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Proposal for the 2016 IWC-Pacific Ocean Whale and Ecosystem Research (POWER)

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INTERNATIONAL
WHALING COMMISSION

PROPOSAL FOR THE 2016 IWC-PACIFIC OCEAN WHALE AND ECOSYSTEM RESEARCH (POWER)

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ABSTRACT

This document outlines the line transect sighting survey cruise plan for the 2016 IWC Pacific Ocean Whale and Ecosystem Research (POWER) as one of the short term research program. It is assumed that the research vessel, *Yushin-Maru No.3* (YS3) will be available for this cruise. It is proposed that the 2016 cruise should be conducted in the central north Pacific between 160°W and 135°W, from 20°N to 30°N where the POWER cruise has not been conducted. Photo-id and biopsy experiments are also planned. The cruise would be taken place in mainly July and August. The duration of the survey will be approximately 60 days involving 18 day-transit and 42 days of the research area. Information collected from the survey would contribute to provide essential information for the *Implementation Review* for Bryde's whale which is scheduled in 2017 by the IWC/SC. The outcome of the survey would also contribute to the inter-session workshop to plan for a medium-long term POWER international programme in the North Pacific. The data and report of this survey would be submitted to the IWC/SC meeting soon after the cruise. Details of the planning will be discussed in the planning meeting.

BACKGROUND

The systematic line transect sighting survey cruise of the IWC-Pacific Ocean Whale and Ecosystem Research (IWC-POWER) has been conducted in summer in the central and eastern North Pacific since 2010 as a short term research program (Kato *et al.*, 2010, IWC, 2010, 2011a, 2011b, 2012a, 2012b, 2012c, 2013b). The surveys covered the area comprised north of 40°N and south of Aleutian Islands and Gulf of Alaska region between 170°E and 135°W. Till this date the IWC POWER has collected important data sets of sighting data for the abundance estimate of baleen whales and photo-ID data and biopsy samples for the investigation of stock structure (Matsuoka *et al.*, 2011, 2012, 2013, 2014a, 2015a).

A Technical Advisory Group (TAG) on POWER was formed to develop a detailed plan for the 2013-2015 (or 2016) short term research program. The TAG meetings were held in September 2011 and 2013, and the 2013 and 2014 cruise plans, and technical survey procedures, analysis methods, mid-long-term survey plans including priority of species and permit issues (e.g biopsy samples) were discussed (IWC, 2013b and 2014). Cooperation between US and Japanese Governments has solved the CITES biopsy sampling permit issue. Under the cooperation, the Japanese research vessel can conduct biopsy sampling both outside and inside of the US-EEZ (Exclusive Economic Zone), bring the samples back to Japan, and export them to the US institute from Japan (IWC, 2014).

Although analyses on the distribution, abundance estimates and stock structure of sei and other baleen whales using the 2010-2013 data had been started, they are not completed yet (IWC, 2015c). Because of this reason, there is no decision on the mid-long term research program considering results of the 2010-2013 data in the TAG, although there were some discussions about new research areas including adjacent to the planned area (e.g. Bering Sea, Okhotsk Sea, lower latitudinal waters between 20°N-30°N, second survey for the same areas in September etc.). Initially, the *Implementation review* for North Pacific Bryde's whales was planned in 2013 in the RMP sub-committee but it was postponed until 2017 with expectations that (1) sighting data for abundance estimate in lower latitudinal waters in the eastern North Pacific will be covered during the IWC-POWER

research program during 2013-15 and (2) there are currently no genetic samples for sub-area 2 (east of 180°E), it is expected that biopsy samples will be collected from Bryde's whales during the IWC-POWER research program (IWC, 2013a). Year 2016 also coincides with the second review workshop for the JARPNII, which will provide more information on abundance and stock structure of Bryde's whales in sub-area 1 (west of 180°).

Considering the importance of the IWC/SC, the 2016 POWER could be focused on the collection of abundance and stock structure information for the *Implementation Review* of North Pacific Bryde's whale in the central north Pacific between 160°W and 135°W, from 20°N to 30°N. The information collected during 2016 would be also useful as background information for the inter-sessional workshop to plan for a medium-long term international programme in the North Pacific. The objective of this paper is to provide a research plan for the 2016 IWC POWER survey. Details of the planning will be discussed in the planning meeting.

