

## Progress report on the proposed research programme for satellite tagging western gray whales in 2010

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### BACKGROUND

The western population of North Pacific gray whales (*Eschrichtius robustus*) is critically endangered (IUCN, 2008). The population is estimated to contain about 130 individuals age one or older, of which only about 25 are reproductive females (Cooke *et al.*, 2008), and it faces a number of anthropogenic threats throughout its range. Known threats to the population include interactions (some fatal) with coastal net fisheries (Weller *et al.*, 2008; Bradford *et al.*, 2009) along its migration route(s) and oil and gas development in and near its principal summer feeding area (IUCN, 2010). The wintering area of the population is presently unknown but, based on the limited available information, may be off the coast of southern China in the South China Sea and the Gulf of Tonkin (Weller *et al.*, 2002).

The IWC Scientific Committee and various panels convened under the auspices of IUCN have proposed repeatedly that satellite telemetry is an efficient way to investigate the migratory routes and wintering grounds of western gray whales. Scientists have been cautious about tagging these whales, however, because of the population's very low numbers. To ensure that a telemetry programme on western gray whales is carried out in the safest possible manner, the IWC Scientific Committee established a Scientific Steering Group (SSG) to provide advice on research protocols, study design and measures to be taken to minimise the risk of negative effects on individuals or the population as a whole.

Here, we outline the final set of specific protocols, as agreed to by the SSG, to be used during the satellite tagging research programme on western gray whales in 2010. These protocols ensure consistency between advice provided by the IWC Scientific Committee and the IUCN Western Gray Whale Advisory Panel (WGWAP).

### PROGRAMME REVIEW

In 2009, the IWC Scientific Committee extensively reviewed a proposed western gray whale tagging programme drafted by the SSG (Weller *et al.*, 2009; IWC, 2009). In addition, the WGWAP has reviewed the topic of satellite tagging of western gray whales twice since the 2009 Scientific Committee meeting, once in December 2009 and again in April 2010. Finally, a meeting of the SSG was held 26-27 April 2010 in Seattle. Members of the SSG participating in this meeting included Burdin, Donovan, Larsen and Weller; Brownell, Gales, Reeves and Tsidulko were invited but unable to attend. Amanda Bradford (University of Washington) and Bruce Mate (Oregon State University, OSU) were invited participants as they will be key members of the scientific party conducting the fieldwork. The overarching objectives of this SSG meeting were twofold:

- To complete a full review of the methods and results from a tagging study on eastern gray whales conducted by Mate in 2009-2010 (see SC/62/BRG21). This study, conducted off the north-western coast of the continental US, was designed in part to be a "test case" for tagging western gray whales off Sakhalin Island. In this regard, the study techniques and methods, tags, field protocols and photographic follow up studies to examine tag related wounds and subsequent healing were closely examined by the SSG to assess their appropriateness for the western gray whale tagging programme.
- To agree upon the final scientific field protocols to be used on western gray whales to ensure that they are both practical and meet the quality/safety standards recommended earlier by the IWC Scientific Committee and the WGWAP. This being said, much of the advice given herein is based upon what was learned from the 2009-2010 OSU eastern gray whale tagging project.

### PROGRAMME OVERSIGHT

The IWC will act as the scientific co-ordinator for the tagging/telemetry project *inter alia* to ensure that it is carried out in a risk-averse manner and to enable sponsors to contribute financially without necessarily assuming responsibility for the programme's design, conduct or results. Accordingly, the IWC has agreed to the scientific terms and conditions as developed by the SSG and presented here. Recognising that this programme of research will occur in Russian waters, it is understood that all national permits, permissions, research standards and other related

matters must be followed. To ensure that such matters are addressed in a timely manner, a Joint Administrative Steering Group (JASG) was formed to handle logistical (i.e. non-scientific) issues.

