UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center
8604 La Jolla Shores Drive
La Jolla, CA 92037

28 April 2006

CRUISE REPORT

VESSEL: NOAA Ship *McArthur II*

CRUISE NUMBER: AR-05-07, SWFSC Cruise Number: 1629

PROJECT: Pacific Islands Cetacean Ecosystem Assessment Survey (PICEAS 2005)

STUDY AREA: The United States' Exclusive Economic Zones of Palmyra and Johnston Atoll and adjacent areas where Hawaiian long-line by-catch occurs.

ITINERARY:

Leg 1: Depart 28 July San Francisco, CA	Arrive 08 August Honolulu, HI
Leg 2 – Depart: 11 August Honolulu, HI	Arrive: 09 September Honolulu, HI
Leg 3 – 13 September Honolulu, HI	Arrive: 11 October Honolulu, HI
Leg 4 – 17 October Honolulu, HI	Arrive: 15 November Honolulu, HI
Leg 5 – Depart: 19 November Honolulu, HI	Arrive: 29 November San Diego, CA
Return transit – Depart: 02 December San Diego	Arrive: 07 December Seattle, WA

SPONSORING INSTITUTIONS: Protected Resources Division, Southwest Fisheries Science Center, (SWFSC, NMFS, NOAA)

CRUISE DESCRIPTION AND OBJECTIVES: The PICEAS 2005 cruise was an ecosystem survey in the US EEZ waters of Palmyra and Johnston Atoll and the adjacent waters south of Hawaii where US-based long-line fishing occurs. Line-transect data were collected to estimate density and abundance for all cetacean species present in the study area. Photos were taken to be used as ID data on false killer whales, spinner dolphins, and other key species for population structure and movement studies, and biopsy samples were taken for genetic studies of population structure. In addition, the following data were collected to quantify cetacean, seabird and sea turtle habitats and to allow geo-spatial modeling of cetacean density: oceanographic sampling (sea surface salinity and temperature, CTDs to 1000m, XBTs, chlorophyll samples, primary productivity), net sampling (bongo, manta and dipnet), recordings of acoustic backscatter measuring mid-water prey, and seabird sightings. Cetacean vocalizations were monitored and recorded using a hydrophone array and sonobuoys.

CHIEF SCIENTIST: Dr. Jay Barlow, SWFSC (858) 546-7178, Jay.Barlow@noaa.gov.

1.0 PROCEDURES FOR DAYLIGHT OPERATIONS

1.1 Cetacean Survey - Line-transect survey methods were used to collect abundance data. Search effort started on the trackline at the beginning of each day. The *McArthur II* traveled at approximately 10 knots (through the water) along the designated trackline. If the ship's speed through the water deviated from this by more than one knot while on search effort, the bridge personnel notified the mammal team on watch or the Cruise Leader. A daily watch for cetaceans was maintained on the flying bridge during daylight hours (approximately 0600 to 1900) by 6 mammal observers. Each observer worked in 2-hour rotations, manning each of the following 3 stations on the flying bridge for 40 minutes: a port side 25x150 binocular station, a center-line data recorder position, and a starboard 25x150 binocular station. An "independent observer" kept a separate watch of animals sighted during the cetacean survey operations, to be compared later with the observer team's data. Normal marine mammal survey procedures (closing mode) were used during the transits from San Francisco to Hawaii (Leg 1) and back to San Diego (Leg 5).

1.1.1 Logging of Data - Observation conditions, watch effort, sightings and other required information were entered into a computer, hooked up to the ship's Global Positioning System (for course, speed and position information) and Scientific Computing System (for weather and heading information). All science computers were connected to the same ship's GPS.

1.1.2 Breaking Trackline - On sighting a cetacean school or other feature of biological interest, the Cruise Leader or marine mammal observer team on watch requested that the vessel be maneuvered to approach the school or feature for investigation. When the ship approached a school of cetaceans, the observers made independent estimates of school size and the proportions of each species present. For sperm whales, group size was estimated at 10, 60, and 90 minutes after the initial sightings. Biopsy and photographic operations commenced from the bow, based on directions from the Cruise Leader or Senior Marine Mammal Observers. The Cruise Leader frequently requested the deployment of a small boat for biopsy, photography, or other operations (see 1.3). Occasionally, it was necessary to divert the ship's course from the established trackline during regular effort due to glare or adverse sea conditions. Under these circumstances, the ship diverted up to 30 degrees from the established course. This deviation was continued until the ship was 5 nautical miles from the trackline, at which point, the ship turned back toward the trackline.

1.1.3 Resuming Effort - When the observers completed scientific operations for the sighting, the ship resumed the same course and speed as prior to the sighting. If the pursuit of the sighting took the ship more than 10 nautical miles from the trackline, the observers were notified. The Cruise Leader or Senior Marine Mammal Observers infrequently requested that, rather than proceed directly toward the next waypoint, the ship take a heading of 20 degrees back toward the trackline.

1.2 Seabird Survey - Visual surveys of seabirds were conducted from the flying bridge during daylight hours by two seabird observers. Sighting conditions, effort, sightings, and other required information were entered into a computer interfaced with the ship's GPS (for course, speed, and position information) and SCS (for weather and heading information). All science computers were connected to the same ship's GPS. Seabird observers used handheld and 25x150 binoculars.

1.3 Small Boat Work - A small boat was frequently required for biopsy sampling, photography, seabird collection, island surveys, or marine turtle work. Deployment was requested by the Cruise Leader on an opportunistic basis, including multiple times in a single day, providing the Commanding Officer concurred that operating conditions were safe. Unless the Commanding Officer allowed otherwise, the

small boat remained within sight and radio contact at all times while deployed. With the exception of the small boat and required safety gear, all necessary gear was furnished by the scientific party.

1.4 Biopsy Sampling - Biopsy samples for genetic analyses of cetaceans were collected on an opportunistic basis. Necessary permits were present on the vessel. The animals to be sampled were approached by the research vessel during normal survey operations, approached the vessel on their own, or were approached by a small boat. Samples were collected using a dart fired from a crossbow or rifle when animals were within 10 to 30 m of the bow of the vessel. With the exception of the small boat and safety gear, all necessary gear was furnished and operated by the scientific party.

1.5 Photography - Photographs of cetaceans were taken frequently on this survey. Necessary permits were present on the vessel. The animals to be photographed were approached by the research vessel during normal survey operations, approached the vessel on their own, or were approached by a small boat. With the exception of the small boat and safety apparel, all necessary gear was furnished by the scientific party.

