Report of the Meeting of the IWC-POWER Technical Advisory Group (TAG)

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EXECUTIVE SUMMARY

The meeting was held in a meeting room at the Japanese Fisheries Agency crew house, Tokyo, from 7-9 October 2015. Its primary objective was to review the available information from the first five cruises and to develop a plan to design a medium-term programme to meet the Commission's agreed long-term objectives relating to status, trends and causes of any trends. Species distribution maps were developed and examined for the first six years of surveys (Fig. 2) and review these in conjunction with other information from non-POWER surveys to identify where the final surveys for the short-term programme should take place (see Fig. 7). Information on the efficiency of taking biopsy samples over the six years was examined which will prove valuable in planning for the medium-term; median times ranged from 20-25 minutes for Bryde's, sei and fin whales to around 45 minutes for blue, humpback and killer whales. There was some focus on aspects of visual survey methods including: how to treat unidentified whales (including a recommendation for further work with respect to sei and Bryde's whales), the possibility of $g(0)$ being <1 for sei and Bryde's whales and agreement to undertake Independent Observer mode during the next survey(s) to ascertain this. The TAG was pleased that improved angle and distance measurements had been undertaken on the 2015 cruise and some additional suggestions in terms of logistics and analysis were made. The importance of spatial/habitat modelling work and the associated need to consider information on potential explanatory variables was emphasised and a number of suggestions for further work identified. A plan for a broad scale spatial modelling approach was developed. Collaboration with other groups was also stressed with respect to cetacean studies as well as marine debris and the collection of non-cetacean data (e.g. sea turtles) and ways to achieve this were identified. The importance of combined visual/acoustic survey approaches for estimating sperm whale abundance was recognised and it was agreed that this could usefully be taken forward at the 2015 Scientific Committee meeting. Information from experts that telemetry work was feasible from a large vessel such as that being used at present was welcomed and this will be taken forward in the context of the medium-term programme. There was also recognition of the importance of developing a new fully functional relational database to enable efficient storage of the several kinds of data collected and to facilitate analyses of the data (including a more effective mapping option). This should also be integrated with any onboard data collection system. A strategy for developing this system was agreed. Finally, a detailed work plan and timetable was developed for the period up to October 2017 to take forward the work to develop the medium-term plan.

1. INTRODUCTORY ITEMS

The meeting was held in a meeting room at the Japan Fisheries Agency crew house, from 7-9 October 2015. The list of participants is given as Annex A.

1.1 Opening remarks and welcoming address

Kitakado (Convenor and host) and Yamada (Fisheries Agency of Japan) welcomed the participants to Tokyo. IWC-POWER represents an important component of international co-operation within the IWC. Five cruises had now been completed and scientists from Australia, Japan, Republic of Korea, Mexico, UK and the USA had contributed to the design and implementation of the programme thus far, in addition to the contribution of the Scientific Committee and the Commission. Brownell sent his apologies for being unable to attend the meeting due to unforeseen circumstances.

1.2 Election of Chair

Kitakado was elected Chair. He noted that the purpose of the meeting was to begin the process of examining the results of the agreed short-term programme thus far and finalise the completion of the short-term component with a view to ultimately developing the details of the mid-term programme in the light of the objectives agreed by the Scientific Committee in 2012 (IWC, 2013).

[1]Presented to the Scientific Committee meeting as SC/66b/Rep01.

1.3 Adoption of Agenda

The adopted Agenda is given as Annex B.

1.4 Appointment of rapporteurs

Rapporteurial duties were shared by Donovan, Kelly, Matsuoka and Palka.

1.5 Review of documents

The list of documents is given as Annex C.

2. REVIEW OF THE SURVEY RESULTS FROM 2010-15

Fig. 1 shows a map of the survey areas covered for the first six years of the short-term plan. The original short-term objective was to cover most of the central and eastern North Pacific (the least studied areas) by 2016. It was agreed last year that it was also important to cover the Bering Sea area as part of the short-term programme, particularly with respect to fin, blue and sei whales, based on the information obtained from the 2010-12 cruises. The information obtained on distribution and densities from these initial surveys, as well as practical information on successful techniques and necessary improvements, is essential for designing the medium-term plan (see IWC, 2012a).

2.1 Summary of sightings

Table 1 provides a simple summary of the sightings made during the cruises to date. The sightings positions and cruise tracks are shown in Fig. 2. Discussions arising out of the results are given under Items 4 and 5.

Table 1

Summary of all non-dolphin sightings in the research area. NS=northern stratum, SS=southern stratum. Effort=primary searching effort in n.miles, Coverage=percentage of planned tracklines covered on primary searching effort. The vessel used was the *Yushin-Maru No.3* apart from in 2010 when it was the *Kaiko-Maru*. Sch=schools, ind=individuals.

	2010						2011						2012													
	NS		SS		Total		NS		SS		Total		NS		SS		Total		2013		2014		2015		Total	
Effort/coverage	491/34%		1,326/70%		1,8162		724/58%		1,674/78%		2,398		768/80%		1,359/85%		2,126.1		3,036/94%		3,233/83.4%		3,248/90.5%		10,701/67.5%	
Species	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.
Baleen whales																										
Blue whale	1	1	2	2	3	3	1	1	8	8	9	9	0	0	4	4	4	4	0	0	1	1	0	0	17	17
Fin whale	16	38	7	10	23	48	47	91	33	48	80	139	76	116	38	53	114	169	1	1	0	0	0	0	218	357
Sei whale	4	4	49	27	53	101	0	0	38	73	38	73	2	4	79	147	81	151	0	0	1	1	0	0	173	256
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	87	97	27	32	121	136
Like Bryde's whale*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	2	2	5	5
Common minke whale	8	8	0	0	8	8	1	1	1	1	2	2	1	1	1	1	2	2	0	0	0	0	0	0	12	12
Like minke	1	1	0	0	1	1	1	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	3	3
Humpback whale	5	8	0	0	5	8	74	131	2	2	76	133	7	7	0	0	7	7	0	0	0	0	0	0	88	148
North Pacific right whale	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	1	1
Unid. Large baleen whale*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	49	1	4	26	168
Odontocetes																										
Sperm whale	22	22	45	62	67	84	6	10	51	64	57	74	17	24	28	28	45	52	33	50	65	137	11	50	278	447
Baird's beaked whale	1	20	0	0	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	20
Cuvier's beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	5	8	3	6	10	20
Stejneger's beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	1	110	1	110
Mesoplodon spp.	1	1	2	5	3	6	1	1	5	21	6	22	2	5	1	4	3	9	8	20	7	13	0	0	1	4
Ziphiidae	1	3	3	6	4	9	1	1	11	19	12	20	9	15	13	27	22	42	28	51	35	73	1	2	28	72
Killer whale	6	53	0	0	6	53	6	66	0	0	6	66	8	22	4	20	12	42	0	0	1	3	4	4	105	199
Other																										
Unid. large whale	7	9	20	34	27	43	35	58	24	37	59	95	18	23	26	47	44	70	8	8	9	9	3	3	150	228
Total	**73**	**168**	**128**	**146**	**201**	**314**	**173**	**361**	**174**	**274**	**347**	**635**	**141**	**218**	**194**	**331**	**335**	**549**	**87**	**146**	**261**	**395**	**54**	**214**	**1,285**	**2,253**

*Category introduced in 2014 in response to discussion of unidentified whales at the 2013 TAG meeting (IWC, 2015).

