I. TITLE OF APPLICATION

Request for amendment of Permit 781-1824-01 for Scientific Research under the Marine Mammal Protection Act and Endangered Species Act

II. Date of Application 29 March 2010; revised 19 July 2010

III. Applicant and Personnel

A. Applicant/Permit Holder, Principal Investigator, Co-Investigators and other Personnel Directly Involved in Taking

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B. Qualifications and Experience:

Curriculum vitae of the PI and CIs are in Appendix I

Dr. Hanson will be the primary person conducting remote deployment of implantable dart tags on cetaceans as requested in this amendment application. He has been, and will continue, working closely with Drs. Robin Baird and Russ Andrews, and Mr. Greg Schorr. We have collectively deployed over 140 tags of the type requested in this amendment. Any additional personnel involving tagging (boat driving or tag deployment) will undergo training by the PI/CI or collaborators in tag deployment techniques and will have considerable prior experience with biopsy sampling and deployment of dart or suction-cup attached tags.

Dr. Hanson has been a CI on permit 781-1824-01 as well as permits 967 and 781-1349.

IV. Proposal

A. Summary:

We are seeking an amendment to Permit No. 781-1824-01 to add dart implant and increase suction cup tagging takes on Southern Resident killer whales in the inland waters of Washington State. The primary purpose for this amendment is to increase our ability to characterize cetacean movement patterns for stock structure and habitat use. The total number of each type of take requested is highlighted in bold in Table 1. For Eastern North Pacific southern resident killer whales (*Orcinus orca*) – we want to add 6 dart implant tags and increase suction cup tags to 20 Implant tagging will occur concurrently with already permitted activities (i.e., vessel surveys, focal follows, photo-identification, suction-cup tagging etc), in Pacific Northwest waters.

B. Introduction

1. Species

(a) Target Species/stocks currently permitted – no additional species requested. Amendment request is for changes to takes of Eastern North Pacific Southern Resident stock killer whales.

Harbor Porpoise *(Phocoena phocoena)*
- Central California stock
- Northern California stock
- Oregon/Washington coastal stock
- Washington inland water stock
- Alaska stock (Southeast stock, Gulf of Alaska stock, Bering Sea stock)

Dall's Porpoise *(Phocoenoides dalli)*
- California/Oregon/Washington stock
- Alaska stock

Pacific White-sided Dolphin *(Lagenorhynchus obliquidens)*
California/Oregon/Washington Northern and Southern stocks
Risso's Dolphin *(Grampus griseus)*
California/Oregon/Washington stock
Striped Dolphin *(Stenella coeruleoalba)*
California/Oregon/Washington stock
Short-beaked Common Dolphin *(Delphinus delphis)*
California/Oregon/Washington stock
Northern Right Whale Dolphin *(Lissodelphis borealis)*
California/Oregon/Washington stock
Killer Whale *(Orcinus orca)*
Eastern North Pacific Southern Resident stock
Eastern North Pacific Alaska Resident stock
Eastern North Pacific, West Coast, and Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stocks
Eastern North Pacific Offshore stock
Short-finned Pilot Whale *(Globicephala macrorhynchus)*
California/Oregon/Washington stock
Baird's Beaked Whale *(Berardius bairdii)*
California/Oregon/Washington stock
Alaska stock
Mesoplodon spp.
California/Oregon/Washington stock
Cuvier's Beaked Whale *(Ziphius cavirostris)*
California/Oregon/Washington stock
Sperm Whale *(Physeter macrocephalus)*
California/Oregon/Washington stock
Pygmy Sperm Whale *(Kogia breviceps)*
California/Oregon/Washington stock
Gray Whale *(Eschrichtius robustus)*
Eastern Pacific stock
Eastern North Pacific stock
Minke Whale *(Balaenoptera acutorostrata)*
California/Oregon/Washington stock
Alaska stock
Blue Whale *(Balaenoptera musculus)*
Eastern North Pacific stock (California/Oregon/Washington)
Fin Whale *(Balaenoptera physalus)*
California/Oregon/Washington stock
Alaska stock
Humpback Whale *(Megaptera novaeangliae)*
Eastern North Pacific stock
Central North Pacific stock
Western North Pacific stock

(b) Non-target species:

Incidental harassment of other protected species (ESA listed/other marine mammals) is currently authorized under Permit No. 781-1824 for all activities (photo-identification, behavioral observations, suction-cup tagging etc). No additional non-target species will be affected specifically by the dart tagging activities proposed herein.

c. ESA/MMPA status

The species requested for additional takes is ESA listed southern resident killer whales, which are also listed as depleted under the MMPA.