1.6 Collection of Fish - Fish were collected on an opportunistic basis at the discretion of the Cruise Leader. When conditions permitted, trolling gear was used. While stationary, hook-and-line gear was used. Fish were measured, sexed, and stomach contents were examined and recorded by scientific personnel. The Cruise Leader was responsible for the disposition of the catch, in accordance with NOAA Administrative Order 202-735B, dated January 9, 1989. No recreational fishing was permitted within the Naval Defensive Sea Areas of Johnston Island, Sand Island and Kingman Reef, and the Territorial Waters of the Palmyra Atoll National Wildlife Refuge. The Naval Defensive Sea Area extends approximately 3 nautical miles from the extreme high water marks. The Territorial Waters of Palmyra are 12 nautical miles from the high water mark.

1.6.1 Collection for Food-web Isotope Project - Samples from the fish mentioned above were taken for the Food-web Isotope Project. The date, location, time of day, species, length, and sex of each fish were recorded by scientific personnel. The stomach was removed and frozen, with stomach contents intact, after being examined. A piece of the liver and a core of white muscle was also removed and frozen.

1.7 Collection of Jellyfish samples – Jellyfish and other gelatinous plankton were collected opportunistically for leatherback turtle dietary studies. Jellyfish were collected using dip nets, during scheduled bongo and manta tows, or from the small boat. Samples were frozen for future stable isotope analysis.

1.8 Salvage of Cetaceans - Permits to salvage and import cetacean parts were present on the vessel; however, no cetacean parts were salvaged during this cruise.

1.9 Acoustics - The scientific EK-60 depth sounder was operated continuously, at 38, 120 and 200 KHz and was interfaced to a data acquisition system to estimate micronekton biomass between 0 and 500 m. The vessel's navigational depth sounder was used at the discretion of the Commanding Officer, but remained off while underway in deep waters.

1.9.1 Towed Hydrophone Array - The primary towed hydrophone array was towed 300m behind the ship at a depth of 11m and a speed of 10 knots on Legs 1 through 4. The array was wound onto a hydraulic-powered winch supplied by the SWFSC. Hookup to a ship-powered hydraulic system

was required. Two acoustic technicians rotated on three-hour shifts during daylight hours monitoring the array, recording cetacean sounds, and localizing their positions. Clear cetacean sounds were recorded on a Tascam DA-78HR multi-channel recorder and occasionally high frequency vocalizations were recorded directly to the computer hard disk. Continuous single channel recordings were made to a computer hard drive using a National Instruments data acquisition board (NI-DAQ 6062E) at 200 kHz sampling rate. A record was kept of acoustic effort, comments and five minute acoustic updates using the program WHALTRAK. Real-time visual displays of sounds were monitored using Ishmael software. These angles were then plotted on the WHALTRAK display and saved to file. A summary of acoustic detection information was saved to an Access database. A program call ROCCA (Real-time Odontocete Call Classification Algorithm) was developed by Julie Oswald, and it's ability to classify dolphin species from their whistles was tested on this cruise. Due to breakdowns, the array was not used on Leg 5.

Information on acoustic detections of sperm whale detections was not shared with the visual team until the animals had clearly passed abeam of the vessel, but the vessel could be turned immediately for visual detections. Therefore, on this cruise the visual team was independent of the acoustic team, but not vice versa. Visual observers frequently relayed information about delphinid sightings to the acoustic team to aid them in their documentation of delphinid whistle recordings. The acoustics team would report dolphin schools that had passed the beam within 3 nautical miles if there was an opportunity to chase the animals using localization of the vocalizations. Acoustic chases were made opportunistically, as time allowed, and if the dolphin groups were seen, an off-effort sighting was recorded. ROCCA correctly classified whistles from several dolphin groups as being from false killer whales, and because this was one of the focal species for the cruise, acoustic localizations of this species were sometimes pursued even when they passed more than 3 nautical miles abeam. The towed hydrophone array and ROCCA greatly increased the number of false killer whale groups sampled on this survey.

1.9.1.2 Calibration of Towed Hydrophone Array - To calibrate the sensitivity of the hydrophone array and to measure the propagation of sound at varying distances from the ship, an underwater transducer was lowered from a small boat as it remained at a stationary location, initially 4km in front of NOAA Ship *McArthur II*. The small boat broadcasted a sound at 160 dB source level. NOAA Ship *McArthur II* and its towed hydrophone array approached the boat, passing it approximately 50m to 1km abeam. This experiment was repeated several times at different beam distances and in different locations during the survey. This activity did not require an MMPA permit.

1.9.2 Sonobuoys - Sonobuoys were deployed to record cetacean sounds that could not be successfully recorded from the hydrophone array. The focus of these efforts was to obtain recordings of Brydes whales, especially for animals from which genetic samples were obtained. Sonobuoys (type 53 or 77) were typically deployed within ½ nautical miles of a baleen whale that had been sighted by the visual team. Sonobuoy signals were recorded on a DAT recorder and were monitored using a scrolling spectrographic display.

1.9.3 High-frequency Acoustic Recording Package (HARP) - The Southwest Fisheries Science Center deployed one high-frequency acoustic recording package (HARP) at Palmyra Atoll (at 5° 54.1'N, 162° 7.2'W). The HARP was provided by John Hildebrand, Scripps Institution of Oceanography; it's dimensions were 44"W x 47"D x 32"H, and it weighed approximately 450lbs. It was deployed over the side with a ship speed of about 1 knot. The instrument was hooked with a pelican hook, and tag lines were set to stabilize the instrument during operations. The floats and hydrophone were gently lowered into the water and then the frame and tag lines were released. After release, the

instrument sank at approximately 40m/min. Once it reached the seafloor, an operator on board acoustically communicated with it to ensure proper location and functioning.

1.10 Oceanography - Oceanographic sampling was done by the Oceanographer, ship's Survey Technician, and other designated scientists, while underway during the day.

1.10.1 XBT Drops - There were three XBT drops per day, at 0900, 1200 and 1500 hours local ship time, or as requested by the Cruise Leader. The XBTs were provided by the SWFSC, and the launcher/computer was provided by the ship. XBTs were conducted by one person per drop (either by a member of the scientific party or by the Survey Technician). At least one drop per day was conducted by the ship's Survey Technician. If the vessel was stopped at the scheduled launch time, the drop was delayed until the ship was underway again. If the vessel was not going to move within half an hour, the individual performing the drop would be notified and the drop was delayed or canceled at the discretion of the Cruise Leader. XBTs were not deployed in the waters of the Pacific Remote Islands National Wildlife Refuge Complex.

1.10.2 Surface Water Samples - A surface water sample for chlorophyll *a* analysis and a bucket temperature were taken at 0900, 1200, 1500 and 1800 hours local ship time daily. These samples were taken by either a member of the scientific party or the Survey Technician.