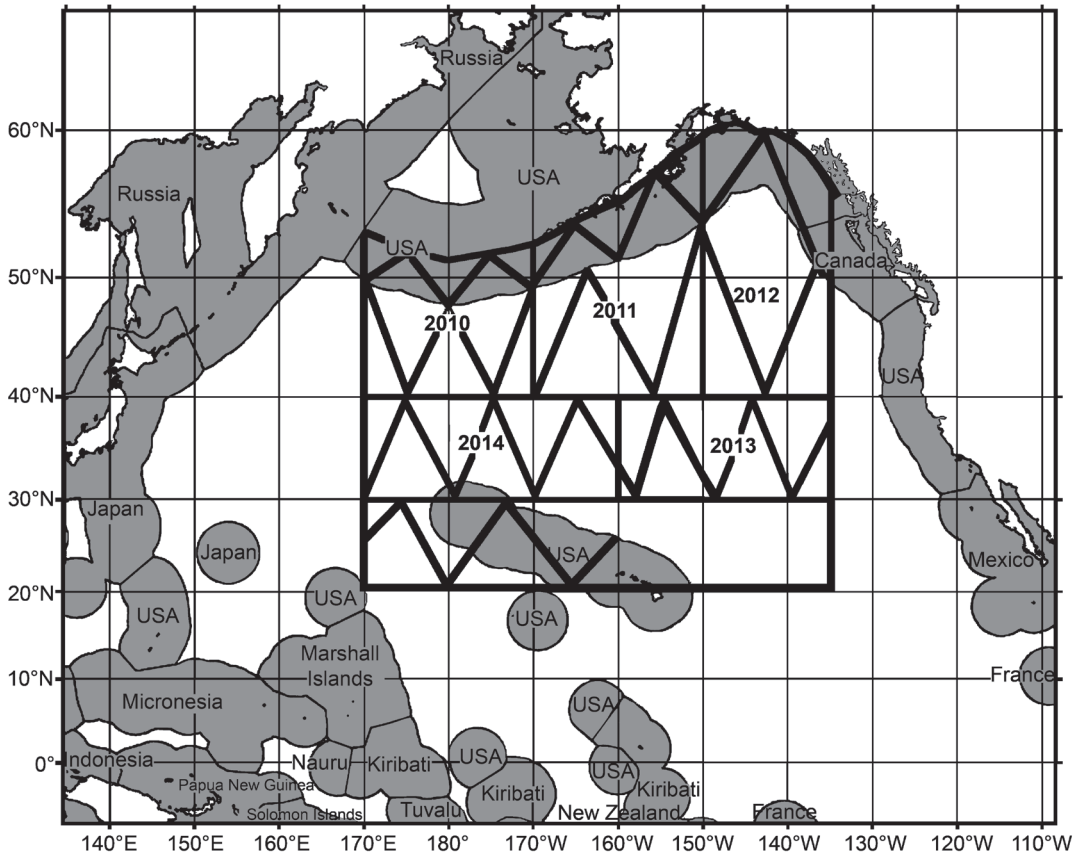

Fig. 1. The North Pacific Ocean showing the proposed tracklines within the research blocks (and survey years) for the completed years. This figure also indicates the EEZs within the Ocean.

Table 2

Medium-term priorities agreed by the Scientific Committee, with summary of the rationale.

Initial priority	Rationale
Blue whale	
Low direct, high opportunistic	Depletion level suggests high priority (i.e. highly depleted based on catch history), but feasibility of addressing outstanding issues in short term is low. Continued photo-id work part of US national programme. Little information on stock structure and movements. Telemetry may be possible.
Bryde's whale	
High, direct, high opportunistic	Depletion levels suggest low priority (i.e. low depletion given catch history). Western side dealt with by the Committee under RMP where a national programme exists. Stock structure and abundance poorly understood in central and eastern North Pacific prior. Valuable to obtain a baseline. Telemetry may be valuable.
Common minke whale	
Low direct, high opportunistic	Depletion levels suggest low priority on east. Western side already dealt with by the Committee under RMP where national programmes exists. However, if Okhotsk Sea covered for other priority species (e.g. right whales) then would provide valuable information incl. biopsy samples. Present 'acceptable' conditions for survey make surveys unsuitable for this species. Telemetry priority to identify breeding areas.
Fin whale	
High direct, moderate opportunistic	Depletion levels suggest high priority. Given major genetic analysis on east then biopsy sampling on offshore east and west high priority to improve overall understanding of stock structure. Co-ordination with US national work in Bering Sea needed. Examination of existing data and coverage of uncovered areas needed to determine survey strategies.
Humpback whale	
Low direct, high opportunistic	Good information already available from a multi-national photo-ID/biopsy programme (SPLASH). Existing programmes sufficient. Opportunistic sightings during cruises may identify new 'SPLASH' areas. Feasibility of collecting biopsy and photo-ID data opportunistically high.
Right whale	
Moderate-high direct, high opportunistic	Depletion level suggests high priority, but feasibility of addressing outstanding issues in short term is low. Poor knowledge of stock structure. Continued photo-ID work part of US national programme. Feasibility of collecting biopsy and photo-ID data opportunistically high. New survey in Sea of Okhotsk has high feasibility to obtain good abundance data provided appropriate permits can be obtained from the Russian Federation. Targeted surveys required.
Sei whale	
High direct, high opportunistic	High priority for in-depth assessment. High feasibility of obtaining abundance estimates and biopsy samples in well-designed surveys. Cover new areas based on available information.
Sperm whale	
High direct, moderate opportunistic	High priority given lack of good information on status and high historic catches. Obtaining abundance estimates for sperm whales can be problematic due to its very long dive times and other issues but combined acoustic/visual surveys have been successful. Feasibility depends on equipment.

2.2 Review of Scientific Committee recommendations

The Technical Advisory Group noted the recommendations relevant to IWC-POWER made at the 2014 Scientific Committee meeting (IWC, 2014b; annex G, appendix 2). These covered a range of topics relating to data validation and archiving, electronic data entry, appropriate survey conditions and survey mode, and angle and distance experiments. These are dealt with under the relevant agenda items below.

3. OBJECTIVES AND PRIORITIES

3.1 Long-term (incl. information gaps)

The IWC has agreed (IWC, 2012a) that the IWC-POWER programme should be a long-term programme that:

> '…will provide information to allow determination of the status of populations (and thus stock structure is inherently important) of large whales that are found in North Pacific waters and provide the necessary scientific background for appropriate conservation and management actions. The programme will primarily contribute information on abundance and trends in abundance of populations of large whales and try to identify the causes of any trends should these occur. The programme will learn from both the successes and weaknesses of past national and international programmes and cruises, including the IDCR/SOWER programme.'

3.2 Medium-term (including information gaps)

After a comprehensive review of the available information and an identification of the knowledge gaps, a number of priority species and topics were identified for the medium term and agreed by the Committee in 2010 (IWC, 2011). In terms of obtaining direct abundance estimates, highest priority was allocated to fin, sei and, in the Okhotsk Sea, North Pacific right whales. Later (in 2013) it was agreed to add Bryde's whales as a high priority in order to provide a baseline estimate for the whole Pacific. If suitable acoustic equipment can be found and deployed (see below), sperm whale abundance could also be a high priority. Other species were identified as being high priority for opportunistically collecting biopsy and photo-identification (photo-identification data during directed cruises including blue whales and humpback whales. The TAG reviewed the medium-term priorities this year and Table 2 summarises the priorities identified (only minor editorial modifications from last year). Further discussion is given under Item 8.

3.3 Short-term options

The initially agreed short-term areas to be surveyed were covered by the end of the 2014 cruise. As discussed in 2012, the value in examining the southern boundary for sei whales as well as obtaining abundance and stock structure information for Bryde's whales as baseline information for comparison with the western North Pacific led to the agreement to cover the region down to the 30°N in addition to the originally agreed areas. Last year the TAG also recognised that consideration should be given to covering the Bering Sea, possibly in 2017 and 2018 (Fig. 3); results from other recent studies including those from Hokkaido University (see Item 6.1) have shown that there are large numbers of fin whales in the Bering Sea in the summer and thus without covering these areas, reliable abundance estimates of fin whale abundance (a high priority species) cannot be made.

This was examined further this year including examination of previous catch data as well as further examination of the sighting survey information from Hokkaido University. This confirmed that the Bering Sea has been an area where species such as the fin whale and to a lesser extent the sei whale (IWC-POWER high priority species) are found in relatively high densities during the boreal summer. Other species found in the area include humpback whales, common minke whales, gray whales, sperm whales and killer whales. Further details on survey areas and strategies are provided under Item 8.1