2. Background/Literature Review

Implantable tag studies

NOAA Fisheries is mandated under the ESA to designate Critical Habitat for listed species which requires location data. The ESA also requires the development of a Recovery Plan with identification of Risk Factors which require additional research (for which movement data may be required) in order to implement mitigation measures. NMFS is also mandated under the MMPA to determine stock structure for all marine mammal species and understanding habitat use is also important in order to meet the MMPA's objective of ensuring that species/stocks are viable components of ecosystems. Adequate stock assessments require both robust estimates of population size and trends as well as accurate delineations of stock structure boundaries. It has been noted that many types of data can provide information on stock structure, including distribution, population response, morphology, genetics, life history, and contaminants, but each has inherent limitations. In some cases genetic data can provide information on where delineations in population structure occur although in others it can only indicate that additional structure exists within the population (Chivers et al. 2007b) Assigning stock boundaries using genetics can be particularly problematic where distributions are contiguous (Martien and Taylor 2003). For some populations photo-ID catalogs exist, and although patterns of movements can be assessed using resights, the use of this method to meet this objective is predicated on the assumption that search effort is equally distributed throughout the range of the stock. This assumption rarely met, resulting in an assessment that can be severely biased.

In the North Pacific Ocean, photo-identification of individuals of a number of species of odontocetes has been used to examine potential population structure. Using photo-identification, movements of individuals of several populations /stocks has been documented among the sites that are nearshore and protected. However, many species likely utilize areas well beyond the range a safety of small boats. Species that are present in Hawaii represent a good example of these data gaps. For instance, main island areas have been documented for short-finned pilot whales, false killer whales, melon-headed whales, and rough-toothed dolphins (Baird et al. 2005; Huggins et al. 2005; Baird unpublished). However, the frequency of inter-island movements varies dramatically among these species, and little is known of the rate of movements. How far individuals of these species range offshore is not known, although there is genetic evidence of island-associated populations for several species of odontocetes (Chivers et al. 2003, 2007a; Martien and Baird 2006).

Some information on short-term movements has been obtained from suction-cup attached

VHF radio tags (e.g., Baird et al. 2006; Baird et al. 2007). However, suction-cup attached tags typically remain attached only for short periods (e.g., with >50 deployments on killer whales in the Pacific, mean attachment duration was approximately 10 hours with a maximum duration of 40 hours), and thus information on movements using this technique is limited. In addition, use of suction cup attached tags for examining movements is limited by migration of the tag along the body due to drag, resulting in the VHF antenna on the tag not clearing the water (and thus no signals may be received). As well, to obtain location information from suction-cup attached VHF tags the animal must be located using radio tagging from a small boat, which limits location information to relatively near-shore and protected waters.

Home range delineations using movement data from animals equipped with telemetry devices is a relatively unbiased approach to provide direct evidence of stock boundaries (Bethke et al. 1996, Hanson 2007a,b). Movement information within a species/stock's range is critical to informed management decisions. As such, within the Tier II assessments (defined as those that would improve stock assessments to fully meet the needs of the MMPA and ESA), marine mammal stock assessment scientists at NMFS Fisheries Science Centers ranked tagging to study distribution and movements as the highest of all of the proposed survey data collection program techniques which would have the greatest impact on their ability to assess species (NMFS 2004).

Limited information is available on movements of individual animals or stock boundaries for populations of most of the species/stocks included in the current request (with the exception of some information on near-shore movements of non-Southern Resident killer whales). There have been a small number of tag deployments killer whales and sperm whales in Alaska by Dr. R. Andrews, and by Dr. Robin Baird (under NMFS permits No. 782-1719 and 774-1714), on short-finned pilot whales (36 satellite, 4 VHF), Cuvier's (6 satellite) and Blainville's beaked whales (11 satellite), melon-headed whales (13 satellite), false (23 satellite) and pygmy killer whales (4 satellite) in Hawaii, and a limited number on Cuvier's beaked whales (2), and fin whales (16), and blue whales (3), bottlenose dolphin (1) in California, and 11 sperm whales and a humpback whale (1) in Alaska. There were also 11 transient killer whales and 1 minke whale tagged in the Pacific Northwest.

