no time:		
	Pre-wash Exam: _____ Veterinarian Signature	Date Washed :	Weight:	Bloodwork Attached ☐
DISPOSITION	Disposition Exam: _____ Veterinarian Signature	Exam Date:	Weight:	Bloodwork Attached ☐
	Disposition Date:	Disposition Location:		
	Disposition Status: RELEASED DIED EUTHANIZED TRANSFERRED RETAINED	Necropsied by:		
	Flipper Tag No.:	Location: RF LF RH LH		

TAG #: _____ SPECIES: _____

Oiled Marine Mammal Daily Progress Form

SpillName_____ Log# _____ Tag Color/# _____ Species_____

Date	Treatment and Progress Notes	Init.

Appendix 6. Oiled Marine Mammal Evidence Collection Protocol

The photograph and oil sample are both considered to be legal evidence therefore it is important that the following procedures are followed closely.

Photograph Evidence

1. Use a Polaroid camera (if possible).
2. Photograph should include the entire animal, highlighting the oiled region, and if possible, the tag number.
3. Label the photograph with Spill Name, Date, Species, Log #, Capture Location, and Tag # and Color.

Sample Collection Techniques for Visible Oiling

1. Scrape visible oil from fur/skin with wooden spatula (tongue depressor).
2. Place oil covered spatula in solvent-rinsed glass jar with a Teflon-lined lid (e.g. I-Chem) and break off the remaining un-oiled portion, allowing the lid to close. If jar is not available, wrap sample in aluminum foil (dull side to sample).
   Note: Avoid touching /contaminating oil sample with your nitrile gloves.
3. Label the glass jar (use waterproof labels).
   Label must include: Spill Name, Log #, Species, Tag #, Arrival Date, Sampling Date, and Capture Location.
4. Fill out Custody Seal and apply it across the lid of the jar and onto the sides of the glass.
5. Keep sample refrigerated or on ice until it can be stored.
6. Lock sample in a -20°C (or colder) freezer.

Sample Collection Techniques for No Visible Oiling

1. Rub an affected area with a 4x4 fiberglass or cotton cloth (or gauze) with sterile forceps or hemostats that have been cleaned with isopropyl alcohol.
   Note: Do not allow the nitrile gloves to touch the oiled area or the cloth.
2. Place the oiled covered cloth into a solvent-rinsed glass jar with a Teflon-lined lid.
3. Seal and fill out the information on the waterproof label (as above).
4. Fill out the Custody Seal and apply it across the lid of the jar and onto the sides of the glass.
5. Keep sample refrigerated or on ice until it can be stored
6. Lock sample in a -20°C (or colder) freezer.

All evidence should be securely stored and refrigerated/frozen until the Wildlife Branch Director provides further instructions. If samples are to be sent for analysis, a Chain of Custody Form is required.

Appendix 7. Petroleum Hydrocarbon Tissue Sampling Protocol

Supplies for sampling

All instruments used in handling (e.g. scalpels and forceps, cutting boards) or storing (e.g. jars, foil, sheets) samples must be made of a non-contaminating material consisting of stainless steel, glass, Teflon, or aluminum.

- Solvent-rinsed glass containers with Teflon-lined lids for tissues
- Solvent-rinsed Teflon sheets for tissues
- Aluminum foil (if Teflon sheets are not available) sample to the dull side
- Sterile syringes and needles
- Amber glass vials or glass vials covered with foil with Teflon lids (for bile, urine)
- Teflon screw top vials (for blood storage and urine)
- Stainless steel scalpels, knifes, forceps
- Isopropyl alcohol (99.9% pesticide free IPA) to rinse instrument
- Wooden tongue depressors (can be used to handle tissues if necessary)
- Whirl-pak bags or Zip-lock freezer bags
- 10% buffered formalin and appropriate containers for histopathology samples
- Permanent marker or pen
- Evidence/Custody tape and labels
- Sample Log/Chain of Custody forms