CRUISE PLAN FOR 2016

Research area and rationale

The cruise should be conducted in summer 2016 in the area shown in Figure 1 for the following reasons:

This area has been poorly covered by previous sighting surveys and not at all in recent decades thus representing an important information gap for several large whale species (e.g. Bryde's and sperm whales). Biopsy sampling outside and inside of the US EEZ can be conducted by Japanese vessel as a result of cooperative work between US and Japanese Governments (IWC, 2014). In addition, Russia and Japan joint sighting survey is planned in Okhotsk Sea in 2015, which involves Russian research vessel to cover areas where Japanese research vessel cannot enter recent years (i.e. North east of Okhotsk Sea). This arrangement could cover the Bering Sea, certain part of which is Russian EEZ.

The 2016 POWER cruise would be focused on the collection of line transect data to estimate abundance and biopsy/photo-identification data. It would make a valuable contribution to the work of the IWC/SC on the conservation and management of large whale species in the North Pacific in a number of ways, including by providing:

- (a) information for the proposed future in-depth assessment of whales in terms of both abundance estimates and stock structure;
- (b) information relevant to *Implementation Reviews* of whales (e.g. Bryde's whale) in terms of both abundance estimates and stock structure;
- (c) baseline information on distribution and abundance in a poorly known area for several large whale species/populations, including those that were known to have been depleted in the past but whose status is unclear;
- (d) biopsy samples and photo-identification photos which contribute to discussions of stock structure for several large whale species/populations, including those that were known to have been depleted in the past but whose status is unclear (i.e. blue whale);
- (e) essential information for a medium-long term international research programme in the North Pacific.

Recent surveys in the Central North Pacific

Figure 1 shows the areas in the North Pacific, which have been covered by cetacean scientific surveys in recent years. The proposed research areas for 2016 surveys have not been surveyed recently except within the US EEZ around Hawaii (Barlow, 2006).

Stratification of the research area and trackline in the research area

No stratification will be considered in the 2016 survey area. Every location within the survey area has an equal probability of being sampled which is calculated by the software "DISTANCE". For this aim the starting points of transect lines within the study area were randomized following IWC SC guidelines (IWC, 2005).

Cruise track and itinerary

The following is a tentative cruise plan because budget from Government of Japan is a provisional at this moment. A total cruise period of approximately 60 days (i.e. including transit time) represents the maximum operation period of the vessel without refuelling/resupplying. Based on past JSV data and catch data, it could be considered that a southern boundary at 20°N and a northern boundary at 30°N would represent the expected main latitudinal range of Bryde's and sperm whales at that timing of the survey (July to August) and allow sufficient coverage. The cruise will take place in July/August and will involve about 28 day-transit to and from the research area and around 32 days in the research area.

The survey area will be treated as a single stratum. Cruise track design (Figure 2) was undertaken using 'Distance' software, following the IWC guidelines and the TAG report recommendation. The randomly selected start point will be along longitude 160°00'W proceeding eastwards to 135° 00'W. Cruise track in the research area for 2016 is 2,324 n.miles (72 n.miles per day). Based on experience elsewhere in the North Pacific, and allowing for poor weather conditions and time for photo-identification and biopsy sampling around 70 n.miles per day are expected to be covered in average in primary searching effort (70 n.miles were covered daily in the 2012 cruise). It is assumed that the sea conditions in the 2016 research area (between 20°N-30°N) will be better than the conditions in the 2010-2012 research areas (north of 40°N). Table 1 shows a tentative itinerary for the 2016 cruise. Estimated experiment days is estimated 6 days (1 day for the Distance & angle experiment, 5 days for photo-ID and biopsy experiments).

Table 1. Tentative itinerary for the 2016 cruise (60days).

Date	Event
1 July 2016	Pre-cruise meeting, Shiogama, northern Japan
2 July 2016	Vessel departs Shiogama
14 July 2016	Vessel arrives in the research area to the starting point at 160°00'W
15 August 2016	Vessel completes the research at 135°00'W (32 days in the research area)
30 August 2016	Vessel arrives Shiogama

Research vessel

It is expected that the research vessel, *Yushin-Maru No.3* (YS3) will be available for this cruise. The YS3 is equipped with a top barrel platform (TOP) and upper bridge. The ICR research data collecting system (Japanese survey version) is set onboard the vessel. Searching will occur at the most comfortable cruising speed normally 11.5 knots. It will have space for four researchers at maximum. Specification of the YS3 is shown in Table 2.