#### **DATA AGREEMENT**

The IWC rules on data availability will formally apply to the western gray whale tagging programme. It is agreed that the information from this research becomes publicly available as soon as practical while retaining the rights of the data owners. To achieve this objective, the following protocols are to be implemented:

- Follow the general IWC Data Agreement process (including confidentiality agreements).
- Prompt reports of work must be submitted to IWC and other data owners, including: (a) weekly summary reports, (b) a detailed progress report presented at the 2011 Scientific Committee meeting and (c) a final report presented at the 2012 Scientific Committee meeting.
- Data owners must develop: (a) a list of agreed upon potential papers and authorship and (b) provide a timetable for publication in journals.
- Data owners may submit documents to the 2011 and 2012 IWC Scientific Committee and/or IUCN WGWAP meetings (there will be no right of veto on presentation of these documents by any individual data co-owner in the event of disagreement);
- Data will be held confidential by the data owners for a period of 2 years after completion of the tagging effort to ensure adequate time for first right to publication. After 2 years, data will become publicly available.
- A public website (to be maintained by OSU) will show approximate positions of tagged whales on a map with a 2 day time lag in reporting of actual positions.
- Precise positional data will be shared (with a confidentiality agreement and at the discretion of the IWC Head of Science) with range state scientists capable of facilitating potential follow-up studies.
- Photo-identification images collected during tagging operations will be shared (with a confidentiality agreement and at the discretion of the IWC Head of Science) with range state scientists capable of facilitating potential follow-up studies.
- In the event that the tagging team collects biopsies opportunistically, these will be divided following a process similar to that used for IWC SOWER cruise samples (i.e. half of any sample will belong to the IWC archives).

#### **TAGGING VESSEL PERSONNEL AND ROLES**

It is agreed by the SSG that Bruce Mate will serve as the field director and chief scientist for this satellite telemetry programme. As such, Mate will have complete decision-making authority with respect to all tagging related field operations (a general decision making tree for daily operations is shown in Fig. 1). It is further agreed that Mate or a protégé of his choosing from OSU with substantial experience satellite tagging gray whales will deploy tags on western gray whales in 2010. In the latter case, Mate will nonetheless be onboard the tagging vessel to serve in a supervisory role. Amanda Bradford will also be onboard the tagging vessel at all times and have complete decision making authority with regard to which whales are candidates for tagging (see below). An experienced boat driver, familiar with close approaches to whales for research purposes, will be essential to the success of this project. Mate will be tasked with identifying this person and ensuring that all boat approaches are carried out in a conscientious and cautious manner to reduce possible disturbance to the whales. One experienced photographer and one videographer are expected to be onboard the tagging vessel to: (a) photo-identify tagged whales and obtain images of the tag and tag site post-deployment, and (b) film tag deployments and any related behavioural responses. It is agreed that Mate and Bradford will design and provide a data form to be used for recording all pertinent data. Thus, a total of five scientists will be dedicated to the tagging operation.

The IWC Scientific Committee has recognised the need for ongoing biopsy sampling of western gray whales to monitor the sex composition and genetic characteristics of the population. While biopsy sampling is not a primary objective of the tagging programme, it may be undertaken on an opportunistic basis provided that it does not interfere with the primary objective of tag deployment and photographic follow-up efforts to document tag related wounds and healing. With this being said, all whales eligible to be tagged must be known males; thus, it is agreed by the SSG that biopsies of tagged whales are not necessary. In his role as the field director, Mate will make the decision as to whether and when biopsy sampling may occur. A qualified expert using techniques proven to be effective and safe for the whales in this population will collect biopsies. Ownership of biopsies will follow IWC SOWER protocols (i.e. half of any sample will belong to the IWC archives) and results of analyses of the latter will become publicly available (subject to a 2 year delay in order to guarantee right of first publication; see data

agreement above). Any biopsy sampling will be recorded with photo and video equipment for comparison with available photo-identification catalogues.

Participation in the field programme by scientists from all of the range states is encouraged. The SSG agree, however, that the critically endangered status of the population in combination with the limited time (approximately three weeks) being devoted to tagging 12 whales makes the project ill suited for training inexperienced individuals.

### **TAG DESIGN, DATA TRANSMISSION AND DEPLOYMENT METHODOLOGY**

It is agreed by the SSG that Wildlife Computers Spot-5 implantable tags (3 cell battery configuration) will be used on western gray whales in 2010. These stainless steel tags are 27.8 cm in length (inclusive of the cutting blade) and have an outside diameter of 1.9 cm. A 4-bladed cutting tip, including two rows of stainless steel attachment petals and a rosette of backward facing wires serve to implant and secure the tag to the whale. To mitigate physical damage and potential infection caused by tagging, each tag will be constructed of surgical quality materials, sterilized prior to deployment and coated with topical long-dispersant antibiotics. In some cases, deployments of these tags on eastern gray whales have exceeded 200 days (see SC/62/BRG21). In addition, photographic follow-up studies of eastern gray whales tagged with the Spot-5 suggest that minimal harm, in terms of wounding, occurs and that healing appears to progress in a manner of little or minimal concern.