Sampling Protocol

Tissues to collect for petroleum hydrocarbon analysis in order of preference:

a. bile
b. urine
c. whole blood
d. stomach and intestinal contents
e. blubber/fat
f. liver
g. kidney
h. lung
i. intestine
j. brain
k. muscle

i. Samples taken for analysis should only be collected from **alive** or **freshly dead animals**. If a necropsy cannot be performed within 24 hrs after death, the carcass should be frozen for later examination.

ii. Recommended **minimum sample size** is **10-20 g of tissues** (approx. 1-2 tablespoons) and **5 ml for fluids** (blood, urine, bile, feces, stomach contents). However, analysis can be performed on as little as 100 μL of bile; therefore collect whatever amount is present.

iii. Fluids such as blood, urine, and bile should be collected using sterile syringes or pipettes and transferred to Teflon vials (blood) or amber glass vials (bile, urine).

iv. Use powder-free nitrile gloves. Vinyl gloves are an acceptable alternative. Avoid contact of gloves with samples.

v. Scalpels, knifes, and cutting tools used for tissue collection should be cleaned and rinsed with isopropyl alcohol between tissues. If heavily contaminated with oil, instruments can be cleaned with detergent (e.g. Dawn), rinsed with water, and then rinsed with alcohol.

vi. Samples are stored preferably in solvent-rinsed Teflon-lined glass jars, labeled, and secured with evidence tape/custody seal. If glass jars are not available, samples can be placed in Teflon sheets or aluminum foil (dull side to sample) and stored in whirl-paks/freezer bags.

vii. If samples/tissues have come in contact with a contaminating material (e.g. plastic bag), collect and store a representative example of that material (e.g. plastic bag) using the same method as for collecting tissues.

viii. Collect a representative sample of each tissue (< 1 cm thick) preserved in 10% buffered formalin for histopathology. Duplicate hydrocarbon and histology samples whenever possible.

ix. Each sample must be labeled with **Spill Name, Log #, Level A Field #, Species, Tag#, Arrival Date, Sampling Date, and Capture Location** and securely stored.

x. Samples for PAH analysis should be chilled immediately on ice/refrigeration and then frozen as soon as possible to -20ºC or colder in a locked freezer. Histopathology samples are stored at room temperature.

All evidence should be securely stored and refrigerated/frozen until the Wildlife Branch Director provides further instructions. If samples are transferred to a different location or sent for analysis, a Chain of Custody form is required. A Chain of Custody form can be found in this document, but are often provided by the laboratory.

Shipping:
Ship samples frozen on blue ice or with ~5 lbs dry ice according to laboratory specification using Federal Express (FedEx). FedEx follows IATA regulations for shipping hazardous materials and maintains chain of custody record by tracking packages.
Sampling supplies such as jars, label, and custody seals are often supplied by the analytical laboratory and are produced by:

I-Chem™ Brand, Certified 300 Series jars
Order: 1-800-451-4351, www.ichembrand.com

Appendix 8. Oil Spill Response Laboratories

Laboratories with tissue petroleum hydrocarbon analysis expertise

Northwest Fisheries Science Center 2725 Montlake Boulevard East Seattle, WA 98112-2097 Jon Buzitis, (206) 860-3309 Gina Ylitalo, (206) 860-3325	**Alaska Fisheries Science Center** Auke Bay Laboratory 11305 Glacier Highway Juneau, Alaska 99801-8626 Jeep Rice, (907) 789-6020
Petroleum Chemistry Laboratory Office of Spill Prevention and Response California Department of Fish and Game 1995 Nimbus Rd Rancho Cordova, CA 95670 (916) 358-2803	**TDI-Brooks International** 1902 Pinon College Station, TX 77845 (979) 693-3446 Thomas McDonald, (979) 220-3821
Alpha Woods Hole Laboratories 375 Paramount Drive Raynham, MA 02767 Peter Kane, (508) 822-9300	**Zymax Forensics** 71 Zaca Lane San Luis Obispo, CA 93401 (805) 544-4696 Alan Jeffrey, (805) 546-4693
Mote Marine Laboratory 1600 Ken Thompson Parkway Sarasota, Florida 34236 (941) 388-4312 Dana Wetzel, (941) 388-4441	**Geochemical & Environmental Research Group (GERG)** Texas A&M University 833 Graham Road College Station, Texas 77845 (979) 862-2323

The laboratory should be able to perform analysis of the 16 traditionally-studied, parent PAHs listed as priority pollutants by the Environmental Protection Agency (EPA) in addition to the 44 alkylated and heterocyclic PAHs.