Table 2. Specification of the YS3.

<i>Yushin-Maru No.3</i>	
Call sign	7JCH
Length overall [m]	69.61
Molded breadth [m]	10.80
Gross tonnage (GT)	742
Barrel height [m]	19.5
Upper bridge height [m]	11.5
Bow height [m]	6.5
Engine power [PS / kW]	5280 / 3900

International researchers

The *Yushin-Maru No.3* can accommodate a maximum of four researchers. Appropriate researcher from IWC member countries, especially coastal states would be welcomed. The steering group of this cruise which will be established in the IWC SC will nominate these researchers. It was noted the budget for the 2016 cruises are substantially reduced from the 2014 amount because the cost associated with the cruise leader is substantially reduced as the cost for the cruise leader (Matsuoka) would be met by Japan for 2016 cruises (IWC, 2015c).

All researchers should submit their personal details, including Last Name, First Name, Sex, Nationality, Date of Birth, Institute, Address, TEL, FAX, E-mail, Passport No., Language, Survey experience; Line Transect:, Biopsy:, Photo-ID:, Acoustics:. Researchers should need to bring their own protective clothing, computers, office supply as in previous years. The daily subsistence charge aboard the vessel will be ¥2,500 per day for each researcher.

Details of the cruise

Survey modes and length of research days

Activities onboard the ship are classified into two principal groups: on-effort and off-effort. On-effort activities are times when full search effort is being executed and conditions (such as weather and sea conditions) are within acceptable parameters to conduct research. Off-effort activities are all activities that are not on-effort. All sightings recorded while the ship is on-effort are classified as primary sightings. All other sightings are secondary sightings.

Two survey modes, Normal Closing Mode (NSC) and Independent Observer with passing mode (IO) were used in 2010 cruise as in the case of the SOWER cruises in the Antarctic. However, the use of passing mode in the POWER would result in very high proportions of unidentified cetaceans. For example, priority species such as fin, sei and Bryde's whales are difficult to identify unambiguously unless close to the vessel. Because of the reason, the TAG recommended that Passing with abeam closing mode (NSP) is the most appropriate survey mode, both with respect to confirming species identity and school size (IWC, 2013b). NSP was used in 2011, 2012, 2013 and 2014. When the sighting passed abeam of the vessel, the ship approached the sighting for confirmation of species and school size. Normally, sightings within 3 n.miles, perpendicular distance from the trackline) were approached. Sighting records were made by the international researchers and all data submitted to the IWC secretariat in each year.

On-effort sightings survey research is conducted by the Passing Mode – which are scheduled for specific legs during the survey of the research area. Sighting effort is conducted by the two primary observers, researchers and the chief engineer or deputies are also present. Primary search effort is only conducted in acceptable weather conditions. These conditions are used as guidelines; in some circumstances, less severe conditions may still be inappropriate for search effort.

For 2016 survey, following advice from the Scientific Committee and the TAG, the 2016 survey will alternate modes between NSP and IO mode (*ca* every 50 n.miles).

Research hours during the cruise will be the same as on recent SOWER cruises (from 6:00-18:00; begin 60 minutes after sunrise and end 60 minutes before sunset, with a maximum 12 hours per day). As in the SOWER programme, for biopsy sampling/photo-identification work on priority species (Bryde's, sei, common minke, North Pacific right, blue, humpback, fin, with higher priority to the former two species in this cruise) there may be occasions when it is beneficial to extend research outside the normal research hours. The basis for such special extension of research hours will involve mutual agreement between the captain and cruise leader and an allocation of equivalent time-off the following morning or evening. Details of photo-identification and biopsy works are shown below.

The research day in transits will begin 30 minutes after sunrise and end 30 minutes before sunset, with a maximum of a 12-hour research day. Time-zone changes will be in 30-minute intervals, coming into effect at

midnight. In transit, and at the Cruise Leader's discretion, as much IO mode effort will be undertaken as possible, to try to ensure that a sufficient sample size is obtained to allow $g(0)$ for Bryde's whales to be estimated.

