



CDAS 3.11 – Marine Birds and Mammals at Sea

APPENDIX - SUMMARY OF STUDIES

The current data set includes 25 studies; more may be added. Details on studies are provided below and in the summary table following. Data from 19 aerial survey programs, 2 ship survey programs, and 4 small boat survey programs are included.

Please reference this compilation as CDAS 3.11 Marine Birds and Mammals at Sea. Washington, Oregon, California 1975-2008. Prepared for California Department of Fish and Game Office of Spill Prevention and Response. Data CD and Display Software. 2009.

MMS Surveys and Related Studies

Several studies funded by the Minerals Management Service are included in this compilation.

Marine Mammal and Seabird Surveys of the Southern California Bight

PRINCIPAL INVESTIGATOR(S)/AFFILIATION: K. S. Norris and B. J. Le Boeuf, University of California, Santa Cruz, and G. L. Hunt, University of California, Irvine.

STUDY AREA and TIME PERIOD:

The Southern California Bight, from Point Conception to the U.S.-Mexico boundary and offshore to the 2,000 m isobath, May 1975 through March 1978.

METHODOLOGY: Aerial and ship surveys were conducted along pre-established transects designed to systematically sample marine mammal and seabird abundance in all waters of the study area. Aerial surveys were conducted at two altitudes (200 ft and about 750-1,000 ft ASL) alternating at 2-3 week intervals. Seabirds and pinnipeds were recorded only on the low-altitude surveys which predominantly sampled along eight lines of latitude, separated by 25 nm, and connecting lines of longitude. High-altitude surveys sampled cetacean abundance along 15 Loran lines oriented northeast-southwest and separated by 12-15 nm. On low-altitude surveys, seabirds were counted only within a 50 m corridor on the shaded side of the aircraft. Marine mammals were counted in an unbounded corridor on one side of the aircraft on low-altitude surveys and both sides of the aircraft on high-altitude surveys. A clinometer or marks on the wing-strut were used to estimate the declination, and the measurement or estimate later used to calculate probability density functions of frequency with right-angle distance. Ships were used for surveys of inshore waters along standard (i.e., predetermined and replicate) transects and for search, catch, and tagging/tracking of small cetaceans. The standard ship transect cruises sampled abundance of seabirds and marine mammals over banks, basins, and ridges in waters inshore of the Patton Escarpment (the shelf break). Seabirds and marine mammals were counted on both sides of the cruise track and distance estimated or measured with a range-finder. Catch cruises attempted to find and remain with schools of common dolphin and other small cetaceans; therefore, data on sightings from these cruises cannot be used as samples of animal abundance. The Southern California Bight Study

also included ground and aerial censuses of pinniped and seabird colonies, and special studies of productivity, mortality rates, and foraging range.

STUDIES and CODES:

SHIMAM -- So. Calif. Bight High Aerial [Cetaceans Only]
SLOMAM -- So. Calif. Bight Low Aerial [Mammals Only]
SLOBRD -- So. Calif. Bight Low Aerial [Birds Only]
SCBSHP -- So. Calif. Bight Ship Surveys [Birds and Mammals]

DATA AVAILABILITY:

These data may be distributed freely. Please cite this compilation and the original studies.

REFERENCES:

Bonnell, M. L., B. J. Le Boeuf, M. O. Pierson, D. H. Dettman, and G. D. Farrens. 1981. Pinnipeds of the Southern California Bight. Part I of Investigator's Reports, Summary of Marine Mammal and Seabird Surveys of the Southern California Bight Area, 1975-1978. Final Report prepared by the University of California, Santa Cruz, for the Bureau of Land Management, Contract No. AA550-CT7-36. National Technical Information Service, Springfield, Virginia. NTIS # PB-81-248-171. 535 pp.

Briggs, K. T., E. W. Chu, D. B. Lewis, W. B. Tyler, R. L. Pitman, and G. L. Hunt. 1981. Distribution, Numbers, and Seasonal Status of Seabirds of the Southern California Bight. Part III of Investigator's Reports, Summary of Marine Mammal and Seabird Surveys of the Southern California Bight Area, 1975-1978. Final Report prepared by the University of California, Santa Cruz, for the Bureau of Land Management, Contract No. AA550-CT7-36. National Technical Information Service, Springfield, Virginia. NTIS # PB-81-248-197. 470 pp.

