I. APPLICATION FOR A PERMIT
FOR SCIENTIFIC RESEARCH
UNDER THE
MARINE MAMMAL PROTECTION ACT

II. DATE OF APPLICATION: 08 February 2008

III. APPLICANT AND PERSONELL
A. Applicant/Permit Holder: **Dr. John Boreman** **Director, Office of Science and Technology** **National Oceanic and Atmospheric Administration** **National Marine Fisheries Serivice** **Office of Science and Technology** **1315 East-West Highway** **Silver Spring, MD 20910-6233**
B. Principal Investigator (PI): **No Change**
C. Co-Investigators (CI): **No Change**
D. Primary contact for correspondence during permit review process: **Mr. Clayton H. Spikes** **Chief Engineer, Marine Acoustics, Inc.** **4100 Fairfax Drive, Suite 730, Arlington, VA 22203** **Tel: 703-465-8404; Fax: 703-465-8420; E-mail: clay.spikes@marineacoustics.com**

Table of Contents

III.B. APPLICANT AND PERSONNEL QUALIFICATIONS AND EXPERIENCE

No change in personnel is requested

IV. PROPOSAL

A. SUMMARY

Purpose: Same as in original permit application. To provide underpinning data to evaluate the risk of mid-frequency sonars to beaked whales and other toothed whales By making direct measurements of behavioral responses to sound exposure.

Target species: Same as in original permit application. Blainville's beaked whale (*Mesoplodon densirostris*); Cuvier's beaked whales (*Ziphius cavrostris*); sperm whale (*Physeter macrocephalus*); melon headed whale (*Peponocephala electra*); short-finned pilot whale (*Globocephala macrorhynchus*); Risso's dolphin (*Grampus griseus*). Additional species selected for tagless playback (but already present in original permit for incidental playback takes): Bottlenose dolphin (excluding mid-Atlantic coastal stock) (*Tursiops truncatus*), Fraser's Dolphin (*Lagenodelphis hosei*), Common dolphin (*Delphinus delphis* and *D. capensis*), Atlantic spotted dolphin (*Stenella frontalis*), Pantropical spotted dolphin (*Stenella attenuata*), Striped dolphin (*Stenella coeruleoalba*), Spinner dolphin-long snouted (*Stenella longirostris*), Spinner dolphin-short snouted (*Stenella clymene*), Rough-toothed dolphin (*Steno bredanensis*), Killer whale (*Orcinus orca*), False Killer whale (*Pseudorca crassidens*), and Pygmy killer whale (*Feresa attenuata*).

Type and manner of take: Same as in original application: close approach, photo-id, tagging, focal-follow and playback. Export of skin sloughed in tagging.

Numbers of animals to be taken for each activity: We request an increase in the number of takes of several species, according to the changes identified in Table IV.C.2-1, by harassment by harassment due to the additional activity of playbacks without tags and the fact that we are including all potential animal takes as either originating in international waters and possibly moving into Bahamian waters during the taking activity; or vice-versa.

Numbers and kinds of non-target ESA-listed marine mammal incidental takes: We request an increase in the number of takes of several species by harassment, according to the changes identified in Table IV.C.2-1, by harassment due to the additional activity of playbacks without tags and the fact that we are including all potential animal takes as either originating in international waters and possibly moving into Bahamian waters during the taking activity; or vice-versa.

Specific geographical locations: Same as original permit application: Bahamas.

IV.B. INTRODUCTION

B.1. Species:

B.1.a. Target Species = Intentional Take in table below.

Same species as existing permit plus adding the following species from incidental playback take to intentional playback take: Bottlenose dolphin (excluding mid-Atlantic coastal stock) (*Tursiops truncatus*), Fraser's Dolphin (*Lagenodelphis hosei*), Common dolphin (*Delphinus delphis* and *D. capensis*), Atlantic spotted dolphin (*Stenella frontalis*), Pantropical spotted dolphin (*Stenella attenuata*), Striped dolphin (*Stenella coeruleoalba*), Spinner dolphin-long snouted (*Stenella longirostris*), Spinner dolphin-short snouted (*Stenella clymene*), Rough-toothed dolphin (*Steno bredanensis*), Killer whale (*Orcinus orca*), False Killer whale (*Pseudorca crassidens*), and Pygmy killer whale (*Feresa attenuata*).

B.1.b. Non-Target Species = Incidental Take in table below.

Table IV.B-1 Marine Mammal Species in Vicinity of Proposed Activity (AUTEC Range, Andros Island, Bahamas)

Table IV.B-1 has been changed from original application. The new Type of Take requested is italicized to indicate the changes that have been made. The changes made are to intentionally take some species by acoustic ensonification without tagging.

Scientific Name	Common Name	MMPA, ESA, CITES Status	Stock(s)	Type of Take (acous. enson. and tagging)	Probability of Being Present: H=high; M=medium; L=low; VL=very low; R=rare; N=none documented		
					Mediterranean Sea	e. North Atlantic	Bahamas
Balaenoptera musculus	blue whale	ESA end. CITES App.I	w. N. Atlantic, e. N. Atlantic	Incidental	N	VL	N
Balaenoptera physalus	fin whale	ESA end. CITES App.I	w. N. Atlantic; British Isles, Spain & Portugal; Med.	Incidental	H	L	VL
Balaenoptera borealis	sei whale	ESA end. CITES App.I	Nova Scotia, e. N. Atlantic	Incidental	VL	VL	N
Balaenoptera edeni	Bryde's whale	CITES App.I	n. GOMEX, N. Atlantic	Incidental	N	VL	VL
Balaenoptera acutorostrata	minke whale	CITES App.I	Can.E.Coast; ne N. Atlantic	Incidental	L	L	L

Scientific Name	Common Name	MMPA, ESA, CITES Status	Stock(s)	Type of Take (acous. enson. and tagging)	Probability of Being Present: H=high; M=medium; L=low; VL=very low; R=rare; N=none documented		
					Mediterranean Sea	e. North Atlantic	Bahamas
Megaptera novaeangliae	humpback whale	ESA end. CITES App.I	Gulf of Maine; N. Atlantic	Incidental	VL	VL	L (summer)
Eubalaena glacialis	n. right whale	ESA end. CITES App.I	w. Atlantic	Incidental	R	R	N
Physeter macrocephalus	sperm whale	ESA end. CITES App.I	N. Atlantic; n. GOMEX, Me	**Intentional**	M	M	M
Kogia breviceps	pygmy sperm whale	CITES App.II	w. N. Atlantic; n. GOMEX, e. N. Atlantic	Incidental	N	VL	M
Kogia simus	dwarf sperm whale	CITES App.II	w. N. Atlantic; n. GOMEX, e. N. Atlantic	Incidental	R	VL	M
Hyperoodon ampullatus	n. bottlenose whale	CITES App.I	w. N. Atlantic, Scotian Shelf (SARA), e. N. Atlantic	Incidental	R	VL	N
Ziphius cavirostris	Cuvier's beaked wh	CITES App.II	w. N. Atlantic; n. GOMEX, e. N. Atlantic, Med.	**Intentional**	L	L	L
Mesoplodon bidens	Sowerby's beaked whale	CITES App.II	w. N. Atlantic, e. N. Atlantic	**Intentional**	R	VL	N
Mesoplodon densirostris	Blainville's beaked whale	CITES App.II	w. N. Atlantic, n. GOMEX, e. N. Atlantic	**Intentional**	R	L	H
Mesoplodon europaeus	Gervais' beaked wh	CITES App.II	w. N. Atlantic; n. GOMEX, e. N. Atlantic	**Intentional**	R	L	L
Mesoplodon mirus	True's beaked whal	CITES App.II	w. N. Atlantic, e. N. Atlantic	**Intentional**	N	L	L
Orcinus orca	killer whale	CITES App.II	w. N. Atlantic; n. GOMEX, e. N. Atlantic	***Intentional***	VL	VL	VL