Number of crew on effort

As in 2013, two topmen will observe from the barrel at all times in passing mode. Two primary observers will be in the barrel whenever full searching effort using reticle binoculars and angle board is conducted. Two primary observers (Captain and helmsman) will be at the upper bridge with binoculars with reticles, regardless of the research mode. Also present on the upper bridge, whenever the sighting survey is conducted, will normally be the Chief Engineer (or an alternate). With four researchers on board, the Cruise Leader should ensure that the number of researchers searching from the Upper Bridge is standardised. In IO mode, there would be an additional person in the IO platform.

Navigation and research speed Acceptable conditions

As in 2014, 11.5 knots (through the water) will be maintained during research. It was noted that in conditions of heavy swell, searching speed might have to be reduced. The usual guidelines for acceptable conditions will apply, i.e. visibility (to see a minke whale) is greater than 2.0 n.miles and wind speed is <21 knots; the sea state should be <Beaufort 6.

Estimated angle and distance training and experiment

The experiment is designed to calibrate and identify any biases in individual observers' estimation of angle and distance. The experiment should be conducted during weather and sea conditions representative of the conditions encountered during the survey. Following the TAG recommendations, procedure of this experiment should be improved; (1) use of relatively inexpensive GPS technology (for a waterproof tough model) on the buoy to improve detectability (a) at greater distances and (b) in more realistic sea/weather conditions than may be possible using the present radar system; (2) use of two or more buoys which can (a) reduce the potential lack of independence with one buoy with the correct experimental protocols and (b) allow increased efficiency which will assist when having a greater distance range and when including researchers as well as the crew in the experiment (multi-buoy experiments have been successfully conducted in the North Atlantic). With respect to the additional buoy, the TAG suggested that perhaps a smaller buoy than the one currently used (to simulate a whale's body rather than the blow) could be provided on the vessel. The detailed protocol will be discussed in the planning meeting and found in the Guide for Researchers.

Data format

The survey will be conducted using the same data forms as on the SOWER cruise (see the Guide for Researchers) and the 201 POWER cruise data forms (Anon, 2010).

Biopsy sampling

As appropriate and decided by the Cruise Leader, research time will be given for biopsy sampling of Bryde's, sei, common minke, blue, humpback, grey, fin and whales (bowhead and North Pacific right whales are unlikely to be seen south of 40°N), with higher priority given to the former two species in this cruise (see items (1) and (2) in page 1). Biopsy of killer and sperm whales will be attempted on an opportunistic basis.

Projectile biopsies will be collected using either a compound crossbow or the Larsen gun system. During any single encounter, no more than five biopsy sampling attempts per individual will be made. It is rare that an animal would be targeted for biopsy more than twice during one encounter, but we conservatively request five sample attempts to allow for occasional low success rates. If signs of harassment such as rapid changes in direction, prolonged diving and other behaviours are observed from an individual or a group, the biopsy activities will be discontinued on that individual or group. The animals to be sampled will either approach the

vessel on their own or be approached by the main research vessel during normal survey operations. The projectile biopsy sample will be collected from animals within approximately 5 to 30 m of the bow of the vessel.

For large cetaceans, small samples (<1 gram) will be obtained from free-ranging individuals using a biopsy dart with a stainless steel tip measuring approximately 4 cm in length with an external diameter of 9 mm and is fitted with a 2.5 cm stop to ensure recoil and prevent deeper penetration (so that only 1.5 cm of the tip is available to penetrate the animal). Between sample periods, the biopsy tips are thoroughly cleaned and sterilized with bleach. Biological samples may be collected from adults, juveniles, females with calves and calves. The same size biopsy dart would be used for calves as for adults. No biological samples will be taken from newborn calves. The age of a calf would be determined by the subjective judgment of our field biologists who have up to 20+ years experience in the field.