Briggs, K.T., W.B. Tyler, D.B. Lewis, and D.R. Carlson. 1987. Bird communities at sea off California: 1975 to 1983. *Stud. Avian Biol.* 11.

Dohl, T. P., K. S. Norris, R. C. Guess, J. D. Bryant and M. W. Honig. 1981. Cetacea of the Southern California Bight. Part II of Investigator's Reports, Summary of Marine Mammal and Seabird Surveys of the Southern California Bight Area, 1975-1978. Final Report prepared by the University of California, Santa Cruz, for the Bureau of Land Management, Contract No. AA550-CT7-36. National Technical Information Service, Springfield, Virginia. NTIS # PB81248189. 414 pp.

Marine Mammal and Seabird Surveys of Central and Northern California

PRINCIPAL INVESTIGATOR(S)/AFFILIATION: Thomas P. Dohl, Center for Marine Studies, University of California, Santa Cruz.

STUDY AREA and TIME PERIOD:

Shelf, slope, and offshore waters to a distance of 100 nm off the California coast from Point Conception to the California-Oregon boundary, February 1980 through June 1983.

METHODOLOGY: Offshore transect surveys were flown twice-monthly at two different altitudes (200 ft and about 750-1,000 ft ASL) along approximately 40 east-west transect lines extending an average of 60 nm offshore. The transects sampled on a given survey were selected randomly from a set of 92 standard (predetermined) lines spaced at intervals of 5' of latitude. Standard transects provided systematic coverage of shelf, slope, and offshore waters in the study area. Sightings of seabirds, pinnipeds, and sea otters were recorded only on low-

altitude surveys. Sightings of cetaceans and turtles were recorded on both low- and high-altitude surveys. Seabird sightings were recorded only on the shaded side of the aircraft within a strip transect of 50 m width. Marine mammal and turtle sightings were recorded within an unbounded corridor on both high- and low-altitude surveys, but only the shaded side of the aircraft was searched on the low-altitude surveys. Cross-legs connecting standard transects were searched only on high-altitude surveys. Offshore cross-legs were searched on both sides of the aircraft, while only the nearshore side was searched on cross-legs along the coast. Declination angle was measured and noted for each marine mammal/turtle sightings and later used to calculate a probability density function of frequency with right-angle sighting distance. Navigation was by Loran and VLF-Omega.

STUDIES and CODES:

CHIMAM -- Central/Northern Calif - High Aerial [Cetaceans Only]
CLALL1 -- Central/Northern Calif - Low Aerial [Birds and Mammals] *Part 1*
CLALL2 -- Central/Northern Calif - Low Aerial [Birds and Mammals] *Part 2*

DATA AVAILABILITY:

These data may be distributed freely. Please cite this compilation and the original studies.

REFERENCES:

Bonnell, M. L., M. O. Pierson, and G. D. Farrens. 1983. Pinnipeds and Sea Otters of Central and Northern California, 1980-1983: Status, Abundance, and Distribution. Part of Investigator's Final Report, Marine Mammal and Seabird Study, Central and Northern California, Contract No. 14-12-0001-29090. Prepared by Center for Marine Sciences, University of California, Santa Cruz, for the Pacific OCS Region, Minerals Management Service. OCS Study MMS 84-0044. 220 pp.

Briggs, K. T., W. B. Tyler, D. B. Lewis, and K. F. Dettman. 1983. Seabirds of Central and Northern California, 1980-1983: Status, Abundance, and Distribution. Part of Investigator's Final Report, Marine Mammal and Seabird Study, Central and Northern California, Contract No. 14-12-0001-29090. Prepared by Center for Marine Sciences, University of California, Santa Cruz, for the Pacific OCS Region, Minerals Management Service. OCS Study MMS 84-0043. 246 pp.