Scientific Name	Common Name	MMPA, ESA, CITES Status	Stock(s)	Type of Take (acous. enson. and tagging)	Probability of Being Present: H=high; M=medium; L=low; VL=very low; R=rare; N=none documented		
					Mediterranean Sea	e. North Atlantic	Bahamas
Pseudorca crassidens	false killer whale	CITES App.II	n. GOMEX, e. N. Atlantic	***Intentional***	VL	VL	VL
Feresa attenuata	pygmy killer whale	CITES App.II	w. N. Atlantic; n. GOMEX, e. N. Atlantic	***Intentional***	N	VL	VL
Peponocephala electra	melon-headed whal	CITES App.II	w. N. Atlantic, n. GOMEX, e. N. Atlantic	**Intentional**	N	VL	VL (summer)
Globicephala macrorhynchus	short-finned pilot whale	CITES App.II	w. N. Atlantic, n. GOMEX, e. N. Atlantic	**Intentional**	N	L	M
Globicephala melas	long-finned pilot w	CITES App.II	w. N. Atlantic, e. N. Atlantic Med.	**Intentional**	M	L	N
Grampus griseus	Risso's dolphin	CITES App.II	w. N. Atlantic, n. GOMEX, e. N. Atlantic, Med.	**Intentional**	M	M	VL (summer)
Delphinus delphis	common dolphin	CITES App.II	w. N. Atlantic, e. N. Atlantic Med.	***Intentional***	M	H	N
Steno bredanensis	rough-toothed dolp	CITES App.II	n. GOMEX, e. N. Atlantic	***Intentional***	VL	L	L
Stenella coeruleoalba	striped dolphin	CITES App.II	w. N. Atlantic, n. GOMEX, e. N. Atlantic, Med.	***Intentional***	H	M	VL
Stenella clymene	short-snouted spinn dolphin; Clymene dolphin	CITES App.II	w. N. Atlantic, n. GOMEX, e. N. Atlantic	***Intentional***	N	VL	N

Scientific Name	Common Name	MMPA, ESA, CITES Status	Stock(s)	Type of Take (acous. enson. and tagging)	Probability of Being Present: H=high; M=medium; L=low; VL=very low; R=rare; N=none documented		
					Mediterranean Sea	e. North Atlantic	Bahamas
Stenella longirostris	long-snouted spinn dolphin	CITES App.II	w. N. Atlantic, n. GOMEX	***Intentional***	N	VL	N
Stenella attenuata	pantropical spotted dolphin	CITES App.II	w. N. Atlantic, n. GOMEX	***Intentional***	N	VL	L
Stenella frontalis	Atlantic spotted dol	CITES App.II	w. N. Atlantic, n. GOMEX, e. N. Atlantic	***Intentional***	N	M	M
Tursiops truncatus	bottlenose dolphin	CITES App.II	GOMEX Cont. Shelf; GOM OCS; wNA coastal; wNA offshore; e. N. Atlantic; Mec	***Intentional***	M	M	H (coastal Ecotype)
Lagenodelphis hosei	Fraser's dolphin	CITES App.II	n. GOMEX, e. N. Atlantic	***Intentional***	N	L	VL
Phocoena phocoena	harbor porpoise	CITES App.II	GoM/BOF, e. N. Atlantic	Incidental	VL	VL	N
Phoca vitulina	harbor seal		w. N. Atlantic, e. N. Atlantic	Incidental	N	VL	N
Monachus monachus	Mediterranean mon	ESA end. CITES App.I	e. N. Atlantic; Med.	Incidental	VL	N	N

IV.B.1.c. Status of Affected Stocks

Same as in original permit application.

IV.B.2. Background/Literature Review

B.2.a. Succinct review of the current knowledge of the problem

There is a distinct and validated need for field research to understand behavioral and physiological responses of beaked whales to underwater anthropogenic sounds, including active mid-frequency (MF) sonar sounds, and how these may pose a risk of stranding and/or injury. NOAA, U.S. Navy, and the marine biological research community in general, have not been able to define the acoustic mechanism of the observed effects on beaked whales from MF sonar sounds. This data gap has hampered various efforts of the U.S. and other governments to meet their mandated requirements for marine conservation while enabling military training activities that are critical to national security. The behavioral response studies to be undertaken under the proposed SRP will benefit future efforts at minimizing underwater sound impacts to beaked whales through better understanding of their baseline behavior and diving characteristics, as well as their responses to biological sounds and MF sonar sound signals. Comparison of responses of beaked whales to other odontocetes, in turn, can provide benefit to all deep-diving odontocete species, and will contribute to our general understanding of the reactions of marine mammals to underwater sound exposure.

The proposed BRS research activity follows an initial season (2007) as a continuing part of a study that examines the responses of deep-diving odontocetes (including beaked whales) to various underwater natural and anthropogenic sounds. The purpose of the field research is to quantify the behavioral responses of deep-diving odontocetes to measured acoustic exposure events.

This type of field research has been repeatedly identified by various reports by the National Research Council (1994; 2000; 2003; 2005) as a critical data need and was unanimously identified as the foremost data need regarding beaked whales and sonars at the Marine Mammal Commission (MMC) symposium on beaked whales (see Cox et al., 2006). In their effort to establish empirically based acoustic criteria for impact on marine mammals, the Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations, published in Aquatic Mammals (Southall et al., 2007), stated, "Research is needed to quantify behavioral reactions of a greater number of free-ranging marine mammal species to specifically controlled or well-characterized exposures from different human sound sources. The most direct way to obtain these kinds of extremely detailed data would be to attach acoustic dosimeter tags to individuals and directly measure noise exposure, behavioral response, and physiological changes, if any." Also, the absence of direct behavioral information on the potential effects of military active sonar and offshore oil/gas exploration on odontocetes is clearly one of the most challenging issues facing the NOAA/NMFS Office of Protected Resources (OPR) in managing oceanic noise issues.

This BRS project builds upon traditional playback and tagging methods and research (e.g. McGregor et al. 1992; Johnson and Tyack 2003; Tyack et al. 2004). It also builds upon previous

experimental studies of behavioral reactions of marine mammals to anthropogenic sounds; for example, studies on avoidance behavior of marine mammals exposed to sounds such as those of acoustic deterrent or harassment devices, sounds of oil industry, etc. This research does not duplicate any previous efforts in that there are no similar studies using tags to document detailed responses of odontocetes to sounds of sonar, nor to relate these responses to reactions to sounds of natural predators. The only similar study is an ongoing study of responses of tagged killer whales, *Orcinus orca*, to sound s of European mid-frequency sonar signals (Kvadsheim et al. 2007).

BRS-07 was seen a successful progression toward our main objective which is to characterize behavioral responses that could be used to measure the effects of MFA sonars on beaked whales and other species. While further analyses of the data are ongoing, we believe that we have obtained a relatively clear set of behavioral responses by an adult female beaked whale to the controlled playbacks of MFA sonar and killer whale sounds. The tags precisely quantified the acoustic exposure associated with the onset of the responses. However, it must be noted that this experiment involved two exposures to a single individual with limited baseline information. Now that we have demonstrated that this experimental paradigm can provide useful information, without apparent harm or undue risk to the animals, additional results using a similar paradigm are needed. Additionally, the absence of negative control stimuli for BRS-07 means that this test must be repeated with other stimuli that do not elicit such a response. Such tests would allow us to better understand the sound features that elicit responses.

The protocols initially proposed for playbacks were carried through without major in-field modification. However, the detailed action list and control procedures for the playback protocol has been refined and modified as a result of the BRS-07 results. The experimental procedures were refined throughout the study and the experience of BRS-07 has resulted in a number of lessons learned and recommendations for future research.

The post-playback mitigation and monitoring observations, both vessel-based and aerial, were conducted at the start and end of BRS and after both playbacks to ensure that there were no injured or stranded marine mammals in and around a large area surrounding the location of each playback. In some cases, weather and practical considerations extended the periods of time over which this monitoring was conducted, but for all playbacks there was extensive monitoring of both the waters and surrounding shorelines. None of the animals' responses were outside of the realm of expected behavioral changes. We feel that the visual and passive acoustic monitoring were effective mitigation measures. Further, no distressed, injured, dead, or stranded animals were detected at any time. Full details regarding Phase I of the BRS will follow in the annual report.