The proposed work will address a key data gap (winter distribution) identified for Southern resident killer whales and will allow managers to revise the designated Critical Habitat to include a more complete portion of their range. Despite ongoing efforts to document the whales' winter distribution through an enhanced coastal sighting network, deployment of autonomous acoustic recorders, and dedicated research cruises a significant gap remains in their spatial and temporal distribution which precludes finalizing Critical Habitat. Although tagging in the same area and season might appear duplicative, the requested sample size of tagged individuals is very small and we expect different pods may use different regions and this may vary annually. In addition, tagging animals in the same area and season may be warranted due to the need to assess current and future impacts of anthropogenic activities, (e.g., fishery interactions, naval exercises). As well, new sensors, e.g., depth, are becoming incorporated into satellite tags which provide important additional information on habitat use. As noted above, tagging provides movement information that is unbiased, with spatial and temporal scales that are uniquely different to other methodologies.

3. Hypothesis/Objectives and Justification

3 a.

Implantable tag studies

The primary objective of the deployment of satellite tags on southern resident killer whales is to gain new information on movements at unique temporal and spatial scales for use in stock assessment, habitat use, and assessment of the impact of anthropogenic activities. The tagging of southern resident killer whales has dedicated research funding. The sample size outlined for southern resident killer whales is predicated on deploying 2 tags in each of the three pods, J, K, and L. The deployment of two tags allows for redundancy in case of a premature failure of the transmitter or attachment system). Candidate animals for tagging are listed in Table 2 and will be limited to post-reproductive females (i.e., >40 years of age), and adult males (i.e., >15 years of age). Tagging of animals exhibiting suboptimal health status, e.g., emaciation, will be evaluated on a case-by-case basis, as being able locate and follow-up on some of these animals would provide extremely valuable information on health or carcass recovery. Even a few tags will provide significant new information that will potentially allow for the assessment of:

- How far do resident-type killer whales range latitudinally on the outer coast of the U.S and Canada? – needed for Critical Habitat designation
- Whether and how far resident-type killer whales inhabit off-shore waters (e.g., > 30 km of coast) of the U.S and Canada? - needed for Critical Habitat designation
- What are the core areas for resident-type killer whales in offshore waters? - needed for Critical Habitat designation
- What are the prey species of resident killer whales on the outer coast of the U.S. and Canada? – Recovery Plan prey/availability selection risk factor
- Large-scale habitat use patterns - will provide key information be used to assess Critical Habitat for ESA listed species and for ecosystem models
- What is the frequency and rate of inter-core area movements? needed for Critical Habitat designation
- What is the frequency and rate of large-scale movements? - needed for Critical Habitat designation
- What is the maximum range size and core areas for different species? – stock assessment and habitat use
- Do coastal and island associated populations have both along-shore and offshore movements? – will be important input for ecosystem models
- How often do individuals use areas where fishing activities or naval exercises occur? – needed for mitigation measures
- How do dive and movement patterns change in the presence of loud anthropogenic sound sources (e.g., Commercial shipping, MFAS, naval or whale watching vessels)? - needed for mitigation measures

All of these factors will be used in the assessment of stock structure for this stock in combination with information obtained from ongoing photo-identification studies, and will be made available

to NMFS and the Pacific and Alaska Scientific Review Groups for assessment of stock structure.

Tags are typically expected to remain attached and functioning for approximately 3-12 weeks, based on previous deployments of these tags on killer whales (Andrews et al. 2008, Baird et. al. 2010, Schorr et al. 2010, R. Andrews unpubl. data, NWFSC, unpubl data) and on similar species, short-finned pilot whales (Hanson et al. 2008). Some tags are expected to fail quickly (within 1-2 days) due to poor attachments, electronic failure due to impact, or damage to the electronics due to pressure from deep dives. For example, of six tags deployed under Permit No. 782-1719in Nov/Dec 2006 two were likely to have failed within a few days due to damage to the electronics from the pressure of deep dives.

b. (1)

Implantable tag studies

Winter distribution is the primary data gap for southern resident killer whales and their Critical Habitat designation has been only partly defined because managers lacked sufficient information to adequately delineate this for the outer coast.

The Pacific Scientific Review group that evaluates NMFS marine mammal stock assessment efforts has recommend that southern resident killer whale be satellite tagged to provide significant new information on movements and habitat use that will be pertinent to a more accurate Critical habitat designation. This approach is also identified in the Recovery Plan for southern resident killer whales. Less than 50 locations of southern resident killer whales have been documented on the outer coast during the winter and spring over the past 33 years that this population has been monitored. Tag deployments on other species have demonstrated that significant new information on movements will be obtained in a very short time period (see Andrews et al. 2008).