Unified Command and Trustee Agencies will make final decision on laboratory use.

Appendix 9. Oiled Marine Mammal Necropsy Form

Oiled Marine Mammal

Gross Necropsy Report

Spill Name:			
Animal Log #			
Level A Field #		**Tag #**	
Species:			
Sex:		**Age:**	
Weight:	kg. (estimate/actual)		
SON:	emaciated 1 2 3 4 5 6 7 obese		
Measurements:		Blubber depth	mm
SL cm	AG cm	UG cm	XG cm

Form completed by:	Date:	
Enforcemnent Officer:		
Strand/Capture location:		
Collecters Name:		
Intake date:		Euthanasia
Death date:	Time:	☐ yes
Post mortem date:	Time:	☐ no
Carcass Classification:	**Frozen**: ☐ yes ☐ no	
2- fresh, 3-fair (organs intact), 4-poor, 5- mummified		
Photographs: ☐		
Radiographs: ☐		

Clinical signs/diagnosis	
Antibiotics given	
Pertinent lab results	

GROSS NECROPSY ABNORMALITIES:

HYDROCARBON ANALYSIS SAMPLES		
bile	kidney	blubber/fat
blood	muscle	other:
urine	lung	
liver	intestine	

MICROBIOLOGY	**SWABS: other**
Lung ☐	
Liver ☐	
other ☐	

HISTOLOGY SAMPLES

lung	thyroid	ileum	kidney	mammary gland	muscle	**LYMPH NODES:**	
trachea	tonsil	colon	ureter	adrenal	gonad	colonic	gastric
heart	tongue	pancreas	urinary bladder	skin	prostate	sublumbar	hepatic
aorta	esophagus	spleen	urethra	eye (L/R)	uterus	inguinal	mediastinal
pulmonary artery	stomach	liver	blubber	fat--site:	vagina	axillary	submandibular
thymus	duodenum	gall bladder	bone marrow		cervix	mesenteric	tracheobronchial
salivary gland	jejunum	brain	spinal cord	whole repro	penis		
other:							

Cause of death (preliminary diagnosis):

Examiner:	Examiner's signature:	Date:

Appendix 10. Chain of Custody Form

CHAIN OF CUSTODY RECORD

Case Number:

DATE AND TIME OF SEIZURE:	DUTY STATION:	EVIDENCE/PROPERTY SEIZED BY:

SOURCE OF EVIDENCE/PROPERTY (person and/ or location) TAKEN FROM: RECEIVED FROM: FOUND AT:	DEFENDANT/COMPANY NAME AND REMARKS:

ITEM NO:	DESCRIPTION OF EVIDENCE/PROPERTY (include Seizure Tag numbers and any serial numbers):

ITEM NO:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE:	DELIVERED VIA: FEDEX U.S. MAIL IN PERSON OTHER:
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE	RECEIPT DATE:	

ITEM NO:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE:	DELIVERED VIA: FEDEX U.S. MAIL IN PERSON OTHER:
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE:	

ITEM NO:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE:	DELIVERED VIA: FEDEX U.S. MAIL IN PERSON OTHER:
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE	RECEIPT DATE:	
ITEM NO:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE:	DELIVERED VIA: FEDEX U.S. MAIL IN PERSON OTHER:
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE:	
ITEM NO:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE:	DELIVERED VIA: FEDEX U.S. MAIL IN PERSON OTHER
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE	RECEIPT DATE:	
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	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE:	
ITEM NO:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE:	DELIVERED VIA: FEDEX U.S. MAIL IN PERSON OTHER:
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE	RECEIPT DATE:	
ITEM NO:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE:	DELIVERED VIA: FEDEX U.S. MAIL IN PERSON OTHER:
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE:	