B.2.b. Complete literature citations: see Section VII (References) below.

B.3. Hypothesis/Objectives and Justification

B.3.a. Clear statement of objectives and expected significance of the proposed research.

Same as in original permit application.

B.3.b. Statutory and regulatory requirements addressed for the target species.

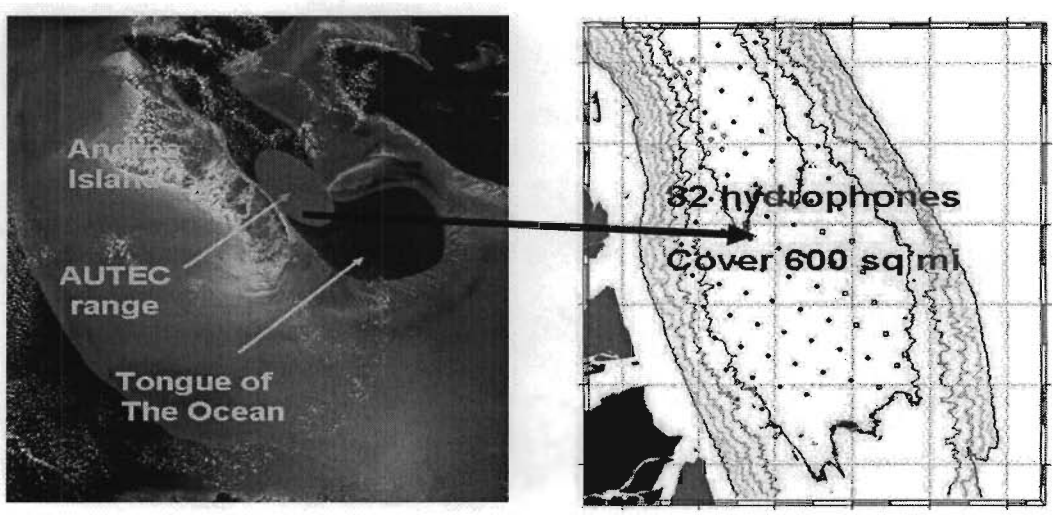
Same as in original permit application.

IV.C. METHODS

C.1. Duration of project and location of taking:

The field work will continue over several years until a sufficient sample of animals have been tested, pending future scientific research permits. We request this permit to extend for three year from the start date of 13 August 2008 in order to meet these needs. The proposed field research will be conducted over approximately 7 weeks in the summer/fall of each year, 2008 through 2010. The field work will take place on or near the AUTEC range in the Bahamas. Samples collected during the field seasons may be imported/exported until January 1, 2011.

Dates of Proposed Research	Location of Proposed Research	Ports of entry	Remarks
Aug 08 thru Jan 11 Phase II	Bahamas	US, Bahamas	Some of the research may occur inside Bahamian territorial seas. This will be conducted under a Bahamian research Permit.



The Behavioral Response Study (BRS) will take place on or near the Tongue of the Ocean (TOTO) and the adjacent Atlantic Undersea Test and Evaluation Center (AUTEC) on Andros Island, Bahamas August through October 2008 through 2010. AUTEC has a 600-square-mile permanent grid of seafloor hydrophones in the deep ocean canyon of the TOTO where beaked whales are known to occur.

C.2. Types of Activities, Methods and Numbers of Animals or Specimens to be Taken or Imported/Exported

C.2.a. Take Table for BRS Phase II

- Males and females of all target species may be tagged.
- All sex and age classes of a species may be exposed to playback sounds.
- All age classes may be tagged, excluding animals small enough to be young of the year.
- For expected import/export of marine mammal parts, see Subsection IV.C.5. below.
- Transport methods: Not Applicable.
- Location of take: For 2008 through 2010: Bahamas.
- Location of import or export: Andros Island, AUTEC, Bahamas; Nassau Bahamas, Miami, Florida.
- Individual whales will not be subject to more than 3 close approaches per day for tagging.
- As much as is practicable, individuals will be photo-identified before tagging and playback to minimize the chances of repeated takes within a year.
- Dates or time period when activity will occur: approximately 7 week time period in the August through October season for each year, 2008-2010.

The following take tables, which include five categories that may result in takes, are based on the number of individuals approached or incidentally harassed.

The five categories are presented in Table IV-C.2-1 and include:

1) "Close approach, tag attachment, photo-identification, focal follow, playback". The term 'successful' has been inserted by the applicant to clarify this category.

2) "Close approach, tag attachment, photo-identification, focal follow". This category includes those animals that might be tagged, but playback does not follow attachment.

3) Playback to non-tagged animals outlined in Table IV.C.2-2 being followed visually and/or acoustically.

4) "Incidental harassment during close approaches to target animal". This category includes the animals within the group that contains the animal that the scientists are attempting to tag, or unsuccessful tagging attempts. This value is detailed in Table IV.C.2-3.

5) "Incidental harassment by exposure to playbacks directed at target animal". This category includes the exposure of non-targeted species in the vicinity.

   This category includes both the incidental exposure of animals that are not the focus of a research effort, as well as the members of the group containing a tagged

animal that is the focus of the research. For non-target species, only an "incidental" exposure calculation (see Table IV.C.2-5) is listed in the summary Table IV.C.2-1.

For the six targeted species, this value is a combination of intentionally (Table IV.C.2-4) and incidentally (Table IV.C.2-5) exposed animals.

Table IV.C.2-1 Summary Annual Take Table for BRS Phase II

This is the summary of a number of calculations which will be presented in more detail in the following Subsections. The numbers in parentheses are the calculations presented in the original application and authorized in the original permit.

Take Category	1	2	3	4	5
NMFS Take Type Categorization	Close approach, tag attachment, photo-identification, focal follow, playback	Close approach, tag attachment, photo-identification, focal follow	INTENTIONAL Playback to non-tagged animals (New Category)	Incidental harassment during close approaches to target animal	Incidental harassment by exposure to playbacks directed at target animal
Humpback whale (Megaptera novaeangliae)					4 (3)
Minke whale (Balaenoptera acutorostrata)					9 (6)
Bryde's whale (Balaenoptera edeni)					18 (6)
Sei whale (Balaenoptera borealis)					4 (3)
Fin whale (Balaenoptera physalus)					18 (6)
Blue whale (Balaenoptera musculus)					4 (3)
Sperm whale (Physeter macrocephalus)	30 (3)	30 (2)	60	450 (24)	54 (92)
Beaked whales (Mesoplodon spp.)	40 (3)	40 (2)	100	1200 (45)	10 (35)
Cuvier's beaked whale (Ziphius cavirostris)	40 (3)	40 (2)	60	800 (30)	6 (21)

NMFS Take Type Categorization	Close approach, tag attachment, photo-identification, focal follow, playback	Close approach, tag attachment, photo-identification, focal follow	INTENTIONAL Playback to non-tagged animals	Incidental harassment during close approaches to target animal	Incidental harassment by exposure to playbacks directed at target animal
Pilot whales-short finned (Globicephala macrorhynchus)	60 (6)	60 (3)	400	900 (45)	12 (42)
Bottlenose dolphin (excluding mid-Atlantic coastal stock) (Tursiops truncatus)			120		108 (18)
Fraser's dolphin (Lagenodelphis hosei)*			475		190
Common dolphin (Delphinus delphis and D. capensis)			2540		508 (381)
Atlantic spotted dolphin (Stenella frontalis)			120		108 (18)
Pantropical spotted dolphin (Stenella attenuata)			120		108 (18)
Striped dolphin (Stenella coeruleoalba)			450		405 (68)
Spinner dolphin-long snouted (Stenella longirostris)			1640		328 (246)
Spinner dolphin-short snouted (Stenella clymene)			640		576 (96)
Rough-toothed dolphin (Steno bredanensis)			140		126 (21)
Kogia spp. (K. simus and K. breviceps)					6 (6)
Risso's dolphin (Grampus griseus)	30 (3)	30 (2)	140	1050 (56)	126 (98)