Alternative species can not be used because the movement and habitat use information needed is specific to these species. As noted previously, the Recovery Plan outlines specific data needs that the use of telemetry would fulfill relative to either conservation problems or basic biology.

C. Methods

1.a. Duration of Project

Tagging using dart implant tags will be undertaken from when the permit modification is issued through the expiration of the permit (April 14, 2011). We propose to begin implant tagging in November or December 2010.

1.b. Location of Taking

Implantable tag studies

Tagging using implant dart tags and other requested activities will be undertaken in the coastal and inland waters of the Pacific Northwest. Tagging southern resident killer whales is primarily expected to be conducted in Puget Sound in the fall, but could also occur in coastal waters as late as spring. Tagging of individuals in this population will be conducted outside close visual range of the general public from shore or boats.

2a. Take Table

Table 1a. Permitted and proposed (in bold) activities per year for ESA listed species in the Pacific Ocean (U.S. EEZ and Int. areas) - For southern residents killer whales tagging will be limited to post-reproductive females, and adult males.

Species / Population	Aerial/vessel surveys, photo-ID, photo-/video-grammetry, focal follows, passive acoustic recording	Biopsy	Breath sample	Ultrasound	Implant-able tags **(including dart tags)**	Suction cup tags	Incidental harassment for research activities	Worldwide import/ export of parts/ samples
Blue whale *Balaenoptera musculus*	40	10	--	--	15	--	20	5
Fin whale *Balaenoptera physalus*	25	10	--	--	10	--	10	5
Humpback whale, *Megaptera novaeangliae*	140	25	10	0[1], 5[2]	20	--	200	5
Sperm whale, *Physeter macrocephalus*	80	20	--	--	10	--	100	10
Killer whale (Southern Resident), *Orcinus orca*	215	25	5	--	**Change from 0 to 6 dart tags**	**Change from 10 to 20**	300	30

[1]Individuals will only be successfully tagged once per year, but there may be up to two tagging attempts per individual per day, and no more than four tagging attempts per individual per year.
[2]Activities may occur year-round in each location.

2.b. Types of Activities, Methods, and Numbers of Animals to be Taken

Implantable tag studies

The primary type of satellite and VHF radio tags to be deployed on cetaceans will be a dart implant attachment system. This system to be used was developed by Russ Andrews, University of Alaska. It is currently in use by researchers working with killer whales in Alaska and in the Antarctic and with transient killer whales the Pacific Northwest by the applicant in

collaboration with R. Baird and G. Schorr, Cascadia Research, Russ Andrews, University of Alaska, Ken Balcomb, Center for Whale Research, and John Ford, Department of Fisheries and Oceans Canada. In addition, R. Baird and G. Schorr have deployed these tags successfully on short-finned pilot whales, Cuvier's beaked whales, Blainville's beaked whales, false killer whales, pygmy killer whale, and melon-headed whales in Hawaii (under permits No. 774-1714 and/or 782-1719) and on Cuvier's beaked whales, fin and blue whales, and a Risso's and bottlenose dolphin in southern California.

The tag body is dome shaped with the current configuration (including a Wildlife Computers Spot-5 PTT or a VHF transmitter) approximately 7 cm in length, 3 cm in width, and 2.2 cm in height, with a 17 cm long antenna sticking out of the center of the half dome. Current configurations of satellite tags weigh 44-46 grams and VHF tags weigh 46-47 grams. Latest generation equipment will be used to reduce tag size as it is available. On the flat side of the tag is a retention system. Currently this uses two titanium darts, approximately 0.6 cm in diameter, and 7 cm long, with backwards facing flanges that act to anchor the tag (Figure 1).