Dohl, T. P., R. C. Guess, M. L. Duman, and R. C. Helm. 1983. Cetaceans of Central and Northern California, 1980-1983: Status, Abundance, and Distribution. Part of Investigator's Final Report, Marine Mammal and Seabird Study, Central and Northern California, Contract No. 14-12-0001-29090. Prepared by Center for Marine Sciences, University of California, Santa Cruz, for the Pacific OCS Region, Minerals Management Service. OCS Study MMS 84-0045. 284 pp.

California Seabird Ecology Study

PRINCIPAL INVESTIGATOR(S)/AFFILIATION: Kenneth T. Briggs, Institute of Marine Sciences, University of California, Santa Cruz; portions of this work were done by D. G. Ainley and others at Point Reyes Bird Observatory, Stinson Beach, CA, and by L. B. Spear and others at Science Applications International Corporation, Monterey, CA.

STUDY AREA and TIME PERIOD:

From Monterey Bay to about Bodega Head., 1984 through 1987.

METHODOLOGY: Surveys of seabird abundance and distribution were done by aircraft and by ship (not included here). Data collection protocols for aerial surveys were identical with

those used for the Central and Northern California Marine Mammal and Seabird Surveys (see above). Four aerial surveys were conducted in the spring and summer of 1985 (March 12-13, 21, May 10, 27-28). Effort data for aerial surveys consist of start-stop pairs of coordinates (date/time, latitude, and longitude); sightings have been assigned a position interpolated from the time of the observation.

STUDIES and CODES:

SBECOL -- Seabird Ecology Study (Aerial Portion) [Birds and Mammals]

DATA AVAILABILITY:

These data may be distributed freely. Please cite this compilation and the original studies.

REFERENCE:

Briggs, K. T., D. G. Ainley, D. R. Carlson, D. B. Lewis, W. B. Tyler, L. B. Spear, and L. A. Ferris. 1987. Final Report: California Seabird Ecology Study. Prepared by the Institute of Marine Sciences, University of California, Santa Cruz, for the Pacific OCS Region, Minerals Management Service, Contract No. 14-12-001-30183. vii and 153 pp.

Briggs, K.T., W.B. Tyler, and D.B. Lewis. 1985a. Aerial surveys for seabirds: methodological experiments. *Journal of Wildlife Management* 49(2): 412-417.

Briggs, K.T., W.B. Tyler, and D.B. Lewis. 1985b. Comparison of ship and aerial surveys of birds at sea. *Journal of Wildlife Management* 49(2):405-411.

Briggs, K.T., W.B. Tyler, D.B. Lewis, and D.R. Carlson. 1987. Bird communities at sea off California: 1975 to 1983. *Stud. Avian Biol.* 11.

Oregon and Washington Marine Mammal and Seabird Surveys

PRINCIPAL INVESTIGATOR(S)/AFFILIATION: G. A. Green, Ebasco Environmental, Bellevue, Washington, M. L. Bonnell and K. T. Briggs, Ecological Consulting, Inc., Portland, Oregon

STUDY AREA and TIME PERIOD:

Pacific Ocean waters of Oregon and Washington from the coast to approximately 60 nautical miles offshore, April 1989 through October 1990.

METHODOLOGY: Aerial surveys were conducted along 32 pre-established transects designed to systematically sample marine mammal and seabird abundance in all waters of the study area. Coastal surveys and one shelf break survey were also conducted. Standard transects provided systematic coverage of shelf, slope, and offshore waters in the study area. Sightings of seabirds, pinnipeds, cetaceans, and turtles were recorded. Seabird sightings were recorded only on the shaded side of the aircraft within a strip transect of 50 m width. Marine mammal and turtle sightings were recorded within an unbounded corridor. Declination angle was measured and noted for each marine mammal/turtle sightings and later used to calculate a probability density function of frequency with right-angle sighting distance. Navigation was by Loran and VLF-Omega. One ship survey was also conducted from aboard the NOAA ship Miller Freeman during August 1989.

STUDIES and CODES.