NMFS Take Type Categorization	Close approach, tag attachment, photo-identification, focal follow, playback	Close approach, tag attachment, photo-identification, focal follow	INTENTIONAL Playback to non-tagged animals	Incidental harassment during close approaches to target animal	Incidental harassment by exposure to playbacks directed at target animal
Killer whale (Orcinus orca)			35		14 (11)
False Killer whale (Pseudorca crassidens)			145		58 (44)
Pygmy killer whale (Feresa attenuata)			150		60 (45)
Melon-headed whale (Peponocephala electra)	30 (3)	30 (2)	500	1500 (184)	464 (1041)

*** Fraser's dolphin was mistakenly left off of this table in the original permit, though, they should have been included for the incidental harassment by exposure to playbacks directed at target animal category. They are now included for both Intentional takes from playback to non-tagged animals and for incidental harassment by exposure to playbacks directed at target animal.**

Category 1: Estimating the number of animals that may be taken by close approach, tag attachment, photo-identification, focal follow, and playback during the course of the proposed research activity:

The values in this category are the tagging goal for each species. Only animals that are successfully tagged, focal followed and presented with a playback stimulus are included in this category.

Category 2: Estimating the number of animals that may be taken by close approach, tag attachment, photo-identification and focal follow (but no playback) during the course of the proposed research activity:

The goal of the proposed research is to observe the behavior of animals that are presented with an acoustic stimulus. However, it is important to obtain baseline data from animals that are tagged but not exposed, and there is the further possibility that animals may be successfully tagged, and there may be logistical or technical reasons that would prevent a playback of the acoustic stimulus. In this case, the animals may still be focal followed to obtain additional data on their movement and behavior. Since control data are so important, the numbers requested here are the same as the playback goal.

Category 3: Estimating the number of animals that may be taken by intentional playbacks to non-tagged animals

A significant rate-limiting step on field experiments using controlled exposures to animals involves the time, effort, and logistics required to tag a whale. Animals must be detected and localized acoustically. A tag boat must be vectored to and find the animals and then the tag must be attached to animals sufficiently that it will remain on during and following the playback sequence. The source boat must then be positioned within reasonable proximity to the tagged animal. Beaked whales (*M. Densirostris and Ziphius Cavrostris*) spend little time on the surface and are extremely difficult to sight. Consequently, tagging is restricted to low sea-state conditions (< Sea State 1). Sophisticated, archival tags are used because they provide the most detailed information about behavioral responses and they can measure acoustic exposure directly at the animal. However, they do not telemeter these data in real-time so they are not useful in modulating playback parameters in real time. Such monitoring of responses comes from visual observers on vessels following the animals and/or from acoustic monitors using the AUTEC hydrophone array to detect and locate vocalizing whales.

One of the clear responses of the tagged *Mesoplodon densirostris* to MFA playback during BRS-07 involved premature cessation of clicking during a deep foraging dive. This was detected in real time using the passive acoustic AUTEC sensors, as well as post hoc in the acoustic record of the recovered acoustic tag. Thus, it appears likely that passive acoustic sensors can be used to measure real-time responses. Consequently, a logical way to increase the sample size of playbacks to different groups in diverse contexts would involve playbacks to beaked whales that are not tagged. Many of the protocols used in BRS-07 would be similar. However, the response measure in this case would not be clicks from the individual tagged whale, but rather the last member of the group to stop clicking.

The key advantage of these tagless playbacks compared to opportunistic observations involves the ability to time the start of transmission just after the group has dived and started clicking. Early cessation of clicking on a dive can be associated with a received level of sound if one can localize the whales at cessation of clicking. To achieve this, the sound field will be estimated using a Navy standard underwater sound propagation model. In addition, these predictions will be validated by monitoring the receive level on the AUTEC hydrophones surrounding the source vessel. Using the time of click cessation as the end point of the individual experiment is a more sensitive response measure than prolonged inter-vocal intervals (although these will also be measured post hoc). One concern with these "tagless" playbacks to beaked whales is our ability to document a response, similar to the prolonged avoidance response of the tagged individual *Mesoplodon* observed after the orca playback in 2007. This suggests that it would be prudent to delay tagless playbacks to beaked whales until after one or two more playbacks of MF sonar to tagged beaked whales has taken place. In any circumstance, and regardless of the vocal duration during a dive, the playback will be terminated within 3-5 minutes of the group of animals stopping clicking.

The other way to observe responses of untagged whales to playback involves visual observations of whales at the surface. This is not practical for untagged beaked whales, but can be done for

delphinids such as pilot whales or smaller pelagic dolphins that form groups that are easily followed visually from a small vessel. If an individual within the group has a very distinctive natural marking, it may be possible to conduct an individual follow, but most of the time this method would involve a group follow. Visual observations, when feasible, coupled with acoustic monitoring of group vocalizations using the range hydrophones, should provide a good indication of the track of the group, along with categorization of group behavior and cohesion. Repeated photo-identification should also help to quantify stability of association patterns during the follow. If these data are collected as part of a systematic protocol for behavioral sampling, they should provide sufficient information to assess onset of behaviors that might be associated with an increased risk of stranding. Even though the data associating stranding of these species with sonar exercises is much weaker than for beaked whales, quantification of safe exposure is very important for these species as well, including delphinid species that are not currently considered taggable with DTAGs. Table IV.C.2-2 provides the non-tagged animal take estimates for BRS Phase II .

Table IV.C.2-2 Non-tagged Animal Take Table for BRS (New Table)

Species	Goal no. playbacks	Group size	Number of takes
Physeter	10	6	60
Mesoplodon	20	5	100
Ziphius	20	3	60
Globcepala	20	20	400
Peponocephala	10	50	500
Grampus	10	14	140
Tursiops	10	12	120
Lagenodelphis	5	95	475
Delphinus	10	254	2540
Stentalla frontalis	10	12	120
S. attenuata	10	12	120
S. coeruleoalba	10	45	450
S. longirostris	10	164	1640
S. clymene	10	64	640
Steno	10	14	140
Orcinus	5	7	35
Pseudorca	5	29	145
Feresa	5	30	150

Category 4: Estimating the number of animals that may be taken by unintentional Close Approach during the course of the proposed research activity:

This number is larger than the Maximum Number of Tagging Takes because some CAs are required for photo-identification etc., and because the tagging team is not able to touch a tag to the animal on every CA. Sometimes the animal may dive or move away. If the tagging team feels that the animal is showing a negative reaction to the CA (e.g., repeated avoidance), they break off. The probability that a CA will lead to the tag touching the animal depends upon the species. In addition, in most species, an animal selected for tagging may surface close enough to other

individuals that a CA to the selected animal requires the tagging vessel to also approach relatively close to the other individuals. This number of close companions also varies by species. These close companions are also counted as incidental CAs. Therefore, for these species, we are requesting a larger number of CA takes than tagging takes. This increase in the estimated number of takes, likely overestimated, makes the environmental analyses of this SRP more conservative.

Group size for cetaceans at sea is often defined as all of the animals that can be sighted together. For estimating CA takes, it is more appropriate to consider smaller subgroups and we propose to count animals surfacing within a few body lengths of the focal animal. This subgroup size will be considered to be one-half of the total group size for most species (see Table IV.C.2-3 below). Since the group size of melon-headed whales tends to be much larger, the subgroup size will be considered to be 10 percent of the group size. Therefore, in order to estimate the potential number of incidental CA takes for these species, we will multiply the number of tagging attempts by the subgroup size.

The tagging goal for each species is listed in Table IV.C.2-3, as well as the estimated success rate for tag attachment. The number of tag attachments to reach the goal is the tagging goal divided by the estimated success rate. This number is larger than the tagging goal because not every tagging take yields the data we need for a successful tagging. NMFS (OPR) counts a tagging take as every time any part of the tag touches an animal. The probability that a tag will stay on the animal once it has touched depends upon the species, and the duration of attachment that we need for success depends on other factors as well.