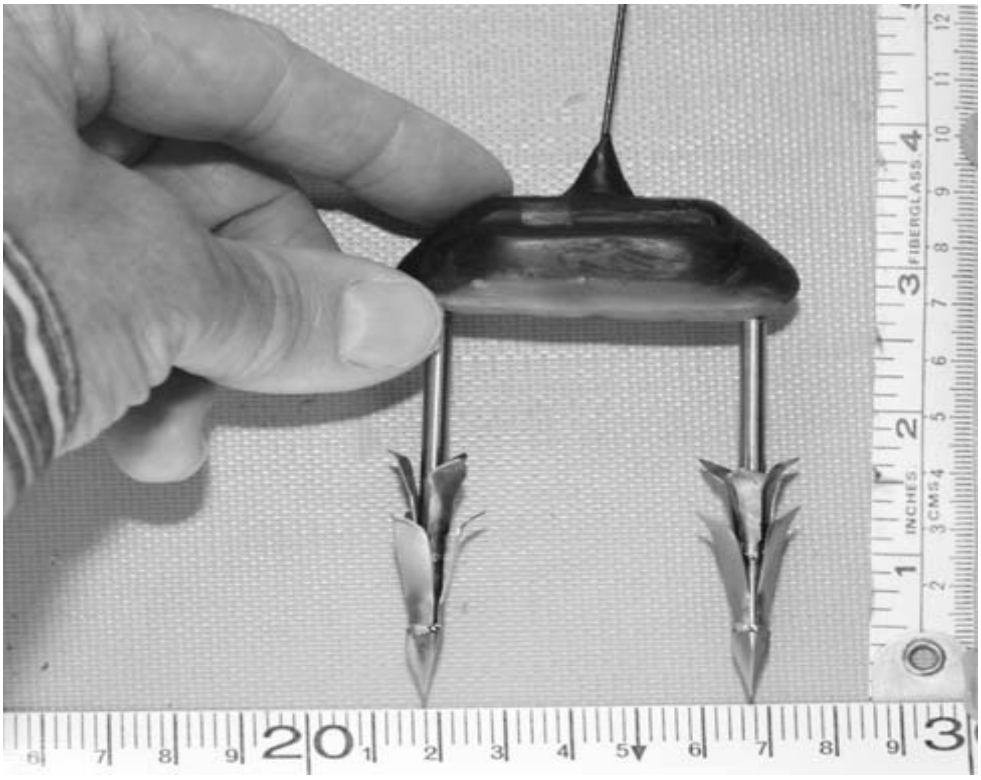

Figure 1. Current design of darts used on remotely deployed dorsal mounted satellite tag.

Tag designs are constantly being evaluated based on information obtained as a result of previous tags deployed by the applicants and collaborating individuals (e.g., Dr. R. Andrews, University of Alaska), and thus exact tag dimensions, weights, and configurations may vary, including dart length, diameter, and the number and size of retention flanges. In general, we will be striving to reduce dart mass (i.e., reduce shaft diameter and length, and size of retention structures) to improve deployment distance while maintaining or increasing attachment durations

and minimizing tissue impacts.

All darts will be sterilized by first vigorously scrubbing with warm soapy water. Darts are then rinsed and boiled twice for 5 minutes, changing water between. Next they are soaked in 10% bleach solution for 10 minutes, and rinsed. This is followed by a rinse and then a soak in acetone and then they are dried. The darts are then soaked in isopropyl alcohol and when dry are coated with non-analgesic triple antibiotic and then wrapped in acetone washed foil and placed in a Ziploc bag.

Approaches to whales for tagging will be undertaken in the same way as currently authorized for suction-cup tagging of southern resident killer whales on the original permit. The research vessel will slow as the whale group is approached to match the speed and direction of the individuals in the group. For southern resident killer whales implant dart tagging will be limited to post-reproductive females (estimated age >40) and adult males (estimated age 15 or greater) (Table 2). This includes 6 of the 28 whales in J pod 5 of the 19 whales in K pod, and 19 of 42 whales in L pod. Priority will be given to tagging post-reproductive females as there is recent evidence that attachment durations are shorter on adult males than adult females (transient killer whales) for reasons that remain unclear (NWFSC, unpubl. data, C. Matkin, pers. comm.). Only 2 tags would be deployed in each pod per year with the exception of L pod due to the generally different occurrence patterns of some subgroups, e.g., L11/L12 subgroup. Additional selectively will be based on association patterns, e.g., L87 may be tagged as a surrogate for a K pod whale and L7 or L53 may be tagged as surrogates for J pod whales due to recent extended associations.

Individuals will only be successfully dart implant tagged once per year, but there may be up to two tagging attempts per individual per day, and no more than four tagging attempts per individual per year. Individuals may be taken by harassment incidental to tagging activities (e.g., non-target individuals, target individuals during unsuccessful tagging attempts), as is currently authorized under the permit. Individuals that are dart tagged will be photo-id'd and may be subsequently approached for focal follows, biopsy sampling, or suction cup tagging at a later date.

Tags may be deployed with a Pneumatic projector, a crossbow, or a pole, at distances from 2-8 m. The primary target for tag attachment is the middle part of the dorsal fin or on the back near the base of the dorsal fin. The tag deployment will be photographed with digital cameras to verify the animal ID, the tag's location and orientation, and whether it is seated flush to the skin.