Photo-id

As appropriate and decided by the Cruise Leader, research time will be given for photo-identification and /or video taping of right, blue, humpback whales in this cruise. Killer whale is "non-target" cetacean which lower priority on the opportunistic basis. As noted above, the estimated daily number of miles to be steamed in searching mode has a built in allowance for such work. Photographs will be available under the standard IWC Guidelines. Generally, large whales will be approached within approximately 15-20 meters. Photo-identification of adult and juvenile males and females will occur. If the opportunity arises, females accompanied by calves may be approached for photo-identification, but efforts will cease immediately if there is any evidence that the activity may be interfering with pair bonding, nursing, reproduction, feeding or other vital functions.

Acoustic studies

This will depend on whether it is practical to use a towed array for sperm whales and whether it is possible to obtain suitable sonobuoys for blue whales.

Oceanographic studies

No specific oceanographic studies are planned for 2016.

Identification of home port organiser

It will be the responsibility of the Japanese scientists to organise matters in the home port Shioyama.

Necessary permits

The US EEZ of Hawaiian Islands occurs in the planned research area. It should be noted that at least the following three different kinds of permit or permission would be needed to survey within US waters and all of them are supposed to be obtained through cooperation between US and Japanese Governments. Research permits (a US MMPA and ESA) would be needed for any surveys for cetaceans. Such permits could be granted by the US National Marine Fisheries Service.

A second kind of necessary permission would be from the US government (State Department) for entry of a foreign vessel into US waters to carry out scientific research.

CITES permits would also be required to (1) import permit for biopsy samples collected within US EEZ to Japan, and (2) send a half of the biopsy samples to the NOAA/NMFS Southwest Fisheries Science Center (SWFSC) in La Jolla (IWC Registry) from Japan, as is the case for the SOWER samples.

Data holders and transportation of equipment

The rules for data availability, shipping and storage will be the same as for the previous POWER cruises in the North Pacific. It also noted that existing IWC equipment used in the 2014 cruise could be used on the 2015

cruise if allowed/required. All records will be discharged in Shiogama and will be sent to the IWC Secretariat under the responsibility of the cruise leader.

All photo-ID digital photographs of this cruise are to be sent to IWC and copied to Japan as same as previous IWC/SOWER and the POWER cruises. Photographs are available under standard IWC guidelines. Copied data will be stored at the Institute of Cetacean Research (ICR).

Samples for molecular genetic analyses are to be divided in half, with one half of the sample for IWC (to be sent to the SWFSC) and the other half for Japan. All samples will be frozen. In addition, when biopsy samples have a significant amount of blubber attached, the blubber is to be separated from the skin, wrapped in aluminium foil, and frozen. Details can be found in the “Information for researchers” (Anon., 2010).

Meetings

Arrangements for the holding of pre- and post-cruise meetings with crew and researchers will be the responsibility of the cruise leader and Japanese scientists.

Reports

The cruise will follow the requirements for reports and documentation developed for cruises that could provide data for use under the RMP. This will be the responsibility of the cruise leader. A draft of the cruise report will be prepared, in accordance with the guidelines documented in IWC (1994), prior to arrival in the home port and, as necessary, the draft will be reviewed during the post-cruise meeting. The Cruise Leader will email the final report to the IWC Secretariat as soon as possible. It will also be made available on the IWC website. Copies of the final report will be forwarded by the IWC Secretariat to all Steering Group members and all researchers.

REVIEW OF THE BUDGET

The above-mentioned survey plan assumes the same level of Japanese funding being available as for the 2014 North Pacific sighting survey cruise. Direct funds already requested for to the IWC budget for 2016 survey and already endorsed (IWC, 2015c).