Table IV.C.2-3 Estimation of Incidental CA takes for BRS Phase II
The numbers in parentheses are the calculations presented in the original application.

A. Taxon	B. Tagging Goal	C. Est. tagging success rate	D. Max Number of tagging approaches: (B/C)	E. Sub-group size	F. Incidental CA takes (D x E)
Sperm Whale	60 (3)	40%	150 (8)	3	450 (24)
***Mesoplodon* spp.**	80 (3)	20%	400 (15)	3	1200 (45)
Cuvier's beaked whale	80 (3)	20%	400 (15)	2	1200 (30)
Short-finned pilot whale	120 (6)	40%	300 (15)	3	900 (45)
Melon-headed whale	60 (3)	40%	150 (8)	10 (23)	1500 (184)
Risso's dolphin	60 (3)	40%	150 (8)	7	1050 (56)

Category 5: Estimating the number of animals that may be taken by unintentional playback exposures during the course of the proposed research activity:

As can be seen in Table IV.C.2-4 below, the total targeted PB takes is larger than the goal number of PBs for two reasons: 1) some animals may be incidentally exposed to PBs in the course of an experiment directed at another species; and 2) most of the species covered by this SRP application are social; any PB directed at one or a few tagged members of a group are likely to lead other members of the group to be exposed as well. Since sound travels well underwater,

more animals could potentially be affected by PB than by the CAs for tagging. Therefore, the group size is used to estimate PB takes. Given the expectation that few animals further away than the focal animal will be harassed by FF, the estimated numbers may seem unreasonably high. However, one of the goals of these studies is to detect and report any disruption of behavior. The conservative process for estimating large numbers of potential takes ensures that even the most subtle behavioral changes, potentially discovered well after the field work is over, would be covered by this SRP.

The subject of each PB experiment is the tagged animal(s), but animals other than the tagged ones may also be exposed to the playback of underwater MF sound signals. This project will help to determine the thresholds for disturbance to these animals, and will help to estimate what kinds of exposures elicit what kinds of behavioral reactions. For the purposes of estimating number of incidental harassment takes for this SRP, we will report all animals in the group of the study subject as potential harassment takes during PB experiments. As instructed by NMFS (OPR), each stage of estimating potential takes is overestimated for several reasons. This overestimation reduces the probability that the SRP limits the field research from achieving its goals. Since some of the research covered in this permit application is specifically designed to detect and measure behavioral disruption, and since the relationship between exposure and response is not completely understood, it is also important that the estimated number of takes allows for unanticipated subtle responses being detected in post-test analyses.

Category 5 of Table IV.C.2-1 details the estimated number of animals that may be exposed to playback unintentionally. This would occur if animals were in the area (defined as ≤ 1 km from the source) and undetected, or if they were detected and the decision was made to proceed with playback.

The details of the calculations, which are shown in Table IV.C.2-5, are as follows:

1) The total possible number of playbacks for all species is obtained from summing Categories I and III. (Column A).

2) The Group Size of each species for the area is obtained from the latest data (Column B)

3) The qualitative value for the "Probability of being present" as shown in Table IV.B-1 is reproduced in Column D. This value is quantified using the following conversion, and is shown in Column E. This approach is used because accurate density information for the Tongue of the Ocean are not available. The high probability of being present category is assigned a probability value of 1.0. The subsequent categories are each one order of magnitude lower, but have been multiplied by 5, in an effort to be conservative.

Probability of being present	Assigned numerical value
H=High	1.0
M = Medium	0.5
L = Low	0.05
VL = Very Low	0.005
R = Rare	0.0005
N = None	0.00005

4) Finally, an assessment is made of the species-specific probability of detection. Furthermore, a species-specific consideration is made as to course of action should an animal be detected within 1 kilometer of the source. The two courses of action are to:
    a. Abort or delay the playback
    b. Continue the playback and consider the nearby group as an intentional playback exposure.

5) Column F is the probability of detection of the presence of the species AND the decision to a) abort the playback OR b) continue the playback and consider the second group as an intentional exposure. All species are given a value of 0, with the following exceptions. Target species are assigned a value of 0.9, since they are very likely to be detected acoustically. The PIs then have option to abort or delay the playback, or continue and consider the second group as an intentional exposure. Large groups of social dolphins would certainly be acoustically and/or visually detectable, and playback would be probably be aborted or delayed if they were within 1 kilometer of the source to avoid unintentional exposure of that many animals.

6) Thus, the formula for calculating the number of incidental exposures is:

$$A \times B \times E \times (1-F)$$

7) Finally, this calculated value is compared with the twice the estimated group size (to allow for more than one group during the experiment), and the larger of these two is used as the value for estimated incidental take. This is done because it does not make sense to report a value smaller than the group size, as this would imply only exposing a portion of the group.

Table IV.C.2-4 Estimation of intentional target animal PB takes for BRS
The numbers in parentheses are the calculations presented in the original application and authorized in the original permit.

A. Taxon	B. Number of Playbacks	C. Est. # Tagged/ Group	D. Tagged Animal Playback Takes (B x C)	E. Tagged Animal Non-Playback Takes (D x 2)	F. Est. Group Size	G. Non-tagged Animal Playback Takes (B x F-1) + (B X F)	H. Total Targeted Animal Playback Takes (D + G)
Sperm Whale	10 (2)	3	30 (10)	60	6	110 (12)	140 (22)
Beaked Whale Mesoplodon	20 (2)	2	40 (8)	80	5	180 (10)	220 (18)
Beaked Whale Ziphius	20 (2)	2	40 (4)	80	3	100 (6)	140 (10)
Short-finned Pilot Whale	20 (2)	3	60 (10)	120	20 (12)	780 (12)	840 (22)
Melon-headed Whale	10 (2)	3	30 (462)	60	50* (232)	990 (0)	1020 (462)
Risso's Dolphin	10 (2)	3	30 (26)	60	14	270 (0)	300 (26)

* Average of the size of two groups reported in NMFS Atlantic SAR for melon-headed whales.

There are two categories of intentional targeted non-tagged animal PB takes (column G). One set involves animals that are not tagged but are in the same group as a tagged whale. These are calculated as the number of PBs x (group size -1). One is subtracted to account for the tagged animal, which is tabulated separately. The second category involves playbacks to animals where no animal is tagged in the group. This category is calculated as is the total group size x the goal number of PBs, as seen in Table IV.C.2-5. The total targeted number of PB takes is the sum of these two columns D+G.

Column H of Table IV.C.2-4 tabulates the maximum number of individual animals to be intentionally exposed to PBs, and it includes the best estimates of group size. Many of these estimates stem from Claridge (2005). For pilot whales, the mean group size was 5.8. BRS07 often encountered larger groups of this species, so we will use a nominal group size of 20. However, larger group sizes may be encountered in the course of the experiment. Therefore, to account for this possibility, the total targeted animal PB takes is multiplied by 1.5 and then added to the incidental (non-targeted) animal PB takes that are calculated below (Table IV.C.2-5). This multiplication is included as a conservative measure and results in larger numbers of exposures than are actually expected.

In the area where this research is proposed, individuals of other marine mammal species may be present. A major goal of the proposed research is to help define acoustic criteria that cause changes in behavior that may be considered takes by harassment. In the absence of such data, we propose to follow current NMFS practice and report all marine mammals or sea turtles sighted

within a range from the source vessel during PBs where the animal RL is predicted to be 160 dB SPL in a tally of animals that might be used to estimate potential unintentional harassment takes (NMFS 2003). The target species for PBs are beaked whales, pilot whales, melon headed whales, Risso's dolphins and/or sperm whales. In order to cover the possibility of unintentional exposure during PB, we are requesting potential takes by harassment of other marine mammal species that may be present in the research area. The maximum range out to the 160 dB isopleth used for this analysis is 1,000 m. This estimate is made for a SL of 220 dB, which cannot be produced by the primary underwater acoustic sound source available for use during the BRS Phase II (2008 through 2010) research. It is likely that the estimates of incidental harassment takes for the non-target species are over-estimated.