Each tag has a user-programmable interface to determine the hours of transmission (duty cycle) and other characteristics of the transmission pattern and message content. Given the available duty cycle settings, transmission times and regional satellite coverage, it is expected that at least one reliable location per day will be obtained from each whale tagged.

Tags will be deployed using a modified version of the ARTS air-powered applicator system (Mate *et al.*, 2007). Given the expected use of a bowsprit on the rigid-hulled inflatable tagging boat (RHIB), to place the tagger as close to and above the candidate whale to the fullest extent possible, it is agreed by the SSG that every effort should be made to implant the tags in a vertical orientation (i.e. with the antenna pointed skyward). To ensure the highest chance of successful attachment, deployments should not be made from any further than about 3.5 m from the whale and attachment should be targeted well forward of the dorsal hump and about 15-30 cm offset from the mid-line of the animal. These latter recommendations regarding tag orientation, distance from the mid-line and deployment distance are all based on examination of the results from the OSU tagging project on eastern gray whales (see details in SC/62/BRG21). Following the above protocols should result in the tags being attached as close to “flush” as possible. In the case of eastern gray whales, flush attachments (i.e. the total length of the tag is implanted resulting in the end cap of the tag being flush with the epidermis) resulted in the longest duration attachments (see SC/62/BRG21).

Further, it is expected that researchers undertaking the tagging of these whales will follow the guidelines used by the Society for Marine Mammalogy<sup>1</sup> with regard to the treatment of marine mammals in field research, particularly section 4.5 regarding attachment of equipment to free-ranging animals. These guidelines are intended to reflect internationally accepted and scientifically valid approaches to field research on marine mammals and represent the ethical standards of the international marine mammal scientific community.

### **CANDIDATE WHALE SELECTION**

The SSG agrees that no more than 12 tags should be deployed on 12 male western gray whales, all in good body condition. Real-time identification and selection of candidate whales will draw upon the genetic (sex determination), photo-identification and body condition data sets collected by the Russia-US research team during the past decade. With regard to body condition determination, the SSG agrees that the protocol developed by the Russia-US team (Bradford *et al.*, 2008) should be followed. Candidate whale selection will rely on the unique ability of Bradford to recognize individual male whales and assess their body condition in real-time. It is understood that Bradford will need sufficient time in advance of any tagging attempts to confirm the individual identity of a given whale. Accordingly, Bradford will have complete decision making authority with regard to which whales are candidates for tagging and at what point in the approach and preparation phase an attempt at tag deployment can begin (also see vessel protocol section below).

Since the beginning of discussions within the IWC Scientific Committee as well as the WGAP, the satellite tagging effort off Sakhalin has not been viewed as an “experiment”, but rather as a directed research action with a

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<sup>1</sup> (<http://www.marinemammalogy.org>)

specific focus on learning more about the migration route(s) and wintering area(s) of western gray whales. Interest in obtaining this information has been driven by concern about the mortality of whales in fishing gear in Japan and the hope that better understanding of the location and timing of occurrences in Korean, Japanese and Chinese waters would inform and enable conservation measures to reduce the risk of injury and mortality. Thus, whereas in an experimental context it could be argued that selection of whales for tagging should be without bias (in this case, granted that only males in good body condition would be considered, given the desire to avoid any stress or injury to females in a critically endangered population), in the present situation an informed bias that improves the chances of achieving the study goals is agreed to be important by the SSG.

To this end, for the 83 males known in the population, a genetics-based priority ranking plan for selecting candidate whales to tag (not factoring in occurrence patterns and ease of visual recognition) has been developed by the Russia-US programme and the SSG recommends that this system be used to the fullest extent possible. This priority-ranking scheme is as follows:

- *Priority 1:* Good candidates for tagging based on high assignment probabilities and the inference that they are putative fathers of calves observed off Sakhalin (N = 44 individuals).
- *Priority 2:* Intermediate candidates, including individuals with mid-range assignment probabilities as well as some with low assignment probabilities but inferred as putative fathers (N = 24 individuals).
- *Priority 3:* Poor candidates based on low assignment probabilities and a lack of genetic evidence that they have contributed to reproduction in the western gray whale population (N = 15 individuals).