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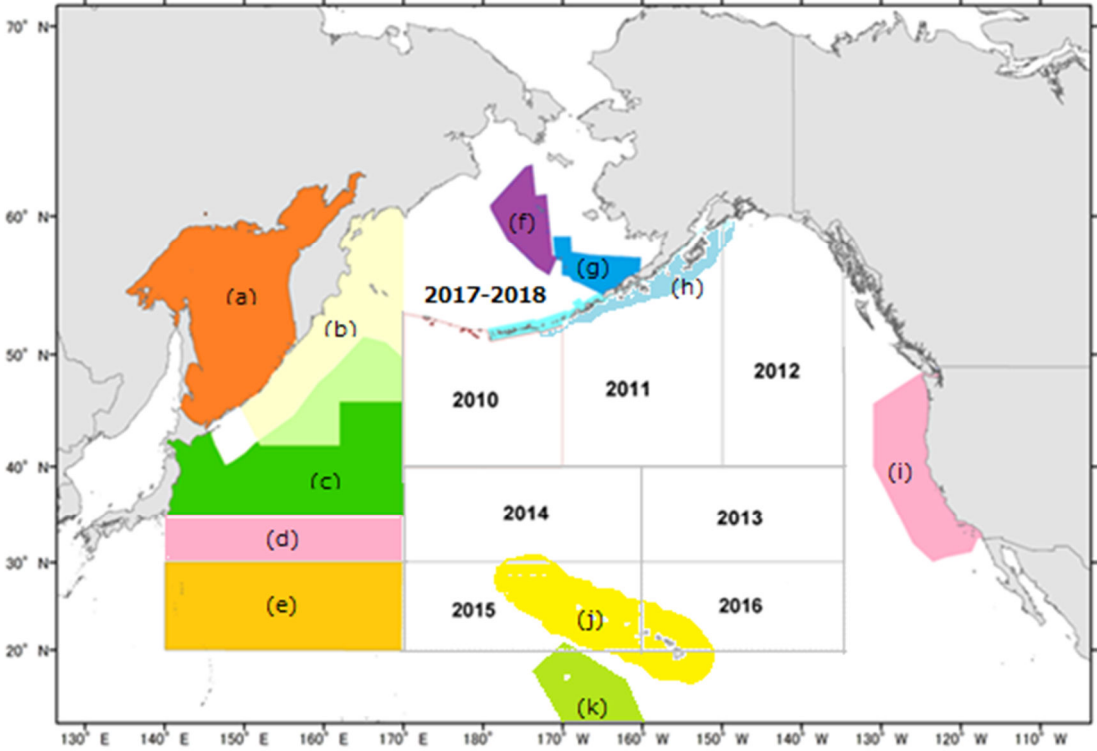


Figure 1. Proposed area for the 2016 sighting survey. Other coloured areas represent surveys conducted in the North Pacific in recent years: in 1999 (purple) and 2000 (blue) by Moore et al. (2002), in 2001-2003 (sky blue) by Zerbini *et al.* (2007), in 2001 and 2005 (pink) by Barlow and Forney (2007), in 2005 (light green) by Miyashita (2006), in 2014 (orange) by Matsuoka *et al.*(2014b). Sighting surveys have been conducted in the green area since 1994 as a part of JARPN II (Pastene *et al.*, 2009). In addition, Russia-Japan joint survey with a Russian research vessel is planned in Okhotsk Sea in 2015 (dark orange).

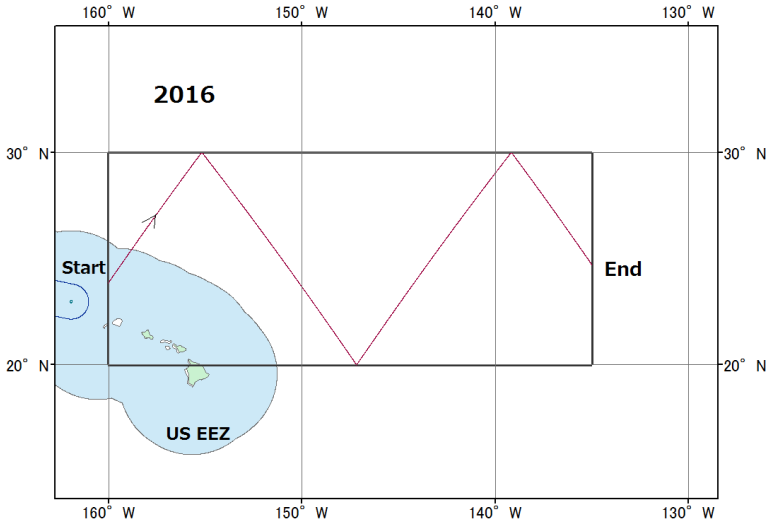


Figure 2. Proposed research area and trackline for the 2016 sighting survey. A total distance is 2,324 n.miles in the research area, almost 70 n.miles per day (IWC, 2015b).