Table IV.C.2-5 Estimation of incidental non-target animal playback takes for BRS Phase II (Updated Table)

Taxon	Number of Tag - Playbacks	Number of Non-Tag Playbacks
Physeter	10	10
Mesoplodon	20	20
Ziphius	20	20
Globcepala	20	20
Grampus	10	10
Peponocephala	10	10
Sum	90	90

Taxon	A. Number of Playbacks	B. Group Size	C. Group Size Source	D. Probability of Being Present	E. Nominal Probability of Occurrence during one playback trial	F. Probability of Detection within 1 km of the focal group AND playback abort OR consideration of second group as an intentional take	Estimated Incidental Takes A * B * E (1 - F)	Group Size X 2	**Greater of Calculation and Group size Estimate**
Humpback whale (*Megaptera novaeangliae*)	180	2	Matilla et al 1994	VL	0.005	0	1.8	4	**4**
Minke whale (*Balaenoptera acutorostrata*)	180	1	Claridge report (table 2.5)	L	0.05	0	9	2	**9**
Bryde's whale (*Balaenoptera edeni*)	180	2	Silber et al 1994	L	0.05	0	18	4	**18**
Sei whale (*Balaenoptera borealis*)	180	2	Schilling et al 1992	VL	0.005	0	1.8	4	**4**
Fin whale (*Balaenoptera physalus*)	180	2	Panigada 2005	L	0.05	0	18	4	**18**
Blue whale (*Balaenoptera musculus*)	180	2	(Reilly and Thayer 1990)	VL	0.005	0	1.8	4	**4**

Taxon	A. Number of Playbacks	B. Group Size	C. Group Size Source	D. Probability of Being Present	E. Nominal Probability of Occurrence during one playback trial	F. Probability of Detection within 1 km of the focal group AND playback abort OR consideration of second group as an intentional take	Estimated Incidental Takes A * B * E (1 - F)	Group Size X 2	**Greater of Calculation and Group size Estimate**
Sperm whale (*Physeter macrocephalus*)	180	6	Claridge report (table 2.5)	M	0.5	0.9	54	12	**54**
Beaked whales (*Mesoplodon* spp.)	180	5	Claridge report (table 2.5)	L	0.05	0.9	4.5	10	**10**
Cuvier's beaked whale (*Ziphius cavirostris*)	180	3	Claridge report (table 2.5)	L	0.05	0.9	2.7	6	**6**
Pilot whales-short finned (*Globicephala* macrorhynchus)	180	6	Claridge report (table 2.5)	L	0.05	0.9	5.4	12	**12**
Bottlenose dolphin (excluding mid-Atlantic coastal stock) (*Tursiops truncatus*)	180	12	Claridge report (table 2.5)	M	0.05	0	108	24	**108**

Taxon	A. Number of Playbacks	B. Group Size	C. Group Size Source	D. Probability of Being Present	E. Nominal Probability of Occurrence during one playback trial	F. Probability of Detection within 1 km of the focal group AND playback abort OR consideration of second group as an intentional take	Estimated Incidental Takes A * B * E (1 - F)	Group Size X 2	**Greater of Calculation and Group size Estimate**
Common dolphin (*Delphinus delphis* and *D. capensis*)	180	254	(Silber et al. 1994	L	0.05	0.9	228.6	508	**508**
Atlantic spotted dolphin (*Stenella frontalis*)	180	12	Claridge report (table 2.5)	L	0.05	0	108	24	**108**
Pantropical spotted dolphin (*Stenella attenuata*)	180	12	Claridge report (table 2.5)	L	0.05	0	108	24	**108**
Striped dolphin (*Stenella coeruleoalba*)	180	45	Claridge report (table 2.5) and Mobley 2004	L	0.05	0	405	90	**405**
Spinner dolphin-long snouted (*Stenella longirostris*)	180	164	Mullin and Fulling 2004	L	0.05	0.9	147.6	328	**328**

Taxon	A. Number of Playbacks	B. Group Size	C. Group Size Source	D. Probability of Being Present	E. Nominal Probability of Occurrence during one playback trial	F. Probability of Detection within 1 km of the focal group AND playback abort OR consideration of second group as an intentional take	Estimated Incidental Takes A * B * E (1 - F)	Group Size X 2	**Greater of Calculation and Group size Estimate**
Spinner dolphin-short snouted (*Stenella clymene*)	180	64	Mullin and Fulling 2004	L	0.05	0	576	128	**576**
Rough-toothed dolphin (*Steno bredanensis*)	180	14	Claridge report (table 2.5) and Mobley 2004	L	0.05	0	126	28	**126**
Kogia spp. (*K. simus* and *K. breviceps*)	180	3	Claridge report (table 2.5)	VL	0.005	0	2.7	6	**6**
Risso's dolphin (*Grampus griseus*)	180	14	Claridge report (table 2.5)	M	0.5	0.9	126	28	**126**
Killer whale (*Orcinus orca*)	180	7	Claridge report (table 2.5)	VL	0.005	0	6.3	14	**14**

Taxon	A. Number of Playbacks	B. Group Size	C. Group Size Source	D. Probability of Being Present	E. Nominal Probability of Occurrence during one playback trial	F. Probability of Detection within 1 km of the focal group AND playback abort OR consideration of second group as an intentional take	Estimated Incidental Takes A * B * E (1 - F)	Group Size X 2	**Greater of Calculation and Group size Estimate**
False Killer whale (*Pseudorca crassidens*)	180	29	Mullin and Fulling 2004	VL	0.005	0	26.1	58	**58**
Pygmy killer whale (*Feresa attenuata*)	180	30	Claridge report (table 2.5)	VL	0.005	0	27	60	**60**
Melon-headed whale (*Peponocephala electra*)	180	232	Claridge report (table 2.5) and Mobley 2004	L	0.05	0.9	208.8	464	**464**
Fraser's Dolphin	180	95	Claridge report (table 2.5)	N	0.0005	0	8.55	190	**190**

Table IV.C.2-5 references:

Claridge D.E. 2006. Fine-scale distribution and habitat selection of beaked whales. University of Aberdeen, pp 127

Johnson, M. P. & Tyack, P. L. 2003. A Digital Acoustic Recording Tag for Measuring the Response of Wild Marine Mammals to Sound. *IEEE Journal of Oceanic Engineering* **28**, 3-12.

Kvadsheim, P., Benders, F., Miller, P., Doksæter, L., Knudsen, F., Tyack, P., Nordlund, N., Lam, F.-P., Samarra, F., Kleivane, L. & Godø, O. R. 2007. Herring (sild), killer whales (spekkhogger) and sonar – the 3S-2006 cruise report with preliminary results. Horten, Norway: Forsvarets forskningsinstitutt/Norwegian Defence Research Establishment.

Mattila, D. K., P. J. Clapham, O. Vasquez, and R. S. Bowman. 1994. Occurrence, population composition and habitat use of humpback whales in Samana Bay, Dominican Republic. Can. J. Zool. 72:1898-1907.

McGregor, P. K. 1992. *Playback and Studies of Animal Communication*. New York: Plenum Press.

Mobley, J. R. J. 2004. Results of marine mammal surveys on U.S. Navy underwater ranges in Hawaii and Bahamas. Office of Naval Research, Arlington.

Mullin, K. D., and G. L. Fulling. 2004. Abundance of cetaceans in the Oceanic Northern Gulf of Mexico, 1996-2001. Marine Mammal Science 20(4):787-807.

Panigada, S., G. Nortarbartolo di Sciara, M. Panigada, S. Airoldi, J. Borsani, and M. Jahoda. 2005. Fin whales (*Balaenoptera physalus*) summering in the Ligurian Sea: distribution, encounter rate, mean group size and relation to physiographic variables. JCRM 7(2):137-145.