- OWPELB -- Oregon/Washington Aerial [Birds and Mammals]
- OWPELM -- Oregon/Washington Aerial [Mammal Observations Only]
- OWMLFR -- Oregon/Washington Ship [Bird and Mammal Observations]

DATA AVAILABILITY:

These data may be distributed freely. Please cite this compilation and the original studies.

REFERENCES:

Green, G. A., J. J. Brueggeman, C. E. Bowlby, R. A. Grotefendt, M. L. Bonnell, and K. T. Balcomb, III. 1991. Cetacean Distribution and Abundance Off Oregon and Washington, 1989-1990. Final Report prepared by Ebasco Environmental, Bellevue, WA, and Ecological Consulting, Inc., Portland, OR, for the Minerals Management Service, Pacific OCS Region. OCS Study MMS 91-0093. 100 pp.

Bonnell, M. L., C. E. Bowlby, and G. A. Green. 1991. Pinniped Distribution and Abundance Off Oregon and Washington, 1989-1990. Final Report prepared by Ebasco Environmental, Bellevue, WA, and Ecological Consulting, Inc., Portland, OR, for the Minerals Management Service, Pacific OCS Region. OCS Study MMS 91-0093. 60 pp.

Briggs, K. T., D. H. Varoujean, W. W. Williams, R. Glenn Ford, M. L. Bonnell, and J. L. Casey. 1991. Seabirds of the Oregon and Washington OCS, 1989-1990. Final Report prepared by Ebasco Environmental, Bellevue, WA, and Ecological Consulting, Inc., Portland, OR, for the Minerals Management Service, Pacific OCS Region. OCS Study MMS 91-0093. 164 pp.

CDFG-OSPR and Related Aerial Surveys

Training Flights, Special Projects, and Related MMS Surveys

Contract Number: FG7407-OS with California Department of Fish and Game (CDFG), Office of Spill Prevention and Response (OSPR); and 14-35-0001-30758 (Task 13293) with the Coastal Marine Institute, University of California, Santa Barbara.

PRINCIPAL INVESTIGATOR(S)/AFFILIATION: Michael L. Bonnell, Ph.D. (1994- 1999) and W. Breck Tyler (2000-2008) Institute of Marine Sciences, University of California, Santa Cruz.

OBJECTIVES: Develop and maintain a capability to provide aerial surveys of marine bird and mammal distribution and abundance for oil spill response and post-spill injury assessment.

STUDY AREA and TIME PERIOD:

Coastal and inland marine waters of California, June 1994 through June 2008.

METHODOLOGY:

Aerial surveys were conducted in a variety of California locales with experienced observers and trainees. The aircraft used was a Partenavia PN68 Observer provided by the Department of Air Services, CDFG, flown at an altitude of 200' (60m) above ground level and at a typical air speed of 90 kts. Two observers (at least one experienced) occupied middle seats and

searched a corridor of 50m (1994-2001) or 75m (2003-2008) on each side of the aircraft. Width was defined by clinometer and simple trigonometric functions. Species, numbers, behavior and other information was described on hand-held voice recorders for later transcription and computer entry. The co-pilot position was occupied by a navigator/computer operator. This individual recorded number of observers on-watch, transect status (i.e., on-effort, off-effort, and commutes), as well as sea state, weather and other observation conditions. Date, time, and position of the aircraft were recorded directly into the data-logging computer with time, latitude and longitude provided by a Global Positioning System (GPS).

Databases produced include date, time, latitude/longitude, behavior, observation conditions, and other information for each sighting of marine birds, mammals, and turtles. Some surveys were solely for the purpose of drills and training and some were for systematic data collection. Effort for earlier surveys (year range) was binned to 5 minute latitude longitude blocks and for later surveys (year range) was binned to 1 minute latitude longitude blocks.

OSPR and UCSC provided observers for the OSPR surveys, southern California surveys using the same protocols were conducted by the Minerals Management Service (MMS), Pacific OCS Region, which provided most observers for surveys flown in Santa Barbara Channel and the Santa Maria Basin.