1.10.3 Filtering Water Samples - On all five legs, small samples of particulate organic matter (POM) were filtered from seawater collected near the sea surface for the Food-web Isotope Project. At a convenient hour in the morning, water was collected from the ship's thermosalinograph outflow, placed in a pressurized carboy filtration system, and left for several hours (up to about 6 h) to filter on to 25-mm glass fiber filters. After filtration was complete, the glass fiber filters were placed in pre-baked aluminum foil, and stored frozen. R. Olson, IATTC, provided the sampling equipment and instructions.

1.10.4 Thermosalinograph Sampling - The ship provided and maintained a thermosalinograph (TSG), which was calibrated and in working order, for continuous measurement of surface water temperature and salinity. The SCS served as the main data collection system. The Oceanographer provided the ship's Operations Officer and Electronics Technician with detailed SCS acquisition information before departure and a member of the scientific party sailing on the initial transit provided additional technical support. All SCS data was provided to the SWFSC Oceanographer following each leg of the cruise.

2.0 PROCEDURES FOR NIGHT OPERATIONS

A chronological record of oceanographic and net tow stations were kept by the ship (Marine Operations Log) with dates and times in GMT. The ship provided a copy of the electronic marine operations log (with the cruise Weather Log and SCS data) to the SWFSC Oceanographer at the completion of the cruise. The main SeaBird CTD system was provided, maintained, and operated by the Survey Technician. The collection of oceanographic samples and their processing was conducted by the scientific party and Survey Technician. The crew of the vessel operated all deck equipment and were responsible for the termination (and any necessary reterminations) of the CTD cable pigtail to the conducting cable of the winch. The ship provided a complete backup system, consisting of a frame with weights, deck unit, and SeaBird 9/11+ CTD with conductivity and temperature sensors. All instruments,

their spares, and spare parts provided by the ship were maintained in working order and had current calibrations.

2.1 CTD Stations - Weather permitting, one or two CTD stations were occupied each night: an evening cast at the end-of-effort location (unless the ship would resume effort within 10 nautical miles the next morning), and a pre-dawn CTD. CTD data and seawater samples were collected using a SeaBird 9/11+ CTD with rosette and Niskin bottles fitted with silicone tubing and o-rings (supplied by Oceanographer). All casts were to 1000m, with the descent rate at 30m/min for the first 100m of the cast, then 60m/min after that, including the upcast between bottles. Cast times changed since sunrise and sunset varied during the cruise.

2.1.1 Pre-daylight Cast - The morning cast (1000m) began approximately one and one-half hours prior to sunrise. The exact starting time was determined the evening before, by the Operations Officer or Deck Officer. The time did not change more than 15 minutes from the previous day, even if sunrise changed more than this. This schedule was infrequently modified by the Oceanographer. Niskin bottle water samples were collected at seven light depths and five additional standard depths, between the surface and 1000m. These depths were determined just prior to each cast by entering the ship's position into a computer program. From each cast, chlorophyll samples (to 200m) and salinity samples (2 to 6 samples per cast, at least 500 and 1000m or bottom) were collected and processed on board. The 265ml chlorophyll samples were filtered onto GF/F filters, placed in 10ml of 90% acetone, refrigerated for 24 hours, and then analyzed on a Turner Designs model 10AU field fluorometer. Nutrient samples (0 - 500m) were collected, frozen, and stored on board. Salinity calibration samples were collected, recorded in the log provided, and then analyzed when one case of 24 bottles was full and had been temperature stabilized in the location of the salinometer. Both the Survey Technician and Oceanographer participated in sample collection (chlorophylls, nutrients and salts) and analysis of chlorophyll and salinity samples. Primary productivity was measured by radioactively labeled carbon uptake methods performed by the Oceanographer. Seven samples taken by the Oceanographer were spiked with ^{14}C, incubated on deck for 24 hours, and then filtered and stored for later analysis at the SWFSC. The Niskin bottles (#1-7) were rinsed after each cast and acid-washed at the end of each leg. Prior to departure from San Diego, the Oceanographer was trained by SWFSC personnel in the use of radioactive materials. A copy of the Southwest Fisheries Science Center's NRC license for the use of radioisotopes was kept on board. All radioactive waste was stored in secured drums and boxes, and returned to San Diego (i.e. no disposal of radioactivity at sea).

2.1.2 Post Effort Cast - An evening CTD cast, to 1000m, was conducted a minimum of one hour after sunset. The exact time was determined by the Deck Officer (by 1800 local ship time that day). Bottle samples were collected from 12 standard depths (0, 20, 40, 60, 80, 100, 120, 140, 170, 200, 500, 1000m). Samples for chlorophyll, nutrients and salts were taken as listed above (except for the addition of four salinity samples taken from every other evening cast).

2.2 Net Sampling - Net tows were conducted by the scientific party as assigned by the Cruise Leader, with the assistance the Survey Technician and a winch operator from the vessel.

2.2.1 Dipnetting - Concurrent with the evening CTD station on legs 2, 3 and 4, dipnetting for surface fauna was conducted by scientific personnel at the discretion of the Cruise Leader, for one full hour, from the starboard side of the ship. This station began no sooner than one full hour after sunset. Deck lights illuminated the water surface in the area of dipnet sampling. Samples were preserved, labeled, and stored in the vessel's freezer. Scientists also collected surface fauna for the aquarium on

board. All live organisms were donated to the Birch Aquarium upon return to San Diego.

2.2.1.1 Dipnetting for Food-web Isotope Project - Surface fauna as mentioned above was shared with the Food-web Isotope Project, at the discretion of the Cruise Leader and the scientist directing this activity. Samples were labeled and stored in the vessel's freezer.

2.2.2 Bongo Tow - An oblique bongo tow (45 minute station time) was conducted for fifteen minutes immediately following the post-sunset CTD station and dipnetting, to a depth of 200m (wire out 300m on starboard hydro winch). The Bongo had 505 micron mesh on the starboard side, and 333 micron mesh on the port side. The sample from the starboard, metered net was preserved in formalin, labeled and stored in containers provided by the SWFSC until the vessel returned to San Diego (post-cruise analysis by FRD). The second cod end of the bongo (port side, 333 micron mesh) was frozen for the Food Web-Isotope Project (B. Olson/ IATTC)

2.2.2.1 Samples for Food-web Isotope Project (Bob Olson) and the Leatherback Turtle Diet Isotope Project (Jeff Seminoff) - The contents of the second cod end of the bongo were placed in plastic Ziploc bags, labeled, and stored frozen. R. Olson, (IATTC), provided supplies to label and store these samples.