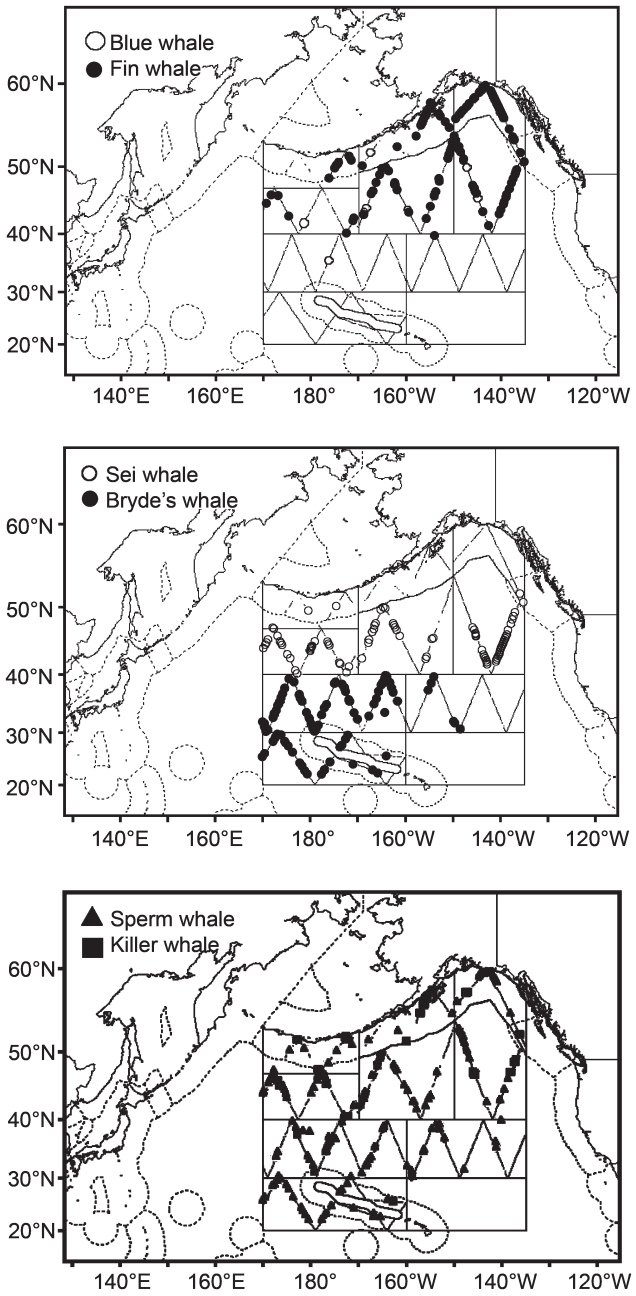

Fig 2. (a) Primary sightings of blue (white) and fin (black) whales for 2010-15. (b) Primary sightings of sei (white) and Bryde's (black) whales for 2010-15. (c) Primary sightings of sperm (triangles) and killer (squares) whales for 2010-15. On effort completed tracklines shown (see Fig.1 for expected tracklines).

Depending on the results of analyses of the cruises up to 2019, the potential for one or two additional cruises (with possible emphasis on topics such as additional variance or technological advances) should be considered before finalising a mid-term programme in line with the agreed objectives. This is discussed further under Item 8.

4. STOCK STRUCTURE AND MOVEMENTS

4.1 Genetics

4.1.1 Available genetic samples

Table 3 summarises the biopsy samples taken during the cruises to date and Figs 4-6 show the positions of the samples.

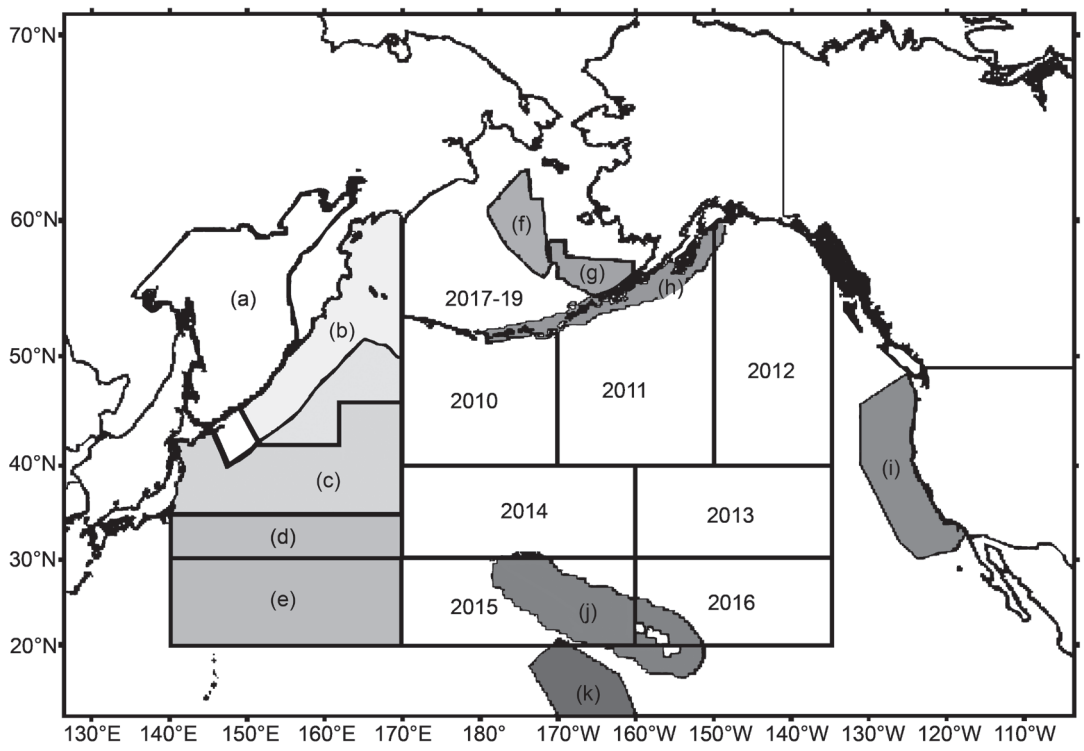

Fig. 3. Schematic showing the proposed areas for coverage in the 2016-19 period, prior to the start of the medium term period. Coloured areas represent surveys conducted in the North Pacific in recent years: (a): Miyashita and Berzin (1991); (b): Miyashita (2006); (c): Pastene *et al.* (2009); (d): Matsuoka *et al.* (2013); (e): Matsuoka *et al.* (2014); (f): Moore *et al.* (1999); (g): Moore *et al.* (2002); (h): Zerbini *et al.* (2007); (i) Barlow and Forney (2007); (j): Barlow (2006a); (k): Barlow (2006b).

Table 3

Biopsy samples (numbers of individuals) taken during the 2010-15 IWC-POWER cruises.

Biopsy	2010	2011	2012	2013	2014	2015	Total
Blue whale	1	4	2	0	1	0	8
Fin whale	2	12	12	1	0	0	27
Sei whale	13	30	37	1	0	0	81
Bryde's whale	0	0	0	6	78	34	118
Humpback whale	0	1	0	0	0	0	1
Sperm whale	0	0	0	0	0	1	1
Killer whale	2	0	1	0	1	2	6
Total	**18**	**48**	**51**	**7**	**80**	**37**	**241**

Sei whale samples have made a major contribution to the review of sei whale stock structure in the North Pacific as part of the ongoing in-depth assessment (e.g. Kanda *et al.*, 2013). Fig. 4 shows the positions of the IWC-POWER samples relative to those from other sources. Similarly, Bryde's whale samples from IWC-POWER have provided samples from new areas of the North Pacific to assist greatly in the Committee's work on understanding stock structure of Bryde's whales relevant to the forthcoming *Implementation Review* as well as the forthcoming JARPN II review in 2016. The IWC-POWER programme has shown that it is possible to efficiently collect biopsy samples from large vessels whilst undertaking systematic sightings surveys to estimate abundance.

This year, the TAG was impressed that the cruise had managed to obtain 34 Bryde's whale samples bringing the total to 128 IWC-POWER samples for this species. The distribution of samples in addition to those held elsewhere is summarised in Fig. 5. The positions of the IWC-POWER samples for the other species are shown in Fig. 6.

The TAG recalled that each sample collected on IWC-POWER is divided into two, with one-half being retained by Japan and the other half being kindly held on the IWC's behalf by the Southwest Fisheries Science Center, La Jolla, USA.

The TAG **agrees** that the Steering Group should encourage collaboration with other groups holding genetic samples for the North Pacific (see Item 7.3.3).

4.1.2 Efficiency of approaches to obtain sufficient samples

The experience in obtaining biopsy samples in the 2010-14 period by species is summarised in Table 4.

The time taken for fin, sei and Bryde's whales to be sampled is around 20-25 minutes, whilst blue, humpback and killer whales take much longer, around 45-50 minutes. The time to obtain samples from Bryde's whales was longer than in 2014 due to poorer weather conditions. The above information is valuable in terms of designing future cruises and allocating likely effort.

4.2 Individual identification (photo-identification)

Table 5 summarises the numbers of animals photographed and provisionally identified as individuals. Discussion of work required to validate catalogues for each species is given under Item 7.3.2. The TAG noted that in most cases the objective was to obtain biopsy samples as well as identification photographs where possible, recognising that the latter was easier.

Table 4

Summary of the effort expended on biopsy sampling by species summed over years 2010-15
(note that for Bryde's whales, mother/calf pairs were not included in the calculations).