Tag deployments will be conducted outside the visual range of public. Because the primary data gap for southern residents is winter distribution, dart tag deployments will be initiated no earlier than October but no later than the end of March. These tags are expected to provide location data for periods ranging from 16-94 days (Table 3).

Table 2. IDs of post-reproductive female and adult male southern resident killer whales that would be candidates for implant-dart tagging

Whale ID	Sex	Estimated Age
J1	Male	59
J2	Female	99
J8	Female	77
J26	Male	19
J27	Male	19
J30	Male	15
K11	Female	77
K40	Female	47
K21	Male	24
K25	Male	19
K26	Male	17
L25	Female	82
L12	Female	77
L41	Male	33
L2	Female	50
L85	Male	19
L87[K]	Male	18
L79	Male	17
L89	Male	17
L78	Male	18
L88	Male	17
L26	Female	54
L92	Male	15
L7[J]	Female	49
L53[J]	Female	33*
L27	Female	45
L5	Female	47
L73	Male	24
L74	Male	24
L84	Male	20

* has produced no calves
[J] Typically associates with J pod
[K] Typically associates with K pod

Table 3. Deployment duration for 11 satellite tagged transient killer whales on the U.S. west coast

Whale ID	Date	Location	Number of transmission days	Duration of Attachment
T30	9/14/08	San Juan Islands	94	>94 <126
T30A	9/14/08	San Juan Islands	47	47
T19B	9/16/08	San Juan Islands	21	21*
Unk. ID	4/6/09	Oregon Coast	24	24*
T11	4/6/09	Oregon Coast	93	93+
CA173	4/8/09	Washington Coast	22	22*
T60	9/14/09	Gulf Islands BC	86	86+
T20	9/18/09	Gulf Islands BC	29	29*
T36A	9/20/09	South Puget Sound	86	86+
T100B	2/21/10	North Puget Sound	17	17*
T100C	2/21/10	North Puget Sound	16	16*

*Attachment failure assumed due to normal battery parameters

The October to March deployment window will also likely allow dart out-migration and tissue healing before the whales return to inland waters in the late spring when whale watching is active. Tissue impacts at the dart attachment site have been monitored for numerous species (Hanson et al. 2008), including killer whales, which show healing within this timeframe.

Tag loss has been documented to proceed in a predictable manner with the darts eventually out-migrating from the tissue in whales of four different species (Hanson et al.2008, Cascadia unpubl. data), as well as 3 of the 11 tagged transient killer whales. Figures 2 and 3 illustrate that the dorsal fin tissue typically heals with only a small area of de-pigmentation at the dart penetration sites within about 3 months post tag loss. Figure 4 illustrates that the tissue condition 547 days post-tag deployment on a transient killer whale following a tag attachment duration of approximately 3 months also include raised areas at the dart penetration sites. The following web site contains photographs of a short-finned pilot whale and a Blainville's beaked whale tagged in Hawaii using the proposed method (conducted under Permit No. 782-1719): http://www.cascadiaresearch.org/hawaii/satellite.htm#cbw, and scroll down to pictures with satellite transmitters).

For southern resident killer whales there will be a dedicated resighting effort in order to collect ancillary data on foraging/habitat use and condition of the tag attachment.. As has been done with transient killer whales, we will coordinate this relocation effort with other researchers conducting photo-ID work: Robin Baird, Cascadia Research Collective, Ken Balcomb, Center for Whale Research, John Ford, Department of Fisheries and Oceans Canada. However, it is important to realize that the whales will likely be in the coastal waters of U.S. and Canada the vast majority of the winter and spring such that access to the whales via small boats from the widely separated coastal ports will be extremely challenging due to persistent inclement weather and limited daylight hours. In order to maximize the potential to relocate the whales and the amount of information on tag attachment and animal condition, prey selection and habitat use, we will request that our sea day allocation on NOAA ocean class research vessels overlap with

the predicted duration of tag attachments in order to maximize successful relocation of the tagged whale. If the tagged whales can be relocated, we will be able to collect information on tag attachment condition and more detailed information of habitat use. In addition, if weather allows small boat operations to be conducted, we will also potentially be able to collect predation and fecal samples in order to better assess prey selection in coastal waters as well as biopsy samples to examine trophic level from stable isotopes levels. Consequently, we hope to be able to periodically conduct focal follows for a period of several hours on days when whales can be relocated. Photographs of previously tagged whales will also be obtained opportunistically post-tag loss when they return to inland waters in the summer.