The initial premise of this priority-ranking scheme is that any male in good condition is a candidate for tagging but based on the above, some males would be preferred over others. For example, in a scenario where several individual whales are within range of the tagging RHIB and are determined to be previously identified males, then everything else being equal the first priority would be to try to tag the highest-priority individual(s). This does not preclude that some Priority 2 and even some Priority 3 individuals will be tagged, but it is intended to help ensure that a relatively high proportion of those that are tagged have a high probability of migrating to the southern wintering area(s).

## **VESSEL PROTOCOL**

It is encouraged by the SSG that tags are deployed during the mid-August to mid-September period to optimise weather conditions and opportunities for resightings of tagged whales. The availability of a suitable support vessel, however, is likely to dictate the actual timing of the field programme.

All field operations will be based on a large support vessel capable of housing a minimum of 8-10 persons and deploying the tagging RHIB. Responsibility for procurement of this vessel along with assurances that it is technically capable (e.g. communication capabilities including internet access with data upload and download capacity) rests entirely with the JASG.

The support vessel is expected to remain mostly in “standby mode”, ready to launch and retrieve a small (~ 6 m) RHIB used for tagging. The SSG agrees that in no cases should the support vessel actively approach any whales in the region and should remain as far away from the tagging RHIB as is safely possible during whale approaches and tag deployments.

In all cases the first approach to a whale by the tagging RHIB will not be a close approach for tagging. This approach will only be to a distance from which the whale can be visually identified, photographed, determined to be male and observed to be in good body condition by Bradford (see above). The duration of this initial approach(es) will be determined by Bradford. Only when she is confident in her decision regarding the candidate whale will the operation change to a tagging mode. After adequate photographic coverage has been obtained, if the whale approached is not a candidate for tagging, or if Bradford cannot make a confident individual determination, contact with the animal(s) will be terminated. As it can be difficult to target a single individual in a group of whales, distinguishing identification marks of the candidate individual(s) will be communicated by Bradford to the entire tagging team (via wireless headsets) to ensure that tags are deployed on the appropriate whale. This approach has been quite successful in the past during “individual specific” biopsy sampling efforts by the Russia-US programme.

During tagging approaches, the small boat will be moved to within 1-3 m of the whale (tags should not be deployed at distances > 3.5 m). Whales will always be approached from behind and slightly to one side at a slow enough speed to not alarm the whale, but fast enough to be positioned for tag deployment during a surfacing period. Overall, the SSG agrees that an approach at just above idle speed, with as little change in engine throttle (sound) as possible

is optimal. If repeated unsuccessful approaches on an individual are made which result in a behavioural response (e.g. increase in speed, erratic changes in direction, fluke slapping, breaching, etc.) it is expected that Mate, as field director, will make the decision to terminate tagging efforts on that particular whale/group.

## FOLLOW-UP STUDIES

The SSG agrees that assessing the potential effects of tagging should be a key part of this programme. In particular, every effort should be made to resight and photograph/video-record tagged whales during the period of the study. Specific emphasis should be given to obtaining close-up images of the tag site for evaluation of wounding and healing. These same images will also allow for information on depth of tag penetration and evaluation of tag condition.

Further, the SSG highlights the importance of all range states to be involved in follow-up studies by: (a) contributing information on the specific locations of tagged whales, (b) co-ordinating efforts to obtain additional information on these animals or (c) making visual observations of the animals and collecting photographs of the tag site. This will require that the range state collaborators have real time access to the location of tagged whales in their waters (see above section on Data Agreement).

## SUMMARY AND CONCLUSION

The programme outlined above adheres to the previous recommendations by the IWC Scientific Committee and the IUCN WGWAP. In establishing the specific protocols herein, the SSG believes that due consideration has been given to the goal of minimising potential risks from tagging on the health of individual animals and the population as a whole. It is important that initiation of the satellite-tagging programme not be further delayed, and that every effort be made to attempt tagging during mid-August to mid-September 2010 whilst recognising outstanding potential logistical problems (including finance, available personnel and permit requirements).

We emphasize that much of the information that this tagging programme could provide is urgently needed. For example, it is important to identify wintering areas and migration routes and assess their spatio-temporal overlap with various threat factors such as fishing gear, vessel traffic and industrial activities so that appropriately focused mitigation measures can be taken. Moreover, the potential for achieving a key precautionary element of the tagging effort, i.e. selecting candidate whales for tagging based on their sex, relative age, health status and other factors, is diminishing with time as it depends on the Russia-US team's availability (in practice, the presence of A. Bradford as part of the tagging team) and ability to keep current with the individual whales.

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Figure 1. Decision making tree for daily operations