Species	No. events	No. shots	No. samples	% success	Total time	Mean	Median	Min	Max
Blue whale	17	23	8	34.78	14:06:14	00:49:47	00:46:58	00:06:00	02:30:48
Fin whale	57	76	27	35.53	24:13:01	00:25:29	00:20:00	00:04:00	02:30:48
Sei whale	117	214	77	35.98	44:52:00	00:23:01	00:18:00	00:03:00	02:00:00
Humpback whale	2	6	1	16.67	01:31:00	00:45:30	00:45:30	00:40:00	00:51:00
Bryde's whale	110	249	100	40.16	41:03:00	00:22:23	00:18:00	00:04:00	01:18:00
Killer whale	7	20	6	30.00	05:41:00	00:48:43	00:41:00	00:28:00	01:37:00

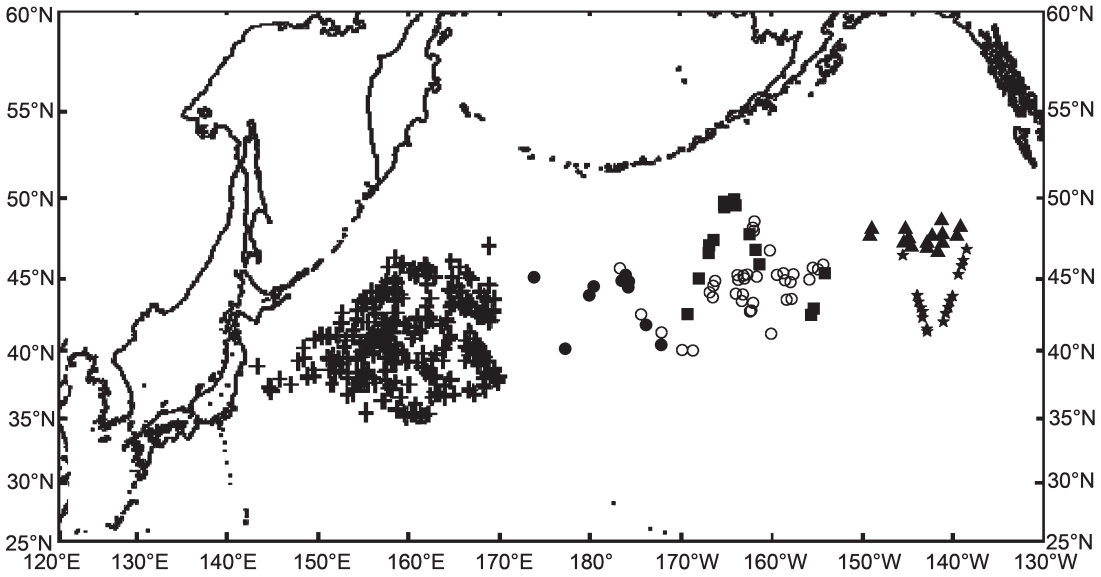

Fig. 4. Positions of available samples used during the recent analysis of North Pacific sei whale stock structure in the North Pacific (Kanda *et al.*, 2013) shown with black crosses (up to 2007). The IWC-POWER samples shown by the black circles (2010), black squares (2011) and black stars (2012). The only previous samples from similar regions were from commercial whaling from around 40 years ago.

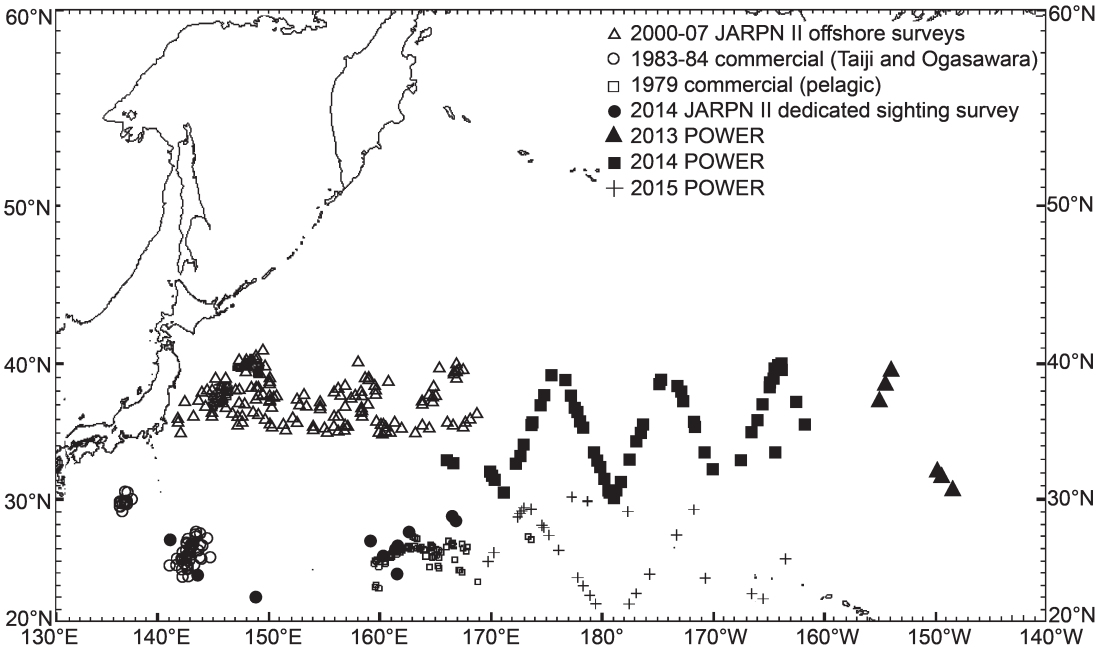

Fig. 5. Positions of available Bryde's whale samples. The pre-2013 samples have been analysed and the results were reported (Kanda *et al.*, 2009).

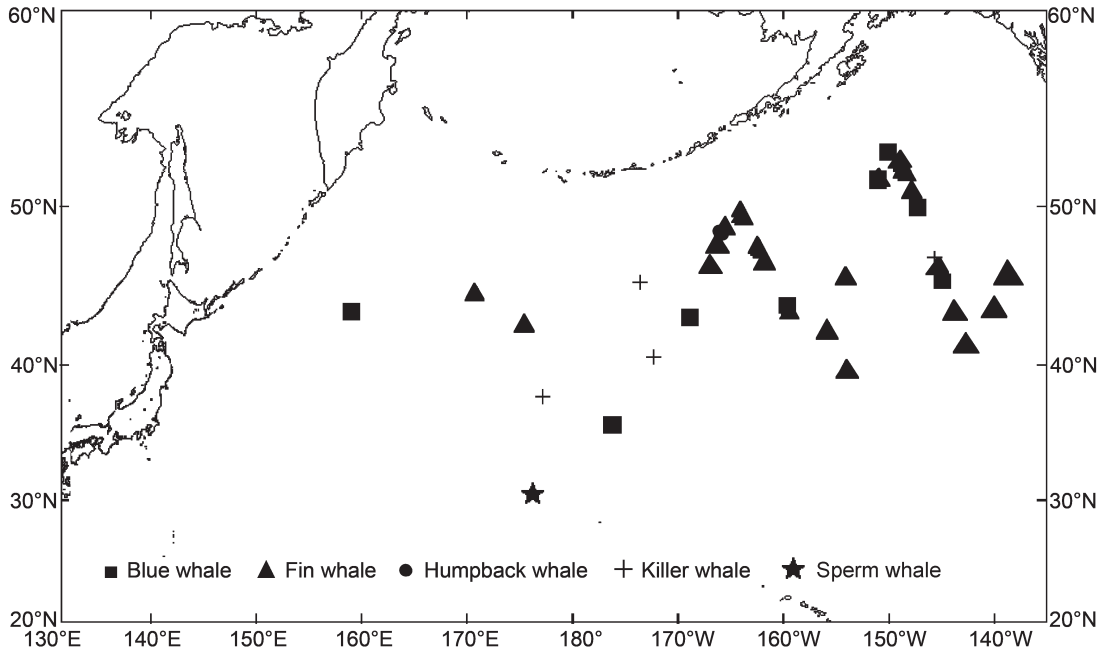

Fig. 6. Location of the biopsy samples from other species.
Key: squares: blue whale; triangles: fin whale, white circles: humpback whale; black circles: sperm whale; crosses: killer whale.

Table 5
Summary of the number of individuals provisionally identified during the 2010-14 IWC-POWER cruises.

Photo-ID	2010	2011	2012	2013	2014	2015	Total
Blue whale	3	9	4	0	1	0	17
Fin whale*	0	25	59	3	0	0	87
Sei whale*	0	27	51	2	0	0	80
Bryde's whale*	0	0	0	6	69	49	128
Humpback whale	5	48	26	0	0	0	79
North Pacific right whale	0	0	1	0	0	0	1
Sperm whale	0	0	1	0	0	22	27
Killer whale	45	18	50	0	3	4	116
Total	**53**	**127**	**192**	**11**	**80**	**75**	**539**

*Subject to checking (see Item 7.3.2).

4.3 Telemetry

The TAG recalled that last year, consultations had revealed that while it might not be as easy as from a small boat, it was certainly possible to carry out telemetry work from large vessel (e.g. see Lydersen *et al.*, 2011; Mikkelsen *et al.*, 2007). No new information was received this year. The TAG **confirms** the conclusion reached last year that the use of telemetry studies to fill information gaps (e.g. on movements and migration, including identification of breeding areas for some species) should be considered carefully for the medium-term programme.