2.2.3 Manta Tow - A surface manta net tow was conducted for fifteen minutes immediately following the post-sunset bongo tow and dipnetting. The manta tow was done in the dark with deck lights turned off for the 15-minute duration of the tow. The net was deployed from the starboard hydro winch. Samples were preserved in formalin, labeled, and stored in containers provided by the SWFSC until the vessel returned to San Diego.

2.3 Transit - When scientific operations were complete for the night, the ship resumed course and proceeded along the trackline, until it was necessary to stop and position the ship for the morning (pre-daylight) CTD station. The ship transited between 5 and 100 nautical miles per night.

3.0 SCIENTIFIC PERSONNEL

3.1 Chief Scientist - The Chief Scientist was Dr. Jay Barlow, SWFSC, at phone (858) 546-7178.

3.2 Participating Scientists -

Leg 1:

Position	Name	Affiliation
Chief Scientist	Jay Barlow	SWFSC
Senior Mammal Observer	Jim Cotton	SWFSC
Senior Mammal Observer	Richard Rowlett	SWFSC
Biopsy/Mammal Observer	Juan Carlos Salinas	AFL
Mammal Observer	Christopher Cutler	AFL
Mammal Observer	Suzanne Yin	AFL
Seabird Observer	Michael Force	AFL
Seabird Observer	Sophie Webb	AFL
Oceanographer	Melinda Kelley	AFL
Acoustician	Shannon Rankin	SWFSC
Acoustic Technician	Julie Oswald	AFL/SIO
Visiting Scientist	Alyssa Campbell	Marine Mammal Commission
Teacher-at-sea	Katie Roberts	Boston School District

Leg 2:

Position	Name	Affiliation
Chief Scientist	Jay Barlow	SWFSC
Senior Mammal Observer	Jim Cotton	SWFSC
Senior Mammal Observer	Richard Rowlett	SWFSC
Biopsy/Mammal Observer	Juan Carlos Salinas	AFL
Mammal Observer	Christopher Cutler	AFL
Mammal Observer	Suzanne Yin	AFL
Mammal Observer	Beth Goodwin	AFL
Seabird Observer	Michael Force	AFL
Seabird Observer	Sophie Webb	AFL
Oceanographer	Melinda Kelley	AFL
Acoustician	Shannon Rankin	SWFSC
Acoustic Technician	Julie Oswald	AFL/SIO
Visiting Scientist	Kerri Danil	SWFSC
Visiting Scientist	Stephanie Grassia	Visiting Scientist

Leg 3:

Position	Name	Affiliation
Chief Scientist	Lisa Ballance	SWFSC
Senior Mammal Observer	Jim Cotton	SWFSC
Senior Mammal Observer	Richard Rowlett	SWFSC
Mammal Observer	Lilian Carswell	AFL
Mammal Observer	Christopher Cutler	AFL
Biopsy/Mammal Observer	Suzanne Yin	AFL
Mammal Observer	Beth Goodwin	AFL
Seabird Observer	Michael Force	AFL
Seabird Observer	Sophie Webb	AFL
Oceanographer	Melinda Kelley	AFL
Acoustician	Shannon Rankin	SWFSC
Acoustic Technician	Sara Heimlich	OSU
Visiting Scientist	Robert Pitman	SWFSC
Visiting Scientist	Luis Vilchis	AFL/SIO

Leg 4:

Position	Name	Affiliation
Chief Scientist	Karin Forney	SWFSC
Senior Mammal Observer	Jim Cotton	SWFSC
Senior Mammal Observer	Richard Rowlett	SWFSC
Biopsy/Mammal Observer	Mark Deakos	HAMER
Mammal Observer	Christopher Cutler	AFL
Mammal Observer	Suzzane Yin	AFL
Mammal Observer	Beth Goodwin	AFL
Seabird Observer	Michael Force	AFL
Seabird Observer	Sophie Webb	AFL
Oceanographer	Melinda Kelley	AFL
Acoustician	Shannon Rankin	SWFSC
Acoustic Technician	Jen Pettis	AFL
Visiting Scientist	Dave Johnson	PIFSC
Visiting Scientist	Scott Benson	SWFSC

Leg 5:

Position	Name	Affiliation
Chief Scientist	Dave Johnson	PIFSC
Senior Mammal Observer	Jim Cotton	SWFSC
Senior Mammal Observer	Richard Rowlett	SWFSC
Biopsy/Mammal Observer	Mark Deakos	HAMER
Mammal Observer	Christopher Cutler	AFL
Mammal Observer	Suzanne Yin	AFL
Mammal Observer	Beth Goodwin	AFL
Seabird Observer	Michael Force	AFL
Seabird Observer	Sophie Webb	AFL
Oceanographer	Melinda Kelley	AFL
Acoustician	Shannon Rankin	SWFSC
Acoustic Technician	Jen Pettis	AFL
Teacher-at-sea	Lorayne Meltzer	Prescott College

4.0 RESULTS

The following summarizes the area surveyed and the data collected:

Figure 1. Tracklines surveyed aboard the NOAA Ship *McArthur II* during PICEAS 2005.

Figure 2. Sighting Locations of false killer whales (*Pseudorca crassidens*). Sightings are plotted over the tracklines for Figures 2-8.

Figure 3. Sighting Locations of short-finned pilot whales (*Globicephala macrorhynchus*).

Figure 4. Sighting Locations of Bryde's whales (*Balaenoptera edeni*).

Figure 5. Sighting Locations of spinner dolphins (*Stenella longirostris*).

Figure 6: Sighting Locations of rough-toothed dolphins (*Steno bredanensis*).

Figure 7: Sighting Locations of spotted dolphins (*Stenella attenuata*).

Figure 8: Sighting Locations of striped dolphins *(Stenella coeruleoalba*).

Table 1. Summary of the number of cetacean sightings during PICEAS 2005.

Table 2. Number of cetacean biopsy samples collected.

Table 3. Preliminary estimates of the number of cetacean and pinniped photographs obtained during PICEAS 2005 (digital and some 35mm).

Table 4. Summary of environmental data collected.

Table 5. Number of sighted cetacean groups per leg for which acoustic recordings were obtained using a towed hydrophone array.

Table 6. Number of non-sighted cetacean groups for which acoustic recordings were obtained using a towed hydrophone array.

Table 7. Sonobuoys deployed during PICEAS 2005.

5.0 DISPOSITION OF DATA

All data are currently being analyzed. The final data reports will be completed by January 2007.

Marine Mammal and passive acoustic data were delivered to the Chief Scientist, Dr. Jay Barlow, SWFSC, for analysis and distribution.

Biopsy samples were delivered to Dr. Barbara Taylor, SWFSC, for analysis and distribution.