STUDIES and CODES:

WOSPR5 – OSPR Aerial Surveys [Birds and Mammals] 1994-2001
MMSSBC -- So. Calif Bight/MMS Surveys [Birds and Mammals] 1995-1997
WSOSPR -- OSPR Aerial Surveys [Birds and Mammals] 2003-2008
LHMAMA – Marbled Murrelet Aerial Surveys – 2005-2006

DATA AVAILABILITY:

These data may be distributed freely. Please cite this compilation and the original studies.

Aerial Surveys in Response to Various Oil Spill Incidents

PRINCIPAL INVESTIGATOR(S)/AFFILIATION: Michael L. Bonnell and W. Breck Tyler, University of California, Santa Cruz under contract to CDFG-OSPR.

STUDY AREA and TIME PERIOD:

Waters off California and in San Francisco Bay, in response to various oil spill incidents, 1997 – 2007.

METHODOLOGY: Aerial surveys were conducted in a variety of California locales with experienced observers and trainees. The aircraft used was a Partenavia PN68 Observer provided by the Department of Air Services, CDFG, flown at an altitude of 200' (60m) above ground level and at a typical air speed of 90 kts. Two observers (at least one experienced) occupied middle seats and searched a corridor of 50m (1994-2002) or 75m (2003-2008) on each side of the aircraft. Width was defined by clinometer and simple trigonometric functions. Species, numbers, behavior and other information was described on hand-held voice recorders for later transcription and computer entry. The co-pilot position was occupied

by a navigator/computer operator. This individual recorded number of observers on-watch, transect status (i.e., on-effort, off-effort, and commutes), as well as sea state, weather and other observation conditions. Date, time, and position of the aircraft were recorded directly into the data-logging computer with time, latitude and longitude provided by a Global Positioning System (GPS).

STUDIES and CODES:

IRKURE – Incident Response Surveys – *M.V. Kure* 1997
IRCOMM – Incident Response Surveys – *M.V. Command* -- 1998
IRSTUY– Incident Response Surveys – *M.V. Stuyvesant* 1999
IRLUCK – Incident Response Surveys – *Jacob Luckenbach* – 2001-2003
IRSBCH – Incident Response Surveys – Ventura Oiled Bird Incident – 2005
IRCOBU– Incident Response Surveys – *M.V. Cosco Busan* 2007

DATA AVAILABILITY:

These data may be distributed freely. Please cite this compilation and the original studies.

REFERENCES:

Command Oil Spill Final Restoration Plan and Environmental Assessment (United States Fish and Wildlife Service, National Oceanic and Atmospheric Administration, California Department of Fish and Game, California Department of Parks and Recreation, and California State Lands Commission , 2004).

Kure/Humboldt Bay Oil Spill Final Damage Assessment Restoration Plan/Environmental Assessment, Final Damage Assessment and Restoration Plan/Environmental Assessment (California Department of Fish and Game, U.S. Fish and Wildlife Service, July 2008).

S.S. Jacob Luckenbach and Associated Mystery Oil Spills Final Damage Assessment and Restoration Plan/Environmental Assessment (California Department of Fish and Game, National Oceanic and Atmospheric Administration, and United States Fish and Wildlife Service, 2006).

Stuyvesant/Humboldt Coast Oil Spill Final Damage Assessment and Restoration Plan/Environmental Assessment, (California Department of Fish and Game, California State Lands Commission, and United States Fish and Wildlife Service, 2007). .

Other California Studies

PRINCIPAL INVESTIGATOR(S)/AFFILIATION: Laird Henkel, University of California, Santa Cruz, HT Harvey & Associates, and CDFG-OSPR.

STUDY AREA and TIME PERIOD:

Various studies in nearshore waters off central California , 1999 – 2007.

METHODOLOGY:

Boat-based surveys were conducted from small boats (< 6m) in nearshore waters (< 2km from shore) off California. Surveys were conducted off San Mateo and Santa Cruz Counties, with the exception of “Morro Bay Boat Surveys” off San Luis Obispo County. Experienced

observers recorded all birds within a 50m corridor on each side of the vessel. Observer height varied from approximately 1m to 3m off the water. Survey speed was typically 15-20 km/hr.