5. DISTRIBUTION, ABUNDANCE AND TRENDS

5.1 Visual survey methods

The TAG identified a number of matters for discussion related to the abundance estimation component of the surveys to date, related both to practical and analytical issues to obtain estimates from the existing cruises and for developing the medium-term plan in light of the agreed objectives related to abundance and trends.

5.1.1 Unidentified whales

In 2013, an examination by the TAG of the summary results for each of the cruises undertaken showed a relatively high proportion of large whale sightings that were unidentified to species within the research area. However, this problem decreased when examining the distribution of those sightings and the proportion unidentified within and beyond 3 n.miles, i.e. when passing mode closure occurs (see Table 6). To try to improve the situation, additional species codes had been established. In both 2014 and 2015, mostly Bryde's and sperm whales were seen and only the 'like Bryde's whale', 'unid large baleen whale' and 'unidentified large whale' codes were used.

Since so few other positively identified baleen whales were detected in 2014 and 2015 (only one sighting of a blue whale and one of a sei whale in 2014), the TAG **agreed** that the unidentified large baleen whale sightings were very probably Bryde's whales; this option should be considered in the analyses of the sightings data.

Last year, the TAG had briefly considered the question of allocation of unidentified whales to sei or Bryde's whales. The relationship of their distribution to SST has long been discussed (IWC, 1974).

A crude preliminary examination of the data showed that all of the Bryde's whale sightings were at SSTs of 18°C or above whilst the highest SST for a sei whale sighting (n=1) was 22.5°C. There was considerable overlap around 18-22°C. In terms of latitude, all of the Bryde's whale sightings

Table 6

Consideration of unidentified sightings (see text). Key: B=blue; F=fin; S=sei; Br=Bryde's; H=humpback; ULB=unidentified large baleen whale (code only introduced in 2014); UL=unidentified large whale; %=% of unidentified whales (for 2014 the first percentage is for UL only and the second is for UL+ULB); (N)=northern stratum; (S) southern stratum.

Year	Schools sighted <3 n.miles (perpendicular distance)								Schools sighted > 3 n.miles (perpendicular distance)							
Species	B	F	S	Br	H	ULB	UL	%	B	F	S	Br	H	ULB	ULW	%
2010 (N)	1	16	2	0	3	0	4	15	0	0	0	0	0	0	1	100
2010 (S)	2	7	47	0	0	0	5	8	0	0	0	0	0	0	2	100
2011 (N)	1	44	0	0	59	0	21	17	0	0	0	0	0	0	12	100
2011 (S)	8	31	36	0	2	0	6	7	0	0	1	0	0	0	1	50
2012 (N)	0	70	2	0	7	0	3	4	0	1	0	0	0	0	8	89
2012 (S)	3	35	77	0	0	0	8	7	0	1	0	0	0	0	9	90
2013	0	1	0	6	0	0	7	50	0	0	0	0	0	0	1	100
2014	1	0	1	87	0	29	8	6/29	0	0	0	1	0	17	1	5/95
2015	0	0	0	27	0	1	2	7/10	0	0	0	0	0	0	1	100/100

were south of 40°N whilst all of the Bryde's whale sightings were above that latitude. This suggested that further work was required (including spatial modelling) before assigning probabilities to unidentified whales that they are one species or the other; a fuller analysis should include information for additional sightings outside the IWC-POWER cruises as well as from catches.

The TAG **agreed** that unidentified sightings could be used in abundance estimates (at least in terms of examining sensitivity) by prorating the abundance estimate of unidentified whales by the proportions of positively identified species (there is a new DISTANCE module that accomplishes this task) or by examining environmental factors (e.g. SST and latitude as discussed above for sei and Bryde's whales).

5.1.2 Survey methods and modes given resources and priority species

IO (independent observer) mode is particularly important where $g(0)$ is expected to be considerably less than 1 (e.g. for common minke whales). During the 2013 TAG meeting and the SC/65b meeting, it was **agreed** that the available evidence suggested that the $g(0)$ for sei and Bryde's whales may be below one, particularly in higher Beaufort sea states, and thus additional IO mode surveying should be conducted during the 2015 survey. It is also important to conduct the IO mode during a variety of sighting conditions to investigate how Beaufort state effects the estimate of $g(0)$.

The TAG was pleased to receive information that about half of the 2015 survey had been accomplished in IO mode. With respect to Bryde's whales, 16 sightings were made from the IO platform of which 10 were definite duplicates and the remaining six were definite non-duplicates. Whilst the sample size is too small for a full analysis, it was **agreed** that the results are strongly indicative of a $g(0)$ value considerably less than one.

It was noted that the IO platform has one observer whilst the Barrel has the usual two observers. Since the IO sightings are the basis of the trial, having only one IO observer allows the calculation of $g(0)$ but will provide a smaller sample size (and thus a larger CV).

To obtain an accurate estimate the TAG **recommends** increasing the sample size of IO sightings. To achieve this it **recommends** undertaking the IO mode for at least 75% of the time during the 2016 POWER survey which is an area expected to have high densities of Bryde's whales. In addition the TAG **recommends** considering the option of using an additional observer (e.g. a researcher) as an additional IO observer which will also increase the number of IO sightings.

Hakamada informed the TAG that he will analyse the POWER data to obtain an abundance estimate of western North Pacific Bryde's whales that includes an estimate of $g(0)$.

After discussion of possible analysis options, the TAG **recommends** that the IO mode Bryde's whale data collected during the 2015 survey be used, analysed using mark recapture distance sampling methods (available in program DISTANCE), and the estimates with and without the correction presented as preliminary analyses to the 2016 Scientific Committee meeting (SC/66b).

When the additional 2016 data become available, the final analyses could explore the use of the point-independence versus full-independence assumption, the use of covariates in the detection function, and the possibility of applying this estimate of $g(0)$ to the Bryde's whale data collected during the 2013 and 2014 IWC-POWER surveys which did not collect IO data.

5.1.3 Survey design, including additional variance

The TAG **reiterated** that the question of cruise track design/level of effort for the medium-term programme cannot be properly considered until analyses of the data from the short-term cruises has been completed. At that time it will be important to look at the question of available effort, survey blocks and order of blocks surveyed, and cruise track design in the context of the priorities for the programme, including the estimation of trends for priority species. This future examination will include consideration of additional variance and the undertaking of further power analyses.

Last year, the TAG noted that the estimation of additional variance is particularly important for high priority species such as sei and Bryde's whales, whose distribution and density appear to be strongly influenced by environmental conditions including sea temperature. The TAG **reiterated** the value of the spatial modelling exercise being planned (see Item 7.3.1) to the effort to investigate additional variance. In addition, the additional variance structure could be explored by using data collected in same the spatial strata at different times from other data sources or, for example, a comparison of results from data collected in the survey area to results from data collected during the transits to and from the home port, if the transits cross over the regular POWER cruise lines or to results from data collected during the JARPN sighting surveys that are in adjacent or overlapping strata.

5.1.4 Angle and distance experiments

Reliable measurement of angle and distance to sightings is of fundamental importance to obtaining good abundance estimates from line-transect surveys. Estimated Distance and Angle (EDA) experiments are thus an essential part of the Committee's 'Requirements and Guidelines for Surveys' (IWC, 2012b).

The TAG **welcomed** the preliminary results from the EDA experiments undertaken during the 2015 IWC-POWER voyage. Several improvements based on previous TAG recommendations (IWC, 2016b) were implemented during the 2015 IWC-POWER survey, *viz*.:

(1) use of relatively inexpensive GPS technology (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; and
(2) use of two buoys which can: (a) reduce the potential lack of independence with one buoy when applying the correct experimental protocols; (b) allow increased efficiency (i.e., allow more trials), which will assist when having a greater distance range, and when including researchers, as well as the crew, in the experiment; and (c) using the recommended buoys that simulate either a whale's body or a blow.

A total of 60 trials were conducted for each platform (top and IO barrels, and upper bridge), out to a maximum distance of 4.5 n.miles, where primary observers could no longer see the new tall buoy from the upper bridge. Comparisons suggest distances indicated by radar and GPS were almost identical.

In discussion, it was noted that during the EDA experiments, the TAG **recommends** that observers should only participate on the platforms for which they will occupy during the survey. This will allow an increased number of pertinent trials for correcting sighting data from individual observers. It was also **agreed** that more effort should be put into examining why there was more variation in estimated angles than estimated distances.

The TAG **reiterated** its recommendation of previous years that random effects models should be used when analysing these experimental data to allow estimation of the effect of differing observing patterns/capabilities of individual observers. It was noted that observer-wise random effects were incorporated into EDA experiments for both the SCANS and NASS surveys.