Oceanographic data were delivered to Dr. Paul Fiedler, SWFSC, for analysis and distribution.

Food-web Isotope samples were delivered to Bob Olson, IATTC for analysis and distribution.

Prepared by: Sarah E Jackson LTJG NOAA Dated: 28 APRIL 2006
LTJG Sarah E. Jackson
Survey Coordinator, SWFSC

Dated: 28 Apr 2006
Dr. Jay Barlow
Chief Scientist, SWFSC

Approved by: Dated: 5/1/2006
Dr. Stephen Reilly
Chief, Protected Resources Division

Approved by: Dated: 5/2/06
Dr. William W. Fox, Jr.
Science Director, F/SWR

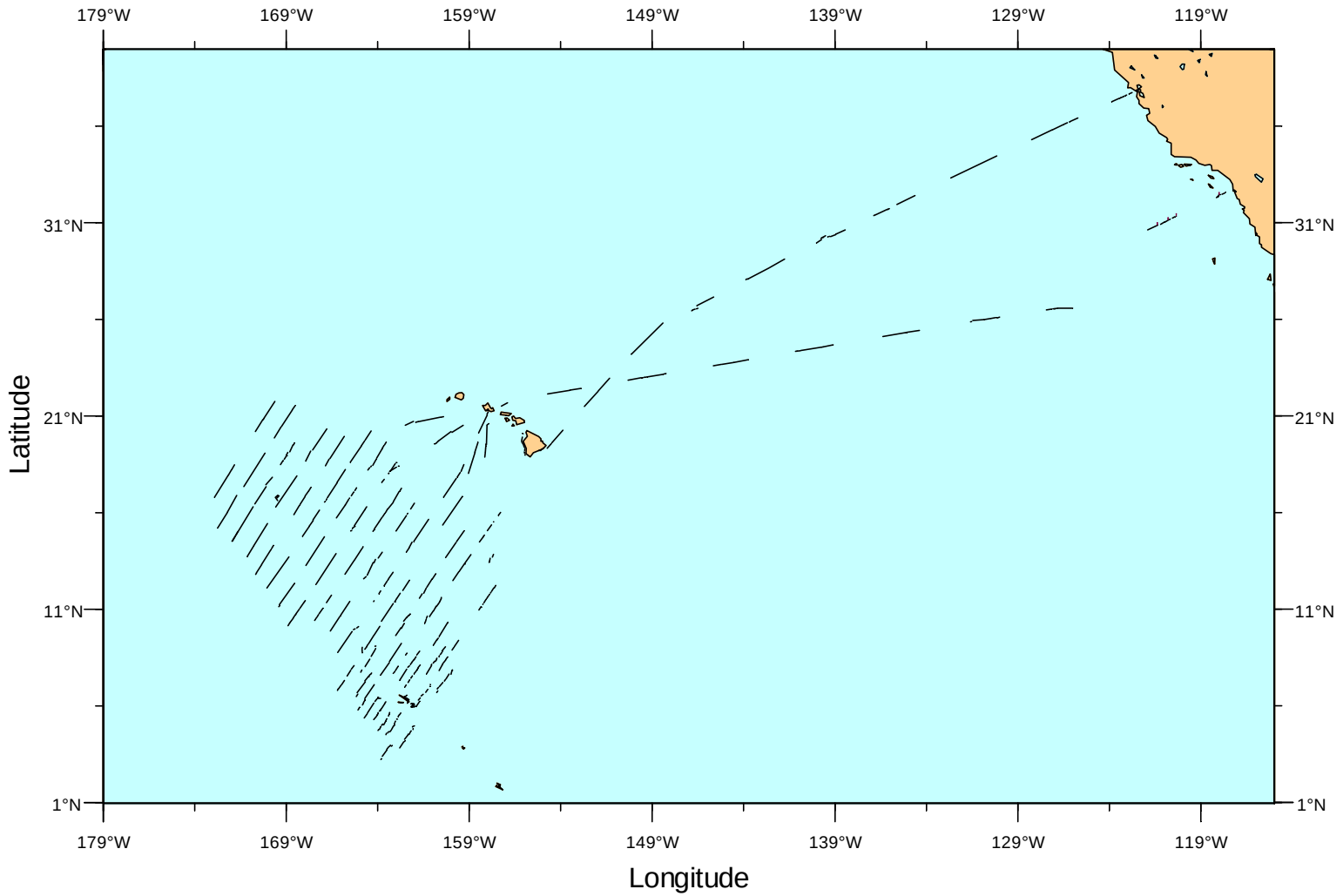

Figure 1. Tracklines surveyed aboard NOAA Ship *McArthur II* during PICEAS 2005.

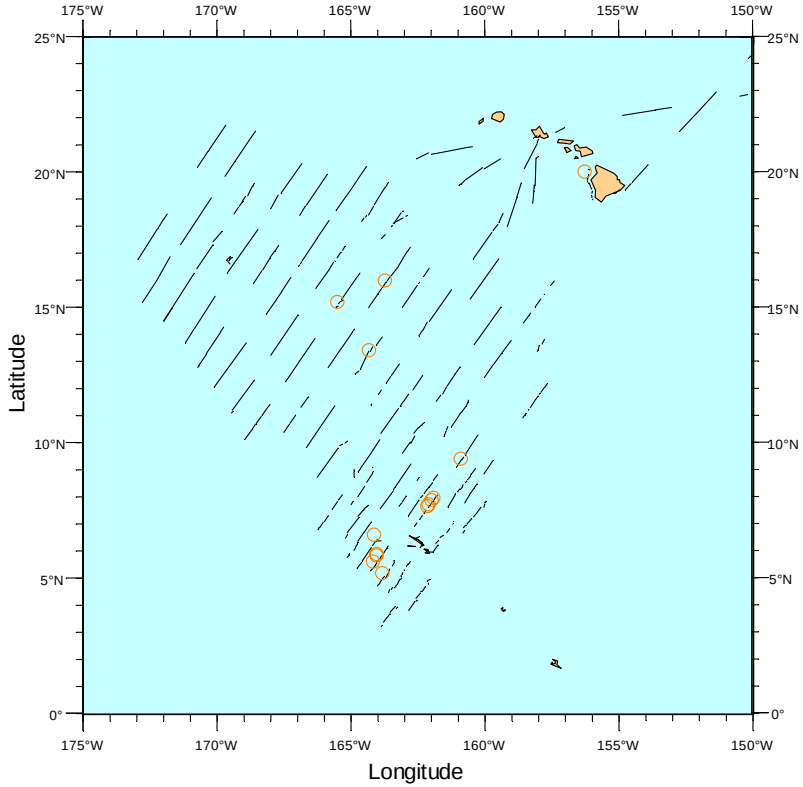

Figure 2. Location of false killer whales (*Pseudorca crassidens*)