STUDIES and CODES:

LHMAMB – Marbled Murrelet Boat Surveys – 2005-2006

MAMUMB – Morro Bay Boat Surveys – 2003-2004

MAMUCC – Central California Boat Surveys -- 2007

ANUEVO -- Año Nuevo Boat Surveys – 1999-2002

DATA AVAILABILITY:

These data may be distributed freely. Please cite this compilation and “L. Henkel, unpubl. data.”

REFERENCES:

HENKEL, L.A., FORD, R.G., TYLER, W.B. & DAVIS, J.N. 2007. Comparison of aerial and boat-based survey methods for Marbled Murrelets *Brachyramphus marmoratus* and other marine birds. *Marine Ornithology* 35: 145–151.

Peery, M.Z., L.A. Henkel, B.H. Becker, S.H. Newman, J.T. Harvey, C. Thompson, and S.R. Beissinger. 2008. Effects of rapid flight-feather molt on post-breeding dispersal in a pursuit-diving seabird. *Auk* 125(1): 113-123.

STUDY CODE	Taxa*	Name	Investigator	Years	Platform
SCBSHP	B/M	So. Cal. Bight	Briggs/Bonnell/Dohl	1975-1978	SHIP
OWMLFR	B/M	Miller Freeman Cruise	K. Briggs	1989	SHIP
SLOBRD	B/M	So. Cal. Bight Low Aerial [B]	K. Briggs	1975-1978	AIR
CLALL1	B/M	Cent/Nor Calif. Low Aerial 1	K. Briggs/M. Bonnell	1980-1981	AIR
CLALL2	B/M	Cent/Nor Calif. Low Aerial 2	K. Briggs/M. Bonnell	1982-1983	AIR
SBECOL	B/M	Seabird Ecology Study Aerial	K. Briggs	1985	AIR
OWPELB	B/M	Oregon/Washington Pelagic [B]	K. Briggs	1989-1990	AIR
WOSPR5	B/M	OSPR Wildlife Surveys 1	Bonnell/Tyler	1994-2003	AIR
MMSSBC	B/M	MMS Santa Barbara Channel	Bonnell/Pierson	1995-1997	AIR
WSOSPR	B/M	OSPR Wildlife Surveys 2	W. Tyler	2004-2008	AIR
IRLUCK	B/M	<i>Luckenbach</i> Surveys	W. Tyler	2001-2003	AIR
IRKURE	B/M	<i>Kure</i> Surveys	M. Bonnell	1997	AIR
IRSTUY	B/M	<i>Stuyvesant</i> Surveys	W. Tyler	1999	AIR
IRCOBU	B/M	<i>Cosco Busan</i> Surveys	W. Tyler	2007	AIR
IRCOMM	B/M	<i>Command</i> Surveys	W. Tyler	1998	AIR
IRSBCH	B/M	Ventura Oiled Bird Incident	W. Tyler	2005	AIR
LHMAMA	B/M	LH Marbled Murrelet Surveys 1	L. Henkel	2005-2006	AIR
LHMAMB	B/M	LH Marbled Murrelet Surveys 2	L. Henkel	2005-2006	BOAT
MAMUMB	B/M	LH Morro Bay	L. Henkel	2003-2004	BOAT
MAMUCC	B/M	LH Central California	L. Henkel	2007	BOAT
ANUEVO	B/M	LH Año Nuevo	L. Henkel	1999-2002	BOAT
SLOMAM	M	So. Cal. Bight Low Aerial [M]	M. Bonnell	1975-1978	AIR
SHIMAM	C	So. Cal. Bight High Aerial [C]	T. Dohl	1975-1978	AIR
CHIMAM	C	Cent/Nor Calif. High Aerial [M]	T. Dohl	1980-1983	AIR
OWPELM	M	Oregon/Washington Pelagic [M]	J. Brueggeman	1989-1990	AIR

* B/M = Birds and Mammals, **M** = Mammals Only, **C** = Cetaceans Only.