5.1.5 Environmental factors

As already noted above, the collection of environmental variables is important to inform the additional variance structure as well as to inform spatial modelling exercises for model-based abundance estimation (and see the discussion under Item 6.1 and 7.3.1). Environmental data are also important in the future to investigate possible causes of trends in abundance or changes in distribution (longer-term objectives of the IWC-POWER programme).

Following on from discussions last year, the TAG **recommends** that a small group (convened by Palka and Matsuoka) compiles a list of habitat related information sources for the time frame of the IWC POWER cruises thus far. Examples include satellite and model derived data, ARGOS buoy data, along with data collected via oceanographic or other sea surveys.

5.2 Mark-recapture

The TAG reiterated its conclusions last year that with respect to estimating abundance using mark-recapture data, the time needed to obtain sufficient photo-identification data or biopsy samples for most species renders it impractical. However, this does not negate the objective of collecting photo-identification data or biopsy samples for other purposes, including stock structure.

5.3 Acoustic methods

The TAG **reiterated** the value of combined acoustic/visual methods for estimating the abundance of sperm whales and the potential value for targeted studies of rare species (e.g. blue whales, right whales) on special cruises. Given the continually improving development of passive acoustic arrays and analysis methods, the TAG **expects** that it should be possible for the medium-term POWER surveys to include the collection of passive acoustic data for at least sperm whales.

6. OTHER POTENTIAL ASSOCIATED STUDIES

6.1 Oceanographic studies

Ideally, the best habitat data related to the IWC-POWER data would be oceanographic data collected simultaneously on the same vessel. However, given the logistics and practicality, it is currently not possible for the IWC-POWER vessels to simultaneously collect additional oceanographic data. The TAG noted the discussions last year regarding use of a SeaGlider[2] and **agreed** that whilst the costs had made its use in 2015 impractical, the issue should continue to be investigated, particularly with the medium-term programme in mind.

Sekiguchi provided an update of her presentation of last year on a potential collaborator, Hokkaido University, that is involved in a series of oceanographic and marine mammal surveys being conducted at similar times and in the IWC-POWER study area are the summer surveys on the T/S *Oshoro Maru*.

The TAG thanked Sekiguchi for her presentation and noted that such data could be valuable in a spatial/habitat modelling context (see Item 7.3.1).

6.2 Marine debris

The issue of marine debris is one that has been attracting attention within the Commission, noting that a scientific workshop (IWC, 2014a) and a Conservation Committee workshop have been held (IWC, 2016a). The marine debris information collected on the IWC-POWER cruises, whilst clearly not sufficient on its own and a secondary objective compared to collecting whale data, can contribute to broader studies. Those Workshops had recommended collaboration with other relevant agencies to gauge the usefulness of the type and quality of marine debris data that are now being collected and determine whether improvements could be made for the medium-term cruises.

In addition to individual members of the Steering Group consulting with agencies in their own countries the TAG **requested** the Secretariat to contact the US Marine Debris Programme (*http://www.marinedebris.noaa.gov*) who also hold a database of marine debris information.

6.3 Other

There is the potential to collect data on the presence and distribution of other sea life, such as turtles, pinnipeds and sea birds during the IWC-POWER surveys. Previously the TAG noted these data may be useful to other agencies and research programmes; however, the collection of these data should not distract from the collection of the whale data, the main focus of the surveys.

[2] *http://www.km.kongsberg.com/ks/web/nokbg0240.nsf/AllWeb/EC2FF8B58CA491A4C1257B870048C78C?OpenDocument.*

Taking this in account, the TAG **recommends** that data on turtles and pinnipeds (but not birds) be collected during the IWC POWER surveys on a routine basis, as long as they do not distract from the collection of whale data. To achieve this, the species codes and descriptions Matsuoka and Donovan should update the 'Information for Researchers' document (also see Item 7.1.1) and the necessary identification books must be available during the cruise.

The TAG **agreed** with previous recommendations that as long as it does not interfere with collecting data on whales, data recording the presence of other species (birds should not be considered as they are too distracting) should be collected.

As with marine debris, the TAG therefore **recommends** that the Steering Group identifies relevant agencies/ research groups to be approached to gauge the usefulness of the type and quality of other species data, especially on marine turtles, that are now being or could be collected and determine whether improvements could be made for the medium term cruises. Any data collected should be made available to relevant research groups.

7. DATA COLLECTION, STORAGE AND ANALYSES

7.1 On board recording

7.1.1 'Guide for Researchers'

Last year, the TAG had **reiterated** the importance of the new IWC Lightroom photo-catalogue and **recommended** that the process to import photographs be more fully documented in the Guide to the Catalogue and that this information is also included in the revised 'Guide for Researchers' document.

During the 2015 POWER cruise the suggested changes were tried and the process was revised given their experience. This final process is now being incorporated into the 'Information for Researchers' by Matsuoka and Donovan that will be available for the 2016 POWER cruise. As mentioned under Item 6.3 the TAG also **recommends** recording other sea life such as turtles and pinnipeds. These new species codes and their descriptions will be included in the next version of the Information for Researchers document.

7.1.2 ICR automated data acquisition system

Last year the TAG recommended that, at the discretion of the chief scientist on board, the researchers, when possible, do not fill out the paper data sheets in addition to the computerised data entry system. That is paper sheets only be used when necessary, such as during high density regions. During the 2015 POWER cruise this process worked well. All of the data were recorded directly into the computerised data entry system, paper sheets were not needed and the data were backed up daily.

Given this success the TAG **recommends** continuing this process noting paper sheets should be available if needed.

7.1.3 Potential software/hardware systems

The TAG noted previous discussions of the desire to improve/expand the data acquisition system. It **appreciated** the improvements that have been made to the existing ICR automated data acquisition system. It **recognises** the importance of an effective and efficient onboard electronic system be developed that will assist with the management of the cruise data, is easy to enter data, efficiently validates and backups the data, efficiently integrate the various types of data collected (line transect, weather, biopsies, photos, etc.), and easily output the data so that it can be analysed.

To facilitate this, the TAG **recommends** that an inter-sessional group, convened under Palka, considers other researcher's existing systems and develop a list of desired features of the onboard system. This needs to be considered in the context of the long term database (see Item 7.2). A paper will be submitted to the 2016 Scientific Committee meeting that describes other researchers systems, other available data acquisition systems, and lists desired features on a future onboard system.

7.2 Long-term database

The TAG noted previous discussions of this issue. Any large scale monitoring programme requires a fully functional relational database to enable efficient storage of the several kinds of data collected and to facilitate analyses of the data (including a more effective mapping option). This is especially the case as data collected under IWC programmes are publicly available within the Data Availability Guidelines (*cf* the IDCR/SOWER data). IWC-DESS was developed for the IDCR/SOWER programme but it is now somewhat old, restricted to sightings/effort data and is rather limited in terms of mapping capabilities and incorporation of other data (e.g. photo-ID, biopsy sampling). It is important to learn from the strengths and weaknesses of IWC-DESS and other similar databases in developing a new database that meets the present and likely future needs of the IWC including storing the IWC-POWER programme data as well as the IDCR/SOWER data and the other data that are supplied to the IWC from national programmes. Such a database should also be linked to the extensive photographic database being developed by the IWC Secretariat.

At the 2015 SC meeting the IWC Secretariat indicated there were funds to contract a database developer and so a small intersessional steering group which includes a professional database developer was convened under Palka to: (1) review of database needs, across the broad range scientific and management data collected by the IWC; (2) document the issues with the current system; and (3) use the first two points to help develop scope for a tender for a bespoke comprehensive database system. The small steering group will also consider incorporating the ability to combine mapping and data from the catch database. The TAG **endorses** the terms of reference for this steering group and looks forward to their results.

7.3 Logistics of data analysis

7.3.1 Sightings data

The TAG recognised the valuable work of the Japanese scientists in providing initial analyses of the IWC-POWER sightings data using standard line-transect methods (and see Table 7). However, it **agrees** that now the short-term programme is coming to a close it is important: (a) for the existing data to be analysed fully; and (b) to identify appropriate analyses of the available data to allow the efficient planning in the medium-term in light of the agreed objectives. This will clearly involve power analyses to identify the effort required to detect trends should they occur.

In particular, the TAG recognises the importance of developing a spatial modelling approach that uses IWC-POWER in conjunction with any other suitable data from other sources (e.g. Hokkaido University, US cruises).

Table 7

Summary of status of sightings data analyses for IWC-POWER data. Numbers of sightings of blue whales and common minke whales preclude analyses of these data alone. A proposal for model-based estimates will be developed for consideration at the 2016 meeting.