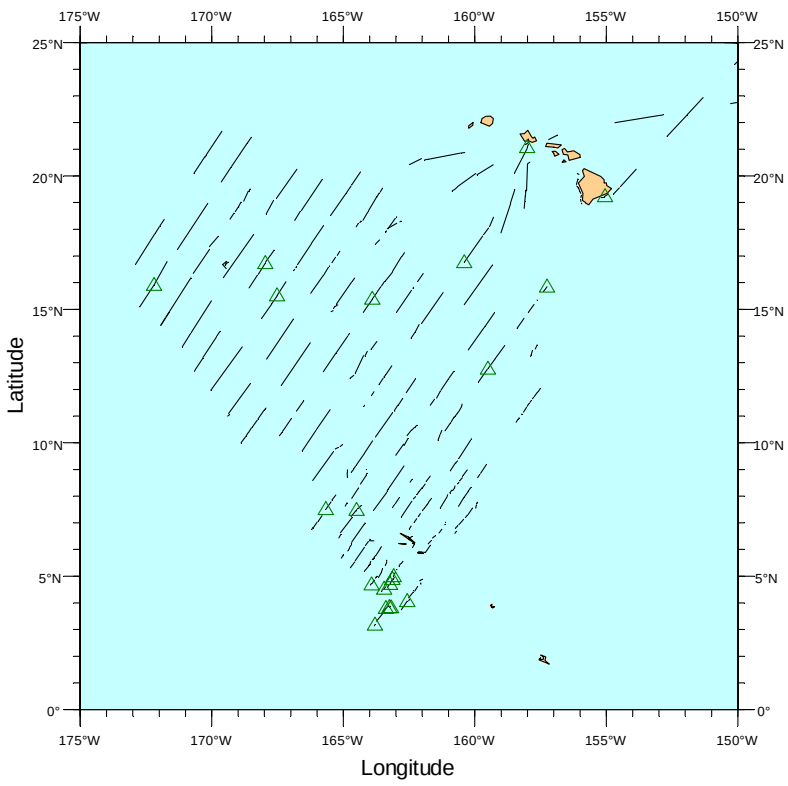

Figure 3. Location of short-finned pilot whales (*Globicephala macrorhynchus*).

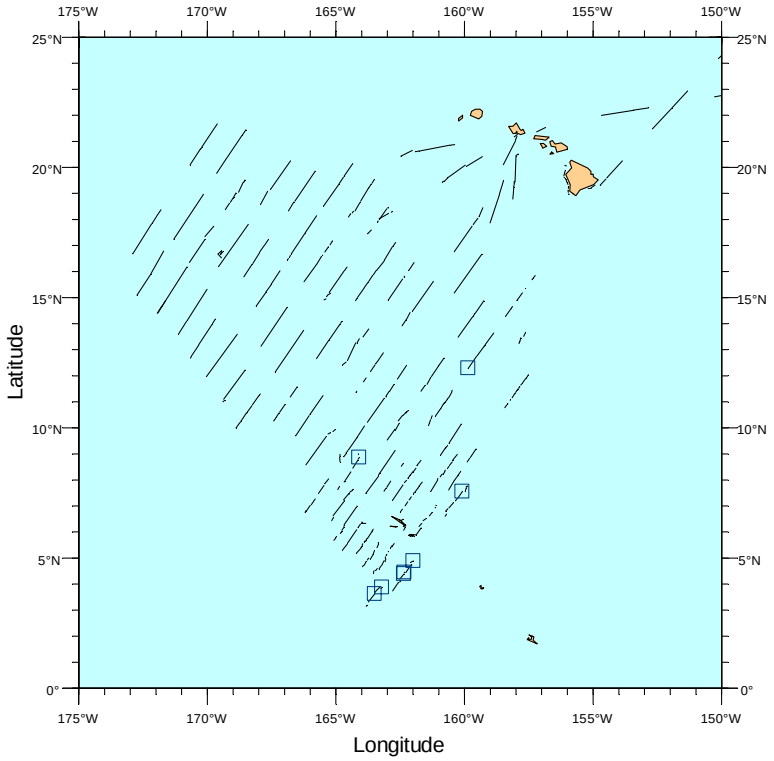

Figure 4. Location of Bryde's whales (*Balaenoptera edeni*).

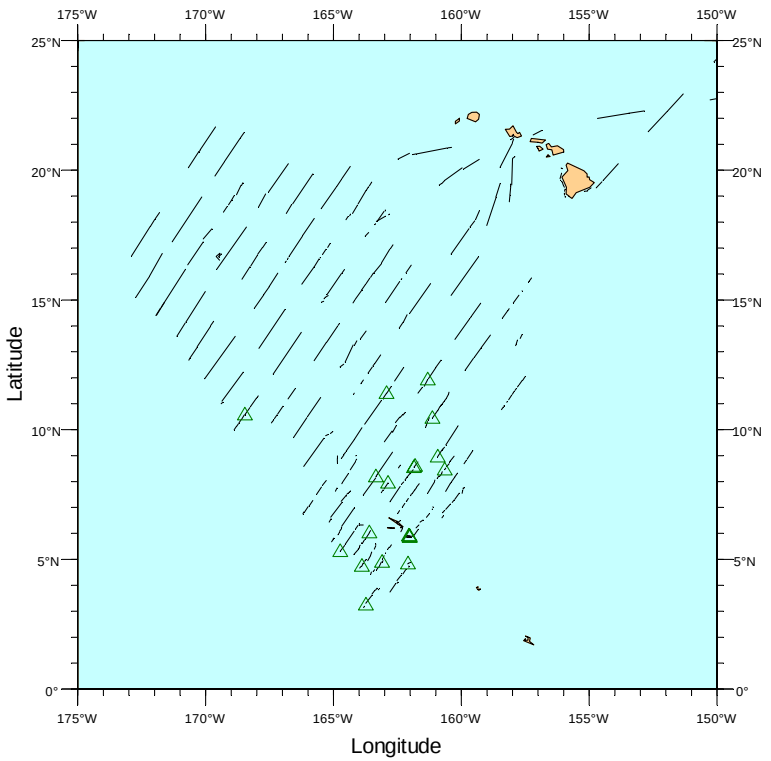

Figure 5. Location of spinner dolphins (*Stenella longirostris*).