Reilly, S. B., and V. G. Thayer. 1990. Blue Whale *Balaenoptera musculus* Distribution in the Eastern Tropical Pacific. Marine Mammal Science 6(4):265-277.

Schilling, M. R., I. Seipt, M. T. Weinrich, A. E. Kuhlberg, and P. J. Clapham. 1992. Behavior of individually-identified sei whales *Balaenoptera borealis* during an episodic influx into the southern gulf of Maine in 1986. U S Natl Mar Fish Serv Fish Bull 90(4):749-755.

Silber, G. K., M. W. Newcomer, P. C. Silber, H. Pérez-Cortés M, and G. M. Ellis. 1994. Cetaceans of the northern Gulf of California: distribution, occurrence, and relative abundance. Marine Mammal Science 10(3):283-298.

Southall, B. L., Bowles, A. E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene, C. R. Jr., Kastak, D., Ketten, D. R., Miller, J. H., Nachtigall, P. E., Richardson,W. J., Thomas, J. A., and Tyack, P. L. 2008. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals 33(4):411-509.

Tyack, P. L., Gordon, J. & Thompson, D. 2004. Controlled Exposure Experiments to Determine the Effects of Noise on Marine Mammals. *Marine Technology Society Journal* **37**, 41-53.

C.2.b. Narrative account of research

Same description of Close Approach, Tag, and Focal Follow in original permit application.

Playbacks (PB): The BRS Phase II PB experiments (2008-2010) will use underwater sound projectors capable of producing MF sounds. The vessel-based PBs may involve a stationary source of sound, or the source vessel may slowly reposition in relation to the subject(s). The RL at the animal subject will be limited to less than a maximum sound exposure level, which will be set below levels that might cause injury. We propose a maximum RL at the whale of 170 dB SPL for

underwater MF sounds. We will take all scientifically reasonable precautions in controlling the SL of the PBs to ensure the RL at the animal will not exceed the maximum RL above. Before starting each PB, we will estimate range to the animal subject using acoustic localization or visual sighting data and adjust the SL to achieve a specified RL at the animal. See Subsection IV.C.3 of this application for additional research protocol information. PBs involve a series of exposures, starting at a low exposure level, and only increasing exposure if no identifiable adverse behavioral reaction has been observed at the lower level. This design minimizes the exposure necessary to define the relationship between exposure and possible responses.

We are not expecting to tag all of these animals. The subjects for each experiment will be determined by the available animals on site at the time of the experiment. During the 42 experimental days for BRS-07, we had bad weather on 75 percent of the days, and we tagged a whale on 60 percent of the days with good weather. Given the need for baseline data and the limited opportunities, we only conducted 2 playbacks. However, since it is not possible to predict the number of opportunities for each target species, nor how many animals may be available, we are requesting the full sample size for each species to be able to take full advantage of field opportunities, depending upon what animals we encounter.

The number of estimated takes derives from the number of attempts required to tag and the number of animals that may be taken intentionally and incidentally during each activity. Only a percentage of CAs yield a successful tag attachment, and only a percentage of tag attachments last long enough for a playback experiment. No individual animal will be taken more than six times in one day by any combination of tag attachment, focal follow, or photo-identification activies and more than two times in one day by intentional exposure to playbacks. After that, we will break off and find another individual to attempt to tag. When one approaches a focal animal, other individuals might be near enough to the focal animal to be considered part of the CA. Similarly, when one conducts a PB to a focal whale, other animals in the area may also be exposed to the sounds. One goal of the PBs is to determine what exposures may lead to enough behavioral disruption to constitute a "take" by harassment.

Tagging success rate is broken down into two components. There is the percentage of CAs that yield a tag touch and the percentage of tags that touch the animal and last long enough to be considered a successful attachment. Many of the times when the tag touches the animal and falls off soon thereafter, the vessel approach will only involve a CA and no FF. On the other hand, some animals may not be tagged long enough for us to consider it a fully successful tag attachment, but long enough for us to have started a FF. Our FF protocol is designed so that the observation vessels do not affect the behavior of the followed animals.

We have now been tagging sperm whales with DTAGs for five years and can use past experience to estimate tagging success. About 4 out of 10 tags that touch the animal stay attached long enough for PB studies. This yields an attachment success rate of about 40 percent. At this rate, we would need to request 50 tag attachments for these species in order to meet a goal sample size of 20. Our success rate in close approaches (CAs) with sperm whales for tagging depends upon how easily approachable they are. For some groups, we may approach several individuals the maximum of three times, with no opportunity to tag. In other situations, the success rate is much

higher. On average, one out of three CAs allow us to touch the animal with a tag, yielding a 33 percent success rate for touching an animal with a tag.

Based upon our own experience tagging beaked and pilot whales with the DTAG, we will assume a 20 percent success rate (# successful attachments/touch) for attachment to beaked whales and 40 percent for pilot whales. Beaked whales are not just difficult to tag, but they are also difficult to sight and approach. Based upon our field work, we estimate 4 CAs are required for one chance to touch an animal with a tag. During our field work with *Ziphius* in the Ligurian Sea, we followed groups that grew to up to 7 individuals. However, animals are often sighted alone. For this BRS, we assume a beaked whale group size of five for *Mesoplodon spp.* and 3 for *Ziphius*. On average a CA to a beaked whale for tag attachment may actually involve CA to two or more whales in addition to the tagging subject. Claridge (2006) identifies average group size of short-finned pilot whales for the AUTEC region to be 6, which is used in our calculations. This is a smaller group size than the one we use for playback takes, which can include several dispersed subgroups.

Playback Takes

Same as in original permit application.

IV.C.3. Additional Information for Removing Animals from the Wild into Captivity and Research or Enhancement on Captive or Rehabilitating Animals

Same as in original permit application. Not applicable; no marine mammal will be removed from the wild under this SRP.

IV.C.4. Lethal Take

Same as in original permit application. Not applicable; no intentional or unintended lethal takes are anticipated to occur under this SRP.

IV.C.5. Exports of Marine Mammals from the U.S.

Same as in original permit application.

(a) The country of exportation, country of origin, export destinations:

Species	Part for import/export	Import: country of origin and exportation	Export: destination country
Sperm whale (*Physeter macrocephalus*)	Skin samples	Bahamas	U.S., U.K.
Beaked whales (*Ziphius, Mesoplodon* spp.)	Skin samples	Bahamas	U.S., New Zealand
Pilot whale (*Globicephala* spp.)	Skin samples	Bahamas	U.S.
Melon headed whale (*Peponocephala electra*)	Skin samples	Bahamas	U.S.
Risso's dolphin (*Grampus griseus*)	Skin samples	Bahamas	U.S.

(b) A description of how the marine mammal part/product to be imported were taken in the country of origin:

Species affected	Part collected
beaked whale (sp.), pilot whale (sp.), sperm whale, melon headed whale, Risso's dolphin	Skin samples collected from skin sloughed with suction cup tag

(c) Statement and documentation of the status of collected materials:

Same as in original permit application.

IV.D. RESEARCH EFFECTS AND MITIGATION MEASURES

D.1. Effects

Same as in original permit application.

IV.D.2. Measures to Minimize Effects

Same as in original permit application.

IV.D.3. Monitoring effects of activities

What criteria will be used to judge when a disturbance occurs?

Same as in original permit application.

Post disturbance monitoring procedures

As far as is possible, vessel-based and aerial-based monitoring will be conducted in the vicinity of where playback had been conducted.

IV.D.4. Alternatives

Same as in original permit application.

IV.E. RESOURCES NEEDED TO ACCOMPLISH OBJECTIVES

There are a number of resources required to complete Phase II of the BRS. At the time this application was written, contracts were being developed for all of the major organizations involved in the study. These contracts will be similar to those in-place during BRS-07. Table IV.E.1-1 provides an organizational list and associated sponsors.