Species	Analysts*	References	Schedule
Fin whale	ICR (design-based)		Preliminary 2017
Sei whale	ICR (design-based)	Hakamada and Matsuoka (2015)	2017
Bryde's whale	ICR (design-based)		Preliminary 2016
Humpback whale	TUMSAT		To be confirmed (tbc)
Sperm whale	TUMSAT		To be confirmed (tbc)
Killer whale	TUMSAT		To be confirmed (tbc)
Dolphin species	NRIFSF		To be confirmed (tbc)

ICR=Institute of Cetacean Research; TUMSAT=Tokyo University of Marine Science and Technology; NRIFSF= National Research Institute of Far Seas Fisheries.

Table 8

Summary of status of photo-identification data for IWC-POWER data. Numbers of samples of blue, right, sperm and killer whales preclude analyses of these data alone but they are being analysed as part of wider study by Lang *et al*. A proposal for future genetic analyses is being developed for consideration at the 2016 meeting.

Species	Analysts	Comments
Blue whale	Mizroch *et al.*	Initial processing complete subject to validation
Fin whale	Mizroch *et al.*	Initial processing complete subject to validation
Sei whale	Mizroch *et al.*	Initial processing complete subject to validation
Bryde's whale	Mizroch *et al.*	Initial processing complete subject to validation
Humpback whale	Mizroch *et al.*	Initial processing complete

To further this process, the TAG **recommends** that a steering group under Kitakado be established to begin preparations for such broad scale analyses and present a proposal to the 2016 Scientific Committee meeting. In order to assist this effort the TAG has begun to compile a list of information from previously conducted surveys. The question of environmental variables is discussed under Item 5.1.5.

The TAG also **recommends** that the Secretariat give high priority to completing the coding of the IWC POWER in collaboration with Matsuoka.

7.3.2 Photo-identification data

As is standard practice for the development of such catalogues, and recognising that photo-identification for species such as fin, sei and Bryde's is more complex than for species such as humpback, blue and right whales, last year the TAG recommended that researchers familiar with the development of catalogues for these or similar species are requested to undertake a 'blind' experiment to develop comparable catalogues for fin, sei and Bryde's whales from the IWC-POWER data.

The TAG **agreed** that a matching exercise should be developed co-ordinated by Donovan and Taylor using researchers involved in matching fin whales as a 'blind experiment.'

It is hoped that results will be presented at the next Scientific Committee meeting. The TAG **recommends** that the IWC-POWER catalogues are held at the IWC Secretariat. Where there are existing North Pacific catalogues it **recommends** that the IWC photographs are held within those (e.g. humpback and killer whales). It **reiterates** that use of IWC photographs needs to follow the IWC data request process.

The TAG also **re-emphasises** the importance of sharing information with other researchers in the region working on photo-identification and welcomed efforts to ensure this.

Table 9

Summary of status of biopsy data analyses for IWC-POWER data. Numbers of samples of blue, sperm and killer whales preclude analyses of these data alone but they are being analysed as part of wider study by Lang *et al*. A proposal for future genetic analyses is being developed for consideration at the 2016 meeting.

Species	Analysts	References	Schedule
Fin whale	ICR		Preliminary 2017
Sei whale	ICR	Kanda *et al.* (2013)	2016
Bryde's whale	ICR		Preliminary 2016

7.3.3 Biopsy samples

The existing biopsy samples collected during previous IWC-POWER cruises are being archived at the SWFSC. The TAG would like to thank SWFSC for continuing to undertake this essential work.

As discussed under sightings data, the TAG recommended that analyses of the available data be identified that would allow the effective planning in the medium-term in light of the agreed objectives and these analyses be submitted to the next Scientific Committee meeting. At present the proposed and ongoing analyses utilising POWER biopsy samples is in Table 8. Since there are biopsy samples collected from the North Pacific that are being collected under other programs the TAG **recommends** that other researchers are contacted to determine if collaborative analyses can be conducted.

8. INTEGRATED STRATEGY TO ACHIEVE SHORT-MEDIUM GOALS

8.1 Short-term plan (up to 2019)

As discussed above (Item 3.1), the TAG confirmed that the short-term plan should incorporate the Bering Sea. This is summarised in Fig. 3 and in the work plan given under Item 9. However, it recognised that it is possible that the Scientific Committee may also wish for the IWC-POWER programme to operate in the Okhotsk Sea depending upon progress with national programmes.

8.1.1 Research area, boundaries and seasons
Given the size and complexity of the Bering Sea region and the relatively poor weather conditions that meant that a target distance of 35-40 n.miles per day was appropriate, the TAG **agreed** that to adequately cover the Bering Sea would take three years with one vessel. In formulating a year- and strata-based strategy to survey the entire Bering Sea, there is a tension between uncertainties in obtaining permits to survey in Russian waters and potentially influential environmental gradients (i.e., bathymetry) that exist in the region. The target distance for good weather areas (such as those in recent years where the main target species was Bryde's whales) was 70 n.miles.

Taking advantage of the three-year time frame to survey the Bering Sea, a design was formulated that splits the region into three survey blocks of roughly the same area (see Fig. 7); each block will be covered in a single year. The two northern blocks (northeast and northwest) both straddle the shelf-break, and reach from shallower coastal waters, and through to deep waters; placing tracklines along this gradient will give the best chance of identifying any potential bathymetry-driven patterns in whale densities. The southern block covers the deeper water region towards the Aleutian Islands.

8.1.2 Survey method
The TAG **agrees** that the previously employed survey methods be used but that details be finalised next year (e.g. with respect to whether IO mode is employed).

8.1.3 Research permits
In light of past difficulties encountered in obtaining permits to operate in Russian waters the TAG **recommends** that the northeastern block (in US and international waters) is surveyed in 2017. The issue of permits is discussed further under Item 8.3.

8.2 Medium-term plan (6-10 years)
The TAG has frequently indicated that it will not be possible to finalise plans for the medium-term programme without reviewing the results from the short-term programme. In order for this work to be completed in a timely fashion, the TAG has agreed the process described under Item 7 and summarised in the workplan given under Item 9. Taking into account previous discussions, and examining the information available to date on the priority species given in Table 2, it seems clear that if information on trends is to become available in a timely fashion under IWC-POWER, then effort must be made to incorporate more than one vessel in the programme. This general issue is discussed further under Items 8.3.2 and 8.3.3.

The TAG also **reiterated** that the IWC-POWER cruises as presently implemented (i.e. with respect to acceptable sightings conditions) will not provide satisfactory estimates of abundance for common minke whales - the species is considered of low 'direct' priority (see Table 2).

One of the medium-term objectives is to, if feasible, estimate abundance of sperm whales. An accepted survey method that accounts for the long dives times of sperm whales is combining the typical visual line transect data with passive acoustic detections of sperm whales.

8.3 Co-ordination and logistics
8.3.1 Permits
The TAG recognised that the issue of permits (both for permission to operate in national waters and with respect to CITES) is an important component of IWC-POWER logistics. After the agreement between Japan and the USA in 2013 with respect to CITES, it was noted that at least some US waters are expected to be covered in all of the proposed cruises up to 2019. There is no CITES permit requirement for biopsy samples entering and existing the US EEZ which were collected on the High Seas. However, if biopsy samples are collected in the US EEZ, it is necessary that a NOAA person be on the IWC-POWER vessel as was the case for the 2015 IWC-POWER cruise.

The TAG noted that part of the waters of the Bering Sea projected to be covered in 2018 and 2019 are within the EEZ of the Russian Federation. The application needs to be presented formally 6 months prior to entering the EEZ, as noted above, the TAG **recommends** that efforts to begin the permitting process begin as soon as practical. It was noted that since the vessel must pass through the 'checkpoint' set by the Russian coast guard when entering and leaving the EEZ, there is a need for more transit time than usual. It is necessary for Russian observer(s) to be present during the cruise. Biopsy, sightings and photo identification work will be undertaken. The Memorandum of Co-operation on gray whales (signed to date by Japan, Russian Federation and the USA) should prove useful in this regard as gray whales are likely to be seen within the area. The TAG also **recommends** that a Russian scientist be invited to attend next year's TAG/Planning meeting.

8.3.2 Participation of other range states in IWC-POWER and Co-ordination with other research activities
The TAG **reiterates** the importance of other range states becoming involved in the IWC-POWER programme. It notes that national research by a number of range states can contribute to the aims of the programme even if particular activities are not directly developed by the IWC Scientific Committee.

It **recommends** that the Scientific Committee and IWC member range states consider how best these activities can be incorporated in a co-ordinated way to further the long term objectives of IWC POWER as endorsed by the Commission. To assist this process it **recommends** that the IWC Secretariat announce the planned cruises for 2016-19 as soon as possible. It also **agrees** that Palka contacts DeMaster with respect to co-ordinating research activities for the 2017-19 period. It also noted that the US National Marine Fisheries Service is planning to conduct two abundance sighting surveys in the North Pacific during 2016: a 60-day survey of the Hawaiian EEZ (dates not yet finalised) and a 30-day survey in August 2016 in the California Current region. Palka will contact the relevant organisers with information on the IWC-POWER effort in or near these areas.