Figure 2. Pilot whale Gm 5 41 days post tag deployment.

Figure 3. Pilot whale Gm 5 138 days post tag deployment.

Figure 4. Killer whale T30A 547 days post-tag deployment.

D. Research Effects and Mitigation Measures

1. Effects

Implantable tag studies

a.) Effects of tagging can include short- and long-term effects. Short-term effects could include those from boat approaches for tagging, behavioral impacts of tagging on non-target individuals (or on target individuals if the tag attempt misses), and impacts of the tag attachment itself. Effects associated with approaches or behavioral impacts of tagging on non-target individuals (or on the target individual if the tag attempt misses) are expected to be no greater than typical effects of approaches or biopsy attempts; e.g., a short-term increase in speed and/or change in direction. Southern resident killer whales can be closely approached (based on prior work by the applicant) with no avoidance reaction. Reactions of non-target individuals typically depend on the proximity of these individuals to the target; nearby individuals may exhibit a flinch and/or fast dive response similar to target individuals that are suction cup tagged, biopsy sampled, or dart tagged (see 2007 and 2008 Annual Reports for Permit No. 782-1824).

Because the dart tags penetrate the skin and connective tissue of the dorsal fin, and remain attached for up to several weeks, a risk of infection is a potential long-term effect. However, it should be noted that a gross examination of tissue condition using resight photos of many of the whales tagged in Hawaii do not show any obvious signs of infection (Hanson et al. 2008). It should be noted that some killer whales in various ecotypes have sustained damage to the trailing edge of the dorsal fin that exceeds the tissue damage the out-migrating darts cause. In addition, odonotocetes inhabiting Hawaiian waters are regularly bitten by cookie-cutter sharks, which create wounds up to several cm deep and 5-10 cm in diameter, and thus the tissue impacts associated with tag attachment may not be particularly unusual for these species. Tag attachments are not expected to have any long-term effect on an individual, or population level impacts. Martin et al. (2006) report on a study examining survival and reproduction in tagged and untagged botos (*Inia geoffrensis)*, and found no effects on either survival or reproduction for tagged versus untagged individuals. Similarly, Wells et al. (2008) found that some bottlenose dolphins survived amputation of the distal end of the fin and continued to reproduce. One of the tagged Blainville's beaked whales was subsequently resighted with a calf (R. Baird, unpubl. data).

2. Measures to minimize effects

Implantable tag studies

Tags will be deployed without capturing individuals, thus eliminating risk associated with capture and handling. Approaches for the purposes of tagging will be made in a way as to minimize disturbance to individuals, with the research vessel gradually reducing speed as the group is approached to match the group/individual speed and direction. To minimize Level B harassment of non-target individuals, when there is a choice of a suitable target individual that is somewhat separated from the main body of a group, these individuals will be targeted. It should be noted however that for some species (e.g., beaked whales) opportunities for tagging are rare and there may be no option for tagging individuals away from the main body of a group. An

individual will be not be intentionally tagged more than once per year. No more than two tagging attempts per individual per encounter, or four tagging attempts per individuals per year, will be made.

To minimize hydrodynamic drag the smallest, lowest volume package available is used. Current versions of tags weigh 44-47 grams, in comparison to typical suction-cup attached tags being deployed under Permit 782-1824, which weigh from approximately 250-450 grams. To minimize risk of infection, prior to deployment the darts are sterilized and coated with antibiotic as described by the procedure outlined previously.

Tagging of southern residents will be conducted in coordination with all other permit holders. Similarly, tagging of cetaceans in other areas of the North Pacific will be conducted in coordination with Cascadia Research, Alaska, Southwest and Pacific Islands Fisheries Science Centers, and University of Alaska.

3. Monitoring effects of activities

Implantable tag studies

During field projects when tagging is undertaken, and during subsequent field projects, attempts will be made to obtain photographs of previously tagged individuals to examine wound healing and modes of tag failures. In addition, photographs taken by other researchers working in the area will be utilized. Examples of this type of information are included in Hanson et al. (2008).