Table IV.E.1-1 Participating Organizations

Organization	Sponsor	POC	Phone
Marine Acoustics, Inc.	PEO IWS 5, CNO (N872A)	Clayton Spikes	(703) 465-8404
WHOI	ONR, PEO IWS 5, CNO (N872A, N45)	Peter Tyack	(508) 289-2818
BMMRO	ONR	Diane Claridge	242-366-4155
St. Andrews Univ. (SMRU)	PEO IWS 5, CNO (N872A)	Ian Boyd	011-44-133-446-3628
NOAA/NMFS	same	Brandon Southall	301-713-2363 x163
NUWC (Code 71)	ONR, PEO IWS 5, CNO (N872A, N45)	David Moretti	401-832-5749
SPAWARSYSCEN, San Diego	PEO IWS 5	Angela D'Amico	(619) 553-1794
Cornell University	PEO IWS 5, CNO (N872A)	Christopher Clark	607-254-2408

Types and operational characteristics of the research vessels

This field work will require vessels to perform several different functions: FF, tag attachment, animal/tag tracking, animal and vessel observation, PB, and acoustic monitoring. In some cases, the same vessel can play more than one role. Functionally, they are:

Tag attachment vessel (TAV)

Tag delivery will be conducted to minimize the potential for disturbing the animal. We propose to use small maneuverable vessels for tag attachment. We have successfully used 5-15 m vessels for attaching tags to animals in 1998 - 2007, with minimal signs of disturbance using a 12+ m long cantilevered pole or a 4-5 m handheld pole. We propose to attach tags using a pole or remote attachment system deployed from a similar kind of vessel (e.g., 3-5 m RIB) by approaching them slowly.

Whale Observation/Tag tracking Vessel (OV or WTV)

The primary requirement for the whale tracking vessel (WTV) are:

- Height for antenna placement and for visual observations;
- Silent propulsion and ability to deploy hydrophone array;
- Ability to deploy TAV;
- Cabin and bunk space for tagging team, visual monitors, and a crew of acoustic monitors to operate around the clock, if required.

A large quiet research vessel is optimal for this task. One critical component of the PBs involves accurate assessment of range from the PB source to the focal animal. We will measure the angle between a surfacing animal and the horizon or use laser range-finding binoculars to calculate range for animals visually sighted at the sea surface. In some circumstances, it is possible for the acoustic monitors to estimate the range to vocalizing animals as well (Thode et al. 2002). If the OV and PBV are separate vessels, we will have a data link between them to allow each platform to plot the locations of ships and animals in near-real-time. These data will be supplemented by the standard AUTEC platform reconstruction data, coupled with the best estimate of animal underwater location from the range hydrophone data.

Playback vessel (PBV)

The PB vessel will be used to deploy the sound source(s) and transmit the experimental stimuli signals. It must have hardware for deploying the sound source(s) and a suitable deck and lab space for the source equipment and sound generation electronics (computer, power amplifiers, etc.). The sound source(s) will produce mid frequency signals and provide the ability to closely emulate the signals produced by the U.S. Navy mid frequency sonars--one significant difference being that the source is not capable of transmitting at the source levels produced by Navy sonars. As previously discussed, sources deployed from the PBV will not transmit at levels greater than 220 dB. One critical component of the PBs involves accurate assessment of range from the PB source to the focal animal. We will use laser range-finding binoculars or measure the angle between a surfacing animal and the horizon to calculate range for animals visually sighted at the sea surface. In some circumstances, it is possible for the acoustic monitors to estimate the range to vocalizing animals as well (Thode et al. 2002). This vessel should have a relatively quiet propulsion system to minimize potentially confounding vessel noise. These data will be supplemented by the standard ship location data, coupled with the best estimate of animal underwater location from the range hydrophone data.

DTAGs

Same as in original permit application.

Passive Acoustic Monitoring (PAM)
Same as in original permit application.

Source Characteristics

The BRS team will have a primary and alternate source for PB operations. These sources will be capable of transmitting signals in the 1Khz to 20 Khz spectrum at broadband source levels not exceeding 220 dB re: 1 μPa at 1m. Based on the transmission loss (TL) analysis for TOTO, a TL of approximately 60dB is realized over a distance of 1000 m or less, therefore the maximum range out to the 160 dB isopleth is 1,000 m. NMFs uses 160 dB as a criterion to estimate level B harassment takes; i.e. it assumes no takes for RLs <150 dB. This 1000 m buffer zone was established for use during BRS-07 as a guide to ensure animals were further than the predicted range at which level B harassment takes might occur. This buffer will be the standard for future BRS efforts unless new results or other circumstances dictate a modification (which would be requested in an amendment to our permit for a reduction in buffer zone). Received levels at animals would be less than the 170 dB threshold and in most instances not exceed 160 dB.

Playback of Orca vocalizations cover a fairly wide spectrum and will likely result in a lower RL due to the lower frequency response of the source at frequencies exceeding 5 Khz.

In all PB instances, a source ramp-up period will be exercised starting at 152 dB SL (which would result in a RL of approximately 92dB). This SL is so low that the signal will be near detectability at the animal. The SL will be incrementally increased until the maximum SL is achieved, the maximum RL at the animal is reached, or it is determined that an animal response was elicited. The source will be capable of stopping transmissions in less than 10 seconds should the need arise. Animal response will be monitored via methods previously described.

IV.F. PUBLICATION OF RESULTS

The preliminary results in the form of a "Quicklook Report" will be made available to the general public approximately 60 days after each BRS field effort concludes. A final report synthesizing results from all seasons will be completed within 180 days of expiration of the permit. In addition, the research results will be published in peer-reviewed scientific journals, such as the Journal of the Acoustical Society of America (JASA), Behavioral Ecology and Sociobiology, Marine Mammalogy, Marine Mammal Science, Acoustics Today, Nature, and Animal Behavior. The results will also be presented at the earliest possible opportunities at scientific seminars and conferences, such as the Acoustical Society of America (ASA), the European Cetacean Society, and the Society for Marine Mammalogy.

V. NEPA CONSIDERATIONS
Same as original permit application

VI. PREVIOUS AND OTHER PERMITS

A. PREVIOUS PERMITS

Permit no. 1121-1900 was for Phase I of the BRS (2007) which involved tagging and playback experiments with beaked whales, ended September 2007.

B. OTHER PERMITS

This research will occur in the EEZ of another nation (Bahamas), and some of it will occur within that nation's territorial seas. We will apply for the appropriate permits from the foreign controlling authorities for this research. BRS-07 was conducted under Bahamian Permit No. 02-07.

Any import/export of tissue from CITES species will occur with a CITES permit.

VII. REFERENCES

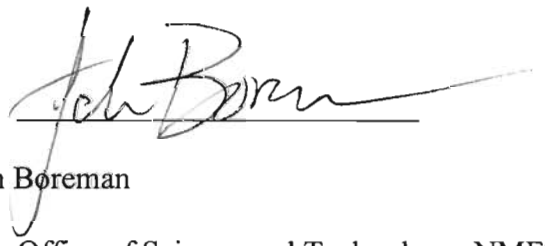
Same as original permit application.

VIII. CERTIFICATION AND SIGNATURE

"I hereby certify that the foregoing information is complete, true, and correct to the best of my knowledge and belief. I understand that this information is submitted for the purpose of obtaining a permit under one or more of the following statutes and the regulations promulgated thereunder, as indicated in Section I of this application:

- The Endangered Species Act of 1973 (16 U.S.C. 1531-1543) and regulations (50 CFR 222.23(b)); and/or
- The Marine Mammal Protection Act of 1972 (16 U.S.C. 1361-1407) and regulations (50 CFR Part 216); and/or
- The Fur Seal Act of 1966 (16 U.S.C. 1151-1175).

I also understand that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or to penalties provided under the Endangered Species Act of 1973, the Marine Mammal Protection Act of 1972, or the Fur Seal Act of 1966, whichever are applicable."

APPLICANT SIGNATURE: 

PRINT NAME: Dr. John Boreman

TITLE: Director, Office of Science and Technology, NMFS

DATE:

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