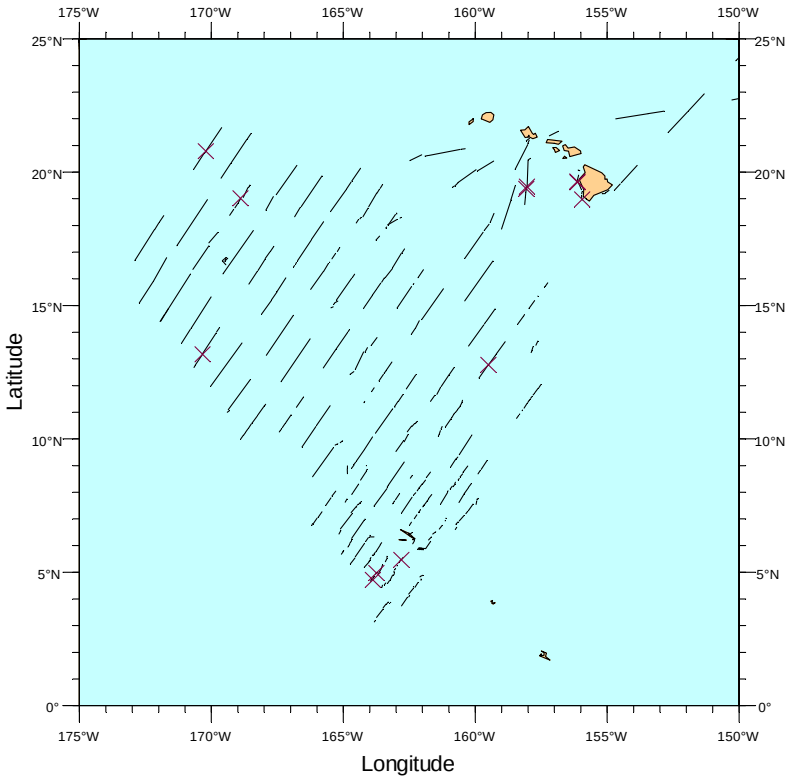

Figure 6. Location of rough-toothed dolphins (*Steno bredanensis*).

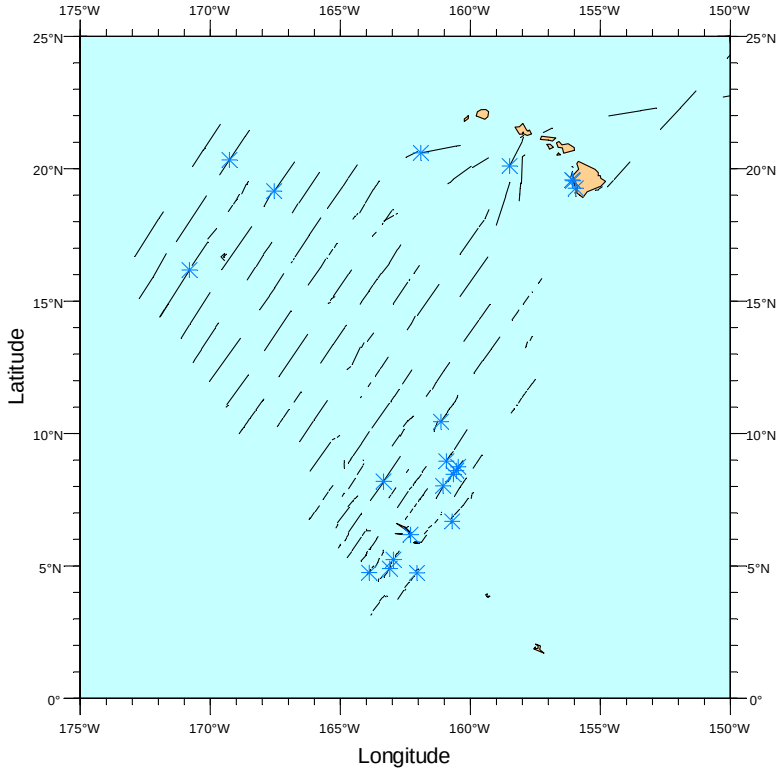

Figure 7. Location of spotted dolphins (*Stenella attenuata*).

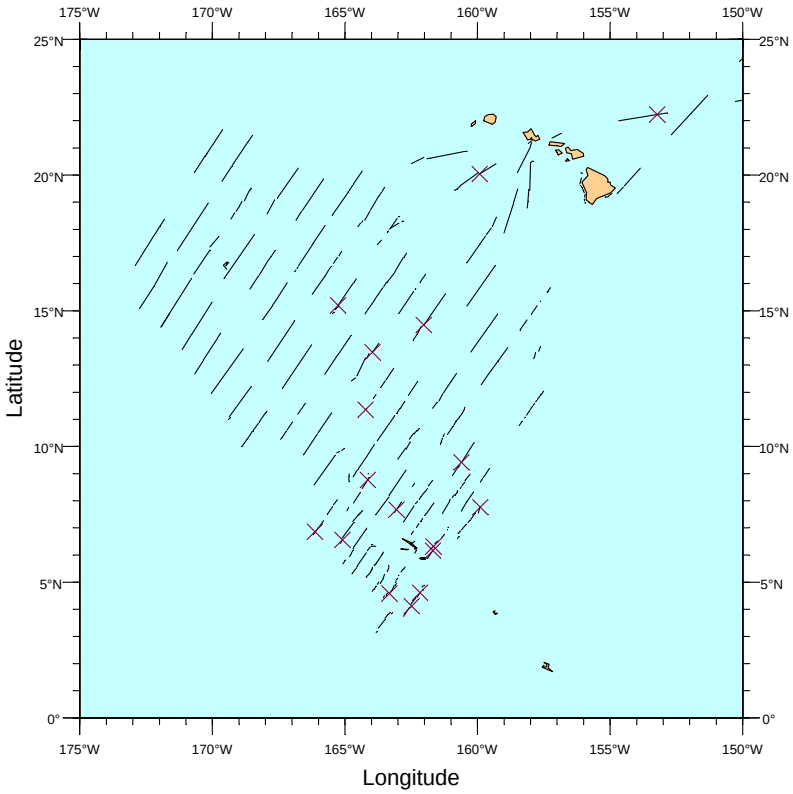

Figure 8. Location of striped dolphins (*Stenella coeruleoalba*).

Table 1. Summary of PICEAS 2005 marine mammal sightings. Mixed schools are counted once for each sighting category that occurs in them. School size is the mean of the best estimates of total school size for pure schools, and subgroup size of the sighting category in the case of mixed schools.