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APPENDIX M

SOCIOECONOMIC INFORMATION SUMMARY TABLES

Table 1: Summary of overall statewide information on veterinary services

State	Number of Establishments	Revenues and Receipts ($000's)	Annual Payroll ($000's)	Number of Paid Employees
Atlantic/Gulf of Mexico Region				
Alabama	470	215,658	66,007	3,647
Connecticut	308	278,984	101,581	3,555
Delaware	57	54,598	19,773	760
Florida	1,665	1,027,526	337,264	14,363
Georgia	721	456,376	157,582	7,242
Louisiana	393	191,983	58,361	3,231
Maine	149	96,997	34,837	1,298
Maryland	466	350,277	129,439	5,218
Massachusetts	448	374,325	145,196	5,371
Mississippi	238	104,586	31,209	1,642
New Hampshire	155	109,833	36,762	1,467
New Jersey	548	487,464	185,615	6,126
New York	1,130	934,481	321,104	12,124
North Carolina	720	510,742	180,959	8,000
Pennsylvania	940	618,142	205,655	8,884
Rhode Island	75	56,751	20,800	766
South Carolina	326	189,719	61,557	3,060
Texas	2,010	1,224,701	389,384	17,405
Virginia	684	503,041	191,682	8,221
Puerto Rico	85	23,846	4,257	302
Virgin Islands[1]	9	3,330	845	35
Pacific Region				
Alaska	60	40,411	15,051	621
California	2,445	1,948,390	660,464	24,733
Oregon	464	306,031	105,358	4,624
Washington	685	439,702	139,487	6,041
Pacific Islands Region				
Hawaii	77	51,308	16,447	656
Guam	4	2,078	595	37
American Samoa[1]	4	59	1	2
Commonwealth of the Northern Mariana Islands[1]	8	1,780	450	34

2002 Economic Census
North American Industry Classification System (NAICS) code 541940
[1] NAICS code 5419 which includes veterinary services as well as other sub-industries

Table 2: Summary of overall statewide information for all zoos, aquariums, and botanical gardens

State	Number of Establishments	Revenues and Receipts ($000's)	Annual Payroll ($000's)	Number of Paid Employees
Atlantic/Gulf of Mexico Region				
Alabama	6	9,815	4,884	257
Connecticut	7	28,102	9,156	346
Delaware	1	D	D	a
Florida	56	123,503	43,203	2,448
Georgia	16	45,331	16,489	692
Louisiana	13	D	D	f
Maine	8	3,965	1,548	44
Maryland	8	D	D	f
Massachusetts	17	55,603	18,742	776
Mississippi	2	D	D	b
New Hampshire	1	D	D	a
New Jersey	10	12,567	5,587	276
New York	48	266,257	83,410	2,457
North Carolina	13	7,992	2,409	95
Pennsylvania	26	98,672	32,665	1,365
Rhode Island	1	D	D	b
South Carolina	11	34,679	8,493	419
Texas	37	140,819	44,071	2,232
Virginia	11	8,584	4,438	247
Puerto Rico[2]	18	13,690	3,714	218
Virgin Islands[2]	5	3,583	973	48
Pacific Region				
Alaska	3	D	D	b
California	46	272,488	105,438	3,687
Oregon	11	15,067	6,075	255
Washington	16	29,801	5,670	204
Pacific Islands Region				
Hawaii	20	27,701	7,994	390
Guam	N/A	N/A	N/A	N/A
American Samoa	N/A	N/A	N/A	N/A
Commonwealth of the Northern Mariana Islands[2]	1	D	D	a

2002 Economic Census
NAICS code: 712130
D = Information withheld by Census to avoid disclosing data for individual companies
a = 0-19 employees
b = 20-99 employees
f =500-999 employees
[2] NAICS code 712 which designates museums, historical sites, and similar institutions. This category includes zoos and aquariums.