4. Alternatives

Implantable tag studies

Using satellite tags to examine movements of individuals is the least biased and most feasible way of assessing offshore movements of individual cetaceans. The only alternative method for obtaining information on offshore movements is through boat-based photo-identification, which is severely limited in scope by sea conditions and range of small vessels. Work far offshore is prohibitively expensive and provides biased information on movements, as individuals can only be detected in areas surveyed, rather than with satellite tags, where individual locations can be determined regardless of where the individual travels. Even when ocean class vessels are used, the home ranges of some of these stocks are so large that the encounter rate is very low given the limited number of sea days that are typically available. Suction-cup attached tags typically remain attached for only short-periods and are thus not suitable. While the longest duration suction-cup attached tag to date remained attached for 79 hours, typical durations are less than 24 hours (e.g., with >50 deployments of suction-cup attached tags on killer whales in the Pacific, mean duration is approximately 10 hours, with maximum duration of 40 hours).

E. Resources needed to accomplish objectives.

The NWFSC has base funds to carry out its research plan for southern resident killer whales. This plan includes the use of satellite tagging to address the winter distribution data gap. In order to demonstrate the benefits of tagging to the public we opportunistically tagged transient killer whales and a minke whale in the Pacific Northwest in 2008-9 while conducting other southern resident killer whale research.

Cooperating institutions/researchers include:

- Dr. Robin Baird and Mr. Greg Schorr, Cascadia Research Collective
- Dr. Russ Andrews, University of Alaska, Fairbanks
- Mr. Ken Balcomb, Center for Whale Research, Friday Harbor, WA
- Dr. John Ford, Department of Fisheries and Oceans Canada
- Mr. Dan McSweeney, Wild Whale Research Foundation (a 501(c)3 non-profit research organization based in Hawaii), providing boats and other logistical support for tagging.

The only other individuals currently using satellite tags on any of the species/stocks discussed here are Dr. Russ Andrews (and collaborators) and Dr. Robin Baird, and Mr. Greg Schorr. Although Mr. Ken Balcomb has applied for a permit to tag only adult male southern resident killer whales, he has yet to exercise this option. Any tagging activities with these species/stocks would be coordinated with these individuals to minimize duplication of effort.

F. Publication of Results

Results of this research will be made available to the scientific community and the public in a variety of ways. The results will be published in peer-reviewed scientific journals as well as presented at national and international scientific conferences, presented to groups such as the Pacific Scientific Review Group (SRG) of NMFS, and posted on the applicant's web page.

V. NATIONAL ENVIRONMENTAL POLICY ACT CONSIDERATIONS

1. Remote deployments of VHF or satellite transmitters on free-ranging cetaceans have been undertaken a number of species, including gray whales (Swartz et al. 1987), humpback whales (Mate et al. 1998), blue whales (Mate et al. 1999), fin whales (Mouillot and Viale 2001), minke whales (Heide-Jorgensen et al. 2001), North Pacific and North Atlantic right whales (Mate et al. 2000; Wade et al. 2006), sperm whales (Watkins and Tyack 1991), bowhead whales (Heide-Jorgensen et al. 2006), killer whales (Andrews et al. 2008), short-finned pilot whales (Baird et al. unpublished), and Cuvier's and Blainville's beaked whales (Baird et al. 2007, Schorr etal. 2010). As such, the technique is not considered experimental.
2. The research proposed does not involve the collection, handling or transport of potentially infectious agents or pathogens or the use or transport of hazardous substances. Fecal samples are transferred to a tube or ziplock bag using sterilized gauze or pipets while wearing appropriate PPE (i.e., gloves) for storage in a -80 freezer.
3. No aspect of the activities proposed would impact the physical environment. Research will occur primarily at the surface of the ocean and will not involve activities that would impact the bottom substrate or shorelines.
4. The work proposed will not affect entities listed in or eligible for listing in the National Register of Historic Places or cause the loss or destruction of scientific, cultural or

historic resources, as there are no such locations within the action area for this amendment.

5. The proposed activities do not include any actions that might involve the transportation of any material from one area to another other than collecting scat and prey parts. Samples are preserved in tightly seals jars and transported directly to a laboratory

VI. Previous Permits and Other Permits:

A. Previous Permits: Previous permits issued to the NWFSC by the NMFS include General Authorization 781-1725-00. MMPA permits 967 and 782-1349 were issued to Brad Hanson for deployment of telemetry tags.

B. Other Permits: The NWFSC has obtained permits to conduct research activities in Olympic Coast and Gulf of Farallons National Marine Sanctuaries (Permit issued by the Superintendent of the OCNMS in 2005). Permits will be obtained from the US Fish and Wildlife Service to authorize under CITES the import/export activities included in this application. Appropriate permits will be obtained from the State of Hawaii. Any necessary Sanctuary or other permits will be sought prior to initiation of any activity in other areas.

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