Code	Sighting Category	Pure Schools	Mixed Schools	Total Sightings	School Size
17	*Delphinus delphis*	1	3	4	129.5
36	*Globicephala macrorhynchus*	15	6	21	24.3
21	*Grampus griseus*	4	0	4	13.9
26	*Lagenodelphis hosei*	1	1	2	182.2
22	*Lagenorhynchus obliquidens*	5	1	6	21.2
37	*Orcinus orca*	3	0	3	5.3
31	*Peponocephala electra*	3	3	6	100.8
33	*Pseudorca crassidens*	13	1	14	8.8
2	*Stenella attenuata (offshore)*	15	8	23	50.2
13	*Stenella coeruleoalba*	19	2	21	46.4
102	*Stenella longirostris (Gray's)*	2	1	3	154.6
101	*Stenella longirostris (southwestern)*	6	2	8	92.9
3	*Stenella longirostris (unid. subsp.)*	5	3	8	41.7
15	*Steno bredanensis*	9	3	12	13.4
18	*Tursiops truncatus*	10	4	14	11.8
96	*unid. cetacean*	1	0	1	1
77	*unid. dolphin*	14	3	17	13.3
377	*unid. large delphinid*	2	0	2	4.5
277	*unid. medium delphinid*	1	0	1	2
177	*unid. small delphinid*	21	3	24	23.4
40	*Phocoena phocoena*	12	0	12	2.6
44	*Phocoenoides dalli*	12	0	12	2.2
99	*Balaenoptera borealis/edeni*	8	0	8	1.1
72	*Balaenoptera edeni*	8	0	8	3.8
70	*Balaenoptera sp.*	4	0	4	1.3
65	*Indopacetus pacificus*	1	0	1	14.2
48	*Kogia sima*	1	0	1	1
76	*Megaptera novaeangliae*	10	0	10	1.7
51	*Mesoplodon sp.*	2	0	2	3.5
46	*Physeter macrocephalus*	14	0	14	7.9
79	*unid. large whale*	1	0	1	1
78	*unid. small whale*	3	0	3	4
98	*unid. whale*	1	0	1	1.6
49	*ziphiid whale*	4	0	4	1
61	*Ziphius cavirostris*	6	0	6	3
Total		237	44	281	1

Table 2. Number of cetacean biopsy samples collected during PICEAS 2005.

Species	**Number of biopsy samples**
Balaenoptera edeni	1
Globicephala macrorhynchus	2
Megaptera novaeangliae	3
Peponocephala electra	40
Physeter macrocephalus	4
Pseudorca crassidens	18
Stenella attenuata	2
Stenella longirostris longirostris	3
Steno bredanensis	2
Tursiops truncatus	12
Unid small delphinid *(Stenella coeruleoalba or Delphinus delphis)*	4
Total Samples	**91**

Table 3. Preliminary estimates of the number of cetacean and pinniped photographs obtained during PICEAS 2005. When different species were photographed together, they were listed together. This number was not added to that of species photographed individually.

Species	**Category**	**Total**
Unidentified Spinner Dolphins	Groups Photographed	1
Stenella longirostris	Groups Photographed	8
Stenella attenuata	Groups Photographed	6
Stenella attenuata and *Stenella longirostris*	Groups Photographed	3
Stenella coeruleoalba	Groups Photographed	9
Stenella coeruleoalba and *Delphinus delphis*	Groups Photographed	1
Steno bredanensis		5
Steno bredanensis and *Peponocephala electra*		1
Delphinus delphis	Groups Photographed	3
Tursiops truncates	Groups Photographed	7
Grampus griseus	Groups Photographed	4
Lagenorhynchus obliquidens		3
Lagenodelphis hosei		2
Peponocephala electra		6
Pseudorca crassidens		4
Globicephala macrorhynchus		17
Orcinus orca	Dorsal	2
Physeter macrocephalus	Fluke/Dorsal/Head	5
Physeter macrocephalus and *Tursiops truncatus*		1
Ziphius cavirostris		1
Indopacetus pacificus		1
Balaenoptera edeni		6
Megaptera novaeangliae	Catalogue-quality flukes	2
Unidentified dolphins	Groups Photographed	1

Table 4. Summary of environmental data collected during PICEAS 2005.

	Transit Leg 1	**Leg 2**	**Leg 3**	**Leg 4**	**Transit Leg 5**	**Total**
CTD casts	1	49	46	39	0	135
CTD chlorophyll samples	0	469	400	373	0	1242
Surface chlorophyll samples	40	106	102	88	38	374
Primary productivity samples	0	159	175	147	0	481
Nutrient samples	0	515	493	414	0	1422
Salinity samples	0	162	134	104	0	400
XBT drops	32	90	87	103	43	355
Bongo Tows	0	23	22	19	0	64
Manta Tows	0	22	22	15	0	59

Table 5. Number of sighted cetacean groups per leg for which acoustic recordings were obtained using a towed hydrophone array on the *McArthur II* during PICEAS 2005, listed in order of the number of recordings obtained. This includes recordings of mixed-species schools. A total of 111 sighted cetacean schools were detected and recorded with the acoustic array, including 11 mixed-species schools. The array was not used on Leg 5.

Species	Leg 1	Leg 2	Leg 3	Leg 4	Total
Stenella attenuata	6	12	1	2	21
Stenella longirostris	0	12	0	4	16
Pseudorca crassidens	1	4	0	9	14
Globicephala macrorhynchus	0	10	1	3	14
Physeter macrocephalus	3	9	0	0	12
Stenella coeruleoalba	0	9	0	3	12
Unidentified dolphins	1	9	2	0	12
Steno bredanensis	3	5	2	1	11
Tursiops truncatus	1	5	0	1	7
Lagenodelphis hosei	0	2	0	0	2
Peponocephala electra	1	1	0	0	2
Grampus griseus	0	0	0	1	1
Total	16	78	6	24	124

Table 6. Number of non-sighted cetacean groups per leg for which acoustic recordings were obtained using a towed hydrophone array on the *McArthur II* during PICEAS 2005, listed in order of the number of recordings obtained. All non-sighted acoustic detections, with the exception of minke whales and sperm whales, were defined as "unidentified dolphins". There were a total of 162 non-sighted acoustic detections, of which there were two non-sighted minke whale acoustic detections and 24 sperm whale detections.

Species	Leg 1	Leg 2	Leg 3	Leg 4	Total
Unidentified dolphins	10	65	18	43	136
Physeter macrocephalus	10	8	2	4	24
Balaenoptera acutorostrata	0	0	0	2	2
Total	20	73	20	49	162

Table 7. Sonobuoys deployed during PICEAS 2005. One sonobuoy was deployed on one sighting of an unidentified whale (probable *Balaenoptera edeni*), and four sightings of *Balaenoptera edeni*. Vocalizations were detected on two of the *Balaenoptera edeni* sightings, including a possible new vocalization attributed to *Balaenoptera edeni*.

Low Frequency Sonobuoys Deployed	Of those Deployed # Functional
17	6