Table 3: Summary of statewide information on zoos, aquariums, and botanical gardens with federal tax-exempt status

State	Number of Establishments	Revenues and Receipts ($000's)	Annual Payroll ($000's)	Number of Paid Employees
Atlantic/Gulf of Mexico Region				
Alabama	6	9,815	4,884	257
Connecticut	6	D	D	e
Delaware	1	D	D	a
Florida	22	60,756	22,323	979
Georgia	11	D	D	f
Louisiana	6	D	D	f
Maine	6	D	D	b
Maryland	6	D	D	f
Massachusetts	13	50,387	17,125	676
Mississippi	2	D	D	b
New Jersey	7	D	D	e
New York	34	237,360	75,523	2,219
North Carolina	6	D	D	b
Pennsylvania	18	95,617	31,483	1,314
Rhode Island	1	D	D	b
South Carolina	5	10,703	3,793	165
Texas	22	131,268	41,775	2,102
Virginia	5	6,737	3,807	185
Puerto Rico	N/A	N/A	N/A	N/A
Virgin Islands	N/A	N/A	N/A	N/A
Pacific Region				
Alaska	2	D	D	b
California	32	268,086	104,104	3,622
Oregon	7	12,822	5,289	210
Washington	12	D	D	c
Pacific Islands Region				
Hawaii	12	D	D	c
Guam	N/A	N/A	N/A	N/A
American Samoa	N/A	N/A	N/A	N/A
Commonwealth of the Northern Mariana Islands	N/A	N/A	N/A	N/A

2002 Economic Census
NAICS code: 712130
D=Information withheld by Census to avoid disclosing data for individual companies
a= 0-19 employees
b= 20-99 employees
c=100-249 employees
e=250-499 employees
f=500-999 employees

Table 4: Summary of overall information on coastal food and lodging services

State	Number of Establishments	Revenues and Receipts ($000's)[1]	Annual Payroll ($000's)[1]	Number of Paid Employees[1]
Atlantic/Gulf of Mexico Region				
Alabama	956	713,581	202,919	18,299
Connecticut	4,502	4,979,638	1,454,704	80,017
Delaware	1,576	1,231,595	355,458	26,972
Florida	23,742	20,991,636	5,847,116	460,330
Georgia	1,113	1,040,073	300,917	24,583
Louisiana	3,384	3,408,930	972,762	76,709
Maine	2,446	1,346,224	393,600	25,814
Maryland	5,139	4,322,393	1,189,482	95,547
Massachusetts	8,572	7,172,834	2,103,016	139,707
Mississippi	723	1,701,789	472,684	27,523
North Carolina	1,626	997,181	277,497	26,059
New Hampshire	751	498,076	152,805	10,857
New Jersey	9,923	10,596,279	2,933,489	165,618
New York	22,802	19,302,622	5,535,678	309,156
Pennsylvania	4,045	2,742,606	734,949	54,681
Rhode Island	2,701	1,731,799	502,394	38,573
South Carolina	2,608	2,741,304	771,157	55,853
Texas	9,002	7,626,398	2,100,395	178,631
Virginia	2,695	2,125,937	556,374	52,167
Puerto Rico	4,133	3,360,226	732,147	63,810
Virgin Islands	313	331008	92,357	5,639
Region Total	112,752	98,962,129	27,681,900	1,936,545
Pacific Region				
Alaska	1,598	1,178,807	354,615	20,379
California	45,609	40,169,743	11,522,595	800,742
Oregon	1,909	1,058,286	305,453	25,221
Washington	9,212	6,275,983	1,874,094	139,301
Region Total	58,328	48,682,819	14,056,757	985,643
Pacific Islands Region				
Hawaii	3,138	5,551,380	1,604,706	85,641
Guam	392	629,672	168,623	11,199
American Samoa	99	21,335	3,598	536
Commonwealth of the Northern Mariana Islands	151	197,187	47,275	4,304
Region Total	3,780	6,399,574	1,824,202	101,680

2002 Economic Census

NAICS code: 72 (combined food and lodging industry category)

[1]The following coastal counties were excluded since information for these counties were withheld by the Census to avoid disclosing data for individual companies: Camden County, NC; Perquimans County, NC; Kenedy County, TX; Kleberg County, TX; Mathews County, VA; Surry County, VA; Aleutians East Borough, AK; Lake and Peninsula Borough, AK; Northwest Arctic Borough, AK; Wade Hampton Census Area, AK; and Kalawao County, HI.