9. WORK PLAN (UP TO OCTOBER 2017)

See Table 10 for the work plan up to October 2017.

10. ADOPTION OF REPORT

The meeting closed at 13:30 on 9 October 2015 after reviewing those parts of the report that were available. Donovan circulated a near-final version for comment on 10 October and the final report was agreed by email on 21 October 2014.

Kitakado thanked the participants for their hard work and in particular thanked the Cruise Leader, Matsuoka, for processing the 2015 data so promptly. He also thanked the rapporteurs. The participants thanked Kitakado for his efficient handling of the meeting and noted that considerable work was needed as outlined under Item 9. The meeting also thanked the Fisheries Agency of Japan for the excellent working environment.

Table 10
IWC-POWER work plan.

Item	Activity	Responsible persons	Time
(1)	Complete validation of IWC-POWER sightings and effort data for the period up to the 2014 cruise and 2015 if possible.	Hughes and Matsuoka	March 2016
(2)	Encourage collaboration with other groups holding: genetic samples; individual identification data; marine debris data (direct and/or through website); other species data (e.g. turtles, seals).	TAG and Secretariat	March 2016
(3)	Complete importation and classification of 2015 IWC-POWER photographs into the IWC Lightroom catalogue	Taylor and Donovan	March 2016
(4a)	Develop proposal for spatial analyses of sightings data to inform *inter alia* medium-term plans for submission to SC/66b.	Kitakado (with TAG)	By SC/66b
(4b)	Compile a list of habitat-related information sources for the time frame of the IWC POWER cruises to contribute to 4a.	Palka and Matsuoka	By SC/66b
(5)	Develop proposal for analyses of genetic data to inform *inter alia* stock structure discussions related to medium-term plans.	Lang (convenor WG on SD) with Pastene and TAG	By SC/66b
(6)	Develop integrated proposal for onboard data collection system and long-term database.	TAG Palka (with relevant members of TAG)	By SC/66b
(7a)	Submit results of preliminary abundance estimate analyses for Bryde's whales to SC/66b following advice provided in this report.	Hakamada and colleagues	By SC/66b
(7b)	Undertake review of angle/distance experiments following advice given in this report (and relevant to 7a).	Hakamada and colleagues	By SC/66b
(8)	Develop a matching exercise to compare different ID catalogues with data from IWC-POWER.	Donovan, Taylor, Cooke	By SC/66b
(9)	Announce the POWER cruises for 2016-19 and encourage other range states to join the programme.	Secretariat and TAG	Begin now and finalise at SC/66b
(10)	Begin work on obtaining permits for POWER cruises south of the Bering Sea in the EEZs of Russia and the USA.	Okazoe, Donovan, Palka and DeMaster	Begin now and report progress at SC66b
(11)	Update 'Guide for Researchers' (paper sheets only as backup).	Matsuoka and Donovan	Finalise at SC/66b
(12)	Develop detailed proposal for the 2017 cruise to submit to SC/66b.	Matsuoka (Planning Group)	By SC/66b
(13a)	Liaise with the NMFS on their surveys of the Hawaiian EEZ and California Current with respect to 2016 survey (see 9b).	Palka	By SC/66b
(13b)	Conduct 2016 cruise in area shown in Fig. 3.	Cruise Leader/team	July-August 2016
(14)	Review progress on analyses recommended above and finalise plans for 2017 IWC-POWER cruise (invite Russian scientists).	TAG/Planning Group	October 2016
(15)	Develop an initial proposal for the medium-term (post-2020) programme for consideration at SC/66b.	TAG/Planning Group	Up to SC/67a (May 2017)
(16)	Develop proposal for the 2018/19 cruises in Bering Sea to submit to SC/66b.	Planning Group	Up to SC/67a (May 2017)
(17)	Conduct 2017 cruise.	Cruise Leader/team	July-August 2017
(18)	Review results of analyses recommended above, refine proposal for medium-term and finalise plans for 2018 IWC-POWER cruise.	TAG/Planning Group	October 2017

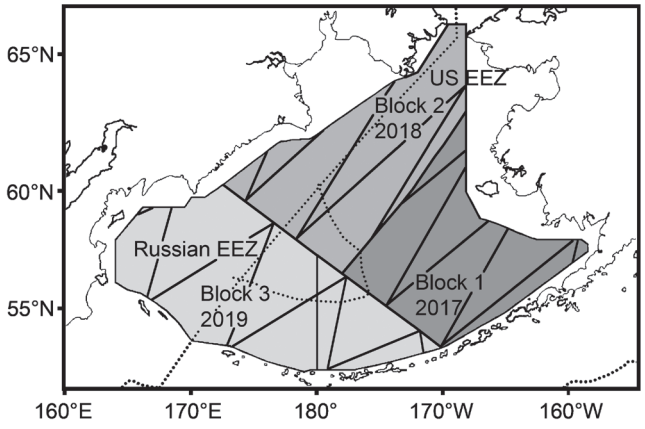

Fig. 7 Proposed survey blocks and preliminary tracklines to cover the Bering Sea from 2017-19.

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Annex A

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Annex B

Agenda

1. Introductory items
   - 1.1 Opening remarks and welcoming address
   - 1.2 Election of Chair
   - 1.3 Adoption of Agenda
   - 1.4 Appointment of rapporteurs
   - 1.5 Review of documents
2. Review of the survey results from 2010-2014
   - 2.1 Summary of sightings
   - 2.2 Review of the SC recommendations
3. Objectives and priorities
   - 3.1 Long-term (incl. information gaps)
   - 3.2 Medium-term (incl. information gaps)
4. Stock structure and movements
   - 4.1 Genetics
     - 4.1.1 Available genetic samples
     - 4.1.2 Efficiency of approaches to obtain sufficient samples
   - 4.2 Individual identification (photo-identification and genetic)
     - 4.2.1 Efficiency of approaches
   - 4.3 Telemetry
5. Distribution, abundance and trends
   - 5.1. Visual survey methods
     - 5.1.1 Survey methods and modes given resources and priority species
     - 5.1.2 Survey design
     - 5.1.3 Angle and distance experiments
     - 5.1.4 Estimation of variance
     - 5.1.5 Environmental factors
   - 5.2 Mark-recapture methods
   - 5.3 Acoustic methods
6. Other potential associated studies
   - 6.1 Oceanographic studies
   - 6.2 Marine debris
   - 6.3 Other
7. Data collection, storage and analyses
   - 7.1 On board recording
     - 7.1.1 'Information for researcher'
     - 7.1.2 ICR automated data acquisition system
     - 7.1.3 Potential software/hardware systems
   - 7.2 Long-term database
   - 7.3 Logistics of data analysis
     - 7.3.1 Sightings data
     - 7.3.2 Photo-identification data
     - 7.3.3 Biopsy samples
8. Integrated strategy to achieve short-medium goals
   - 8.1 Short-term plan (up to 2017 or 2018)
     - 8.1.1 Research area boundary, period, etc.
     - 8.1.2 Survey method
     - 8.1.3 Permits
   - 8.2 Medium-term plan (6-10 years)
   - 8.3 Co-ordination and logistics
     - 8.3.1 Permits
     - 8.3.2 Participation of other range states in IWC-POWER
     - 8.3.3 Co-ordination with other research activities
9. Work plan
10. Adoption of the Report

Annex C

List of Documents

1. International Whaling Commission. 2016. Report of the Meeting of the IWC-POWER Technical Advisory Group (TAG), 8-10 October 2014, Tokyo, Japan. *J. Cetacean Res. Manage. (Suppl.)* 17:443-58.
2. International Whaling Commission. 2015. Report of the Planning Meeting for the 2015 IWC-POWER Cruise in the North Pacific, 11-12 October 2014, Tokyo, Japan. *J. Cetacean Res. Manage. (Suppl.)* 17:459-70.
3. International Whaling Commission. 2016. Report of the Scientific Committee. *J. Cetacean Res. Manage. (Suppl.)* 17:1-92 (extracts).
4. International Whaling Commission. 2016. Report of the Scientific Committee. Annex G. Report of the Sub-Committee on In-Depth Assessments. *J. Cetacean Res. Manage. (Suppl.)* 17:224-49.
5. Cruise report of the 2015 IWC-POWER cruise.
6. Result of the distance and angle experiments.
7. Summary of the IWC-POWER surveys (2010-15).
8. Review of recommendations from cruise reports.
9. Plans on abundance estimation for North Pacific Bryde's whales based upon IWC-POWER data.
10. Proposed trackline for 2017-19 IWC-POWER in the Bering Sea (revised).
11. List of equipment.
12. North Pacific sighting survey data (ver 20151008).
